BOARD OF COUNTY COMMISSIONERS OF DOUGLAS COUNTY, KANSAS

WEDNESDAY, FEBRUARY 27, 2013
6:35 p.m.

CONSENT AGENDA

(1) (a) Consider approval of Commission Orders;
(b) Consider acquisition of Right-of-Way for Structure No. 6.00N-19.03E (Michael Kelly); and
(c) Consider waiving Purchasing Policy and approving Agreement for Engineering Services for E 1750 Road surfacing project from Baldwin City Limits to Route 12 (Keith Browning).

REGULAR AGENDA

(2) **CUP-12-00099**: Consider a Conditional Use Permit for sand excavation and extraction for Penny Sand Pit, approximately 434 acres located on the NE Corner of N 1500 Road & E 1850 Road. Submitted by Landplan Engineering, for William Penny & Van LLC, property owners of record. *(The Planning Commission voted at their October meeting to forward the CUP to the County Commission. The CUP application was returned to Planning Commission for a new public hearing after identification of error in mailed public notice for the October meeting. The Planning Commissions reconsidered the item at their joint January 30, 2013 meeting following re-notification and took the following action: The Lawrence-Douglas County Metropolitan Planning Commission voted 4 to 3 to recommend denial, and the Eudora Planning Commission voted 4 to 0 to recommend denial)* (PC Item 8; 1/30/13) Mary Miller will present the item.

(3) (a) Consider approval of Accounts Payable (if necessary)
(b) Appointments
-Lawrence Douglas County Metropolitan Planning Commission 05/13
-Heritage Conservation Council 05/13
-Property Crimes Compensation Board 04/13
(c) Public Comment
(d) Miscellaneous

(4) Adjourn

WEDNESDAY, MARCH 6, 2013
-Proclamation declaring March 10-17, 2013 as "Ninth Street Missionary Baptist Church Anniversary Celebration Week"

6:35 p.m.
Consider revised phasing schedule for Big Springs Quarry, CUP-12-09-06, located at 2 North 1700 Road, Lecompton. Submitted by Eric Bettis, for Mid-States Materials; operator of Big Springs Quarry. Mary Miller will present.

WEDNESDAY, MARCH 13, 2013

WEDNESDAY, MARCH 20, 2013 – Light Meeting

WEDNESDAY, MARCH 27, 2013

WEDNESDAY, MAY 22, 2013-Cancelled

Note*: The Douglas County Commission meets regularly on Wednesdays at 4:00 P.M. for administrative items and 6:35 P.M. for public items at the Douglas County Courthouse. Specific regular meeting dates that are not listed above have not been cancelled unless specifically noted on this schedule.*

DOUGLAS COUNTY PUBLIC WORKS
1242 Massachusetts Street
Lawrence, KS 66044-3350
(785) 832-5293 Fax (785) 841-0943
dgcopubw@douglas-county.com
www.douglas-county.com

Keith A. Browning, P.E.
Director of Public Works/County Engineer

MEMORANDUM

TO : Board of County Commissioners

FROM : Keith A. Browning, P.E., Director of Public Works
Michael D. Kelly, L.S., County Surveyor

DATE : February 22, 2013

RE : Drainage Structure Replacement; Structure No. 6.00N – 19.03E
Acquisition of Easement; Consent agenda

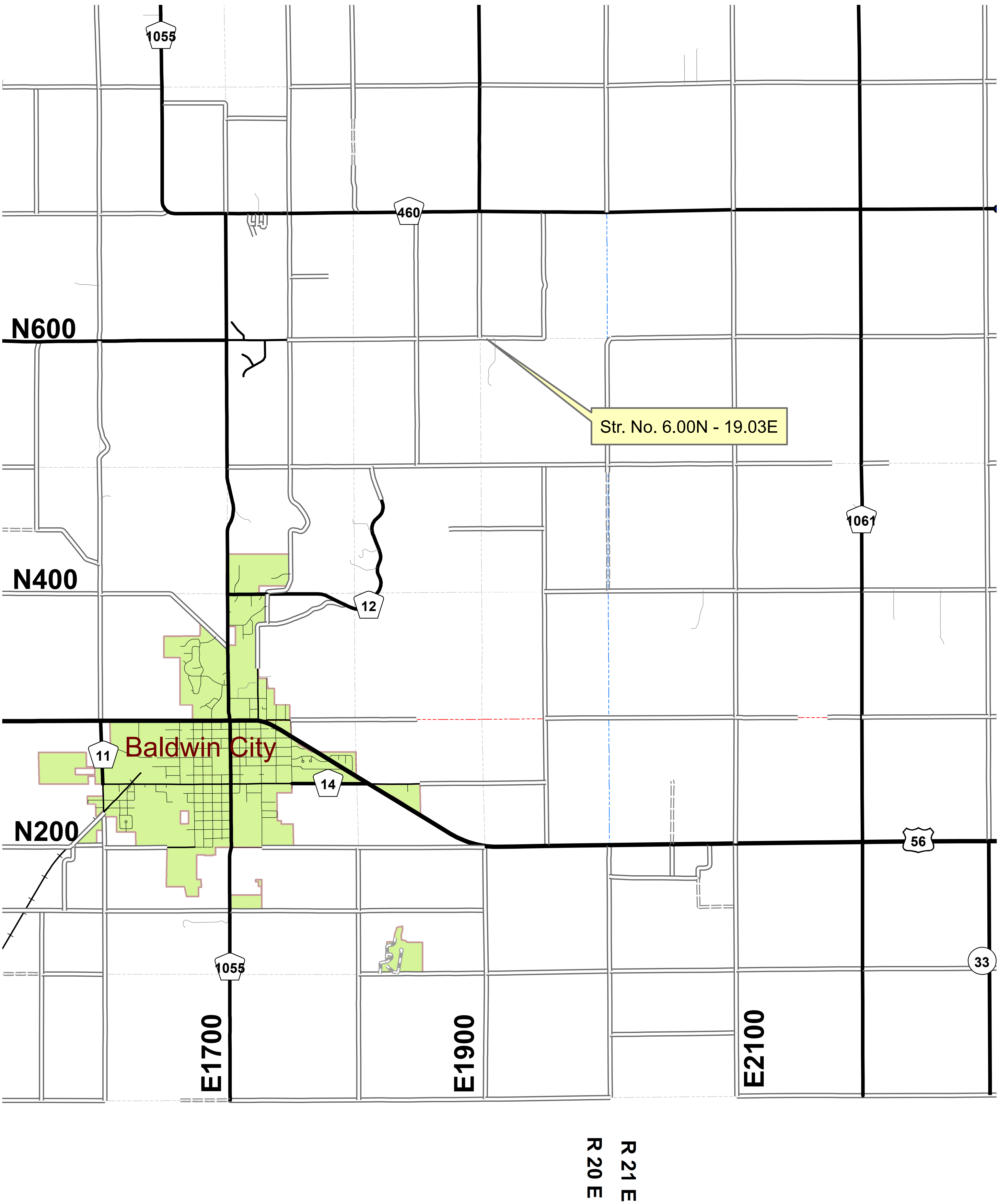
A project has been designed to replace a deficient drainage structure located approximately 2 miles southeast of Vinland on N600 Road. Plans were developed in-house and negotiations with the pertinent landowners for permanent easement have been completed.

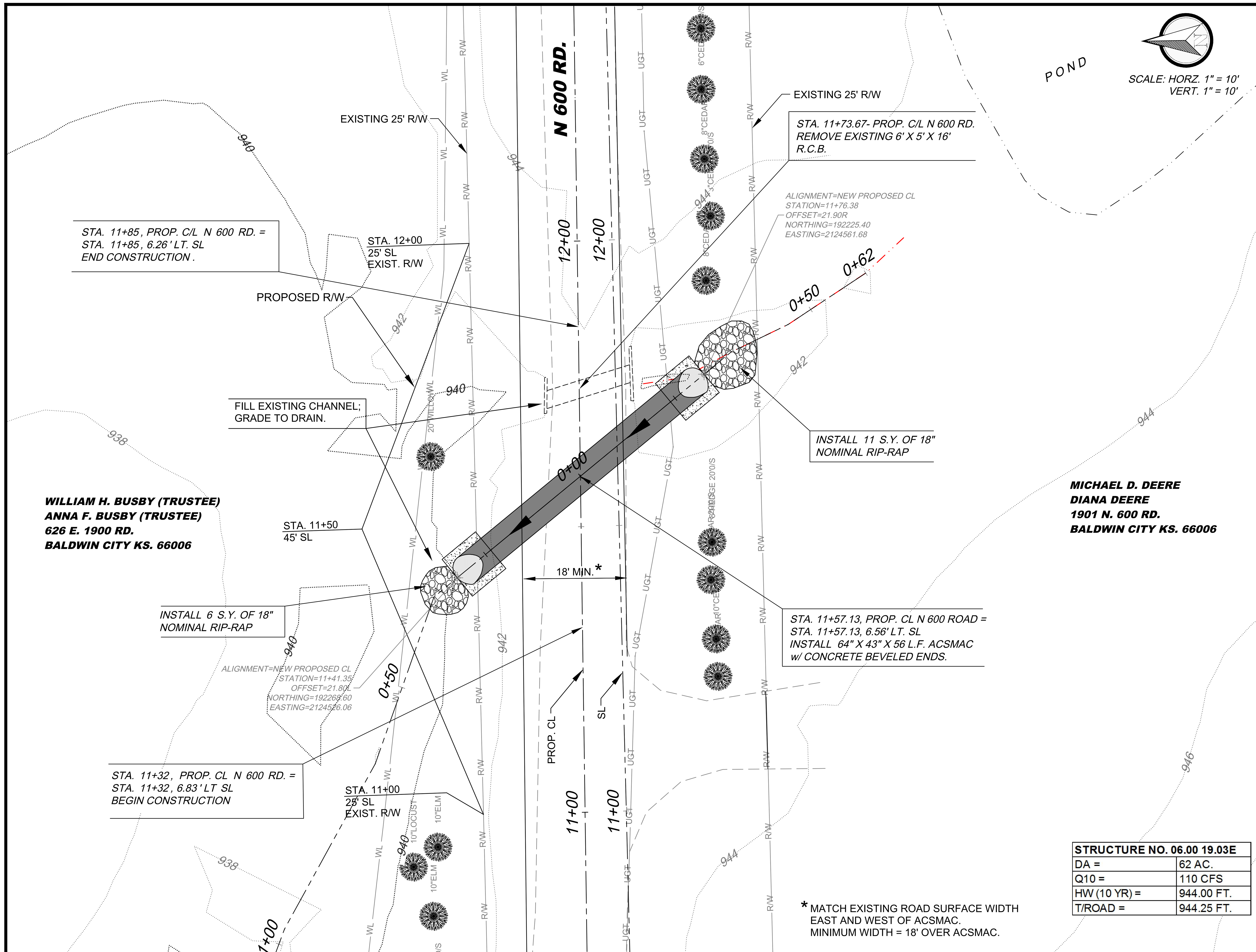
Construction is planned for March 2013 and will be accomplished using county personnel.

To ensure the proper completion of a necessary construction project approval is recommended for the attached CONTRACT's FOR HIGHWAY PURPOSES.

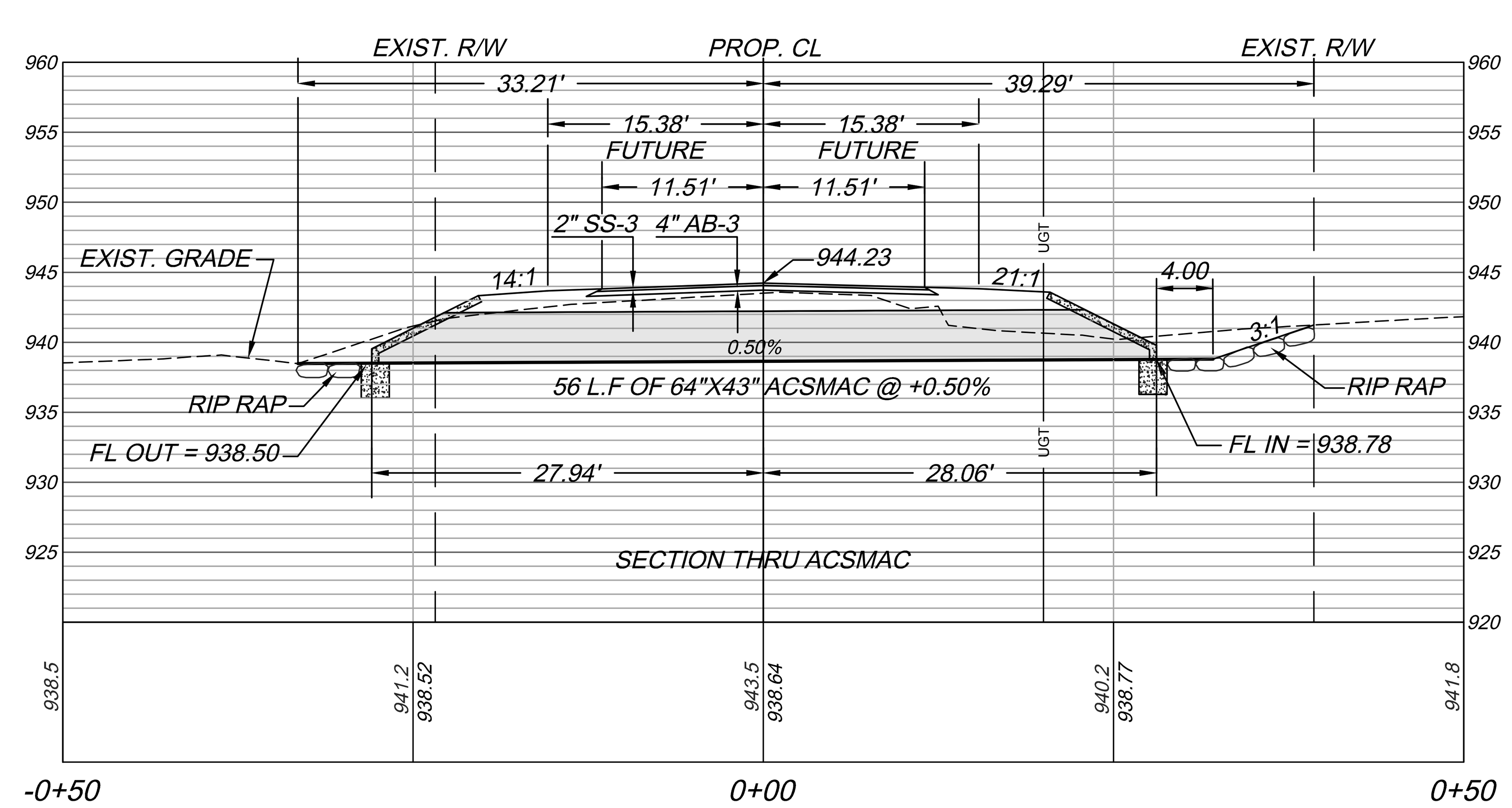
ACTION REQUIRED: Consent agenda approval of the CONTRACT's FOR HIGHWAY PURPOSES for Drainage Structure No. 6.00N – 19.03E.

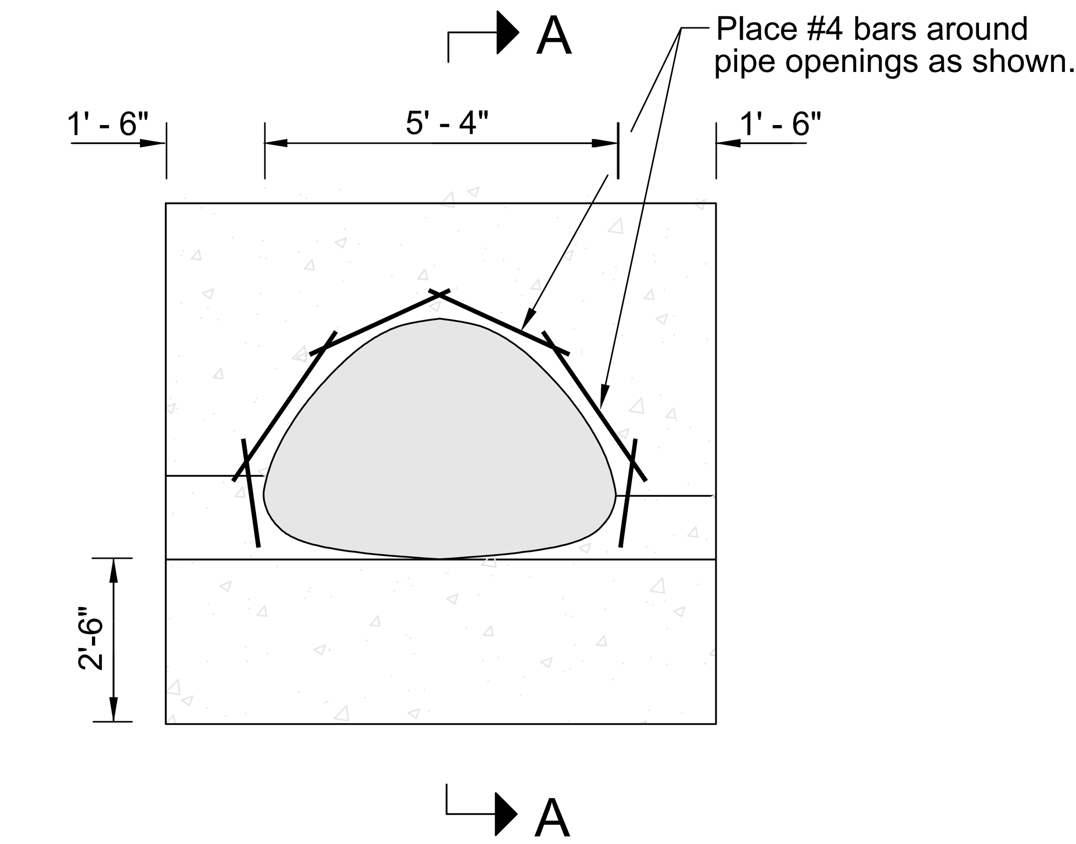
Structure No.
6.00N - 19.03E



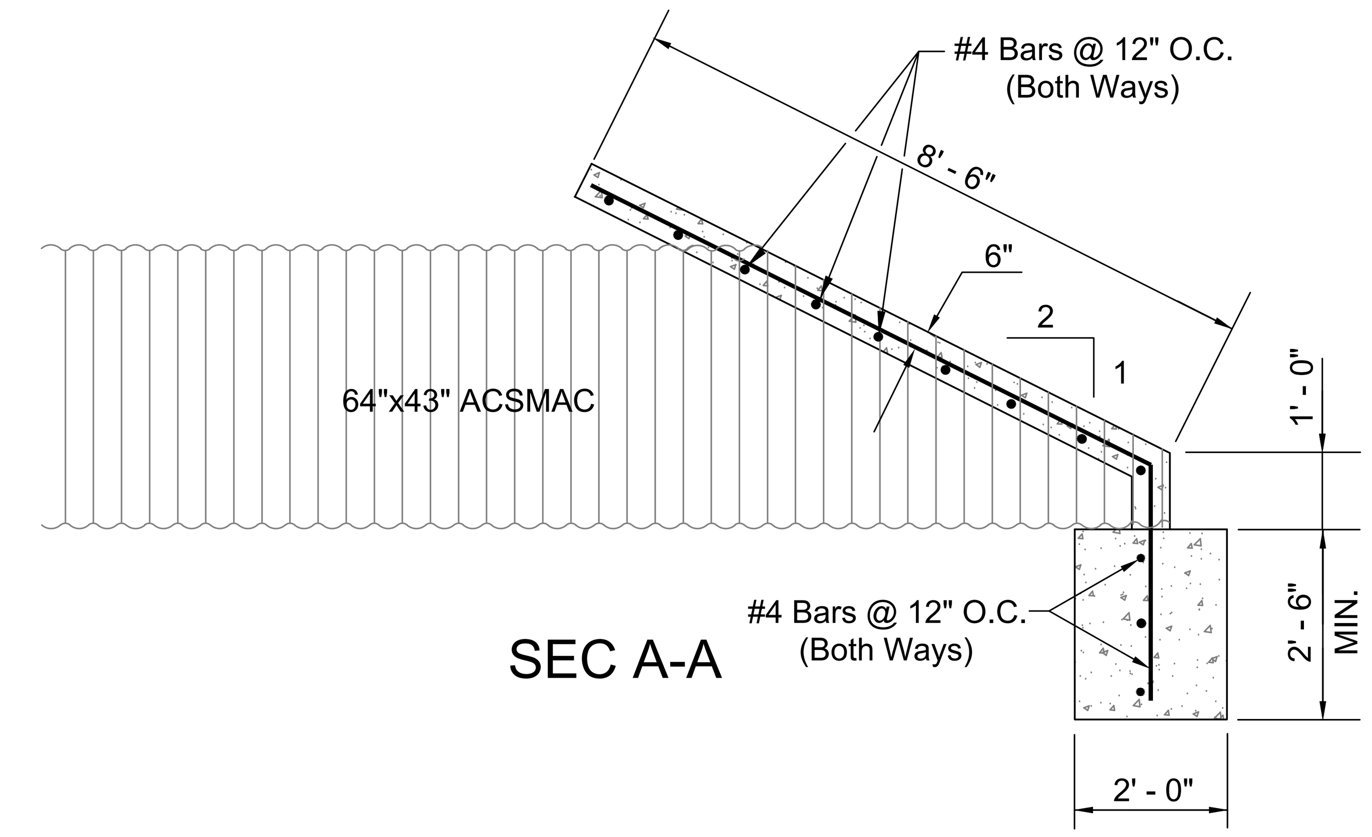


STRUCTURE NO. 06.00 19.03E	
DA =	62 AC.
Q10 =	110 CFS
HW (10 YR) =	944.00 FT.
T/ROAD =	944.25 FT.

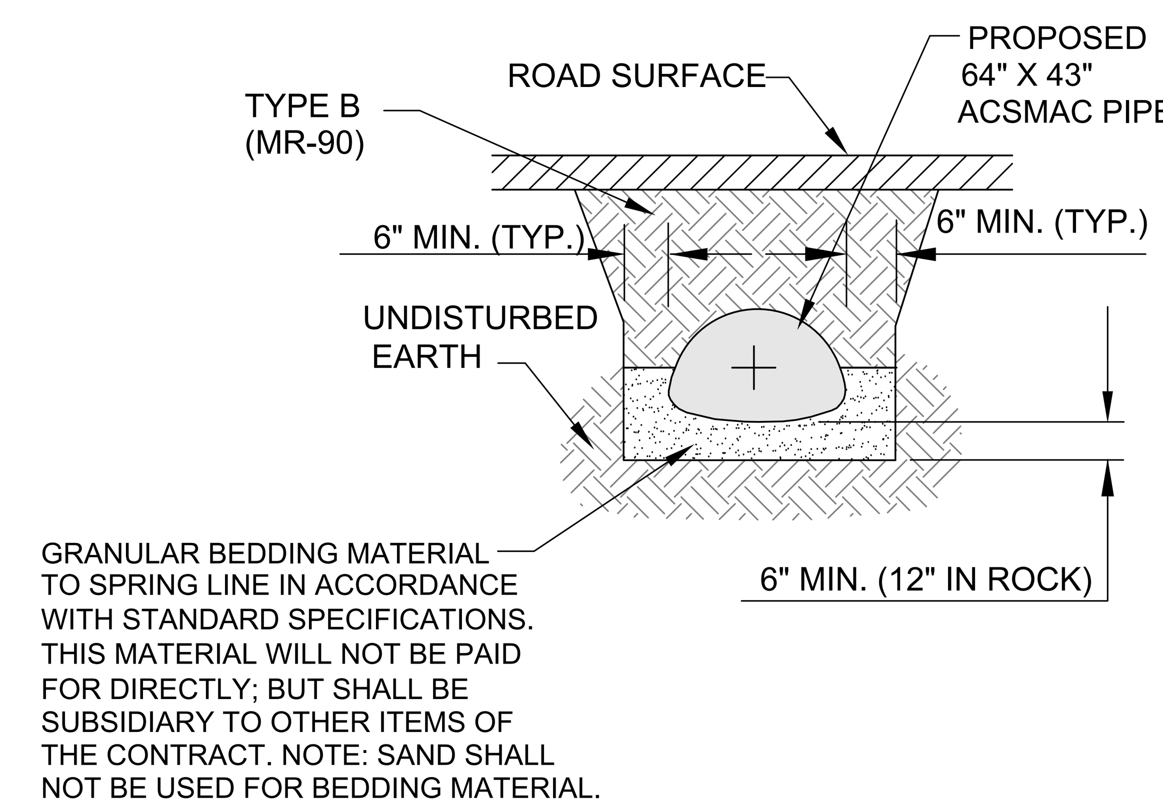




CONCRETE BEVELED END DETAIL



SEC A-A



TYPICAL TRENCH DETAIL

BM #1
STA. 10+00 = 5/8" BAR LOCATED ON THE N.W. CORNER SEC 24, T14S, R20E
N. 192236.73
E. 2124385.12
ELEV. = 944.01

SECTION CORNER INFORMATION

STATION	SECTION CORNER	RCODE	SECTION CORNER COORDINATE		ELEVATION	CORNER STATUS
	NL 1/4 CORNER SEC. 24-T14-R20	T23N	N: 192303.192	E: 2127044.392	1002.44	FOUND RECORD
10+00	NW CORNER SEC. 24-T14-R20	T21N	N: 192236.51	E: 2124385.272	944.53	FOUND RECORD
	NL 1/4 CORNER SEC. 23-T14-R20	T19N	N: 192139.191	E: 2121738.965	919.98	FOUND RECORD

Douglas County Public Works
1242 Massachusetts
Lawrence, Kansas 66044

Project: CULVERT REPLACEMENT FOR N 600 ROAD
Project No.: 0600/1903
Designed By: A.S. Drawn By: L.H.
Checked By: T.G. Date: 11/1/2012

STRUCTURE NO. 06.00N 19.03E
CHANNEL PLAN & PROFILE & PROPOSED R/W
SHEET 2 OF 4

CULVERT REPLACEMENT FOR N 600 ROAD

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Keith A. Browning, P.E.
Director of Public Works/County Engineer

MEMORANDUM

To : Board of County Commissioners

From : Keith A. Browning, P.E., Director of Public Works/County Engineer KAB

Date : February 21, 2013

Re : Consider approving Agreement for Engineering Services
E 1750 Road surfacing from Baldwin City Limits to Route 12
Project No. 2013-5

The 2013 CIP includes a project to chip seal E 1750 Road from the Baldwin City limits to Route 12. The project will include adding rock base material to the road, and priming and double chip sealing the road. The project will likely also include some minor grading to facilitate drainage. Project costs will be shared 50/50 with Baldwin City. Douglas County will contract for engineering design services, let a construction contract, and inspect the construction. We will invoice Baldwin City for 50% reimbursement.

BG Consultants conducted a preliminary study on improvements to this road. They are very familiar with this and other roads and infrastructure in Baldwin City, and are well qualified to perform on this project. We recommend contracting with BG Consultants for this work.

Attached are two (2) original copies of an Agreement for Engineering Services with BG Consultants, Inc. with a not-to-exceed cost of $21,885.72.

Action Required: Waive Purchasing Policy requirements, and execute two (2) original copies of the attached agreement with BG Consultants, Inc. at a not-to-exceed cost of $21,885.72 for engineering services to chip seal E 1750 Road from the Baldwin City limits to Route 12.

Project No. 2013-5
E 1750 Road, Baldwin City Limits to Route 12
ENGINEERING SERVICES AGREEMENT

THIS Engineering Services Agreement is entered into by and between Douglas County, Kansas ("County") and **BG Consultants, Inc.** ("Engineer"), as of the ___________ day of ________________ 2013 (the "Effective Date").

RECITALS

WHEREAS, County desires to employ Engineer to provide professional engineering services in the design of certain road(s) in Douglas County, Kansas, in connection with Douglas County Project No. 2013-5 (the "Project"); and

WHEREAS, Engineer agrees to provide such services.

TERMS OF AGREEMENT

NOW THEREFORE, in consideration of the promises contained in this Agreement, County employs Engineer and Engineer agrees to provide professional engineering services as follows:

I. DEFINITIONS

In addition to other terms defined in the body of this Agreement, the following terms shall have the meanings ascribed herein unless otherwise stated or reasonably required by this Agreement, and other forms of any defined words shall have a consistent meaning:

"Additional Services" means any services requested by County which are not covered by Exhibit A.

"Agreement" means this contract and includes change orders issued in writing.

"County Engineer" means the person employed by County with the title of County Engineer, who is licensed to practice engineering in the State of Kansas.

"Engineer" means the company or individual identified in the preamble of this Agreement. Engineer shall employ for the services rendered engineers, architects, landscape architects, and surveyors licensed, as applicable, by the Kansas State Board of Technical Professions.

"Contract Documents" means those documents identified in the Contract for Construction of the Project, including Engineering Documents. All terms defined in the General Conditions of the Contract for Construction shall have the same meaning when used in this Agreement unless otherwise specifically stated, or in the case of a conflict, in which case the definition used in this Agreement shall prevail in the interpretation of this Agreement.

"Engineering Documents" means all plans, specifications, reports, drawings, tracings, designs, calculations, computer models, sketches, notes, memorandums and correspondence related to the Engineering Services.

"Engineering Services" and "Services" mean the professional services and other acts or duties required of Engineer under this Agreement, together with Additional Services as County may request and as evidenced by a supplemental agreement pursuant to the terms of this Agreement.

"Project" means the Douglas County project identified above in the Recitals.

"Subsurface Borings and Testing" means borings, probings and subsurface explorations, laboratory tests and inspections of samples, materials and equipment, and appropriate professional interpretations of all of the foregoing.

II. COMPENSATION

Engineer's compensation and related matters are as follows:

A. MAXIMUM TOTAL FEE AND EXPENSE

Engineer's fee shall be based on the actual hours expended on the Project at the rates indicated in the attached Estimate of Engineering Fee (attached hereto as Exhibit B and incorporated herein by reference) and the actual reimbursable expenses permitted under this Agreement and incurred on this Project, with the fee and reimbursable expenses not to exceed $21,885.72 ("Total Maximum Fee"). The Total Maximum Fee is based on the scope of Services outlined in Exhibit A, attached hereto and incorporated herein by reference, which Services shall be completed on or before **September 1, 2013.** Engineer's fees and expenses shall not exceed the amounts for each phase as detailed in Exhibit B. Additional or alternative methods of compensation shall be paid only with written approval of the County Engineer.

B. HOURLY RATE

Any Additional Services which are not set forth in this Agreement will be charged on the basis of the hourly rate schedule in Exhibit B and reimbursable expenses not contemplated in this Agreement will be charged at actual cost. No Additional Services or costs shall be incurred without written approval by County.

C. REIMBURSABLE EXPENSES

Reimbursable expenses shall be included in the Total Maximum Fee and shall be reimbursed at Engineer's actual cost, without mark-up. Reimbursable expenses must be authorized by County and include expenses of transportation in connection with the Project, expenses in connection with authorized out-of-town travel, long-distance communications, expenses of printing and reproductions, postage and facsimile transmissions, expenses of renderings and models requested by County, and other costs as authorized by County. Reimbursable expenses will not include overhead costs or additional insurance premiums, which are included in the hourly rate structure. Unit rates for reimbursable expenses are included in Exhibit B. Records documenting reimbursable expenses shall be made available to County if requested in writing. Production of these documents shall be made at Engineer's office during normal business hours within a reasonable time of request, at a date and time mutually convenient to both parties.

D. SALES TAX EXCLUDED

Compensation as provided for herein is exclusive of any sales, use or similar tax imposed by taxing jurisdictions on the amount of compensation, fees or services. Should such taxes be legally imposed, County shall reimburse Engineer for such taxes in addition to the contractual amounts provided. Engineer, however, shall use County's sales tax exemption where applicable, and County need not reimburse Engineer for sales or use taxes Engineer pays in transactions legally exempt from such tax.

E. BILLING

Engineer shall bill County monthly for all its fees and reimbursable expenses. Monthly pay requests must generally be received by the 5th day of the month. The bill submitted by Engineer shall itemize the Services and reimbursable expenses for which payment is requested, and shall be deemed to include a representation by Engineer to County that the Services have proceeded to the point stated in the bill and that amounts requested in the bill are due and owing pursuant to this Agreement. County agrees to pay Engineer within 10 days after approval by the governing body or 30 days after the invoice is received, whichever is later.

F. COUNTY'S RIGHT TO WITHOLD PAYMENT

In the event County becomes credibly informed that any material representations of Engineer provided in its monthly billing are wholly or partially inaccurate, County may withhold payment of disputed sums then, or in the future, otherwise due Engineer until the inaccuracy and the cause thereof is corrected to County's reasonable satisfaction. In the event County questions some element of an invoice, that fact shall be made known to Engineer as soon as reasonably possible. Engineer will assist in resolution of the matter and transmit a revised invoice if necessary. County shall pay the undisputed portion of any invoice as provided in Paragraph E above.

G. PROGRESS REPORTS WITH PAY APPLICATIONS

A written progress report, as set out in <u>Exhibit C</u> (attached hereto and incorporated herein by reference) must be submitted with each monthly bill, indicating the percentage completion of each specific design task and those tasks that will be performed the following month. This report will serve as support for payment to Engineer.

H. CHANGES IN SCOPE

For substantial modifications in authorized Project scope and/or substantial modifications of drawings and/or specifications previously accepted by County, when requested by County and through no fault of Engineer, Engineer shall be compensated for the time required to incorporate such modifications at Engineer's standard hourly rates per <u>Exhibit B</u>. An increase in Total Maximum Fee or contract time, however, must be requested by Engineer and must be approved through a written supplemental agreement prior to performing such Services. Engineer shall correct or revise any errors or deficiencies in its designs, drawings or specifications without additional compensation when due to Engineer's negligence, error, or omission.

I. ADDITIONAL SERVICES

Engineer shall provide services in addition to those described in this Agreement, including Exhibit A, when such services are requested in writing by County. Prior to providing any such Additional Services, Engineer shall submit a proposal outlining the Additional Services and an estimation of total hours and a maximum fee, based upon the Fee Schedule in Exhibit B. Payment to Engineer, as compensation for these Additional Services, shall be in accordance with the Fee Schedule in Exhibit B. Reimbursable expenses incurred in conjunction with Additional Services shall be paid at actual cost. Reimbursable expenses will not include overhead costs or additional insurance premiums, which are included in the hourly rate structure. Unit rates for reimbursable expenses are included in Exhibit B. Records of reimbursable expenses pertaining to Additional Services shall be made available to County if requested in writing. Production of these documents shall be made at Engineer's office during normal business hours within a reasonable time of request, at a date and time mutually convenient to both parties.

III. RESPONSIBILITIES OF ENGINEER

Engineer shall furnish and perform the Engineering Services in all phases of the Project, as specifically provided in Exhibit A and which are required for the completion of the Project, according to the Project Schedule set forth in Exhibit D, attached hereto and incorporated herein. Such services shall include the following services during the following Project phases:

A. PRELIMINARY DESIGN PHASE

Engineer shall do the following during the preliminary design phase:

1. Services: Engineer shall provide the services during this phase as described in Exhibit A.

2. Preliminary Design Documents: Engineer shall furnish County with 3 copies of the preliminary design documents for review as set out in Exhibit A.

3. Probable Cost: Engineer shall furnish County an opinion of probable Project cost based on Engineer's experience and qualifications. If the probable cost exceeds the amount budgeted for the Project, County may terminate this Agreement at the completion of this phase. If directed by County, Engineer shall modify the drawings and specifications as necessary to achieve compliance with the budgeted construction cost, and be compensated as Additional Services.

B. FINAL DESIGN PHASE

Engineer shall do the following during the final design phase:

1. Services: Engineer shall provide the services during this phase as described in Exhibit A.

2. Final Design Documents: Engineer shall furnish County with raster files and hard copies of the final plans in an accepted format as specified in Exhibit A.

The raster files, as well as the hard copies, shall contain all required signatures from County and the signature and seal of the design engineer.

3. Contract Documents: County standard Contract Documents shall be used and Engineer shall furnish all details and specifications that are unique for the Project.

C. BIDDING PHASE

Engineer shall do the following during the bidding phase:

1. Services: Engineer shall provide the Services during this phase as described in Exhibit A.

2. Bids Exceeding Cost Estimate: If bids exceed the estimated probable Project cost, County may discuss with Engineer and the lowest responsible bidder ways to reduce the cost, and Engineer shall provide suggestions for reducing the Project costs. This discussion will be accomplished at no additional cost to County.

D. CONSTRUCTION PHASE

Engineer shall do the following during the construction phase:

1. Services: Provide the Services during this phase as described in Exhibit A.

2. Administration: County will provide in-house administration of the construction contract; however, Engineer shall consult with and advise County and act as County's representative when requested. If County requests, Engineer shall provide contract for construction administration and observation services as Additional Services.

3. Contract Interpretation: When requested by County, Engineer shall visit the site and issue necessary interpretations and clarifications of the Contract Documents. Engineer shall provide such services at no additional cost to County.

4. Additional Drawings: If, during construction, situations arise which require additional drawings or details, or revision of the plan drawings or details, Engineer agrees to provide such additional drawings or revisions at no additional cost to County when such changes are required to correct Engineer's errors or omissions in the original design and preparation of construction drawings. If additional drawings or details are required through no fault of Engineer, or are beyond its control, both parties agree to negotiate an equitable payment to Engineer for its services rendered, which shall be accomplished through a supplemental agreement.

5. Shop Drawings: Engineer shall review and take appropriate action on each contractor's shop drawings and samples, and the results of tests and inspections and other data which each contractor is required to submit for the limited purposes of checking for compliance with the design concept and

information shown in the Contract Documents. Such review shall not extend to means, methods, sequences, techniques, quantities, fabrication processes, procedures of construction, coordination of the work with other trades, or to safety precautions and programs incident thereto, all of which are the sole responsibility of the contractor, unless an obvious defect or deficiency exists, in which case Engineer shall advise County of such defect or deficiency so the same can be prevented.

E. GENERAL DUTIES AND RESPONSIBILITIES

Engineer shall have the following general duties and responsibilities:

1. Personnel: Engineer shall assign only qualified personnel to perform the Engineering Services. At the time of execution of this Agreement, the parties anticipate that the following individual will perform as the principal on this Project: David Hamby, P.E. ("Project Principal").
The Project Principal shall be the primary contact with County and shall have authority to bind Engineer. So long as the Project Principal remains actively employed or retained by Engineer, this individual shall continue to serve as the Project Principal.

2. Independent Contractor: Engineer is an independent contractor and as such is not an employee of County.

3. Special Services: Engineer may be called upon to serve as a witness in any litigation, arbitration, legal or administrative proceeding arising out of the Project. If Engineer is requested in writing by County to appear as a witness, Engineer will be paid its hourly fee as reflected on the Fee Schedule in Exhibit B; provided, however, that Engineer shall not be paid its hourly fee if the appearance is to defend Engineer's Engineering Services.

4. Subsurface Borings and Testing: If County requests subsurface boring or other tests for design, in addition to those described in Exhibit A, Engineer shall prepare specifications for the taking of the additional testing. Such testing may be provided by Engineer through other contractors. Payment to Engineer will be negotiated in writing.

5. Service by and Payment to Others: Any work authorized in writing by County and performed by a party other than Engineer or its approved subcontractors shall be contracted for and paid for by County directly to the third party. Fees for such work shall be subject to negotiation between County and the third party and shall be approved by County prior to the performance of any such work.

6. Subcontracting or Assignment of Services: Engineer shall not subcontract or assign any of the Engineering Services to be performed under this Agreement without first obtaining the written consent of County regarding the Services to be subcontracted or assigned and the firm or person proposed to perform the Services. Unless otherwise stated in County's written consent to a subcontract or assignment, no subcontract or assignment will release or discharge Engineer from any obligation under this Agreement.

7. Endorsement: Engineer shall sign and seal all final plans, specifications, estimates and engineering data furnished by Engineer. Any review or approval by County of any documents prepared by Engineer, including, but not limited to, the plans and specifications, shall be solely for the purpose of determining whether such documents are consistent with County's construction program and intent. No review of such documents shall relieve Engineer of its responsibility for their accuracy. It is Engineer's responsibility to verify the existence of any and all rights-of-way and easements, including temporary construction easements, that are necessary for the Project. Rights-of-way and easements shown on the plans shall have proper legal verification to prove their existence.

8. Professional Responsibility: Engineer will exercise reasonable skill, care and diligence in the performance of the Engineering Services as is ordinarily possessed and exercised by a licensed professional engineer performing the same services under similar circumstances. Engineer represents to County that Engineer is professionally qualified to provide such services and is licensed to practice engineering by all public entities having jurisdiction over Engineer and the Project.

9. Inspection of Documents: Engineer shall maintain all Project records for inspection by County during the term of this Agreement and for 3 years following the completion of the Project.

IV. RESPONSIBILITIES OF COUNTY

A. GENERAL DUTIES AND RESPONSIBILITIES

County shall have the following general duties and responsibilities:

1. Communication: County shall provide to Engineer information and criteria regarding County's requirements for the Project, examine and timely respond to Engineer's submissions, and give notice to Engineer whenever County observes or otherwise becomes aware of any defect in the Engineering Services.

2. Access: County shall procure and provide access agreements for Engineer to enter public and private property when necessary.

3. Program and Budget: County shall provide full information stating County's objectives, schedule, budget with reasonable contingencies, and necessary design criteria.

4. Other Engineers: County may contract with "specialty" engineers when such services are requested by Engineer.

5. Testing: County shall furnish any tests required to supplement the scope of services or tests required by law.

6. Bond Forms: County shall furnish all bond forms required for the Project.

7. Project Representative: County Engineer, or County Engineer's designee, shall represent County in coordinating the Project with Engineer, with authority to transmit instructions and define policies and decisions of County.

8. Payment: Pay Engineer its fees and reimbursable expenses in accordance with this Agreement.

V. PROJECT SCHEDULE

The Project Schedule is set forth in Exhibit D, attached hereto and incorporated by reference. Engineer shall perform the Engineering Services in a timely manner; provided, however, if, during its performance, for reasons beyond the control of Engineer, protracted delays occur, Engineer shall promptly provide written notice to County describing the circumstances preventing continued performance and Engineer's efforts to resume performance.

VI. SUSPENSION OR TERMINATION OF THE CONTRACT

A. SUSPENSION BY ENGINEER

Engineer may suspend performance of the Services under this Agreement if County consistently fails to fulfill County's material obligations under this Agreement, including County's failure to pay Engineer its fees and costs, within 15 days of Engineer's delivery to County of written notice of such default; provided, however, that Engineer may not suspend performance of Services based upon non-payment of fees or costs that is subject to a bona fide dispute, for which this Agreement authorizes County to withhold payment. Any such suspension shall serve to extend the contract time on a day for day basis.

B. TERMINATION BY ENGINEER

Engineer may terminate this Agreement upon 15 days written notice to County if (i) County suspends performance of the Services for its convenience for a period of 60 consecutive days through no act or fault of Engineer or a subcontractor or their agents or employees or any other persons or entities performing portions of the Engineering Services under direct or indirect contract with Engineer, or (ii) Engineer has suspended the performance of its Services for a period of 60 consecutive days pursuant to Section VI.A. above; and, during said 15 day written notice period, County has failed to cure its default. If Engineer terminates this Agreement, County shall pay Engineer such amounts as if County terminated this Agreement for its convenience pursuant to Section VI.E.

C. TERMINATION BY COUNTY FOR CAUSE

County may terminate this Agreement for cause upon 7 days written notice to Engineer: (i) persistently or repeatedly refuses or fails to supply enough qualified workers or proper materials; (ii) assigns or subcontracts any part of the Engineering Services without County's prior written consent; or (iii) otherwise is guilty of substantial breach of this Agreement; and, during said 7 day written notice period, Engineer fails to cure its default.

If County terminates this Agreement for cause, Engineer shall immediately transfer to County digital and mylar copies of all Engineering Documents completed or partially completed at the date of termination. In addition, County may without prejudice to any other rights or remedies of County, finish the Engineering Services for the Project by whatever reasonable method County may deem expedient, including through contract with an alternate engineer, and bill Engineer for the sum of the amounts County pays Engineer pursuant to this Agreement, plus the costs County incurs in completing the Engineering Services, reduced by the Total Maximum Fee. Upon request of Engineer, County shall furnish Engineer a detailed accounting of the costs incurred by County in completing the Engineering Services. If County terminates this Agreement for cause Engineer shall not be entitled to receive further payment until the Engineering Services are completed.

If the Engineer for any reason is not allowed to complete all the Services called for by this Agreement, the Engineer shall not be held responsible for the accuracy, completeness or constructability of the construction documents prepared by the Engineer if changed or completed by the County or by another party. Accordingly, the County agrees, to the fullest extent permitted by the law, to waive and release the Engineer, its officers, directors, employees, and subconsultants from any damages, liabilities or costs, including reasonable attorney's fees and defense costs arising from such change or completion by any other party of any construction documents prepared by the Engineer.

D. SUSPENSION BY COUNTY FOR CONVENIENCE

County may, without cause, order Engineer in writing to suspend, delay or interrupt the Engineering Services in whole or in part for such period of time as County may determine.

The Total Maximum Fee and contract time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption.

E. TERMINATION BY COUNTY FOR CONVENIENCE

County may, at any time, terminate this Agreement for County's convenience and without cause. Upon receipt of written notice from County of such termination for County's convenience, Engineer shall: (i) except for Engineering Services directed to be performed prior to the effective date of termination as stated in the notice, cease operations under this Agreement; and (ii) take actions necessary or that County may direct, for the protection and preservation of the Engineering Services and Engineering Documents.

If County terminates this Agreement for its convenience, Engineer shall immediately transfer to County digital and mylar copies of all Engineering Documents completed or partially completed at the date of termination. County shall compensate Engineer for all Services completed prior to receipt of the termination notice or performed pursuant to the termination notice. County need not pay, and Engineer waives, compensation for Engineering Services not actually provided, anticipatory profit or consequential damages.

VII. <u>GENERAL PROVISIONS</u>

A. DISPUTE RESOLUTION

County and Engineer agree that disputes relative to the Project should first be addressed by direct negotiations between the parties. If direct negotiations fail to resolve the dispute, the party initiating the claim that is the basis for the dispute shall be free to take such steps as it deems necessary to protect its interests; provided, however, that notwithstanding any such dispute and assuming County has not terminated this Agreement, Engineer shall proceed with the Services in accordance with this Agreement as if no dispute existed.

B. OWNERSHIP OF ENGINEERING DOCUMENTS

All documents and electronic files prepared or furnished by Engineer pursuant to this Agreement are instruments of Engineer's professional service, and Engineer shall retain an ownership and property interest therein. Engineer grants the County a perpetual license to use and modify instruments of Engineer's professional services for the purpose of constructing, occupying, maintaining, altering and adding to the Project and future projects relating to, incorporating, or in the vicinity of the Project. Topographic data collected by the Engineer pursuant to this Agreement shall be considered a part of the instruments of Engineer's professional service and the County's license to use this information pertains only to the portions of this data directly related to this Project. Reuse or modification of any such licensed documents, electronic files or other data by the County, shall be at the County's sole risk and without liability to Engineer, and the County agrees to indemnify and hold Engineer harmless from all claims, damages, and expenses, including attorney's fees, arising out of such reuse by the County or by others acting through the County, except the County does not agree to indemnify or hold engineer harmless from Engineer's own negligence.

C. INSURANCE

Engineer shall maintain throughout the term of this Agreement the following insurance coverage:

1. Professional Liability: Professional Liability Insurance in an amount not less than $1,000,000 per claim and in the annual aggregate, which insurance shall be maintained not only during the term of this Agreement but also for a period of 3 years after completion of the Project.

2. Commercial General Liability: Commercial General Liability Insurance in an amount not less than $1,000,000 per occurrence and $2,000,000 in the general aggregate. The policy shall include personal injury, products/completed operations, and contractual liability,

3. Worker's Compensation: Worker's Compensation Insurance in accordance with statutory requirements.

4. Employer's Liability: Employer's Liability Insurance in amounts not less than the following:

Bodily Injury by Accident	$100,000	(each accident)
Bodily Injury by Disease	$500,000	(policy limit)
Bodily Injury by Disease	$100,000	(each employee)

5. Automobile Insurance: Automobile Liability Insurance in an amount not less than $1,000,000 per accident to protect against claims for bodily injury and/or property damage arising out of the ownership or use of any owned, hired and/or non-owned vehicle.

6. Subcontractor's Insurance: If a part of this Agreement is subcontracted, Engineer shall either:

   a) Cover all subconsultants in its insurance policies; or
   b) Require each subconsultants not so covered to secure insurance which will protect against all applicable hazards or risks of loss in the amounts applicable to Engineer.

7. Valuable Papers Insurance. Valuable papers insurance to assure the restoration of any plats, drawings, notes or other similar data relating to the Engineering Services in the event of their loss or destruction.

8. Industry Ratings: Unless mutually agreed upon by County and Engineer to vary the requirements, Engineer shall provide County with evidence to substantiate that any insurance carrier providing insurance required under this Agreement satisfies the following requirements:

   a) Is licensed to do business in the State of Kansas;
   b) Carries a Best's Policyholder rating of A or better; and
   c) Carries at least a Class X financial rating.

All general and automobile liability insurance shall be written on an occurrence basis. County shall be shown as an additional insured on all required insurance policies except professional liability, automobile, and worker's compensation. Each required insurance policy shall contain a provision by which County must be given 30 days notice prior to any insurance policy cancellation. Engineer shall provide County with acceptable certificates of such insurance evidencing the required insurance coverage before County issues its Notice to Proceed, at County's reasonable request, from time to time during the term of this Agreement.

D. INDEMNITY

Engineer hereby agrees to indemnify and hold harmless County and its departments, divisions, officers, employees and elected officials from all loss, damage, cost and expenses, including reasonable attorneys' fees and expenses, incurred by or on behalf of any of the foregoing arising out of or related to personal or bodily injury or property damage, that to the extent arise from or related to the wrongful acts or negligent acts, errors or omissions of Engineer or its employees, agents or subconsultants. The provisions of this section shall survive the termination of this Agreement.

E. ENTIRE AGREEMENT; NO VERBAL AMENDMENTS

This Agreement constitutes the entire agreement between the parties and supersedes all prior agreements, whether oral or written, covering the same subject matter. This Agreement, including the Maximum Fee and contract time and other terms and conditions, may be amended only by a written supplemental agreement signed by County and Engineer, except in the case of an emergency situation, in which case County Engineer may give verbal and facsimile approval to be followed by a written and signed supplemental agreement. If notice of any change affecting the general scope of the Engineering Services or provisions of this Agreement, including, but not limited to, Maximum Fee and contract time, is a requirement of any insurance policy held by Engineer as a requirement of this Agreement, the provision of such notice shall be Engineer's responsibility.

F. APPLICABLE LAW

This Agreement shall be governed by, and is to be construed and enforceable in accordance with, the laws of the State of Kansas and the codes and established policies of County.

G. ASSIGNMENT OF AGREEMENT

This Agreement shall not be assigned or transferred by either party without the written consent of the other party.

H. NO THIRD PARTY BENEFICIARIES

Nothing contained herein shall create a contractual relationship with, or any rights in favor of, any third party.

I. FEDERAL LOBBYING ACTIVITIES (Only applies to projects receiving federal funds via County)

31 U.S.C. Section 1352 requires all subgrantees, contractors, and engineers who receive federal funds via County to certify that they will not use federal funds to pay any person for influencing or attempting to influence a federal agency or Congress in connection with the awarding of any federal contract, grant, loan or cooperative agreement. In addition, contract applicants, recipients and subrecipients must file a form disclosing any expenditures they make for lobbying out of non-federal funds during the contract period. Engineer shall obtain the necessary forms from County, execute such forms, and return such forms to County. Engineer shall also obtain executed forms from any of its subcontractors who fall within the provisions of the statute and provide such forms to County.

J. COVENANT AGAINST CONTINGENT FEES

Engineer warrants that it has not employed or retained any company or person, other than a bona fide employee working for Engineer, to solicit or secure this Agreement, and that it has not paid or agreed to pay any company or person, other than a bona fide employee, any fee, commission, percentage, brokerage fee, gift, or any other consideration contingent upon or resulting from the award or making of this Agreement. For breach or violation of this warranty, County may terminate this Agreement without liability or may, in its discretion, deduct from the contract price or otherwise recover the full amount of such fee, commission, percentage, brokerage fee, gift or contingent fee.

K. COMPLIANCE WITH LAWS

Engineer shall abide by applicable federal, state and local laws, ordinances and regulations applicable to this Project that are in effect as of the date of Services rendered until the Engineering Services required by this Agreement are complete. Engineer shall secure all occupational and professional licenses, permits, etc. from public and private sources necessary for the fulfillment of its obligations under this Agreement.

L. NOTICES

Any notice or other communication required or permitted by this Agreement shall be made in writing to the address specified below:

Engineer:	David Hamby, P.E. BG Consultants, Inc. 1405 Wakarusa Drive Lawrence, KS 66049
County:	Keith A. Browning, P.E. Douglas County, Kansas 1242 Massachusetts Lawrence, KS 66044

Nothing contained in this Section, however, shall be construed to restrict the transmission of routine communications between Engineer and County.

M. TITLES AND SUBHEADINGS

Titles and subheadings as used herein are provided only as a matter of convenience and shall have no legal bearing on the interpretation of any provision of the Agreement.

N. SEVERABILITY CLAUSE

Should any provision of this Agreement be determined to be void, invalid, unenforceable or illegal for any reason, such provision shall be null and void; provided, however, that the remaining provisions of this Agreement shall be unaffected thereby and shall continue to be valid and enforceable.

O. NON-DISCRIMINATION

Engineer agrees: (a) to comply with the Kansas Act Against Discrimination (K.S.A. 44-1001 et seq.) and the Kansas Age Discrimination in Employment Act (K.S.A. 44-1111 et seq.) and the applicable provisions of the Americans With Disabilities Act (42 U.S.C. 12101 et seq.) (ADA) and to not discriminate against any person because of race, religion, color, sex, disability, national origin or ancestry, or age in the admission or access to, or treatment or employment in, its programs or activities; (b) to include in all solicitations or advertisements for employees, the phrase "equal opportunity employer"; (c) to comply with the reporting requirements set out at K.S.A. 44-1031 and K.S.A. 44-1116; (d) to include those provisions in every subcontract or purchase order so that they are binding upon such subcontractor or vendor; (e) that a failure to comply with the reporting requirements of (c) above or if Engineer is found guilty of any violation of such acts by the Kansas Human Rights Commission, such violation shall constitute a breach of contract and the contract may be cancelled, terminated or suspended, in whole or in part, by County; and (f) if it is determined that Engineer has violated applicable provisions of ADA, such violation shall constitute a breach of contract and the contract may be cancelled, terminated or suspended, in whole or in part, by County.

P. WAIVER

A waiver by either County or Engineer of any breach of this Agreement shall be in writing. Such a wavier shall not affect the waiving party's rights with respect to any other or further breach.

Q. SUCCESSORS AND ASSIGNS

This Agreement shall be binding upon the directors, officers, partners, successors, executors, administrators, assigns, and legal representatives of the parties.

R. RELATIONSHIP OF PARTIES

Nothing contained herein shall be construed to make County a partner, joint venturer, or associate of Engineer, nor shall either party be deemed the agent of the other.

S. AUTHORITY TO SIGN

The individual signing this Agreement on behalf of Engineer represents that such person is duly authorized by Engineer to execute this Agreement on behalf of Engineer and, in doing so, that Engineer becomes bound by the provisions hereof.

IN WITNESS WHEREOF, the parties have executed this Agreement, effective as of the Effective Date.

ENGINEER:

BG Consultants, Inc.
(Name of Engineering Firm)

By: ______________________
Engineer's Authorized Signatory

David J. Hamby
Printed Name

Principal
Title

COUNTY:

DOUGLAS COUNTY, KANSAS by the BOARD OF DOUGLAS COUNTY, KANSAS COMMISSIONERS

By: ______________________

____
Printed Name
Title: Chair

ATTEST:

____

Douglas County, Clerk

Exhibits:

A. Scope of Services
B. Fee Schedule
C. Form of Progress Reports
D. Project Schedule
E. CAD Requirements (if referenced in Exhibit A)

Project No. 2013-5
E 1750 Road, Baldwin City Limits to Route 12
EXHIBIT A
SCOPE OF SERVICES

I. PROJECT LOCATION AND DESCRIPTION

Provide professional services described as follows: design road improvements for E 1750 Road, Baldwin City Limits to Route 12. Design shall include grading, pavement modification, drainage modifications that include ditch grading and culvert replacement or modification.

II. PRELIMINARY DESIGN PHASE (Field Check)

1. Meet with County staff to determine specific project needs and general project desires. Also, review and receive available information and plans. Project budget will be provided by County staff.

2. Perform design and cadastral surveys as required to prepare plan and profile sheets in order to provide sufficient control, location, and land information necessary to prepare a complete set of construction plans and to prepare any legal descriptions required for easement acquisition. All surveys and point coordinates for the Project must tie into and be in the Kansas State Plane (North Zone). Cadastral surveys shall include locating the position of pertinent PLSS corners (including quarter and sixteenth corners) pertaining to the project and shall conform to the accuracy standards as set forth by the Kansas State Board of Technical Professions. All survey data must be provided to County in digital format allowing insertion into AutoCad environment using standard fieldbook format (PNEZD space delimited).

3. Obtain information from utility companies who have facilities within the Project limits. Utility companies shall be required to locate their facilities within the Project limits. Include utility locations in survey data. Provide preliminary utility coordination. Horizontal location is required for all utilities.

4. Obtain ownership and easement information on the properties that abut the Project site. Copies of all ownership maps and recorded plats will be obtained from the Douglas County Public Works Department.

5. Determine horizontal and vertical alignment of the road.

6. ~~Prepare a hydrological study and analysis to establish recommendations concerning appropriate waterway opening for all drainage structures, length of the structure, and roadway profile~~.

7. Design any required storm sewer culverts to carry the 10 year storm event.

8. Review alternative design concepts, if needed, with the County prior to progressing to the detail aspects of the Project. Alternative concepts shall be discussed to determine the best horizontal and vertical alignments for the Project. County's concurrence in the selection of an alternate or preliminary

concept will be contingent on the accuracy and completeness of the background information provided by Engineer.

9. Prepare Field Check plans in sufficient detail for County to review. These documents shall include horizontal and vertical alignments, storm sewer design, ~~drainage area map, drainage design data~~, and preliminary right-of-way and easement acquisitions, if any needed.

10. The following will be needed, as a minimum, to develop Field Check plans:

    a) Prepare the base drawing with a plan portion showing existing topography, contours, utilities, property lines, right-of-way, and profiles of any existing structures and approach roadways. The base drawings shall later be used as full scale base drawings for right-of way and final design plans.

    b) The Field Check plans shall be prepared in conformity with the state and federal design criteria appropriate for the Project. Plans shall also conform to A Policy on Geometric Design of Highways and Streets (current edition, the "Green Book") prepared by AASHTO, the KDOT Corridor Management Policy, and the latest version, as adopted by the Secretary, of the Manual on Uniform Traffic Control Devices prepared by the FHWA.

    c) The Field Check plans shall include existing and proposed easement and right-of-way limits, property lines and ownerships, section lines, townships and ranges, city limits, a general outline of the construction staging, and other critical design items.

    d) The plan view scale shall be 1 inch = 20 feet. The profile view scale shall be 1 inch = 20 feet horizontal and 1 inch = 5 feet vertical.

11. The Consultant shall be responsible for verification, furnishing, and recording of any legal land corners necessary for legal descriptions used in easement documents. The Consultant shall tie the approved centerline or corner to established land corners.

12. Prepare Field Check estimate of probable construction cost for the Project.

13. Prepare two full size set of Field Check plans for County review. Allow ~~two~~ one week~~s~~ for County review. If Project is over budget, a determination of alternates will be required. Contract may be terminated if additional funds are not available or project modifications cannot be made.

14. Once Field Check plans have been reviewed by County staff, the Consultant shall arrange a Field Check meeting with County staff to discuss all review comments. All review comments made by County staff shall be discussed and addressed. Changes to the plans required by these comments shall be considered part of the project development process and shall not be a basis for additional design fees unless the original scope is changed.

III. FINAL DESIGN PHASE (Office Check)

1. ~~Prepare a right-of-way strip map, if needed, and furnish County with the original and two copies of the strip map as well as digital files in pdf format. Also, furnish County with 8 1/2" x 11" exhibits and legal descriptions of each property required for right-of-way or easement acquisition~~. The Consultant shall be responsible for making revisions to the right-of-way and construction plans resulting from negotiations with the property owners.

2. Prepare all applications, exhibits, drawings, and specifications necessary to obtain all required permits including the National Pollutant Discharge Elimination System (NPDES) Permit for Construction Activities, U.S. Army Corps of Engineers permits, and/or the Kansas Department of Agriculture, Division of Water Resources permits. Applications shall be prepared for the County's execution and submittal. Assist the County in obtaining permit approvals by furnishing additional information about the Project design. The County will submit and pay for all permits. If necessary, provide for inclusion in the specifications, a list of the permits which must be obtained by the construction contractor.

3. The Office Check plans shall include a detailed traffic control plan with an outline for construction staging conforming to the requirements of the Manual on Uniform Traffic Control Devices and the Kansas Department of Transportation standards. The traffic control plan requires submittal to County for review and approval prior to inclusion in the final design plans.

4. The Office Check plans shall include detailed stormwater pollution prevention plans (SWP3) as required by the State.

5. The Consultant shall prepare computations for all Office Check plan quantities and bid items. If requested by Douglas County, the Consultant shall provide copies of design calculations and/or supporting documentation.

6. The Consultant shall design the plans in conformance with KDOT specifications. The Consultant shall design and detail all structures or improvements not covered by KDOT standard detail sheets or detail sheets provided by the supplier.

7. Prepare Office Check plans, incorporating all Field Check comments from County staff.

8. As a minimum, the Office Check plans shall include the following:

    a) Title Sheet
    b) Typical Sections
    c) Plan Sheets
    d) Profile Sheets
    e) Traffic Control Plan Sheets
    f) Stormwater Pollution Prevention Plan
    ~~g) Drainage Area Map~~
    ~~h) Hydrologic and hydraulic data for drainage systems~~

i) KDOT Standard Detail Sheets
j) Earthwork Quantities, Cross Sections and Entrance Sections with existing and proposed grades
k) Miscellaneous Detail Sheets, non-standard details
l) Summary of Quantities listed as bid items

Additional plans and information may be required to complete Office Check plans.

9. Provide all utility companies a set of Office Check plans for their use. Meet with each utility company to discuss the relocation of their facilities and the time schedule.

10. Prepare Office Check estimate of probable construction cost for the Project.

11. Submit Office Check plans to County for review. Allow ~~two~~ one week~~s~~ for County review. All review comments made by County staff shall be discussed and addressed. Changes to the plans required by these comments shall be considered part of the project development process and shall not be a basis for additional design fees unless the original scope is changed.

12. Provide any required Special Provisions to the KDOT construction specifications as needed for construction items on the plans. The County will prepare the Project Specifications including front end documents and the KDOT construction specifications.

13. After all comments from the County are made on the plans, submit final signed and sealed plans to the County for County signature, including all Special Provisions.

14. AutoCad .dwf files or .pdf files are to be supplied to the County in lieu of original mylars. The Consultant shall submit a .pdf file of the complete set of plans (after it is signed and sealed) using PDF Converter Professional 6.0 or other software approved by the County. Two (2) full size copies and two (2) half size copies of the final signed and sealed plans, printed on 24" x 36" bond paper or 12" x 18" bond paper as appropriate, shall also be delivered to the County.

15. At any time prior to completion and final acceptance of the construction contract for this Project, the Consultant shall be responsible for correcting all errors and omissions due to the negligence of the Consultant and submitting revised final plans to the County.

IV. BIDDING PHASE

1. Answer questions from contractors regarding the final plans. If necessary, issue any requested addenda.

2. If requested by the County, attend a pre-bid meeting to explain any extraordinary conditions or designs and to answer questions regarding the plans.

3. Review and make recommendations regarding proposed alternates or value engineering proposals by the contractor.

V. CONSTRUCTION PHASE

1. Attend a pre-construction meeting with the County and the contractor once the Project has been awarded to explain any extraordinary conditions or designs and to answer questions regarding the plans.

2. Answer all questions from the contractor regarding the design and interpretation of the plans. Provide consultation concerning conditions encountered during construction that conflict with or were not addressed by the final plans.

3. A separate agreement for construction inspection will be executed at a later date if desired by the County.

VI. GENERAL

1. Prepare the design plans for the Project for such parts and sections, and in such order of completion, as designated by the County and in conformance with the Project's current official schedule. Further, Consultant agrees to complete all design plan development stages no later than the due dates on the Project's current official schedule (Exhibit D), exclusive of delays beyond the Consultant's control.

2. Provide written monthly progress reports as detailed in Exhibit C.

3. The Consultant must notify County of additional costs for service requested prior to performing the service. For example, if Consultant is asked to attend a meeting not included in the scope of service, the cost must be determined before attending.

4. Written notes from any meetings with state, federal, or other agencies will be provided to County by the Consultant. These need not be "formal minutes" but notes on discussion topics and requirements imposed.

5. All documents must be provided in the current version of Microsoft Word as designated by the County at the time of execution of this contract.

6. All drawings must be prepared on 24"x36" sheets in general conformance with KDOT standards. Also, final plans, field notes, and other pertinent Project mapping records are to be provided to County on digital format, as detailed in Exhibit E.

~~VII. ITEMS CONSIDERED AS ADDITIONAL SERVICES~~

Project No. 2013-5, E 1750 Road, Baldwin City Limits to Route 12
EXHIBIT B
ESTIMATE OF ENGINEERING FEE

I. DIRECT PAYROLL

Scope Item and Description	Principal / Project Manager	Project Engineer III	Senior Design Engineer	Design Engineer	Bridge Dept. Manager	Bridge Engineer	CAD System Operator *	Senior Project Surveyor *	Survey Crew *	Clerical *	Total Hours	Total Payroll
	$55.00	$50.00	$45.00	$32.00	$55.00	$34.00	$31.00	$50.00	$42.00	$16.00		
A. Preliminary Design Phase (Field Check plan preparation)												
1. Meet with County staff to determine specific project needs and general project desires. Also, review and receive available information and plans. Project budget will be provided by County staff.												
a. Prepare for Meeting	0.5										0.5	$ 27.50
b. Attend Meeting	1										1	$ 55.00
c. Meeting Minutes	0.5										0.5	$ 27.50
2. Perform design and cadastral surveys as required to prepare plan and profile sheets in order to provide sufficient control, location, and land information necessary to prepare a complete set of construction plans and to prepare any legal descriptions required for easement acquisition. All surveys and point coordinates for the Project must tie into and be in the Kansas State Plane (North Zone). Cadastral surveys shall include locating the position of pertinent PLSS corners (including quarter and sixteenth corners) pertaining to the project and shall conform to the accuracy standards as set forth by the Kansas State Board of Technical Professions. All survey data must be provided to County in digital format allowing insertion into AutoCAD environment using standard fieldbook format (PNEZD space delimited).												
a. Manage the Survey Phase	1							2			3	$ 155.00
b. GPS Survey Control									4		4	$ 168.00
c. Topographic Survey									16		16	$ 672.00
d. Project Control, Right-of-Way Determination								3			3	$ 150.00
e. Process Survey Data and prepare Base Drawing							4				4	$ 124.00
3. Obtain information from utility companies who have facilities within the Project limits. Utility companies shall be required to locate their facilities within the Project limits. Include utility locations in survey data. Provide preliminary utility coordination. Horizontal location is required for all utilities.			1								1	$ 45.00
4. Obtain ownership and easement information on the properties that abut the Project site. Copies of all ownership maps and recorded plats will be obtained from the Douglas County Public Works Department.			1								1	$ 45.00
5. Determine horizontal and vertical alignment of the road.	2		6								8	$ 380.00
6. ~~Prepare a hydrological study and analysis to establish recommendations concerning appropriate waterway opening for all drainage structures, length of the structure, and roadway profile.~~												
~~a. Hydrology Analysis~~											0	$ -
~~b. Existing Ditch and Culvert Hydraulic Analysis~~											0	$ -
~~c. Prepare Report~~											0	$ -

Scope Item and Description	Principal / Project Manager	Project Engineer III	Senior Design Engineer	Design Engineer	Bridge Dept. Manager	Bridge Engineer	CAD System Operator *	Senior Project Surveyor *	Survey Crew *	Clerical *	Total Hours	Total Payroll
	$55.00	$50.00	$45.00	$32.00	$55.00	$34.00	$31.00	$50.00	$42.00	$16.00		
7. Design any required storm sewer culverts to carry the 10 year storm event.												
a. Culvert Design											0	$ -
8. Review alternative design concepts, if needed, with the County prior to progressing to the detail aspects of the Project. Alternative concepts shall be discussed to determine the best horizontal and vertical alignments for the Project. County's concurrence in the selection of an alternate or preliminary concept will be contingent on the accuracy and completeness of the background information provided by Engineer.												
a. Geometric Design Options Analysis	1										1	$ 55.00
b. Cross Section, Grading, Construction Limits Analysis	4										4	$ 220.00
c. Meet with County to discuss options, revise and review for approval	1										1	$ 55.00
9. Prepare Field Check plans in sufficient detail for County and KDOT to review. These documents shall include horizontal and vertical alignments, storm sewer design, drainage area map, drainage design data, and preliminary right-of-way and easement acquisitions.	(SEE Part I.A., Item 10)										0	$ -
10. The following will be needed, as a minimum, to develop Field Check plans:												
a. Title Sheet	1										1	$ 55.00
b. General Notes and Typical Sections	1										1	$ 55.00
c. Plan & Profiles	6										6	$ 330.00
~~d. Drainage Area Map~~											0	$ -
e. Right-of-Way/Easement Map	1										1	$ 55.00
11. The Consultant shall be responsible for verification, furnishing, and recording of any legal land corners necessary for legal descriptions used in easement documents. The Consultant shall tie the approved centerline or corner to established land corners.								0.5			0.5	$ 25.00
12. Prepare Field Check estimate of probable construction cost for the Project.	0.5			2							2.5	$ 91.50
13. Prepare two full size set of Field Check plans for County and KDOT review. Allow two weeks for County review. If Project is over budget, a determination of alternates will be required. Contract may be terminated if additional funds are not available or project modifications cannot be made.							1				1	$ 31.00
14. Once Field Check plans have been reviewed by County and KDOT, the Consultant shall arrange a Field Check meeting with County staff to discuss all review comments. All review comments made by County and KDOT shall be discussed and addressed. Changes to the plans required by these comments shall be considered part of the project development process and shall not be a basis for additional design fees unless the original project scope is changed.	1										1	$ 55.00
											Subtotal A =	**$ 2,876.50**

Scope Item and Description	Principal / Project Manager	Project Engineer III	Senior Design Engineer	Design Engineer	Bridge Dept. Manager	Bridge Engineer	CAD System Operator *	Senior Project Surveyor *	Survey Crew *	Clerical *	Total Hours	Total Payroll
	$55.00	$50.00	$45.00	$32.00	$55.00	$34.00	$31.00	$50.00	$42.00	$16.00		
B. Final Design Phase (Office Check plan preparation)												
1. ~~Prepare a right-of-way strip map, if needed, and furnish County with the original and two copies of the strip map as well as digital files in pdf format. Also, furnish County with 8-1/2" x 11" exhibits and legal descriptions of each property required for right-of-way or easement acquisition. The Consultant shall be responsible for making revisions to the right-of-way and construction plans resulting from negotiations with the property owners.~~												
~~a. Prepare Legal Descriptions (2 properties anticipated)~~											0	$ -
~~b. Prepare Strip Maps~~											0	$ -
2. Prepare all applications, exhibits, drawings, and specifications necessary to obtain all required permits including the National Pollutant Discharge Elimination System (NPDES) Permit for Construction Activities, U.S. Army Corps of Engineers 404 Permit, and/or the Kansas Department of Agriculture, Division of Water Resources permits. Applications shall be prepared for the County's execution and submittal. Assist the County in obtaining permit approvals by furnishing additional information about the Project design. The County will submit and pay for all permits. If necessary, provide for inclusion in the specifications, a list of the permits which must be obtained by the construction contractor.												
a. NPDES NOI			1								1	$ 45.00
3. The Office Check plans shall include a detailed traffic control plan with an outline for construction staging conforming to the requirements of the Manual on Uniform Traffic Control Devices and the Kansas Department of Transportation standards. The traffic control plan requires submittal to County for review and approval prior to inclusion in the final design plans.	1										1	$ 55.00
4. The Office Check plans shall include detailed stormwater pollution prevention plans (SWP3) as required by the State.	(SEE Part I.B., Item 8)										0	$ -
5. The Consultant shall prepare computations for all Office Check plan quantities and bid items. If requested by Douglas County, the Consultant shall provide copies of design calculations and/or supporting documentation.			2								2	$ 90.00
6. The Consultant shall design the plans in conformance with KDOT specifications. The Consultant shall design and detail all structures or improvements not covered by KDOT standard detail sheets or detail sheets provided by the supplier.	(SEE Part I.B., Item 8)										0	$ -
7. Prepare Office Check plans, incorporating all Field Check comments from County staff.	(SEE Part I.B., Item 8)										0	$ -
8. As a minimum, the Office Check plans shall include the following:												
a. Title Sheet	0.5										0.5	$ 27.50
b. Typical Sections	1										1	$ 55.00
c. Plan Sheets	4										4	$ 220.00
d. Profile Sheets	4										4	$ 220.00
e. Traffic Control Sheets	1										1	$ 55.00
f. Stormwater Pollution Prevention Plan			1								1	$ 45.00
~~g. Drainage Area Map~~											0	$ -
~~h. H&H Sheets and Data for Drainage Systems~~											0	$ -
i. KDOT Standard Detail Sheets							1				1	$ 31.00
j. Earthwork Quantities, Cross Sections and Entrance Sections	6			8			2				16	$ 648.00
k. Miscellaneous Details			1								1	$ 45.00
l. Summary of Quantities			1								1	$ 45.00
m. Design Management & QA/QC Check	1	2									3	$ 155.00

Scope Item and Description	Principal / Project Manager	Project Engineer III	Senior Design Engineer	Design Engineer	Bridge Dept. Manager	Bridge Engineer	CAD System Operator *	Senior Project Surveyor *	Survey Crew *	Clerical *	Total Hours	Total Payroll
	$55.00	$50.00	$45.00	$32.00	$55.00	$34.00	$31.00	$50.00	$42.00	$16.00		
9. Provide all utility companies a set of Office Check plans for their use. Meet with each utility company to discuss the relocation of their facilities and the time schedule.												
a. Provide Plans to each utility Company							1				1	$ 31.00
b. Meet with and Coordinate Utility Relocations			3								3	$ 135.00
10. Prepare Office Check estimate of probable construction cost for the Project.			2								2	$ 90.00
11. Submit Office Check plans to County for review. Allow two weeks for County review. All review comments made by County shall be discussed and addressed. Changes to the plans required by these comments shall be considered part of the project development process and shall not be a basis for additional design fees unless the original project scope is changed.							1				1	$ 31.00
12. Provide any required Special Provisions to the KDOT construction specifications as needed for construction items on the plans. The County will prepare the Project Specifications including front end documents and the KDOT construction specifications.			1								1	$ 45.00
13. After all comments from the County are made on the plans, submit two sets of final signed and sealed plans to the County for County signature, including Special Provisions.												
a. QA/QC Check	1										1	$ 55.00
b. Print, Prepare and Deliver Documents							1				1	$ 31.00
14. AutoCad .dwf files or .pdf files are to be supplied to the County in lieu of original mylars. The Consultant shall submit a .pdf file of the complete set of plans (after it is signed and sealed). Two (2) full size copies and two (2) half size copies of the final signed and sealed plans, printed on 24" x 36" bond paper or 12" x 18" bond paper as appropriate, shall also be delivered to the County.											0	$ -
15. At any time prior to completion and final acceptance of the construction contract for this Project, the Consultant shall be responsible for correcting all errors and omissions due to the negligence of the Consultant and submitting revised final plans to the County.											0	$ -
											Subtotal B =	**$ 2,154.50**

Scope Item and Description	Principal / Project Manager	Project Engineer III	Senior Design Engineer	Design Engineer	Bridge Dept. Manager	Bridge Engineer	CAD System Operator *	Senior Project Surveyor *	Survey Crew *	Clerical *	Total Hours	Total Payroll
C. Bidding Phase												
1. Answer questions from contractors regarding the final plans. If necessary, issue any requested addenda.	2										2	$ 110.00
2. If requested by the County, attend a pre-bid meeting to explain any extraordinary conditions or designs and to answer questions regarding the plans.	1										1	$ 55.00
3. Review and make recommendations regarding proposed alternates or value engineering proposals by the contractor.	2										2	$ 110.00
											Subtotal C =	**$ 275.00**

Scope Item and Description	Principal / Project Manager	Project Engineer III	Senior Design Engineer	Design Engineer	Bridge Dept. Manager	Bridge Engineer	CAD System Operator *	Senior Project Surveyor *	Survey Crew *	Clerical *	Total Hours	Total Payroll
	$55.00	$50.00	$45.00	$32.00	$55.00	$34.00	$31.00	$50.00	$42.00	$16.00		
D. Construction Phase												
1. Attend a pre-construction meeting with the County and the contractor once the Project has been awarded to explain any extraordinary conditions or designs and to answer questions regarding the plans.	2										2	$ 110.00
2. Answer all questions from the contractor regarding the design and interpretation of the plans. Provide consultation concerning conditions encountered during construction that conflict with or were not addressed by the final plans.	2										2	$ 110.00
5. A separate agreement for construction inspection will be executed at a later date if desired by the County.											0	$ -
											Subtotal D =	$ 220.00

	TOTAL DIRECT PAYROLL (Part I) =	$ 5,526.00
II. SALARY RELATED OVERHEAD	TOTAL DIRECT PAYROLL x 1.912 =	$ 10,565.71
III. TOTAL PAYROLL PLUS OVERHEAD	TOTAL Part I + TOTAL Part II =	$ 16,091.71
IV. NET FEE	12% of TOTAL Part III =	$ 1,931.01
V. DIRECT EXPENSES		
Ownership and Easement Certificates	25 @ $150 per each	$ 3,750.00
Mileage	200 miles @ $0.565 per mile =	$ 113.00
	TOTAL DIRECT EXPENSES =	$ 3,863.00

TOTAL DESIGN PHASE (Sections A, B) =	$ 16,408.30
TOTAL BIDDING PHASE (Section C) =	$ 896.90
TOTAL CONSTRUCTION PHASE (Section D) =	$ 717.52

GRAND TOTAL (Total Payroll Plus Overhead (III) + Net Fee (IV) + Direct Expenses (V)) = $ 21,885.72

NOTES: 1) The hourly rates shown above are effective for services through December 31st of the contract year and are subject to revision annually
2) * = For any non exempt personnel in positions marked with an asterisk (*), overtime will be billed at 1.5 times the hourly labor billing rates shown

Project No. 2013-5
E 1750 Road, Baldwin City Limits to Route 12
EXHIBIT C
PROGRESS REPORTS

Progress reports shall include the following:

1. Status of design: List each principal task and the percentage complete.

2. Status of right-of-way or easement descriptions: Describe the status of legal descriptions for property to be acquired for the Project.

3. Tasks to be performed in the next month: List each principal task which is anticipated to be started or completed in the next month.

4. Issues which need direction from County: List all items where further direction from County is needed by Engineer in order to complete the Project within the Project Schedule detailed in this Agreement.

5. Issues which may present a problem for meeting the Project Schedule: List all issues and problems which may prevent a timely completion of the plans or which may create a problem during construction.

Project No. 2013-5
E 1750 Road, Baldwin City Limits to Route 12
EXHIBIT D
PROJECT SCHEDULE

Submit Field Check plans and estimate (allow 1 week for County review) – March 18, 2013*

Submit Office Check plans and estimate (allow 1 week for County review) – April 15, 2013*

Submit Final Plans, Special Provisions, and estimate – April 29, 2013*

Tentative Bid Date (5 weeks after final plans submitted) – May 31, 2013*

* Based upon a Notice to Proceed date of February 28, 2013

Project No. 2013-5
E 1750 Road, Baldwin City Limits to Route 12
EXHIBIT E
CAD REQUIREMENTS

1. Software requirement: Civil 3D (Version 2011 preferred). A layer list for each project shall accompany the digital media. Ensure that all objects are on their proper layers.

2. Project drawings shall be developed by the Consultant using Civil 3D and made available to the County on digital media. Two sets of final plans will be submitted on 24"x36" bond paper and sealed by the professional engineer responsible for the project. These two sets of plans will be signed by the Director of Public Works for Douglas County. One set will be returned to the Consultant for their permanent records and one set will be retained by Douglas County for their permanent records.

3. Once all signatures have been placed on the plans, the Consultant shall provide a digital version of the final signed and sealed plans in both .pdf and .dwf format. The Consultant shall submit a .pdf file of the complete set of plans using PDF Converter Professional 6.0 or other software approved by the County. Also, submit the base drawing, topographic drawing, and the sheet layouts in Civil 3D and .dxf format.

4. Acceptable Digital Media: DVD.

5. Compression Utilities: If a compression utility is used, save file(s) as "self-extracting" file(s).

Memorandum
City of Lawrence – Douglas County
Planning & Development Services

TO: Lawrence-Douglas County Metropolitan Planning Commission

FROM: Mary Miller, Planner

CC: Scott McCullough, Director of Planning and Development Services
Sheila Stogsdill, Assistant Director of Planning

Date: For January 30, 2013 meeting

RE: **ITEM NO. 8 CONDITIONAL USE PERMIT FOR PENNY SAND PIT; N 1500 RD & E 1850 RD (MKM)**

CUP-12-00099: Consider a Conditional Use Permit for sand excavation and extraction for Penny Sand Pit, approximately 434 acres located on the NE Corner of N 1500 Road & E 1850 Road. Submitted by Landplan Engineering, for William Penny & Van LLC, property owners of record. *Joint meeting with Eudora Planning Commission. (The Planning Commission voted at their October meeting to forward the CUP to the County Commission. The CUP application is being returned to Planning Commission for a new public hearing after identification of error in mailed public notice for the October meeting.)*

The recommended conditions included with this memo have been revised based on discussions with the applicant and the City of Eudora representatives. New language is shown in ***bold print*** *and deleted text is ~~struckthrough~~. The date in the heading has been revised to 2013. The changes made are intended to provide clarity to the condition.*

Attachments:
Attachment A— Original Planning Commission staff report
Attachment B— Independent Consultant (Conestoga Rovers & Associates) report
Attachment C— CUP plans
Attachment D-- Communications and previous Planning Commission minutes

Background:
- The Conditional Use Permit (CUP) application was considered at a joint Lawrence-Douglas County and Eudora Planning Commission meeting on October 22, 2012 and was forwarded to the County Commission with the following recommendations:

The Lawrence-Douglas County Metropolitan Planning Commission voted 4 to 3 to forward the CUP application to the County Commission with a recommendation for approval subject to certain conditions of approval.

The Eudora Planning Commission voted 4 to 1 to forward the CUP application to the County Commission with a recommendation that the item be deferred to allow time for studies be conducted to obtain additional data related to the groundwater issues.

- The County Commission considered the CUP application at their November 28, 2012 meeting and voted unanimously to defer action to the January 2, 2013 meeting. The Commission directed the County Engineer to contract with an independent consulting firm to review the various reports which have been supplied by hydrology and water resource experts on the sand pits potential to impact the groundwater.

- Prior to the January 2, 2013 County Commission meeting, a technical error in public notification was identified which required the application to be returned to the Planning Commission for a new hearing. The 1000 ft notification area extended into Leavenworth County and the Leavenworth residents were not notified. (Figure 1) As a result the item was removed from the January 2nd County Commission agenda and returned to the Planning Commission following re-notification.

- In the interim, the independent consultant completed their review of the various reports and information that had been provided with the CUP application and communications.

Staff Discussion:
The original staff report is included with this memo as Attachment A. The independent consultant's report is included as Attachment B. The independent consultant's review stated the following:

> *"In summary, our review does not indicate that there are any major problems or concerns with regard to the proposed operation; however, we have several recommendations for further assessment to confirm this position and implement precautionary measures and best management practices for the operation (presuming they are not already addressed). We further recommend that the proponent be responsible for the implementation of these measures subject to review/approval by a competent professional – either a public agency representative or a third-party consultant."* (Page 1, Conestoga-Rovers and Associates December 20, 2012 letter report to Keith Browning)

Figure 1. Notification area. Arrow marks the area north of the KS River in Leavenworth County.

Staff prepared a set of conditions based on the consultant's recommendations. These are listed below, followed by a complete set of recommended conditions. Staff has discussed the option of having the County contract with the independent consultant for the studies necessary for the pre-dredging report with the provision that the applicant would reimburse the County for any monies spent and/or pay the 3rd party consultant when the report is complete. The Conditional Use Permit and the pre-dredging report would be placed back on the County Commission agenda for consideration. At that time, any additional measures determined to be necessary from the pre-dredging report by the County Engineer would be considered. The conditions of the CUP could be revised if necessary, based on the information provided in the pre-dredging report. The County Commission will consider this option when the CUP is forwarded to them for consideration; however, staff wanted the Planning Commission to know that this is being discussed.

Conditions related to the Conestoga-Rovers & Associates Report:

Conditions 1 to 8 are based on recommendations from Conestoga-Rovers and Associates. These conditions are divided into 2 groups: those which must be completed before the conditional use is released to the Douglas County Zoning and Codes Department for a permit and those which are ongoing measures and best management practices for the sand dredging operation.

Conditions which must be met prior to the release of the Conditional Use to the Zoning and Codes Department for permit:

The following actions must be taken prior to the release of the Conditional Use to the Zoning and Codes Department for the Conditional Use Permit. (*Staff recommends that an independent consulting firm be retained to complete Conditions 1 through 5 and submit a pre-dredging report. Staff recommends the independent consulting firm work directly for the County, as opposed to the applicant. If this avenue is taken the County would pay the consultant's fee following the execution of an agreement between the applicant and the County Commission which specifies that the applicant for the CUP would reimburse the County Commission for the expense following completion of the pre-dredging report which is accepted by the County Engineer. This decision would be made by the County Commission during their consideration of the Conditional Use Permit.)*

1. A pre-dredging report shall be provided to the County Engineer for review and to the Planning Office for the CUP file. The CUP will be placed back on the County Commission's agenda for discussion of the results of the pre-dredging report and any recommendations provided by the 3rd party consultant. The County Commission may revise the conditions of the CUP based on the results of this report. The pre-dredging report shall:

    a. Determine the potential zone of influence through the following steps:

        i. Take field measurements to determine the current groundwater table and flow direction.

ii. Determine the anticipated maximum dewatering influence from maximum rate of sand and water extraction, evaporation, and any other water consumption. The information provided should include the proposed rate of sand and water extraction or taking from the pond while recognizing the recycling of water. (Page 5 of the consultant's report explains that this assessment could be completed based on existing information.)

iii. The results and an exhibit of the potential zone of influence shall be included with the pre-dredging report.

b. Confirm existing groundwater and/or soil quality to ensure there is no significant contamination from existing site area and operations, including an initial environmental site assessment (ESA) of potential sources and existence of contamination (if an ESA has not already been conducted) through the following:

i. Installation and sampling of groundwater wells in down-gradient area in locations approved by the County Engineer.

ii. Soil assessment to determine suitability of soils for placement below water with reclamation.

iii. The results shall be included in the pre-dredging report.

The County Engineer will determine if further investigation and remedial actions are necessary based on the results. Should potential contaminant sources be identified during the ESA process, the test pits shall be installed and additional soil testing shall be conducted per the County Engineer's recommendation.

c. Establish baseline water quality and quantity conditions within potential zone of influence through a private water well survey of both up-gradient and down-gradient wells. Such survey is subject to landowner access permission. This information shall be included in the pre-dredging report.

d. Determine the location **and number** of groundwater monitoring wells **to be installed by the applicant.** ~~on the south and east sides of the site~~. The location of these wells must approved by the County Engineer and an exhibit showing their location included in the pre-dredging report.

2. The applicant shall prepare and submit a fuel/chemical handling and spill response plan for the County Engineer's approval.

Ongoing conditions – Best Management Practices and Precautionary Measures:
(these conditions are to be listed on the CUP plan)

3. Document the sand production levels and effective water consumption on an annual basis to aid in interpretation of monitoring data. Provide an annual report to the Zoning and Codes Department.

4. Monitor groundwater levels in adjacent private water supply wells **(subject to property owner's permission)** within the potential zone of influence on a quarterly basis. This information shall be provided to the Zoning and Codes Department in a quarterly report.

5. Monitoring of groundwater levels in monitoring wells ~~on south and east sides of site~~ on a quarterly basis. (In early years, monitoring while extraction is occurring in the NW part of the site will help confirm the zone of influence.) This information shall be provided to the Zoning and Codes Department in a quarterly report.

    a. If any changes are determined in the potential zone of influence, adjustments will be made to the monitoring wells as deemed necessary by the County Engineer.

6. Install berms along the perimeter of the pit to prevent runoff from entering the pit.

7. The Zoning and Codes Department shall be notified if any fill import is proposed throughout the operation of the pit. Any fill import must be sampled and analyzed for chemical suitability and the results provided to the Zoning and Codes Department for approval prior to installation.

8. Remediate/report any spills in accordance with the fuel/chemical handling and response plan.

Conditions as revised by the Lawrence-Douglas County metropolitan Planning Commission on October 22, 2012:

9. The approval is contingent upon the issuance of all State and/or Federal permits which are required for this operation.

10. An agreement designating responsibility for the ongoing maintenance of the berms to the property owner shall be executed and recorded with the Register of Deeds prior to the release of the CUP plans to the Zoning and Codes Office. A copy of the agreement shall be provided to the Planning Office for the file.

11. A copy of the easement for the off-site access drive shall be provided to the Planning Office for the file prior to the release of the CUP plans to the Zoning and Codes Office.

12. The applicant shall obtain a Flood Plain Development Permit from the Director of Zoning and Codes prior to the release of the CUP plans.

13. The reclamation plan shall be revised with the following changes prior to release of the CUP plans:

    a. The plan shall note the requirement that the lake that is being created will have a varied shoreline and will appear natural in appearance.

b. The plan shall note that the intended use of the lake, when mining and reclamation is complete, is to be a recreational feature.

c. The plan shall note the maximum slope of the lake shoreline for a specified depth to insure that the slopes are of a grade that it would be possible for a person or animal that accidentally entered the lake to exit.

d. The plan shall explain the sequential nature of the reclamation process; that overburden produced in one phase will be used to reclaim previously excavated areas.

e. The reclamation plan shall note that topsoil will be placed over the overburden in areas that are to be reclaimed as farmland, shoreline, or berms. If topsoil is to be stockpiled and stored it must be vegetated to prevent erosion.

14. The applicant shall submit a revised CUP plan with the following changes:

a. A detailed landscaping plan for the buffer area surrounding the McElwee house will be submitted.

b. The Book and Page number of the recorded easement for the off-site access road shall be noted on the CUP plan.

c. The ownership shall be noted as Van, LLC as well as Penny's Concrete Inc. on the CUP plan.

d. The on-site residential structure on the east side of the property will be shown on the CUP plan as on the reclamation plan.

e. If stockpiling of overburden is to occur on the subject property, the CUP or operation plan should note the maximum height and approximate location. The stockpiles should be placed as far from the existing residences as possible.

f. List the following CUP conditions on the plan:

i. Hours of operation are 6:30 AM to 6:30 PM, Monday through Friday. No removal, transfer, or placement of overburden is permitted outside these operating hours; however dredging and extraction of sand may exceed these hours when necessary.

ii. The approval for this Conditional Use is valid for 30 years. An extension request for the CUP must be submitted prior to the expiration date or a new CUP application must be submitted. The Zoning and Codes office shall conduct 5 year administrative reviews to insure compliance with the CUP, operation, and reclamation plans.

iii. Only exterior lighting in the areas to be excavated will be the dredge lighting as required by the U.S. Coast Guard

iv. The scale house, processing plant, sediment pond, and stockpile area, approved with CUP-2-2-79, will be used to serve the subject property.

v. Sales of overburden, topsoil, sand or aggregate products will occur only on the portion of the property that contains the scale house on the CUP plan.

vi. Truck traffic will utilize Noria Road (E 1750 Road), and is restricted from using N 1500 Road or E 1850 Road.

vii. The applicant shall work with the Army Corps of Engineers to determine how the existing wetlands on the property will be treated. Prior to any excavation in Phase 21, the applicant will provide documentation to the Planning Office on the wetlands indicating whether the wetlands will be maintained on site or if they will be mitigated elsewhere. If the wetlands will be maintained on site, the operation plan will be revised to include the protection measures and the property owner shall submit a revised CUP plan for administrative review/approval of the wetland setbacks. If the wetlands are to be mitigated, a revised CUP plan shall be submitted to note the removal of the wetlands.

15. The following improvements to nearby roads and intersections shall be completed per the County Engineer's approval before issuance of a permit for the Conditional Use :
    a. Realignment of the entrance to the sand facility so that it opposes the Noria Road intersection at N 1500 Road.
    b. Pavement of a 100 ft long section of the site access drive just north of N 1500 Road, as recommended in the TIS.
    c. Reconstruction of pavement in the Noria Road (E 1750 Road)/N 1500 Road intersection. The existing surfacing is likely a crushed rock base that has been chip sealed. This will not stand up to the increased truck traffic crossing N 1500 Road.
    d. Construction of an eastbound right turn lane on Route 442 (N 1400 Road) at Route 1057 (E 1900 Road). This is mentioned as a desirable improvement in the TIS. Pavement on the existing shoulder at this location is not adequate for the projected amount of truck traffic.

16. The applicant **shall** install ~~3 observations wells and one control well~~ **monitoring wells as recommended by Conestoga Rovers and Associates in the pre-dredging report**. **These wells shall be installed prior to the release of the Conditional Use Permit.** The City of Eudora shall be allowed to monitor those wells on an ongoing basis.

(*The following condition was recommended by staff following discussions with KDOT.)*

17. Dredging on the subject property shall not occur concurrently with dredging on the property to the north as approved with CUP-2-2-79.

PLANNING COMMISSION REPORT
Regular Agenda
Joint Meeting with Eudora Planning Commission

PC Staff Report
09/24/12 (Corrected)

ITEM NO. 1: CONDITIONAL USE PERMIT FOR PENNY SAND PIT; N 1500 RD & E 1850 RD (MKM)

CUP-12-00099: Consider a Conditional Use Permit for sand excavation and extraction for Penny Sand Pit, approximately 434 acres located on the NE Corner of N 1500 Road & E 1850 Road. Submitted by Landplan Engineering, for William Penny & Van LLC, property owners of record. *Joint meeting with Eudora Planning Commission.*

STAFF RECOMMENDATION: Staff recommends approval of the Conditional Use Permit for Penny Sand Pit and forwarding it to the Board of County Commissioners with a recommendation for approval based on the findings of fact found in the body of the staff report subject to the following conditions:

1) The approval is contingent upon the issuance of all State and/or Federal permits which are required for this operation including the Army Corps of Engineers.
2) An agreement designating responsibility for the ongoing maintenance of the berms to the property owner shall be executed and recorded with the Register of Deeds prior to the release of the CUP plans to the Zoning and Codes Office. A copy of the agreement shall be provided to the Planning Office for the file.
3) A copy of the easement for the off-site access drive shall be provided to the Planning Office for the file prior to the release of the CUP plans to the Zoning and Codes Office.
4) The applicant shall obtain a Flood Plain Development Permit from the Director of Zoning and Codes prior to the release of the CUP plans.
5) The reclamation plan shall be revised with the following changes prior to release of the CUP plans:
    a. The plan shall note the requirement that the lake that is being created will have a varied shoreline and will appear natural in appearance.
    b. The plan shall note that the intended use of the lake, when mining and reclamation is complete, is to be a recreational feature.
    c. The plan shall note the maximum slope of the lake shoreline for a specified depth to insure that the slopes are of a grade that it would be possible for a person or animal that accidentally entered the lake to exit.
    d. The plan shall explain the sequential nature of the reclamation process; that overburden produced in one phase will be used to reclaim previously excavated areas.
    e. The reclamation plan shall note that topsoil will be placed over the overburden in areas that are to be reclaimed as farmland, shoreline, or berms. If topsoil is to be stockpiled and stored it must be vegetated to prevent erosion.
6) The applicant shall submit a revised CUP plan with the following changes:
    a) A detailed landscaping plan for the buffer area surrounding the McElwee house will be submitted.

b) The Book and Page number of the recorded easement for the off-site access road shall be noted on the CUP plan.

c) The ownership shall be noted as Van, LLC as well as Penny's Concrete Inc. on the CUP plan.

d) The on-site residential structure on the east side of the property will be shown on the CUP plan as on the reclamation plan.

e) If stockpiling of overburden is to occur on the subject property, the CUP or operation plan should note the maximum height and approximate location. The stockpiles should be placed as far from the existing residences as possible.

f) List the following CUP conditions on the plan:

   i. Hours of operation are 6:30 AM to 6:30 PM, Monday through Friday. No removal, transfer, or placement of overburden is permitted outside these operating hours; however dredging and extraction of sand may exceed these hours when necessary.

   ii. The approval for this Conditional Use is valid for 30 years. An extension request for the CUP must be submitted prior to the expiration date or a new CUP application must be submitted. The Zoning and Codes office shall conduct 5 year administrative reviews to insure compliance with the CUP, operation, and reclamation plans.

   iii. The only exterior lighting in the areas to be excavated will be the headlights on the dredge.

   iv. The scale house, processing plant, sediment pond, and stockpile area, approved with CUP-2-2-79, will be used to serve the subject property.

   v. Sales of overburden, topsoil, sand or aggregate products will occur only on the portion of the property that contains the scale house on the CUP plan.

   vi. Truck traffic will utilize Noria Road (E 1750 Road), and is restricted from using N 1500 Road or E 1850 Road.

   vii. The applicant shall work with the Army Corps of Engineers to determine how the existing wetlands on the property will be treated. Prior to any excavation in Phase 21, the applicant will provide documentation to the Planning Office on the wetlands indicating whether the wetlands will be maintained on site or if they will be mitigated elsewhere. If the wetlands will be maintained on site, the operation plan will be revised to include the protection measures and the property owner shall submit a revised CUP plan for administrative review/approval of the wetland setbacks. If the wetlands are to be mitigated, a revised CUP plan shall be submitted to note the removal of the wetlands.

7) The following improvements to nearby roads and intersections shall be completed per the County Engineer's approval before issuance of a permit for the Conditional Use :

a. Realignment of the entrance to the sand facility so that it opposes the Noria Road intersection at N 1500 Road.

b. Pavement of a 100 ft long section of the site access drive just north of N 1500 Road, as recommended in the TIS.

c. Reconstruction of pavement in the Noria Road (E 1750 Road)/N 1500 Road intersection. The existing surfacing is likely a crushed rock base that has been chip sealed. This will not stand up to the increased truck traffic crossing N 1500 Road.

d. Construction of an eastbound right turn lane on Route 442 (N 1400 Road) at Route 1057 (E 1900 Road). This is mentioned as a desirable improvement in the TIS. Pavement on the existing shoulder at this location is not adequate for the projected amount of truck traffic.

Reason for Request: *"The owner wishes to conduct sand excavation, extraction and processing operations on the subject property in conjunction with the existing agricultural uses."*

KEY POINTS

- Per Section 12-319-4.11 of the Zoning Regulations for the Unincorporated Territory of Douglas County, mining and excavation uses are permitted in the A and V-C Districts when approved as a Conditional Use.
- The area is encumbered with floodplain including the regulatory floodway and floodway fringe of the Kansas River.
- Previous Conditional Use Permits were approved for the river dredging operation to the north and northwest of the subject property. The Conditional Use Permits are not being combined with this request; however, the processing plant and access drive on the property with the previous Conditional Use Permits will be utilized. These previous Conditional Use Permits are discussed in more detail later in the report.

ATTACHMENTS

A – Public Communications received prior to printing of this staff report.
B – Traffic Impact Study and Addendum
C – Plans
D – Ground Water Report

DESCRIPTION OF USE

The applicant is requesting a Conditional Use Permit to allow pit dredging on the subject property. The applicant has an existing Conditional Use Permit for river dredging in the property along the river, north of the subject property [CUP-2-2-79] and a CUP was approved for river dredging on the property to the west owned by David and Carmiletta Penny. The applicant has been operating the two river dredging operations and intends to utilize the access drive which was constructed for the river dredging facilities. The intent is also to use the same processing plant, currently located in the middle of the existing stockpiles; however, it will be moved to the subject property in the location marked on the CUP plan after the first few phases. The reclamation plan indicates that portions of the property will be reclaimed for agricultural uses and the remainder will be reclaimed as a lake.

ASSOCIATED CASES/OTHER ACTION REQUIRED

- Approval of Conditional Use Permit by Board of County Commissioners.
- Conditional Use Permit Plan released to the Zoning and Codes Office.
- Issuance of permit for the Conditional Use by the Zoning and Codes Office following application and determination that all conditions have been met.

PUBLIC COMMENT RECEIVED PRIOR TO PRINTING

- August 9th phone call from Carl McElwee, adjacent property owner listing the following concerns with the project: 1) unstability of the river bank, 2) possible pollution of the aquifer, and 3) loss of prime agricultural soils.
- Staff met with Carl McElwee on August 31st to discuss his concerns with the CUP. Mr. McElwee provided a letter and reference material which is included in Attachment A.
- Petition from nearby property owners on September 17th in opposition to the sand pit.
- Letter from David Penny, president of Master's Dredging Company, requesting deferral. This letter is included in Attachment A.
- Letter from Carl McElwee on September 18th in opposition to the deferral request, Attachment A.

GENERAL INFORMATION

Current Zoning and Land Use:	V-C (County- Valley-Channel), F-W (Floodway Overlay) and F-F (Floodway Fringe Overlay) Districts; rural residential and agriculture.
Surrounding Zoning and Land Use:	To the west: V-C (Valley-Channel), and F-W (Floodway Overlay) Districts; rural residential and agriculture. To the north: V-C (Valley-Channel), and F-W (Floodway Overlay) Districts; river dredging operation approved with CUP-2-2-79 and the Kansas River. To the east: V-C (Valley-Channel), F-W (Floodway Overlay) and F-F (Floodway Fringe Overlay) Districts; rural residential and agriculture. To the south: V-C (Valley-Channel), and F-F (Floodway Fringe Overlay) Districts; rural residential and agriculture. (Figure 1)

Site Summary:	
Subject Property:	465 acres
Proposed Buildings:	No new buildings are being proposed.
Off Street Parking Required:	1 space per 2 employees. 4 employees/ 2 spaces are required.
Off Street Parking Provided:	2 spaces provided on property to north, included within CUP-2-2-79.

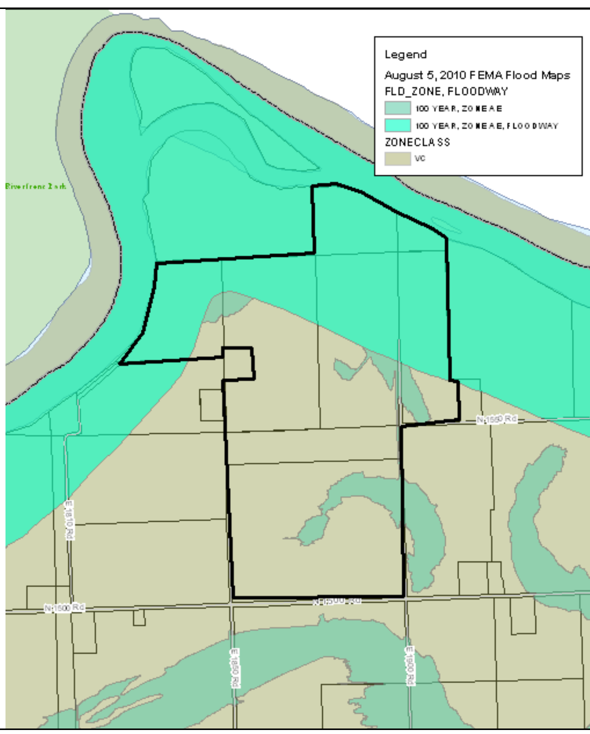

Figure 1a. Zoning in the area.

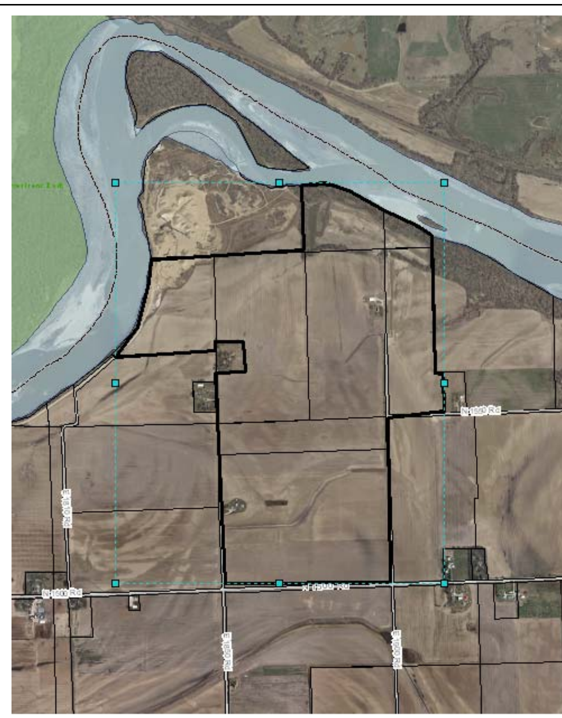

Figure 1b. Land use in the area.

I. ZONING AND USES OF PROPERTY NEARBY

The subject property contains approximately 465 acres and is located northwest of the intersection of N 1500 and E 1900 Roads in portions of Sections 25, 26, 35, and 36 in Township 12 South, Range 20 East.

The nearby area is zoned V-C (Valley Channel), a protective zoning district that was created prior to the construction of Clinton Dam and development of the FEMA Flood Insurance Rate Maps for property which was prone to flooding. The V-C District permits the following limited land uses: agricultural land uses, public or private commercial recreational facilities and structures, open space, and farm dwellings provided a minimum area of 5 acres per dwelling unit is provided. Per Section 12-319-4.05, mining, extraction, and excavation of raw materials in the V-C District require approval of a Conditional Use Permit (CUP) and approval of a reclamation plan. Land uses in the area include rural residences, agricultural land uses, and mining/excavation land uses approved with CUPs. Conditional Use Permits which have been approved in this area for sand dredging are listed below and the areas included are shown in Figure 2.

- A Conditional Use Permit application, CUP-2-2-79, for river dredging was submitted in 1979 for the area north of the subject property. Planning Commission voted to recommend approval at their April 25, 1979 meeting.
- A Conditional Use Permit application, CUP-1-3-91, was submitted in 1991 for approximately 130 acres located to the west of the subject property to permit river dredging along the shore and pit dredging on the remainder. The Planning Commission voted to recommend approval of the river dredging at their March 27, 1991 meeting but voted to recommend denial of the pit operation at their May 22, 1991 meeting. The minutes indicated the vote for denial was based primarily on concerns with the possibility of contamination of ground water and local wells and the possibility of the pit accelerating the changing of the river's course.
- Various extensions were approved for CUP-1-3-91 and a new file number, CUP-3-3-01, was assigned in 2001 for that extension. On December 17, 2001, the County Commission approved a 5 year extension of the CUP through December 31, 2006. CUP-1-3-91 expired as the Corps of Engineer permit was issued after the expiration date of Dec. 31, 2006.
- CUP-06-04-08 was submitted in 2008 to replace the expired CUP-1-3-91. Planning Commission voted to recommend approval at their August meeting. County Commission approved the CUP on September 17, 2008. The CUP will expire December 31, 2012 unless a new Army Corps of Engineers permit is obtained and approved by the Zoning and Codes Director.

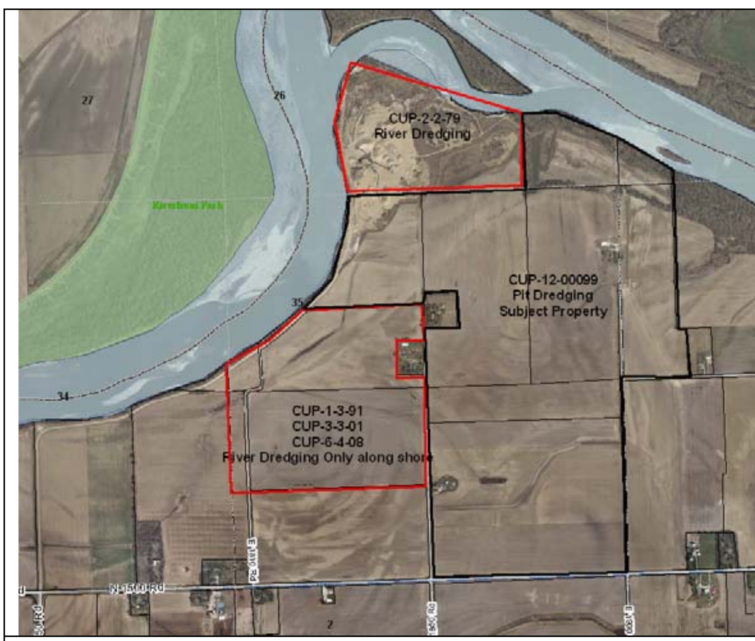

Figure 2. Approximate area included in CUPs for sand dredging in the area. Previously approved CUPs outlined in red, subject property in black.

Staff Finding – The area is zoned V-C (Valley Channel) and portions are encumbered by the Regulatory Floodway and the Regulatory Floodway Fringe. The predominate land uses in the area are agriculture, mining and extraction, and rural residential. The proposed land use, mining and excavation, is permitted in the V-C District and has been approved in the area.

II. CHARACTER OF THE AREA

The subject property is located east of the City of Lawrence and is outside of, and adjacent to, the Urban Growth Area boundary. This is an agricultural area with scattered rural residences. Natural features in the area include the Kansas River, which borders the area to the north and is the dividing line between Douglas and Leavenworth Counties; riparian woodlands along the Kansas River; floodplain; and high quality agricultural soils. The property has good access to the transportation network through N 1500 Road, which is classified as a minor collector on the Major Thoroughfares Map. N 1500 Road connects E 15th Street with County Route 1061 (E 2200 Road), both classified as minor arterials.

Staff Finding – This is predominately an agricultural area with scattered rural residences, floodplain, and natural resources in the form of sand reserves and high quality agricultural soils. N 1500 Road, a minor collector, provides a connection through the area to minor arterials to the east and west.

III. SUITABILITY OF SUBJECT PROPERTY FOR THE USES TO WHICH IT HAS BEEN RESTRICTED

Applicant's response:

> *"A Conditional Use Permit (CUP) was granted to Dunbar in 1979 for removal of sand from the river bank. The original permit covered an area approximately 114 acres gross in size which is approximately located in the northwest corner of the CUP request. The mining is a use that is allowed in V-C (Valley Channel)."*

Existing Uses

Uses allowed in the V-C District include farms, truck gardens, orchards, nurseries, grazing, hunting and fishing, public or private commercial recreation facilities and structures, preserves, reservations and other similar open uses, and farm residences when located on a minimum of 5 acres. Mining and excavation activities are permitted as a Conditional Use. A Conditional Use requires approval though a public review process. Section 12-319 of the County Zoning Regulations states:

> *"Recognizing that certain uses may be desirable when located in the community, but that these uses may be incompatible with other uses permitted in a district, certain conditional uses listed in Section 12-319-4 below, when found to be in the interest of the public health, safety, morals and general welfare of the community may be permitted, except as otherwise specified, in any district from which they are prohibited."*

The property is partially encumbered by the Regulatory Floodway and Regulatory Floodway Fringe. Per Section 12-328 of the County Zoning Regulations, the purpose of the floodplain management regulations is to protect individuals and property from flood hazards or flooding by providing for the orderly and safe development of the floodplain for the most advantageous uses which are consistent with the health, safety, and welfare of the general public. Any development in the area requires review and issuance of a floodplain development permit by the Zoning and Codes Office.

Proposed Uses

The property has many features which suit it well for the mining and excavation use which is being requested. It is located adjacent to the Kansas River in an area with sand reserves and has good access to the major transportation network. The property is located at the western reaches of the Eudora Wellhead Protection Zone and is outside the FAA 10,000 ft Wildlife Mitigation Area. (Figure 3) Conditional Use Permits for river dredging have been approved for the property to the north and an off-site access drive was constructed to accommodate this facility. There is little residential development in the area; however, 4 residences are within very close proximity to the area proposed to be pit mined with 2 of these being located on the subject property. The area is not served by a rural water district, but relies on well water. Care must be taken through the approval and operation process to minimize any negative impacts to the nearby residences.

The subject property is located in a large contiguous area of high quality agricultural soils. (Figure 4) There is a conflict between the two natural resources in that the removal of the underground sand deposits will remove the high quality soils in this location. The fact that sand reserves are typically located near the river, and often within the floodplain makes it difficult to avoid locating in areas with high quality soils.

Staff Finding – The property is well suited to the agricultural and residential uses to which it has been restricted by the V-C Zoning District. The property is also suited to the Conditional Use of mining and excavation provided that appropriate measures are taken to minimize negative impacts on nearby residences. A policy decision for the Commission would be a decision regarding the competing natural resources in the area: high quality agricultural soils and off-river sand reserves.

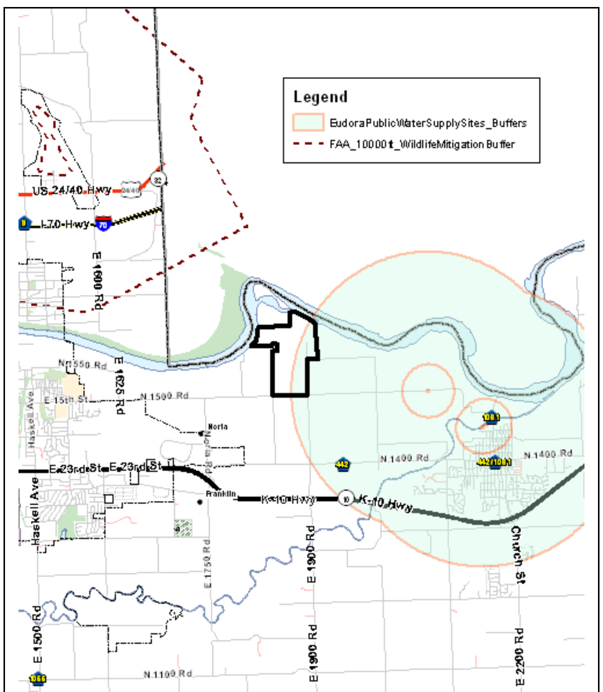

Figure 3. Eudora Wellhead Protection Zone and FAA Wildlife Mitigation Area.

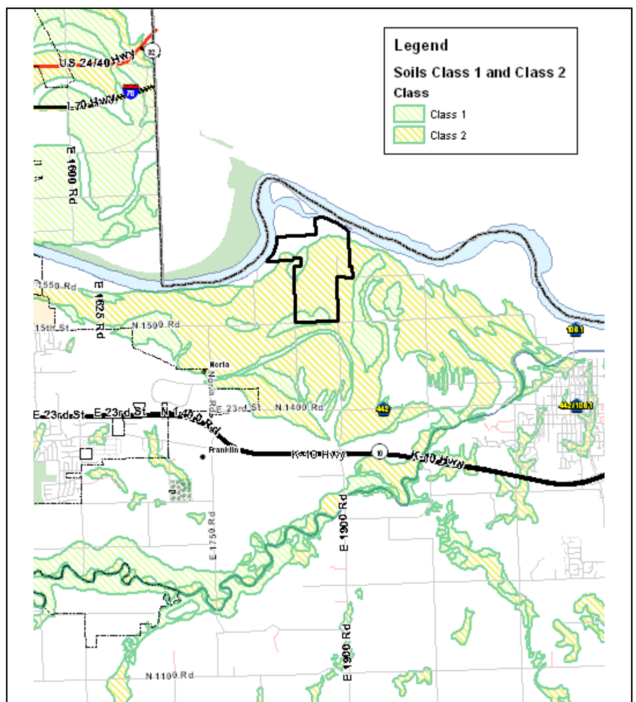

Figure 4. High Quality Agricultural Soils in the area. Subject property outlined.

IV. LENGTH OF TIME SUBJECT PROPERTY HAS REMAINED VACANT AS ZONED

Staff Finding – The V-C District permits limited development of agricultural, recreational uses or farm residences. The property has been used for farming and 2 farm residences were constructed on the property in the early 1900s. There has been no other development on the subject property.

V. EXTENT TO WHICH REMOVAL OF RESTRICTIONS WILL DETRIMENTALLY AFFECT NEARBY PROPERTY

Applicant's Response:

> *"No detriment to nearby properties will occur. This CUP request maintains existing agricultural uses on the land while adding employment and revenue opportunities in northeast Douglas County. The Corps of Engineers regulate the mining activity on the river along with several other governmental agencies which require permits."*

The proposed use will produce permanent changes in the area. Agricultural uses will continue as mining occurs by phase; however, eventually all phases will be mined. The reclamation plan shows some areas being returned to farmland, particularly around the residence on the east side of the property and the area in the northwest corner of the subject property adjacent to the Kansas River and the rest being reclaimed as a lake. An access drive installed for an earlier CUP will be utilized and this will have direct access to a paved road.

Sand pits have the possibility to detrimentally affect nearby properties through the following:

- **Stockpiles**: Overburden, topsoil, and finished products of sand and aggregate will be stockpiled on the area. The placement, height, and maintenance of stockpiles to prevent dust pollution are important considerations to reduce any negative impact. The applicant indicated that overburden would be used primarily to construct the perimeter berms and for reclamation of previously excavated phases. If stockpiling of overburden is proposed on the subject property, the CUP plan should note the maximum height and location. The stockpiles should be kept as far from the existing residences as possible to reduce visual impact.
- **Ground water:** As mentioned earlier, properties in this area are not served by public water and must rely on well water. The mining will occur above and below the water table. It would be important to study any impact the mining activity could have on the quality of ground water and the quantity available to nearby wells. The applicant provided a study on the impact of the mining activity on groundwater. The study looked at wells which are registered with Division of Water Resources, Kansas Department of Agriculture. It is important to note that some wells in the area were installed prior to the requirement to register. The study was prepared by Carl E. Nuzman, P.E., P.HG, a consulting engineer and hydrogeologist. The following are excerpts taken from the study:
    a. The report provided the following information on the quantity of water available for the wells: *"A well can decrease in yield due to biological fouling and lack of property maintenance but unless the static water level has a substantial decline reducing the saturated thickness, the yield available from the aquifer remains constant."* (Page 5, Nuzman report.)
    b. And the following recommendation in relation to the McElwee well: *"The C. McElwee domestic well is up-gradient from the sand pit and down-gradient from the Kansas River. Although the property is about 5 acres in area, it is recommended that the set back of the pit mining be 300 feet from his property line. The radius of influence of the domestic well is less than 300 feet and will not be adversely affected by the sandpit."* (page 8, Nuzman report.)
    c. Regarding the impact of the sand pit on the quantity of water available for other wells in the area: "*Sand pits beneficially support the yield of wells that are down-gradient from a pit that is within the area of influence of a well."* (Page 8, Nuzman report.)

d. "*Due to the hydraulic gradient of the valley aquifer system and recharge to the aquifer from rainfall, the aquifer flow to the City wells is from the west-southwest. The Penny sand pit will be a half mile north of the capture zone of the City wells and will have no influence on the Eudora public water supply wells*." (page 7, Nuzman report)

The report recommended that a 300 ft setback be maintained between the property boundary of any residence out parcel and the active dredging of sand from the pit and concluded that the proposed sand pit lake that will be developed will have no effect on the McElwee wells, Public Wholesale Water Supply District No. 25 or the City of Eudora's wells or water supply. The applicant provided a revised CUP plan with the 300 ft setback shown.

- **River channel:** Concern was raised that allowing the pit mining to occur so close to the river could accelerate a change in the river channel, especially during flood events. The river is naturally working to change its channel in this location. Wakefield Dort, a retired KGS professor, examined the channel changes in the Kansas River and Carl McElwee provided an excerpt of one of his publications in his materials. Staff contacted a hydrologist with the USGS (United States Geological Survey) Midwest Division, Kyle E Juracek, for his opinion on the impact of the dredging operation and pit on the river channel. Mr. Juracek indicated that the location of a lake could result in channel change in the event of a flood but pointed out that the river channel may change as a result of a flooding event even without a lake in close proximity. Rip-rap including large pieces of concrete and smaller infill pieces has been placed on the Kansas River shore to stabilize it since the river dredging operation began.

- **Visual impact:** To minimize the visual impact on nearby properties, particularly the residential properties that are in close proximity to the mining area, it is necessary to establish well-landscaped buffers and to place limits on the location and height of stockpiled materials. The Operation Plan indicates that excess overburden and topsoil might be sold. To minimize activity near these residences, sales should be by delivery only or occur on the northern area where the scale house is shown on the CUP. The reclamation plan should provide details about the lake which is to be created, showing the approximate boundaries, and shape. Development of a lake that is an attractive natural feature could be a positive impact on the area.

- **Traffic:** The applicant provided a Traffic Impact Study (TIS) and addendum which are included with this report as Attachment B. The TIS estimated that on a high production day as many as 200 trucks a day could be expected (400 truck trips as these would be round trips). The increase in truck traffic that would result from the sand plant expansion would be 20 trucks a day (40 trip-ends, 20 in and 20 outbound trips). The applicant's consultant provided an amended TIS which explains that the traffic generation estimated in the original TIS assumed that the river dredging operation and the sandpit operation would be occurring concurrently. The applicant indicated that the primary reason for the expansion of the plant is to switch over the river dredging to off-river pit dredging maintaining its current rate of sand distribution at approximately 1,000 (+/-) tons on an average day. The TIS indicates that all truck traffic will utilize Noria Road, and will not use N 1500 Road; this should be listed as a condition on the CUP plan. When the sand pit dredging operation replaces the river dredging the estimated number of trucks serving the site will be around 40 trucks per day. The consultant also clarified that the 200 trucks per day estimate was based on a high productivity day, 5000 tons, which may still occur but on a very infrequent basis.

  Based on this information, traffic can be assumed to be about 40 trucks a day on an average day and up to 200 trucks a day on a high productivity day.

These documents were provided to the County Engineer for review, and also to the City Engineer as some of the roads used to access the plant lie within the City of Lawrence. The County Engineer recommended the following improvements to nearby roads and intersections to accommodate the increased traffic associated with the sand pit:

a. Realignment of the entrance to the sand facility so that it opposes the Noria Road intersection at N 1500 Road.

b. Pavement of a 100 ft long section of the site access drive just north of N 1500 Road, as recommended in the TIS.

c. Reconstruction of pavement in the Noria Road (E 1750 Road)/N 1500 Road intersection. The existing surfacing is likely a crushed rock base that has been chip sealed. This will not stand up to the increased truck traffic crossing N 1500 Road.

d. Construction of an eastbound right turn lane on Route 442 (N 1400 Road) at Route 1057 (E 1900 Road). This is mentioned as a desirable improvement in the TIS. Pavement on the existing shoulder at this location is not adequate for the projected amount of truck traffic.

These changes shall be noted as conditions of approval which must be met before the Conditional Use Permit is issued.

- **Activity:** A sand pit operation includes the removal of overburden with heavy equipment, the dredging of sand, processing and sale of the sand/aggregate products, and reclamation activities. These activities could have an impact on surrounding properties due to lighting or noise. The operation plan indicates that typical hours of operation will be Monday through Friday from 6:30 AM to 6:30 PM. There may be extenuating circumstances which would require operation on Saturdays or for dredging to occur beyond the regular hours of operation due to the nature of the construction business. The operation of the dredge should be low impact as the 4 headlights that are on the dredge provide the only lighting when operating at night and the dredge operates relatively quietly. It should be noted as a condition of approval that no removal, transfer, or placement of overburden which requires heavy equipment would be permitted outside these operating hours. This will serve to keep the higher intensity uses within the regular business hours.

Staff Finding –Potential negative impacts the proposed use could have on nearby properties include the noise and activity associated with the mining, reduced visual appeal created by stockpiles of overburden or topsoil, impacts on well water, and traffic. Conditions should be placed the CUP to minimize potential negative impacts on nearby properties.

VI. RELATIVE GAIN TO THE PUBLIC HEALTH, SAFETY AND WELFARE BY THE DESTRUCTION OF THE VALUE OF THE PETITIONER'S PROPERTY AS COMPARED TO THE HARDSHIP IMPOSED UPON THE INDIVIDUAL LANDOWNERS

Applicant's Response:
"*No identifiable gain will result by denial of this request; no identifiable hardship will result from its approval.*"

Evaluation of the relative gain weighs the benefits to the community-at-large vs. the benefit of the owners of the subject property. There are many factors to consider when locating a sand pit, and this location meets the geographic criteria of being outside the FAA 10,000 ft wildlife mitigation area, has good access to the arterial roadway system, and is in a lowly populated area. Denial of the request for a Conditional Use Permit would affect the individual landowner by prohibiting the use of the property for the off-river sand dredging pit.

Denial of the CUP request may benefit the area property owners by preventing the proposed mining activity and possible negative impacts. Denial may benefit the public by retaining the high quality soils. Denial may also detrimentally affect the public in that it will prohibit production of sand and aggregate materials from a local source. With the recent move away from river dredging, appropriate locations for pit mining must be found.

Staff Finding – Denial of the CUP would result in a hardship to the applicant and public in that it would prohibit the applicant from operating a sand pit to produce sand and aggregate products from local reserves. Denial of the CUP may benefit the public at large by maintaining the high quality soils which are present. To weigh the benefit the denial of the CUP would have on the public, protection of high quality soils, versus the impact it would have, loss of potential sand and aggregate production from a local source, it is necessary to choose between these two natural resources in this location.

VII. CONFORMANCE WITH THE COMPREHENSIVE PLAN

The subject property is not located within an identified urban growth area. The comprehensive plan recommends that agricultural uses continue to be the predominant land use within the areas of the county beyond the designated urban growth areas. Uses permitted in the rural area should continue to be limited to those which are compatible with agricultural production and uses. The mining activity and the resultant lake would be compatible with agricultural production and uses.

Chapter 16 Policy 2.7 "*Encourage the protection of High Quality Agricultural Land in Douglas County for current and future agricultural use.*" (page 16-15, *Horizon 2020)*
This policy contains the following 4 steps to encourage the protection of High Quality Agricultural Land:

- Including the protection of High Quality Agricultural Land as a key assumption in the sector planning process.
- Establishing tools to protect High Quality Agricultural Land for farming and make its protection economically feasible for the land owner.
- Maintaining an inventory of High Quality Agricultural Land in Douglas County and track the amount lost to urbanization.
- Encourage and develop policies that support agri- and eco-tourism.

Chapter 16: *Resource Management*
"This section encourages the responsible use of marketable natural resources within Douglas County through proper extraction and reclamation methods. They are essential to sustainable development activity, primarily in the form of low cost raw materials, such as sand, gravel, timber, oil, gas, and stone, etc." (page 16-21, *Horizon 2020*)

The Comprehensive Plan recommends both the encouragement of the protection of High Quality Agricultural Land and the responsible use of marketable natural resources.

Staff Finding – The proposed use is in general conformance with the recommendations in the Comprehensive Plan; however, it is proposing the use of marketable natural resources rather than the protection of High Quality Agricultural Land.

STAFF REVIEW

As discussed earlier, there are two approved Conditional Use Permits for river dredging in this area, CUP-2-2-79 and CUP-06-04-08. CUP-06-04-08 replaced an expired Conditional Use Permit, CUP-1-3-91, which had requested both river and pit mining for the area to the west of the subject property (Figure 2). The river dredging request was approved but the pit dredging request was denied. CUP-2-2-79 was approved for the property to the north of the subject property. The processing plant, scale house and stockpiles are currently located on this property. The scale house and stockpiles would remain in this location; however, the processing plant would be located to the east onto the property within the current CUP in later phases of excavation. An easement was dedicated in 1979 for the access drive and this access drive will continue to provide access for the subject property. A copy of this easement shall be provided to the Planning Office for the file.

Most of the neighbor's concerns were addressed in an earlier section of this report dealing with possible negative impacts to surrounding properties; however, another concern was raised regarding the perpetual maintenance of the berms in the future to insure that stormwater runoff does not enter the lake. Staff recommends that an agreement placing the responsibility for the perpetual maintenance of the berms on the property owner should be executed and recorded with the Register of Deeds prior to the release of the CUP permit.

Wetlands are present on the subject property as shown on the CUP plan. The applicant's intention is to either protect the wetlands or mitigate them off-site; however, the decision has not been made at this time. The applicant shall work with the Army Corps of Engineers to determine how the existing wetlands on the property will be treated. Prior to any excavation occurring in the phase adjacent to the phase containing the wetlands, the applicant should provide documentation to the Planning Office indicating the plans for the wetlands, whether they will be maintained on site or if they will be mitigated elsewhere. If the wetlands are to be maintained, the operation plan should be revised to include the protection measures and the revised plan should be submitted to the Planning Office for administrative approval of the wetland setbacks and protection measures.

The applicant indicated that their long term plan for the area is to reclaim the areas to farmland as shown on the reclamation plan and to create a lake for recreational use in the remainder. A note should be added to the reclamation plan which indicates that the lake will be contoured with a more natural shape than the rectangular shape shown on the plan and to note the intended use following reclamation.

The previously approved CUP restricted sand pit access on E 1810 Road to employees and required customers and commercial trucks to use the established access drive. A note to this effect should be included on the CUP plan.

Due to the nature of mining and excavation uses, the approval time frames are typically for 30 years. This allows time for the mining, excavation and reclamation of the land. An extension request may be submitted to the Planning Office for public hearing before the Planning Commission and action by the County Commission. The Zoning and Codes office shall conduct 5 year reviews to insure compliance with the CUP, operation, and reclamation plans.

The applicant explained the mining process will begin with excavation of the overburden in Phase 1 and the dredge will be moved in for removal of sand when possible. A picture of the dredge and the processing plant is included in Figure 5. The mine is to be sequentially reclaimed which means that that earlier phases will be in the reclamation process as later phases are being excavated. The first few phases are planned to be reclaimed as farm land so overburden from later phases will be placed in the area to be reclaimed. Topsoil will then be applied and vegetation planted. As they move through the phases the overburden will be excavated and placed within the previously created pit. Overburden will also be used to create the perimeter berms which will keep stormwater runoff from surrounding areas from entering the lake. This is an important step is preventing pollution of ground water. There may be some incidental sales of excess overburden or topsoil but this would occur on the property with the scale house. All stockpiling of finished material will occur on the area designated on CUP-2-2-79. A note should be added to the plan that states that the area shown on CUP-2-2-79 with the scale house, processing plant, sediment pond, and stockpile area will also be used to serve the subject property and CUP.

Figure 5a. Picture of processing plant which will remain on the north portion of the property.

Figure 5b. Picture of dredge which will be used for mining operations.

Public Communications
Public Communications included with this staff report in Attachment A include a letter from adjacent land owner, Carl McElwee, expressing his concerns with the possible impact the proposal may have on the area; a petition signed by neighbors in opposition to the project; a request for deferral from adjacent property owner, Dave Penny, and a letter of opposition to the deferral request from Carl McElwee. The concerns raised in Carl McElwee's letter have been discussed throughout this staff report. Staff does not typically make recommendations when deferrals are requested, but the letters have been provided for the Commission's consideration.

Joint Hearing
County Resolution No 80-5 established the policy that a joint hearing be held for requests within 3 miles of the incorporated cities in Douglas County so that the County Commission would have the benefit of both Planning Commissions' recommendations. The subject property is approximately 2 miles west of the Eudora City Limits; therefore, a joint meeting is being held between the Lawrence/Douglas-County Metropolitan Planning Commission and the City of Eudora Planning Commission and their recommendations will be forwarded to the Board of County Commissioners.

Conclusion
Approval of a Conditional Use can be tailored to address specific issues such as intensity or frequency of use, include time limitations, and provide screening requirements. The recommended conditions respond to the specific nature of this request. The sand pit, as conditioned, should be compatible with nearby land uses.

CONESTOGA-ROVERS & ASSOCIATES

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December 20, 2012 Reference No. 080649

Mr. Keith A. Browning, P.E.
Director of Public Works
Douglas County Public Works
1242 Massachussetts Street
Lawrence, KS 6604-3350

Dear: Mr. Browning

Re: Review of Hydrogeology Considerations for Open Pit Aggregate Mining Application
Penny's Concrete and Sand LLC, Douglas County, Kansas

Conestoga-Rovers & Associates (CRA) is pleased to provide this report on our third-party review findings on the hydrogeologic considerations of the proposed open pit mining application by Penny's Concrete and Sand LLC (Penny's) in Douglas County, west of Eudora. In particular, the focus of our review was the potential of the proposed sand facility to contaminate the aquifer and threaten downgradient (down-aquifer) wells. Our review is based primarily on the documents provided, our experience and expertise in these matters, as wells as other publicly available information.

1.0 SUMMARY AND RECOMMENDATIONS

In summary, our review does not indicate there are any major problems or concerns with regard to the proposed operation; however we have several recommendations for further assessment to confirm this position and implement precautionary measures and best management practices for the operation (presuming they are not already addressed). We further recommend that the proponent be responsible for the implementation of these measures subject to review/approval by a competent professional – either a public agency representative or a third-party consultant.

Our recommendations include the following:

1.1 PRIOR TO APPROVAL

1. Determination of the current groundwater table and flow direction based by field measurements.
2. Determination of anticipated maximum dewatering influence from maximum rate of sand (and water) extraction, evaporation, and any other water consumption. This

would include clarification on the proposed rate of sand and water extraction or taking from the pond (recognizing the recycling of water).

3. Confirmation of existing groundwater or soil quality to ensure there is no significant contamination from existing Site area and operations, including a screening assessment of potential sources and existence of contamination and installation and sampling of groundwater wells in downgradient area. Assessment should include suitability of soils for placement below water in support of site rehabilitation plans. If any problems are indicated, they should be further investigated and evaluated as to whether any remedial actions are necessary.
4. Private water well survey to establish baseline water quantity and water quality conditions within potential zone of influence (#1 and #2, above). Such survey would be subject to landowner access permission and include areas upgradient as well as downgradient from the site.
5. Prepare and submit a fuel/chemical handling and spill response plan.
6. Commit to documenting sand production levels and effective water consumption on an annual basis to aid in interpretation of monitoring data

1.2 DURING OPERATIONS

1. Monitoring of groundwater levels in adjacent private water supply wells. Zone to be established based on predicted zone of influence (#1 and #2, above).
2. Monitoring of groundwater levels in dedicated monitoring wells installed on south and east sides of site. Monitoring in early years while extraction is occurring in the northwest part of the site will help confirm the zone of influence predicted above (#1 and #2, above).
3. Periodic (quarterly) monitoring of water quality in downgradient area using monitoring wells and private water supply wells (if available).
4. Prevent runoff from off-site as well as on-site areas from flowing into the pit lake.
5. Any fill import must be sampled and analyzed for chemical suitability.
6. Remediate/report any spills in accordance with fuel/chemical handling and response plan (#5 above).

2.0 REVIEW

Based on the scope and timing of this review we have not attempted to document a detailed recounting of the technical information, positions presented by various stakeholders, and our response to individual points raised. Instead we have focused on the primary considerations and our assessment of the potential for concern based on our experience and knowledge elsewhere. We'd be happy to provide further assistance to the County if that is desired.

While the focus of our review is related to the potential to contaminate water quality for down-gradient wells, we also offer some comments regarding water quantity considerations as we believe they are important to the overall understanding of the proposed operation and some of the issues being raised. It is important to recognize, however, that the water quality considerations described herein, may be adequately addressed without fully addressing the water quantity concerns.

2.1 EXTRACTION PLANS

The Penny Sand and Gravel operation has filed an extraction plan that involves removal of sands and gravels by mechanical means in an area to the south of the Kansas River between Lawrence and Eudora. Materials will be removed and processed on-site via washing and sizing for use as construction materials and other uses in the local area. The materials are alluvium (placed by water) and generally in the sand range as far as particle size and range in thickness depending on where in the Kansas River Valley you are.

Mining methods in this and the many other operations generally consist of removal by excavators, draglines and haulage by on and off-road capable trucks and in some cases conveyor systems to the processing area. Penny has indicated that a sand dredge will be employed at this facility for some of the removal as well. Sand and water are directed to the processing facility with the water returned to a settling pond. Surface water run-off in proximity to the pit area will be diverted direct to the Kansas River using berms to minimize pit inflows. The pit bottom will be roughly 70 feet (ft) below current grade at the deepest upon completion. There are planned set-backs from the river and adjacent properties during and after extraction and reclamation are complete. The pit will be partially backfilled with materials for which no market is found but include only materials originally extracted from the pit area.

2.2 WATER QUANTITY CONSIDERATIONS

Assessment of the proposed undertaking is challenged by the lack of current groundwater level and flow information in the site region as well as the lack of a quantitative assessment of the potential influence of the proposed undertaking.

Groundwater Flow Directions

The existing groundwater levels and flow directions appear to not be defined. Reference is made to historical studies that reflect fundamentally different conditions and no determination of current conditions is presented.

Nuzman (September 12, 2012, Exhibit D) presents an analysis based on data from KGS Bulletin 130, Part 3 (1958) showing a northeastward groundwater flow direction in the site area.

McElwee (September 18, 2012, Figure 1) and Terrane Resources Co. (September 17, 2012 and October 28, 2012) present groundwater contours from KGS Bulletin 206, Part 2 (1975). McElwee suggests a due east flow direction through the site area; however the groundwater contours show a groundwater depression to the south-southwest of the site, indicating a southwestward component of groundwater flow. The depression is presumably associated with groundwater pumping in this area; however, the exact conditions at the time of analysis and at the present time are not apparent in this review.

None of the above information is current and therefore does not define the current groundwater levels or groundwater flow direction. The lack of current definition, particularly in light of the opposing flow directions presented above, prevents a determination of what water supplies may actually be considered downgradient of the site.

Potential Influence of Proposed Operations

The mining operation involves the removal of sand from below the groundwater table, creating a pond (part of which is subsequently proposed to be filled in). The proposed operation is by dredge; however, its overall effect would be similar if it was by other means such as excavator or dragline. The effect of sand extraction on water quantity relates to two primary aspects. First is the removal of volume from below the water table, the second is the change in evaporation by changing a vegetated land area to a pond.

The removal of volume from below the water table relates to the removal of both sand and water in the course of the mining operation. While the water is recycled back to the pit lake, the volume of sand is not. Each cubic foot of sand removed, must be replaced by an equivalent volume of water (accounting for the drainage of pore water from the sand back to the pond and evaporation loss from stockpiles). This volume replacement has the same kind of dewatering effect on the surrounding groundwater flow system as pumping of water.

Based on available information a rough estimate of the sand quantity within the mining footprint is in the 625,000,000 cubic foot (ft^3)range (based on an extraction area of 12,500,000 square feet, an excavation depth of 70 ft and an average of 20 ft of "overburden" that is not considered product and would be returned to the pit). The reviewed information indicates a 25 year extraction period and therefore the annual production rate (assuming equal amounts each year) would be about 25,000,000 ft^3. The dredge set-up at Penny's redirects water back to the pit after going through a settling pond system so the effective dewatering rate will be less. Assuming an average drainable (i.e., de-waterable using planned separation technology) porosity of 0.30 (i.e., 70 percent volume removal from below a groundwater level about 20 ft below surface), the production rate corresponds to a dewatering rate of 17,500,000 ft^3 per year or 33 ft^3 per minute or 250 gallons per minute (gpm) on an average annual basis.

The increased evaporation from creating a pond also manifests itself as a dewatering effect from the pond. A net evaporative loss will result in a draw of water from the aquifer. The maximum open water area would be on the order of 12,000,000 million square feet. Using an incremental net loss estimate of 29 inches of water per year (surface water evaporation (52 inches) minus existing evapotranspiration (23 inches)) an additional dewatering effect of 29,000,000 cubic feet per year or 55 ft^3 per minute or about 415 gpm can be estimated.

The combined effect of the two dewatering components above is about 665 gpm on an average annual basis. This estimate appears to be a reasonably modest dewatering rate compared to the aquifer yield and size of the extraction pond that will be created; however additional information and analysis would be needed to confirm this estimate and the potential influence on groundwater drawdown and groundwater flow directions. While theoretical calculations may show predicted influences many hundreds or even more than a thousand feet, these are expected to be limited to small theoretical changes and would not correlate to actual noticeable changes in water supply conditions for private well or municipal wells.

However, we are not aware that Penny's or their consultant have conducted such an assessment. Conducting such an assessment would assist in understanding the proposed operation and the potential implications thereof. This assessment can likely be completed based on existing information and would not require extensive field investigations such as pumping tests.

We note that the comparison to the effect of in-river dredging is not analogous as any "dewatering effect" (as described above) would clearly be masked by the flow in the Kansas River.

3.0 WATER QUALITY

3.1 EXPERIENCE WITH AGGREGATE EXTRACTION AND WATER QUALITY

Experience throughout North America and the world has shown that aggregate (sand/gravel) extraction from unconsolidated deposits such as the proposed operation by Penny's sand pit are compatible with groundwater supplies.

A study conducted by the Ontario Ministry of Natural Resources (2006) entitled ***Applied Research on Source Water Protection Issues in the Aggregate Industry Phase 1 Findings*** conducted a comprehensive international literature study and did not identify any instances of an aggregate extraction operation impacting municipal water supplies.

CRA has been involved in numerous aggregate sites, including sites with below water sand extraction with adjacent water supply wells. We are not aware of any instances where aggregate operations have impacted water supplies. CRA is familiar with specific instances of active and historic aggregate sites, both above and below water, that are within the wellhead capture zones of municipal wells. While some of these wells have existing issues with fertilizer and road salt issues, there are no issues identified in relation to the aggregate operations.

A specific example is The Caledon Village Well (No. 3) operated by the Region of Peel (north of Toronto, Canada). This is a clear example of a municipal well operating successfully and the siting of new wells in close proximity to aggregate extraction. Caledon Well 3 has been in operation since 1982 and is located immediately west of Highway 10, with active licensed aggregate extraction areas in close vicinity around the wellhead on both sides of Highway 10.

The municipal well draws water from an unconfined sand and gravel aquifer. The aggregate extraction operations include both above and below the water table extraction within the Wellhead Protection Areas (WHPAs). The WHPA include an extraction pond approximately 300 ft upgradient of the wellhead in the same aquifer.

The water supply from Well 3 remains suitable for water supply as confirmed through monitoring programs and indicated by the following statement from the Region of Peel: "over the previous 26 years…the water quality from Well 3 has been excellent…water taking from an aquifer adjacent to an aggregate extraction site, when operated with 'due diligence' …

can co-exist." Similar statements by their consultants and other agencies confirm that there is no evidence that aggregate activities have had a negative impact on drinking water quality over the past monitoring years while the aggregate sites were in operation within the WHPA (CVCA, 2012) and water quality was found to be excellent and that the remaining aquifer provides effective in-situ filtration (Geo Kamp Ltd, supply consultants).

The Region of Peel completed an Environmental Assessment to establish a new municipal well to increase the water supply for the Caledon/Alton area in 2011. The preferred location selected for the new well is the same area as Well 3, completed in the same unconfined aquifer interval between the active aggregate operations on either side of Highway 10.

Further, our experience has shown that water quality impacts to municipal wellfields in unconsolidated materials are more likely to be impacted by untreated run-off from industry, roadways, large retail complexes, wastewater system storm event overflows and other situations rather than aggregate operations.

In instances where water quality concerns are raised with respect to aggregate operations, they typically do not result in adverse impacts down-gradient. Common factors in areas where there is more likely to be concern are use of pit pond as a receiver of area runoff – particularly in an urban setting – and uncontrolled use resulting in contamination of pond water from garbage/waste disposal, recreational use, including animal or human waste, etc. It is noted that even if there is some change in water quality that does not necessarily mean there is a negative impact to potability, particularly at a distant receptor. For example, a surface pond may result in some desirable reduction in hardness which might otherwise be higher than desirable from a water supply perspective.

3.2 WATER QUALITY CONSIDERATIONS

Typically no chemicals are used in the processing and the only potential contaminants involved with operations are the fuels and fluids (e.g., hydraulics, coolants, lubricants) associated with necessary equipment. These fluids are limited in volume and can be readily observed and cleaned-up if accidentally released through an appropriate management, monitoring, and spill response plan.

Potential concerns for off-site sources of water quality impacts have been raised by others, including runoff (sediment, pesticides, herbicides, biological parameters). The primary control for such measures is to prevent the runoff of surface water (stormwater) into the pit. Such controls are reportedly planned (Nuzman, September 12, 2012, page 8) and also includes settling of process water from the dredging operation to limit recycling of fines (fine-grained overburden) back into the pit pond. Ideally, runoff from active un-mined site areas will also be prevented from running off into the pit pond, particularly where equipment is active/stored, agriculture is ongoing, or the ground is otherwise being worked (e.g., soil stripping).

Further, since the site appears to be in continued use as an active agricultural area (as well as existing aggregate operations), there is some potential for existing contaminants (e.g., pesticide/herbicide, hydrocarbons, etc.) in the soil or groundwater from past use or spills. It is recommended there be a confirmation of no existing groundwater or soil contamination from existing Site area and operations, including a screening assessment of potential sources and existence of contamination and installation and sampling of groundwater wells in downgradient area. Assessment should include suitability of soils for placement below water in support of site rehabilitation plans (see below). If any problems are indicated, they should be further investigated and evaluated as to whether any remedial actions are necessary

Under rehabilitated site conditions (post mining), the primary consideration is the potential for biological impacts associated with the open water pond being in hydraulic connection with the groundwater flow system as this has the potential to influence water quality in the local area. Other potential impacts can be controlled by preventing surface water inflow (as above) and controlling land use to prevent unrelated sources of contamination (e.g., illegal dumping). Potential for biological impacts can be minimized by managing after use to limit the potential for biological factors such as occur with recreational use (garbage/littering, swimming/bathing, pet wastes, etc.).

The proposed site plans include the placement of non-aggregate soils in to the northern part of the pit pond. Some simple precautions are recommended to limit potential water quality concerns, include assessment of existing soil conditions (as above) and separating any soils with elevated organic (non-mineral) content such as topsoil from deeper soils so that they can be placed at an elevation that will remain above the pond level. No vegetation or woody debris should be place below the pond level (some minor amounts of logs/stumps may be appropriate if part of aquatic habitat creation).

The available information does not indicate the likelihood of any credible water quality concern from the proposed aggregate operations for municipal water supply. However, the location and protection of adjacent private water supplies is less clear based on the available information. The report by Nuzman indicates a minimum separation of 300 ft while notes associated with what appears to be a presentation by Penny's or their representative indicates the closest private well is 1200 ft ("Point 4" on page 4 of notes). While 1200 ft appears more than adequate and 300 ft may well be adequate, clear identification of what wells are downgradient (or may be under future conditions) and potential travel times is warranted. In the event of potential concern for downgradient private wells in relatively close proximity to the site, a water quality monitoring program would be advantageous to confirm there is no impact to water wells. Alternatively, as a precautionary measure or in the event of an identified impact, well-head water quality treatment could be provided by the operator. Although there are not precise bounds on potential distances or travel times for impacts, they are limited and based on our knowledge of various guidelines, standards and practices a zone less than 500 or 1000 ft or 100 to 200 days travel time from the pit would appear to address the potential for influence. As noted above, based on the present information, it is not apparent who is presently down-gradient of the site nor who will be under operating conditions.

Thank you for the opportunity to provide this review for Douglas County. Please don't hesitate to contact us if you have any questions regarding this information or if you have need of further assistance in this matter.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

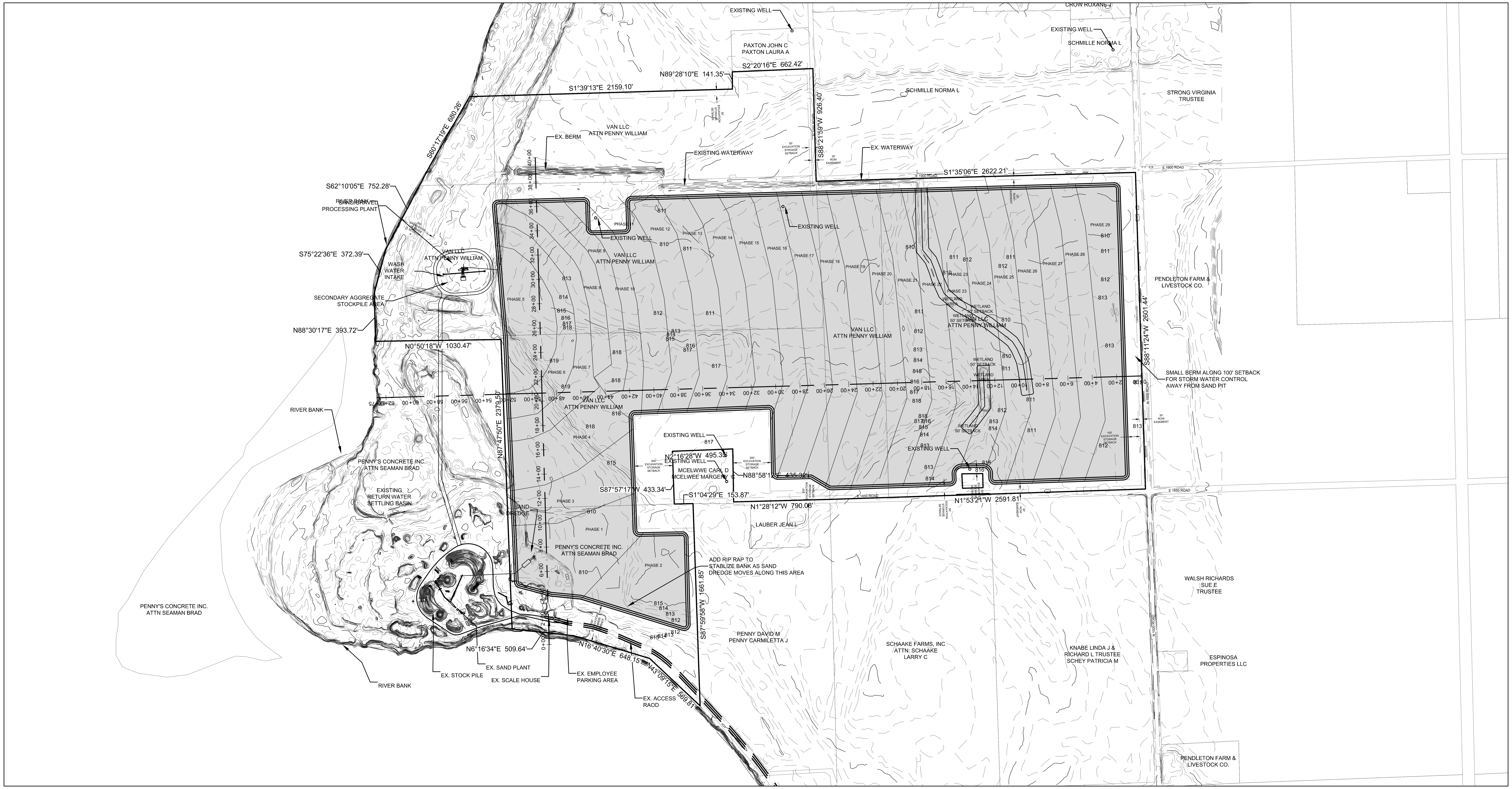
Kirk Hoeffner, P.G. (Kansas)

Peter Oram, P.Geo (Nova Scotia)

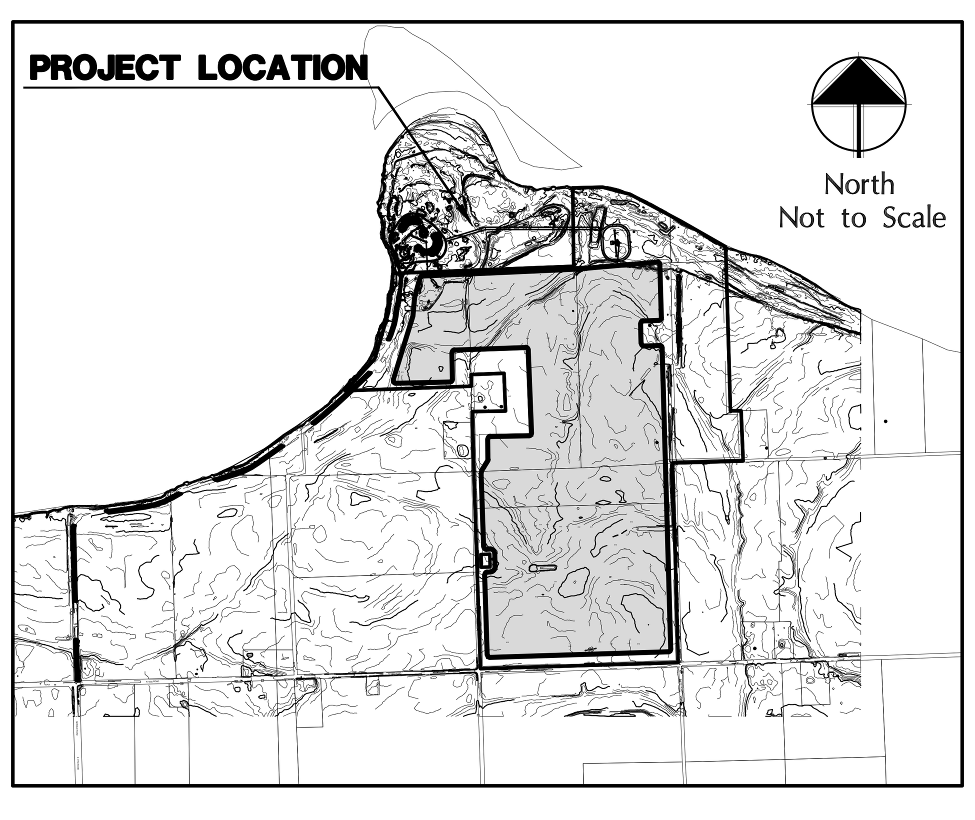
J. Richard Murphy, P.Eng. (Ontario)

JRM/kf/2

cc: Travis Kogl, CRA
Mike Staffileno, CRA



Location Map



Legal Description

A TRACT OF LAND LOCATED IN PORTIONS OF SECTIONS 25, 26, 35 AND 36 IN TOWNSHIP 12 SOUTH, RANGE 20 EAST OF THE 6TH PRINCIPAL MERIDIAN, IN DOUGLAS COUNTY, KANSAS, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF THE SOUTHEAST QUARTER OF SECTION 35, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE NORTH, ALONG THE WEST LINE OF SAID QUARTER SECTION TO THE CENTER OF SAID SECTION 35, THENCE NORTH ALONG THE WEST LINE OF THE NORTHEAST QUARTER OF SAID SECTION 35, 765.00 FEET TO THE SOUTHWEST CORNER OF A TRACT RECORDED IN BOOK 307, PAGE 487; THENCE EAST 442.00 FEET ALONG THE SOUTH LINE OF SAID TRACT; THENCE NORTH 492.00 FEET ALONG THE EAST LINE OF SAID TRACT; THENCE WEST 442.00 FEET ALONG THE NORTH LINE OF SAID TRACT TO THE WEST LINE OF THE NORTHEAST QUARTER OF SECTION 35, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE SOUTH ALONG SAID WEST LINE, 126.40 FEET TO THE SOUTH LINE OF THE NORTH 77 ACRES OF THE EAST 134 ACRES OF THE NORTHWEST QUARTER OF SAID SECTION 35, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE WEST ALONG THE SOUTH LINE OF THE NORTH 77 ACRES TO THE EAST BANK OF THE KANSAS RIVER; THENCE NORTHEASTERLY, ALONG SAID EAST BANK, TO THE NORTH LINE OF SECTION 35, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE EAST, ALONG THE NORTH LINE OF SAID SECTION 35, TO THE SOUTHWEST CORNER OF THE EAST 11.53 ACRES OF GOVERNMENT LOT 1 IN SECTION 26, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE NORTH, ALONG THE WEST LINE OF SAID EAST 11.53 ACRES, TO THE SOUTH BANK OF THE KANSAS RIVER; THENCE EASTERLY, ALONG THE SOUTH BANK OF THE KANSAS RIVER, TO THE WEST LINE OF SECTION 25, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE CONTINUING SOUTHEASTERLY, ALONG THE SOUTH BANK OF THE KANSAS RIVER, TO THE NORTHWEST CORNER OF A TRACT RECORDED IN BOOK 1056, PAGE 5024, SAID POINT LYING 739.2 FEET EAST OF THE WEST LINE OF THE NORTHWEST QUARTER SECTION 36, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE SOUTH, ALONG THE WEST LINE OF SAID TRACT, AND PARALLEL TO THE WEST LINE OF THE NORTHWEST QUARTER OF SECTION 36, TOWNSHIP 12 SOUTH, RANGE 20 EAST TO A POINT 151.78 FEET WEST OF THE NORTHWEST CORNER OF THE TRACT RECORDED IN BOOK 1000, PAGE 3430; THENCE EAST 151.78 FEET TO THE NORTHWEST CORNER OF SAID TRACT; THENCE SOUTH 660 FEET, ALONG THE WEST LINE OF SAID TRACT, TO THE SOUTH LINE OF THE NORTHWEST QUARTER OF SECTION 36, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE WEST ALONG SAID SOUTH LINE, 890.98 FEET TO THE SOUTHWEST CORNER OF THE NORTHWEST QUARTER OF SECTION 36, TOWNSHIP 12 SOUTH, RANGE 20 EAST, ALSO KNOWN AS THE NORTHEAST CORNER OF THE SOUTHEAST QUARTER OF SECTION 35, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE SOUTH, ALONG THE EAST LINE OF SAID SOUTHEAST QUARTER TO THE SOUTHEAST CORNER OF SAID SECTION 35, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE WEST, ALONG THE SOUTH LINE OF SAID QUARTER, TO THE POINT OF BEGINNING. CONTAINS 465 ACRES, MORE OR LESS.

General Notes

OWNER: PENNY'S CONCRETE, INC.
ATTN: BILL PENNY
800 EAST 8TH STREET,
LAWRENCE, KS 66044

1. LAND PLANNER/ ENGINEER: LANDPLAN ENGINEERING, P.A.
1310 WAKARUSA DRIVE
LAWRENCE, KS 66049
2. TOPOGRAPHIC INFORMATION OBTAINED FROM 2006 CITY OF LAWRENCE LIDAR AERIAL DATA.
3. EXISTING LAND USE: AGRICULTURAL
4. PROPOSED LAND USE: SAND EXCAVATION, PROCESSING PLANT AND EXTRACTION; AGRICULTURAL
5. EXISTING ZONING: A – VC
6. PROPOSED ZONING: A – VC
7. THIS SITE IS LOCATED WITHIN THE FLOODPLAIN PER FEMA MAP #20045C0203D, DATED AUGUST 5, 2010.
8. PHASE BOUNDARIES ARE ONLY AN APPROXIMATION DUE TO VARIABILITY OF UNDERGROUND DEPOSITS. SEQUENCES OF EXCAVATION MAY VARY. APPROXIMATELY 350,000 TONS TO 400,000 TON PER YEAR.
9. NO FOREIGN MATTER, RUBBISH, TREES, JUNK, SHALL BE DEPOSITED IN THE EXTRACTION AREA.
10. NO ON SITE STORAGE OF FUELS OR CHEMICALS.
11. THE ACCESS POINT AT NORIA ROAD AND N 1500 SHALL BE REALIGN AS REQUIRED BY COUNTY ENGINEER.
12. OVERBURDEN AND TOPSOIL WILL BE SOLD ON SITE.

Site Summary

GROSS CUP/SITE AREA:	20,255,400 SF /	465 AC
PUBLIC RIGHTS–OF–WAY:	0 SF /	0.00 AC
PIT AREA:	13,083,057 /	294 AC

Parking Summary

REQUIRED = 1 SPACE/2 EMPLOYEES; 8–10 TOTAL EMPLOYEES = 4–5 SPACES
PROVIDED = 8 SPACES
PARKING NEXT TO EXISTING SCALE HOUSE SHOWN ON CUP 06–04–08

SCALE: 1" = 400'

400 200 0 400 800

A CUP Site Plan for

Penny Sand Lawrence Facility

Douglas County, Kansas

Civil Engineering
Landscape Architecture
Community Planning
Surveying

Landplan Engineering, P.A.
Lawrence, KS • Kansas City, MO • Manhattan, KS
Blue Springs, MO • The Woodlands, TX

1310 Wakarusa Drive
Lawrence, Kansas 66049
tele (785)843-7530
fax (785)843-2410
email: info@landplan-pa.com
Web www.landplan-pa.com

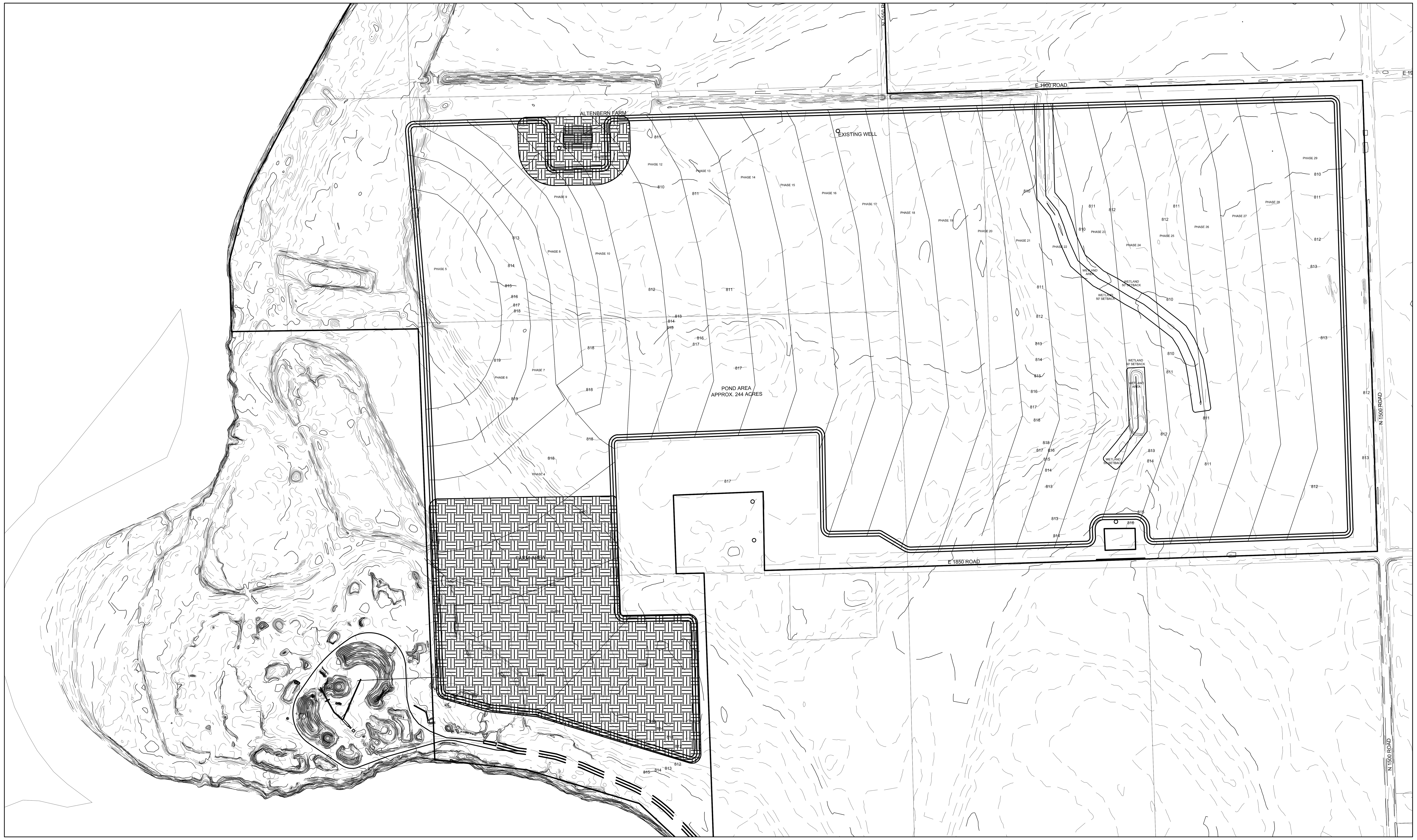
PENNY SAND FACILITY CONDITIONAL USE PERMIT CUP SITE PLAN

REV	DATE	DESCRIPTION
1	8.28.12	PLANNING COMMENTS
2	9.17.12	PLANNING NOTES

DATE:	7.2.12
PROJECT NO.:	20121146
DESIGNED BY:	CLM
DRAWN BY:	CLM
CHECKED BY:	CLM

ISSUE	SHEET NO.
A	C-001

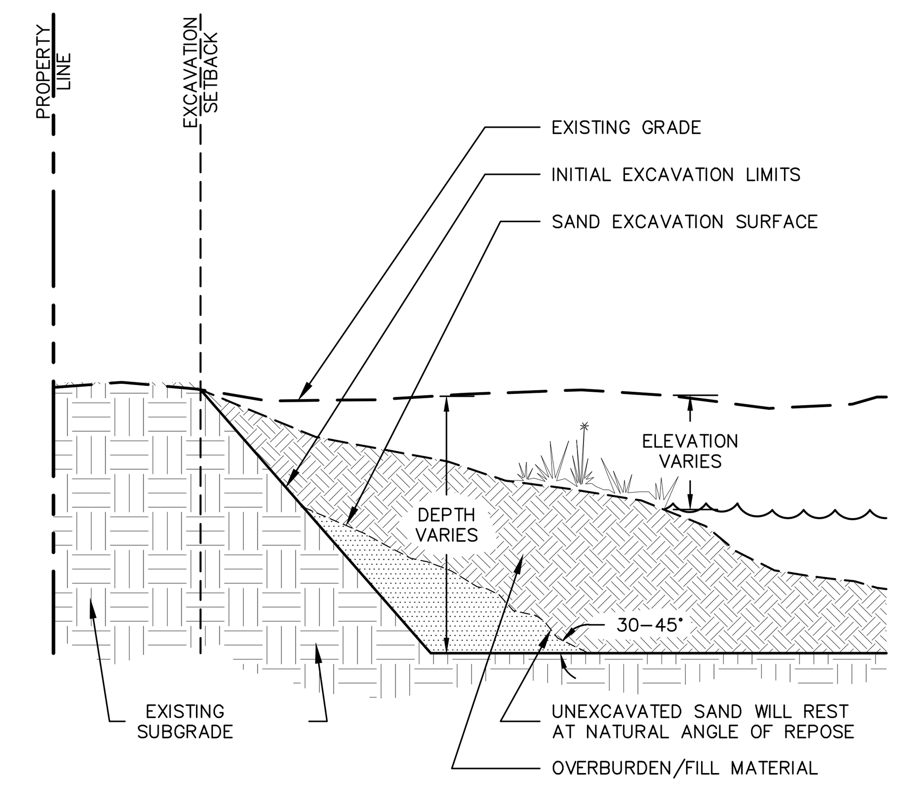
OF 3 SHEETS



Approx. Reclamation Schedule

PHASE 1 - 4	APPROX. 2017-2027
PHASE 4 - 10	APPROX. 2027-2037
PHASE 10 - 17	APPROX. 2037-2047
PHASE 17 - 24	APPROX. 2047-2057
PHASE 24 - 30	APPROX. 2057-2067

1. RECLAMATION TIME FRAMES ARE APPROXIMATE.
2. TIME FRAMES AND SEQUENCE OF RECLAMATION MAY VARY DUE TO VARIABILITY OF UNDERGROUND DEPOSITS AND THE DEMAND FOR MATERIALS.
3. RECLAMATION WILL TYPICALLY BEGIN ONLY AFTER THE PERIMETER OF THE EXCAVATION HAS REACHED THE EXCAVATION LIMITS AND A SUFFICIENT LENGTH OF BANK IS READY FOR RESTORATION.
4. A MINIMUM OF 12" OF SOIL FROM THE PROCESSING PLANT AND STOCKPILE AREAS TO BE REMOVED AND REPLACED WITH TOPSOIL, SEEDED, MULCHED AND FERTILIZED OR RETURNED TO AGRICULTURAL PURPOSES.



Typical Reclamation/Restoration Outer Edges of Lake

NOT TO SCALE

Civil Engineering
Landscape Architecture
Community Planning
Surveying

1310 Wakarusa Drive
Lawrence, Kansas 66049
tele (785)843-7530
fax (785)843-2410
email: info@landplan-pa.com
Web www.landplan-pa.com

Landplan Engineering, P.A.
Lawrence, KS • Kansas City, MO • Manhattan, KS
Blue Springs, MO • The Woodlands, TX

PENNY SAND FACILITY
CONDITIONAL USE PERMIT
RECLAMATION PLAN

REV	DATE	DESCRIPTION
1	9/17/12	POND SIZE

SCALE: 1" = 300'

300 150 0 300 600

A Reclamation Plan for

Penny Sand Lawrence Facility

Douglas County, Kansas

DATE:	8/03/11
PROJECT NO.:	20101019
DESIGNED BY:	LPE/KVC
DRAWN BY:	LPE
CHECKED BY:	RDD/CLM

ISSUE A

SHEET NO. R-001

OF 2 SHEETS

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GENERAL

With the current restrictions which The Corps of Engineers has placed on dredging sand from the Kansas River, many river dredging operations have had their permits suspended or restricted, and will be forced to terminate their dredging operations. Although the Kansas River is being restricted for the dredging of sand, the need for this raw material for construction and development continues. Throughout the river valley / river channel sand is one of the natural resources available for local mining.

Extraction Process

Overburden Removal: A location will be selected for the first stage of sand removal. This location is referenced on the Site Plan as Phase 1. Within this location, topsoil and overburden are removed to expose the sand deposit by means of appropriate earthmoving equipment. Overburden is defined as any earthen material lying above the aggregates. Topsoil and overburden will be used to grade the site as necessary. Excavation will be no closer than 50 feet from any property line. Overburden will be retained for use in reclamation with any excess materials stockpiled and available for resale.

Extraction: Excavation will continue until the water table is exposed. At this point. the material will be dredged from the pit, pumped to the processing plant.

Material Processing:

As sand is extracted, it is pumped to the plant for processing. Through plant processing, sand will be sorted by particle size and blended to make a quality product that can be used in concrete, asphalt, ice control, masonry, glass, insulation or specifications provided for a particular project.

The processing plant uses water from the excavated lake to wash sand over a series of screens separating the material into different classifications of material. The processing plant contains vibrating screens with various size of openings. After the material is sorted, these materials will be stockpiled via radial stackers or front end loaders. Pea gravel, river rock will also be stockpiled.

Water used during the operations will be diverted either to a sedimentation pond where solids suspended in these waters can settle out or in the event the material is of a coarser nature will return directly to the excavated lake.

With wet processing, we would expect minimal dust to be created during the process. Dust exposure is monitored by Mine Safety Health Administration to assure minimal risks to our employees and therefore also to surrounding areas.

Noise levels are monitored, as well, by MSHA for assurance the decibel levels do not exceed the safety standards.

Material Handling

Finished material is conveyed to stockpiles consisting of various grades fine aggregates. The primary stockpiles are generally 30-40 feet tall. Stockpiles will vary in height. The material will be transported by trucks. The trucks are loaded either by a conveyor / bin or a front end loader, weighed to assure the truck weight is approximately the requested weight or within the legal gross tagged weight, ticketed and then travel to their destination.

Existing access roads will be maintained to promote drainage thus preventing excessive erosion or tracking of mud onsite or offsite. The approximate location of existing access roads, stockpiles, scalehouse and main entrance are shown on the Site Plans.

Reclamation

Reclamation for an off-river dredging operation occurs over the entire lifespan of the operation as the excavated lake reaches its limits. Reclamation involves the restoration of the perimeter of the mining site, leaving a permanent body of water. The reclamation plan will include the placement of fill material along the bank to create a uniformly sloped and stabilized bank to create an area that can be vegetated and maintained. Reclamation plans must be submitted, approved and annually monitored by the State Conservation Commission.

Phased excavation schedules have been provided on the Site Plan. These schedules are approximations and will vary due to the economic demand, the variability of the deposits and the desire to maintain the current agriculture as long as feasibly possible. Similarly, an approximate reclamation schedule has been provided on the Reclamation Plan. Annual reporting to the State Conservation Commission monitors “affected” acreage and any changes to the reclamation plan.

Since reclamation is performed when the excavated lake has reached its limits for the specific phase, it is not uncommon for the first reclamation to occur up to 10 years following the beginning of the operation.

When extraction operations at this site are complete, the final reclamation will include the restoration of all remaining banks, the removal of the processing plant, scalehouse, scales and all other associated equipment and buildings from the site. The processing plant and stockpile areas may be returned to agricultural land or other uses that will be beneficial to the property or owner.

Local, State and Federal Requirements

Penny’s will adhere to all applicable State and Federal Requirements / Regulations. Each required State and Federal permit for this project, will be obtained prior to the commencing of operations which the specific permit regulates. As these permits are obtained, copies will be submitted to the Douglas County Planning Department.

U.S. Army Corps of Engineers:

Clean Waters Act – The U.S. Army Corps of Engineers requires a Section 404 Permit for the discharge of dredged or fill materials into the Waters of the U.S. (regulated rivers, streams, lakes, wetland areas, etc.). This facility is an off-river operation and does not discharge into Waters of the U.S. An official wetland delineation has not been performed for this site. There exists potential wetland areas within the project boundaries, which have been delineated based on aerial photography and site visits. All operations are designed to have no impact on the potential wetland areas. A 50-foot buffer has been provided to ensure the project does not encroach upon potential wetland areas. Therefore, a permit application will not be filed with the U.S. Army Corps of Engineers as pertaining to Section 404 of the Clean Waters Act.

Excavation Near a Levee - There are no levees along the Kansas River near this project, therefore, there will be no excavation within the Critical Area of the levee and no permitting will be required.

Kansas Department of Agriculture – Division of Water Resources:

Water Structures – DWR Water Structures Section requires that, per K.A.R. 5-43-5 of the Rules and Regulations (K.S.A. 82a-012 to 305a), a minimum setback of 50 feet be maintained from the bank of a channel to any sand dredging operations located outside the channel of any stream. A natural riparian buffer currently exists between the northern boundary of the project and the Kansas River. The minimum width of this buffer is approximately 300 feet. The buffer is to remain intact undisturbed.

Water Appropriation - DWR Water Appropriation Section requires an Application for Approval to Change the Place of Use, The Point of Diversion or the Use Made of the Water under an Existing Water Right. There will be no new uses or change of uses of water rights associated with this project. DWR Water Appropriation Section requires permits for all sand and gravel pits in townships where the net average annual potential for net evaporation is greater than 18 inches per year. The potential net evaporation for this site is approximately 6 inches per year; therefore, this permit will not be required. DWR also requires a Notice of Intent to Open or Expand a Sand or Gravel Pit Operation. This NOI has been requested.

Floodplain Management - DWR Floodplain Management Section will require a permit for the placement of fill within the floodplain per K.A.R. 5-45 of the Rules and Regulations (K.S.A. 24-126). All permanent fills and unconsolidated mass storage stockpiles located within the floodway require approval from the Chief Engineer with ‘no-rise” certification.

Kansas Department of Health and Environment:

Stormwater and Erosion Protection – An erosion control plan for construction will be filed with KDHE and a permit will be required under the Kansas General Permit for Stormwater Runoff Associated with Construction Activities. An application for permit will be filed following approval of the Conditional Use Permit.

Because of the industrial nature of the project, a permit will be required for all stormwater runoff originating from an industrial activity. Penny’s will develop and implement a Stormwater Pollution Prevention Plan for the site, to be reviewed and approved by KDHE. An application for permit has been requested.

The predominance of stormwater from onsite will drain back into the water body created by the extraction process. Stormwater from offsite shall be conveyed to the existing wetland areas, as occurs in the existing condition, and will only be allowed to enter the excavation pond during flooding events.

Water – Currently Penny’s is permitted for an onsite well used for irrigation. When it is time for the plugging or elimination of this well, the KDHE Bureau of Water – Geology Section will be contacted and the proper paperwork will be filed.

Fugitive Dust – Penny’s will utilize water trucks and apply dust suppressants to control fugitive dust within the site as needed. However, since the product processed in this operation is drawn from a body of water, the typical need for dust suppressant in minimal.

State Conservation Commission:

Mining Permit/License – The proposed site is subject to the “Surface Mined Land Conservation and Reclamation Act”, K.S.A. 49-602 *et seq*. Penny’s holds License No. 95-064, which must be renewed annually. The current license expires December 31, 2012.

Mine Registry - As required by State law, this site will be registered with the SCC prior commencing with the mining process. Penny’s will file an application to register the site as a mine site with the SCC following approval of the CUP.

Reclamation Bonding – As required by State law, license holders are required to post a bond or other acceptable financial security to the SCC and a Reclamation Plan, detailing the post-mining land use and the reclamation process, must be filed and approved by the SCC prior to any mining taking place on the proposed mine. The bond application / letter of credit will be filed with the SCC upon approval of the CUP.

Department of Wildlife and Parks:

Action Permit – A request will be made to the Kansas Department of Wildlife and Parks for an environmental review of the site for potential endangered species or critical habitats. Based on the findings of the review, the need for an action permit will be determined. KDWP may also request additional review from the Department of the Interior or the U.S. Fish and Wildlife Service.

Environmental Protection Agency:

Spill Prevention, Control and Countermeasure Plan – Penny's may maintain a fuel tank for fueling loaders used for the loading of sand into trucks. Fuel for the dredge will not be stored onsite. Fueling of the dredge will be performed by fuel stored offsite. Other fuel or petroleum-based products used for generators or maintenance will occur in amounts smaller than 55 gallons, which is the minimum container size that that is required to be documented in an SPCC Plan. Overall, the amount of petroleum-based materials stored at this site will not exceed the levels (1,320 gallons) required by the EPA for implementing an SPCC Plan.

Operation Times: Typically hours of operation would be Monday – Friday 6:30 AM – 6:30 PM. There may be extenuating circumstances which would require Penny's to maintain operating hours on Saturdays or to extend the normal hours of operation due to the nature of the construction business. Many clients, including State agencies and City governments require construction activities to be completed at odd hours for the safety of the general public. Weather conditions and / or the necessity to provide materials for the hazardous conditions as it relates to snow and ice to state and local agencies may also result in the need to extend hours of operation. Projects / contracts may have such stringent completion dates and / or penalties for exceeding working days it would necessitate the extension of hours of operation.

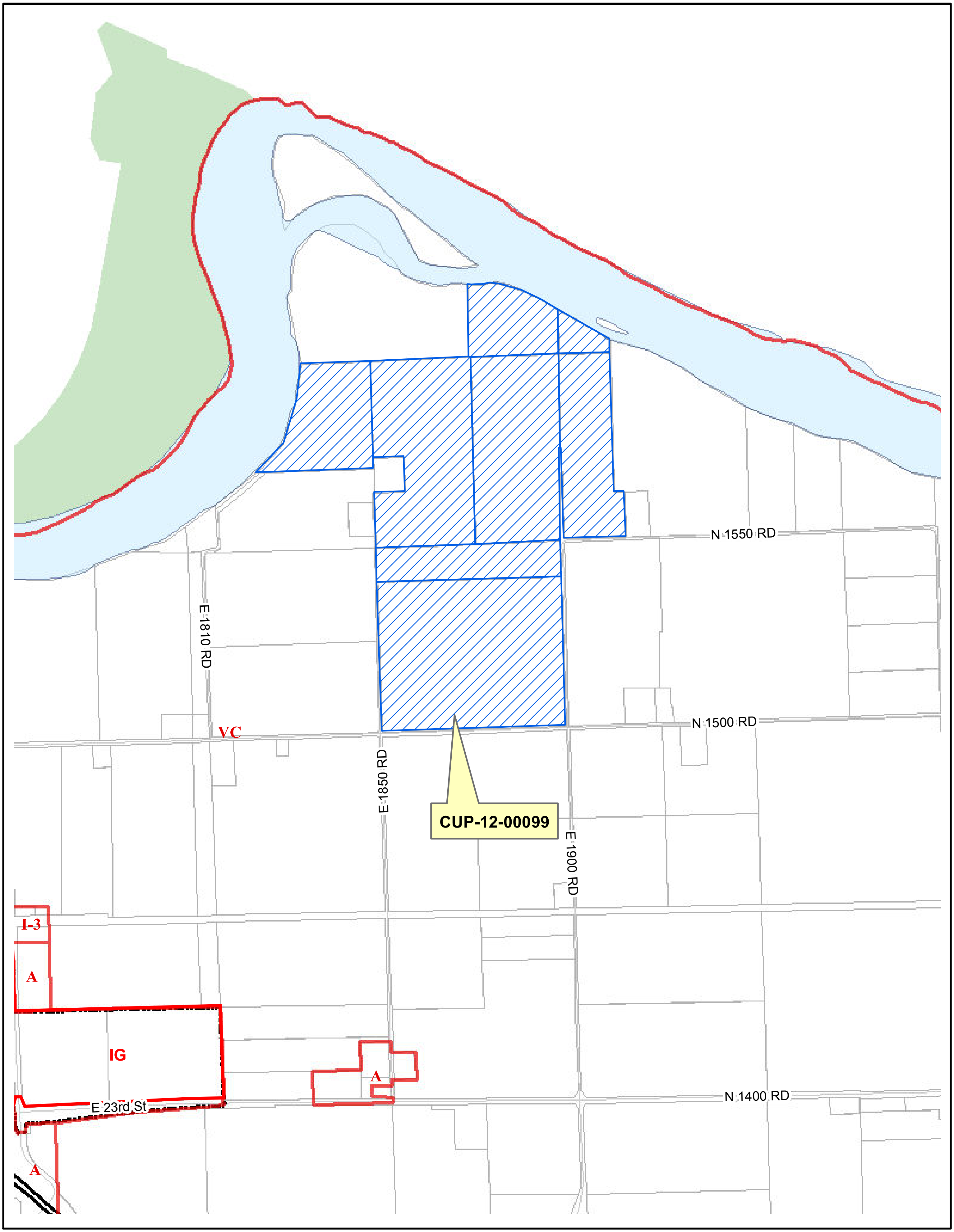
Overburden Placement: During the initial stage of the operation, overburden removed from the excavation area will be used in raising the grade of the processing plant and scalehouse areas and for berms as required. As the excavated lake pond expands into future stages, overburden will be stockpiled at locations deemed beneficial to the reclamation effort, sold, or used to restore the banks of the body of water established by the previous stages.

Operation Life Expectancy: Based upon current economic conditions, the expected life of this project would be 30+ years.

Plan of Response to a Major Flooding Event: Penny's will prepare a plan of action, which would be implemented immediately upon notification that a flood event may occur . The plan will include the removal of all equipment, materials and bulk fuel that is not stationary. The scalehouse, scales and processing plant will remain. Non-stationary items that will be removed will include, but are not limited to, loaders, vehicles, fuel supplies, generators, and any electronic equipment or office materials in the scalehouse.

Power and Fuel Supply: The scalehouse and processing plant will be electrically powered by the Westar Energy lines. The dredge will be diesel-powered. The site fuel supply for the loader and/or generators will be limited to 1,000 gallons. The fuel will be stored in an aboveground storage tank with secondary containment. The fuel pump will be controlled with a power switch located within the scalehouse. The pump will be turned off during non-business hours. Dredge fueling will be performed by fuel from offsite.

<u>Stormwater Runoff</u>: All stormwater falling around the scalehouse, processing plant or stockpiles will be kept on site. The site will be completely non-discharging, with no stormwater leaving the site. Stormwater from offsite shall be conveyed to the existing wetland areas, as occurs in the existing condition, and will only be allowed to enter the excavated lake during flooding events. Any increases in stormwater runoff due the increased impervious surfaces will be substantially offset by the storage capabilities of the excavated lake.



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PC Minutes 10/22/12

Recess LDCMPC

Convene Joint Meeting with Eudora Planning Commission

ITEM NO. 2 CONDITIONAL USE PERMIT FOR PENNY SAND PIT; N 1500 RD & E 1850 RD (MKM)

CUP-12-00099: Consider a Conditional Use Permit for sand excavation and extraction for Penny Sand Pit, approximately 434 acres located on the NE Corner of N 1500 Road & E 1850 Road. Submitted by Landplan Engineering, for William Penny & Van LLC, property owners of record. *Joint meeting with Eudora Planning Commission. Deferred by Planning Commission on 9/24/12.*

STAFF PRESENTATION

Ms. Mary Miller presented the item.

Eudora Planning Commissioners present were Kurt von Achen, Jason Hoover, Johnny Stewart, Glenn Bartlett, and Richard Campbell.

Mr. McCullough said the by-laws state the applicant has 10 minutes to present. Staff recommended the applicant have 40 minutes to present with a 5 minute rebuttal after the public hearing. He also suggested granting 5 minutes for each individual audience member instead of 3 minutes.

APPLICANT PRESENTATION

Mr. Dan Watkins, attorney representing property owner, said the staff report did a good job of covering the golden factors and the applicant agreed with the conditions. He said he would discuss one other possible condition to address concerns about monitoring of ground water in the area. He said the application was to move sand dredging from on-river to off-river. He said the Corps of Engineer was restricting on-river dredging over time. He stated in this particular area sand dredging on-river would be restricted as of December 31st. He said there were many off-river sand pit areas in Kansas. He said usually they were right next to the river and many times right next to towns, even in close proximity to ground water supplies and wells. He stated the Conditional Use Permit would utilize the existing Conditional Use Permit so the stockpiling, processing, scale house, and truck loading would all take place where it currently takes place now, with no change. He said the access and truck traffic would stay the same. He said the staff report did a good job of setting out why this particular site was recommended for approval. He said the use of sand dredging was permitted in the valley channel area and had been allowed for the past 30 years. He said the site had excellent access to major transportation networks, was 7,000’ from the Eudora wellhead protection area, and outside the FAA 10,000’ restrictive area. He said the impacts listed by staff regarding stockpiling, groundwater, river channel, visual, and activity would be the same impacts that have been going on in the area for 30 years. He stated the groundwater issue was already present from the current river dredging. He said the river channel had the potential to change because it changes sometimes, over hundreds of years. He said in 1993 when it flooded, because the banks were fortified by the Penny’s operations it didn’t cut through. He said visually it would change slightly because there would be dredging in the area as it proceeded south. He said there were few sites that met all the things this site does. He said regarding preservation of the river channel, they would be moving dredging off-river. Regarding preservation of quality soil, this area was currently farmed and most would continue to be farmed for many years as the dredging moved south. He said they had a few neighborhood meetings to talk with the neighbors about the impacts and concerns they have. He said they tried to address some of the concerns with adequate buffers. He said that dredging was highly regulated, by state and federal agencies, with many protections built into this.

Mr. C.L. Maurer, Landplan Engineering, discussed the phasing plan. He said they would strip off areas approximately 10 acres in size and build a berm as they go around. He showed pictures of the dredging machine. He said the noise would be contained by the pit and would bounce upward, not out. He said there would be three observation wells on the western side. He said there would be one control well. He showed slides of the area on the overhead. He also showed slides of active and inactive sand pits in other communities.

Mr. Mehrdad Givechi, traffic engineer, said it would not increase the number of truck traffic in and out of the site because it would not generate additional sand distribution. He stated on average there would be 4-5 trucks in and 4-5 trucks out during the peak hour of operation. He said a few minor items needed to be looked at, none of which would be required, but desired for improved safety. He said they were proposing to realign the driveway on the north side of 1500 Road to make a four-legged intersection so there would be no offset in the driveway and Noria Road to the south. He said they would pave about 100' of the proposed driveway to the north in order to prevent gravel from being tracked to 1500 Road. He said the pavement on 1500 Road was not capable of handling truck traffic. He said the traffic would not use 1500 Road so the intersection would be improved to handle the truck traffic in and out of the site. He stated if the distribution increased there would be a need for an east bound dedicated right turn lane at old K-10 and 1057 Road. He said the pavement was already there but needed to be improved to a full dedicated right turn lane. He said he received comments from KDOT regarding the interchange. He said that the count was higher than usual due to road/bridge improvements in the area and that when traffic was normalized they could look at the intersection functioning with the South Lawrence Trafficway. He said as the South Lawrence Trafficway was built in the area KDOT would close the Noria Road intersection and Noria Road would go over existing K-10. He stated it would only effect background traffic and not traffic in and out of the site. He said the applicant agreed to all of the improvements.

Mr. Phil Struble, Landplan Engineering, discussed groundwater issues and said he would cover six pertinent issues. He said Penny's had a permit through the end of the year and has had one for the last 30 years for dredging sand. He said they had been penetrating the aquifer for 30 years with permission from the EPA and Corps of Engineers. He said the permits were not being suspended due to ground water quality. He said the groundwater was there safely today and that the aquifer had already been fully penetrated. He said dredging was 7,000' from Eudora's wells. He said microorganisms would not survive several hundred feet of ground water conditions and that pollutants in the river water would not last long before they would become ground water and no longer river water. He said if Eudora decided to treat water for surface water they would need a trickling sand filter. The sand pit was 7,000' of sand filter, which was better than what Eudora's sand filter could do by itself. He said a concept had been brought up called nick point, which was the fear that when the river flooded the area it would create a vertical cut in the riverbank all the way up the Kansas River to Bowersock Dam. He said even with flooding in the past 25 years the riverbank had not moved at all because it had been maintained. Mr. Struble showed a table on the overhead from the KDHE design guidelines as it relates to private wells, which showed the minimum required setback was 50' and the recommended was 400'. He stated the nearest private water well to Penny's was 1,200'. He said a sand pit was nothing more than a water well that was measured in acres, not inches. He said there was very little difference between the sand pit and a water well. He said just because there was more water impounded in a pit did not make it draw more water into the pit, away from neighboring uses, than what a water well would. He said it would not make what goes into the pit go out of the pit faster or further than anything else. He said the sand around it did not know it was a pit or a water well. He said there were some differences, such as no water consumption out of the pit. He said the water pulled out of the sand pit was put right back into the pit. He said the State Statutes governed how water evaporation was dealt with and that they would have to go to the State of Kansas if they were in an area that evaporates greater than 18" net evaporation per year. He said 5-6" evaporation, such as Douglas County receives, does not have to be accounted for to the State. He said Penny's was regulated and had to protect groundwater supply from pollution. He showed a map of Kansas corridor sand pits and water wells. He said there had not been a single instance where a sand pit polluted a private or public well.

PUBLIC HEARING

Mr. Carl McElwee (via prerecorded video that was shown on the overhead) did not want to see industrial activity encroach on three sides of his property. He said there was a petition from 23 local property owners that opposed the sand pit. He expressed concern that historical houses in the area would not be protected and that good agriculture land would be lost. He said once the overburden was stripped off there was the potential for pollution of the very productive underlying aquifer. He said neighboring wells could be affected adversely by lowered water levels and quality problems caused by mixing pit surface water with aquifer water. He felt the Eudora well 'capture curve' would include the sand pit. He said a large flow-thru lake would be created by the pit, which would mix pit surface water with aquifer ground water and send it further down the river, possibly leading to quality issues. He expressed concern about a nick point being created in the river. He felt the aquifer should be safeguarded and agricultural land protected. He asked Planning Commission to deny the Conditional Use Permit.

Mr. Scott Michie, Eudora Consultant Staff Planner, said the City of Eudora finding was that it does conform with land use and planning policies from a development standpoint. He said Eudora's recommendation was based on Mr. Ned Marks study.

Mr. Ned Marks, geologist hired by the City of Eudora, reviewed the report he wrote that was included in the packet. He said if a contaminant entered through the pit it would have access to the deeper portion of the aquifer that the Eudora wells were completed in. He said any contamination that made it to the bottom of the aquifer would move faster than if it had entered through the soil profile. He said no recent data to evaluate the potential negative or positive impact of the proposed pit was available at this time. He said there was some concern that the water level in the pit would be the same as the water level in the river. He felt the options were to either not approve the Conditional Use Permit or to approve with limitations.

Mr. Doug Helmke, geologist with the Kansas Rural Water Association, said he provides technical assistance to public water systems on water rights and source water protection. He said he advised the City of Eudora to oppose the proposed Conditional Use Permit for a sand dredging operation in the vicinity of their well field, as there had been no reliable information presented that would guarantee that the sand pit would not introduce biological or chemical contaminates into the aquifer. He said surface water used for drinking water required much more treatment than ground water, with much higher infrastructure treatment testing and labor expenses. If the water quality was changed to resemble surface water in any way KDHE would likely require a surface water treatment facility to be constructed if Eudora wanted to continue the use of their existing water rights.

Mr. Scott Jackson, lives east of the proposed sand pit, felt it was wasteful to reduce 400 acres of good agricultural land into something that could not be used. He said a 30" berm was a good idea but felt fertilizer, pesticides, and herbicides would blow into the lake and part of the aquifer. He said even if it took 7-12 years to reach the Eudora wells it would still be there and what would they do then.

Ms. K.T. Walsh agreed with what Mr. Jackson said regarding reclaiming the land back to farmland. She said she was a member of Friends of the Kaw and was surprised they were in favor of the Conditional Use Permit. She wanted to see alternatives proposed.

Mr. Kerry Altenbernd said it was prime agricultural land. He stated there were studies that show one thing and other studies that show something different. He said there would be future floods of the area. He asked Planning Commission to be careful with their decision.

COMMISSION DISCUSSION

Eudora Commissioner Johnny Stewart asked who would pull the samples from the monitoring wells.

Mr. Marks said he oversees drilling on a lot of different operations and has been involved with installing monitoring and observation wells so if he was involved with the project he would be onsite when that was done.

Eudora Commissioner Stewart asked who would control the proposed monitoring wells to the west.

Mr. Marks said that would probably be a determination between the applicant and City of Eudora.

Eudora Commissioner Stewart asked if there would be a condition that the City of Eudora would have access to take samples from the wells.

Mr. Marks said one of his recommendations was that the City of Eudora would have access to collect samples and collect water level data at different times of the year.

Eudora Commissioner Richard Campbell inquired about accumulation of data.

Mr. Marks said if he was involved with the project the first thing he would do was pull all the available information he could find and compile it. He said they would look at the historical information and compare it to the present day information. He said the City of Eudora would have to do a well field analysis, an aquifer test, and collect site specific aquifer characteristic data that could be put back into the models to calibrate and verify.

Eudora Commissioner Campbell inquired about the time period.

Mr. Marks said it could easily take 6-8 months.

Eudora Commissioner Stewart asked Mr. Helmke how he became aware of this situation.

Mr. Helmke said the City of Eudora asked for his opinion on the facts presented.

Eudora Commissioner Stewart asked if it was a paid opinion.

Mr. Helmke said no.

Eudora Commissioner Stewart asked what his role was with the Kansas Rural Water Association.

Mr. Helmke said half his time was spent giving advice on water rights, perfecting water rights, and offering opinions on whether other existing water rights should be purchased. He said the other half of his job was development of source water protection plans.

Eudora Commissioner Stewart asked what his key concern was.

Mr. Helmke said there appeared to be beds of gravel in the aquifer and it was his understanding that there may be a minimal amount of filtration in those beds of gravel. He said if the beds of gravel were exposed in the sides of the pit there was a good chance it would create a preferential flow path of water to the wells, which may contain common contaminates such as bacteria and viruses.

Eudora Commissioner Campbell asked if this was his area of expertise.

Mr. Helmke said it was his job to look at the worst case scenarios and try to protect the water supply from those things. He said he was not saying it would happen but that nobody could probably say there was no risk with the sand pit.

Eudora Commissioner Campbell asked if the studies Mr. Marks discussed could be completed in a year or less.

Mr. Helmke said he would have to defer to Mr. Marks because he had more experience with those kind of aquifer studies and well tests.

Eudora Commissioner Campbell inquired about the gravel data.

Mr. Helmke said he had not seen what was at the pit and away from the pit in the direction of Eudora's well field.

Eudora Commissioner Campbell asked if it was a different kind of study.

Mr. Helmke said no, it was what Mr. Marks talked about with understanding how well the wells operate, what drawdown cones they create, and probably an evaluation of what happens in a dry time of year when there would be large demands of the ground water aquifer and also if the water in the river was high.

Eudora Commissioner Stewart asked why the ground water was hard to clean once contaminated.

Mr. Helmke said if the presence of contamination shows up 12 years away from where it was introduced there would still be current contamination coming through the system to the water wells.

APPLICANT CLOSING COMMENTS
Mr. Watkins said there had been no evidence presented that river water would navigate to Eudora wells. He said there were many sand pits and were highly regulated and not contaminating wells in much closer proximity than the Eudora wells. He said there would be no light or oxygen for the ground water and that would limit the possible contaminants to nitrates and salt, primarily. He said KDHE recommends a 100' setback for this particular use and that Penny's would have a 300' setback from Mr. McElwee's house, which was upstream from the sand pit. He said they would be 1200' from any other well in the area and 7,000' from the Eudora wells. He stated the aquifer was already exposed to river water today and had been for 30 years. He said there was no evidence that there was migration or contamination. He said there was a need for sand and that valley channels were the place to get it. He stated the impacts listed by staff were the same that had existed for 30 years. He felt this was as close to an ideal site as any.

Eudora Commissioner Stewart asked Mr. Watkins if samples could be collected from the monitoring wells.

Mr. Watkins said yes, as often as they wanted to.

COMMISSION DISCUSSION
Commissioner Britton asked why the Corps of Engineers was ending the current permit.

Ms. Miller said she believed it was because of damage to the habitat on the river caused by on-river dredging.

Mr. Struble said in 1990 the Corps of Engineers got together with the Kansas River Dredgers and created an operating program that would monitor what happens in the Kansas River and it was a 20 year program that technically started in 1992 and expires at the end of this year. Part of that program was that they shoot cross sections of the entire Kansas River to monitor degradation of the riverbed as it exists on an every other year basis. He said the operating permit says that if any section degradation was more than 2' they would suspend those permits until that section aggregates back up and then permits can be reissued. He said it had nothing to do with environmental issues.

Commissioner Britton asked why it was important for the river to come back up 2'.

Mr. Struble said to maintain the hydraulic grading of the Kansas River through the whole section. He said if one section goes down then there is bank degradation and other negative impacts.

Commissioner Britton said those sounded like environmental factors.

Mr. Struble said the rule was only that if the riverbed degradation was more than 2' than the permit would be suspended.

Commissioner Josserand asked if that was degradation away from the actual dredging site.

Mr. Struble said that was correct.

Commissioner Josserand asked if it would be correct to say that in recent years there had been a concern about in-river dredging and the urging of non-river sand extracting methods.

Mr. Struble said yes but that it was not just limited to Kansas.

Commissioner Josserand asked if there was a shortage of sand that was driving up development costs in Douglas County.

Mr. Struble said yes. He said it had not been unusual in the last 3 years for the majority of sand used in Lawrence to be trucked in from other places. He said the trucking cost becomes part of the cost of sand.

Commissioner Josserand inquired about the potential risks of rechanneling of the river.

Mr. Struble said that was a difficult question to answer. He said rivers move and it was hard to control rivers. He said the approach was that they were trying to do the best they could. He said Penny's rock armored the banks and received compliments from the Corps of Engineers for doing that. He said there was only one access road to the site and Penny's wanted to protect their investment. He said they had had a number of meetings with the Corps of Engineers to discuss these types of issues. He stated they would be willing to a condition to provide rock armor on the back side.

Commissioner Josserand asked if they should we be worried about an evulsion event.

Mr. Struble said the Corps of Engineers responsibility ends at the top of the bank. He said the Corps of Engineers encouraged the dredging to relocate off-river.

Commissioner Josserand asked if the Corps of Engineers had announced any policy in Kansas that they would refuse all river dredging.

Mr. Struble said no. He said they were in the process of negotiating a new 20 year river dredging permit. He said that did not mean that they would get to dredge for 20 years.

Commissioner Culver asked Mr. Struble how many current sand pit operations were in Douglas County.

Mr. Struble said the number extracting sand was zero.

Commissioner Belt inquired about increased demand for sand.

Mr. Struble said there was no change for the demand of sand.

Commissioner Belt wondered if hydraulic fracturing pulled the market in that direction.

Mr. Struble said he was not involved in that and said he would suspect the sand not involved in that.

Commissioner Liese said he was sensitive to times when one city, such as Eudora, draws a conclusion that was different from what Lawrence decides. He asked staff to comment.

Mr. McCullough said staff had some experience with these types of applications. He said they were looking county wide and have an active exercise to try and find out where in the county staff could support these types of uses, taking into account several different elements. He said there was a second application much closer to Eudora where staff supported Eudora's opposition. He said there was a lot of discussion at the time regarding proximity, and if it moved to the west between Lawrence and Eudora would staff support it. He stated when staff weighed all the issues, such as demand, location, prime agricultural soil, traffic, and with this being an existing location for the use of dredging of sand, staff felt obligated to support this. He said regarding the issue of wells, there was an argument that the data was unknown, which could become known through monitoring. He said they did not hear the same type of testimony that they did when it was adjacent and much closer to the wells of Eudora. He said the testimony to date on this site was that there was potential and much farther away. He felt there should be some exercise in determining how steps could be taken to mitigate the impact.

Commissioner Liese asked how the number of years for the 30 year Conditional Use Permit was determined.

Ms. Miller said that was a standard number of years for a quarry because of the time it takes.

Commissioner Liese asked if there were any other conditions regarding testing that could reassure the citizens of Eudora.

Mr. McCullough said he thought they would need to develop a condition that spoke to that very issue. He said if it came out as a recommendation to the County Commission staff would need to take the time to meet with the City of Eudora and applicant to negotiate the condition out.

Commissioner Liese asked if a condition could be that one year of testing take place before further development.

Mr. McCullough said it could be a condition.

Commissioner Liese asked if Bismarck Lake was a sand pit.

Mr. Watkins said it was.

Commissioner Liese asked if there was a sand pit being developed just north of Lecompton on the other side of the river.

Mr. Watkins said yes. He said he thought it was being developed by MPM from Manhattan, who applied for the one that was too close to the airport, so they developed in Jefferson County.

Commissioner Liese asked how big the Penny's sand pit would be compared to the one being built near Lecompton.

Mr. Struble said it would be a third bigger than the one in Lecompton.

Eudora Commissioner von Achen said once a Conditional Use Permit was approved with the intention that testing would be done the horse was already out of the barn. He felt that the item should be deferred until testing could be done. He wondered who would pay for the error if the applicant was wrong. He felt they should negotiate something such as a surety bond, insurance policy, or surcharge on sand sold out of the pit that would establish a fund to take care of any problems that could develop. He said it was a difficult issue because they needed sand but water was a vital resource and they should not be gambling with it.

Commissioner Liese said he was pretty adamant about voting against the last sand pit proposal. He inquired again about conditioning it.

Mr. McCullough said it could be a condition but it would need to be framed very carefully. He said there were different ways to get at the issue.

Commissioner Burger asked if Eudora had a water development plan that was 30 years long.

Eudora Commissioner Stewart said he could not answer that. He stated half the people in the country get their water from ground source. He suggested the option that if contamination was found in the monitoring wells then the Conditional Use Permit would have a clause that would shut down the plant until the cause and effect were known.

Commissioner Liese asked the applicant to respond to that option.

Mr. Struble said it was not unusual for operations like this to have a plan to what would be done. He said the monitoring well plan included a control well. He said they were concerned that if something was found in the monitoring wells they would want to know it was from Penny’s or coming through from somewhere else. He stated even if more research was done in 6-8 months, a lot of that water would not even get to the monitoring wells in that time period. He said depending on whatever pollutant was discovered in the wells there would be a little different progression of plan. He said they were willing to have conversations about it.

Commissioner Burger inquired about monitoring wells in the 10 year area.

Mr. Struble showed possible locations for monitoring wells on the overhead.

Commissioner Burger said the observation wells made sense in 30 years but she wondered what made sense to the engineers and scientists as the process proceeded.

Mr. Struble said his geologist was not present this evening to speak about that.

Commissioner Britton asked why monitoring wells were part of the plan if the whole idea was 1,200’-7,000’ of soil and sand would get rid of contaminants that could be cause by the sand pit.

Mr. Struble said the monitoring wells were part of the first comments from the City of Eudora regarding Penny’s application. He said they were not part of the original plan.

Commissioner Britton asked if his position was that the monitoring wells were not necessary because even if something showed up in the monitoring wells there was no way it was actually getting to the well being used.

Mr. Struble said that was correct.

Mr. Watkins said there were certain things that do not break down, such as salt and nitrates. He said they would want to know if those were coming through so that was the idea for the observation wells. He said if those were detected then it would need to be determined where they were coming from. He said the existing operation had access to the aquifer. He said there was no evidence that there were nitrates or salt in any well in the valley. He said the monitoring wells provided an answer to the ‘what if’ questions and would show if it was happening and allow time to do something about it.

Eudora Commissioner von Achen said another theory was that the aquifer had not been penetrated because the river receives its water from the aquifer. He stated only when there is a huge flood is there minimal charging of the aquifer from the river and that was not very much. He said it was contradictory to what they were saying. He said the river had been polluted his whole life and has not polluted the aquifer because the water flowing down the river does not get into the aquifer, but rather the river was charged by the aquifer.

Commissioner Britton asked Mr. Helmke to comment about the filtering process through 1,200’-7000’.

Mr. Helmke said it was not known.

Eudora Commissioner Campbell said both sides had hired experts and consultants but there was one unpaid expert from the State of Kansas that clearly states there was not enough information.

Mr. Helmke said he did not work for the State of Kansas and that the Kansas Rural Water Association was a private non-profit association.

Eudora Commissioner Campbell felt the only prudent way to proceed was to defer for a year.

Commissioner Liese asked if Mr. Helmke could draw conclusions in a year.

Mr. Helmke said there were other experts more qualified to do those analysis.

Commissioner Liese asked if it could be a condition of the Conditional Use Permit.

Mr. McCullough said it would be a complicated framework for the Conditional Use Permit. He said it would be more beneficial to collect additional data and further analysis, if they felt it was needed. He said it may be prudent to allow that to unfold, be collected, and analyzed. He said it depended on where they were at with the data issue and the potential harm to City of Eudora's wells.

Commissioner Liese asked the applicant to respond to the comment of deferral for 1 year

Mr. Watkins said he did not like it. He said there was no evidence presented that this type of operation caused the kind of problem they were talking about. He said they were willing to do safeguards and if there was any evidence of some pollutant migrating then it would be stopped. He said it was a hypothetical situation that hasn't occurred. He asked Planning Commission to act on the Conditional Use Permit and put conditions on it.

Commissioner Burger asked if there was a reason why 400+ acres was needed for the sand pit operation.

Mr. Watkins said it wasn't needed right away, but over a 30 year time period it would be.

Commissioner Britton inquired about class I and II soils being lost.

Mr. Watkins said some of it could be used in the vicinity and they expected 25% of it to be reclaimed. He said they would gradually lose that area as a farming area as some areas would come back as a farming area but there would be a net loss of farming area.

Commissioner Britton asked if it would still be the same class of soil afterward.

Mr. Watkins said it should be because the topsoil would be put back.

Eudora Commissioner von Achen said Eudora Planning Commission did not participate in the Eudora City Commission Council meeting as was stated earlier. He said he recognized the recommendation would go to County Commission.

Eudora Commissioner Stewart felt the applicant had done a good job of stating their case and felt it had much less potential impact to Eudora water than the last sand pit application. He said with the addition of the monitoring wells if pollution was found it would give Eudora 8-12 years to determine how to handle the contamination headed their way. He said with the appropriate conditions of monitoring well, he was leaning in favor of the Conditional Use Permit.

Eudora Commissioner Campbell said the consultant's, Mr. Helmke, opinion was that there was not enough information to do this and he was not paid by either side, which he felt carried great weight.

ACTION TAKEN by Eudora
Motioned by Eudora Commissioner Campbell, seconded by Eudora Commissioner Bartlett, to defer the Conditional Use Permit until the appropriate data was accumulated to let the experts give an opinion.

Eudora Commissioner Kurt von Achen said they needed sand but that water resources were important. He said he would support the motion.

Motion carried 4-1, with Eudora Commissioner Stewart voting in opposition.

Additional COMMISSION DISCUSSION

Mr. McCullough said the resolution that established the joint meeting did not spell out the process. He said even a motion to defer would be a recommendation to County Commission for their decision.

Commissioner Britton asked if they would send separate recommendations to County Commission.

Mr. McCullough said that was correct.

Commissioner Liese asked the applicant to respond to who would take care of Eudora if the water was polluted.

Mr. Watkins said the condition of the monitoring wells would detect if there was an issue and stop any subsequent pollution and require the owner to fix it if the problem was coming from the pit. He said in terms of investment, the operator was willing to install the wells and place the wells so that monitoring could take place. He said they were willing to have that sort of condition as protection for the City of Eudora. He said maybe they could work out an agreement that Eudora could monitor the wells anytime. He stated the condition could say that if a problem was detected the operator would have to address it and not operate until it was fixed.

Mr. McCullough said if Planning Commission chose that condition staff could craft some language and send it to County Commission.

Eudora Commissioner von Achen said if pollution was found neighbors and Eudora should not have to pay for any damage.

Mr. Watkins said they have a damage claim if water was affected.

Eudora Commissioner von Achen said the damage claim goes far past the 30 year Conditional Use Permit. He suggested a surcharge of so many cents a ton on the sand to build a fund to give real dollar protection to people downstream. He said if it will never happen then the applicant should make sure it doesn't cost any money. He felt someone else should take the risk, not the City of Eudora.

Commissioner Liese asked if he was talking about escrow.

Eudora Commissioner Kurt von Achen said some sort of surety bond, insurance policy, or some other way to significantly protect people downstream.

Mr. Watkins said there were liabilities as an operator that were insured. He said you can't contaminate water without people having a claim, so there were certain protections, such as early detection. He said this hypothetical situation had not been borne out anywhere. He said putting the kind of conditions they were talking about was what protected the public interest. He said he sympathized with the City of Eudora wanting to protect their water supply. He said Eudora suggested the monitoring wells and then decided the risk was too great.

Eudora Commissioner Kurt von Achen said they should assume the risk.

Mr. Watkins said they would be assuming the risk.

Eudora Commissioner Kurt von Achen said they should accept the ongoing risk.

Mr. Watkins said there was no evidence there was significant risk.

Commissioner Pennie von Achen inquired about the USDA rating the sand in the area as poor quality.

Mr. Watkins said he disagreed with that. He said it was more the level at Mr. McElwee's property that you would have to go down to get the sand. He did not think the operator would be trying to get sand out of the area that was not usable.

Commissioner Culver said he believed it was rated as poor because of the depth they would have to go down to extract, not necessarily the quality of the sand.

Commissioner Pennie von Achen asked about the cost to go down so far for sand.

Mr. Watkins said it affects the return on investment. He said there were not many sites in Douglas County to extract sand.

Commissioner Pennie von Achen asked if the overburden would go back into the pit.

Mr. Watkins said yes, it would be recycled back in.

Commissioner Pennie von Achen inquired about contaminates.

Mr. Watkins said the topsoil would be stockpiled and then the overburden would be recycled. He said if contaminates were found they would need to be addressed.

Commissioner Pennie von Achen asked if the overburden was tested for contaminates.

Mr. Watkins said the observation wells would be for detection. He said the overburden was not currently tested.

Commissioner Belt inquired about additional conditions.

Mr. McCullough said Planning Commission would have to have direct staff on what conditions they wanted to grasp on to. He said they discussed monitoring wells as a way to mitigate potential impacts and pollutants to the aquifer and accepted an argument about protecting the financial position of the City Eudora. He said they also discussed process. He stated typically when an item was deferred it was a short time frame to direct the applicant to go get additional information so Planning Commission could make an analysis and decision. He said Eudora's recommendation was a long term deferral to get that information and negotiate with the City of Eudora regarding some of the issues, and let County Commission make the final decision.

Commissioner Belt asked if deferring was reasonable.

Mr. McCullough said they should be specific as possible and provide proactive language in the motion that they want to move it to County Commission, if that was their desire. He said if they wanted to keep it at the Planning Commission level it would typically be a deferral for one or two months to get specific information. He said Eudora's motion was to have a year's worth of data collected to make decisions about the impact to the wells.

Commissioner Britton felt County Commission should be given the opportunity to make that decision now instead of Planning Commission bottling it up for a year with Penny's left not knowing what to do since their permit expires on December 31, 2012. He felt that was a bad position to put Penny's in. He said he would support passing this along to County Commission with a recommendation of deferral, pending any results of a study to be completed by a consultant selected jointly by the City of Eudora and developer. He felt the deferral should be designed to give the developer the opportunity to explore avenues of giving some financial security to the City of Eudora. He said he would not be supportive of an approval at this point.

Commissioner Belt said the applicant did a nice job of covering as many bases they could reasonably be expected to cover that were factually based. He felt they had a fiduciary responsibility to this municipality as well as a responsibility to Eudora. He did not feel comfortable placing specific conditions that were not reasonable with so many unknowns.

Commissioner Burger expressed concern about the size of the Conditional Use Permit and asked about the size of other operations.

Mr. Watkins said this would probably be the largest sand pit operation on the Kansas River. He said many of them were 70-100 acres in size. He said anything smaller than that would not allow room to dredge.

Commissioner Liese said he was uncomfortable with Lawrence Planning Commission deferring it. He said one of their primary roles was making recommendations. He said he would not vote to defer unless it was for specific information over a short period of time.

Commissioner Culver said it was their responsibility to make a recommendation and a shorter term deferral would not give them the information they would need or would be helpful in making this decision. He felt they had an onus to the applicant, City of Eudora, and Douglas County to give it due process and make a recommendation to the governing body. He said he would not support a deferral at this time.

Commissioner Pennie von Achen said she would support a deferral. She felt the proposal put class I and II soils and water at risk. She said she would not vote in favor of it at this point. She said she could vote for denial but would like more information.

Commissioner Britton said he would support a deferral but felt it didn't matter if they called it deferral or denial because it would be because of the same concerns. He said the important thing was that it went to County Commission one way or the other.

Commissioner Josserand said one of the overlying policy considerations, by a number of people, was to move in-river sand dredging to non-river sand dredging. He said he was concerned about the evulsion risk but said the river would change some day. He said he would prefer the Corps of Engineer be involved to speak to the risks but he understood they were only concerned about the river. He said he was not nearly as concerned for the potential health or water quality risks if there was an appropriate set of monitoring wells. He felt the applicant had tried to explore that issue but it seemed it may not be good enough. He said the only condition he would like to defer to was trying to figure out a better condition regarding testing modification without sending to County Commission but felt they could work with staff on that. He said he would prefer not to defer.

Commissioner Britton said he was sensitive to the issue but not too worried about the impact on neighbors from industrial activity and traffic since that's what's been going on there for several decades. He said it was a valid concern but didn't rise to the level of denial of this request. He said the water issue was a much closer call and was hard to figure out what study to believe or what logical argument to give more weight to. He stated it would make sense to at least explore some sort of method by which the developer could give financial security where they would be on the hook for the cost of addressing a contamination issue. He felt agricultural land and class I and II soils were a much more valuable and rare resource than the sand being extracted. He felt there were ways this could be worked out given more time and opportunity.

Commissioner Liese said Planning Commission was not the deciding body, County Commission was. He said the applicant had done a terrific job of thinking about the community and about the implications of what they were doing. He said he would not vote for denial but would support the proposal with conditions.

Commissioner Culver said he would not support the recommendation for denial. He said Chapter 16 of the Comprehensive Plan, Horizon 2020, says *...encourages the responsible use of marketable natural resources* *within Douglas County through proper extraction and reclamation methods. They are essential to sustainable development activity, primarily in the form of low cost raw materials, such as sand, gravel, timber, oil, gas, and stone, etc.* He felt there were competing values and that's what makes this difficult. He was concerned about the previous sand pit operation that tried to locate in Douglas County but moved to Jefferson County and now Douglas County has no control or say over that operation. He said if they kick the ball far enough ahead and don't make a decision they would miss the boat to where they could come to a good solution that protects the citizens and allows for natural resources in Douglas County to be utilized in a responsible way. As the applicant mentioned, this was a highly regulated industry with securities, precautions, measurements, and regulations in place for any kind of dredging or sand pit operation and were in place for a reason. He said those would take care of a lot of the issues discussed and continue to evolve to address some of those concerns. He said he supported the application because it was an active site so a lot of the impacts listed in the staff report would remain fairly consistent with the current activity and proposed activity. He said there was a need for sand. He said the applicant was willing to provide an abundance of caution by investing in observation wells and the possibility of discussing the opportunity for the City of Eudora and others to sample the wells on an ongoing basis. He said the unknowns made this difficult. He said they could do years and years of research and still may not know some of the possible effects. He said there was no way to minimize the risk completely. He liked the discussions about ways to protect the City of Eudora and felt the governing body could address some of those. He said he was concerned about the class I and II soils and did not think there was necessarily a full mitigation for that but the applicant was willing to reclaim part of the sand pit area to farmland. He said regarding the pollution concerns there was no evidence of that happening in other sand pit locations. He said it was a tough position because there was a movement to take dredges out of rivers but they hadn't adequately planned for how to replace that. He felt there needed to be alternatives because there was still a need for sand. He was not comfortable supporting a denial but would support recommending approval to County Commission.

Commissioner Liese said Friends of the Kaw were supportive of this proposal but encouraged Planning Commission to carefully consider and address neighbor concerns.

Commissioner Josserand agreed with Commissioner Culver's comments.

Commissioner Burger said she was not comfortable with over 400 acres but the conditions in the staff report were so thorough. She said Horizon 2020 supported this type of resource extraction and Eudora land use documents supported it. She said she would not vote to deny but would be much more comfortable with a similar scale of other sand pits along the river.

ACTION TAKEN BY Lawrence
Motioned by Commissioner Britton, seconded by Commissioner von Achen, to deny the Conditional Use Permit.

> Motion failed 3-4-1, with Commissioners Belt, Britton, and von Achen voting in favor of the motion. Commissioners Burger, Culver, Josserand, and Liese voted in opposition. Commissioner Lamer abstained.

Motioned by Commissioner Culver, seconded by Commissioner Josserand, to approve the Conditional Use Permit for Penny Sand Pit and forwarding it to the Board of County Commissioners with a recommendation for approval based on the findings of fact found in the body of the staff report subject to the following conditions:

1.) The approval is contingent upon the issuance of all State and/or Federal permits which are required for this operation.
1.) An agreement designating responsibility for the ongoing maintenance of the berms to the property owner shall be executed and recorded with the Register of Deeds prior to the release of the CUP plans to the Zoning and Codes Office. A copy of the agreement shall be provided to the Planning Office for the file.
2.) A copy of the easement for the off-site access drive shall be provided to the Planning Office for the file prior to the release of the CUP plans to the Zoning and Codes Office.

3.) The applicant shall obtain a Flood Plain Development Permit from the Director of Zoning and Codes prior to the release of the CUP plans.

4.) The reclamation plan shall be revised with the following changes prior to release of the CUP plans:

   a. The plan shall note the requirement that the lake that is being created will have a varied shoreline and will appear natural in appearance.
   b. The plan shall note that the intended use of the lake, when mining and reclamation is complete, is to be a recreational feature.
   c. The plan shall note the maximum slope of the lake shoreline for a specified depth to insure that the slopes are of a grade that it would be possible for a person or animal that accidentally entered the lake to exit.
   d. The plan shall explain the sequential nature of the reclamation process; that overburden produced in one phase will be used to reclaim previously excavated areas.
   e. The reclamation plan shall note that topsoil will be placed over the overburden in areas that are to be reclaimed as farmland, shoreline, or berms. If topsoil is to be stockpiled and stored it must be vegetated to prevent erosion.

5.) The applicant shall submit a revised CUP plan with the following changes:

   a) A detailed landscaping plan for the buffer area surrounding the McElwee house will be submitted.
   b) The Book and Page number of the recorded easement for the off-site access road shall be noted on the CUP plan.
   c) The ownership shall be noted as Van, LLC as well as Penny's Concrete Inc. on the CUP plan.
   d) The on-site residential structure on the east side of the property will be shown on the CUP plan as on the reclamation plan.
   e) If stockpiling of overburden is to occur on the subject property, the CUP or operation plan should note the maximum height and approximate location. The stockpiles should be placed as far from the existing residences as possible.
   f) List the following CUP conditions on the plan:
      i. Hours of operation are 6:30 AM to 6:30 PM, Monday through Friday. No removal, transfer, or placement of overburden is permitted outside these operating hours; however dredging and extraction of sand may exceed these hours when necessary.
      ii. The approval for this Conditional Use is valid for 30 years. An extension request for the CUP must be submitted prior to the expiration date or a new CUP application must be submitted. The Zoning and Codes office shall conduct 5 year administrative reviews to insure compliance with the CUP, operation, and reclamation plans.
      iii. The only exterior lighting in the areas to be excavated will be the dredge lighting as required by the U.S. Coast Guard.
      iv. The scale house, processing plant, sediment pond, and stockpile area, approved with CUP-2-2-79, will be used to serve the subject property.
      v. Sales of overburden, topsoil, sand or aggregate products will occur only on the portion of the property that contains the scale house on the CUP plan.
      vi. Truck traffic will utilize Noria Road (E 1750 Road), and is restricted from using N 1500 Road or E 1850 Road.
      vii. The applicant shall work with the Army Corps of Engineers to determine how the existing wetlands on the property will be treated. Prior to any excavation in Phase 21, the applicant will provide documentation to the Planning Office on the wetlands indicating whether the wetlands will be maintained on site or if they will be mitigated elsewhere. If the wetlands will be maintained on site, the operation plan will be revised to include the protection measures and the property owner shall submit a revised CUP plan for administrative review/approval of the wetland setbacks. If the wetlands are to be mitigated, a revised CUP plan shall be submitted to note the removal of the wetlands.

6.) The following improvements to nearby roads and intersections shall be completed per the County Engineer's approval before issuance of a permit for the Conditional Use :

   a. Realignment of the entrance to the sand facility so that it opposes the Noria Road intersection at N 1500 Road.

b. Pavement of a 100 ft long section of the site access drive just north of N 1500 Road, as recommended in the TIS.
c. Reconstruction of pavement in the Noria Road (E 1750 Road)/N 1500 Road intersection. The existing surfacing is likely a crushed rock base that has been chip sealed. This will not stand up to the increased truck traffic crossing N 1500 Road.
d. Construction of an eastbound right turn lane on Route 442 (N 1400 Road) at Route 1057 (E 1900 Road). This is mentioned as a desirable improvement in the TIS. Pavement on the existing shoulder at this location is not adequate for the projected amount of truck traffic.

7.) The applicant shall install three observation wells and one control well and that the City of Eudora be allowed to monitor those wells on an ongoing basis.

Commissioner Josserand said he would like the County Commission to examine the scope and size and also examine the possibility of what Eudora Planning Commission made reference to regarding risk.

Commissioner Burger said she was uncomfortable with the acreage but would vote in favor. She expressed concern about the flow and movement of the river.

Commissioner Liese asked if the body of water would be useable for recreation.

Mr. Watkins said it could be.

> Motion carried 4-3-1, with Commissioners Burger, Culver, Josserand, and Liese voting in favor of the motion. Commissioners Belt, Britton, and von Achen voted in opposition. Commissioner Lamer abstained.

Adjourn Joint Meeting
Reconvene LDCMPC

Memorandum

Date: September 13th, 2012

To: C.L. Maurer, RLA, ASLA
Senior Landscape Architect
Landplan Engineering, P.A.

From: Mehrdad Givechi, PE, PTOE, *Mehrdad Givechi*
Managing Principal
MGineering Solutions

Re: Penny Sand Plant Expansion, Addendum No. 1
Between Lawrence and Eudora, Douglas County, KS

This memo is prepared as an Addendum No. 1 to Traffic Impact Study for "Penny Sand Plant Expansion" dated 7/23/12 to re-evaluate impact of the traffic generated by this development, using the new information provided by the applicant as summarized in the following paragraphs:

1. The original TIS report dated 7/23/12 was prepared based on the "worst case scenario" when the proposed sand facility would potentially distribute approximately 5,000 tons of sand on a highly productive day (a very rare event). Based on the new information provided by the applicant, the primary reason for the proposed expansion of the plant (from 114 acres to 465 acres) is to switch over the sand excavation area from the river-side to the in-land side, maintaining its current rate of sand distribution at approximately 1,000(+/-) tons on an average day (based on most recent 7-year average) for foreseeable future. It is, however, to be noted that as the economy improves, a higher distribution rate will be likely as demand goes up with the absolute maximum rate of 5,000 tons a day (a very rare event) as described and studied in the original TIS dated 7/23/12.
2. As mentioned in the original TIS, N. 1500 Road has posted weight limit signs of 5 tons on both sides of Noria Road and is not a designated truck route. Currently, all

site-generated trucks use Noria Road to access the site. Under the proposed development plan, all site-generated trucks will maintain the same route to access the site and will not be using N. 1500 Road.

3. The original TIS dated 7/23/12 states that, currently, the facility is staffed by 4 employees and no increase in the number of employees is anticipated. Based on the new information provided by the applicant, the number of current employees is 8 and expected to increase to 10.

Traffic Impact Reassessment

Using the average distribution rate of 1,000 tons/day following the same analogy mentioned in the original TIS, the estimated number of trucks serving the site will be around 40 trucks/day with 5 trucks/peak-hour - equivalent to 10 truck trip-ends/peak-hour (5 inbound and 5 outbound). Comparing this number to that generated by the existing sand plant (8 truck trip-ends, 4 inbound and 4 outbound) results in an increase of 2 truck trip-ends/peak-hour (1 inbound and 1 outbound) – a nominal increase in truck traffic, none of which will be impacting N. 1500 Road except at the access point to the site.

Using the ITE trip generation rates for the office component of the site (ITE Land Use Code 715) indicates that the increase in the number of employees (2 new people) will likely result in 2 new trip-ends (all passenger cars) during the peak-hour of a typical weekday – a nominal increase in passenger car traffic with insignificant impact on the roadway network.

Re-evaluation of the operating conditions of traffic in the study area, given the new information, indicates that, during the critical peak-hour of a typical weekday when the plant is operating under average conditions, the increase in the number of trucks and passenger cars is insignificant with nominal impact on the roadway network.

In light of the new information provided by the applicant and the traffic impact reassessment:

1. It is still desirable that 100' long section of the site access, just north of N. 1500 Road be paved as listed in the original TIS under improvement #1.
2. The need for a dedicated eastbound right-turn lane on Route 442 (Old K-10) at its intersection with Route 1057 (as listed under improvement #2 in the original TIS) becomes less relevant because the increase in truck traffic will be nominal for a foreseeable future. As time goes by and economy improves with higher demand for sand distribution, the increase in site-generated truck traffic should be studies to re-assess the need for this turn lane.
3. As stated in the original TIS, under improvement #3, pavement conditions along certain segments of the roadway network should be evaluated to determine if they can withstand heavy truck loads. This was merely suggested based on a cursory visual field observation and is not the result of a formal pavement analysis and/or evaluation. It should be noted that pavement analysis and/or evaluation is beyond the scope of a typical traffic impact study.

Traffic Impact Study

for

Penny Sand Plant Expansion

1-1/2 mile Northeast of the Intersection of Noria Road and N 1500 Road

Douglas County, Kansas

Prepared
for
Landplan Engineering, PA

Prepared
By

MGineering Solutions
Serving Communities Through Excellence
Kansas - Missouri - Michigan - California

MEHRDAD GIVECHI
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Mehrdad Givechi, PE, PTOE

July 2012

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Introduction

Proposed Development

The existing "Penny Sand Extraction" facility - located next to Kansas River approximately 1-1/2 miles northeast of the intersection of Noria Road (E 1750 Rd.) and N 1500 Road in Douglas County, Kansas – comprises approximately 114 acres. Under the proposed plan, the site will be expanded to include an additional sand excavation area of approximately 351 acres for a total site area of approximately 465 acres (See Location Map, Figure 1 of Appendix I). Access to the site, as shown on the Site Plan (Figure 2 of Appendix I), will remain unchanged at its current location at the intersection of Noria Road and N 1500 Road (i.e. north leg of the intersection).

The facility will be open for operation on weekdays and some Saturdays (approximately 250 days a year) between the hours of 6:30 a.m. and 6:30 p.m., staffed by as many as four (4) employees.

According to the Horizon 2020 (Map 4-2), the site is FEMA designated "Floodway" and "Floodway Fringe".

Existing Nearby Developments

Currently, the vast majority of the land in the proximity of the site is undeveloped with the exception of

- "East Hills Business Park" located on the west side of Noria Road approximately 2/3 miles south of N 1500 Road; and
- A few scattered residential dwelling units in the study area.

Purpose

The purpose of this study is to:

1. Evaluate the existing operating conditions of traffic along the anticipated route that site-generated trucks will utilize to access the site including the intersections of
    a. Noria Road and N 1500 Road;
    b. Noria Road and DG CO 442 (Old K-10);
    c. DG CO 442 (Old K-10) and DG CO 1057 (E 1900 Rd); and

    d. The interchange of K-10 and DG CO 1057 (E 1900 Rd).
2. Assess impact of the trips generated by the proposed expansion of the sand facility on the above mentioned intersections and roadway network; and
3. Recommend off-site improvements needed (if any) as the result of this expansion.

Data Collection and Summary

In order to assess the impact of traffic generated by the expansion of the existing sand facility in the study area, field observations and traffic counts (including truck traffic) were conducted. The following paragraphs summarize the results of data collection efforts for this project.

Roadway Network Geometric & Operating Characteristics

In the vicinity of the development site, as illustrated in Figure 3 of Appendix I,

- N. 1500 Road is a two-way, two lane roadway that runs east/west approximately 1.4 miles south of the development site. This roadway extends west and becomes 15th Street at approximately 1-3/4 miles west of Noria Road as it enters the city limits of Lawrence. Some of the other roadway characteristics for N 1500 Road include:
    - Asphalt pavement with uneven surface west of E 1810 Road turning into gravel road east of there.
    - No shoulders.
    - An active railroad crossing (with gate and signal) approximately 1.3 miles west of Noria Road (just west of E 1625 Road).
    - Posted speed limit of 40 mph, changing to 30 mph west of E 1625 Road where railroad crossing is located.
    - Posted weight limit sign of “5 Tons” for commercial vehicles for both directions of travel.
    - East of Noria Road, it is designated as “Rural Minor Collector” on the County’s T2030 Major Thoroughfare Map. This designation changes to “Minor Arterial” for the segment west of Noria Road.
    - West of Noria Road, it serves as a commuter route between Lawrence and both, Eudora and “East Hills Business Park”.

- Noria Road (E. 1750 Road) is a two-way, two lane roadway that runs north/south along east side of “East Hills Business Park” connecting N 1500 Road to DG CO 442 (Old K-10) and K-10 Highway. Some of the other characteristics of this roadway include:
    - An active railroad crossing (with gate and signal) approximately 1/2 mile south of Noria Road.
    - Concrete pavement with 6’ paved shoulders north of the railroad track. Asphalt pavement with 4’ shoulders south of the railroad track.
    - Posted speed limit of 45 mph between Noria Road and DG CO 442 (old K-10), with an advisory speed limit sign of 35 mph along the curve south of DG CO 442.
    - Designated as “Minor Arterial” on the County’s T2030 Major Thoroughfare Map.
    - It serves as a commuter route between Lawrence and both Eudora and “east Hills Business Park”.
- DG CO 442 (Old K-10) is a two-way, two lane roadway that runs east/west approximately 1 mile south of Noria Road and goes through city of Eudora to the east. Other roadway characteristics include:
    - Asphalt pavement with uneven surface and unpaved 4’-6’ shoulders.
    - Posted speed limit of 45 mph within the city limits (near Noria Road), changing to 55 mph in the county (west of Eudora).
    - Between Noria Road and Eudora, it is designated as “Minor Arterial” on the County’s T2030 Major Thoroughfare Map.
    - West of Eudora, this roadway serves as a commuter route between Eudora and both, Lawrence and “East Hills Business Park”.
- DG CO 1057 is a two-way, two lane roadway running north/south crossing DG CO 442 at approximately 1.5 miles east of Noria Road providing a main connection to K-10 Highway. Other roadway characteristics include:
    - Asphalt pavement with unpaved 2’-4’ shoulders.
    - Posted speed limit of 45 mph.
    - Designated as “Minor Arterial” on the County’s T2030 Major Thoroughfare Map.

- All intersections in the study area have one lane on each approach except for the:
    - Intersection of DG CO 1057 and DG CO 442, which has a dedicated northbound right-turn lane with approximately 175' of storage and a dedicated westbound left-turn lane with approximately 110' of storage; and
    - Intersection of Noria Road and DG CO 442, which has a dedicated westbound right-turn lane with 175' of storage; and a channelized northbound right turnout.

<u>Manual Traffic Counts</u>

Currently, the "East Hills Business Park" is the main trip generator in the study area and will most likely dictate the time periods during which traffic on the adjacent roadway network reaches its peak. As part of this study, therefore, vehicular turning movement counts (including truck traffic) were conducted at the intersections under study during the time periods when shift changes for the "East Hills Business Park" occur.

Currently the shifts change at 6:30, 7:00 and 7:30 in the morning and 2:30, 3:00 and 3:30 in the afternoon. Therefore, for the purpose of this analysis, turning movement counts were conducted from 6:00 to 9:00 a.m. and 2:00 to 5:00 p.m. on typical weekdays (July 11th, 12th and 17th, 2012). The results, as summarized in Appendix III and illustrated in Figures 4 and 5 of Appendix I, indicate that

- Morning peak occurs between 7:30 and 8:30 a.m. for all vehicles including truck traffic; and
- Afternoon peak occurs between 4:00 and 5:00 p.m. for all vehicles, and between 3:00 and 4:00 p.m. for truck traffic.
- At the intersection of Noria Road and N 1500 Road, the predominant movements are eastbound right-turn and northbound left-turn with no truck traffic on N 1500 Road.
- At the intersection of Noria Road and DG CO 442, the predominant movements are southbound left-turn and westbound right-turn. The predominant truck movements,

however, are northbound through (31% to 46%) and southbound left-turn (7% to 16%).

- At the intersection of DG CO 442 and DG CO 1057, the predominant movements are eastbound and westbound through. The predominant truck movements, however, are eastbound right-turn (19% to 31%) and northbound right-turn (unusually high at 27% to 60%).
- At the interchange of K-10 and DG CO 1057, the predominant movements are southbound right-turn (at the north ramps) and eastbound left-turn (at the south ramps). The predominant truck movements, however, are southbound left-turn (20% to 32%) and eastbound left-turn (unusually high at 25% to 34%), both at the south ramps.
- Field observations indicate that loaded trucks, leaving the existing sand plant, take Noria Road south to DG CO 442 (Old K-10), then east to DG CO 1057, then south to K-10 interchange, then east to their destinations. After their delivery, the trucks head back to the sand plant using K-10 Highway, then north on Noria Road straight to the plant entrance off of N 1500 Road.

NOTES:

1. *During the time period traffic counts were being conducted for this study, there was a paving project near Eudora that generated a large number of truck traffic. Loaded trucks, carrying asphalt material, got to the job site from west using K-10 Highway to access DG CO 1057 at the interchange, then head north to DG CO 442 (Old K-10), then east to Eudora. Empty trucks left the job site using Church Street south to K-10 Highway, then west to the asphalt plant. This construction activity resulted in an skew in the normal truck traffic pattern in the study area, which caused the heavy truck movement for the eastbound left-turn movement at the interchange and northbound right-turn movement at the intersection of DG Co 1057 and DG CO 442.*
2. *DG CO 1057, approximately ½ mile south of the K-10 interchange, has been closed to traffic for a bridge replacement project. This also affected the through traffic on DG CO 1057 south of the interchange.*

Evaluation of the Existing Operating Conditions

A volume/capacity analysis (using methodologies outlined in the *2000 Highway Capacity Manual (HCM) published by the Transportation Research Board*) was conducted to determine the level-of-service (LOS) for all movements at the intersections under study during the afternoon peak-hour of a typical weekday.

Level-of-service, as defined in the HCM, describes the quality of traffic operating condition and ranges from "A" to "F", with LOS "A" representing the best (most desirable with minimum delay) conditions and LOS "F" the worst (severely congested with excessive delays). The following chart outlines the level-of-service criteria for unsignalized and signalized intersections.

Level-Of-Service	Control Delay for Unsignalized Intersections (seconds/vehicle)	Control Delay for Signalized Intersections (seconds/vehicle)
A	0 – 10	0 – 10
B	> 10 – 15	> 10 – 20
C	> 15 – 25	> 20 – 35
D	> 25 – 35	> 35 – 55
E	> 35 – 50	> 55 – 80
F	> 50	> 80

The results of analysis, as shown in Appendix II and summarized in Figure 6 of Appendix I, indicate that, under the existing conditions, all movements at all intersections in the study area operate at LOS "B" or higher during both morning and afternoon peak-hours of a typical weekday.

Trip Generation Analysis

Typically, trips generated by a proposed development are estimated using trip generation rates suggested by the *Institute of Transportation Engineers, Trip Generation Manual, 8th Edition*. Since the Manual does not have information for land use type “Sand Plant”, the following procedure was used for analysis:

- For the sand processing component of this development, the number of trucks generated by this site was estimated based on the following assumptions:
  - With the proposed new expansion, the plant is anticipated to distribute as much as 5,000 tons of sand on a most productive day.
  - 80% of trucks serving the site will be Tractor Trailers each with a maximum load capacity of 25-30 tons. The remaining 20% will be tandem trucks each hauling between 15 and 18 tons. This is equivalent to an average truck load of approximately 25 tons.
  - Assuming a high productive day (5,000 tons of distribution), the estimated number of trucks serving the site will be around 200 trucks/day, which equates to a total of 400 trip-ends (two-way trips) per day.
  - Hauling time varies for different plants. Truckers going to the same plant have different lap times. The only time that trucks tend to arrive somewhat simultaneously is first thing in the morning when a plant opens. Their departure from the plant, however, is not simultaneous due to individual loading times. Other times throughout the day, truck traffic to/from the plant is spread out randomly over the 12-hours of operation (6:30 a.m. to 6:30 p.m.). For analysis purposes, it is assumed that peak-hour truck traffic will be approximately 12% of the daily truck traffic, which is approximately 48 trip-ends (24 inbound and 24 outbound) during the morning peak-hour of operation.
  - To account for the existing traffic in/out of the site (i.e. current operation of the sand plant), a truck count survey was conducted during the time period when turning movement counts were being conducted. The results, as summarized in Figure 5 of Appendix I, indicate that the existing sand processing facility generates 8 trip-ends (4 inbound and 4 outbound)

during the morning peak-hour, and 9 trip-ends (5 inbound and 4 outbound) during the afternoon peak-hour.

- For the office component of this development, no increase in number of employees are anticipated, hence no additional trips will be generated by the office component.

Using above mentioned assumptions, the ***net increase*** in number of trips resulted by the proposed sand plant expansion will be approximately 40 trip-ends (20 inbound and 20 outbound) during both morning and afternoon peak-hours of a typical weekday - all truck traffic.

Analysis Time Period

An overview of the existing traffic volumes in the study area and their peak characteristics, in conjunction with estimated trips generated from the proposed development, indicate that the most critical peak period will likely occur during *morning peak-hour* of a typical weekday. Therefore, the morning peak-hour is selected as the analysis time period for this study. In addition, afternoon peak-hour is also analyzed.

Trip Distribution and Assignment Analysis

As mentioned earlier, field observations indicate that all truck traffic generated by the existing sand operation head south on Noria Road, thence east on DG CO 442, thence south on DG CO 1057 to access K-10 Highway and head east. Based on the information provided by the applicant, the vast majority of the new trips generated by the site expansion will also follow the same patterns. Figures 7 and 8 of Appendix I illustrate trip distribution patterns and assignment for the site-generated trips, respectively. Note that a small portion of the trips (~ 5%) are assigned to go west on K-10 (at the interchange) to represent occasional trips to the west.

Impact Assessment

Volume/Capacity Analysis

An evaluation of the "Existing + Proposed Development" traffic conditions (using HCS2000 methodology mentioned earlier) indicates that LOS for all movements at all intersections under study remain unchanged at "B" or higher during both morning and afternoon peak-hours of a typical weekday. The results, as shown in Appendix II and illustrated in Figures 9 and 10 of Appendix I, indicate that traffic generated from the proposed facility expansion will not have a negative impact on the capacity of the roadway networks in the study area.

Dedicated Turn-Lane Analysis

Using the guidelines for both right-turn and left-turn treatments at unsignalized intersections (as listed in Appendix IV) indicate that, from traffic volume stand point, no new dedicated turn lanes are required at any intersections in the study area.

Under the existing conditions, during the critical analysis period (morning peak-hour of a typical weekday), approximately 17% of the eastbound traffic at the intersection of DG CO 442 and DG CO 1057 consists of heavy trucks - all of which negotiate right turn at this location. The proposed expansion for the sand plant will significantly increase the heavy truck traffic for this movement to as high as ~42% of the total eastbound movement. Because of their low power/acceleration ratio, not having a dedicated eastbound right-turn lane may interfere with the through traffic creating a safety concern. It is, therefore, desirable (as a safety measure) that a dedicated eastbound right-turn lane be provided at this location to keep the large number of heavy trucks out of the main traffic flow on DG CO 442.

Summary & Recommendations

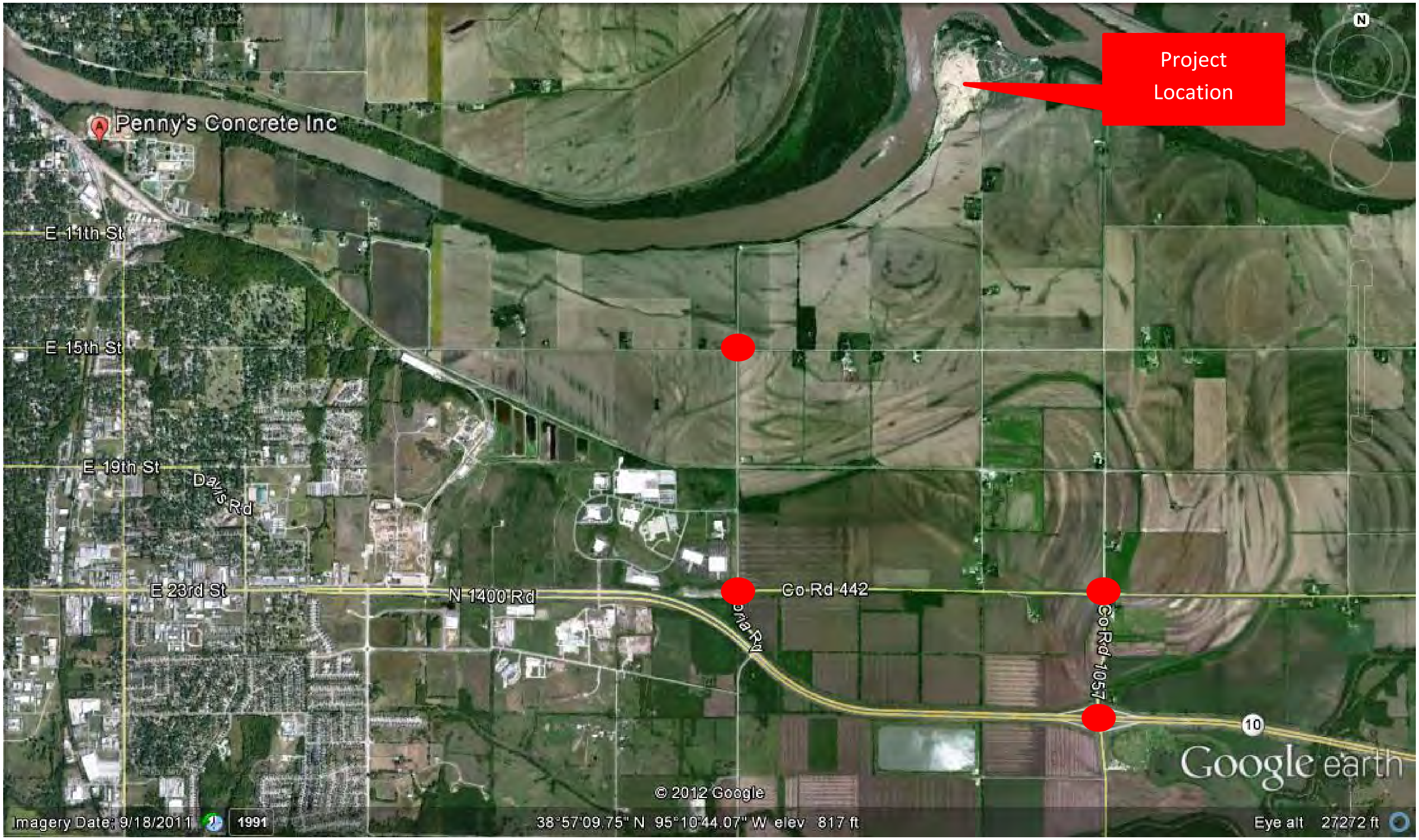
The results of this impact analysis indicate that the proposed “Penny Sand Plant Expansion” will have minimal impact on the capacity of the roadway network in the study area with no degradation of level-of-service at any locations under study (LOS of “B” or higher).

From safety stand point, however, the following improvements are desirable:

1. Pave a 100’ long section of the site access, just north of N 1500 Road, to keep gravel from being tracked, by site-generated trucks, onto the intersection.
2. Provide a dedicated eastbound right-turn lane on DG CO 442 (Old K-10) at its intersection with DG CO 1057 (E 1900 Rd). The minimum storage length for this turn lane should be 150’ in order to accommodate two (2) tractor trailer and two passenger cars. This is a desirable safety measure to keep loaded heavy trucks (having low power/acceleration ratio) out of the main traffic flow. Under the existing conditions, there is a 12’ wide paved area for a length of approximately 140’ that is not marked as a traffic lane rather has white crosshatch pavement marking along its entire length. This area can potentially be utilized to create the subject right-turn lane.
3. Pavement condition along certain segments of the roadway network in the study area should be evaluated to determine if it can withstand the increase in heavy truck traffic resulted by the proposed sand plant expansion.

APPENDIX I

Results of Trip Distribution and Assignment Analysis

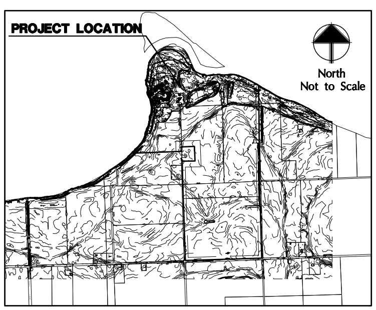


Intersections under study

Figure 1

Location Map

Location Map



Legal Description

General Notes

OWNER: PENNY'S CONCRETE, INC.
ATTN: BILL PENNY
800 EAST 8TH STREET,
LAWRENCE, KS 66044

1. LAND PLANNER/ ENGINEER: LANDPLAN ENGINEERING, P.A.
1310 WAKARUSA DRIVE
LAWRENCE, KS 66049
2. TOPOGRAPHIC INFORMATION OBTAINED FROM 2006 CITY OF LAWRENCE LIDAR AERIAL DATA.
3. EXISTING LAND USE: AGRICULTURAL& SAND EXTRACTION
4. PROPOSED LAND USE: SAND EXCAVATION, EXTRACTION & PROCESSING; AGRICULTURAL
5. EXISTING ZONING: A – VC
6. PROPOSED ZONING: A – VC
7. THIS SITE IS LOCATED WITHIN THE FLOODPLAIN PER FEMA MAP #20045C0203D, DATED AUGUST 5, 2010.
8. THIS SITE HAS BEEN DESIGNED TO COMPLY WITH THE PROVISIONS OF THE AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES (ADAAG) FOR BUILDINGS AND FACILITIES, APPENDIX A TO 28 CFR PART 36.
9. PHASE BOUNDARIES ARE ONLY AN APPROXIMATION DUE TO VARIABILITY OF UNDERGROUND DEPOSITS. SEQUENCES OF EXCAVATION MAY VARY.

Site Summary

GROSS CUP/SITE AREA:	20261272 SF / 465.13 AC
PUBLIC RIGHTS-OF-WAY:	0 SF / 0.00 AC
NET CUP/SITE AREA:	XX SF / XX AC
SAND EXCAVATION & AGRI AREA:	XX / XX AC
SAND/GRAVEL PROCESSING AREA:	XX / XX AC
SCALE HOUSE & MATERIALS LAB:	XX SF
SAND/GRAVEL PROCESSING PLANT:	XX SF

Parking Summary

REQUIRED = 1 SPACE/2 EMPLOYEES; 4 TOTAL EMPLOYEES = 2 SPACES
PROVIDED = 8 SPACES

SCALE: 1" = 400'
400 200 0 400 800

Access Road

Penny Sand Lawrence Facility

Douglas County, Kansas

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Landscape Architecture
Community Planning
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Blue Springs, MO • The Woodlands, TX

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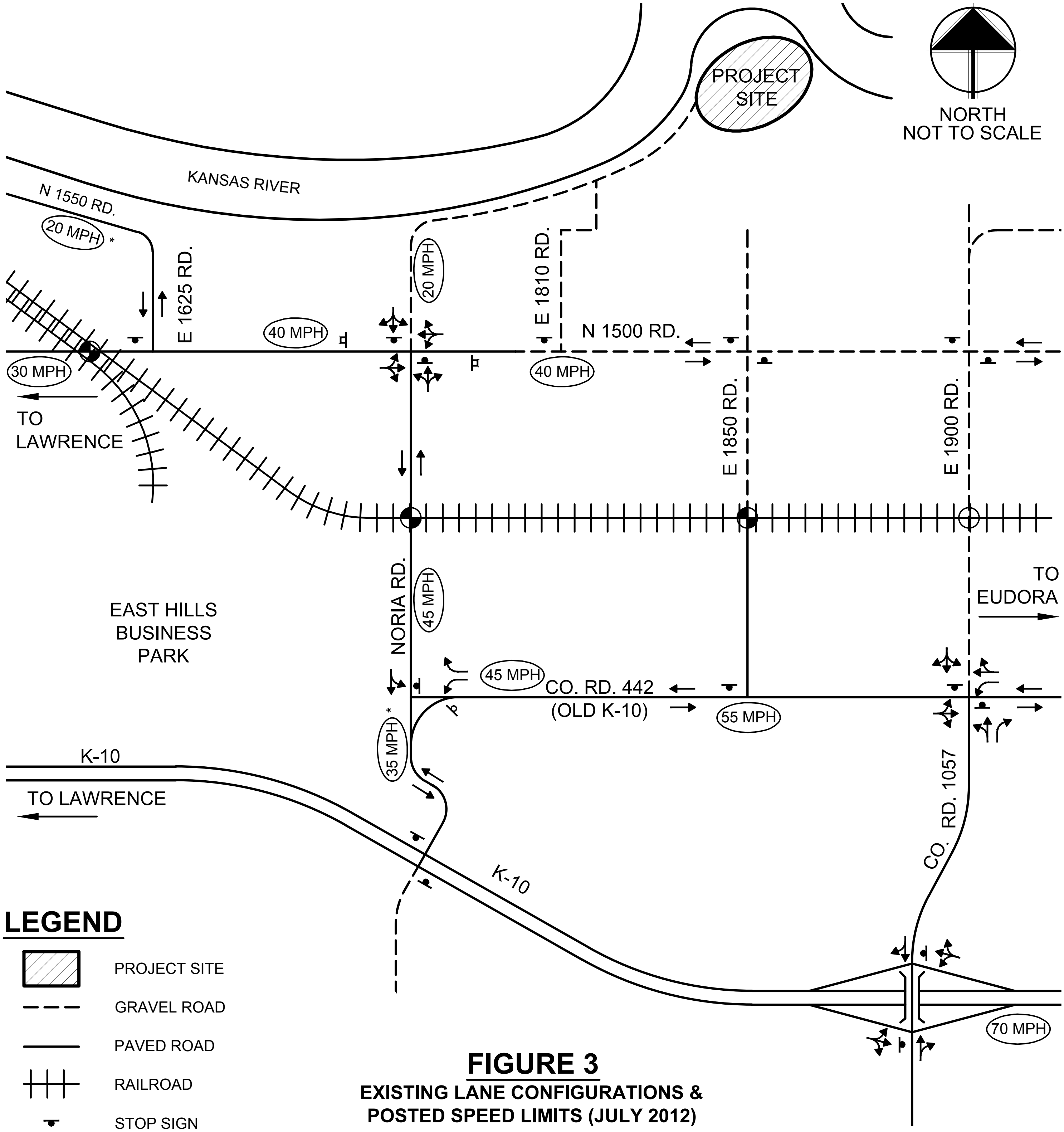
email: info@landplan-pa.com
Web www.landplan-pa.com

PENNY SAND FACILITY
CONDITIONAL USE PERMIT
CUP SITE PLAN

REV	DATE	DESCRIPTION

DATE:	7.2.12
PROJECT NO.:	20121146
DESIGNED BY:	CLM
DRAWN BY:	CLM
CHECKED BY:	CLM

ISSUE A
SHEET NO. C-001
OF 2 SHEETS



LEGEND

PROJECT SITE

GRAVEL ROAD

PAVED ROAD

RAILROAD

STOP SIGN

YIELD SIGN

WEIGHT LIMIT SIGN

ACTIVE RR CROSSING (GATE & SIGNAL)

PASSIVE RR CROSSING (CROSS BUCK)

DEDICATED LANE

SHARED LANE

XX MPH POSTED SPEED LIMIT (*DENOTES ADVISORY SPEED)

FIGURE 3

EXISTING LANE CONFIGURATIONS & POSTED SPEED LIMITS (JULY 2012)

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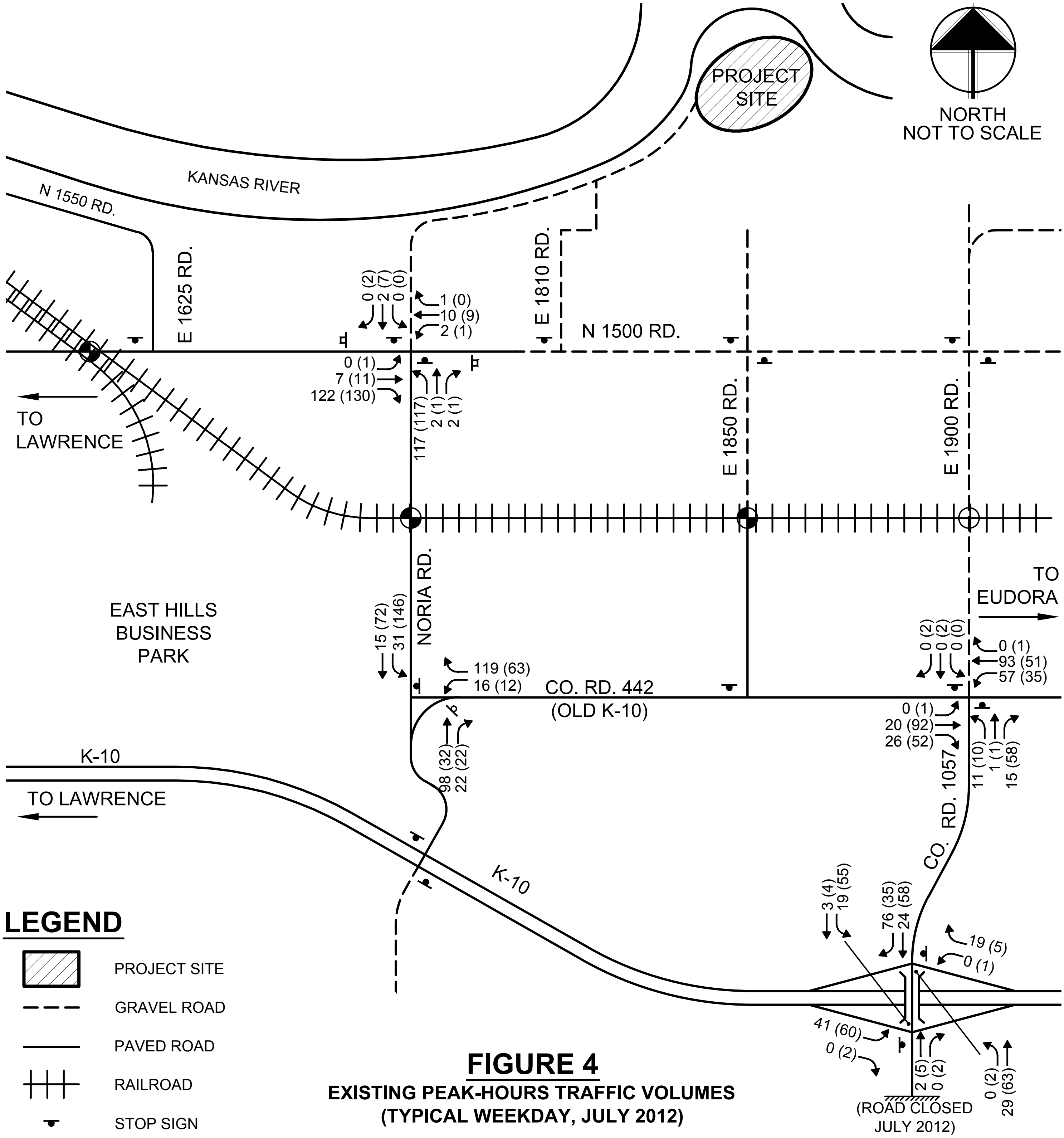

LEGEND

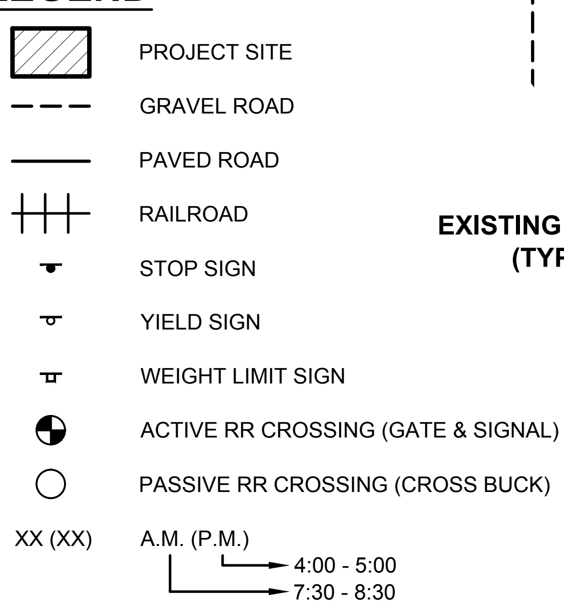

FIGURE 4

EXISTING PEAK-HOURS TRAFFIC VOLUMES
(TYPICAL WEEKDAY, JULY 2012)

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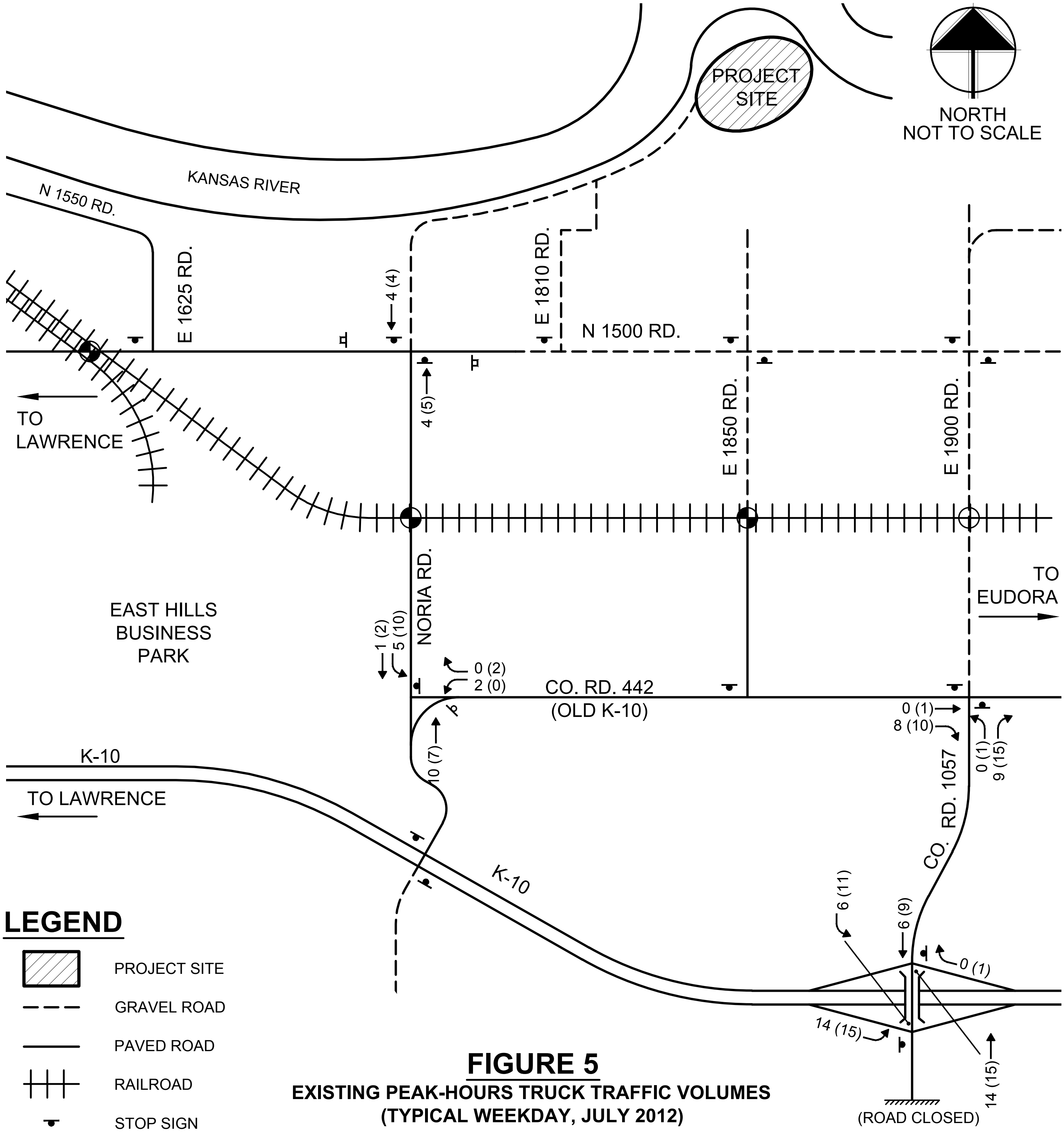

LEGEND

- PROJECT SITE
- GRAVEL ROAD
- PAVED ROAD
- RAILROAD
- STOP SIGN
- YIELD SIGN
- WEIGHT LIMIT SIGN
- ACTIVE RR CROSSING (GATE & SIGNAL)
- PASSIVE RR CROSSING (CROSS BUCK)

XX (XX) — A.M. (P.M.)
- 3:00 - 4:00
- 7:30 - 8:30

FIGURE 5

EXISTING PEAK-HOURS TRUCK TRAFFIC VOLUMES
(TYPICAL WEEKDAY, JULY 2012)

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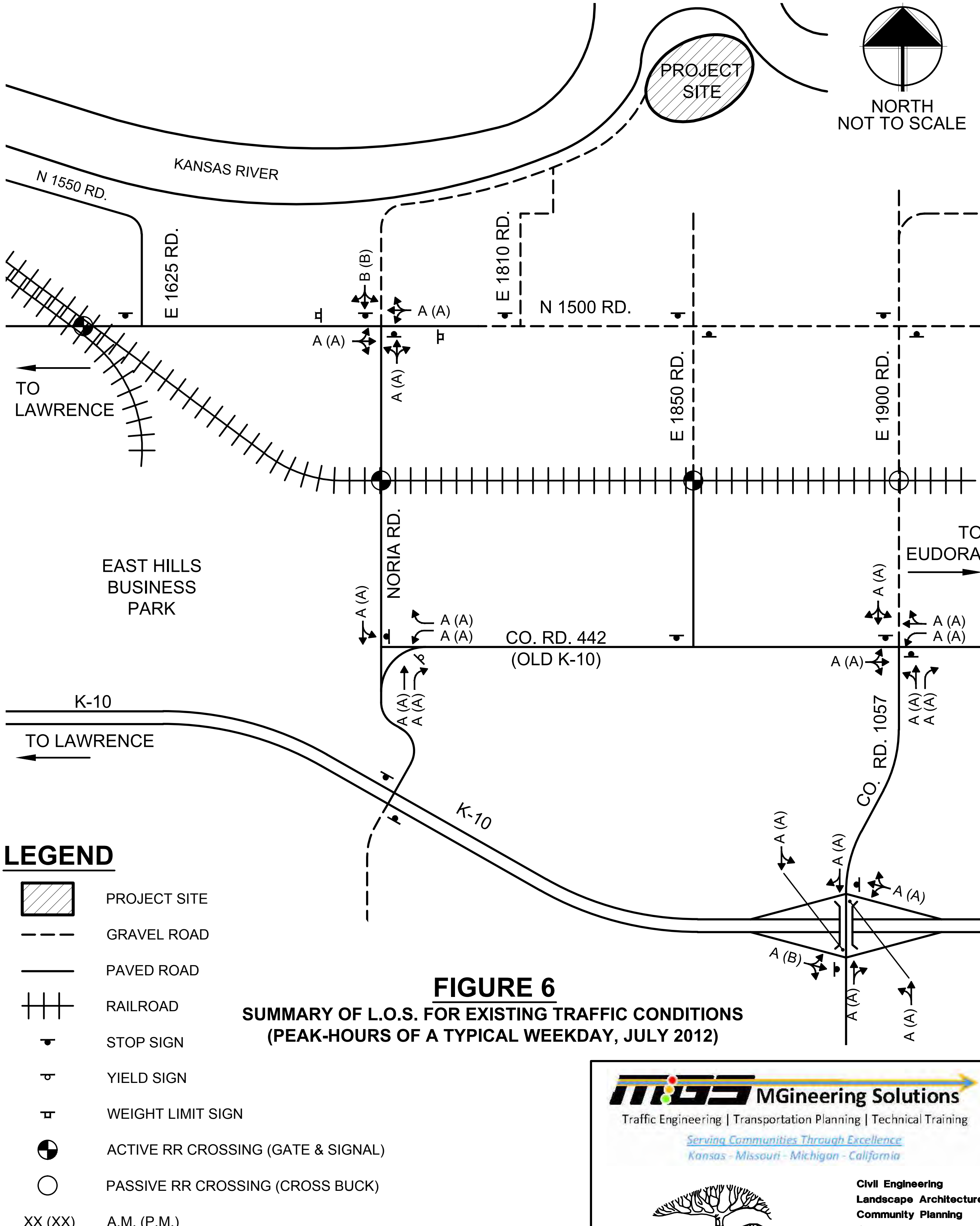

FIGURE 6

SUMMARY OF L.O.S. FOR EXISTING TRAFFIC CONDITIONS
(PEAK-HOURS OF A TYPICAL WEEKDAY, JULY 2012)

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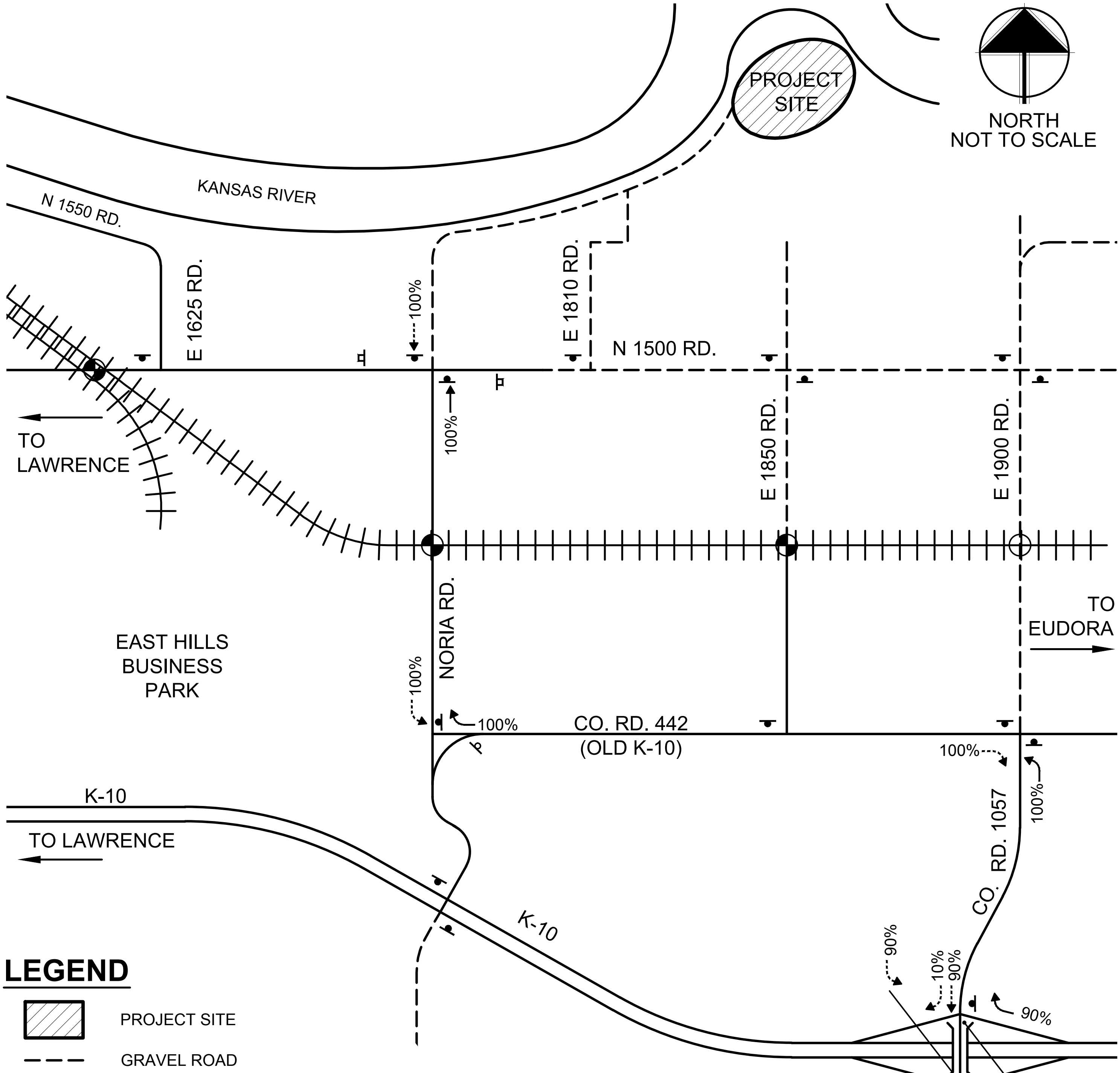

FIGURE 7

TRIP DISTRIBUTION PATTERNS FOR THE PROPOSED DEVELOPMENT (PEAK-HOURS OF ADJACENT ROADWAY NETWORK, TYPICAL WEEKDAY)

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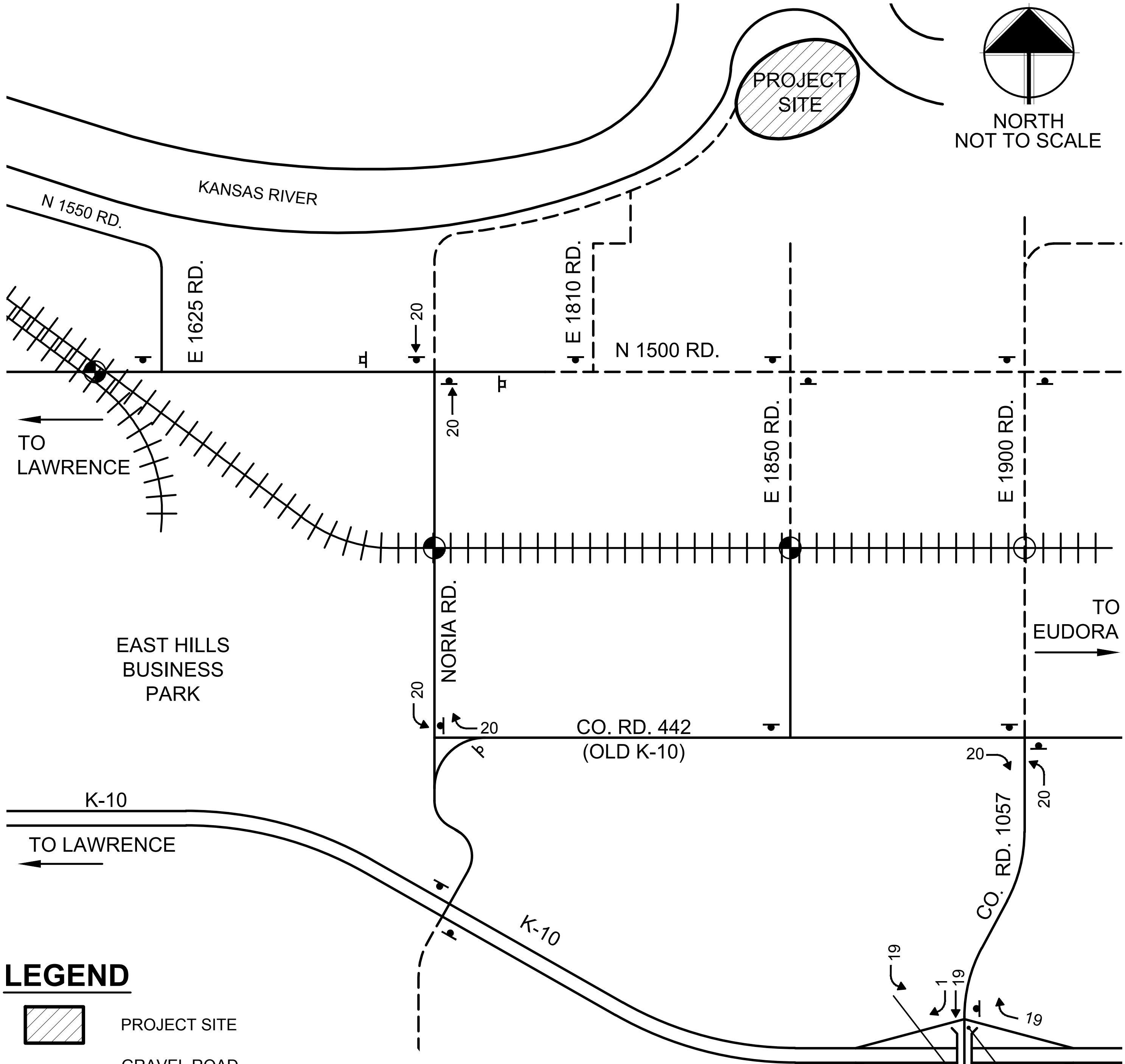

LEGEND

- PROJECT SITE
- GRAVEL ROAD
- PAVED ROAD
- RAILROAD
- STOP SIGN
- YIELD SIGN
- WEIGHT LIMIT SIGN
- ACTIVE RR CROSSING (GATE & SIGNAL)
- PASSIVE RR CROSSING (CROSS BUCK)

FIGURE 8

SITE-GENERATED TRIPS (NET INCREASE IN TRUCK TRAFFIC) FOR THE PROPOSED DEVELOPMENT (PEAK-HOURS OF ADJACENT ROADWAY NETWORK, TYPICAL WEEKDAY)

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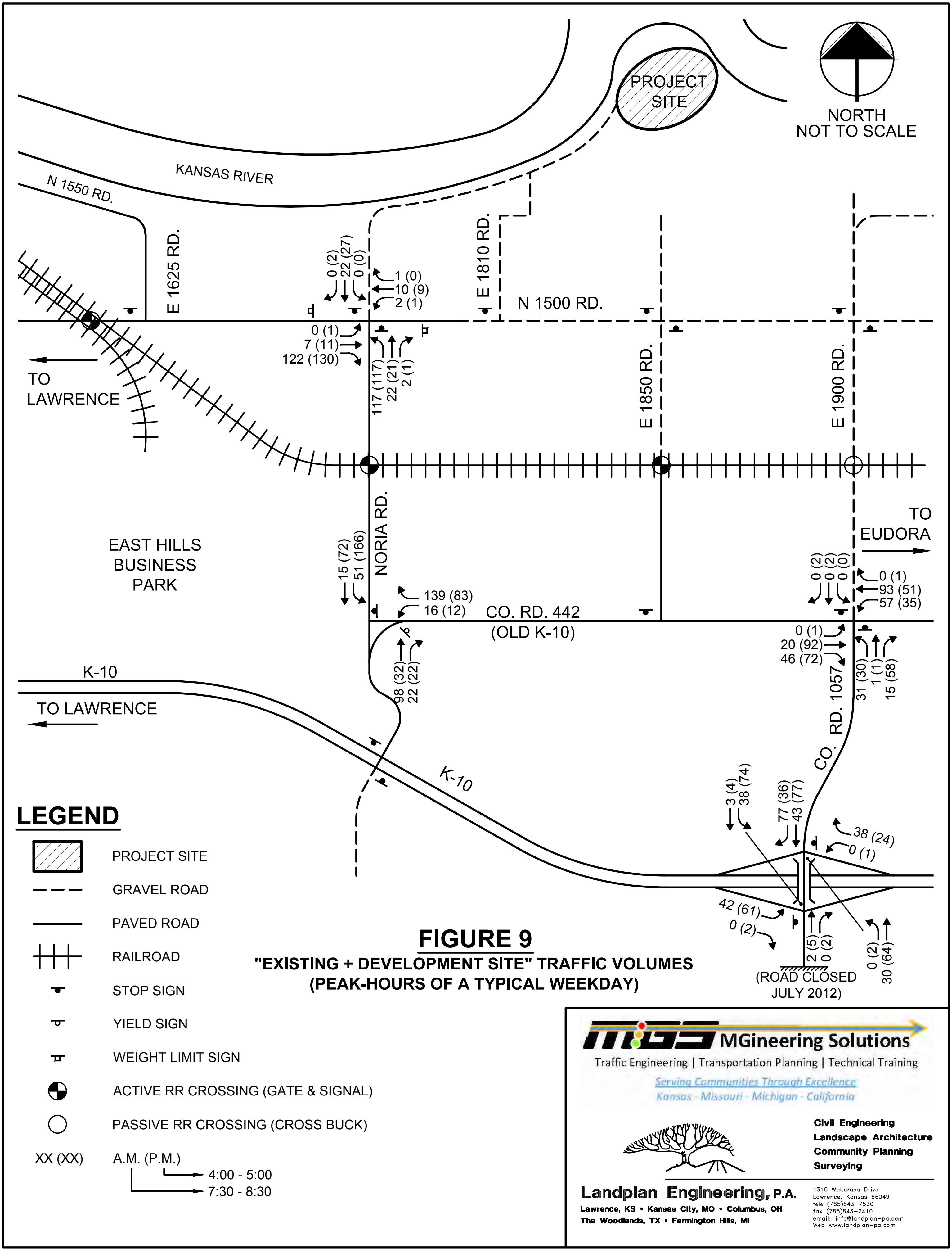

FIGURE 9

"EXISTING + DEVELOPMENT SITE" TRAFFIC VOLUMES
(PEAK-HOURS OF A TYPICAL WEEKDAY)

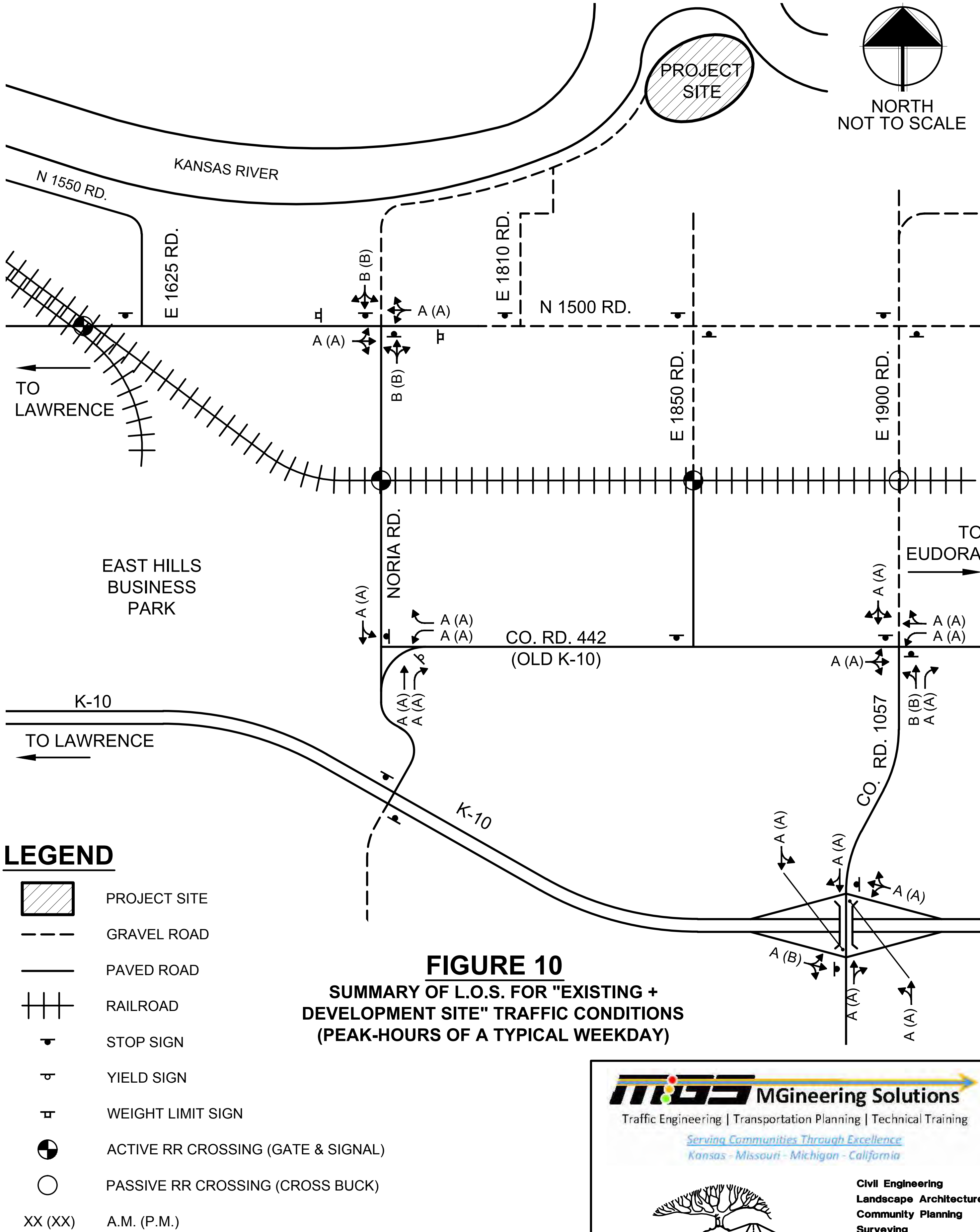

FIGURE 10

SUMMARY OF L.O.S. FOR "EXISTING + DEVELOPMENT SITE" TRAFFIC CONDITIONS (PEAK-HOURS OF A TYPICAL WEEKDAY)

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APPENDIX II

Results of Highway Capacity Analysis

Using

Synchro 7 Software

EXISTING CONDITIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	7	122	2	10	1	117	2	2	0	2	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	8	133	2	11	1	127	2	2	0	2	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	12			140			91	90	74	93	156	11
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	12			140			91	90	74	93	156	11
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	7.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.9	3.3
p0 queue free %	100			100			86	100	100	100	100	100
cM capacity (veh/h)	1607			1443			890	799	988	886	588	1069

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	140	14	132	2
Volume Left	0	2	127	0
Volume Right	133	1	2	0
cSH	1607	1443	890	588
Volume to Capacity	0.00	0.00	0.15	0.00
Queue Length 95th (ft)	0	0	13	0
Control Delay (s)	0.0	1.2	9.7	11.1
Lane LOS		A	A	B
Approach Delay (s)	0.0	1.2	9.7	11.1
Approach LOS			A	B

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	28.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	11	130	1	9	0	117	1	1	0	7	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.876						0.999			0.973	
Flt Protected					0.995			0.953				
Satd. Flow (prot)	0	1632	0	0	1853	0	0	1760	0	0	1025	0
Flt Permitted					0.995			0.953				
Satd. Flow (perm)	0	1632	0	0	1853	0	0	1760	0	0	1025	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		742			793			5163			445	
Travel Time (s)		16.9			18.0			117.3			10.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	100%	2%	2%	100%	2%
Adj. Flow (vph)	1	12	141	1	10	0	127	1	1	0	8	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	154	0	0	11	0	0	129	0	0	10	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 28.8% ICU Level of Service A

Analysis Period (min) 15

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	16	119	98	22	31	15
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	129	107	24	34	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		7				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	190	107			107	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	190	107			107	
tC, single (s)	6.5	6.2			4.3	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.3	
p0 queue free %	98	86			98	
cM capacity (veh/h)	758	948			1401	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	147	107	24	50
Volume Left	17	0	0	34
Volume Right	129	0	24	0
cSH	1075	1700	1700	1401
Volume to Capacity	0.14	0.06	0.01	0.02
Queue Length 95th (ft)	12	0	0	2
Control Delay (s)	9.5	0.0	0.0	5.2
Lane LOS	A			A
Approach Delay (s)	9.5	0.0		5.2
Approach LOS	A			

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	19.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	12	63	32	22	146	72
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	68	35	24	159	78
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		7				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	430	35			35	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	430	35			35	
tC, single (s)	6.4	6.5			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.6			2.3	
p0 queue free %	98	93			90	
cM capacity (veh/h)	522	959			1545	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	82	35	24	237
Volume Left	13	0	0	159
Volume Right	68	0	24	0
cSH	1141	1700	1700	1545
Volume to Capacity	0.07	0.02	0.01	0.10
Queue Length 95th (ft)	6	0	0	9
Control Delay (s)	9.5	0.0	0.0	5.4
Lane LOS	A			A
Approach Delay (s)	9.5	0.0		5.4
Approach LOS	A			

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	28.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	20	26	57	93	0	11	1	15	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	22	28	62	101	0	12	1	16	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									7			
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	101			50			261	261	36	270	275	101
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	101			50			261	261	36	270	275	101
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			96			98	100	98	100	100	100
cM capacity (veh/h)	1491			1557			671	618	1025	651	607	954

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total	50	62	101	29	0
Volume Left	0	62	0	12	0
Volume Right	28	0	0	16	0
cSH	1491	1557	1700	1500	1700
Volume to Capacity	0.00	0.04	0.06	0.02	0.00
Queue Length 95th (ft)	0	3	0	1	0
Control Delay (s)	0.0	7.4	0.0	9.4	0.0
Lane LOS		A		A	A
Approach Delay (s)	0.0	2.8		9.4	0.0
Approach LOS				A	A

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	92	52	35	51	1	10	1	58	0	2	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	100	57	38	55	1	11	1	63	0	2	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									7			
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	57			157			265	263	128	295	291	56
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	57			157			265	263	128	295	291	56
tC, single (s)	4.1			4.1			7.2	6.5	6.5	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.5	3.5	4.0	3.3
p0 queue free %	100			97			98	100	93	100	100	100
cM capacity (veh/h)	1548			1423			654	624	861	596	603	1011

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total	158	38	57	75	4
Volume Left	1	38	0	11	0
Volume Right	57	0	1	63	2
cSH	1548	1423	1700	1025	755
Volume to Capacity	0.00	0.03	0.03	0.07	0.01
Queue Length 95th (ft)	0	2	0	6	0
Control Delay (s)	0.1	7.6	0.0	9.7	9.8
Lane LOS	A	A		A	A
Approach Delay (s)	0.1	3.1		9.7	9.8
Approach LOS				A	A

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	28.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	0	0	19	0	29	0	0	24	76
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	21	0	32	0	0	26	83
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	120	99	67	99	140	32	109			32		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	120	99	67	99	140	32	109			32		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	98	100			100		
cM capacity (veh/h)	839	791	996	883	751	1042	1482			1581		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	21	32	109
Volume Left	0	0	0
Volume Right	21	0	83
cSH	1042	1482	1700
Volume to Capacity	0.02	0.00	0.06
Queue Length 95th (ft)	2	0	0
Control Delay (s)	8.5	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.5	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	15.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	1	0	5	2	63	0	0	58	35
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	1	0	5	2	68	0	0	63	38
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	160	155	82	155	174	68	101			68		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	160	155	82	155	174	68	101			68		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.4	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.5	2.2			2.2		
p0 queue free %	100	100	100	100	100	99	100			100		
cM capacity (veh/h)	800	736	978	811	718	947	1491			1533		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	7	71	101
Volume Left	1	2	0
Volume Right	5	0	38
cSH	921	1491	1700
Volume to Capacity	0.01	0.00	0.06
Queue Length 95th (ft)	1	0	0
Control Delay (s)	8.9	0.2	0.0
Lane LOS	A	A	
Approach Delay (s)	8.9	0.2	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	15.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	41	0	0	0	0	0	0	2	0	19	3	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	45	0	0	0	0	0	0	2	0	21	3	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	47	47	3	47	47	2	3			2		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	47	47	3	47	47	2	3			2		
tC, single (s)	7.4	6.5	6.2	7.1	6.5	6.2	4.1			4.4		
tC, 2 stage (s)												
tF (s)	3.8	4.0	3.3	3.5	4.0	3.3	2.2			2.5		
p0 queue free %	95	100	100	100	100	100	100			99		
cM capacity (veh/h)	871	833	1081	944	833	1082	1619			1444		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	45	2	24
Volume Left	45	0	21
Volume Right	0	0	0
cSH	871	1700	1444
Volume to Capacity	0.05	0.00	0.01
Queue Length 95th (ft)	4	0	1
Control Delay (s)	9.4	0.0	6.5
Lane LOS	A		A
Approach Delay (s)	9.4	0.0	6.5
Approach LOS	A		

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	17.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	60	0	2	0	0	0	0	5	2	55	4	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	65	0	2	0	0	0	0	5	2	60	4	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	130	132	4	133	130	7	4			8		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	130	132	4	133	130	7	4			8		
tC, single (s)	7.3	6.5	6.2	7.1	6.5	6.2	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.7	4.0	3.3	3.5	4.0	3.3	2.2			2.4		
p0 queue free %	92	100	100	100	100	100	100			96		
cM capacity (veh/h)	768	729	1079	812	730	1076	1617			1503		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	67	8	64
Volume Left	65	0	60
Volume Right	2	2	0
cSH	775	1700	1503
Volume to Capacity	0.09	0.00	0.04
Queue Length 95th (ft)	7	0	3
Control Delay (s)	10.1	0.0	7.0
Lane LOS	B		A
Approach Delay (s)	10.1	0.0	7.0
Approach LOS	B		

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		

EXISTING +
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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	7	122	2	10	1	117	22	2	0	22	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	8	133	2	11	1	127	24	2	0	24	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	12			140			102	90	74	104	156	11
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	12			140			102	90	74	104	156	11
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	7.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.9	3.3
p0 queue free %	100			100			85	97	100	100	96	100
cM capacity (veh/h)	1607			1443			851	799	988	853	588	1069

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	140	14	153	24
Volume Left	0	2	127	0
Volume Right	133	1	2	0
cSH	1607	1443	844	588
Volume to Capacity	0.00	0.00	0.18	0.04
Queue Length 95th (ft)	0	0	17	3
Control Delay (s)	0.0	1.2	10.2	11.4
Lane LOS		A	B	B
Approach Delay (s)	0.0	1.2	10.2	11.4
Approach LOS			B	B

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	29.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	11	130	1	9	0	117	21	1	0	27	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	12	141	1	10	0	127	23	1	0	29	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	10			153			114	97	83	109	167	10
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	10			153			114	97	83	109	167	10
tC, single (s)	4.1			4.1			7.1	7.5	6.2	7.1	7.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.9	3.3	3.5	4.9	3.3
p0 queue free %	100			100			85	96	100	100	95	100
cM capacity (veh/h)	1610			1427			828	640	977	844	579	1072

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	154	11	151	32
Volume Left	1	1	127	0
Volume Right	141	0	1	2
cSH	1610	1427	793	598
Volume to Capacity	0.00	0.00	0.19	0.05
Queue Length 95th (ft)	0	0	17	4
Control Delay (s)	0.1	0.8	10.6	11.4
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	0.8	10.6	11.4
Approach LOS			B	B

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	29.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	16	139	98	22	51	15
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	151	107	24	55	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		7				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	234	107			107	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	234	107			107	
tC, single (s)	6.5	6.2			4.3	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.3	
p0 queue free %	98	84			96	
cM capacity (veh/h)	704	948			1401	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	168	107	24	72
Volume Left	17	0	0	55
Volume Right	151	0	24	0
cSH	1057	1700	1700	1401
Volume to Capacity	0.16	0.06	0.01	0.04
Queue Length 95th (ft)	14	0	0	3
Control Delay (s)	9.6	0.0	0.0	6.0
Lane LOS	A			A
Approach Delay (s)	9.6	0.0		6.0
Approach LOS	A			

Intersection Summary			
Average Delay	5.5		
Intersection Capacity Utilization	20.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	12	83	32	22	166	72
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	90	35	24	180	78
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		7				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	474	35			35	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	474	35			35	
tC, single (s)	6.4	6.5			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.6			2.3	
p0 queue free %	97	91			88	
cM capacity (veh/h)	485	959			1545	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	103	35	24	259
Volume Left	13	0	0	180
Volume Right	90	0	24	0
cSH	1097	1700	1700	1545
Volume to Capacity	0.09	0.02	0.01	0.12
Queue Length 95th (ft)	8	0	0	10
Control Delay (s)	9.6	0.0	0.0	5.6
Lane LOS	A			A
Approach Delay (s)	9.6	0.0		5.6
Approach LOS	A			

Intersection Summary			
Average Delay	5.8		
Intersection Capacity Utilization	29.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	20	46	57	93	0	31	1	15	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	22	50	62	101	0	34	1	16	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									7			
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	101			72			272	272	47	280	297	101
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	101			72			272	272	47	280	297	101
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	100			96			95	100	98	100	100	100
cM capacity (veh/h)	1491			1528			660	609	1011	640	590	954

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total	72	62	101	51	0
Volume Left	0	62	0	34	0
Volume Right	50	0	0	16	0
cSH	1491	1528	1700	967	1700
Volume to Capacity	0.00	0.04	0.06	0.05	0.00
Queue Length 95th (ft)	0	3	0	4	0
Control Delay (s)	0.0	7.5	0.0	10.1	0.0
Lane LOS		A		B	A
Approach Delay (s)	0.0	2.8		10.1	0.0
Approach LOS				B	A

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	92	72	35	51	1	30	1	58	0	2	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	100	78	38	55	1	33	1	63	0	2	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									7			
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	57			178			276	274	139	305	312	56
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	57			178			276	274	139	305	312	56
tC, single (s)	4.1			4.1			7.2	6.5	6.5	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.6	4.0	3.5	3.5	4.0	3.3
p0 queue free %	100			97			95	100	93	100	100	100
cM capacity (veh/h)	1548			1398			643	616	849	585	586	1011

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total	179	38	57	97	4
Volume Left	1	38	0	33	0
Volume Right	78	0	1	63	2
cSH	1548	1398	1700	1303	742
Volume to Capacity	0.00	0.03	0.03	0.07	0.01
Queue Length 95th (ft)	0	2	0	6	0
Control Delay (s)	0.1	7.6	0.0	10.0	9.9
Lane LOS	A	A		B	A
Approach Delay (s)	0.1	3.1		10.0	9.9
Approach LOS				B	A

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	31.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	0	0	38	0	30	0	0	43	77
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	41	0	33	0	0	47	84
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	162	121	89	121	163	33	130			33		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	162	121	89	121	163	33	130			33		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	100	100	96	100			100		
cM capacity (veh/h)	771	769	970	854	729	1041	1455			1579		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	41	33	130
Volume Left	0	0	0
Volume Right	41	0	84
cSH	1041	1455	1700
Volume to Capacity	0.04	0.00	0.08
Queue Length 95th (ft)	3	0	0
Control Delay (s)	8.6	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.6	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	17.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	1	0	24	2	64	0	0	77	36
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	1	0	26	2	70	0	0	84	39
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	203	177	103	177	197	70	123			70		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	203	177	103	177	197	70	123			70		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.4	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.5	2.2			2.2		
p0 queue free %	100	100	100	100	100	97	100			100		
cM capacity (veh/h)	733	715	952	784	698	945	1464			1531		

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	27	72	123
Volume Left	1	2	0
Volume Right	26	0	39
cSH	938	1464	1700
Volume to Capacity	0.03	0.00	0.07
Queue Length 95th (ft)	2	0	0
Control Delay (s)	9.0	0.2	0.0
Lane LOS	A	A	
Approach Delay (s)	9.0	0.2	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	16.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	42	0	0	0	0	0	0	2	0	38	3	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	46	0	0	0	0	0	0	2	0	41	3	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	88	88	3	88	88	2	3			2		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	88	88	3	88	88	2	3			2		
tC, single (s)	7.4	6.5	6.2	7.1	6.5	6.2	4.1			4.4		
tC, 2 stage (s)												
tF (s)	3.8	4.0	3.3	3.5	4.0	3.3	2.2			2.5		
p0 queue free %	94	100	100	100	100	100	100			97		
cM capacity (veh/h)	808	779	1081	878	779	1082	1619			1444		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	46	2	45
Volume Left	46	0	41
Volume Right	0	0	0
cSH	808	1700	1444
Volume to Capacity	0.06	0.00	0.03
Queue Length 95th (ft)	4	0	2
Control Delay (s)	9.7	0.0	7.0
Lane LOS	A		A
Approach Delay (s)	9.7	0.0	7.0
Approach LOS	A		

Intersection Summary			
Average Delay	8.2		
Intersection Capacity Utilization	18.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	61	0	2	0	0	0	0	5	2	74	4	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	66	0	2	0	0	0	0	5	2	80	4	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	172	173	4	174	172	7	4			8		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	172	173	4	174	172	7	4			8		
tC, single (s)	7.3	6.5	6.2	7.1	6.5	6.2	4.1			4.3		
tC, 2 stage (s)												
tF (s)	3.7	4.0	3.3	3.5	4.0	3.3	2.2			2.4		
p0 queue free %	91	100	100	100	100	100	100			95		
cM capacity (veh/h)	712	682	1079	755	683	1076	1617			1503		

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	68	8	85
Volume Left	66	0	80
Volume Right	2	2	0
cSH	720	1700	1503
Volume to Capacity	0.10	0.00	0.05
Queue Length 95th (ft)	8	0	4
Control Delay (s)	10.5	0.0	7.2
Lane LOS	B		A
Approach Delay (s)	10.5	0.0	7.2
Approach LOS	B		

Intersection Summary			
Average Delay	8.3		
Intersection Capacity Utilization	21.1%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX III

Summary of Peak-Hours Traffic Counts

- All Vehicles
- Trucks Only

Turning Movement Counts
(All Vehicles)

Intersection of Noria Rd & N 1500 Rd
Morning Peak-Hours
Sunny, Hot

File Name : Noria & N 1500 -eam
Site Code : 1
Start Date : 7/11/2012
Page No : 1

Groups Printed- Unshifted

	Sand Plant Driveway From North					N 1500 Rd From East					Noria Rd From South					N 1500 Rd From West					
Start Time	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Int. Total
06:00 AM	1	0	0	0	1	0	0	0	0	0	0	0	6	0	6	11	0	0	0	11	18
06:15 AM	0	0	0	0	0	0	1	0	0	1	0	1	10	0	11	21	2	0	0	23	35
06:30 AM	0	0	0	0	0	0	1	1	0	2	0	1	21	0	22	19	1	1	0	21	45
06:45 AM	0	1	0	0	1	0	1	0	0	1	1	0	20	0	21	32	3	0	0	35	58
Total	1	1	0	0	2	0	3	1	0	4	1	2	57	0	60	83	6	1	0	90	156
07:00 AM	0	0	0	0	0	0	1	0	0	1	0	0	18	0	18	11	0	0	0	11	30
07:15 AM	0	0	0	0	0	1	1	0	0	2	0	0	32	0	32	20	1	0	0	21	55
07:30 AM	0	0	0	0	0	0	4	0	0	4	0	1	26	0	27	26	0	0	0	26	57
07:45 AM	0	1	0	0	1	0	1	1	0	2	0	0	40	0	40	49	3	0	0	52	95
Total	0	1	0	0	1	1	7	1	0	9	0	1	116	0	117	106	4	0	0	110	237
08:00 AM	0	0	0	0	0	0	3	0	0	3	1	1	27	0	29	19	2	0	0	21	53
08:15 AM	0	1	0	0	1	1	2	1	0	4	1	0	24	0	25	28	2	0	0	30	60
08:30 AM	0	1	0	0	1	0	1	0	0	1	1	3	18	0	22	18	2	0	0	20	44
08:45 AM	0	3	0	0	3	0	1	0	0	1	0	0	20	0	20	19	0	0	0	19	43
Total	0	5	0	0	5	1	7	1	0	9	3	4	89	0	96	84	6	0	0	90	200
Grand Total	1	7	0	0	8	2	17	3	0	22	4	7	262	0	273	273	16	1	0	290	593
Apprch %	12.5	87.5	0	0		9.1	77.3	13.6	0		1.5	2.6	96	0		94.1	5.5	0.3	0		
Total %	0.2	1.2	0	0	1.3	0.3	2.9	0.5	0	3.7	0.7	1.2	44.2	0	46	46	2.7	0.2	0	48.9	

Turning Movement Counts
(All Vehicles)

Intersection of Noria Rd & N 1500 Rd
Morning Peak-Hours
Sunny, Hot

File Name : Noria & N 1500 -eam
Site Code : 1
Start Date : 7/11/2012

	Sand Plant Driveway From North					N 1500 Rd From East					Noria Rd From South					N 1500 Rd From West					
Start Time	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	0	0	0	0	0	4	0	0	4	0	1	26	0	27	26	0	0	0	26	57
07:45 AM	0	1	0	0	1	0	1	1	0	2	0	0	40	0	40	49	3	0	0	52	95
08:00 AM	0	0	0	0	0	0	3	0	0	3	1	1	27	0	29	19	2	0	0	21	53
08:15 AM	0	1	0	0	1	1	2	1	0	4	1	0	24	0	25	28	2	0	0	30	60
Total Volume	0	2	0	0	2	1	10	2	0	13	2	2	117	0	121	122	7	0	0	129	265
% App. Total	0	100	0	0		7.7	76.9	15.4	0		1.7	1.7	96.7	0		94.6	5.4	0	0		
PHF	.000	.500	.000	.000	.500	.250	.625	.500	.000	.813	.500	.500	.731	.000	.756	.622	.583	.000	.000	.620	.697

Turning Movement Counts
(All Vehicles)

Intersection of Noria Rd & N 1500 Rd
Afternoon Peak-Hours
Sunny, Hot

File Name : Noria & N 1500 -epm
Site Code : 1
Start Date : 7/11/2012

Groups Printed- Unshifted

	Sand Plant Driveway From North					N 1500 Rd From East					Noria Rd From South					N 1500 Rd From West					
Start Time	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Int. Total
02:00 PM	1	2	0	0	3	0	2	0	0	2	0	0	19	0	19	13	3	1	0	17	41
02:15 PM	0	1	0	0	1	0	0	0	0	0	1	1	9	0	11	19	2	0	0	21	33
02:30 PM	0	0	0	0	0	0	2	1	0	3	1	1	15	0	17	24	3	0	0	27	47
02:45 PM	0	1	0	0	1	0	1	0	0	1	1	0	16	0	17	16	3	0	0	19	38
Total	1	4	0	0	5	0	5	1	0	6	3	2	59	0	64	72	11	1	0	84	159
03:00 PM	0	1	0	0	1	0	0	0	0	0	0	1	29	0	30	19	0	0	0	19	50
03:15 PM	0	0	0	0	0	0	2	0	0	2	0	0	28	0	28	17	2	0	0	19	49
03:30 PM	0	1	0	0	1	0	3	1	0	4	0	3	52	0	55	26	4	0	0	30	90
03:45 PM	0	1	0	0	1	0	2	0	0	2	0	2	20	0	22	25	2	0	0	27	52
Total	0	3	0	0	3	0	7	1	0	8	0	6	129	0	135	87	8	0	0	95	241
04:00 PM	0	5	0	0	5	0	0	0	0	0	0	0	27	0	27	23	4	1	0	28	60
04:15 PM	1	0	0	0	1	0	4	0	0	4	0	0	14	0	14	35	4	0	0	39	58
04:30 PM	0	2	0	0	2	0	2	0	0	2	1	1	53	0	55	25	1	0	0	26	85
04:45 PM	1	0	0	0	1	0	3	1	0	4	0	0	23	0	23	47	2	0	0	49	77
Total	2	7	0	0	9	0	9	1	0	10	1	1	117	0	119	130	11	1	0	142	280
Grand Total	3	14	0	0	17	0	21	3	0	24	4	9	305	0	318	289	30	2	0	321	680
Apprch %	17.6	82.4	0	0		0	87.5	12.5	0		1.3	2.8	95.9	0		90	9.3	0.6	0		
Total %	0.4	2.1	0	0	2.5	0	3.1	0.4	0	3.5	0.6	1.3	44.9	0	46.8	42.5	4.4	0.3	0	47.2	

Turning Movement Counts
(All Vehicles)

Intersection of Noria Rd & N 1500 Rd
Afternoon Peak-Hours
Sunny, Hot

File Name : Noria & N 1500 -epm
Site Code : 1
Start Date : 7/11/2012
Page No : 2

	Sand Plant Driveway From North					N 1500 Rd From East					Noria Rd From South					N 1500 Rd From West					
Start Time	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 04:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	5	0	0	5	0	0	0	0	0	0	0	27	0	27	23	4	1	0	28	60
04:15 PM	1	0	0	0	1	0	4	0	0	4	0	0	14	0	14	35	4	0	0	39	58
04:30 PM	0	2	0	0	2	0	2	0	0	2	1	1	53	0	55	25	1	0	0	26	85
04:45 PM	1	0	0	0	1	0	3	1	0	4	0	0	23	0	23	47	2	0	0	49	77
Total Volume	2	7	0	0	9	0	9	1	0	10	1	1	117	0	119	130	11	1	0	142	280
% App. Total	22.2	77.8	0	0		0	90	10	0		0.8	0.8	98.3	0		91.5	7.7	0.7	0		
PHF	.500	.350	.000	.000	.450	.000	.563	.250	.000	.625	.250	.250	.552	.000	.541	.691	.688	.250	.000	.724	.824

Turning Movement Counts
(All Vehicles)

Intersection of Noria Rd & DG CO 442
Morning Peak-Hours
Sunny, Hot

File Name : CR 442 & Noria-eam
Site Code : 2
Start Date : 7/12/2012
Page No : 1

Groups Printed- Unshifted

	Noria Rd From North					DG CO 442 From East					Noria Rd From South					From West					
Start Time		Thru	Left		App. Total	Right		Left		App. Total	Right	Thru			App. Total					App. Total	Int. Total
06:00 AM	0	4	2	0	6	13	0	1	0	14	1	6	0	0	7	0	0	0	0	0	27
06:15 AM	0	3	3	0	6	11	0	0	0	11	1	9	0	0	10	0	0	0	0	0	27
06:30 AM	0	3	5	0	8	22	0	2	0	24	5	16	0	0	21	0	0	0	0	0	53
06:45 AM	0	0	8	0	8	27	0	2	0	29	8	28	0	0	36	0	0	0	0	0	73
Total	0	10	18	0	28	73	0	5	0	78	15	59	0	0	74	0	0	0	0	0	180
07:00 AM	0	5	8	0	13	23	0	4	0	27	4	17	0	0	21	0	0	0	0	0	61
07:15 AM	0	0	11	0	11	29	0	2	0	31	5	17	0	0	22	0	0	0	0	0	64
07:30 AM	0	3	4	0	7	42	0	5	0	47	2	16	0	0	18	0	0	0	0	0	72
07:45 AM	0	4	6	0	10	25	0	7	0	32	8	37	0	0	45	0	0	0	0	0	87
Total	0	12	29	0	41	119	0	18	0	137	19	87	0	0	106	0	0	0	0	0	284
08:00 AM	0	2	10	0	12	26	0	3	0	29	7	25	0	0	32	0	0	0	0	0	73
08:15 AM	0	6	11	0	17	26	0	1	0	27	5	20	0	0	25	0	0	0	0	0	69
08:30 AM	0	10	4	0	14	18	0	6	0	24	2	14	0	0	16	0	0	0	0	0	54
08:45 AM	0	6	6	0	12	5	0	8	0	13	1	17	0	0	18	0	0	0	0	0	43
Total	0	24	31	0	55	75	0	18	0	93	15	76	0	0	91	0	0	0	0	0	239
Grand Total	0	46	78	0	124	267	0	41	0	308	49	222	0	0	271	0	0	0	0	0	703
Apprch %	0	37.1	62.9	0		86.7	0	13.3	0		18.1	81.9	0	0		0	0	0	0		
Total %	0	6.5	11.1	0	17.6	38	0	5.8	0	43.8	7	31.6	0	0	38.5	0	0	0	0	0	

Turning Movement Counts
(All Vehicles)

Intersection of Noria Rd & DG CO 442
Morning Peak-Hours
Sunny, Hot

File Name : CR 442 & Noria-eam
Site Code : 2
Start Date : 7/12/2012
Page No : 2

	Noria Rd From North					DG CO 442 From East					Noria Rd From South					From West					
Start Time		Thru	Left		App. Total	Right		Left		App. Total	Right	Thru			App. Total					App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	3	4	0	7	42	0	5	0	47	2	16	0	0	18	0	0	0	0	0	72
07:45 AM	0	4	6	0	10	25	0	7	0	32	8	37	0	0	45	0	0	0	0	0	87
08:00 AM	0	2	10	0	12	26	0	3	0	29	7	25	0	0	32	0	0	0	0	0	73
08:15 AM	0	6	11	0	17	26	0	1	0	27	5	20	0	0	25	0	0	0	0	0	69
Total Volume	0	15	31	0	46	119	0	16	0	135	22	98	0	0	120	0	0	0	0	0	301
% App. Total	0	32.6	67.4	0		88.1	0	11.9	0		18.3	81.7	0	0		0	0	0	0		
PHF	.000	.625	.705	.000	.676	.708	.000	.571	.000	.718	.688	.662	.000	.000	.667	.000	.000	.000	.000	.000	.865

Turning Movement Counts
(All Vehicles)

Intersection of DG CO 442 & Noria Rd
Afternoon Peak-Hours
Sunny, Hot

File Name : CR 442 & Noria-epm
Site Code : 2
Start Date : 7/12/2012
Page No : 1

Groups Printed- Unshifted

	Noria Road From North					DG CO 442 From East					Noria Road From South					From West					
Start Time		Thru	Left		App. Total	Right		Left		App. Total	Right	Thru			App. Total					App. Total	Int. Total
02:00 PM	0	9	9	0	18	16	0	7	0	23	7	2	0	0	9	0	0	0	0	0	50
02:15 PM	0	6	14	0	20	14	0	3	0	17	7	10	0	0	17	0	0	0	0	0	54
02:30 PM	0	12	18	0	30	14	0	6	0	20	6	4	0	0	10	0	0	0	0	0	60
02:45 PM	0	5	19	0	24	8	0	8	0	16	5	7	0	0	12	0	0	0	0	0	52
Total	0	32	60	0	92	52	0	24	0	76	25	23	0	0	48	0	0	0	0	0	216
03:00 PM	0	5	32	0	37	9	0	4	0	13	5	3	0	0	8	0	0	0	0	0	58
03:15 PM	0	3	16	0	19	19	0	6	0	25	2	12	0	0	14	0	0	0	0	0	58
03:30 PM	0	24	30	0	54	11	0	3	0	14	5	7	0	0	12	0	0	0	0	0	80
03:45 PM	0	7	23	0	30	7	0	5	0	12	5	8	0	0	13	0	0	0	0	0	55
Total	0	39	101	0	140	46	0	18	0	64	17	30	0	0	47	0	0	0	0	0	251
04:00 PM	0	24	34	0	58	20	0	4	0	24	5	4	0	0	9	0	0	0	0	0	91
04:15 PM	0	13	33	0	46	19	0	4	0	23	5	11	0	0	16	0	0	0	0	0	85
04:30 PM	0	23	36	0	59	13	0	2	0	15	8	9	0	0	17	0	0	0	0	0	91
04:45 PM	0	12	43	0	55	11	0	2	0	13	4	8	0	0	12	0	0	0	0	0	80
Total	0	72	146	0	218	63	0	12	0	75	22	32	0	0	54	0	0	0	0	0	347
Grand Total	0	143	307	0	450	161	0	54	0	215	64	85	0	0	149	0	0	0	0	0	814
Apprch %	0	31.8	68.2	0		74.9	0	25.1	0		43	57	0	0		0	0	0	0		
Total %	0	17.6	37.7	0	55.3	19.8	0	6.6	0	26.4	7.9	10.4	0	0	18.3	0	0	0	0	0	

Turning Movement Counts
(All Vehicles)

Intersection of DG CO 442 & Noria Rd
Afternoon Peak-Hours
Sunny, Hot

File Name : CR 442 & Noria-epm
Site Code : 2
Start Date : 7/12/2012
Page No : 2

	Noria Road From North					DG CO 442 From East					Noria Road From South					From West					
Start Time		Thru	Left		App. Total	Right		Left		App. Total	Right	Thru			App. Total					App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 04:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	24	34	0	58	20	0	4	0	24	5	4	0	0	9	0	0	0	0	0	91
04:15 PM	0	13	33	0	46	19	0	4	0	23	5	11	0	0	16	0	0	0	0	0	85
04:30 PM	0	23	36	0	59	13	0	2	0	15	8	9	0	0	17	0	0	0	0	0	91
04:45 PM	0	12	43	0	55	11	0	2	0	13	4	8	0	0	12	0	0	0	0	0	80
Total Volume	0	72	146	0	218	63	0	12	0	75	22	32	0	0	54	0	0	0	0	0	347
% App. Total	0	33	67	0		84	0	16	0		40.7	59.3	0	0		0	0	0	0		
PHF	.000	.750	.849	.000	.924	.788	.000	.750	.000	.781	.688	.727	.000	.000	.794	.000	.000	.000	.000	.000	.953

Turning Movement Counts
(All Vehicles)

Intersection of CO Rd 442 & CO Rd 1057
Morning Peak-Hours
Sunny, Hot
Other:

File Name : CR 442 & CR 1057-eam
Site Code : 3
Start Date : 7/17/2012
Page No : 1

Groups Printed- Unshifted

	E 1900 Rd From North					DG CO 442 From East					DG CO 1057 From South					DG CO 442 From West					
Start Time	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Int. Total
06:00 AM	1	0	0	0	1	0	15	6	0	21	2	0	2	0	4	5	2	0	0	7	33
06:15 AM	0	0	0	0	0	0	14	8	0	22	2	0	0	0	2	1	3	0	0	4	28
06:30 AM	0	0	0	0	0	0	37	15	0	52	2	0	1	0	3	10	3	0	0	13	68
06:45 AM	0	0	0	0	0	0	15	15	0	30	5	1	2	0	8	5	4	0	0	9	47
Total	1	0	0	0	1	0	81	44	0	125	11	1	5	0	17	21	12	0	0	33	176
07:00 AM	0	0	0	0	0	0	18	11	0	29	3	0	3	0	6	8	11	0	0	19	54
07:15 AM	0	0	0	0	0	0	23	16	0	39	5	0	5	0	10	3	2	0	0	5	54
07:30 AM	0	0	0	0	0	0	16	8	0	24	5	1	10	0	16	6	3	0	0	9	49
07:45 AM	0	0	0	0	0	0	20	18	0	38	4	0	7	0	11	4	2	0	0	6	55
Total	0	0	0	0	0	0	77	53	0	130	17	1	25	0	43	21	18	0	0	39	212
08:00 AM	0	3	0	0	3	0	16	6	0	22	5	0	6	0	11	8	3	0	0	11	47
08:15 AM	0	1	0	0	1	1	12	5	0	18	8	1	5	0	14	1	11	0	0	12	45
08:30 AM	0	0	0	0	0	1	7	2	0	10	8	0	2	0	10	2	6	0	0	8	28
08:45 AM	0	1	1	0	2	0	4	9	0	13	4	0	1	0	5	3	6	0	0	9	29
Total	0	5	1	0	6	2	39	22	0	63	25	1	14	0	40	14	26	0	0	40	149
Grand Total	1	5	1	0	7	2	197	119	0	318	53	3	44	0	100	56	56	0	0	112	537
Apprch %	14.3	71.4	14.3	0		0.6	61.9	37.4	0		53	3	44	0		50	50	0	0		
Total %	0.2	0.9	0.2	0	1.3	0.4	36.7	22.2	0	59.2	9.9	0.6	8.2	0	18.6	10.4	10.4	0	0	20.9	

Turning Movement Counts
(All Vehicles)

Intersection of CO Rd 442 & CO Rd 1057
Morning Peak-Hours
Sunny, Hot
Other:

File Name : CR 442 & CR 1057-eam
Site Code : 3
Start Date : 7/17/2012

	E 1900 Rd From North					DG CO 442 From East					DG CO 1057 From South					DG CO 442 From West					
Start Time	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:30 AM																					
06:30 AM	0	0	0	0	0	0	37	15	0	52	2	0	1	0	3	10	3	0	0	13	68
06:45 AM	0	0	0	0	0	0	15	15	0	30	5	1	2	0	8	5	4	0	0	9	47
07:00 AM	0	0	0	0	0	0	18	11	0	29	3	0	3	0	6	8	11	0	0	19	54
07:15 AM	0	0	0	0	0	0	23	16	0	39	5	0	5	0	10	3	2	0	0	5	54
Total Volume	0	0	0	0	0	0	93	57	0	150	15	1	11	0	27	26	20	0	0	46	223
% App. Total	0	0	0	0		0	62	38	0		55.6	3.7	40.7	0		56.5	43.5	0	0		
PHF	.000	.000	.000	.000	.000	.000	.628	.891	.000	.721	.750	.250	.550	.000	.675	.650	.455	.000	.000	.605	.820

Turning Movement Counts
(All Vehicles)

Intersection of CO Rd 442 & CO Rd 1057
Afternoon Peak-Hours
Sunny, Hot

File Name : CR 442 & CR 1057-epm
Site Code : 3
Start Date : 7/17/2012

Groups Printed- Unshifted

	E 1900 Rd. From North					DG CO 442 From East					DG CO 1057 From South					DG CO 442 From West					
Start Time	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Int. Total
02:00 PM	0	0	0	0	0	0	11	6	0	17	14	1	2	0	17	5	9	0	0	14	48
02:15 PM	1	1	2	0	4	0	7	6	0	13	14	0	1	0	15	4	12	0	0	16	48
02:30 PM	0	0	0	0	0	0	20	6	0	26	15	0	0	0	15	2	15	1	0	18	59
02:45 PM	0	0	0	0	0	0	11	5	0	16	11	0	3	0	14	0	10	0	0	10	40
Total	1	1	2	0	4	0	49	23	0	72	54	1	6	0	61	11	46	1	0	58	195
03:00 PM	0	0	0	0	0	0	9	8	0	17	14	0	2	0	16	10	22	0	0	32	65
03:15 PM	0	0	0	0	0	0	15	8	0	23	9	0	3	0	12	1	11	0	0	12	47
03:30 PM	0	0	0	0	0	0	11	9	0	20	13	1	0	0	14	10	22	0	0	32	66
03:45 PM	0	0	0	0	0	0	12	3	0	15	10	3	2	0	15	6	18	0	0	24	54
Total	0	0	0	0	0	0	47	28	0	75	46	4	7	0	57	27	73	0	0	100	232
04:00 PM	0	1	0	0	1	0	14	8	0	22	15	0	2	0	17	16	18	0	0	34	74
04:15 PM	0	0	0	0	0	0	9	7	0	16	15	0	5	0	20	11	21	0	0	32	68
04:30 PM	1	0	0	0	1	1	16	11	0	28	15	1	1	0	17	18	32	0	0	50	96
04:45 PM	1	1	0	0	2	0	12	9	0	21	13	0	2	0	15	7	21	1	0	29	67
Total	2	2	0	0	4	1	51	35	0	87	58	1	10	0	69	52	92	1	0	145	305
Grand Total	3	3	2	0	8	1	147	86	0	234	158	6	23	0	187	90	211	2	0	303	732
Apprch %	37.5	37.5	25	0		0.4	62.8	36.8	0		84.5	3.2	12.3	0		29.7	69.6	0.7	0		
Total %	0.4	0.4	0.3	0	1.1	0.1	20.1	11.7	0	32	21.6	0.8	3.1	0	25.5	12.3	28.8	0.3	0	41.4	

Turning Movement Counts
(All Vehicles)

Intersection of CO Rd 442 & CO Rd 1057
Afternoon Peak-Hours
Sunny, Hot

File Name : CR 442 & CR 1057-epm
Site Code : 3
Start Date : 7/17/2012

	E 1900 Rd. From North					DG CO 442 From East					DG CO 1057 From South					DG CO 442 From West					
Start Time	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 04:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	1	0	0	1	0	14	8	0	22	15	0	2	0	17	16	18	0	0	34	74
04:15 PM	0	0	0	0	0	0	9	7	0	16	15	0	5	0	20	11	21	0	0	32	68
04:30 PM	1	0	0	0	1	1	16	11	0	28	15	1	1	0	17	18	32	0	0	50	96
04:45 PM	1	1	0	0	2	0	12	9	0	21	13	0	2	0	15	7	21	1	0	29	67
Total Volume	2	2	0	0	4	1	51	35	0	87	58	1	10	0	69	52	92	1	0	145	305
% App. Total	50	50	0	0		1.1	58.6	40.2	0		84.1	1.4	14.5	0		35.9	63.4	0.7	0		
PHF	.500	.500	.000	.000	.500	.250	.797	.795	.000	.777	.967	.250	.500	.000	.863	.722	.719	.250	.000	.725	.794

Turning Movement Counts
(All Vehicles)

Interchange of K-10 & E 1900 Rd (North Ramps)
Morning Peak-Hours
Sunny, warm

File Name : K10-N Ramps-eam
Site Code : 4
Start Date : 7/12/2012

Groups Printed- Unshifted

	E 1900 Rd / DG CO 1057 From North					K-10 (WB Off Ramp) From East					E 1900 Rd / DG CO 1057 From South					K-10 (WB On Ramp) From West					
Start Time	Right	Thru			App. Total	Right	Thru	Left		App. Total		Thru	Left		App. Total					App. Total	Int. Total
06:00 AM	9	5	0	0	14	0	0	1	0	1	0	3	0	0	3	0	0	0	0	0	18
06:15 AM	2	2	0	0	4	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	7
06:30 AM	3	2	0	0	5	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	8
06:45 AM	10	3	0	0	13	1	0	0	0	1	0	8	0	0	8	0	0	0	0	0	22
Total	24	12	0	0	36	2	0	1	0	3	0	16	0	0	16	0	0	0	0	0	55
07:00 AM	16	6	0	0	22	2	0	0	0	2	0	5	0	0	5	0	0	0	0	0	29
07:15 AM	20	8	0	0	28	6	0	0	0	6	0	3	0	0	3	0	0	0	0	0	37
07:30 AM	20	6	0	0	26	5	0	0	0	5	0	11	0	0	11	0	0	0	0	0	42
07:45 AM	20	4	0	0	24	6	0	0	0	6	0	10	0	0	10	0	0	0	0	0	40
Total	76	24	0	0	100	19	0	0	0	19	0	29	0	0	29	0	0	0	0	0	148
08:00 AM	13	5	0	0	18	1	0	1	0	2	0	9	0	0	9	0	0	0	0	0	29
08:15 AM	14	6	0	0	20	1	0	0	0	1	0	12	1	0	13	0	0	0	0	0	34
08:30 AM	12	2	0	0	14	0	0	0	0	0	0	3	1	0	4	0	0	0	0	0	18
08:45 AM	16	0	0	0	16	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0	23
Total	55	13	0	0	68	2	0	1	0	3	0	31	2	0	33	0	0	0	0	0	104
Grand Total	155	49	0	0	204	23	0	2	0	25	0	76	2	0	78	0	0	0	0	0	307
Apprch %	76	24	0	0		92	0	8	0		0	97.4	2.6	0		0	0	0	0		
Total %	50.5	16	0	0	66.4	7.5	0	0.7	0	8.1	0	24.8	0.7	0	25.4	0	0	0	0	0	

Turning Movement Counts
(All Vehicles)

Interchange of K-10 & E 1900 Rd (North Ramps)
Morning Peak-Hours
Sunny, warm

File Name : K10-N Ramps-eam
Site Code : 4
Start Date : 7/12/2012

	E 1900 Rd / DG CO 1057 From North					K-10 (WB Off Ramp) From East					E 1900 Rd / DG CO 1057 From South					K-10 (WB On Ramp) From West					
Start Time	Right	Thru			App. Total	Right	Thru	Left		App. Total		Thru	Left		App. Total					App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	16	6	0	0	22	2	0	0	0	2	0	5	0	0	5	0	0	0	0	0	29
07:15 AM	20	8	0	0	28	6	0	0	0	6	0	3	0	0	3	0	0	0	0	0	37
07:30 AM	20	6	0	0	26	5	0	0	0	5	0	11	0	0	11	0	0	0	0	0	42
07:45 AM	20	4	0	0	24	6	0	0	0	6	0	10	0	0	10	0	0	0	0	0	40
Total Volume	76	24	0	0	100	19	0	0	0	19	0	29	0	0	29	0	0	0	0	0	148
% App. Total	76	24	0	0		100	0	0	0		0	100	0	0		0	0	0	0		
PHF	.950	.750	.000	.000	.893	.792	.000	.000	.000	.792	.000	.659	.000	.000	.659	.000	.000	.000	.000	.000	.881

Turning Movement Counts
(All Vehicles)

Interchange of K-10 & E 1900 Rd (N Ramps)
Afternoon Peak-Hours
Sunny, Hot

File Name : K10-N Ramps-epm
Site Code : 4
Start Date : 7/17/2012
Page No : 1

Groups Printed- Unshifted

	E 1900 Rd / DG CO 1057 From North					K-10 (WB Off Ramp) From East					E 1900 Rd / DG CO 1057 From South					K-10 (WB On Ramp) From West					
Start Time	Right	Thru			App. Total	Right	Thru	Left		App. Total		Thru	Left		App. Total					App. Total	Int. Total
02:00 PM	7	7	0	0	14	2	0	1	0	3	0	18	0	0	18	0	0	0	0	0	35
02:15 PM	5	5	0	0	10	1	0	0	0	1	0	12	2	0	14	0	0	0	0	0	25
02:30 PM	6	3	0	0	9	0	0	3	0	3	0	14	0	0	14	0	0	0	0	0	26
02:45 PM	5	0	0	0	5	2	0	1	0	3	0	11	0	0	11	0	0	0	0	0	19
Total	23	15	0	0	38	5	0	5	0	10	0	55	2	0	57	0	0	0	0	0	105
03:00 PM	9	11	0	0	20	2	0	0	0	2	0	14	1	0	15	0	0	0	0	0	37
03:15 PM	8	1	0	0	9	3	0	0	0	3	0	9	1	0	10	0	0	0	0	0	22
03:30 PM	6	10	0	0	16	1	0	1	0	2	0	17	0	0	17	0	0	0	0	0	35
03:45 PM	8	7	0	0	15	3	0	0	0	3	0	11	0	0	11	0	0	0	0	0	29
Total	31	29	0	0	60	9	0	1	0	10	0	51	2	0	53	0	0	0	0	0	123
04:00 PM	7	15	0	0	22	0	0	0	0	0	0	19	0	0	19	0	0	0	0	0	41
04:15 PM	9	10	0	0	19	2	0	0	0	2	0	15	0	0	15	0	0	0	0	0	36
04:30 PM	11	23	0	0	34	0	0	0	0	0	0	16	1	0	17	0	0	0	0	0	51
04:45 PM	8	10	0	0	18	3	0	1	0	4	0	13	1	0	14	0	0	0	0	0	36
Total	35	58	0	0	93	5	0	1	0	6	0	63	2	0	65	0	0	0	0	0	164
Grand Total	89	102	0	0	191	19	0	7	0	26	0	169	6	0	175	0	0	0	0	0	392
Apprch %	46.6	53.4	0	0		73.1	0	26.9	0		0	96.6	3.4	0		0	0	0	0		
Total %	22.7	26	0	0	48.7	4.8	0	1.8	0	6.6	0	43.1	1.5	0	44.6	0	0	0	0	0	

Turning Movement Counts
(All Vehicles)

Interchange of K-10 & E 1900 Rd (N Ramps)
Afternoon Peak-Hours
Sunny, Hot

File Name : K10-N Ramps-epm
Site Code : 4
Start Date : 7/17/2012
Page No : 2

	E 1900 Rd / DG CO 1057 From North					K-10 (WB Off Ramp) From East					E 1900 Rd / DG CO 1057 From South					K-10 (WB On Ramp) From West					
Start Time	Right	Thru			App. Total	Right	Thru	Left		App. Total		Thru	Left		App. Total					App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 04:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	7	15	0	0	22	0	0	0	0	0	0	19	0	0	19	0	0	0	0	0	41
04:15 PM	9	10	0	0	19	2	0	0	0	2	0	15	0	0	15	0	0	0	0	0	36
04:30 PM	11	23	0	0	34	0	0	0	0	0	0	16	1	0	17	0	0	0	0	0	51
04:45 PM	8	10	0	0	18	3	0	1	0	4	0	13	1	0	14	0	0	0	0	0	36
Total Volume	35	58	0	0	93	5	0	1	0	6	0	63	2	0	65	0	0	0	0	0	164
% App. Total	37.6	62.4	0	0		83.3	0	16.7	0		0	96.9	3.1	0		0	0	0	0		
PHF	.795	.630	.000	.000	.684	.417	.000	.250	.000	.375	.000	.829	.500	.000	.855	.000	.000	.000	.000	.000	.804

Turning Movement Counts
(All Vehicles)

Interchange of K-10 & E 1900 Rd (South Ramps)
Morning Peak-Hours
Sunny, Warm

File Name : K10-S Ramps-eam
Site Code : 4
Start Date : 7/12/2012
Page No : 1

Groups Printed- Unshifted

	E 1900 Rd / DG CO 1057 From North					K-10 (EB On Ramp) From East					E 1900 Rd / DG CO 1057 From South					K-10 (EB Off Ramp) From West					
Start Time		Thru	Left		App. Total					App. Total	Right	Thru			App. Total	Right	Thru	Left		App. Total	Int. Total
06:00 AM	0	3	3	0	6	0	0	0	0	0	1	0	0	0	1	0	0	3	0	3	10
06:15 AM	0	0	2	0	2	0	0	0	0	0	2	0	0	0	2	0	0	3	0	3	7
06:30 AM	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	4
06:45 AM	0	1	2	0	3	0	0	0	0	0	0	1	0	0	1	0	0	7	0	7	11
Total	0	4	9	0	13	0	0	0	0	0	3	1	0	0	4	0	0	15	0	15	32
07:00 AM	0	0	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	5	0	5	11
07:15 AM	0	0	8	0	8	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	11
07:30 AM	0	1	5	0	6	0	0	0	0	0	0	1	0	0	1	0	0	10	0	10	17
07:45 AM	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	10	0	10	14
Total	0	1	23	0	24	0	0	0	0	0	0	1	0	0	1	0	0	28	0	28	53
08:00 AM	0	1	5	0	6	0	0	0	0	0	0	0	0	0	0	0	0	9	0	9	15
08:15 AM	0	1	5	0	6	0	0	0	0	0	0	1	0	0	1	0	0	12	0	12	19
08:30 AM	0	1	1	0	2	0	0	0	0	0	1	0	0	0	1	0	0	4	0	4	7
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	7	0	8	8
Total	0	3	11	0	14	0	0	0	0	0	1	1	0	0	2	1	0	32	0	33	49
Grand Total	0	8	43	0	51	0	0	0	0	0	4	3	0	0	7	1	0	75	0	76	134
Apprch %	0	15.7	84.3	0		0	0	0	0		57.1	42.9	0	0		1.3	0	98.7	0		
Total %	0	6	32.1	0	38.1	0	0	0	0	0	3	2.2	0	0	5.2	0.7	0	56	0	56.7	

Turning Movement Counts
(All Vehicles)

Interchange of K-10 & E 1900 Rd (South Ramps)
Morning Peak-Hours
Sunny, Warm

File Name : K10-S Ramps-eam
Site Code : 4
Start Date : 7/12/2012

	E 1900 Rd / DG CO 1057 From North					K-10 (EB On Ramp) From East					E 1900 Rd / DG CO 1057 From South					K-10 (EB Off Ramp) From West					
Start Time		Thru	Left		App. Total					App. Total	Right	Thru			App. Total	Right	Thru	Left		App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	1	5	0	6	0	0	0	0	0	0	1	0	0	1	0	0	10	0	10	17
07:45 AM	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	10	0	10	14
08:00 AM	0	1	5	0	6	0	0	0	0	0	0	0	0	0	0	0	0	9	0	9	15
08:15 AM	0	1	5	0	6	0	0	0	0	0	0	1	0	0	1	0	0	12	0	12	19
Total Volume	0	3	19	0	22	0	0	0	0	0	0	2	0	0	2	0	0	41	0	41	65
% App. Total	0	13.6	86.4	0		0	0	0	0		0	100	0	0		0	0	100	0		
PHF	.000	.750	.950	.000	.917	.000	.000	.000	.000	.000	.000	.500	.000	.000	.500	.000	.000	.854	.000	.854	.855

Turning Movement Counts
(All Vehicles)

Interchange of K-10 & E 1900 Rd (S Ramps)
Afternoon Peak-Hours
Sunny, Hot

File Name : K10-S Ramps-epm
Site Code : 4
Start Date : 7/17/2012
Page No : 1

Groups Printed- Unshifted

	E 1900 / DG CO 1057 From North					K-10 (EB On Ramp) From East					E 1900 / DG CO 1057 From South					K-10 (EB Off Ramp) From West					
Start Time		Thru	Left		App. Total					App. Total	Right	Thru			App. Total	Right	Thru	Left		App. Total	Int. Total
02:00 PM	0	2	6	0	8	0	0	0	0	0	0	1	0	0	1	0	0	17	0	17	26
02:15 PM	0	0	5	0	5	0	0	0	0	0	2	2	0	0	4	1	0	12	0	13	22
02:30 PM	0	2	4	0	6	0	0	0	0	0	1	0	0	0	1	0	0	14	0	14	21
02:45 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	11	0	11	12
Total	0	5	15	0	20	0	0	0	0	0	3	3	0	0	6	1	0	54	0	55	81
03:00 PM	0	0	11	0	11	0	0	0	0	0	0	1	0	0	1	0	0	15	0	15	27
03:15 PM	0	0	1	0	1	0	0	0	0	0	2	2	0	0	4	0	0	8	0	8	13
03:30 PM	0	0	11	0	11	0	0	0	0	0	0	0	0	0	0	0	0	17	0	17	28
03:45 PM	0	1	6	0	7	0	0	0	0	0	0	0	0	0	0	2	0	11	0	13	20
Total	0	1	29	0	30	0	0	0	0	0	2	3	0	0	5	2	0	51	0	53	88
04:00 PM	0	0	15	0	15	0	0	0	0	0	0	0	0	0	0	0	0	19	0	19	34
04:15 PM	0	0	10	0	10	0	0	0	0	0	1	2	0	0	3	1	0	13	0	14	27
04:30 PM	0	0	23	0	23	0	0	0	0	0	1	1	0	0	2	0	0	16	0	16	41
04:45 PM	0	4	7	0	11	0	0	0	0	0	0	2	0	0	2	1	0	12	0	13	26
Total	0	4	55	0	59	0	0	0	0	0	2	5	0	0	7	2	0	60	0	62	128
Grand Total	0	10	99	0	109	0	0	0	0	0	7	11	0	0	18	5	0	165	0	170	297
Apprch %	0	9.2	90.8	0		0	0	0	0		38.9	61.1	0	0		2.9	0	97.1	0		
Total %	0	3.4	33.3	0	36.7	0	0	0	0	0	2.4	3.7	0	0	6.1	1.7	0	55.6	0	57.2	

Turning Movement Counts
(All Vehicles)

Interchange of K-10 & E 1900 Rd (S Ramps)
Afternoon Peak-Hours
Sunny, Hot

File Name : K10-S Ramps-epm
Site Code : 4
Start Date : 7/17/2012
Page No : 2

	E 1900 / DG CO 1057 From North					K-10 (EB On Ramp) From East					E 1900 / DG CO 1057 From South					K-10 (EB Off Ramp) From West					
Start Time		Thru	Left		App. Total					App. Total	Right	Thru			App. Total	Right	Thru	Left		App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 04:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	15	0	15	0	0	0	0	0	0	0	0	0	0	0	0	19	0	19	34
04:15 PM	0	0	10	0	10	0	0	0	0	0	1	2	0	0	3	1	0	13	0	14	27
04:30 PM	0	0	23	0	23	0	0	0	0	0	1	1	0	0	2	0	0	16	0	16	41
04:45 PM	0	4	7	0	11	0	0	0	0	0	0	2	0	0	2	1	0	12	0	13	26
Total Volume	0	4	55	0	59	0	0	0	0	0	2	5	0	0	7	2	0	60	0	62	128
% App. Total	0	6.8	93.2	0		0	0	0	0		28.6	71.4	0	0		3.2	0	96.8	0		
PHF	.000	.250	.598	.000	.641	.000	.000	.000	.000	.000	.500	.625	.000	.000	.583	.500	.000	.789	.000	.816	.780

Turning Movement Counts
(Trucks Only)

Intersection of Noria Rd & N 1500 Rd
Morning Peak-Hours
Sunny, Hot

File Name : Noria & N 1500 -eam-truck
Site Code : 1
Start Date : 7/11/2012
Page No : 1

Groups Printed- Unshifted

	Sand Plant Driveway From North					N 1500 Rd From East					Noria Rd From South					N 1500 Rd From West					
Start Time	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Int. Total
*** BREAK ***																					
06:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	2
*** BREAK ***																					
06:45 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	3
*** BREAK ***																					
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
07:45 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
08:15 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3
08:45 AM	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Total	0	4	0	0	4	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	8
Grand Total	0	6	0	0	6	0	0	0	0	0	0	6	0	0	6	0	1	0	0	1	13
Apprch %	0	100	0	0		0	0	0	0		0	100	0	0		0	100	0	0		
Total %	0	46.2	0	0	46.2	0	0	0	0	0	0	46.2	0	0	46.2	0	7.7	0	0	7.7	

Turning Movement Counts
(Trucks Only)

Intersection of Noria Rd & N 1500 Rd
Morning Peak-Hours
Sunny, Hot

File Name : Noria & N 1500 -eam-truck
Site Code : 1
Start Date : 7/11/2012
Page No : 2

	Sand Plant Driveway From North					N 1500 Rd From East					Noria Rd From South					N 1500 Rd From West					
Start Time	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
08:15 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3
08:45 AM	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Total Volume	0	4	0	0	4	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	8
% App. Total	0	100	0	0		0	0	0	0		0	100	0	0		0	0	0	0		
PHF	.000	.333	.000	.000	.333	.000	.000	.000	.000	.000	.000	.333	.000	.000	.333	.000	.000	.000	.000	.000	.667

Turning Movement Counts
(Trucks Only)

Intersection of Noria Rd & N 1500 Rd
Afternoon Peak-Hours
Sunny, Hot

File Name : Noria & N 1500 -epm-truck
Site Code : 1
Start Date : 7/11/2012

Groups Printed- Unshifted

	Sand Plant Driveway From North					N 1500 Rd From East					Noria Rd From South					N 1500 Rd From West					
Start Time	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Int. Total
02:00 PM	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
*** BREAK ***																					
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
*** BREAK ***																					
Total	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
03:00 PM	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	3
*** BREAK ***																					
03:30 PM	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	3
03:45 PM	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
Total	0	4	0	0	4	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	9
04:00 PM	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
*** BREAK ***																					
04:30 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Total	0	3	0	0	3	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	5
Grand Total	0	9	0	0	9	0	0	0	0	0	0	7	0	0	7	1	0	0	0	1	17
Apprch %	0	100	0	0		0	0	0	0		0	100	0	0		100	0	0	0		
Total %	0	52.9	0	0	52.9	0	0	0	0	0	0	41.2	0	0	41.2	5.9	0	0	0	5.9	

Turning Movement Counts
(Trucks Only)

Intersection of Noria Rd & N 1500 Rd
Afternoon Peak-Hours
Sunny, Hot

File Name : Noria & N 1500 -epm-truck
Site Code : 1
Start Date : 7/11/2012
Page No : 2

	Sand Plant Driveway From North					N 1500 Rd From East					Noria Rd From South					N 1500 Rd From West					
Start Time	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 04:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:00 PM																					
03:00 PM	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	3
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	3
03:45 PM	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
Total Volume	0	4	0	0	4	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	9
% App. Total	0	100	0	0		0	0	0	0		0	100	0	0		0	0	0	0		
PHF	.000	.500	.000	.000	.500	.000	.000	.000	.000	.000	.000	.625	.000	.000	.625	.000	.000	.000	.000	.000	.750

Turning Movement Counts
(Trucks Only)

Intersection of Noria Rd & DG CO 442
Morning Peak-Hours
Sunny, Hot

File Name : CR 442 & Noria-eam-truck
Site Code : 2
Start Date : 7/12/2012
Page No : 1

Groups Printed- Unshifted

	Noria Rd From North					DG CO 442 From East					Noria Rd From South					From West					
Start Time		Thru	Left		App. Total	Right		Left		App. Total	Right	Thru			App. Total					App. Total	Int. Total
06:00 AM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3
*** BREAK ***																					
06:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
06:45 AM	0	0	1	0	1	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	4
Total	0	0	1	0	1	0	0	0	0	0	0	7	0	0	7	0	0	0	0	0	8
07:00 AM	0	0	3	0	3	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	4
07:15 AM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	2
07:30 AM	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	2
07:45 AM	0	0	1	0	1	0	0	1	0	1	0	2	0	0	2	0	0	0	0	0	4
Total	0	0	4	0	4	0	0	2	0	2	1	5	0	0	6	0	0	0	0	0	12
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3
08:15 AM	0	1	4	0	5	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	9
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
Total	0	1	4	0	5	0	0	0	0	0	0	10	0	0	10	0	0	0	0	0	15
Grand Total	0	1	9	0	10	0	0	2	0	2	1	22	0	0	23	0	0	0	0	0	35
Apprch %	0	10	90	0		0	0	100	0		4.3	95.7	0	0		0	0	0	0		
Total %	0	2.9	25.7	0	28.6	0	0	5.7	0	5.7	2.9	62.9	0	0	65.7	0	0	0	0	0	

Turning Movement Counts
(Trucks Only)

Intersection of Noria Rd & DG CO 442
Morning Peak-Hours
Sunny, Hot

File Name : CR 442 & Noria-eam-truck
Site Code : 2
Start Date : 7/12/2012

	Noria Rd From North					DG CO 442 From East					Noria Rd From South					From West					
Start Time		Thru	Left		App. Total	Right		Left		App. Total	Right	Thru			App. Total					App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	2
07:45 AM	0	0	1	0	1	0	0	1	0	1	0	2	0	0	2	0	0	0	0	0	4
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3
08:15 AM	0	1	4	0	5	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	9
Total Volume	0	1	5	0	6	0	0	2	0	2	0	10	0	0	10	0	0	0	0	0	18
% App. Total	0	16.7	83.3	0		0	0	100	0		0	100	0	0		0	0	0	0		
PHF	.000	.250	.313	.000	.300	.000	.000	.500	.000	.500	.000	.625	.000	.000	.625	.000	.000	.000	.000	.000	.500

Turning Movement Counts
(Trucks Only)

Intersection of DG CO 442 & Noria Rd
Afternoon Peak-Hours
Sunny, Hot

File Name : CR 442 & Noria-epm-truck
Site Code : 2
Start Date : 7/12/2012
Page No : 1

Groups Printed- Unshifted

	Noria Road From North					DG CO 442 From East					Noria Road From South					From West					
Start Time		Thru	Left		App. Total	Right		Left		App. Total	Right	Thru			App. Total					App. Total	Int. Total
02:00 PM	0	0	4	0	4	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	5
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	4
02:30 PM	0	1	1	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
02:45 PM	0	1	3	0	4	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	5
Total	0	2	8	0	10	0	0	1	0	1	0	6	0	0	6	0	0	0	0	0	17
03:00 PM	0	1	2	0	3	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	4
03:15 PM	0	0	1	0	1	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	4
03:30 PM	0	0	3	0	3	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	6
03:45 PM	0	1	4	0	5	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	7
Total	0	2	10	0	12	2	0	0	0	2	0	7	0	0	7	0	0	0	0	0	21
04:00 PM	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
04:15 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:30 PM	0	1	1	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
04:45 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	5	0	6	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	7
Grand Total	0	5	23	0	28	2	0	1	0	3	0	14	0	0	14	0	0	0	0	0	45
Apprch %	0	17.9	82.1	0		66.7	0	33.3	0		0	100	0	0		0	0	0	0		
Total %	0	11.1	51.1	0	62.2	4.4	0	2.2	0	6.7	0	31.1	0	0	31.1	0	0	0	0	0	

Turning Movement Counts
(Trucks Only)

Intersection of DG CO 442 & Noria Rd
Afternoon Peak-Hours
Sunny, Hot

File Name : CR 442 & Noria-epm-truck
Site Code : 2
Start Date : 7/12/2012
Page No : 2

	Noria Road From North					DG CO 442 From East					Noria Road From South					From West					
Start Time		Thru	Left		App. Total	Right		Left		App. Total	Right	Thru			App. Total					App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 04:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:00 PM																					
03:00 PM	0	1	2	0	3	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	4
03:15 PM	0	0	1	0	1	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	4
03:30 PM	0	0	3	0	3	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	6
03:45 PM	0	1	4	0	5	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	7
Total Volume	0	2	10	0	12	2	0	0	0	2	0	7	0	0	7	0	0	0	0	0	21
% App. Total	0	16.7	83.3	0		100	0	0	0		0	100	0	0		0	0	0	0		
PHF	.000	.500	.625	.000	.600	.500	.000	.000	.000	.500	.000	.583	.000	.000	.583	.000	.000	.000	.000	.000	.750

Turning Movement Counts
(Trucks Only)

Intersection of CO Rd 442 & CO Rd 1057
Morning Peak-Hours
Sunny, Hot
Other:

File Name : CR 442 & CR 1057-eam-truck
Site Code : 3
Start Date : 7/17/2012
Page No : 1

Groups Printed- Unshifted

	E 1900 Rd From North					DG CO 442 From East					DG CO 1057 From South					DG CO 442 From West					
Start Time	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Int. Total
06:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	3
06:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
06:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	4
06:45 AM	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	3	0	0	0	3	4
Total	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	11	0	0	0	11	12
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	3
*** BREAK ***																					
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	6	6
08:00 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	4	0	0	0	4	5
08:15 AM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0	0	4
08:30 AM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	2	0	0	0	2	6
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2
Total	0	0	0	0	0	0	0	0	0	0	9	0	0	0	9	8	0	0	0	8	17
Grand Total	0	0	0	0	0	0	0	1	0	1	9	0	0	0	9	25	0	0	0	25	35
Apprch %	0	0	0	0		0	0	100	0		100	0	0	0		100	0	0	0		
Total %	0	0	0	0	0	0	0	2.9	0	2.9	25.7	0	0	0	25.7	71.4	0	0	0	71.4	

Turning Movement Counts
(Trucks Only)

Intersection of CO Rd 442 & CO Rd 1057
Morning Peak-Hours
Sunny, Hot
Other:

File Name : CR 442 & CR 1057-eam-truck
Site Code : 3
Start Date : 7/17/2012

	E 1900 Rd From North					DG CO 442 From East					DG CO 1057 From South					DG CO 442 From West					
Start Time	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2
08:00 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	4	0	0	0	4	5
08:15 AM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0	0	4
08:30 AM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	2	0	0	0	2	6
Total Volume	0	0	0	0	0	0	0	0	0	0	9	0	0	0	9	8	0	0	0	8	17
% App. Total	0	0	0	0		0	0	0	0		100	0	0	0		100	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.563	.000	.000	.000	.563	.500	.000	.000	.000	.500	.708

Turning Movement Counts
(Trucks Only)

Intersection of CO Rd 442 & CO Rd 1057
Afternoon Peak-Hours
Sunny, Hot

File Name : CR 442 & CR 1057-epm-truck
Site Code : 3
Start Date : 7/17/2012
Page No : 1

Groups Printed- Unshifted

	E 1900 Rd. From North					DG CO 442 From East					DG CO 1057 From South					DG CO 442 From West					
Start Time	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Int. Total
02:00 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	1	0	0	0	1	3
02:15 PM	0	0	0	0	0	0	0	0	0	0	4	0	1	0	5	3	0	0	0	3	8
02:30 PM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0	0	4
02:45 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	0	0	0	0	0	5
Total	0	0	0	0	0	0	0	0	0	0	15	0	1	0	16	4	0	0	0	4	20
03:00 PM	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	4	0	0	0	4	7
03:15 PM	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	1	0	0	0	1	5
03:30 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	0	0	0	0	0	5
03:45 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	3	0	0	0	3	5
Total	0	0	0	0	0	0	0	0	0	0	14	0	0	0	14	8	0	0	0	8	22
04:00 PM	0	0	0	0	0	0	0	0	0	0	6	0	0	0	6	4	0	0	0	4	10
04:15 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	1	0	0	0	1	6
04:30 PM	0	0	0	0	0	0	0	0	0	0	2	0	1	0	3	2	1	0	0	3	6
04:45 PM	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	0	0	0	0	0	3
Total	0	0	0	0	0	0	0	0	0	0	16	0	1	0	17	7	1	0	0	8	25
Grand Total	0	0	0	0	0	0	0	0	0	0	45	0	2	0	47	19	1	0	0	20	67
Apprch %	0	0	0	0		0	0	0	0		95.7	0	4.3	0		95	5	0	0		
Total %	0	0	0	0	0	0	0	0	0	0	67.2	0	3	0	70.1	28.4	1.5	0	0	29.9	

Turning Movement Counts
(Trucks Only)

Intersection of CO Rd 442 & CO Rd 1057
Afternoon Peak-Hours
Sunny, Hot

File Name : CR 442 & CR 1057-epm-truck
Site Code : 3
Start Date : 7/17/2012

	E 1900 Rd. From North					DG CO 442 From East					DG CO 1057 From South					DG CO 442 From West					
Start Time	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Right	Thru	Left		App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 04:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:45 PM																					
03:45 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	3	0	0	0	3	5
04:00 PM	0	0	0	0	0	0	0	0	0	0	6	0	0	0	6	4	0	0	0	4	10
04:15 PM	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	1	0	0	0	1	6
04:30 PM	0	0	0	0	0	0	0	0	0	0	2	0	1	0	3	2	1	0	0	3	6
Total Volume	0	0	0	0	0	0	0	0	0	0	15	0	1	0	16	10	1	0	0	11	27
% App. Total	0	0	0	0		0	0	0	0		93.8	0	6.2	0		90.9	9.1	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.625	.000	.250	.000	.667	.625	.250	.000	.000	.688	.675

Turning Movement Counts
(Trucks Only)

Interchange of K-10 & E 1900 Rd (North Ramps)
Morning Peak-Hours
Sunny, warm

File Name : K10-N Ramps-eam-truck
Site Code : 4
Start Date : 7/12/2012
Page No : 1

Groups Printed- Unshifted

	E 1900 Rd / DG CO 1057 From North					K-10 (WB Off Ramp) From East					E 1900 Rd / DG CO 1057 From South					K-10 (WB On Ramp) From West					
Start Time	Right	Thru		trucks	App. Total	Right	Thru	Left	trucks	App. Total		Thru	Left	trucks	App. Total					App. Total	Int. Total
06:00 AM	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1
*** BREAK ***																					
Total	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1
07:00 AM	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
*** BREAK ***																					
07:30 AM	0	0	0	2	2	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	4
07:45 AM	0	0	0	1	1	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	4
Total	0	0	0	7	7	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	12
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	4
08:15 AM	0	0	0	3	3	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	8
08:30 AM	0	0	0	2	2	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	4
08:45 AM	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
Total	0	0	0	6	6	0	0	0	0	0	0	0	0	12	12	0	0	0	0	0	18
Grand Total	0	0	0	13	13	0	0	0	1	1	0	0	0	17	17	0	0	0	0	0	31
Apprch %	0	0	0	100		0	0	0	100		0	0	0	100		0	0	0	0		
Total %	0	0	0	41.9	41.9	0	0	0	3.2	3.2	0	0	0	54.8	54.8	0	0	0	0	0	

Turning Movement Counts
(Trucks Only)

Interchange of K-10 & E 1900 Rd (North Ramps)
Morning Peak-Hours
Sunny, warm

File Name : K10-N Ramps-eam-truck
Site Code : 4
Start Date : 7/12/2012

	E 1900 Rd / DG CO 1057 From North					K-10 (WB Off Ramp) From East					E 1900 Rd / DG CO 1057 From South					K-10 (WB On Ramp) From West					
Start Time	Right	Thru		trucks	App. Total	Right	Thru	Left	trucks	App. Total		Thru	Left	trucks	App. Total					App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	0	0	2	2	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	4
07:45 AM	0	0	0	1	1	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	4
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	4
08:15 AM	0	0	0	3	3	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	8
Total Volume	0	0	0	6	6	0	0	0	0	0	0	0	0	14	14	0	0	0	0	0	20
% App. Total	0	0	0	100		0	0	0	0		0	0	0	100		0	0	0	0		
PHF	.000	.000	.000	.500	.500	.000	.000	.000	.000	.000	.000	.000	.000	.700	.700	.000	.000	.000	.000	.000	.625

Turning Movement Counts
(Trucks Only)

Interchange of K-10 & E 1900 Rd (N Ramps)
Afternoon Peak-Hours
Sunny, Hot

File Name : K10-N Ramps-epm-truck
Site Code : 4
Start Date : 7/17/2012
Page No : 1

Groups Printed- Unshifted

	E 1900 Rd / DG CO 1057 From North					K-10 (WB Off Ramp) From East					E 1900 Rd / DG CO 1057 From South					K-10 (WB On Ramp) From West					
Start Time	Right	Thru		trucks	App. Total	Right	Thru	Left	trucks	App. Total		Thru	Left	trucks	App. Total					App. Total	Int. Total
02:00 PM	0	0	0	2	2	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	5
02:15 PM	0	0	0	3	3	0	0	0	1	1	0	0	0	3	3	0	0	0	0	0	7
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	5
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	4
Total	0	0	0	5	5	0	0	0	1	1	0	0	0	15	15	0	0	0	0	0	21
03:00 PM	0	0	0	4	4	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	8
03:15 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	4
03:30 PM	0	0	0	0	0	0	0	0	1	1	0	0	0	5	5	0	0	0	0	0	6
03:45 PM	0	0	0	3	3	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	5
Total	0	0	0	8	8	0	0	0	1	1	0	0	0	14	14	0	0	0	0	0	23
04:00 PM	0	0	0	5	5	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	9
04:15 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	6
04:30 PM	0	0	0	2	2	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	6
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	2
Total	0	0	0	8	8	0	0	0	0	0	0	0	0	15	15	0	0	0	0	0	23
Grand Total	0	0	0	21	21	0	0	0	2	2	0	0	0	44	44	0	0	0	0	0	67
Apprch %	0	0	0	100		0	0	0	100		0	0	0	100		0	0	0	0		
Total %	0	0	0	31.3	31.3	0	0	0	3	3	0	0	0	65.7	65.7	0	0	0	0	0	

Turning Movement Counts
(Trucks Only)

Interchange of K-10 & E 1900 Rd (N Ramps)
Afternoon Peak-Hours
Sunny, Hot

File Name : K10-N Ramps-epm-truck
Site Code : 4
Start Date : 7/17/2012
Page No : 2

	E 1900 Rd / DG CO 1057 From North					K-10 (WB Off Ramp) From East					E 1900 Rd / DG CO 1057 From South					K-10 (WB On Ramp) From West					
Start Time	Right	Thru		trucks	App. Total	Right	Thru	Left	trucks	App. Total		Thru	Left	trucks	App. Total					App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 04:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	0	0	0	0	0	0	0	0	1	1	0	0	0	5	5	0	0	0	0	0	6
03:45 PM	0	0	0	3	3	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	5
04:00 PM	0	0	0	5	5	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	9
04:15 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	6
Total Volume	0	0	0	9	9	0	0	0	1	1	0	0	0	16	16	0	0	0	0	0	26
% App. Total	0	0	0	100		0	0	0	100		0	0	0	100		0	0	0	0		
PHF	.000	.000	.000	.450	.450	.000	.000	.000	.250	.250	.000	.000	.000	.800	.800	.000	.000	.000	.000	.000	.722

Turning Movement Counts
(Trucks Only)

Interchange of K-10 & E 1900 Rd (South Ramps)
Morning Peak-Hours
Sunny, Warm

File Name : K10-S Ramps-eam-truck
Site Code : 4
Start Date : 7/12/2012
Page No : 1

Groups Printed- Unshifted

	E 1900 Rd / DG CO 1057 From North					K-10 (EB On Ramp) From East					E 1900 Rd / DG CO 1057 From South					K-10 (EB Off Ramp) From West					
Start Time		Thru	Left	trucks	App. Total					App. Total	Right	Thru		trucks	App. Total	Right	Thru	Left	trucks	App. Total	Int. Total
*** BREAK ***																					
07:00 AM	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
*** BREAK ***																					
07:30 AM	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	4
07:45 AM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	4
Total	0	0	0	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	12
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4
08:15 AM	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	8
08:30 AM	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	4
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Total	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	12	12	17
Grand Total	0	0	0	12	12	0	0	0	0	0	0	0	0	0	0	0	0	0	17	17	29
Apprch %	0	0	0	100		0	0	0	0		0	0	0	0		0	0	0	100		
Total %	0	0	0	41.4	41.4	0	0	0	0	0	0	0	0	0	0	0	0	0	58.6	58.6	

Turning Movement Counts
(Trucks Only)

Interchange of K-10 & E 1900 Rd (South Ramps)
Morning Peak-Hours
Sunny, Warm

File Name : K10-S Ramps-eam-truck
Site Code : 4
Start Date : 7/12/2012
Page No : 2

	E 1900 Rd / DG CO 1057 From North					K-10 (EB On Ramp) From East					E 1900 Rd / DG CO 1057 From South					K-10 (EB Off Ramp) From West					
Start Time		Thru	Left	trucks	App. Total					App. Total	Right	Thru		trucks	App. Total	Right	Thru	Left	trucks	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	4
07:45 AM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	4
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4
08:15 AM	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	8
Total Volume	0	0	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	14	14	20
% App. Total	0	0	0	100		0	0	0	0		0	0	0	0		0	0	0	100		
PHF	.000	.000	.000	.500	.500	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.700	.700	.625

Turning Movement Counts
(Trucks Only)

Interchange of K-10 & E 1900 Rd (S Ramps)
Afternoon Peak-Hours
Sunny, Hot

File Name : K10-S Ramps-epm-truck
Site Code : 4
Start Date : 7/17/2012
Page No : 1

Groups Printed- Unshifted

	E 1900 / DG CO 1057 From North					K-10 (EB On Ramp) From East					E 1900 / DG CO 1057 From South					K-10 (EB Off Ramp) From West					
Start Time		Thru	Left	trucks	App. Total					App. Total	Right	Thru		trucks	App. Total	Right	Thru	Left	trucks	App. Total	Int. Total
02:00 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	4
02:15 PM	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	6
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	5
02:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4
Total	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	15	15	19
03:00 PM	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	8
03:15 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	4
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	5
03:45 PM	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	5
Total	0	0	0	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	14	14	22
04:00 PM	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	9
04:15 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	6
04:30 PM	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	6
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2
Total	0	0	0	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	15	15	23
Grand Total	0	0	0	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	44	44	64
Apprch %	0	0	0	100		0	0	0	0		0	0	0	0		0	0	0	100		
Total %	0	0	0	31.2	31.2	0	0	0	0	0	0	0	0	0	0	0	0	0	68.8	68.8	

Turning Movement Counts
(Trucks Only)

Interchange of K-10 & E 1900 Rd (S Ramps)
Afternoon Peak-Hours
Sunny, Hot

File Name : K10-S Ramps-epm-truck
Site Code : 4
Start Date : 7/17/2012

	E 1900 / DG CO 1057 From North					K-10 (EB On Ramp) From East					E 1900 / DG CO 1057 From South					K-10 (EB Off Ramp) From West					
Start Time		Thru	Left	trucks	App. Total					App. Total	Right	Thru		trucks	App. Total	Right	Thru	Left	trucks	App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 04:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:45 PM																					
03:45 PM	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	5
04:00 PM	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	9
04:15 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	6
04:30 PM	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	6
Total Volume	0	0	0	11	11	0	0	0	0	0	0	0	0	0	0	0	0	0	15	15	26
% App. Total	0	0	0	100		0	0	0	0		0	0	0	0		0	0	0	100		
PHF	.000	.000	.000	.550	.550	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.750	.750	.722

APPENDIX IV

Crash History

(Source: Douglas County)

APPENDIX V

Guidelines for Right-Turn & Left-Turn Treatments

at

Unsignalized Intersections

Report No. K-TRAN:KSU-95-5
Final Report

GUIDELINES FOR RIGHT-TURN TREATMENTS AT UNSIGNALIZED INTERSECTIONS AND DRIVEWAYS

Tanweer Hasan
Robert W. Stokes
Kansas State University
Manhattan, Kansas

May 1996

K-TRAN

A COOPERATIVE TRANSPORTATION RESEARCH PROGRAM BETWEEN:
KANSAS DEPARTMENT OF TRANSPORTATION
THE KANSAS STATE UNIVERSITY
THE UNIVERSITY OF KANSAS

Table 7.1 Right-turn treatment guidelines for two-lane highways.[a]

(*Turning speed = 15 mph*)

Roadway DDHV (vph)	Roadway Operating Speed (mph)											
	40		45		50		55		60		65	
	Lane	Taper	Lane	Taper	Lane	Taper	Lane	Taper	Lane	Taper	Lane	Taper
200				83	73	30	35	14	20	8	15	7
300			120	40	41	19	24	9	15	7	12	6
400	200	85	52	27	30	14	19	8	12	6	11	5
600	50	27	26	13	20	9	14	6	10	5	9	4
800	25	12	16	8	15	7	11	5	9	4	8	3
1000	14	8	12	5	11	5	9	4	8	3	7	3
1200	10	6	9	4	9	4	8	4	7	3	7	3

[a] Minimum right-turn design hour volumes (vph) required to warrant right-turn treatments.

225

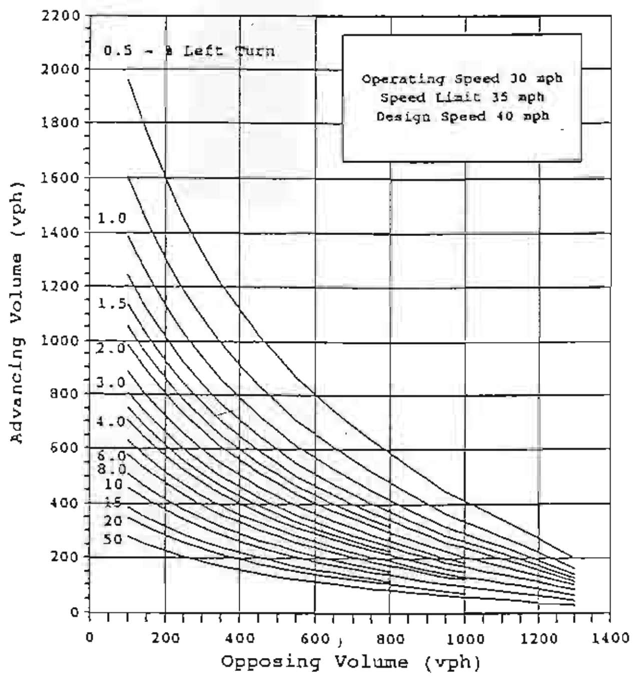
National Cooperative Highway Research Program

NCHRP Synthesis 225

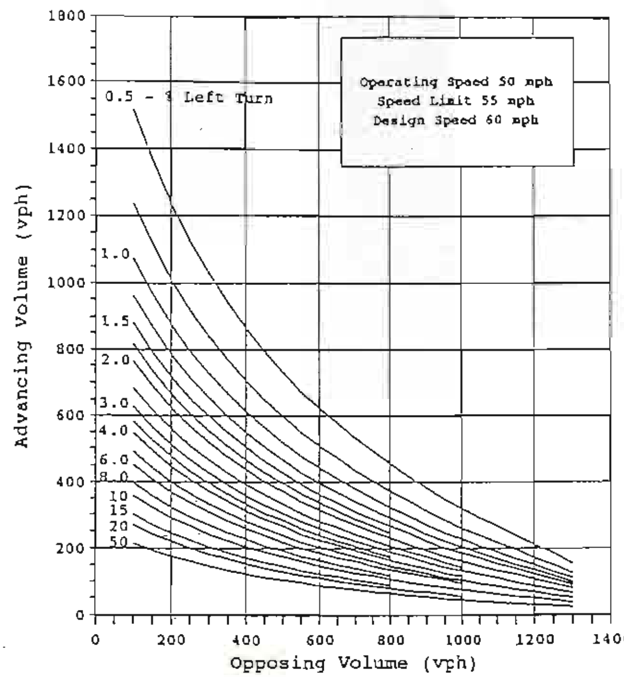
Left-Turn Treatments at Intersections

A Synthesis of Highway Practice

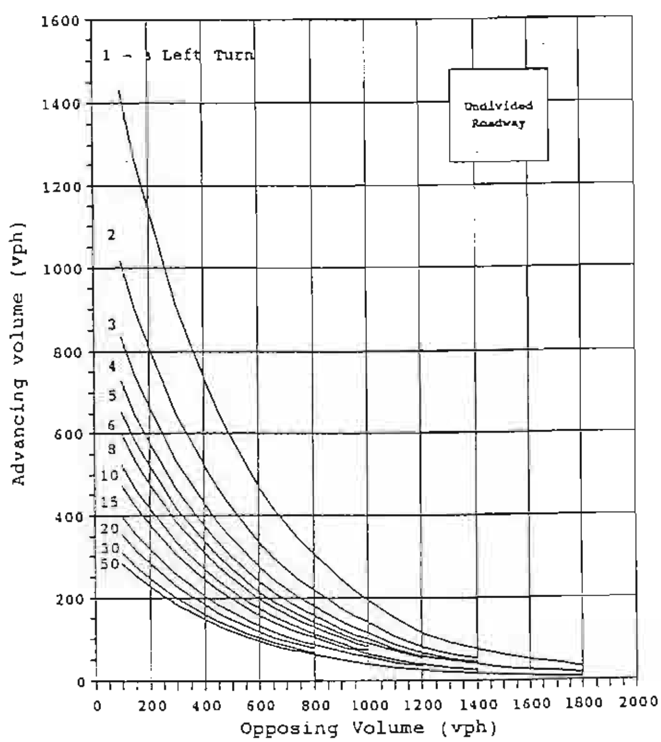
Transportation Research Board
National Research Council



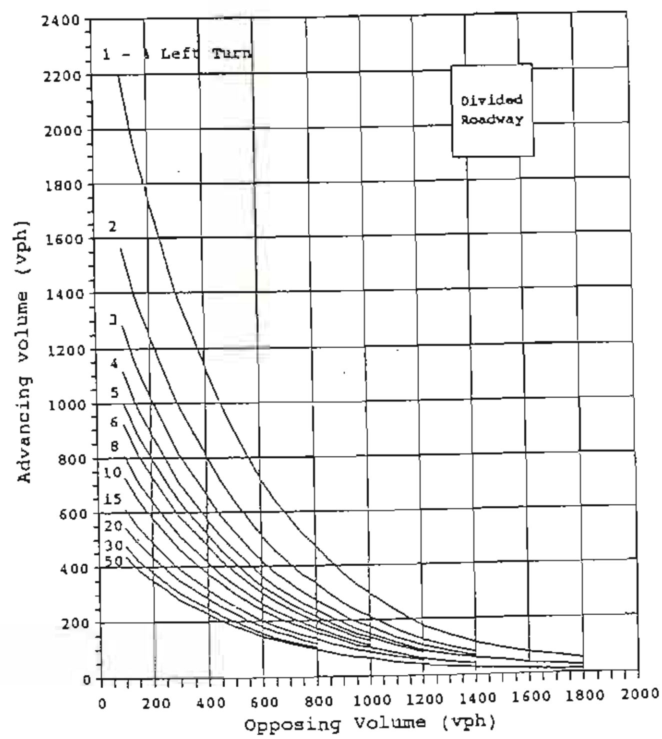
Guidelines for Left-turn Lane at Unsignalized Intersection - Two-lane Roadway



Guidelines for Left-turn Lane at Unsignalized Intersection - Two-lane Roadway

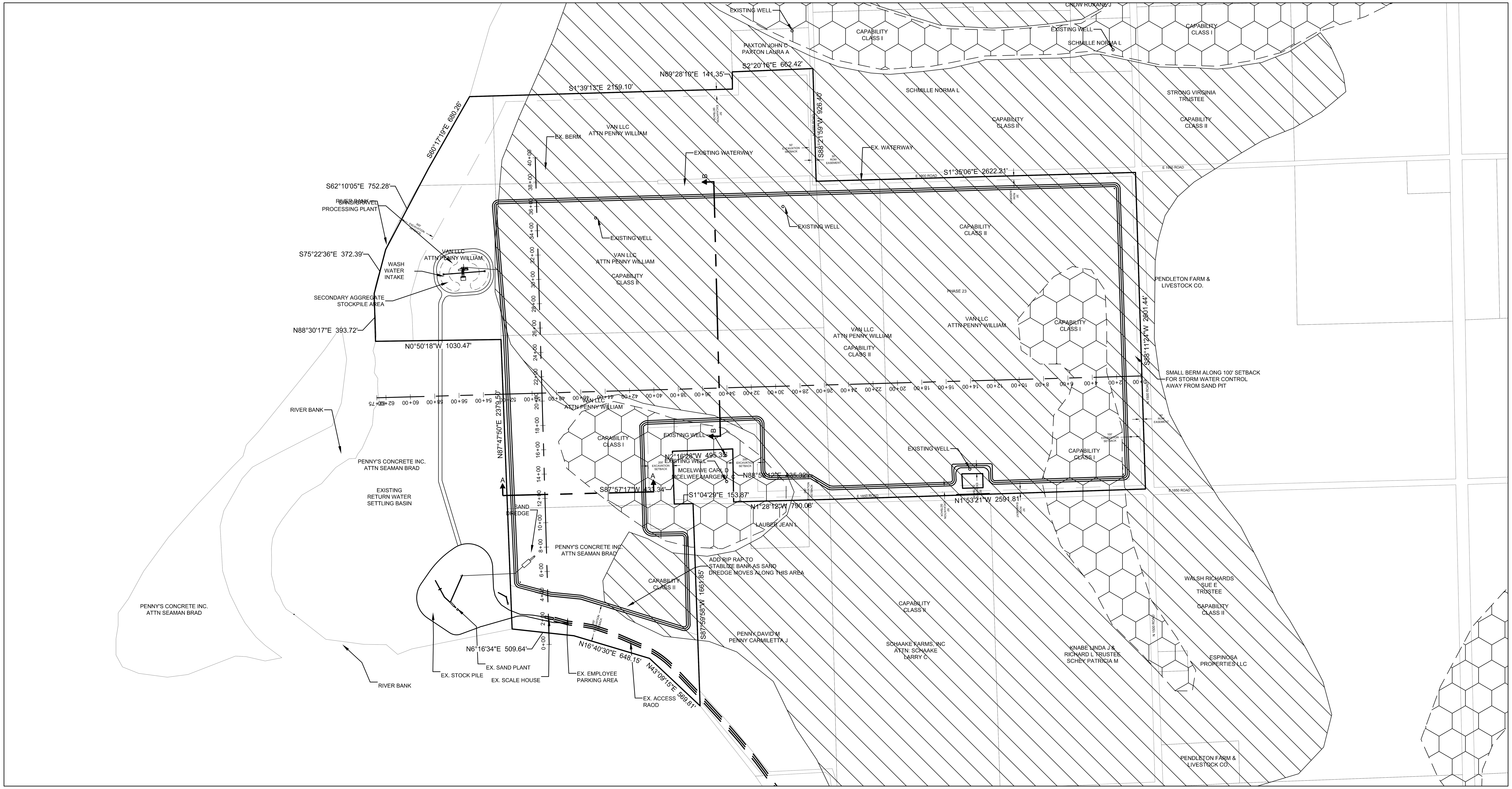


Guidelines for Left-turn Lane at Unsignalized Intersection - Four-lane, Undivided Roadway

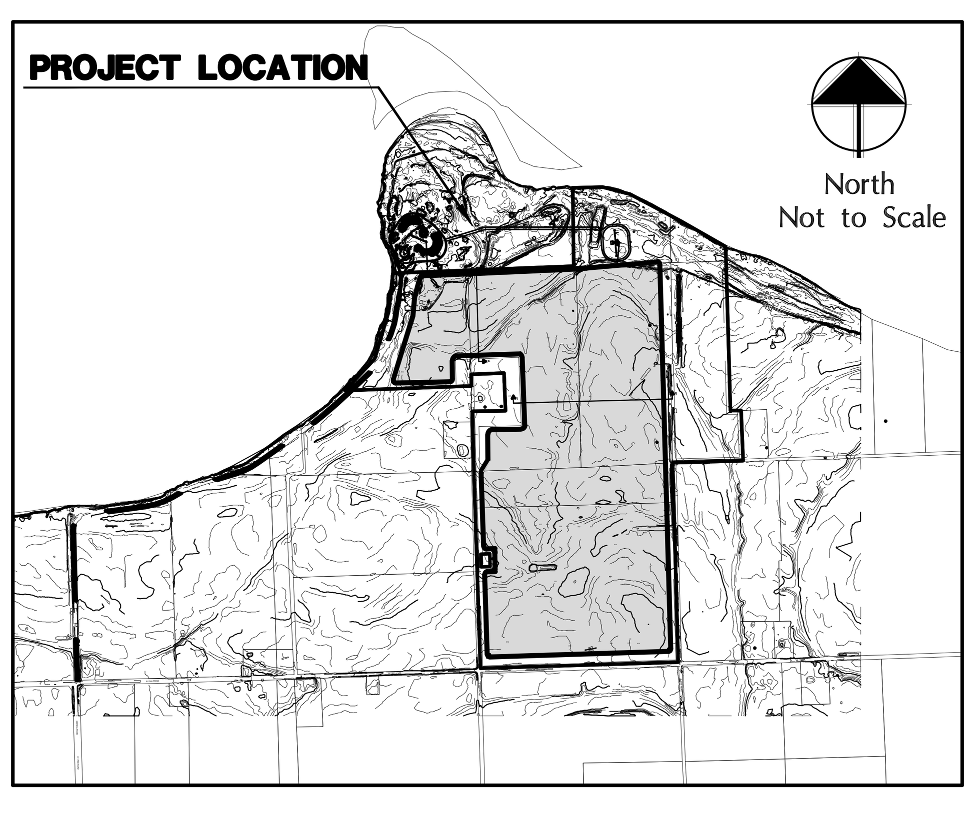


Guidelines for Left-turn Lane at Unsignalized Intersection - Four-lane, Divided Roadway

FIGURE 5 ITE guidelines for left-turn lanes. *(18)*



Location Map



Legal Description

A TRACT OF LAND LOCATED IN PORTIONS OF SECTIONS 25, 26, 35 AND 36 IN TOWNSHIP 12 SOUTH, RANGE 20 EAST OF THE 6TH PRINCIPAL MERIDIAN, IN DOUGLAS COUNTY, KANSAS, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF THE SOUTHEAST QUARTER OF SECTION 35, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE NORTH, ALONG THE WEST LINE OF SAID QUARTER SECTION TO THE CENTER OF SAID SECTION 35, THENCE NORTH ALONG THE WEST LINE OF THE NORTHEAST QUARTER OF SAID SECTION 35, 765.00 FEET TO THE SOUTHWEST CORNER OF A TRACT RECORDED IN BOOK 307, PAGE 487; THENCE EAST 442.00 FEET ALONG THE SOUTH LINE OF SAID TRACT; THENCE NORTH 492.00 FEET ALONG THE EAST LINE OF SAID TRACT; THENCE WEST 442.00 FEET ALONG THE NORTH LINE OF SAID TRACT TO THE WEST LINE OF THE NORTHEAST QUARTER OF SECTION 35, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE SOUTH ALONG SAID WEST LINE, 126.40 FEET TO THE SOUTH LINE OF THE NORTH 77 ACRES OF THE EAST 134 ACRES OF THE NORTHWEST QUARTER OF SAID SECTION 35, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE WEST ALONG THE SOUTH LINE OF THE NORTH 77 ACRES TO THE EAST BANK OF THE KANSAS RIVER; THENCE NORTHEASTERLY, ALONG SAID EAST BANK, TO THE NORTH LINE OF SECTION 35, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE EAST, ALONG THE NORTH LINE OF SAID SECTION 35, TO THE SOUTHWEST CORNER OF THE EAST 11.53 ACRES OF GOVERNMENT LOT 1 IN SECTION 26, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE NORTH, ALONG THE WEST LINE OF SAID EAST 11.53 ACRES, TO THE SOUTH BANK OF THE KANSAS RIVER; THENCE EASTERLY, ALONG THE SOUTH BANK OF THE KANSAS RIVER, TO THE WEST LINE OF SECTION 25, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE CONTINUING SOUTHEASTERLY, ALONG THE SOUTH BANK OF THE KANSAS RIVER, TO THE NORTHWEST CORNER OF A TRACT RECORDED IN BOOK 1056, PAGE 5024, SAID POINT LYING 739.2 FEET EAST OF THE WEST LINE OF THE NORTHWEST QUARTER SECTION 36, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE SOUTH, ALONG THE WEST LINE OF SAID TRACT, AND PARALLEL TO THE WEST LINE OF THE NORTHWEST QUARTER OF SECTION 36, TOWNSHIP 12 SOUTH, RANGE 20 EAST TO A POINT 151.78 FEET WEST OF THE NORTHWEST CORNER OF THE TRACT RECORDED IN BOOK 1000, PAGE 3430; THENCE EAST 151.78 FEET TO THE NORTHWEST CORNER OF SAID TRACT; THENCE SOUTH 660 FEET, ALONG THE WEST LINE OF SAID TRACT, TO THE SOUTH LINE OF THE NORTHWEST QUARTER OF SECTION 36, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE WEST ALONG SAID SOUTH LINE, 890.98 FEET TO THE SOUTHWEST CORNER OF THE NORTHWEST QUARTER OF SECTION 36, TOWNSHIP 12 SOUTH, RANGE 20 EAST, ALSO KNOWN AS THE NORTHEAST CORNER OF THE SOUTHEAST QUARTER OF SECTION 35, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE SOUTH, ALONG THE EAST LINE OF SAID SOUTHEAST QUARTER TO THE SOUTHEAST CORNER OF SAID SECTION 35, TOWNSHIP 12 SOUTH, RANGE 20 EAST; THENCE WEST, ALONG THE SOUTH LINE OF SAID QUARTER, TO THE POINT OF BEGINNING. CONTAINS 465 ACRES, MORE OR LESS.

SCALE: 1" = 400'

HIGH QUALITY AGRICULTURAL LAND EXHIBIT

Penny Sand Lawrence Facility

Douglas County, Kansas

Civil Engineering
Landscape Architecture
Community Planning
Surveying

Landplan Engineering, P.A.
Lawrence, KS • Kansas City, MO • Manhattan, KS
Blue Springs, MO • The Woodlands, TX

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tele (785)843-7530
fax (785)843-2410
email: info@landplan-pa.com
Web www.landplan-pa.com

PENNY SAND FACILITY
HIGH QUALITY AGRICULTURAL LAND
EXHIBIT

REV	DATE	DESCRIPTION

DATE:	7.2.12
PROJECT NO.:	20121146
DESIGNED BY:	CLM
DRAWN BY:	CLM
CHECKED BY:	CLM

ISSUE	SHEET NO.
A	C-002

OF 3 SHEETS

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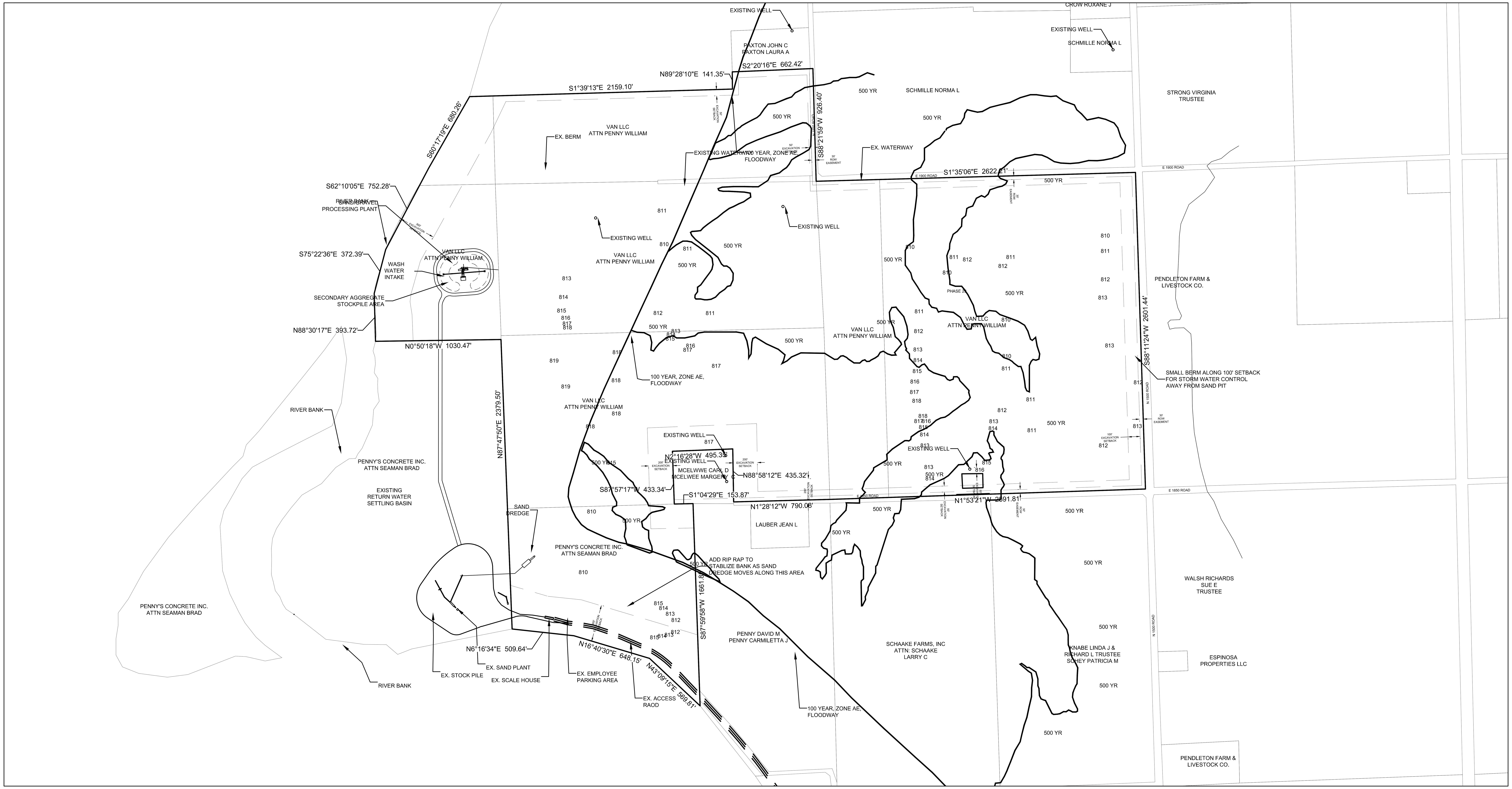
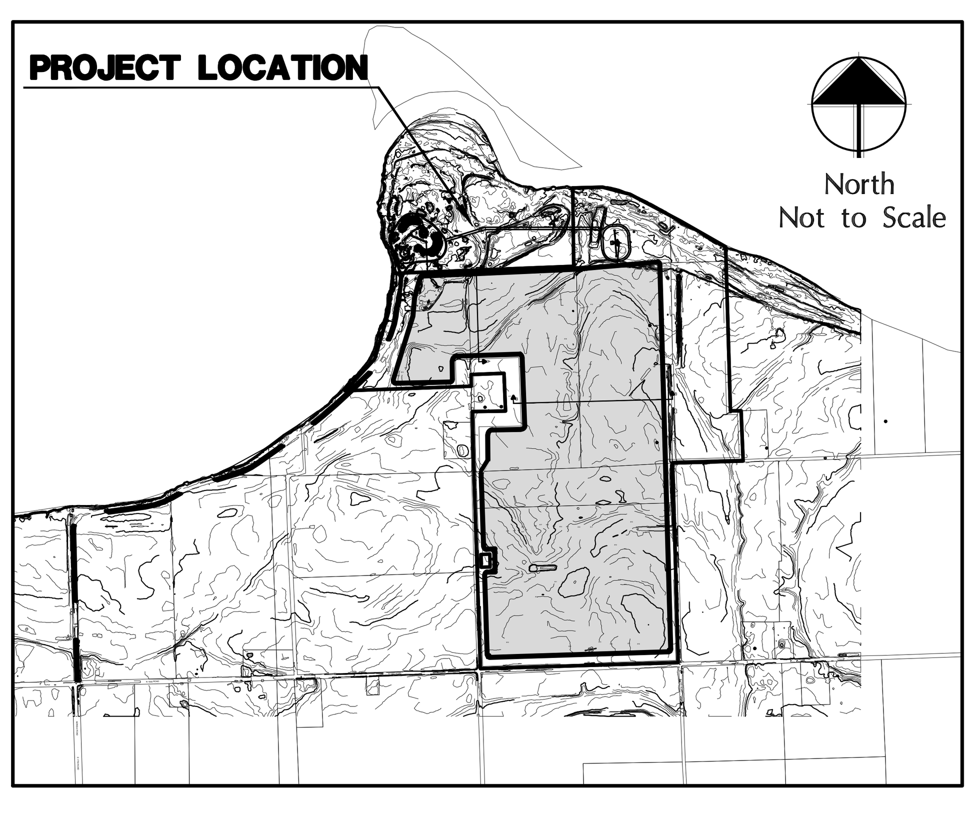


Location Map



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SCALE: 1" = 400'

400 200 0 400 800

FLOODWAY AND 500 YR EXHIBIT

Penny Sand Lawrence Facility

Douglas County, Kansas

Landplan Engineering, P.A.
Lawrence, KS • Kansas City, MO • Manhattan, KS
Blue Springs, MO • The Woodlands, TX
Civil Engineering
Landscape Architecture
Community Planning
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email: info@landplan-pa.com
Web www.landplan-pa.com

PENNY SAND FACILITY
FLOODWAY AND 500 YR
EXHIBIT

REV	DATE	DESCRIPTION

DATE:	7.2.12
PROJECT NO.:	20121146
DESIGNED BY:	CLM
DRAWN BY:	CLM
CHECKED BY:	CLM

ISSUE	SHEET NO.
A	C-003

OF 3 SHEETS

Aug. 30, 2012

Lawrence Douglas County
Metropolitan Planning Office
6 East 6th Street,
P.O. Box 708,
Lawrence, KS 66044

Planning Staff:

My name is Carl McElwee and I live at 1564 E. 1850 Rd. I have lived at this location since 1975 (37 years this November). I am writing this letter to object to the Conditional Use Permit (CUP) that Penny Sand Co. has applied for near my house. This CUP asks permission to surround my house on 3 sides with a pit mining operation for sand removal. This would completely change my immediate surroundings which I have enjoyed for so long. If allowed this CUP would subject me and my family to dramatically increased industrial activity, including noise, dust, and environment destruction. This will undoubtedly dramatically affect my property values.

The affected area has some interesting Douglas County history associated with it. It was obtained very early by the Altenbernd family. Penny Sand has acquired much of the land as elder Altenbernds have died. On the land currently owned by Penny and covered under this CUP there exist two historic houses. One is an early stone homestead house and one is a classic two story farm stead that dates to approximately 1910. There is no mention of what will become of these structures in the CUP. I hope they will be preserved and that this CUP will not be allowed to detract from their historic value. My house was also built by an Altenbernd. As best we can tell it was built in about 1919 and is a classic Craftsman Bungalow style. My wife and I have lived here 37 years and raised our two children here. We do not want to see this environment affected by an ugly and destructive sand mining operation.

This will create a huge strip mining operation that will severely impact the local environment. Naturally, I am opposed to the CUP because of the impact on my property. However, I would like to lay out some scientific reasons why this CUP should be denied. I am a retired Geology Professor from KU and have spent a 35 year career there studying groundwater. I have worked extensively at a research site in the Kansas River Valley just northeast of the Lawrence Airport. So I am qualified to comment on the scientific aspects of the situation.

My scientific bases for opposing this CUP are as follows:

(1) The river bank in the vicinity of this proposed pit mining operation is unstable and has moved considerably over recent times, as shown by the work of Dr. Dort of the KU Geology Department. I have included copies of pertinent pages of his work. It shows that this area is unstable and the river is trying to make a straighter course, cutting off the existing meander. If pit mining is allowed in this area, in times of flood the chances of a dramatic river channel change is magnified greatly. An open pit with a small buffer

region from the river in the vicinity of this unstable bend would make it easy for the flooding river to make a sudden change in direction.

(2) On this proposed 434 acre pit mining site, the majority of the area is covered by some of the highest quality soils as defined by the US Department of Agriculture. I have included a USDA Soil Report and some pages from the 1977 Douglas County Soils Survey to support this. It seems very short sighted to produce sand for short term gain and lose the potential for significant food and fiber production indefinitely. You will notice that the USDA report shows this area as being rated as poor for sand production. This is probably because of the large amount of overburden (unusable soil, silt and clay) that must be removed. I have included three well drilling logs that show 23-24 feet of soil, silt and clay exist in the vicinity of my property. Removing this much overburden will create a very environmentally difficult situation. The spoil piles must be dealt with, not allowing runoff into the river. At the same time surface runoff must not be allowed into the pit because of possible pollution of the aquifer. There is great potential for operational missteps to create environmental problems. We have all seen the detrimental effects of strip mining elsewhere; I hope we can avoid them here.

(3) Opening this pit operation will expose one of the most prolific aquifers in this region to potential pollution. The very sand that they desire to excavate is the material that forms this prolific aquifer. I have included a few pages from a Kansas Geological Survey Bulletin by Fader that shows the characteristics of this aquifer. In general, groundwater in the aquifer moves down the valley from West to East. This aquifer is a magnificent resource that must be protected and preserved for the future. It is capable of producing vast amounts of water for irrigation and public water supply. In the future water may be one of our most valued resources. The alluvial material (loose material, soil, silt, clay, sand) in the river valley varies in depth, but about 70 feet is a good average number. The better sand is near the bottom, so the mining will proceed to the bedrock (harder material). The better sand near the bottom is also the main aquifer of the river valley. The overlying soil, silt, and clay protect the aquifer from surface pollutants. By removing this overburden the aquifer is exposed to potential pollution from surface runoff and anything that is spilled into the pit. In particular, my well would be very close to the proposed pit mine and could be affected by the operation, as could several other neighboring house wells. Just down the valley about 1 5/8 miles lies the Eudora Public Water Supply Well Field (See enclosed map); it could also be affected by the proposed pit mining operation. I do not believe that Penny Sand Co. can guarantee that no pollution will occur. Penny Sand Co will tell us that they will engineer solutions that will prevent any pollution or problems; however, I do not think the risk of a potential engineering failure is appropriate. After the 30 year CUP has finished the pit will remain, who will continue to maintain the site and guarantee aquifer integrity?

Thank you for your consideration. If I may answer any questions, please contact me.

Carl McElwee
1564 E. 1850 Rd.
Lawrence, KS 66046 785-843-4164 cmcelwee@ku.edu

BULLETIN 206, PART 2

Ground Water in the Kansas River Valley Junction City to Kansas City, Kansas

By

Stuart W. Fader

Prepared by the State Geological Survey of Kansas and the United States Geological Survey, with the cooperation of the Division of Water Resources of the Kansas State Board of Agriculture and the Division of Environmental Health of the Kansas State Department of Health.

Printed by authority of the State of Kansas
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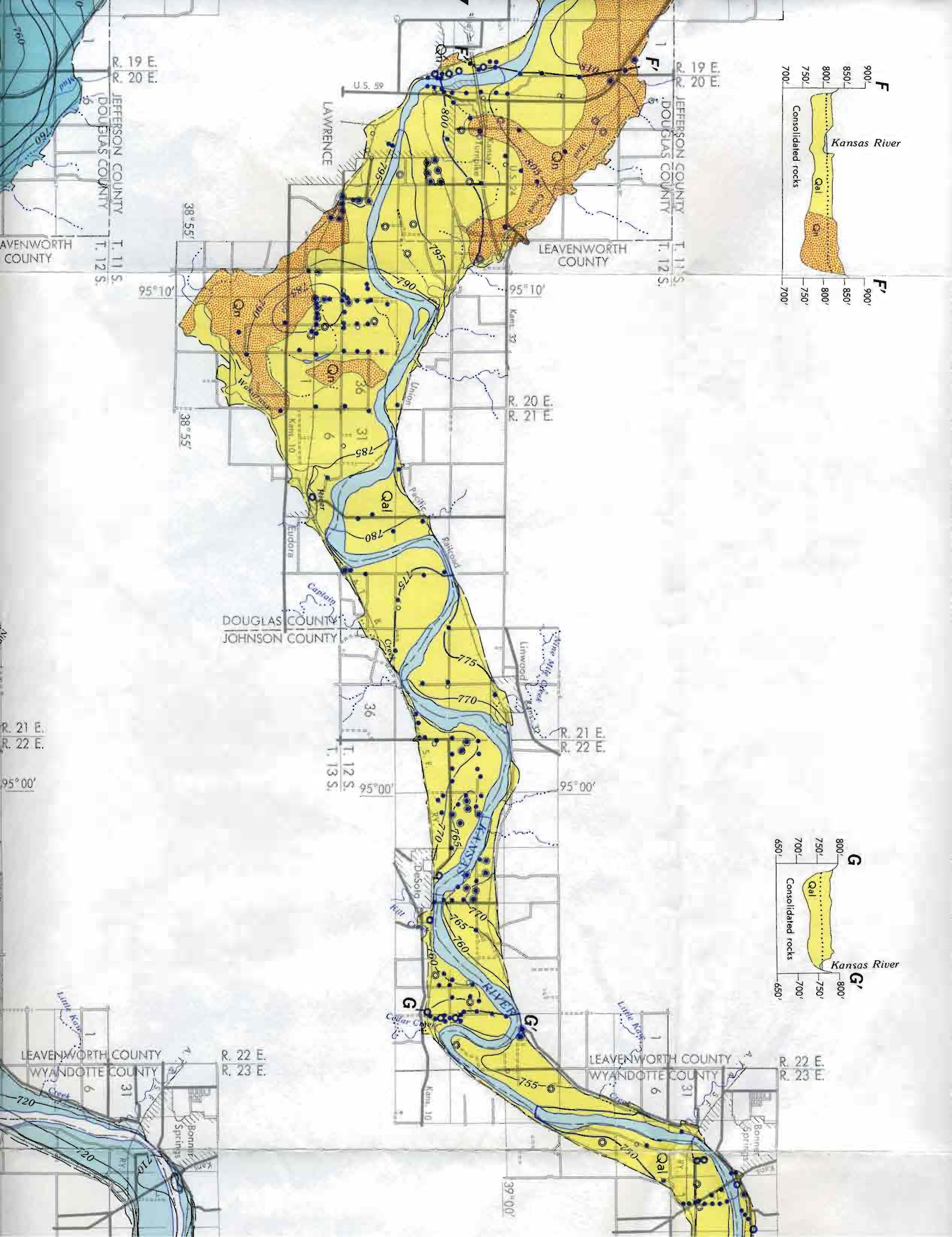
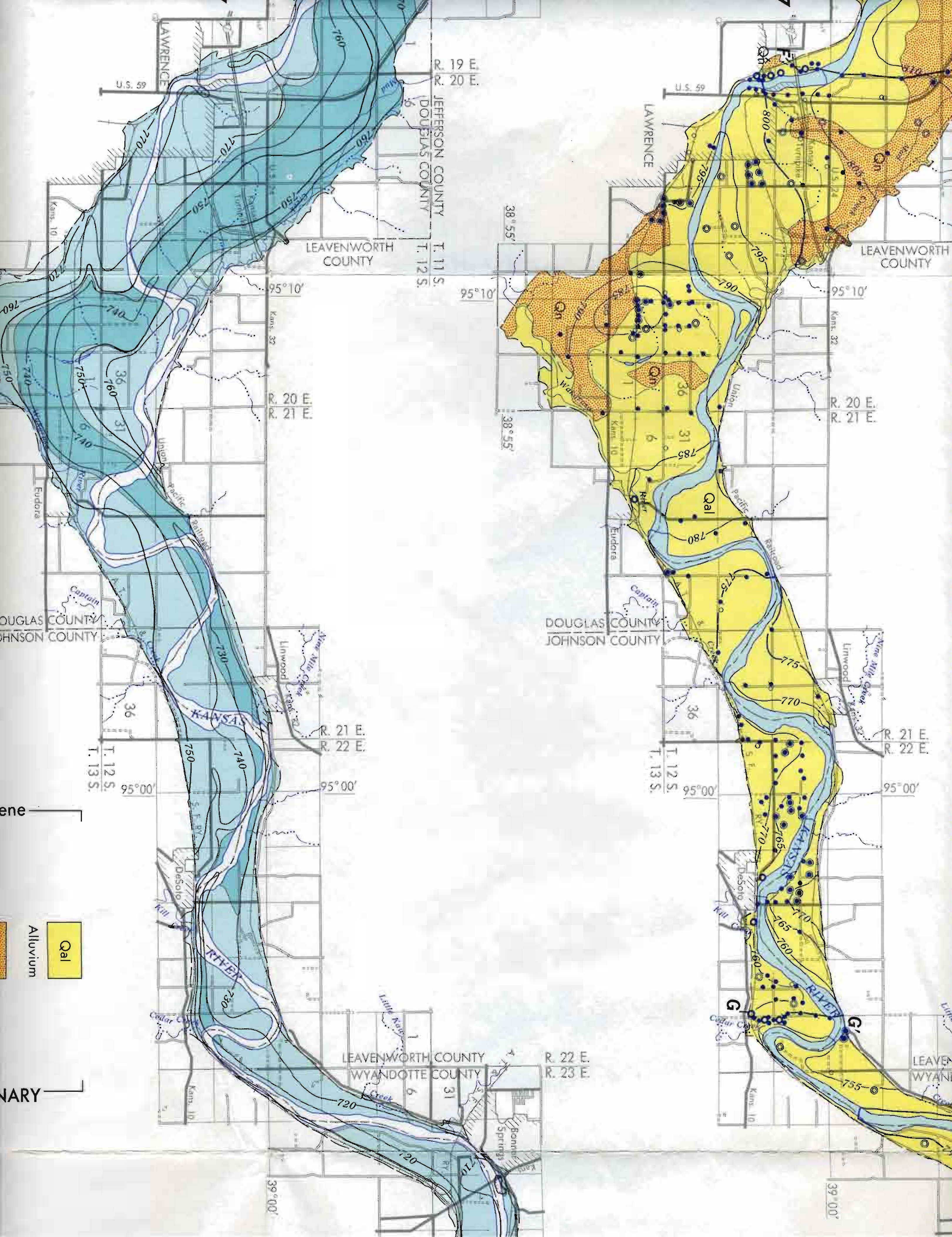
JANUARY 1974



R. 19 E.
R. 20 E.
JEFFERSON COUNTY
DOUGLAS COUNTY
U.S. 59
LAWRENCE
F
F'
Qn
Qal
U.S. 24
38°55'
LEAVENWORTH COUNTY
T. 11 S.
T. 12 S.
95°10'
Kans. 32
Kans. 10
Union
Pacific
Railroad
R. 20 E.
R. 21 E.
Eudora
Captain
Creek
DOUGLAS COUNTY
JOHNSON COUNTY
Linwood
Nine Mile Creek
R. 21 E.
R. 22 E.
T. 12 S.
T. 13 S.
95°00'
DeSoto
Kill Creek
KANSAS RIVER
G
G'
Cedar Creek
Little Kaw Creek
LEAVENWORTH COUNTY
WYANDOTTE COUNTY
R. 22 E.
R. 23 E.
Bonner Springs
39°00'
810
805
800
795
790
785
780
775
770
765
760
755
750
720
710
Kansas River
Consolidated rocks
700'
750'
800'
850'
900'
650'



LAWRENCE
U.S. 59
R. 19 E.
R. 20 E.
JEFFERSON COUNTY
DOUGLAS COUNTY
LEAVENWORTH COUNTY
T. 11 S.
T. 12 S.
95°10′
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T. 12 S.
T. 13 S.
95°00′
DeSoto
Kill Creek
Cedar Creek
Little Kaw
LEAVENWORTH COUNTY
WYANDOTTE COUNTY
R. 22 E.
R. 23 E.
Bonner Springs
39°00′
Qal
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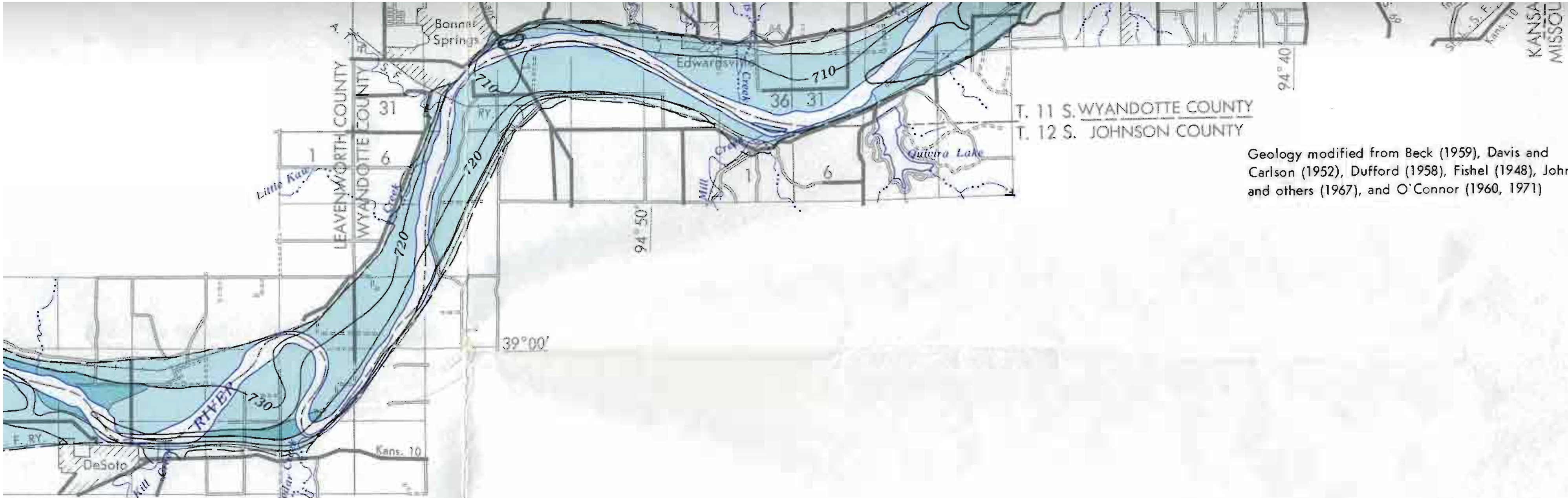
ene
Alluvium
NARY



Geology modified from Beck (1959), Davis and Carlson (1952), Dufford (1958), Fishel (1948), Johnson and others (1967), and O'Connor (1960, 1971)

EXPLANATION

QUATERNARY — Pleistocene

Qal — Alluvium

Qn — Newman terrace deposits

Qb — Buck Creek terrace deposits

Contact
Dashed where inferred on geologic sections

E——E'
Trace of geologic section
Datum for geologic sections is mean sea level and vertical exaggeration x 40

Boundary of project area

785
Water-table contour
Shows altitude of water table, March 1967. Dashed where approximately located. Interval 5 feet. Datum is mean sea level

Water table
Shown on geologic sections

Irrigation well

Public supply well

Industrial well

Domestic or stock well

Test hole

Observation well

Stream-gaging station

Saturated thickness, in feet

Less than 20

20-40

More than 40

760
Bedrock contour
Shows altitude of bedrock surface. Dashed where approximately located. Interval 10 feet. Datum is mean sea level

True North
Magnetic North
9°

APPROXIMATE MEAN DECLINATION, 1972

STATEMENT

March 24, 2004

Carl McElwee

1564 E 1850 Rd Lawrence,Ks. 66046

STRADER DRILLING COMPANY, INC.

Phone: 785-364-3011 — 12302 246th Road
HOLTON, KANSAS 66436

NOTICE: We do not make installment or credit sales. All accounts are due upon receipt of billing. A delinquency charge of 1½% per month (18% per year) will be added to accounts not paid within 30 days from invoice date.

3-16-04			
	1st 40'		1200.00
	8' add'l @	13.00	104.00
	24 bags hole plug	10.00	240.00
	well seal & vent		37.00
	tax on 677.00		42.65
		total	1623.65

0-2 top soil
2-11 clay brown/silty
11-24 clay brown
24-34 fine san brown
34-38 fine/course sand med pea bronw
38-42 fine/course sand med pea br/gr/grn
42-42½ clay grey
42½-48 fine sand br/gr/grn/boulders

48' 12" drilling
50' 5" casing
15' screen 33'-48' — .025 slot
37 GPM - SWL 29'
HP 3'-30'

Drill Logs

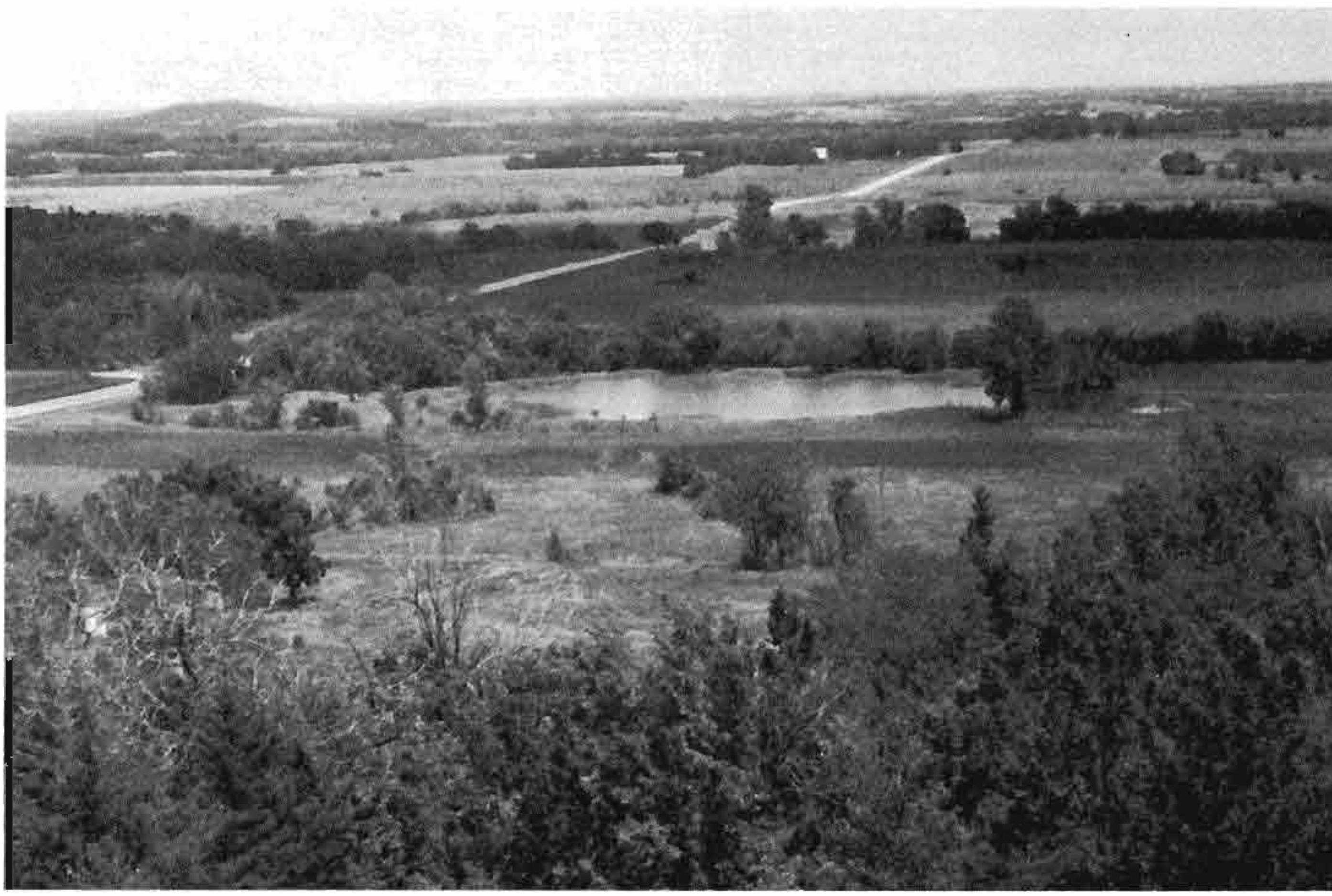
1 April 76 — Carl McElwee's 5 acres

SE Corner	
0-5	black soil
5-23	gray brown clay
23-28	med coarse sand
28-38	coarse sand
38-42	green sand
42	gray clay stringer?
42-50	green sand
50	hard - (boulders?)
50-66	green sand
66	light brown limestone

300' N of SE corner	
0-4	black soil
4-23	brown clay
23-38	pink-brown sand
38-54	green sand
54	crunchy (boulders?)
54-65	green sand
65	light brown limestn

SOIL SURVEY OF

Douglas County, Kansas



United States Department of Agriculture
Soil Conservation Service
In cooperation with
Kansas Agricultural Experiment Station

TABLE 2.—*Yields per acre of crops and pasture*

[All yields were estimated for a high level of management in 1974. Only arable soils are listed]

Soil name and map symbol	Corn	Grain sorghum	Soybeans	Wheat	Alfalfa hay	Smooth bromegrass
	Bu	*Bu*	*Bu*	*Bu*	*Ton*	*AUM*[1]
Eudora:						
Et	110	112	45	50	5.6	6.5
Ev[2]	100	100	40	43	5.0	6.2
Ew[2]	105	106	42	47	5.5	6.3
Gymer:						
Gm	90	94	38	42	4.3	5.5
Gy	83	90	35	40	4.0	6.1
Judson: Ju	109	111	44	52	5.6	7.0
Kennebec: Kb	103	98	40	42	5.5	6.5
Kimo: Km	85	90	38	40	4.5	5.5
Leanna: Le	80	85	32	36	4.0	7.0
Martin:						
Mb	80	85	35	40	3.9	5.5
Mc	75	80	31	38	3.6	5.5
Mh[2]	50	59	24	26	2.9	4.5
Mo[2]	68	78	30	37	3.4	5.0
Morrill:						
Mr	80	85	32	40	4.0	6.5
Ms	68	75	28	37	3.5	6.0
Oska: Oe	67	79	32	38	3.4	5.4
Pawnee:						
Pb	73	80	34	38	3.8	6.0
Pc	68	75	30	35	3.6	5.5
Ph	44	55	23	26	2.7	4.5
Reading: Ra	103	106	44	50	5.6	6.5
Sarpy: Sb[2]	70	80	30	35	5.0	3.9
Sharpsburg:						
Sc	95	95	38	42	4.7	6.8
Sd	90	90	36	41	4.5	6.5
Sibleyville:						
Sh	62	73	25	34	3.6	6.0
So	52	57	21	28	3.0	5.0
Ss[2]	54	60	22	29	3.2	4.5
St[2], Sv[2]	—	—	—	—	—	5.2
Thurman: Tc	60	60	22	32	3.0	5.0
Vinland: Vc[2]	48	55	23	27	2.2	4.0
Wabash:						
Wc	82	88	37	38	4.0	6.0
Wh	65	65	31	32	3.0	5.5
Woodson:						
Wo	65	75	28	34	3.5	5.0
Ws	65	75	24	32	3.5	5.0
Wx	50	55	20	25	2.3	4.5

[1] Animal-unit-month (AUM) is a term used to express the carrying capacity of pasture. It is the amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for a period of 30 days.

[2] This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.


N
Scale 1:20000
1 Mile
5000 Feet
R. 20 E.
R. 21 E.
(Joins sheet 9)
(Joins sheet 1)
(Joins sheet 3)
(Joins sheet 16)
2 810 000 FEET
240 000 FEET
270 000 FEET
KANSAS
RIVER
LEAVENWORTH
COUNTY
ATCHISON
26
25
28
33
35
36
Sb
Ro
Ew
Ev
Et
Km
Sv
Gy
Sw
Ws
Pc
Mo

United States Department of Agriculture

NRCS

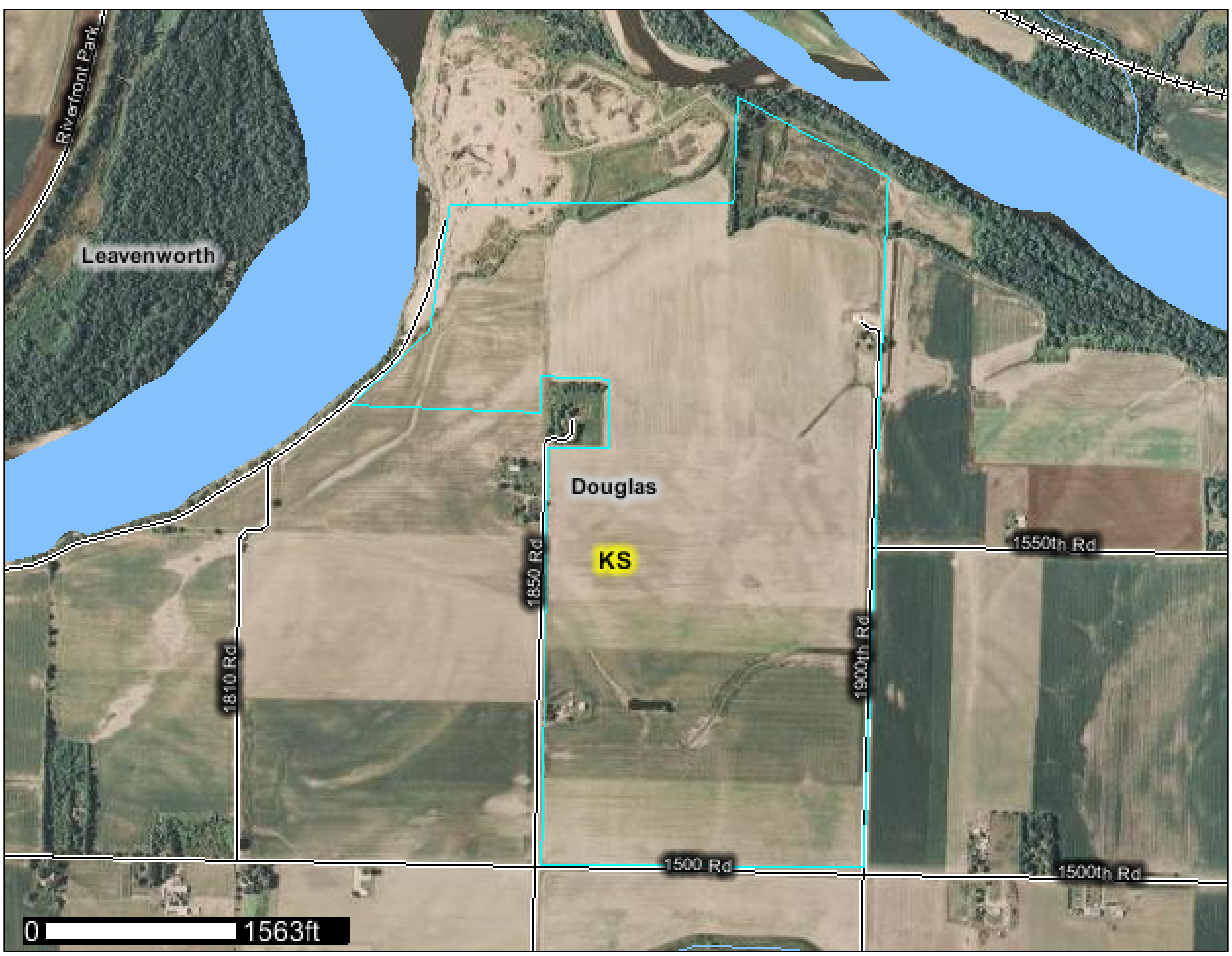
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Douglas County, Kansas

Sand Pit Site



August 22, 2012

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map (Sand Pit Site)

Map Scale: 1:10,100 if printed on A size (8.5" x 11") sheet.

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Gully

Short Steep Slope

Other

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:10,100 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 15N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas County, Kansas
Survey Area Data: Version 8, Nov 30, 2010

Date(s) aerial images were photographed: 6/15/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (Sand Pit Site)

Douglas County, Kansas (KS045)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
7035	Eudora-Bismarckgrove fine sandy loams, overwash, occasionally flooded	61.6	16.5%
7089	Stonehouse-Eudora fine sandy loams, overwash, occasionally flooded	12.1	3.2%
7123	Eudora silt loam, rarely flooded	48.9	13.1%
7127	Eudora-Kimo complex, overwash, rarely flooded	240.6	64.5%
9995	Sand Pits	10.0	2.7%
Totals for Area of Interest		**373.1**	**100.0%**

Map Unit Descriptions (Sand Pit Site)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Douglas County, Kansas

7035—Eudora-Bismarckgrove fine sandy loams, overwash, occasionally flooded

Map Unit Setting

Elevation: 750 to 980 feet
Mean annual precipitation: 31 to 47 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 175 to 215 days

Map Unit Composition

Eudora and similar soils: 55 percent
Bismarckgrove and similar soils: 25 percent
Minor components: 0 percent

Description of Eudora

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-silty alluvium

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water capacity: High (about 11.1 inches)

Interpretive groups

Land capability (nonirrigated): 2w
Ecological site: Loamy Lowland (PE 30-37) (R106XY013KS)

Typical profile

0 to 7 inches: Fine sandy loam
7 to 14 inches: Silt loam
14 to 40 inches: Silt loam
40 to 48 inches: Silt loam
48 to 80 inches: Very fine sandy loam

Description of Bismarckgrove

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water capacity: High (about 10.6 inches)

Interpretive groups

Land capability (nonirrigated): 2w
Ecological site: Loamy Lowland (PE 30-37) (R106XY013KS)

Typical profile

0 to 6 inches: Fine sandy loam
6 to 14 inches: Silty clay loam
14 to 19 inches: Silty clay loam
19 to 29 inches: Silt loam
29 to 44 inches: Silt loam
44 to 80 inches: Stratified loamy fine sand to fine sandy loam

Minor Components

Aquolls

Percent of map unit: 0 percent
Landform: Depressions, drainageways, hillslopes
Down-slope shape: Concave
Across-slope shape: Concave

7089—Stonehouse-Eudora fine sandy loams, overwash, occasionally flooded

Map Unit Setting

Elevation: 750 to 980 feet
Mean annual precipitation: 31 to 47 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 175 to 215 days

Map Unit Composition

Stonehouse and similar soils: 50 percent
Eudora and similar soils: 30 percent
Minor components: 0 percent

Description of Stonehouse

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water capacity: Low (about 5.4 inches)

Interpretive groups

Land capability (nonirrigated): 4s
Ecological site: Sandy Lowland (PE 30-37) (R106XY023KS)

Typical profile

0 to 9 inches: Fine sandy loam
9 to 23 inches: Loamy fine sand
23 to 31 inches: Stratified loamy sand
31 to 45 inches: Stratified fine sand
45 to 71 inches: Stratified sandy loam
71 to 80 inches: Stratified loamy fine sand

Description of Eudora

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-silty alluvium

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water capacity: High (about 11.1 inches)

Interpretive groups

Land capability (nonirrigated): 2w
Ecological site: Loamy Lowland (PE 30-37) (R106XY013KS)

Typical profile

0 to 7 inches: Fine sandy loam
7 to 14 inches: Silt loam
14 to 40 inches: Silt loam
40 to 48 inches: Silt loam
48 to 80 inches: Very fine sandy loam

Minor Components

Aquolls

Percent of map unit: 0 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave

7123—Eudora silt loam, rarely flooded

Map Unit Setting

Elevation: 800 to 1,050 feet
Mean annual precipitation: 31 to 47 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 175 to 215 days

Map Unit Composition

Eudora and similar soils: 85 percent
Minor components: 0 percent

Description of Eudora

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-silty alluvium

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water capacity: High (about 11.8 inches)

Interpretive groups

Land capability (nonirrigated): 1
Ecological site: Loamy Lowland (PE 30-37) (R106XY013KS)

Typical profile

0 to 7 inches: Silt loam
7 to 14 inches: Silt loam
14 to 40 inches: Silt loam
40 to 48 inches: Silt loam
48 to 80 inches: Very fine sandy loam

Minor Components

Aquolls, ponded

Percent of map unit: 0 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave

Aquolls

Percent of map unit: 0 percent
Landform: Depressions, drainageways, hillslopes
Down-slope shape: Concave
Across-slope shape: Concave

7127—Eudora-Kimo complex, overwash, rarely flooded

Map Unit Setting

Elevation: 400 to 1,200 feet
Mean annual precipitation: 31 to 47 inches
Mean annual air temperature: 52 to 59 degrees F
Frost-free period: 175 to 215 days

Map Unit Composition

Eudora and similar soils: 60 percent
Kimo and similar soils: 30 percent
Minor components: 5 percent

Description of Eudora

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-silty alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water capacity: Very high (about 12.2 inches)

Interpretive groups
Land capability (nonirrigated): 2w
Ecological site: Loamy Lowland (PE 30-37) (R106XY013KS)

Typical profile
0 to 12 inches: Silt loam
12 to 72 inches: Silt loam

Description of Kimo

Setting
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey over loamy alluvium

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 22 to 26 inches
Frequency of flooding: Rare
Frequency of ponding: Occasional
Available water capacity: High (about 11.4 inches)

Interpretive groups
Land capability (nonirrigated): 2w
Ecological site: Loamy Lowland (PE 30-37) (R106XY013KS)

Typical profile
0 to 6 inches: Silty clay loam
6 to 28 inches: Silty clay
28 to 60 inches: Silt loam

Minor Components

Wabash
Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Other vegetative classification: CLAY LOWLAND (PE30-37) (106XY004KS_1)

9995—Sand Pits

Map Unit Setting

Mean annual precipitation: 31 to 47 inches
Frost-free period: 175 to 215 days

Map Unit Composition

Pits, sand: 100 percent

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Construction Materials

This folder contains a collection of tabular reports that present soil interpretations related to sources of construction materials. The reports (tables) include all selected map units and components for each map unit, limiting features and interpretive ratings. Construction materials interpretations are tools designed to provide guidance to users in selecting a site for potential source of various materials. Individual soils or groups of soils may be selected as a potential source because they are close at hand, are the only source available, or they meets some or all of the physical or chemical properties required for the intended application. Example interpretations include roadfill, sand and gravel, topsoil and reclamation material.

Source of Sand and Gravel (Sand Pit Site)

This table gives information about the soils as potential sources of gravel and sand. Normal compaction, minor processing, and other standard construction practices are assumed.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. Only the likelihood of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material. The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains sand or gravel, the soil is considered a likely source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness. The ratings are for the whole soil, from the surface to a depth of about 6 feet.

The soils are rated *good*, *fair*, or *poor* as potential sources of sand and gravel. A rating of *good* or *fair* means that the source material is likely to be in or below the soil. The bottom layer and the thickest layer of the soils are assigned numerical ratings. These ratings indicate the likelihood that the layer is a source of sand or gravel. The number 0.00 indicates that the layer is a poor source. The number 1.00 indicates that the layer is a good source. A number between 0.00 and 1.00 indicates the degree to which the layer is a likely source.

Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Report—Source of Sand and Gravel (Sand Pit Site)

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.00 to 0.99. The larger the value, the greater the likelihood that the bottom layer or thickest layer of the soil is a source of sand or gravel]

Source of Sand and Gravel– Douglas County, Kansas					
Map symbol and soil name	Pct. of map unit	Potential as a source of gravel		Potential as a source of sand	
		Rating class and limiting features	Value	Rating class and limiting features	Value
7035—Eudora-Bismarckgrove fine sandy loams, overwash, occasionally flooded					
Eudora	55	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Bismarckgrove	25	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00

Source of Sand and Gravel– Douglas County, Kansas					
Map symbol and soil name	Pct. of map unit	Potential as a source of gravel		Potential as a source of sand	
		Rating class and limiting features	Value	Rating class and limiting features	Value
7089—Stonehouse-Eudora fine sandy loams, overwash, occasionally flooded					
Stonehouse	50	Poor		Fair	
		Bottom layer	0.00	Thickest layer	0.03
		Thickest layer	0.00	Bottom layer	0.13
Eudora	30	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
7123—Eudora silt loam, rarely flooded					
Eudora	85	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
7127—Eudora-Kimo complex, overwash, rarely flooded					
Eudora	60	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
Kimo	30	Poor		Poor	
		Bottom layer	0.00	Bottom layer	0.00
		Thickest layer	0.00	Thickest layer	0.00
9995—Sand Pits					
Pits, sand	100	Not rated		Not rated	

Source of Sand and Gravel (Sand Pit Site)

This table gives information about the soils as potential sources of gravel and sand. Normal compaction, minor processing, and other standard construction practices are assumed.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. Only the likelihood of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material. The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains sand or gravel, the soil is considered a likely source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness. The ratings are for the whole soil, from the surface to a depth of about 6 feet.

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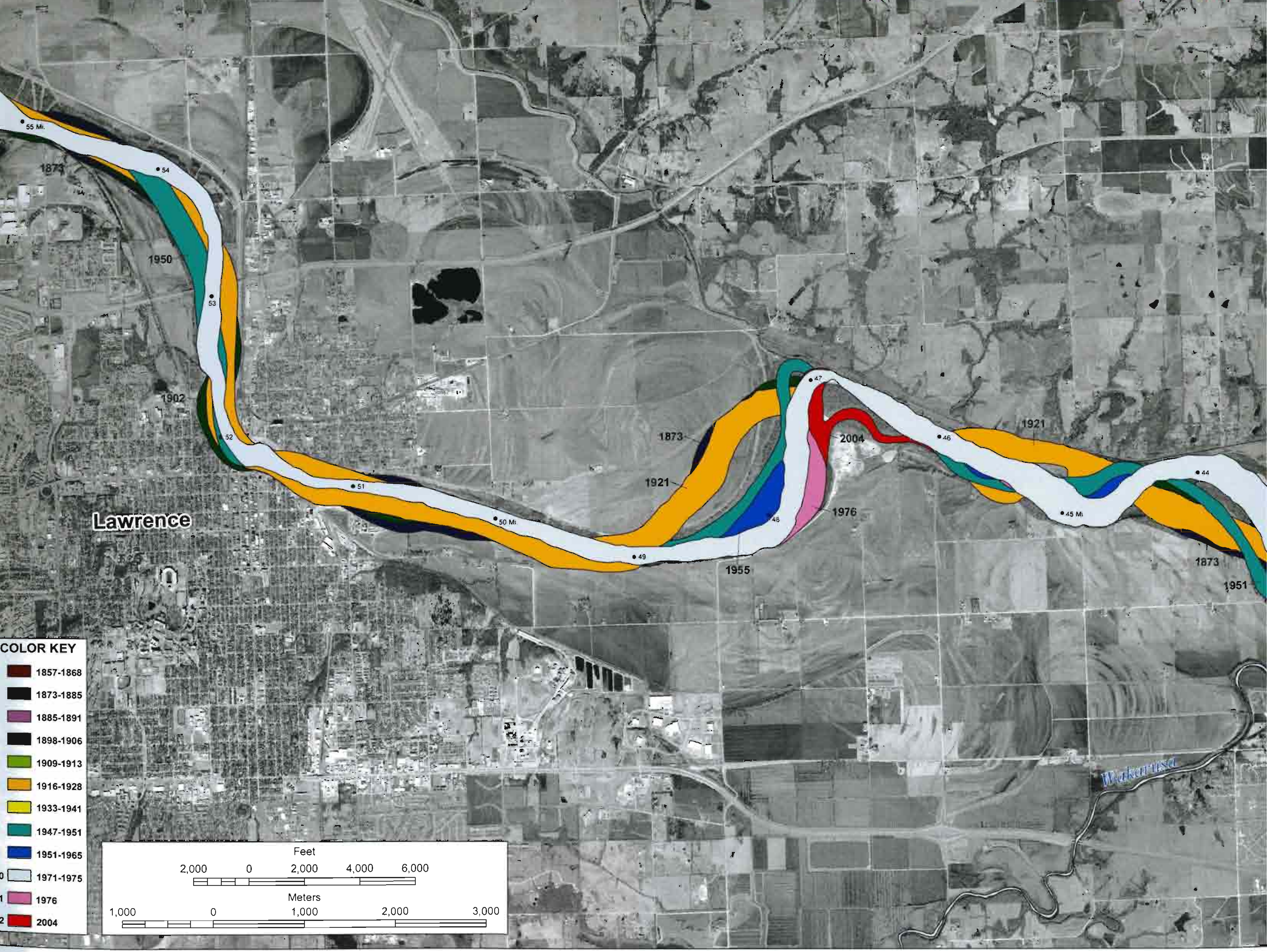
1564 E 1850 Rd, Lawrence, KS
1-5/8mi
X
X
X
Eudora Well Field
N
© 2012 Google
Google earth
Imagery Date 5/30/2011
1991
38°57'39.00" N 95°07'50.91" W elev 811 ft
Eye alt 17376 ft

HISTORICAL
CHANNEL CHANGES
OF THE
KANSAS RIVER
AND ITS MAJOR TRIBUTARIES

WAKEFIELD DORT, JR.

PECIAL PUBLICATION NUMBER 42

AMERICAN GEOGRAPHICAL SOCIETY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1857-1868
1873-1885
1885-1891
1898-1906
1909-1913
1916-1928
1933-1941
1947-1951
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1971-1975
1976
2004
Feet
2,000 0 2,000 4,000 6,000
Meters
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Lawrence
Wakarusa
55 Mi.
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1873
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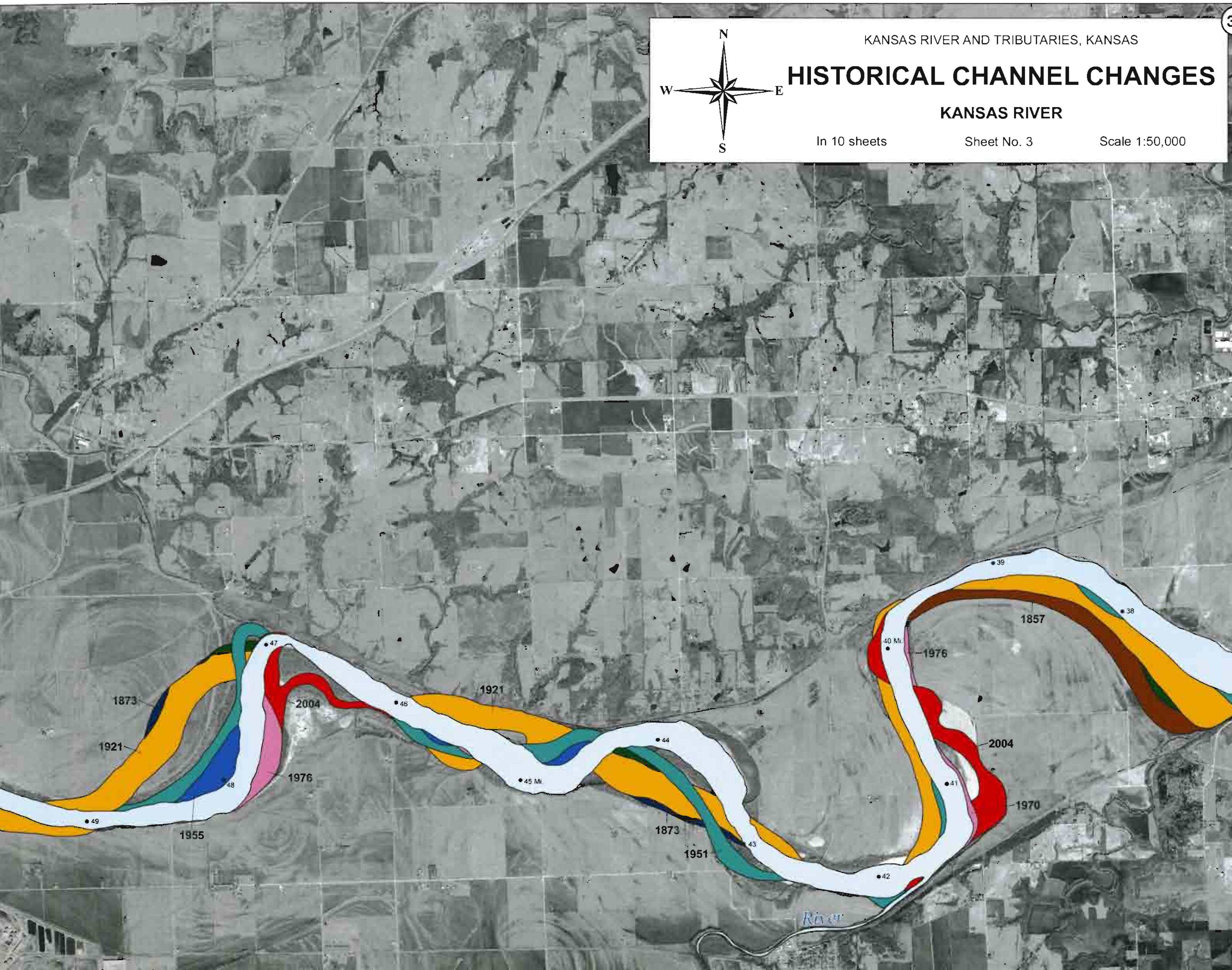
KANSAS RIVER AND TRIBUTARIES, KANSAS

HISTORICAL CHANNEL CHANGES

KANSAS RIVER

In 10 sheets | Sheet No. 3 | Scale 1:50,000



Sept. 9, 2012

Lawrence Douglas County
Metropolitan Planning Office
6 East 6th Street,
P.O. Box 708,
Lawrence, KS 66044

Planning Staff:

As interested property owners, we are writing this letter to object to the Conditional Use Permit (CUP) that Penny Sand Co. has applied for near 1500N and 1850E. This CUP asks permission for a pit mining operation for sand removal. This would completely change the agricultural setting of the area. If allowed, this CUP would subject the area to dramatically increased industrial activity, including noise, dust, and environment destruction. We ask that you deny the CUP for the following reasons:

(1)The affected area has some interesting Douglas County history associated with it and contains some historic houses.

(2) The river bank in the vicinity of this proposed pit mining operation is unstable and has moved considerably over recent times. If pit mining is allowed in this area, in times of flood the chances of a dramatic river channel change is magnified greatly.

(3) On this proposed 434 acre pit mining site, the majority of the area is covered by some of the highest quality soils as defined by the US Department of Agriculture. It seems very short sighted to produce sand for short term gain and lose the potential for significant food and fiber production indefinitely.

(4)There is a large amount of overburden (unusable soil, silt and clay) that must be removed (typically 23-24 feet). Removing this much overburden will create an environmental nightmare

(5) Opening this pit operation will expose one of the most prolific aquifers in this region to potential pollution. This aquifer is a magnificent resource that must be protected and preserved for the future.

(6)Several neighboring house wells could be affected by this pit. Just down the valley about 1 5/8 miles lies the Eudora Public Water Supply Well Field; it could also be affected by the proposed pit mining operation.

Thank you for your consideration of our concerns.

Penny Sand Pit Petition

Name	Address	Phone Number	email
Print: Carl McElwee Signature: Carl McElwee	1564 E. 1850 Rd. Lawrence, KS 66046	785 843-4164	cmcelwee@ku.edu
Print: MARGERY McELWEE Signature: Margery McElwee	1564 E 1850 Rd Lawrence KS 66046	785 843-4164	
Print: Park Jauber Signature: Paul Jauber	1555 E 1850 Rd Lawrence KS	785-393 9028	
Print: Esther McCabria Signature: E. McCabria	1455 E 1900 Rd Eudora KS 66025	542 2492	BMccabria@aol.com
Print: Robert McCabria Signature: Robert E McCabria	1455 E 1900 Rd Eudora, KS 66025	542 2492	"
Print: [illegible] Signature: Scott Jackson	1964 N 1550 Rd Eudora 66025	785 331 6561	Scottjackson 1964@yahoo.com
Print: Bruce Perkins Signature: Bruce Perkins	Eudor 66025	785 764 6295	BrucePerkins55@ Gmail.Com
Print: Philip R Ernst Ernst Signature:	826 Mass, Lawrence	843-2313	
Print: NORMA L. SCHMILLE Signature: Norma L. Schmille	1610 E. GLENN DR. LAWRENCE, KS-66044	843-0943	
Print: AL W DEATHE Signature: Al W Deathe	1918 N 1500 RD EUDORA KS	542-2352	AWDVKD@ SUNFLOWER. Com
Print: ViAnn K. Deathe Signature: ViAnn K Deathe	1918 N 1500 Rd Eudora, KS 66025	542-2352	

Penny Sand Pit Petition

Name	Address	Phone Number	email
Print: Gregory Shipe Signature: Gregory Shipe	1394 E 1900 Rd Eudora, Ks 66025	785 542-2278	Ks_wines@ hotmail.com
Print: Virginia S. Strong Signature: Virginia S. Strong	3712 Trail Rd. Lawrence, Ks 66049	785 843- 2297	
Print: DAVID VERTAČNIK Signature: David Vertačnik	1403 E 1850 Road Lawrence, KS	785 842-4428	davidv@ku.edu
Print: Wendy Leet Vertacnik Signature: Wendy Leet Vertacnik	1403 E. 1850 Rd Lawrence.KS 66046	785- 842.4428	vertacnik@ sunflower.com
Print: Dr Karen Johnston Signature: K Johnston	1928 N 1500 Rd Eudora KS 66025	785 393 2933	drkarenjohnston @gmail.com
Print: Linda Knabe Signature: Linda Knabe	39460 W 143rd ST Eudora, Ks 66025	785 542 2228	Knabefarms@ wildblue.net
Print: Richard Knabe Signature: Richard Knabe	Same		
Print: PETER SHENOUDA Signature: Peter S	1411 E. 1850 Road Lawrence, KS 66046	785-856- 3999	pshenouda@hotmail.com
Print: Building Blocks Daycare Signature: ~~Peter S~~	1411 E.1850 Road Lawrence, KS 66046	785- 856- 3999	buildingblocks@ Sunflower.com
Print: Steve BOYER Signature: Steve Boyer	EUDORA K.S. 2027 N 1500 RD	785-218- 2491	
Print: Nancy Jackson Signature: Nancy Jackson	1964 N 1550th Rd Eudora, KS 66025	785-331- 8743	nancyjackson46@ gmail.com

The Master's Dredging Company, Inc.

Dredging Contractors
P.O. Box 9, Lawrence, KS 66044
(913) 583-3335

September 12, 2012

Mr. Bruce Liese
Chairman, Lawrence-Douglas County Planning Commission
6 East 6th Street
Lawrence, Kansas 66044

Dear Mr. Liese,

We have a CUP for a sand plant operation approved in 1991 on land about 1.5 miles northbeast of the intersection of Noria Road and North 1500 Road. At the time of the 1991 approval of our CUP we had applied for both a Kansas River operation and a sand pit operation on the land where our sand plant was located. At the time, the zoning board did not feel that there was a need for both operations and gave me a choice between the two. I choose the river operation. Under a sand plant lease arrangement, Pennys Concrete has been producing sand from our river permit for over 17 years.

With a pending Corps of Engineer decision to halt both ours and Pennys' river permits, Pennys Concrete (1) terminated their lease agreement with us and (2) applied for zoning of an off-river sand pit operation. In light of this we are renewing our CUP zoning application for an off-river sand pit on land immediately adjacent to the Pennys Concrete's application for a CUP permit for off river sand pit operation. We are presently applying for a CUP for an off-river sand pit operation.

In light of the fact that Pennys Concrete and we have nearly identical CUP applications on adjacent lands, I would like to request that the zoning board defer consideration of Pennys Concrete's application and that the zoning board would consider both Pennys' and our CUP applications concurrently. I would appreciate your passing on this request to the rest of your zoning board, the planning staff, and county commissioners. If you have any questions, feel free to email me at (davidpenny@theaquaticgroup.com) or call me: 913-583-3335 (office, but please do not leave a message) or 785-218-8800 (cell, leave a message if you do not get me).

Sincerely,

David Penny

David Penny
President

Sept. 18, 2012

Lawrence Douglas County
Metropolitan Planning Office
6 East 6th Street,
P.O. Box 708,
Lawrence, KS 66044

Planning Commission:

I would like to object to the request in David Penny's letter from The Masters Dredging Company, Inc. to defer consideration of the Penny Sand CUP from the Sept. 24 meeting. I and other land owners have worked to prepare for that meeting and would like to see our concerns addressed in a timely manner.

I have a long scheduled previous commitment Oct 15-25 and will be out of town. I ask the Planning Commission to please not schedule any meetings on this issue during my absence.

Thank you for your consideration. If I may answer any questions, please contact me.

Sincerely,

Carl McElwee

Carl McElwee
1564 E. 1850 Rd.
Lawrence, KS 66046   785-843-4164   cmcelwee@ku.edu

Evaluation of Penny's Concrete and Sand LLC, Proposed Sand Pit Operation on Ground Water

For the Lawrence Facility

For

Penny's Concrete and Sand LLC

23400 West 82nd Street

Shawnee, Kansas

By

Carl E. Nuzman, P.E., P.Hg.

Consulting Engineer/Hydrogeologist

3314 NW Huxman Road

Silver Lake, KS 66539

Phone 785 224 9929

September 12, 2012

TABLE OF CONTENTS

Evaluation of Penny's Concrete and Sand LLC,

Proposed Sand Pit Operation on Ground Water for the Lawrence Facility

1. INTRODUCTION

A study and evaluation was made of the aquifer characteristics of the Kansas River Valley alluvial sediments in the vicinity between Lawrence, KS and Eudora to determine if any detrimental effects will occur to the existing wells in the vicinity of the proposed sand mining operation. Penny Concrete and Sand proposes to establish a pit to mine sand located in the East ½, and the NE¼ of the NW ¼ of Section 35 excluding two outparcels, the West 60 acres of the West ½ of the NW ¼ of Section 36, and a portion of the SE¼ of the SE¼ of Section 26, all in Township 11 South, Range 20 East in Douglas County, Kansas. Shown on Exhibit A is the conditional use permit (CUP) area where the proposed sand pit is located and wells registered with the Division of Water Resources Kansas Department of Agriculture.

2. GEOLOGIC SETTING

A study was made by Alvin E. Dufford of the Quaternary Geology and Ground-Water Resources of the Kansas River Valley between Bonner Springs and Lawrence. The results of his work were published by the University of Kansas for the Kansas Geological Survey in Bulletin 130, Part 1, in 1958. The Wakarusa River hugs the south edge of the valley while the Kansas River stays close to the north edge of the valley, narrowing as the valley approaches Eudora from the west.

The Kansas River valley has a general eastward slope of about 3 feet per mile with low dissected hills bounding the flood plain on both sides. The Kansas River valley alluvium merges with the Wakarusa River valley alluvium near the center of Section 10, Twp 13 South, Range 20 East in Douglas County, Ks. The valley alluvium that comprises the aquifer consists principally of sand but contains lenses of both coarser and finer material. Generally, the saturated thickness of the aquifer is about 40 to 50 feet thick in the deepest part of the valley but thins to about 20 feet in the vicinity in the saturated thickness, in the proposed sand mining operation. Bed roc elevation in the area was defined by Stuart W. Fader in Ground Water in the Kansas River Valley, Junction City to Kansas City, Kansas in Bulletin No. 206, Part 2.

Well logs of selected wells in the area are given in Appendix I from the WWC-5 forms filed with the Kansas Geological Survey water well log file in Lawrence, KS. Exhibit B, is a geologic west to east cross-section along North 1500 Road showing the geology profile in that area. Static water levels given on the well log reports do not reflect average conditions of the aquifer. Static water levels can vary several feet with changes in precipitation in the area. The static water levels will be higher during periods of normal or above normal precipitation and will decline during periods of drought. Static water levels given in the WWC-5 reports may not have been allowed to completely stabilize after pumping.

3. HYDROLOCIC SITUATION

The Eudora area has a humid continental climate. Normally, more than 70% of the annual precipitation falls during the growing season from April through September. Precipitation during this period is usually from thunderstorms (high intensity rainfall of brief duration) in the evening and early morning hours. The mean hourly wind speed is about 10 miles per hour usually from the south or southwest, and the sun usually shines more than 60% of the daylight hours.

The Kansas River which flows in an easterly direction is the principal stream in the area. The Army Corps of Engineers normally maintains a minimum desirable stream flow of 1,000 cubic feet per second at the DeSoto gaging station on the Kansas /river. The Wakarusa River is hydrologically an important tributary stream because it is a major source of recharge to the alluvial aquifer, especially in the vicinity of major well fields.

4. SAFE YIELD ANALYSIS

The safe yield available for appropriation from an unconfined aquifer at a specific location is determined by the amount of average annual precipitation that becomes recharge to the aquifer occurring within the area of consideration by the Chief Engineer of the Division of Water Resources, Kansas Department of Agriculture. The area of consideration means the portion of the aquifer area that lies within a 2-mile radius from the proposed point of interest, which is the geo-center of the proposed sand pit.

Although a safe yield analysis is not required for a sand pit operation in the Kansas River Basin by the Division of Water Resources, Kansas Department of Agriculture, such an appraisal was made to identify all registered ground water appropriators within a two (2) mile radius of the proposed sand pit operation. There were 15 identified ground water users some of which have multiple water rights on file. All wells registered are given in Appendix II with the well information followed by the owner and their address.

Based on established recharge rate of 9.2 inches per year by the Division of Water Resources, the safe yield for the 2-mile circle comprising and effective area of 6,350 acres is 4,868.33 acre-feet.

The prior appropriations certified in the circle are 4,305.78 acre-feet, with the added permitted appropriated water totaling 5,429.45 acre feet. Only wells 7 and 9 of the City of Eudora are at the edge of 2-mile circle from the geo-centroid of the proposed Penny sand pit.

The City of Eudora's total appropriation of 699 ac-ft or 227.77 MGY for municipal appropriation including future water use for population growth was used in the model given in Exhibits E and F. The maximum authorized diversion rate or pumping in one day is 1.4 million gallons per day. Exhibits E and F show the proposed Penny sand pit will not affect the City of Eudora wells in any way. The over appropriation of water in the area is up-gradient from the City wells and serves to intercept any ground water contamination that may exist in the capture zone of the City of Eudora wells identified in Exhibit F.

5. AQUIFER PROPERTIES

You do not get water from a well. A well is a stabilized hole in the ground to gain access to water bearing material called an ***aquifer***. The yield of an aquifer is controlled by the permeability of the geologic formation and the saturated thickness of that permeable formation. The yield of a well can never be greater than that of the aquifer and usually less depending upon the efficiency of well construction and development. A well can decrease in yield due to biological fouling and lack of proper maintenance but unless the static water level has a substantial decline reducing the saturated thickness, the yield available from the aquifer remains constant.

Data from the WWC-5 report for City Well No 8, shown in Appendix I was used to estimate the properties of the aquifer. The reported drawdown was 4 feet after 11 hours of pumping at 521 gallons per minute (gpm). These values give a well specific capacity of 130 gpm/foot of drawdown when constructed. This value is used to estimate the transmissivity of the aquifer which is estimated to be 220,000 gpd/ft. Utilizing the 25 feet of well screen installed which is less than the formation thickness; the calculated formation permeability is 8,800 gpd/ft^2, a very good formation value. Typical average value of formation permeability for the Kansas River valley alluvium is about 5,000 gpd/ft^2, with a maximum value observed of 10,000 gpd/ft^2. Additional data was found for City wells No. 6 and No. 7. The original specific capacity for well No. 6 was 101.7 gpm/foot of drawdown. The estimated formation transmissivity of the aquifer at well No. 6 location is 172,900 gpd/ft. The original well specific capacity for well No. 7 was 126.8 gpm/ft which gives an estimated formation transmissivity of 215,600 gpd/ft. An average transmissivity value of 210,000 gpd/ft was used to model the aquifer in Exhibits 6 and 7. This value under estimates the transmissivity in the deeper portions of the aquifer and over estimates the transmissivity near the boundaries of the aquifer. The 210,000 gpd/ft is in the same range that was determined by S. W. Fader in Bulletin No. 206, part 2, figure 7.

When a well is pumped, the pump energy creates a partial vacuum that causes a cone of depression to develop around the bore hole. The bore hole for the construction of Well No. 8 was reported to be 42 inches which gives a well radius of 1.75 feet. Using the formation transmissivity value of 220,000 gpd/ft, the drawdown per log cycle was calculated to be 1.0 foot for a pumping rate of 325 gpm, which is the maximum authorized pumping rate established for well No. 6. This information was then plotted on a semi-log plot to obtain the radius of influence for well 6, well 7 and well 8, Reference Exhibit C. The zero (0) drawdown for wells 6 & 7 was 2,400 feet and 2,100 feet for well 8. Drawdown values of less than 1 foot are considered insignificant since annual variations of static water level may vary more than 2 feet in a year due to weather conditions. The 1-foot drawdown occurs at a radius from about 130 to 260 feet for each of the wells shown in Exhibit C. The basic assumptions in the calculations for Exhibit C assume the world is flat and the aquifer properties are ideal. The approximate 1,000 feet distance between City wells minimizes the mutual interference effects from simultaneous pumping of these wells.

6. AQUIFER WATER YIELD AND AREA OF WATER CAPTURE

Simple model system was developed using the analytical-element method often used in modeling well-head protection. The State Geological Survey of Kansas had experienced geologists investigate the Kansas River valley geology and ground water resources from Bonner Springs to the vicinity of Manhattan. The reach of special interest is contained in Bulletin 130, Part 1, Quaternary Geology and Ground-Water Resources of Kansas River Valley between Bonner Springs and Lawrence, Kansas. At that time, the Kansas Geological Survey had their own small drilling rig in which to drill test holes. Many of the data points used in the model were from this work dated back to the 1940's and 1950's.

Figure 3 in Bulletin 130, Part 1 is the basis for the development of Exhibit D, a generalized static water table of the area of interest. In the 1950's there was little or no large pumpage in this area of interest which gives a good representation of pre-development conditions for the aquifer. Since the measurements upon which Figure 3 was based occurred over a period of years, exact replication of the water level elevations was not possible. Using statistical analysis, a very reasonable simulation of the water table gradient was obtained.

The model was then used to simulate the probable maximum pumping rate of 1.4 million gallons per day to obtain the area of direct influence of the City of Eudora well field. You will note that the area of 1 foot drawdown for the City of Eudora's peak pumpage is not circular but somewhat egg shaped extending more up-gradient to the west than to the east. Average annual pumping rate is estimated at 60% of peak day rate. Thus the development of the drawdown simulated in Exhibit E is a representation of the maximum drawdown expected in the future.

A feature of the model called particle tracking was then used to plot the movement of water in the aquifer to each of the four wells shown in Exhibit F. Based on the maximum allowable pumpage of 227.77 MGY authorized by the City's water rights on file with the Division of Water Resources, the travel time of water in the aquifer was calculated. The time period selected was 25 years. Each little collar around the straw like flow path lines represents one (1) year of flow. Due to the hydraulic gradient of the valley aquifer system and recharge to the aquifer from rainfall, **the aquifer flow to the City wells is from the west-southwest.** The Penny sand pit will be a half mile north of the capture zone of the City wells and will have no influence on the Eudora public water supply wells.

7. WELL-HEAD PROTECTION STUDY

The City's concern in regard to protecting the future quality of water from their well field must focus on the area in the immediate vicinity of the wells and to the west of the wells.

In so far as contaminants in the aquifer, the water movement is from west to east in a down-gradient direction. The estimated travel time of water in the Kansas River alluvium aquifer, based on the general formation transmissivity and land surface gradient is about 0.7 feet/day or 8.4 inches per day, a very slow migration rate.

Several potential contamination sources, given in Appendix III, have been identified that could potentially threaten the water quality of the Eudora well field:

a. Septic tanks at the several domestic residences in the vicinity are each a potential threat to the water quality of the City wells.

b. To the east of Well No. 6 near the point of stagnation is or was a cattle feeding operation with livestock present as shown in Appendix III.

c. Chemical fertilizer and herbicides applied to corn planted next to the wells as shown next to Well No. 6 in Appendix III, are a potential threat of contamination to the City wells. This threat of contamination is increased with irrigation, especially on sandy soils. Major portions of Hall and Merrick Counties in Nebraska have nitrates nearly double that of the KDHE and EPA regulations for Nitrates in public water supply due to irrigation and chemigation of corn on sandy loam soils similar to the alluvial soils shown in Bulletin 206, Part 2, Ground Water in the Kansas River Valley Junction City to Kansas City, Kansas by Stuart W. Fader. The Newman Terrace clay loam soils offer more protection of the aquifer from fertilizers.

d. Abandoned wells or old domestic wells that were drilled long ago with thin wall casing that have corroded through the years and were not grout sealed, can allow storm water runoff to flow directly into the aquifer resulting in direct contamination to the City wells. Such a well may exist west of Eudora Well No. 7 as shown in Appendix III, under the old windmill tower.

The C. McElwee domestic well is up gradient from the sand pit and down-gradient from the Kansas River. Although the property is about 5 acres in area, it is recommended that the set back of the pit mining be 300 feet from his property line. The radius of influence of the domestic well is less than 300 feet and will not be adversely affected by the sandpit.

8. SAND PIT OPERATION

The static water level elevation in the sand pit will be about the same as the water surface elevation in the Kansas River. Sand pit lakes that are within the effective radius of influence of a water well support the water production from a well during drought conditions due to the increase of lake water storage which is 5 times greater than the water storage yield capacity of the aquifer itself. This storage yield effect is applicable to any unconsolidated aquifer. Sand pits beneficially support the yield of wells that are down-gradient from a pit that is within the area of influence of a well.

Water pumped by the sand dredge is piped to the sand separator, and then water is diverted to a sediment pond, and returned to the sand pit. Storm water runoff from local precipitation is diverted around the pit. Berms and a grass swale will be provided on the west and south sides of the sand pit for the diversion of local storm water runoff.

9. CONCLUSION

The City of Olathe was concerned about their well field more than 20 years ago when Penny Concrete and Sand proposed to open a pit next to their well field. This consultant was contacted by the City of Olathe and reviewed the situation. It was recommended to the City of Olathe at that time to maintain at least 500 feet of aquifer intact between the sand pit and any well. The sand pit shown in Appendix III, directly up-gradient from the Olathe wells has never caused any contamination to their wells. Since that time, more studies have been made both in Kansas and other states and no significant contamination of an aquifer has been attributed to a sand pit in unconsolidated alluvial aquifers.

Present regulations require 200 feet separation between a surface water source and a well to allow normal biological activity of surface water to be filtered before entering the well. It is recommended that a 300 foot set-back be maintained between the property boundary of any residence out parcel and the active dredging of sand from the pit. The recommended set back from all road right-of way is 100 feet.

It was found in this study that the proposed Penny sand pit lake that will eventually be developed in this study area will have ***absolutely no*** effect on the McElwee wells, Public Wholesale Water Supply District No. 25 or City of Eudora's wells or water supply. The threat of contamination does exist to Public Water Supply wells, but not from the proposed Penny sand mining operation, but from adjacent property to their wells.

EXHIBITS

A. Penny Sand Lawrence Facility – Area Plan

B. West to East Geologic Cross-Section along N 1500 Road

C. Distance-Drawdown Semi-Log Plot of Eudora's Wells No's 6, 7, & 8

D. Generalized Static Water Table in Area (From KGS Bull. 130, Part 1)

E. Eudora Wells Drawdown at Peak Day Pumpage of 1.4 MGD

F. Groundwater Flow Paths to Eudora Wells at 227.77 MGY Pumpage

Evaluation of Penny's Concrete and Sand LLC,

Proposed Sand Pit Operation on Ground Water

For the Lawrence Facility

For

Penny's Concrete and Sand LLC

23400 West 82nd Street

Shawnee, Kansas

By

Carl E. Nuzman, P.E., P.Hg.

Consulting Engineer/Hydrogeologist

3314 NW Huxman Road

Silver Lake, KS 66539

Phone 785 224 9929

September 12, 2012

PENNY SAND FACILITY
AREA PLAN
PREPARED 9/13/12

EXHIBIT A

SCALE: 1" = 500'

Landplan Engineering, P.A.

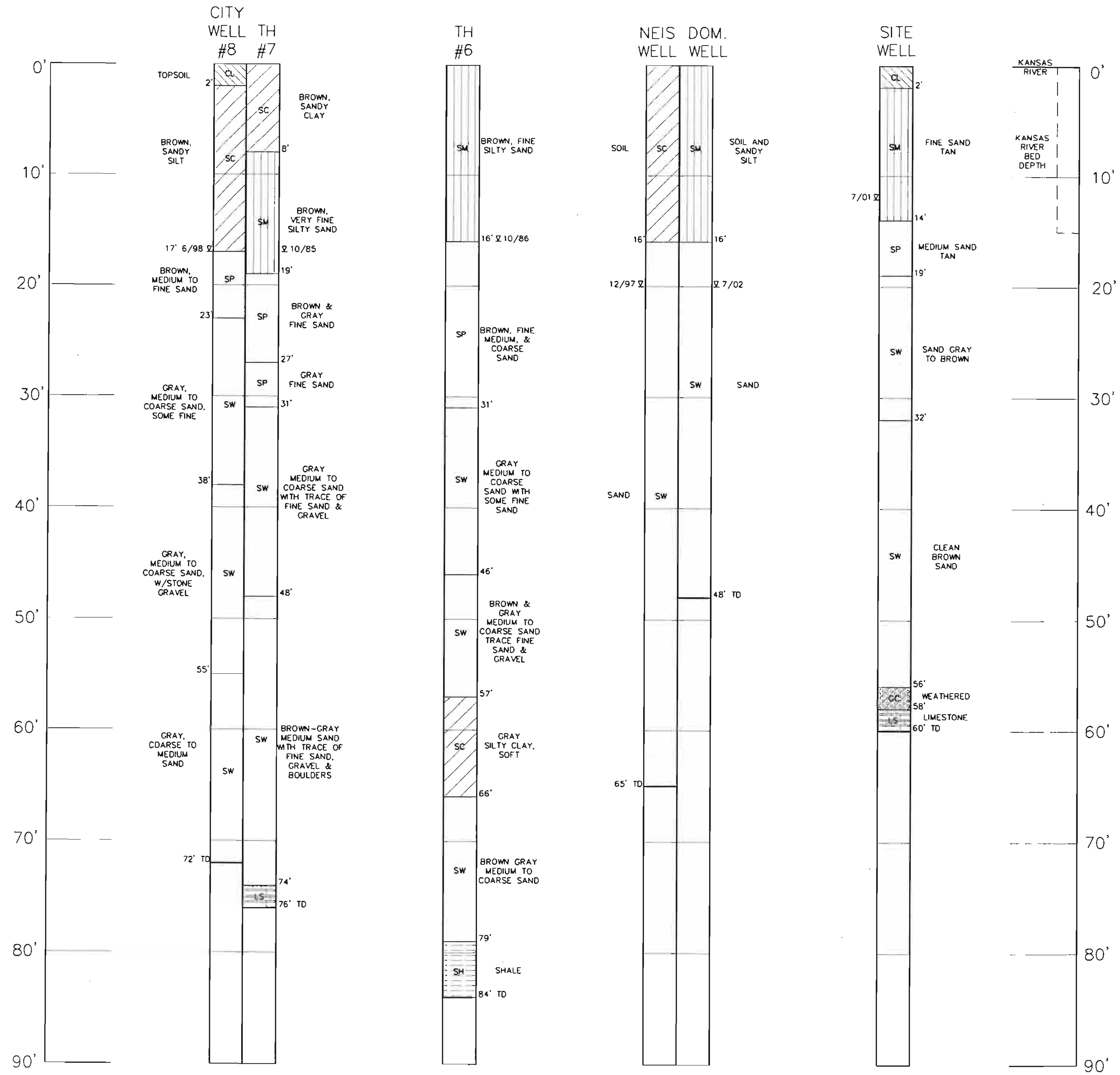


EXHIBIT B
WEST TO EAST CROSS SECTION ALONG N 1500 ROAD

PREPARED 9/13/12

SCALE: 1" = 10'

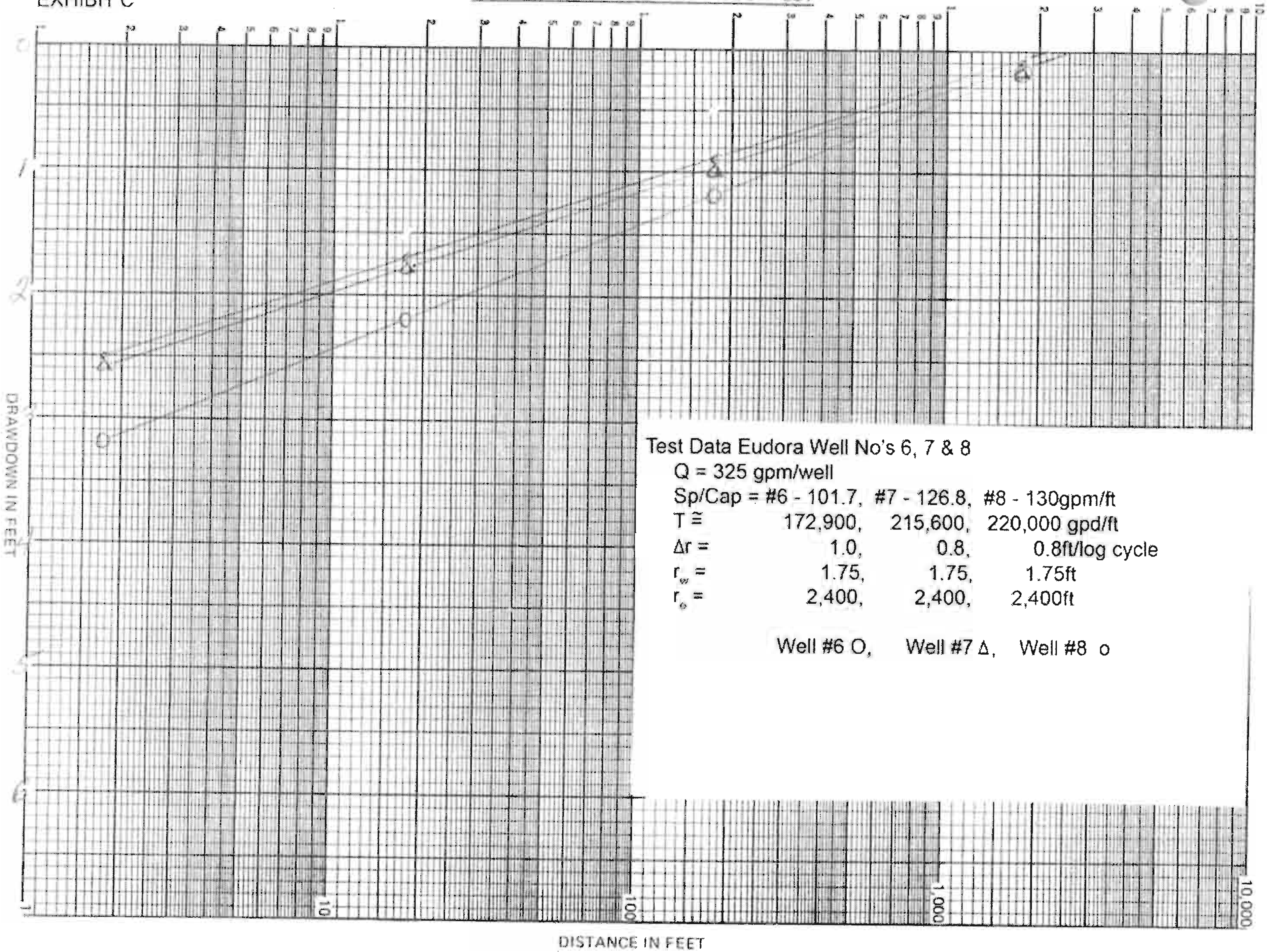
10 5 0 10 20

Civil Engineering
Landscape Architecture
Community Planning
Surveying

Landplan Engineering, P.A.
Lawrence, KS • Kansas City, MO • Columbus, OH
The Woodlands, TX • Farmington Hills, MI

EXHIBIT C

DISTANCE–DRAWDOWN SEMI–LOG PLOT



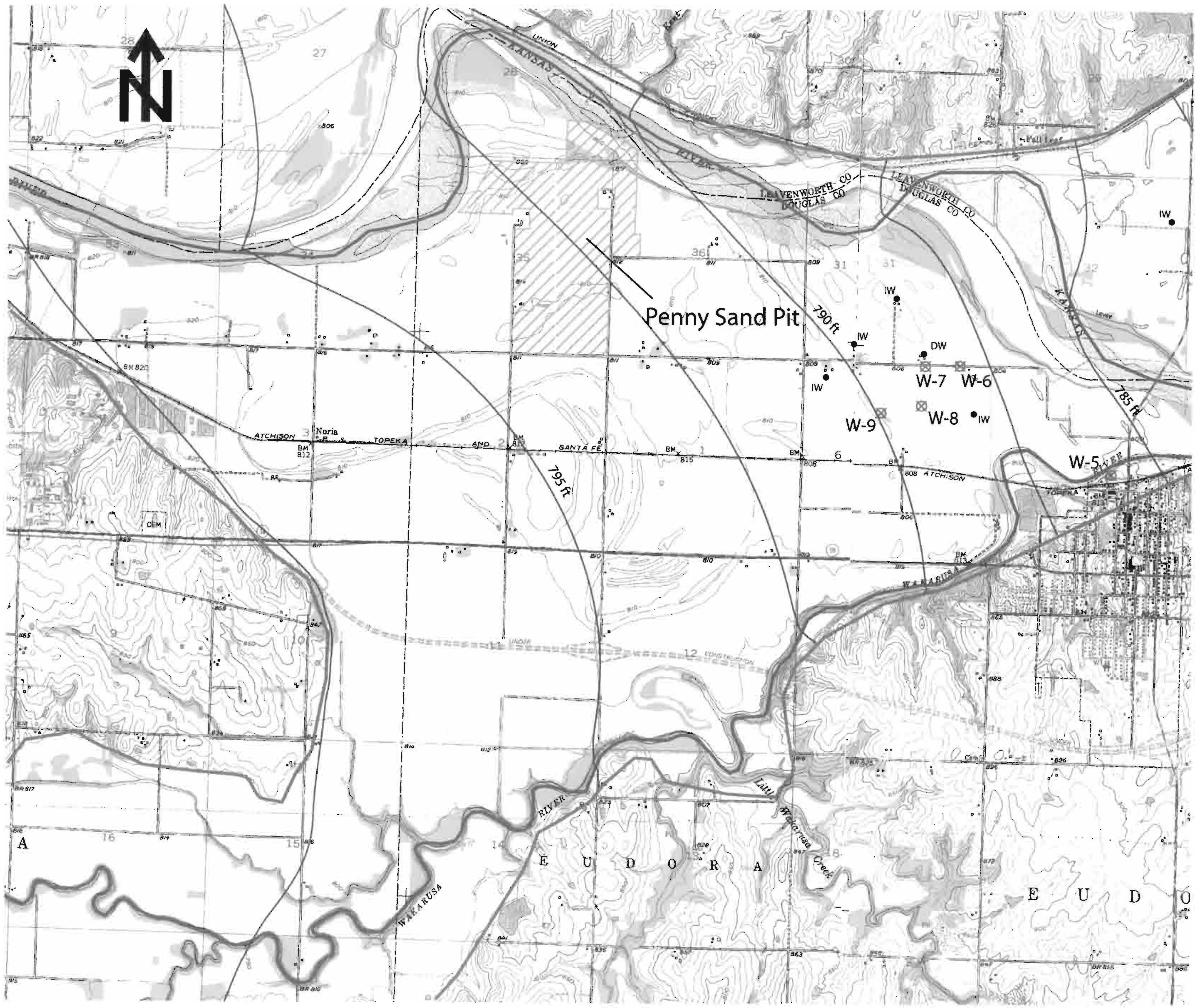


Exhibit D:

Generalized Static Water Table
(Based on data from KGS Bul. 130, Part 1)

Legend

- River
- Aquifer Boundary
- Water Table Elevation (Contour Interval 2.5 feet)
- City of Eudora Water Supply Well (W-7)
- Registered Irrigation or Domestic Well (IW, DW)

Approximate Scale

0 — 0.5 — 1.0 miles

0 — 2,640 — 5,280 feet

Exhibit E:

Eudora Wells - Drawdown at Peak Day Pumpage of 1.4 MGD

Legend

- River
- Aquifer Boundary
- Water Table Drawdown (Contour Interval 0.5 feet)
- W-7 City of Eudora Water Supply Well
- IW DW Registered Irrigation or Domestic Well

Approximate Scale

0 — 0.5 — 1.0 miles

0 — 2,640 — 5,280 feet

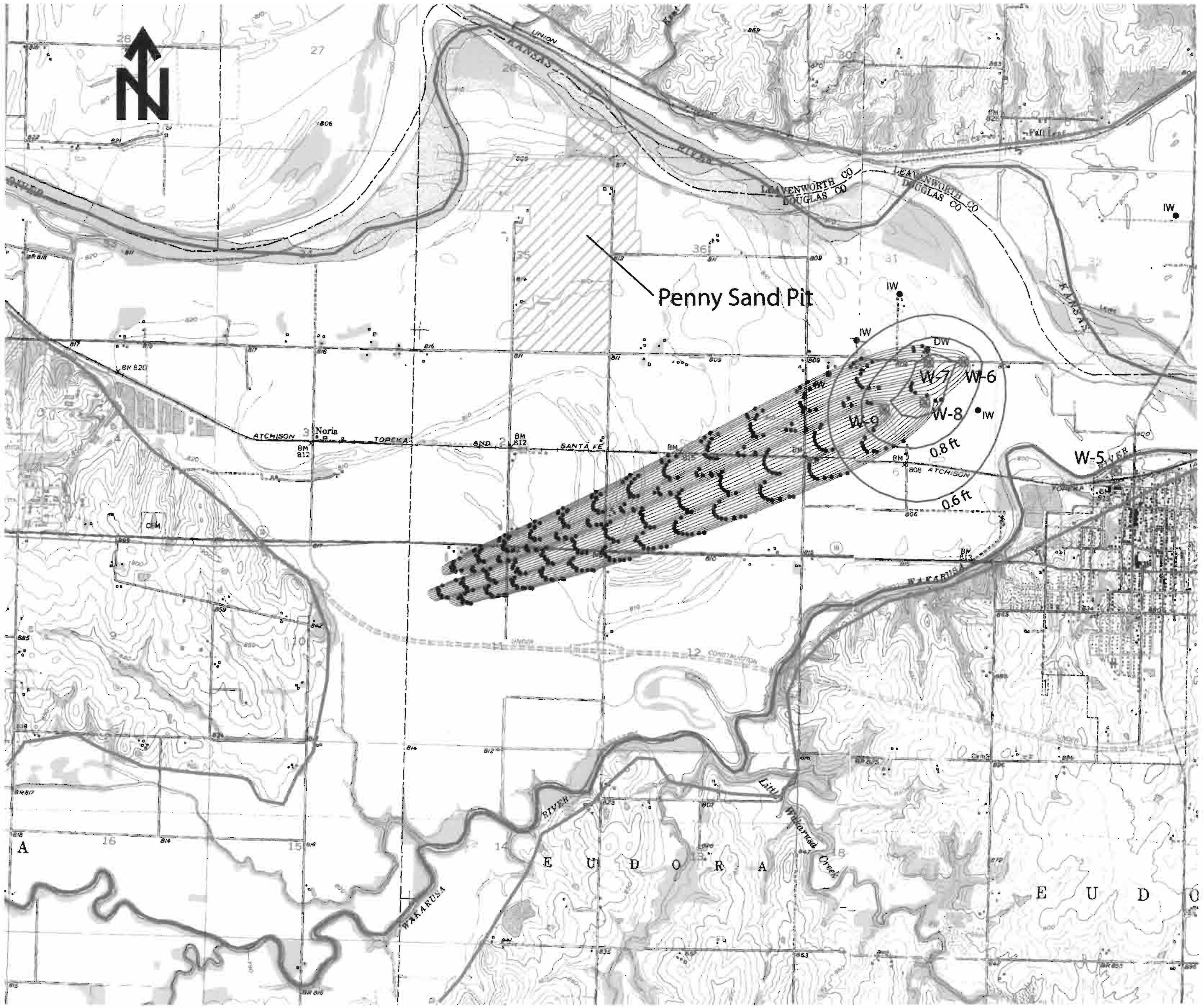


Exhibit F:

Groundwater Flow Paths to Eudora Wells at 227.77 MGY Pumpage

Legend

- River
- Aquifer Boundary
- Water Table Drawdown (Contour Interval 0.2 feet)
- Flowpaths to Pumping Wells (Tick Marks = 2 years travel time)
- City of Eudora Water Supply Well
- Registered Irrigation or Domestic Well

Approximate Scale

0 — 0.5 — 1.0 miles

0 — 2,640 — 5,280 feet

APPENDICES

I. **Selected WWC-5 Water Well Logs in Study Area**

II. **KDA, Division of Water Resources, Safe Yield Analysis Data**

III. **Potential Pollution Sources in the Area**

IV. **Carl E. Nuzman, Resume' and Personal Information**

APPENDIX I.

Selected Water Well Logs from the Kansas Geological Survey Well Log Library for Sections 34, 35, and 36 in Twp 12 South Rng 20 East, Sections 1, 2, 3, 11, and 12 in Twp 13 South Rng 20 East, Section 31 in Twp 12 South, Rng 21 East, and Sections 5 and 6 in Twp 13 South, Rng 21 East, all in Douglas County Kansas.

14 9883 TW9-09

WATER WELL RECORD — Form WWC-5

Division of Water Resources App. No.

1 LOCATION OF WATER WELL: County: Douglas

Fraction: 1/4 SE 1/4 NW 1/4 SE 1/4 — Section Number: 34 — Township No.: T 12 S — Range Number: R 20 ☒E ☐W

Street/Rural Address of Well Location; if unknown, distance & direction from nearest town or intersection: If at owner's address, check here ☐

Approximately 2 1/4 miles east of Lawrence

Global Positioning System (GPS) information:

Latitude: 38-961011 (in decimal degrees)

Longitude: -95.172574 (in decimal degrees)

Elevation: Unknown

Datum: ☐ WGS 84, ☐ NAD 83, ☒ NAD 27

Collection Method: ☒ GPS unit (Make/Model: WAAS) ☐ Digital Map/Photo, ☐ Topographic Map, ☐ Land Survey

Est. Accuracy: ☐ <3 m, ☒ 3-5 m, ☐ 5-15 m, ☐ >15 m

2 WATER WELL OWNER:

RR#, Street Address, Box #: Public Wholesale Water Supply District No. 25, 946 E 650 Rd.

City, State, ZIP Code: Lawrence, KS 66047

3 LOCATE WELL WITH AN "X" IN SECTION BOX:

N

--NW--	--NE--
--SW--	--SE-- X

W — E

S

|-----1 mile-----|

4 DEPTH OF COMPLETED WELL 56 ft.

Depth(s) Groundwater Encountered (1) ____ ft. (2) ____ ft. (3) ____ ft.

WELL'S STATIC WATER LEVEL 24.33 ft. below land surface measured on mo/day/yr 10/01/10

Pump test data: Well water was Not checked ft. after ____ hours pumping ____ gpm

EST. YIELD Unknown gpm. Well water was ____ ft. after ____ hours pumping ____ gpm

Bore Hole Diameter ____ in. to ____ ft., and ____ in. to ____ ft.

WELL WATER TO BE USED AS: ☐ Public water supply ☐ Geothermal ☐ Injection well ☐ Domestic ☐ Feedlot ☐ Oil field water supply ☐ Dewatering ☒ Other (Specify below) ☐ Irrigation ☐ Industrial ☐ Domestic-lawn & garden ☐ Monitoring well — Test Well

Was a chemical/bacteriological sample submitted to Department? ☐ Yes ☒ No

If yes, mo/day/yr sample was submitted ____

Water well disinfected? ☒ Yes ☐ No

5 TYPE OF CASING USED: ☐ Steel ☒ PVC ☐ Other ____

CASING JOINTS: ☒ Glued ☐ Clamped ☐ Welded ☐ Threaded

Casing diameter 5 in. to 34 ft., Diameter ____ in. to ____ ft., Diameter ____ in. to ____ ft.

Casing height above land surface 24 in., Weight 2.36 lbs./ft., Wall thickness or gauge No. .214

TYPE OF SCREEN OR PERFORATION MATERIAL:

☐ Steel ☐ Stainless Steel ☒ PVC ☐ Other (Specify) ____
☐ Brass ☐ Galvanized Steel ☐ None used (open hole)

SCREEN OR PERFORATION OPENINGS ARE:

☐ Continuous slot ☒ Mill slot ☐ Gauze wrapped ☐ Torch cut ☐ Drilled holes ☐ None (open hole)
☐ Louvered shutter ☐ Key punched ☐ Wire wrapped ☐ Saw cut ☐ Other (specify) ____

SCREEN-PERFORATED INTERVALS: From 34 ft. to 54 ft., From ____ ft. to ____ ft.
From ____ ft. to ____ ft., From ____ ft. to ____ ft.

GRAVEL PACK INTERVALS: From 20 ft. to 57 ft., From ____ ft. to ____ ft.
From ____ ft. to ____ ft., From ____ ft. to ____ ft.

6 GROUT MATERIAL: ☐ Neat cement ☐ Cement grout ☒ Bentonite ☐ Other ____

Grout Intervals: From ____ ft. to ____ ft., From 0 ft. to 20 ft., From ____ ft. to ____ ft.

What is the nearest source of possible contamination:

☐ Septic tank ☐ Lateral lines ☐ Pit privy ☐ Livestock pens ☐ Insecticide storage ☒ Other (specify below)
☐ Sewer lines ☐ Cesspool ☐ Sewage lagoon ☐ Fuel storage ☐ Abandoned water well
☐ Watertight sewer lines ☐ Seepage pit ☐ Feedyard ☐ Fertilizer storage ☐ Oil well/gas well — None known

Direction from well ____ Distance from well ____

FROM	TO	LITHOLOGIC LOG	FROM	TO	LITHO. LOG (cont.) or PLUGGING INTERVALS
0	3	Topsoil	54	55	Cemented sand, hard
3	14	Clay, light brown, soft, silty	55	57	Shale, gray, hard
14	31	Sand, fine to coarse			
31	38	Sand, fine to coarse, with gravel, fine,			
		with clay streaks, black			
38	41	Clay, light gray, hard			
41	52	Sand, fine to coarse, with gravel, fine to			
		medium, gray color, dirty			
52	54	Sand, fine to coarse, with gravel, fine to			
		medium, and large rock streaks			

7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was ☒ constructed, ☐ reconstructed, or ☐ plugged under my jurisdiction and was completed on (mo/day/year) 10/01/09 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 185. This Water Well Record was completed on (mo/day/year) 10/06/09 under the business name of Clarke Well & Equipment, Inc. by (signature)

INSTRUCTIONS: Use typewriter or ball point pen. *PLEASE PRESS FIRMLY* and *PRINT* clearly. Please fill in blanks and check the correct answers. Send three copies (white, blue, pink) to Kansas Department of Health and Environment, Bureau of Water, Geology Section, 1000 SW Jackson St., Suite 420, Topeka, Kansas 66612-1367. Telephone 785-296-5522. Send one copy to WATER WELL OWNER and retain one for your records. Include fee of $5.00 for each constructed well. Visit us at http://www.kdheks.gov/waterwell/index.html.

KSA 82a-1212

Check: ☐ White Copy, ☐ Blue Copy, ☐ Pink Copy

89

JR

USE TYPEWRITER OR BALL POINT PEN–PRESS FIRMLY, PRINT CLEARLY.

212

WATER WELL RECORD
KSA 82a-1201-1215

Kansas Department of Health and Environment–Division of Environment
(Water well Contractors)
Topeka, Kansas 66620

95 20599 38.97063 NE NE NE

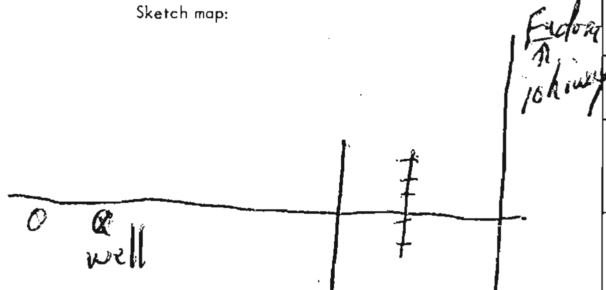
1. Location of well:	County: Douglas	Fraction: ~~S/2 SE NE~~ 1/4	Section number: 35	Township number: T 12 S	Range number: R 20 E/W

2. Distance and direction from nearest town or city: 2mi West 1¼ North of Eudora
Street address of well location if in city:

3. Owner of well: E.C. ALTENBERND
R.R. or street: R.R. 3
City, state, zip code: EUDORA KS. 66025

4. Locate with "X" in section below: N, NW, NE, W, E, SW, SE, S, 1 Mile, 1 Mile

Sketch map:



6. Bore hole dia. 10 in. Completion date Nov 15-77
Well depth 47 ft.

7. X Cable tool __ Rotary __ Driven __ Dug __ Hollow rod __ Jetted __ Bored __ Reverse rotary

8. Use: __ Domestic __ Public supply __ Industry X Irrigation __ Air conditioning __ Stock __ Lawn __ Oil field water __ Other

9. Casing: Material Steel; Height: Above or ~~below~~ Surface 12 in.
Threaded ___ Welded X; Weight 26 lbs./ft.
RMP ___ PVC ___
Dia. 0 in. to 32 ft. depth; Wall Thickness: inches or gage No. .250
Dia. ___ in. to ___ ft. depth

5. Type and color of material

Type and color of material	From	To
Top Soil	0	2
Loamy Clay	2	25
Sand Br Fine	25	27
Sand Grey - Med	27	31
Sand Clay layers	31	34
Sand Gr - Med	34	38
Sand Gr - Med - dirty	38	40
Sand Med - Fair clean	40	47

(Use a second sheet if needed)

10. Screen: Manufacturer's name Johnson
Type Stainless Dia. 10
Slot/gauze 25 Length 15
Set between 32 ft. and 47 ft.
___ ft. and ___ ft.
Gravel pack? NO Size range of material ___

11. Static water level: 23-8 ft. below land surface Date Nov 15-77 mo./day/yr.

12. Pumping level below land surfaces:
___ ft. after ___ hrs. pumping ___ g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.
Estimated maximum yield 300 + g.p.m.

13. Water sample submitted: ___ Yes NO No Date ___ mo./day/yr.

14. Well head completion: ___ Pitless adapter 12+ Inches above grade

15. Well grouted? yes
With: X Neat cement ___ Bentonite ___ Concrete
Depth: From 0 ft. to 10 ft.

16. Nearest source of possible contamination: ft. 500 Direction North Type Livestock
Well disinfected upon completion? X Yes ___ No

17. Pump: ___ Not installed
Manufacturer's name Jacuzzi
Model number 556X1 HP 5 Volts ___
Length of drop pipe 47 ft. capacity 300 g.p.m.
Type: X Submersible ___ Turbine ___ Jet ___ Reciprocating ___ Centrifugal ___ Other

18. Elevation: 811
Topography: ___ Hill ___ Slope ___ Upland X Valley

19. Remarks:

20. Water well contractor's certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Jungmann Bros Drilling co. 119
Business name / License No.
Address Carbondale KS.
Signed James B. J... Authorized representative Date 1-28-78

T 12 R 20 W Sec 35 S/2 SE NE 1/4 1/4 1/4

Forward the white, blue and pink copies to the Department of Health and Environment

Form WWC-5

BR < 764 ∇ = 787

MI-1023

USE TYPEWRITER OR BALL POINT PEN-PRESS FIRMLY, PRINT CLEARLY.

95.20596 38.96860 210

WATER WELL RECORD
KSA 82a-1201-1215

Kansas Department of Health and Environment-Division of Environment
(Water well Contractors)
Topeka, Kansas 66620

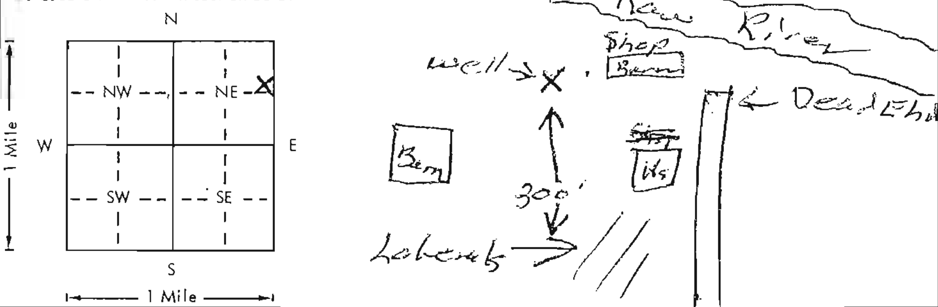
1. Location of well:	County: Douglas	Fraction: SE 1/4 NE 1/4 NE 1/4	Section number: 35	Township number: T 12 S	Range number: R 20 (E)/W

2. Distance and direction from nearest town or city: 3 mi. E.

Street address of well location if in city: Lawrence, Ks

3. Owner of well: E. C. Atterburn R.R.
R.R. or street: Eudora Ks.
City, state, zip code: 66025

4. Locate with "X" in section below: Sketch map:



6. Bore hole dia. 10-8 in. Completion date 8-25-77
Well depth 51 ft.

7. ___ Cable tool X Rotary ___ Driven ___ Dug ___ Hollow rod ___ Jetted ___ Bored ___ Reverse rotary

8. Use: X Domestic ___ Public supply ___ Industry ___ Irrigation ___ Air conditioning ___ Stock ___ Lawn ___ Oil field water ___ Other

9. Casing: Material PVC Height Above or below Surface 24 in.
Threaded ___ Welded ___ Weight 2.74 lbs./ft.
RMP ___ PVC Glue
Dia. 5 in. to 51 ft. depth Wall Thickness: inches or gage No. .258
Dia. ___ in. to ___ ft. depth

10. Screen: Manufacturer's name Pumped
Type PVC Dia. 5"
Slot/gauze .030 Length 10
Set between 41 ft. and 51 ft.
___ ft. and ___ ft.
Gravel pack? Yes Size range of material 1/4 x 1/8

11. Static water level: 12 ft. below land surface Date 8-25-77 mo./day/yr.

12. Pumping level below land surfaces: Air test
___ ft. after ___ hrs. pumping ___ g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.
Estimated maximum yield 100 g.p.m.

13. Water sample submitted: ___ Yes X No Date ___ mo./day/yr.

14. Well head completion: Top Cap
___ Pitless adapter 24 Inches above grade

15. Well grouted? Yes
With: ✓ Neat cement ___ Bentonite ___ Concrete
Depth: From 0 ft. to 10 ft.

16. Nearest source of possible contamination: ft. 300 Direction S Type laterals
Well disinfected upon completion? X Yes ___ No

17. Pump: X Not installed
Manufacturer's name ___
Model number ___ HP ___ Volts ___
Length of drop pipe ___ ft. capacity ___ g.p.m.
Type: ___ Submersible ___ Turbine ___ Jet ___ Reciprocating ___ Centrifugal ___ Other

5. Type and color of material	From	To
Top Soil Silt	0	11
Brown Fine Sand	11	15
Brown Corse Sand	15	33
Gray Med Gravel	33	38
Gray Clay	38	41
Med. Gray. Gravel	41	51
Limestone 51		

(Use a second sheet if needed)

18. Elevation:

Topography: ___ Hill ___ Slope ___ Upland X Valley

19. Remarks: Owner will Pour Slab

20. Water well contractor's certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Business name: Strader Drlg Co Inc. License No. 182
Address: Holton, Ks
Signed: [signature] Authorized representative Date 8-26-77

T 12 R 20 E Sec 35 1/4 1/4 1/4 SE NE NE

Forward the white, blue and pink copies to the Department of Health and Environment

Form WWC-5

MI-1023

WATER WELL RECORD Form WWC-5 KSA 82a-1212 ID No.

1 LOCATION OF WATER WELL: County: Douglas | Fraction: NW ¼ SW ¼ NE ¼ | Section Number: 35 | Township Number: T 12 S | Range Number: R 20E E/W

Distance and direction from nearest town or city street address of well if located within city?
3½ East of Lawrence

2 WATER WELL OWNER: Carl McElwee
RR#, St. Address, Box # : 1564 E 1850 Rd
City, State, ZIP Code : Lawrence, Ks. 66046
Board of Agriculture, Division of Water Resources Application Number:

3 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:

N
NW | NE X
W E
SW | SE
S

4 DEPTH OF COMPLETED WELL 48 ft. ELEVATION:
Depth(s) Groundwater Encountered 1 ft. 2 ft. 3 ft.
WELL'S STATIC WATER LEVEL 29' ft. below land surface measured on mo/day/yr 3-16-04
Pump test data: Well water was ft. after hours pumping gpm
Est. Yield 37 gpm: Well water was ft. after hours pumping gpm
WELL WATER TO BE USED AS: 5 Public water supply 8 Air conditioning 11 Injection well
1 Domestic 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below)
~~2 Irrigation~~ 4 Industrial 7 Domestic (lawn & garden) 10 Monitoring well

Was a chemical/bacteriological sample submitted to Department? Yes No x ; If yes, mo/day/yrs sample was submitted
Water Well Disinfected? Yes x No

5 TYPE OF BLANK CASING USED: 1 Steel 2 PVC 3 RMP (SR) 4 ABS 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass 8 Concrete tile 9 Other (specify below)
CASING JOINTS: Glued x Clamped Welded Threaded
Blank casing diameter 5" in. to ft., Dia in. to ft., Dia in. to ft.
Casing height above land surface 24" in., weight 2.82 lbs./ft. Wall thickness or guage No. .258
TYPE OF SCREEN OR PERFORATION MATERIAL: 1 Steel 2 Brass 3 Stainless Steel 4 Galvanized Steel 5 Fiberglass 6 Concrete tile 7 PVC ~~8 RMP~~ (SR) 9 ABS 10 Asbestos-Cement 11 Other (Specify) 12 None used (open hole)
SCREEN OR PERFORATION OPENINGS ARE: 1 Continuous slot 2 Louvered shutter 3 Mill slot 4 Key punched 5 Guazed wrapped 6 Wire wrapped 7 Torch cut 8 Saw cut ~~9 Drilled holes~~ 10 Other (specify) ft. 11 None (open hole)
SCREEN-PERFORATED INTERVALS: From 33 ft. to 48 ft., From ft. to ft.
From ft. to ft., From ft. to ft.
GRAVEL PACK INTERVALS: From 30 ft. to 48 ft., From ft. to ft.
From ft. to ft., From ft. to ft.

6 GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other
Grout Intervals: From ft. to 3 ft., From 30 ft. to ft., From ft. to ft.
What is the nearest source of possible contamination:
1 Septic tank 2 Sewer lines 3 Watertight sewer lines 4 Lateral lines 5 Cess pool 6 Seepage pit 7 Pit privy 8 Sewage lagoon 9 Feedyard 10 Livestock pens 11 Fuel storage 12 Fertilizer storage 13 Insecticide storage 14 Abandoned water well 15 Oil well/Gas well 16 Other (specify below)
Direction from well? North How many feet? 125'

FROM	TO	LITHOLOGIC LOG	FROM	TO	PLUGGING INTERVALS
0	2	top soil			
2	11	clay brown/silty			
11	24	brown clay			
24	34	brown fine sand			
34	38	fine/course sand med pea brown			
38	42	fine/course sand med pea brown/grey/gren			
42	42½	grey clay			
42½	48	fine sand brown/grey/green/boulders			

7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) 4-16-04 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's Licence No 182 This Water Well Record was completed on (mo/day/yr) 4-16-04 under the business name of Strader Drilling. Co.,Inc. by (signature) Jim Strader

INSTRUCTIONS: Use typewriter or ball point pen. *PLEASE PRESS FIRMLY* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Geology Section, 1000 SW Jackson St., Suite 420, Topeka, Kansas 66612-1367. Telephone 785-296-5522. Send one to WATER WELL OWNER and retain one for your records. Fee of $5.00 for each constructed well.

WATER WELL RECORD Form WWC-5 KSA 82a-1212

1 LOCATION OF WATER WELL: County: Douglas | Fraction: SW ¼ SW ¼ NE ¼ | Section Number: 36 | Township Number: T 12 S | Range Number: R 20 E/W (E circled)

Distance and direction from nearest town or city street address of well if located within city? $1\frac{1}{2}$ west, $1\frac{1}{2}$ north of Eudora

2 WATER WELL OWNER: James Waller
RR#, St. Address, Box # : 1964 N. 1550 Rd.
City, State, ZIP Code : Eudora, KS 66025
Board of Agriculture, Division of Water Resources
Application Number:

3 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:

	N	
W	NW / NE (X in SW corner of NE)	E
	SW / SE	
	S	

1 Mile

4 DEPTH OF COMPLETED WELL 40' ft. ELEVATION:
Depth(s) Groundwater Encountered 1. ft. 2. ft. 3. ft
WELL'S STATIC WATER LEVEL 24' ft. below land surface measured on mo/day/yr 9/06/96
Pump test data: Well water was ft. after hours pumping gpm
Est. Yield 40 gpm: Well water was ft. after hours pumping gpm
Bore Hole Diameter 12" in. to ft., and in. to ft.
WELL WATER TO BE USED AS: 5 Public water supply 8 Air conditioning 11 Injection well
1 Domestic (underlined) 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below)
2 Irrigation 4 Industrial 7 Lawn and garden only 10 Monitoring well
Was a chemical/bacteriological sample submitted to Department? Yes No X ; If yes, mo/day/yr sample was submitted
Water Well Disinfected? Yes X No

5 TYPE OF BLANK CASING USED: 1 Steel 2 PVC (underlined) 3 RMP (SR) 4 ABS 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass 8 Concrete tile 9 Other (specify below)
CASING JOINTS: Glued X Clamped Welded Threaded
Blank casing diameter 5" in. to 0-30 ft., Dia in. to ft., Dia in. to ft.
Casing height above land surface 24" in., weight 2.82 lbs./ft. Wall thickness or gauge No. .258
TYPE OF SCREEN OR PERFORATION MATERIAL: 1 Steel 2 Brass 3 Stainless steel 4 Galvanized steel 5 Fiberglass 6 Concrete tile 7 PVC (underlined) 8 RMP (SR) 9 ABS 10 Asbestos-cement 11 Other (specify) 12 None used (open hole)
SCREEN OR PERFORATION OPENINGS ARE: 1 Continuous slot 2 Louvered shutter 3 Mill slot 4 Key punched 5 Gauzed wrapped 6 Wire wrapped 7 Torch cut 8 Saw cut (underlined) 9 Drilled holes 10 Other (specify) 11 None (open hole)
SCREEN-PERFORATED INTERVALS: From 30 ft. to 40 ft., From ft. to ft.
From ft. to ft., From ft. to ft.
GRAVEL PACK INTERVALS: From 24 ft. to 40 ft., From ft. to ft.
From ft. to ft., From ft. to ft.

6 GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite (underlined) 4 Other
Grout Intervals: From 4 ft. to 24 ft., From ft. to ft., From ft. to ft.
What is the nearest source of possible contamination:
1 Septic tank (underlined) 2 Sewer lines (underlined) 3 Watertight sewer lines 4 Lateral lines 5 Cess pool 6 Seepage pit 7 Pit privy 8 Sewage lagoon 9 Feedyard 10 Livestock pens 11 Fuel storage 12 Fertilizer storage 13 Insecticide storage 14 Abandoned water well 15 Oil well/Gas well 16 Other (specify below)
Direction from well? north How many feet? 200'

FROM	TO	LITHOLOGIC LOG	FROM	TO	PLUGGING INTERVALS
0	4	Top Soil			
4	15	Clay-Brown-Silty			
15	33	Fine Sand-Brown			
33	39	FS-CS-Med Gravel-Brown			
39	40	FS-CS-Med Gravel-Blue			

7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) 9/06/96 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 182 This Water Well Record was completed on (mo/day/yr) 10-9-96 under the business name of STRADER DRILLING CO., INC. by (signature) Dale Askren

INSTRUCTIONS: Use typewriter or ball point pen. *PLEASE PRESS FIRMLY* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone: 913-296-5545. Send one to WATER WELL OWNER and retain one for your records.

95, 12.4941 38.9?

WATER WELL RECORD Form WWC-5 KSA 82a-1212

1 LOCATION OF WATER WELL
County: Douglas
Fraction: NE ¼ NE ¼ NE ¼
Section Number: 1
Township Number: T 13 S
Range Number: R 20 E/W

Distance and direction from nearest town or city? 1 W .5 N of Eudora
Street address of well if located within city?

2 WATER WELL OWNER: Howard whaley
RR#, St. Address, Box # : RR2
City, State, ZIP Code : Eudora, Kansas 66025

Board of Agriculture, Division of Water Resource
Application Number:

3 DEPTH OF COMPLETED WELL 50 ft. Bore Hole Diameter 12 in. to ft., and in. to ft

Well Water to be used as: 1 Domestic 3 Feedlot 5 Public water supply 8 Air conditioning 11 Injection well 2 Irrigation 4 Industrial 6 Oil field water supply 9 Dewatering 12 Other (Specify below) 7 Lawn and garden only 10 Observation well

Well's static water level 30 ft. below land surface measured on December month 19 day 1979 year

Pump Test Data : Well water was ft. after hours pumping gpm
Est. Yield 100 gpm: Well water was ft. after hours pumping gpm

4 TYPE OF BLANK CASING USED: 1 Steel 2 PVC 3 RMP (SR) 4 ABS 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass 8 Concrete tile 9 Other (specify below)

Casing Joints: Glued ✓ Clamped Welded Threaded

Blank casing dia 5 in. to 0-40 ft., Dia in. to ft., Dia in. to f

Casing height above land surface 24 in., weight 2.89 lbs./ft. Wall thickness or gauge No .258

TYPE OF SCREEN OR PERFORATION MATERIAL: 1 Steel 2 Brass 3 Stainless steel 4 Galvanized steel 5 Fiberglass 6 Concrete tile 7 PVC 8 RMP (SR) 9 ABS 10 Asbestos-cement 11 Other (specify) 12 None used (open hole)

Screen or Perforation Openings Are: 1 Continuous slot 2 Louvered shutter 3 Mill slot 4 Key punched 5 Gauzed wrapped 6 Wire wrapped 7 Torch cut 8 Saw cut 9 Drilled holes 10 Other (specify) 11 None (open hole)

Screen-Perforation Dia 5 in. to ft., Dia in. to ft., Dia in to f

Screen-Perforated Intervals: From 40 ft. to 50 ft., From ft. to f
From ft. to ft., From ft. to f

Gravel Pack Intervals: From 10 ft. to 50 ft., From ft. to f
From ft. to ft., From ft. to f

5 GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other

Grouted Intervals: From 0 ft. to 10 ft., From ft. to ft., From ft. to f

What is the nearest source of possible contamination: 1 Septic tank 2 Sewer lines 3 Lateral lines 4 Cess pool 5 Seepage pit 6 Pit privy 7 Sewage lagoon 8 Feed yard 9 Livestock pens 10 Fuel storage 11 Fertilizer storage 12 Insecticide storage 13 Watertight sewer lines 14 Abandoned water well 15 Oil well/Gas well 16 Other (specify below)

Direction from well NORTH How many feet 200 ? Water Well Disinfected? Yes ✓ No

Was a chemical/bacteriological sample submitted to Department? Yes No ✓ : If yes, date sample was submitted month day year: Pump Installed? Yes No ✓

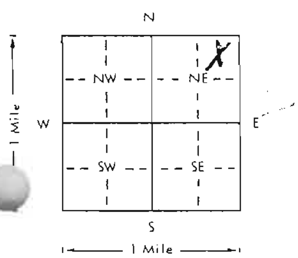
If Yes: Pump Manufacturer's name Model No. HP Volts

Depth of Pump Intake ft. Pumps Capacity rated at gal./min

Type of pump: 1 Submersible 2 Turbine 3 Jet 4 Centrifugal 5 Reciprocating 6 Other

6 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and wa completed on December month 19 day 1979 yea and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 182. This Water Well Record was completed on December month 26 day 1979 year under the busines name of STRADER Drlg Co, Inc. by (signature) Dale Askren

7 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:



ELEVATION:

FROM	TO	LITHOLOGIC LOG	FROM	TO	LITHOLOGIC LOG
0	6	Top Soil			
6	20	Clay			
20	38	Fine Sand			
38	50	Course Sand, gravel			

Depth(s) Groundwater Encountered 1. 30 ft. 2 ft. 3 ft. 4 ft. (Use a second sheet if needed)

INSTRUCTIONS: Use typewriter or ball point-pen, *please press firmly* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Division of Environment, Water Well Contractors, Topeka, KS 66620. Send one to WATER WELL OWNER and retain one for your records.

WATER WELL RECORD Form WWC-5 KSA 82a-1212 ID No. ____

1 LOCATION OF WATER WELL:	Fraction	Section Number	Township Number	Range Number
County: Douglas	NW ¼ NW ¼ NW ¼	1	T 13 S	R 20E E/W

Distance and direction from nearest town or city street address of well if located within city?
1 mile north 2½ miles west of Eudora 1919 N. 1500Rd. Eudora 66025

2 WATER WELL OWNER: Virginia Strong
RR#, St. Address, Box #: 3712 Trail Rd.
City, State, ZIP Code: Lawrence, KS. 66049
Board of Agriculture, Division of Water Resources
Application Number:

3 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX: (X in NW quarter; N, S, E, W; NW, NE, SW, SE; 1 Mile)

4 DEPTH OF COMPLETED WELL 52 ft. ELEVATION: ....
Depth(s) Groundwater Encountered 1. .... ft. 2. .... ft. 3. .... ft.
WELL'S STATIC WATER LEVEL 27 ft. below land surface measured on mo/day/yr 6-21-2001
Pump test data: Well water was .... ft. after .... hours pumping .... gpm
Est. Yield 50 gpm: Well water was .... ft. after .... hours pumping .... gpm
Bore Hole Diameter 12 in. to .... ft., and .... in. to .... ft.
WELL WATER TO BE USED AS: 5 Public water supply 8 Air conditioning 11 Injection well
1 Domestic 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below)
2 Irrigation 4 Industrial 7 Domestic (lawn & garden) 10 Monitoring well ....
Was a chemical/bacteriological sample submitted to Department? Yes .... No X ; If yes, mo/day/yrs sample was submitted
Water Well Disinfected? Yes X No

5 TYPE OF BLANK CASING USED: 5 Wrought iron 8 Concrete tile CASING JOINTS: Glued X Clamped ....
1 Steel 3 RMP (SR) 6 Asbestos-Cement 9 Other (specify below) Welded ....
2 PVC 4 ABS 7 Fiberglass Threaded ....
Blank casing diameter 5 in. to .... ft., Dia .... in. to .... ft., Dia .... in. to .... ft
Casing height above land surface 24 in., weight 2.82 lbs./ft. Wall thickness or gauge No. .258
TYPE OF SCREEN OR PERFORATION MATERIAL: 7 PVC 10 Asbestos-cement
1 Steel 3 Stainless steel 5 Fiberglass 8 RMP (SR) 11 Other (specify) ....
2 Brass 4 Galvanized steel 6 Concrete tile 9 ABS 12 None used (open hole)
SCREEN OR PERFORATION OPENINGS ARE: 5 Gauzed wrapped 8 Saw cut 11 None (open hole)
1 Continuous slot 3 Mill slot 6 Wire wrapped 9 Drilled holes
2 Louvered shutter 4 Key punched 7 Torch cut 10 Other (specify) .... ft.
SCREEN-PERFORATED INTERVALS: From 36 ft. to 52 ft., From .... ft. to .... ft.
From .... ft. to .... ft., From .... ft. to .... ft.
GRAVEL PACK INTERVALS: From 27 ft. to 52 ft., From .... ft. to .... ft.
From .... ft. to .... ft., From .... ft. to .... ft.

6 GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other ....
Grout Intervals: From 4 ft. to 27 ft., From .... ft. to .... ft., From .... ft. to .... ft.
What is the nearest source of possible contamination: 10 Livestock pens 14 Abandoned water well
1 Septic tank 4 Lateral lines 7 Pit privy 11 Fuel storage 15 Oil well/Gas well
2 Sewer lines 5 Cess pool 8 Sewage lagoon 12 Fertilizer storage 16 Other (specify below)
3 Watertight sewer lines 6 Seepage pit 9 Feedyard 13 Insecticide storage ....
Direction from well? West How many feet? 210

FROM	TO	LITHOLOGIC LOG	FROM	TO	PLUGGING INTERVALS
0	10	brown silt			
10	18	brown clay			
18	28	brown silt			
28	30	brown fine sand course sand			
30	38	brown fine sand			
38	40	brown fine sand course sand med gravel			
40	41	blue clay			
41	52	grey fine sand			

7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) 6-21-2001 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's Licence No. 182 This Water Well Record was completed on (mo/day/yr) 7-2-2001
under the business name of Strader Drilling Co., Inc. by (signature) [signature]

INSTRUCTIONS: Use typewriter or ball point pen. *PLEASE PRESS FIRMLY* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone 785-296-5524. Send one to WATER WELL OWNER and retain one for your records. Fee of $5.00 for each constructed well.

WATER WELL RECORD Form WWC-5 KSA 82a-1212

1 LOCATION OF WATER WELL: County: DOUGLAS | Fraction: NW ¼ SW ¼ SW ¼ | Section Number: 1 | Township Number: T 13 S | Range Number: R 20 E/W

Distance and direction from nearest town or city street address of well if located within city? 2 west of Eudora

2 WATER WELL OWNER: Harold Boehle
RR#, St. Address, Box # : 1420 E. 1900 Rd.
City, State, ZIP Code : Eudora, KS 66025
Board of Agriculture, Division of Water Resources
Application Number:

3 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX: N, W, E, S; NW, NE, SW (X), SE; 1 Mile

4 DEPTH OF COMPLETED WELL 50' ft. ELEVATION:
Depth(s) Groundwater Encountered 1. ft. 2. ft. 3. ft.
WELL'S STATIC WATER LEVEL 22' ft. below land surface measured on mo/day/yr 2-15-93
Pump test data: Well water was ft. after hours pumping gpm
Est. Yield 50 gpm: Well water was ft. after hours pumping gpm
Bore Hole Diameter 12" in. to ft., and in. to
WELL WATER TO BE USED AS: 5 Public water supply 8 Air conditioning 11 Injection well
1 Domestic 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below)
2 Irrigation 4 Industrial 7 Lawn and garden only 10 Monitoring well
Was a chemical/bacteriological sample submitted to Department? Yes........No......X...; If yes, mo/day/yr sample was submitted
Water Well Disinfected? Yes X No

5 TYPE OF BLANK CASING USED: 1 Steel 2 PVC 3 RMP (SR) 4 ABS 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass 8 Concrete tile 9 Other (specify below)
CASING JOINTS: Glued X Clamped Welded Threaded
Blank casing diameter 5" in. to 0-40 ft., Dia in. to ft., Dia in. to
Casing height above land surface 24" in., weight 2.82 lbs./ft. Wall thickness or gauge No. .258
TYPE OF SCREEN OR PERFORATION MATERIAL: 1 Steel 2 Brass 3 Stainless steel 4 Galvanized steel 5 Fiberglass 6 Concrete tile 7 PVC 8 RMP (SR) 9 ABS 10 Asbestos-cement 11 Other (specify) 12 None used (open hole)
SCREEN OR PERFORATION OPENINGS ARE: 1 Continuous slot 2 Louvered shutter 3 Mill slot 4 Key punched 5 Gauzed wrapped 6 Wire wrapped 7 Torch cut 8 Saw cut 9 Drilled holes 10 Other (specify) 11 None (open hole)
SCREEN-PERFORATED INTERVALS: From 40 ft. to 50 ft., From ft. to
From ft. to ft., From ft. to
GRAVEL PACK INTERVALS: From 24 ft. to 50 ft., From ft. to
From ft. to ft., From ft. to

6 GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other
Grout Intervals: From 4 ft. to 24 ft., From ft. to ft., From ft. to
What is the nearest source of possible contamination:
1 Septic tank 2 Sewer lines 3 Watertight sewer lines 4 Lateral lines 5 Cess pool 6 Seepage pit 7 Pit privy 8 Sewage lagoon 9 Feedyard 10 Livestock pens 11 Fuel storage 12 Fertilizer storage 13 Insecticide storage 14 Abandoned water well 15 Oil well/Gas well 16 Other (specify below)
Direction from well? south How many feet? 100'

FROM	TO	LITHOLOGIC LOG	FROM	TO	PLUGGING INTERVALS
0	6	Top Soil			
6	30	Clay-Brown-Silty			
30	35	Fine SAnd-Coarse Sand-Blue			
35	41	Fine Sand-Blue			
41	47	Fine Sand-Coarse Sand-Brown			
47	48	Clay-Blue			
48	50	Fine Sand-Coarse Sand-Med Gravel-Brown			

7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) 2-15-93 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 182 This Water Well Record was completed on (mo/day/yr) 4-7-93 under the business name of STRADER DRILLING CO., INC. by (signature) Dale Askren

INSTRUCTIONS: Use typewriter or ball point pen. *PLEASE PRESS FIRMLY* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone: 913-296-5545. Send one to WATER WELL OWNER and retain one for your records.

WATER WELL RECORD Form WWC-5 KSA 82a-1212

1 LOCATION OF WATER WELL: County: DOUGLAS | Fraction: NE 1/4 NE 1/4 NW 1/4 | Section Number: 2 | Township Number: T 13 S | Range Number: R 20 E/W (E circled)

Distance and direction from nearest town or city street address of well if located within city?
2 miles east of Lawrence @ 1837 N. 1500 Rd.

2 WATER WELL OWNER: Jeff Wallace
RR#, St. Address, Box #: 1201 E. 13th
City, State, ZIP Code: Lawrence, KS 66044
Board of Agriculture, Division of Water Resources
Application Number:

3 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:
N
NW (X) | NE
SW | SE
W — E — S — 1 Mile

4 DEPTH OF COMPLETED WELL 52' ft. ELEVATION:
Depth(s) Groundwater Encountered 1. ft. 2. ft. 3. ft.
WELL'S STATIC WATER LEVEL 30' ft. below land surface measured on mo/day/yr 2/24/98
Pump test data: Well water was ft. after hours pumping gpm
Est. Yield 50 gpm: Well water was ft. after hours pumping gpm
Bore Hole Diameter 12" in. to ft., and in. to ft.
WELL WATER TO BE USED AS: 5 Public water supply 8 Air conditioning 11 Injection well
1 Domestic (underlined) 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below)
2 Irrigation 4 Industrial 7 Lawn and garden only 10 Monitoring well
Was a chemical/bacteriological sample submitted to Department? Yes No X; If yes, mo/day/yr sample was submitted
Water Well Disinfected? Yes X No

5 TYPE OF BLANK CASING USED: 1 Steel 2 PVC (underlined) 3 RMP (SR) 4 ABS 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass 8 Concrete tile 9 Other (specify below)
CASING JOINTS: Glued X Clamped Welded Threaded
Blank casing diameter 5" in. to 0-45 ft., Dia in. to ft., Dia in. to ft.
Casing height above land surface 24" in., weight 2.82 lbs./ft. Wall thickness or gauge No. .258
TYPE OF SCREEN OR PERFORATION MATERIAL: 1 Steel 2 Brass 3 Stainless steel 4 Galvanized steel 5 Fiberglass 6 Concrete tile 7 PVC (underlined) 8 RMP (SR) 9 ABS 10 Asbestos-cement 11 Other (specify) 12 None used (open hole)
SCREEN OR PERFORATION OPENINGS ARE: 1 Continuous slot 2 Louvered shutter 3 Mill slot 4 Key punched 5 Gauzed wrapped 6 Wire wrapped 7 Torch cut 8 Saw cut (underlined) 9 Drilled holes 10 Other (specify) 11 None (open hole)
SCREEN-PERFORATED INTERVALS: From 45 ft. to 52 ft., From ft. to ft.
From ft. to ft., From ft. to ft.
GRAVEL PACK INTERVALS: From 30 ft. to 52 ft., From ft. to ft.
From ft. to ft., From ft. to ft.

6 GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite (underlined) 4 Other
Grout Intervals: From 4 ft. to 30 ft., From ft. to ft., From ft. to ft.
What is the nearest source of possible contamination:
1 Septic tank 2 Sewer lines (underlined) 3 Watertight sewer lines 4 Lateral lines 5 Cess pool 6 Seepage pit 7 Pit privy 8 Sewage lagoon 9 Feedyard 10 Livestock pens 11 Fuel storage 12 Fertilizer storage 13 Insecticide storage 14 Abandoned water well 15 Oil well/Gas well 16 Other (specify below)
Direction from well? south How many feet? 50'

FROM	TO	LITHOLOGIC LOG	FROM	TO	PLUGGING INTERVALS
0	4	Top Soil			
4	15	Clay-Brown-Silty			
15	27	Silt-Brown			
27	31	Fine Sand-Brown			
31	32	Clay-Blue			
32	35	Fine Silt-Brown			
35	39	Clay-Brown			
39	41	Fine Sand-Brown			
41	47	Fine Sand-Coarse Sand-Brown			
47	52	Fine Sand-Coarse Sand-Med-Pea Brown			

7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) 2/24/98 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 182 This Water Well Record was completed on (mo/day/yr) 3-4-98 under the business name of STRADER DRILLING CO., INC. by (signature) Dale Oakren

INSTRUCTIONS: Use typewriter or ball point pen. *PLEASE PRESS FIRMLY* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone: 913-296-5545. Send one to WATER WELL OWNER and retain one for your records.

WATER WELL RECORD Form WWC-5 KSA 82a-1212

1 LOCATION OF WATER WELL:	Fraction	Section Number	Township Number	Range Number
County: DOUGLAS	NW 1/4 NW 1/4 NE 1/4	11	T 13 S	R 20 E/W

Distance and direction from nearest town or city street address of well if located within city?
2½ miles east of Lawrence

2 WATER WELL OWNER: Daniel E. Lynch
RR#, St. Address, Box #: 642 N. 9th
City, State, ZIP Code: Lawrence, KS 66044

Board of Agriculture, Division of Water Resources
Application Number:

3 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX: X in NE quarter (N, S, E, W; NW, NE, SW, SE; 1 Mile)

4 DEPTH OF COMPLETED WELL 60' ft. ELEVATION:
Depth(s) Groundwater Encountered 1. ft. 2. ft. 3. ft.
WELL'S STATIC WATER LEVEL 32' ft. below land surface measured on mo/day/yr 04/13/98
Pump test data: Well water was ft. after hours pumping gpm
Est. Yield 50 gpm: Well water was ft. after hours pumping gpm
Bore Hole Diameter 10" in. to ft., and in. to ft.
WELL WATER TO BE USED AS: 5 Public water supply 8 Air conditioning 11 Injection well
1 Domestic 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below)
2 Irrigation 4 Industrial 7 Lawn and garden only 10 Monitoring well
Was a chemical/bacteriological sample submitted to Department? Yes No X; If yes, mo/day/yr sample was submitted
Water Well Disinfected? Yes X No

5 TYPE OF BLANK CASING USED: 1 Steel 2 PVC 3 RMP (SR) 4 ABS 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass 8 Concrete tile 9 Other (specify below)
CASING JOINTS: Glued X Clamped Welded Threaded
Blank casing diameter 5" in. to 0-55 ft., Dia in. to ft., Dia in. to ft.
Casing height above land surface 24" in., weight 2.82 lbs./ft. Wall thickness or gauge No. .258
TYPE OF SCREEN OR PERFORATION MATERIAL: 1 Steel 2 Brass 3 Stainless steel 4 Galvanized steel 5 Fiberglass 6 Concrete tile 7 PVC 8 RMP (SR) 9 ABS 10 Asbestos-cement 11 Other (specify) 12 None used (open hole)
SCREEN OR PERFORATION OPENINGS ARE: 1 Continuous slot 2 Louvered shutter 3 Mill slot 4 Key punched 5 Gauzed wrapped 6 Wire wrapped 7 Torch cut 8 Saw cut 9 Drilled holes 10 Other (specify) 11 None (open hole)
SCREEN-PERFORATED INTERVALS: From ~~XX~~ 55 ft. to ~~XXX~~ 60 ft., From ft. to ft.
From ft. to ft., From ft. to ft.
GRAVEL PACK INTERVALS: From 32 ft. to 60 ft., From ft. to ft.
From ft. to ft., From ft. to ft.

6 GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other
Grout Intervals: From 4 ft. to 32 ft., From ft. to ft., From ft. to ft.
What is the nearest source of possible contamination:
1 Septic tank 2 Sewer lines 3 Watertight sewer lines 4 Lateral lines 5 Cess pool 6 Seepage pit 7 Pit privy 8 Sewage lagoon 9 Feedyard 10 Livestock pens 11 Fuel storage 12 Fertilizer storage 13 Insecticide storage 14 Abandoned water well 15 Oil well/Gas well 16 Other (specify below)
Direction from well? East How many feet? 100'

FROM	TO	LITHOLOGIC LOG	FROM	TO	PLUGGING INTERVALS
0	3	Top Soil			
3	23	Clay-Brown-Silty			
23	26	Clay-Dark Brown			
26	52	Clay-Grey			
52	60	FS-Cs-Med-Pea Chert 1/4x3/8-Brown			

7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) 4/13/98 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 182 This Water Well Record was completed on (mo/day/yr) 4-23-98 under the business name of STRADER DRILLING CO., INC. by (signature) Dale Askren

INSTRUCTIONS: Use typewriter or ball point pen. *PLEASE PRESS FIRMLY* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone: 913-296-5545. Send one to WATER WELL OWNER and retain one for your records.

95.14157 38.93148 WATER WELL RECORD Form WWC-5 KSA 82a-1212

1 LOCATION OF WATER WELL: County: DOUGLAS | Fraction: SW ¼ NE ¼ SW ¼ | Section Number: 12 | Township Number: T 13 S | Range Number: R 20 E/W

Distance and direction from nearest town or city street address of well if located within city? 1 3/4 west of Eudora

2 WATER WELL OWNER: Jeff Gazaway
RR#, St. Address, Box # : 15007 W. 85th Terrace (File #40333)
City, State, ZIP Code : Lenexa, KS 66215
Board of Agriculture, Division of Water Resources
Application Number:

3 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX: N, S, E, W; NW, NE, SW (X), SE; 1 Mile

4 DEPTH OF COMPLETED WELL 68 ft. ELEVATION:
Depth(s) Groundwater Encountered 1. ft. 2. ft. 3. ft.
WELL'S STATIC WATER LEVEL 27' ft. below land surface measured on mo/day/yr 8-23-91
Pump test data: Well water was ft. after hours pumping gpm
Est. Yield 300 gpm: Well water was ft. after hours pumping gpm
Bore Hole Diameter 22" in. to ft., and in. to ft.
WELL WATER TO BE USED AS: 5 Public water supply 8 Air conditioning 11 Injection well 1 Domestic 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below) 2 Irrigation 4 Industrial 7 Lawn and garden only 10 Monitoring well
Was a chemical/bacteriological sample submitted to Department? Yes ... No X ; If yes, mo/day/yr sample was submitted
Water Well Disinfected? Yes X No

5 TYPE OF BLANK CASING USED: 1 Steel 2 PVC 3 RMP (SR) 4 ABS 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass 8 Concrete tile 9 Other (specify below)
CASING JOINTS: Glued ... Clamped ... Welded X ... Threaded ...
Blank casing diameter 12" in. to 0-58 ft., Dia in. to ft., Dia in. to ft
Casing height above land surface 28" in., weight 49 lbs./ft. Wall thickness or gauge No. .375
TYPE OF SCREEN OR PERFORATION MATERIAL: 1 Steel 2 Brass 3 Stainless steel 4 Galvanized steel 5 Fiberglass 6 Concrete tile 7 PVC 8 RMP (SR) 9 ABS 10 Asbestos-cement 11 Other (specify) 12 None used (open hole)
SCREEN OR PERFORATION OPENINGS ARE: 1 Continuous slot 2 Louvered shutter 3 Mill slot 4 Key punched 5 Gauzed wrapped 6 Wire wrapped 7 Torch cut Johnson .125 8 Saw cut 9 Drilled holes 10 Other (specify) 11 None (open hole)
SCREEN-PERFORATED INTERVALS: From 58 ft. to 68 ft., From ft. to ft.
From ft. to ft., From ft. to ft.
GRAVEL PACK INTERVALS: From 25 ft. to 68 ft., From ft. to ft.
From ft. to ft., From ft. to ft.

6 GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other
Grout Intervals: From 0 ft. to 25 ft., From ft. to ft., From ft. to ft.
What is the nearest source of possible contamination: 1 Septic tank 2 Sewer lines 3 Watertight sewer lines 4 Lateral lines 5 Cess pool 6 Seepage pit 7 Pit privy 8 Sewage lagoon 9 Feedyard 10 Livestock pens 11 Fuel storage 12 Fertilizer storage 13 Insecticide storage 14 Abandoned water well 15 Oil well/Gas well 16 Other (specify below)
Direction from well? west How many feet? 420'

FROM	TO	LITHOLOGIC LOG	FROM	TO	PLUGGING INTERVALS
0	3	Top Soil			
3	29	Clay-Brown			
29	49	Clay-Blue			
49	50	Fine Sand-Blue			
50	51	FS-CS-Med-Gravel-Blue			
51	53	Clay-Blue			
53	56	FS-CS-Med-Pea Gravel ¼"-Blue			
56	68	" " " " " Chert ½x1-Blue-Grey			
68	72	Limestone-Grey			

7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) 8-23-91 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 182 This Water Well Record was completed on (mo/day/yr) 9-5-91 under the business name of STRADER DRILLING CO., INC. by (signature) Dale Asken

INSTRUCTIONS: Use typewriter or ball point pen. *PLEASE PRESS FIRMLY* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-7320. Telephone: 913-296-5545. Send one to WATER WELL OWNER and retain one for your records.

(739)

WATER WELL RECORD Form WWC-5 KSA 82a-1212 ID No.

1 LOCATION OF WATER WELL: County: **Douglas**
Fraction: ¼ **S** 1/2 **SW** ¼
Section Number: **31**
Township Number: T **12** S
Range Number: R **21** E/W (E circled)

Distance and direction from nearest town or city street address of well if located within city?
REF: Don Westheffer

2 WATER WELL OWNER: **Nunemaker-Ross Inc.**
RR#, St. Address, Box # : **1616 North 1700 Road**
City, State, ZIP Code : **Lawrence, Ks 66044**
Board of Agriculture, Division of Water Resources
Application Number: **46589**

3 LOCATE WELL'S LOCATON WITH AN "X" IN SECTION BOX:

	N	
W	NW / NE / SW (**X**) / SE	E
	S	

1 Mile

4 DEPTH OF COMPLETED WELL **50** ft. ELEVATION:
Depth(s) Groundwater Encountered 1 ____ ft. 2 ____ ft. 3 ____ ft.
WELL'S STATIC WATER LEVEL **na** ft. below land surface measured on mo/day/yr ____
Pump test data: Well water was ____ ft. after ____ hours pumping ____ gpm
Est. Yield ____ gpm: Well water was ____ ft. after ____ hours pumping ____ gpm
Bore Hole Diameter **28** in. to **51** ft. and ____ in. to ____ ft.

WELL WATER TO BE USED AS: 1 Domestic, **2 Irrigation** (boxed), 3 Feed lot, 4 Industrial, 5 Public water supply, 6 Oil field water supply, 7 Lawn and garden (domestic), 8 Air conditioning, 9 Dewatering, 10 Monitoring well, 11 Injection well, 12 Other (Specify below)

Was a chemical/bacteriological sample submitted to Department? Yes ____ No **X** If yes, mo/day/yr sample was submitted
Water Well Disinfected? Yes **X** No

5 TYPE OF BLANK CASING USED: 1 Steel, **2 PVC** (boxed), 3 RMP (SR), 4 ABS, 5 Wrought Iron, 6 Asbestos-Cement, 7 Fiberglass, 8 Concrete tile, 9 Other (specify below)
CASING JOINTS: Glued **X** Clamped ____ Welded ____ Threaded ____

Blank casing diameter **28** in. to **30** ft., Dia ____ in. to ____ ft., Dia ____ in. to ____ ft.
Casing height above land surface **24** in., weight **16.15** lbs./ft. Wall thickness or gauge No. **.500**

TYPE OF SCREEN OR PERFORATION MATERIAL: 1 Steel, 2 Brass, 3 Stainless steel, 4 Galvanized steel, 5 Fiberglass, 6 Concrete tile, **7 PVC** (boxed), 8 RMP (SR), 9 ABS, 10 Asbestos-cement, 11 Other (specify), 12 None used (open hole)

SCREEN OR PERFORATION OPENINGS ARE: 1 Continuous slot, 2 Louvered shutter, 3 Mill slot, 4 Key punched, 5 Gauzed wrapped, 6 Wire wrapped, 7 Torch cut, **8 Saw cut** (boxed), 9 Drilled holes, 10 Other (specify), 11 None (open hole)

SCREEN-PERFORATED INTERVALS: From **30** ft. to **50** ft. From ____ ft. to ____ ft.
From ____ ft. to ____ ft. From ____ ft. to ____ ft.
GRAVEL PACK INTERVALS: From **20** ft. to **50** ft. From ____ ft. to ____ ft.
From ____ ft. to ____ ft. From ____ ft. to ____ ft.

6 GROUT MATERIAL: 1 Neat cement, 2 Cement grout, 3 Bentonite, 4 Other ____
Grout Intervals From **0** ft. to **20** ft. From ____ ft. to ____ ft. From ____ ft. to ____ ft.

What is the nearest source of possible contamination: 1 Septic tank, 2 Sewer lines, 3 Watertight sewer lines, 4 Lateral lines, 5 Cess pool, 6 Seepage pit, 7 Pit privy, 8 Sewage lagoon, 9 Feedyard, 10 Livestock pens, 11 Fuel storage, 12 Fertilizer storage, 13 Insecticide storage, 14 Abandoned water well, 15 Oil well/ Gas well, 16 Other (specify below) **none**
Direction from well? How many feet?

FROM	TO	CODE	LITHOLOGIC LOG	FROM	TO	PLUGGING INTERVALS
0	3		Surface			
3	24		Clay			
24	35		Sand & gravel			
35	50		Large gravel			
50	51		shale			

7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/yr) **5-13-07** and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. **554** This Water Well Record was completed on (mo/day/yr) **3-30-07** under the business name of **Woofter Pump & Well Inc.** by (signature) Jay C Woofter by MR

INSTRUCTIONS: Please fill in blanks and circle the correct answers. Send three copies to Kansas Department of Health and Environment, Bureau of Water, 1000 S W Jackson St., Ste. 420, Topeka, Kansas 66612-1367. Telephone: 913-296-5545. Send one to WATER WELL OWNER and retain one for your records.

KGS Hydrology | Water Well Database Query

Scan of WWC5 Form

WATER WELL RECORD Form WWC-5 KSA 82a-1212

1 LOCATION OF WATER WELL: County: Douglas | Fraction: NW ¼ SE ¼ SE ¼ | Section Number: 31 | Township Number: T 12 S | Range Number: R 21 E/W

Distance and direction from nearest town or city street address of well if located within city? 3/4 miles N. from NW Eudora

2 WATER WELL OWNER: Eudora Riverview Golf
RR#, St. Address, Box #: 2504 Alabama
City, State, ZIP Code: Lawrence, Ks 66046
Board of Agriculture, Division of Water Resources
Application Number:

3 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX: N, W, E, S; NW, NE, SW, SE (X in SE); 1 Mile

4 DEPTH OF COMPLETED WELL 53 ft. ELEVATION:
Depth(s) Groundwater Encountered 1. 19-53 ft. 2. ft. 3. ft.
WELL'S STATIC WATER LEVEL 19 ft. below land surface measured on mo/day/yr 3-29-95
Pump test data: Well water was ft. after hours pumping gpm
Est. Yield 250 gpm: Well water was ft. after hours pumping gpm
Bore Hole Diameter 12¼ in. to 53 ft., and in. to ft.
WELL WATER TO BE USED AS: 5 Public water supply 8 Air conditioning 11 Injection well
1 Domestic 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below)
2 Irrigation 4 Industrial 7 Lawn and garden only 10 Monitoring well
Was a chemical/bacteriological sample submitted to Department? Yes.....No.....; If yes, mo/day/yr sample was submitted
Water Well Disinfected? Yes X No

5 TYPE OF BLANK CASING USED: 1 Steel 2 PVC 3 RMP (SR) 4 ABS 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass 8 Concrete tile 9 Other (specify below)
CASING JOINTS: Glued X Clamped Welded Threaded
Blank casing diameter 8 in. to 33 ft., Dia in. to ft., Dia in. to ft.
Casing height above land surface 30 in., weight 200# lbs./ft. Wall thickness or gauge No.
TYPE OF SCREEN OR PERFORATION MATERIAL: 1 Steel 2 Brass 3 Stainless steel 4 Galvanized steel 5 Fiberglass 6 Concrete tile 7 PVC 8 RMP (SR) 9 ABS 10 Asbestos-cement 11 Other (specify) 12 None used (open hole)
SCREEN OR PERFORATION OPENINGS ARE: 1 Continuous slot 2 Louvered shutter 3 Mill slot 4 Key punched 5 Gauzed wrapped 6 Wire wrapped 7 Torch cut 8 Saw cut 9 Drilled holes 10 Other (specify) 11 None (open hole)
SCREEN-PERFORATED INTERVALS: From 33 ft. to 53 ft., From ft. to ft.
From ft. to ft., From ft. to ft.
GRAVEL PACK INTERVALS: From 53 ft. to 20 ft., From ft. to ft.
From ft. to ft., From ft. to ft.

6 GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other
Grout Intervals: From 20 ft. to 0 ft., From ft. to ft., From ft. to ft.
What is the nearest source of possible contamination: NONE At the Time
1 Septic tank 2 Sewer lines 3 Watertight sewer lines 4 Lateral lines 5 Cess pool 6 Seepage pit 7 Pit privy 8 Sewage lagoon 9 Feedyard 10 Livestock pens 11 Fuel storage 12 Fertilizer storage 13 Insecticide storage 14 Abandoned water well 15 Oil well/Gas well 16 Other (specify below)
Direction from well? How many feet?

FROM	TO	LITHOLOGIC LOG	FROM	TO	PLUGGING INTERVALS
0	15	Soil, Clay, Silt			
15	52	SAnd			
52	53	Gravel + Limestone			

7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) 3-29-95 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 561 This Water Well Record was completed on (mo/day/yr) 4-3-95 under the business name of Evans Energy Dev. Inc. by (signature) [signature]

INSTRUCTIONS: Use typewriter or ball point pen. PLEASE PRESS FIRMLY and PRINT clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone: 913-296-5545. Send one to WATER WELL OWNER and retain one for your records.

Kansas Geological Survey
Comments to webadmin@kgs.ku.edu

WATER WELL RECORD Form WWC-5 KSA 82a-1212 ID No. ____________

1 LOCATION OF WATER WELL: County: Douglas	Fraction near center-E½-NE¼ ¼ ¼ ¼	Section Number 6	Township Number T 13 S	Range Number R 21E E/W

Distance and direction from nearest town or city street address of well if located within city?
mile northwest of Lecompton

2 WATER WELL OWNER: Mark Neis
RR#, St. Address, Box # : 12775 County Line Rd.
City, State, ZIP Code : Eudora, Ks. 66025

Board of Agriculture, Division of Water Resources
Application Number:

3 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:
N / NW / NE / W / E / SW / SE / S / 1 Mile

4 DEPTH OF COMPLETED WELL....63........ft. ELEVATION:..................
Depth(s) Groundwater Encountered 1..................ft. 2..................ft. 3..................ft.
WELL'S STATIC WATER LEVEL 19½..... ft. below land surface measured on mo/day/yr ....12-14-2001.....
Pump test data: Well water was ....ft. after .... hours pumping .... gpm
Est. Yield ..950...gpm: Well water was ....ft. after .... hours pumping .... gpm
Bore Hole Diameter...24......in. to ....ft., and..................in. to ....ft.
WELL WATER TO BE USED AS: 5 Public water supply 8 Air conditioning 11 Injection well
1 Domestic 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below)
2 Irrigation 4 Industrial 7 Domestic (lawn & garden) 10 Monitoring well ....
Was a chemical/bacteriological sample submitted to Department? Yes....... No. X...; If yes, mo/day/yrs sample was submitted
Water Well Disinfected? Yes x No

5 TYPE OF BLANK CASING USED: 5 Wrought iron 8 Concrete tile CASING JOINTS: Glued..X..Clamped......
1 Steel 3 RMP (SR) 6 Asbestos-Cement 9 Other (specify below) Welded ....
2 PVC 4 ABS 7 Fiberglass .... Threaded..................
Blank casing diameter....16.......in. to ....ft., Dia ....in. to ....ft., Dia ....in. to ....ft.
Casing height above land surface.....24........in., weight ....15.54............lbs./ft. Wall thickness or gauge No.....500..........
TYPE OF SCREEN OR PERFORATION MATERIAL: 7 PVC 10 Asbestos-cement
1 Steel 3 Stainless steel 5 Fiberglass 8 RMP (SR) 11 Other (specify) ....
2 Brass 4 Galvanized steel 6 Concrete tile 9 ABS 12 None used (open hole)
SCREEN OR PERFORATION OPENINGS ARE: 5 Gauzed wrapped 8 Saw cut 11 None (open hole)
1 Continuous slot 3 Mill slot 6 Wire wrapped 9 Drilled holes
2 Louvered shutter 4 Key punched 7 Torch cut 10 Other (specify) ....ft.
SCREEN-PERFORATED INTERVALS: From...50.......... ft. to ......63......ft., From ....ft. to..................ft.
From.................. ft. to ....ft., From ....ft. to..................ft.
GRAVEL PACK INTERVALS: From...25.......... ft. to ......63......ft., From ....ft. to..................ft.
From.................. ft. to ....ft., From ....ft. to..................ft.

6 GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other ....
Grout Intervals: From...0........ft. to...25.......ft., From ....ft. to..............ft., From ....ft. to..............ft.
What is the nearest source of possible contamination: 10 Livestock pens 14 Abandoned water well
1 Septic tank 4 Lateral lines 7 Pit privy 11 Fuel storage 15 Oil well/Gas well
2 Sewer lines 5 Cess pool 8 Sewage lagoon 12 Fertilizer storage 16 Other (specify below)
3 Watertight sewer lines 6 Seepage pit 9 Feedyard 13 Insecticide storage Open Field...........
Direction from well? How many feet?

FROM	TO	LITHOLOGIC LOG	FROM	TO	PLUGGING INTERVALS
0	11	brown silty clay			
11	18	brown silt			
18	22	brown fs-cs			
22	27	brown fs-cs-med-pea			
27	33	grey fine sand			
33	35	blue clay			
35	38	grey fs-cs-med gravel			
38	42	blue clay			
42	49	fs-cs-med-some pea			
49	54	fs-cs-med-pea			
54	55	blue clay			
55	58	fs-cs-med-pea			
58	63	fs-cs-med-pea ½x3/4			
3		grey limestone			

7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) .12-14-2001.................. and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's Licence No....182............ This Water Well Record was completed on (mo/day/yr) ....1-2-2002..........
under the business name of Strader Drilling co., Inc. by (signature) Dale Askren

INSTRUCTIONS: Use typewriter or ball point pen. PLEASE PRESS FIRMLY and PRINT clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone 785-296-5524. Send one to WATER WELL OWNER and retain one for your records. Fee of $5.00 for each constructed well.

WATER WELL RECORD Form WWC-5 KSA 82a-1212

1 LOCATION OF WATER WELL: County: DOUGLAS | Fraction: SE ¼ NW ¼ NE ¼ | Section Number: 6 | Township Number: T 13 S | Range Number: R 21 (E)/W

Distance and direction from nearest town or city street address of well if located within city?
3 MILES NORTHWEST OF EUDORA

2 WATER WELL OWNER: CITY OF EUDORA
RR#, St. Address, Box #: 4 EAST SEVENTH STREET
City, State, ZIP Code: EUDORA, KS 66026

Board of Agriculture, Division of Water Resources
Application Number:

3 LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:

N / W / E / S — NW, NE, SW, SE — 1 Mile

4 DEPTH OF COMPLETED WELL 72 ft. ELEVATION:
Depth(s) Groundwater Encountered 1. 18 ft. 2. ft. 3. ft.
WELL'S STATIC WATER LEVEL 18 ft. below land surface measured on mo/day/yr 6/16/98
Pump test data: Well water was 20 ft. after 0.5 hours pumping 329 gpm
Est. Yield 325 gpm: Well water was 22 ft. after 11 hours pumping 521 gpm
Bore Hole Diameter 42 in. to 72 ft., and in. to ft.

WELL WATER TO BE USED AS: (5 Public water supply) 8 Air conditioning 11 Injection well
1 Domestic 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below)
2 Irrigation 4 Industrial 7 Lawn and garden only 10 Monitoring well

Was a chemical/bacteriological sample submitted to Department? Yes X No; If yes, mo/day/yr sample was submitted 4/21/97
Water Well Disinfected? (Yes) No

5 TYPE OF BLANK CASING USED: (1 Steel) 3 RMP (SR) 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass 8 Concrete tile 9 Other (specify below)
2 PVC 4 ABS
CASING JOINTS: Glued Clamped Welded X Threaded

Blank casing diameter 12 in. to 47 ft., Dia in. to ft., Dia in. to ft.
Casing height above land surface 18 in., weight PITLESS UNIT lbs./ft. Wall thickness or gauge No. 0.375"

TYPE OF SCREEN OR PERFORATION MATERIAL:
1 Steel (3 Stainless steel) 5 Fiberglass 7 PVC 10 Asbestos-cement
2 Brass 4 Galvanized steel 6 Concrete tile 8 RMP (SR) 11 Other (specify)
9 ABS 12 None used (open hole)

SCREEN OR PERFORATION OPENINGS ARE:
1 Continuous slot 3 Mill slot 5 Gauzed wrapped 8 Saw cut 11 None (open hole)
2 Louvered shutter 4 Key punched (6 Wire wrapped) 9 Drilled holes
7 Torch cut 10 Other (specify)

SCREEN-PERFORATED INTERVALS: From 47 ft. to 72 ft., From ft. to ft.
From ft. to ft., From ft. to ft.
GRAVEL PACK INTERVALS: From 22 ft. to 72 ft., From ft. to ft.
From ft. to ft., From ft. to ft.

6 GROUT MATERIAL: (1 Neat cement) 2 Cement grout 3 Bentonite 4 Other
Grout Intervals: From 6 ft. to 20 ft., From ft. to ft., From ft. to ft.

What is the nearest source of possible contamination:
1 Septic tank 4 Lateral lines 7 Pit privy 10 Livestock pens 14 Abandoned water well
2 Sewer lines 5 Cess pool 8 Sewage lagoon 11 Fuel storage 15 Oil well/Gas well
3 Watertight sewer lines 6 Seepage pit 9 Feedyard 12 Fertilizer storage 16 Other (specify below)
13 Insecticide storage
Direction from well? How many feet?

FROM	TO	LITHOLOGIC LOG	FROM	TO	PLUGGING INTERVALS
0	2	TOP SOIL			
2	17	BROWN SANDY SILT			
17	23	BROWN MEDIUM TO FINE SAND			
23	38	GRAY MEDIUM TO COARSE, SOME FINE			
38	55	GRAY MEDIUM TO COARSE, SOME GRAVEL			
55	72	GRAY COARSE TO MEDIUM			

7 CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and was completed on (mo/day/year) 6/16/98 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. 102 This Water Well Record was completed on (mo/day/yr) 8/5/98 under the business name of LAYNE CHRISTENSEN COMPANY by (signature) [signature]

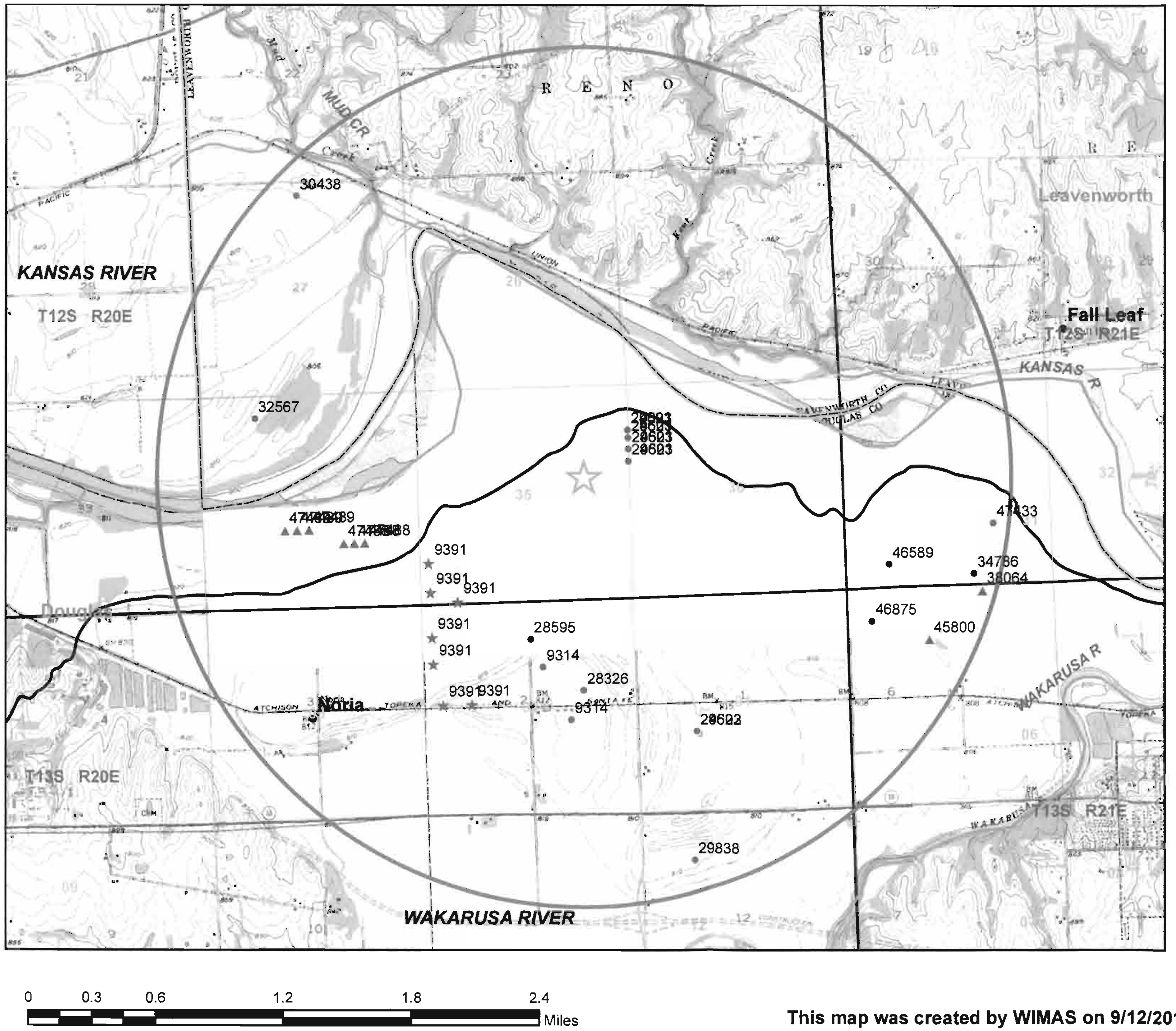
INSTRUCTIONS: Use typewriter or ball point pen. *PLEASE PRESS FIRMLY* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three copies to Kansas Department of Health and Environment, Bureau of Water, Topeka, Kansas 66620-0001. Telephone: 913-296-5545. Send one to WATER WELL OWNER and retain one for your records.

APPENDIX II.

Kansas Department of Agriculture, Division of Water Resources,

Safe Yield Analysis Data

WIMAS Water Right Development - Map Centered on (E½) 35-12S-20E



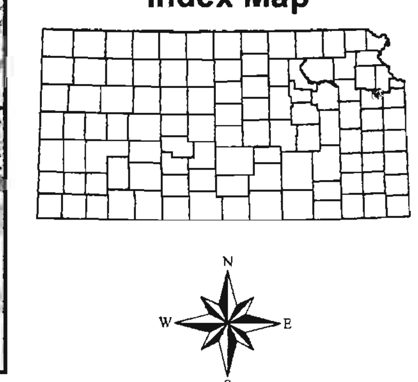
Legend

WIMAS_PD

S_UMW

- G_IND
- G_IRR
- G_MUN

Index Map



This map was created by WIMAS on 9/12/2012 7:49:21 AM

Report Date Wednesday, September 12 2012

Water Rights and Points of Diversion Within 2.00 miles of point defined as:

2940 ft N and 1320 ft W of the SE Corner of Section 35, T 12S, R 20E

Located at: 95.153247 West Longitude and 38.964996 North Latitude

GROUNDWATER ONLY

File	Number	Use	ST	SR	Dist (mi)	Q4	Q3	Q2	Q1	FeetN	FeetW	Sec	Twp	Rng	ID	Batt	Auth_Quan	Add_Quan	Unit
A__	9314 00	IRR	NK	G	1.12	--	NE	NW	SE	-----	-----	2	13	20E	1		102.00	102.00	AF
Same					.89	--	NW	SW	NE	-----	-----	2	13	20E	2				
A__	9391 00	IND	NK	G	.87	--	SW	SW	SW	283	5040	35	12	20E	1		3685.91	3685.91	AF
Same					.80	--	SE	SW	SW	24	4375	35	12	20E	8				
Same					.80	--	NW	SW	SW	1004	5063	35	12	20E	9				
Same					1.23	--	--	--	--	2778	4815	2	13	20E	3				
Same					1.16	--	--	--	--	2771	4092	2	13	20E	4				
Same					1.09	--	--	--	--	3794	5028	2	13	20E	5				
Same					1.00	--	--	--	--	4453	5034	2	13	20E	9				
A__	24621 00	IRR	NK	G	.33	--	SE	NE	NE	4180	50	35	12	20E	4		24.50	24.50	AF
Same					.31	--	SE	NE	NE	3970	50	35	12	20E	5				
Same					.28	--	NE	SE	NE	3680	50	35	12	20E	6				
Same					.25	--	NE	SE	NE	3370	50	35	12	20E	7				
A__	24623 00	IRR	NK	G	1.30	--	CW	NE	SW	1960	3840	1	13	20E	1		4.60	4.60	AF
A__	28326 00	IRR	NK	G	.98	--	SW	SE	NE	3040	1315	2	13	20E	7		36.00	36.00	AF
A__	28595 00	IRR	NK	G	.77	--	SW	NW	NE	4350	2580	2	13	20E	8		23.00	.00	AF
A__	29502 00	IRR	NK	G	1.30	--	CW	NE	SW	1960	3840	1	13	20E	1		49.30	49.30	AF
A__	29503 00	IRR	NK	G	.33	--	SE	NE	NE	4180	50	35	12	20E	4		87.50	87.50	AF
Same					.31	--	SE	NE	NE	3970	50	35	12	20E	5				
Same					.28	--	NE	SE	NE	3680	50	35	12	20E	6				
Same					.25	--	NE	SE	NE	3370	50	35	12	20E	7				
A__	29838 00	IRR	NK	G	1.86	--	SE	NW	NW	4070	4000	12	13	20E	1		26.00	26.00	AF
A__	30438 00	IRR	NK	G	1.87	--	NW	NW	NE	4931	2788	27	12	20E	2		44.00	44.00	AF
A__	32567 00	IRR	NK	G	1.54	--	--	--	--	4750	4000	34	12	20E	2		79.00	79.00	AF
A__	34786 00	IRR	NK	G	1.92	--	SE	SW	SE	300	1950	31	12	21E	1		25.00	25.00	AF
A__	38064 00	MUN	NK	G	1.98	--	NE	NW	NE	5180	1855	6	13	21E	3		190.70	141.97	AF
A__	45800 00	MUN	LO	G	1.85	--	SE	SE	NW	3870	3110	6	13	21E	7		245.51	66.01	AF
A__	46589 00	IRR	LR	G	1.54	--	NC	S2	SW	575	3960	31	12	21E	2		150.00	150.00	AF
A__	46875 00	IRR	KE	G	1.54	--	SE	NW	NW	4613	4547	6	13	21E	9		32.00	32.00	AF
A__	47433 00	IRR	HK	G	1.97	--	SE	NW	SE	1530	1428	31	12	21E	6		91.50	91.50	AF
A__	47488 00	MUN	HK	G	1.09	--	SE	NW	SE	1590	1640	34	12	20E	8 G	2	1290.41	784.16	AF
Same					1.14	--	SE	NW	SE	1590	1902	34	12	20E	6 B	2			
Same					1.04	--	SE	NW	SE	1590	1378	34	12	20E	7 B	2			
A__	47489 00	MUN	HK	G	1.34	--	SE	NE	SW	1953	3046	34	12	20E	5 G	2	1290.41	.00	AF
Same					1.39	--	SW	NE	SW	1953	3346	34	12	20E	3 B	2			
Same					1.28	--	SE	NE	SW	1953	2746	34	12	20E	4 B	2			

Total Net Quantities Authorized:	Direct	Storage
Total Requested Amount (AF) =	.00	.00
Total Permitted Amount (AF) =	907.66	.00
Total Inspected Amount (AF) =	216.01	.00
Total Pro_Cert Amount (AF) =	.00	.00
Total Certified Amount (AF) =	4305.78	.00
Total Vested Amount (AF) =	.00	.00
TOTAL AMOUNT (AF) =	5429.45	.00

An * after the source of supply indicates a pending application for change for the file number

APPENDIX III.

Potential Pollution Sources in the Area

1. Septic tank drain fields and cesspools especially in sandy loam soils can be a potential contamination source of the aquifer. Kansas Department of Health and Environment requires all public water supply ells to have at least 20 feet of grout sealed casing at the top of the well to prevent contamination and entry of flow into the well. However, most older domestic wells do not have grout seals to a safe depth below surface thus becoming a potential sources of contamination of the aquifer. There is supposed to be 100 feet separation between a septic tank drain field and a domestic well on a property.

2. Cattle or other livestock feeding operation can be a source of pollution to an aquifer, depending on the soil type and depth to static water level, especially if located within the effective radius of influence of a well. The effective radius of influence of a well is dependent upon the pumping rate of the well and aquifer characteristics. Domestic wells have a small effective radius of influence usually less than 50 feet. The effective radius of influence can be one thousand feet or more for an irrigation well or other large capacity well.

3. Chemical fertilizer and herbicides applied to corn planted next to the wells as shown next to Eudora Well No. 6 is a potential threat of contamination to the City wells. This threat of contamination is increased with irrigation, especially on sandy soils. Major portions of Hall and Merrick Counties in Nebraska have nitrates nearly double that of the KDHE and EPA regulations for Nitrates in public water supply due to irrigation and chemigation of corn on sandy loam soils similar to the alluvial soils shown in Bulletin 206, Part 2, Ground Water in the Kansas River Valley Junction City to Kansas City, Kansas by Stuart W. Fader. The Newman Terrace clay loam soils offer more protection of the aquifer from fertilizer.

4. Abandoned wells or old domestic wells that were drilled long ago with thin wall casing that have corroded through the years and were not grout sealed, can allow storm water runoff to flow directly into the aquifer resulting in direct contamination to the City wells. Such a well may exist west of Eudora Well No. 7 under the old windmill tower in the picture.

WICHITA SAND PIT STUDY

Sedgwick County Department of Environmental Resources organized and conducted much of the efforts to determine which sand pits to study in more detail. The study group obtained assistance from the U.W. Bureau of Reclamation in drilling and installing three (3) monitoring wells around each of six (6) sites selected for study. Funds were obtained for the U.S. Geological Survey to sample and analyze surface water from the pits, ground water from the monitoring wells, and pit bottom sediment at four (4) sites located at the northwest edge of Wichita. The USGS analyzed the water samples for 18 physical and chemical properties, five (5) bacteriological values, 40 inorganic constituents, 118 pesticides and degradate compounds, and 134 organic compounds other than pesticides. The USGS analyzed the bottom sediments for five (5) physical and chemical properties, 45 inorganic constituents, and 32 organic compounds. The four pits in the Phase I sampling were; Barefoot Bay, Ridge Port, Mooring, and Cropland. Later two south pits were sampled which were; Kingston Cove and Pine Bay Estates.

Maize retention pond/ground-water pit is used for storage of storm water runoff. A special sampling of the storm water flow into the pit was made by others within 30 minutes of when flow commenced and within one to two hours following a storm event. The TDS of the storm water flow was very low at 49 to 111 mg/L when compared to the computed values in the analysis of data of 46 to 83 mg/L by the Kansas Geological Survey. Organic compounds found in the runoff water of concern was Alachlor at 3.8 µg/L in the first June 2007 runoff sample, Alachlor of 3.0 µg/L in the second June 2007 sample. The drinking water MCL for Alachlor is 2 µg/L. However, in the October 2007 pond sample Alachlor was significantly reduced by sunlight and bacterial activity of the pond. The Maize detention pond appears to be an effective means of removing storm water runoff with high bacteria content from the Big Slough waterway.

Storm water runoff into the sand pits does contribute to ground water recharge. The study showed no *significant* evidence of contamination of ground water by storm water runoff into the pits. The key word is *significant* contamination. Trace levels of some organics and mineral constituents such as iron, manganese and the ammonium ion were detected in the down gradient monitoring wells in slightly greater concentrations than the up gradient monitoring wells. On the contrary, most organic contaminants were reduced by the sunlight and bacterial activity existing within the sand pit lakes. Bacterial levels were never greater than the level recommended by KDHE for body contact.

Although some of the pits had piped storm water runoff into the pits from streets, broad width flow ways with grass filtering would capture silt and other contaminants prior to entering the ponds or pits. Road side drainage ditches may have a broad width overflow channels into nearby pits temporarily storing the storm water surge allowing orderly flow through natural water courses. The long term accumulation of silts, sediments and other solids will eventually restrict the recharge to the ground water system as has occurred at the Sedgwick County Zoo pit.

Residential areas have the greater potential for ground water contamination than rural areas. However, the spring runoff from corn fields with atrazine must be bounded by grass filter strips and flows need to be routed in grass waterways to capture sediments with atrazine attached.

Hydraulic Impacts of Quarries and Gravel Pits

Prepared by

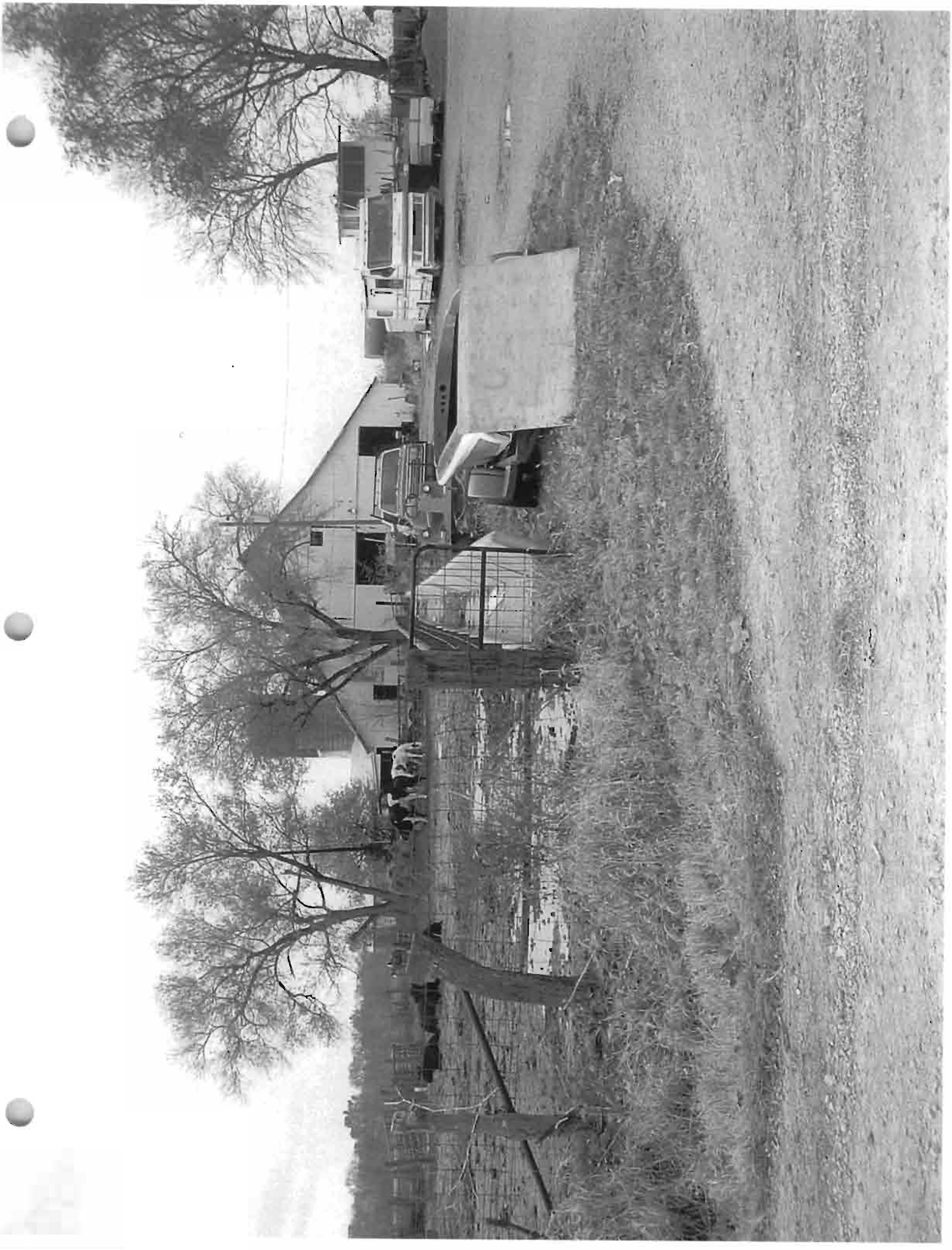
J>A. Green, J.A. Pavlish, R.G. Merritt, ans J.L. Leete

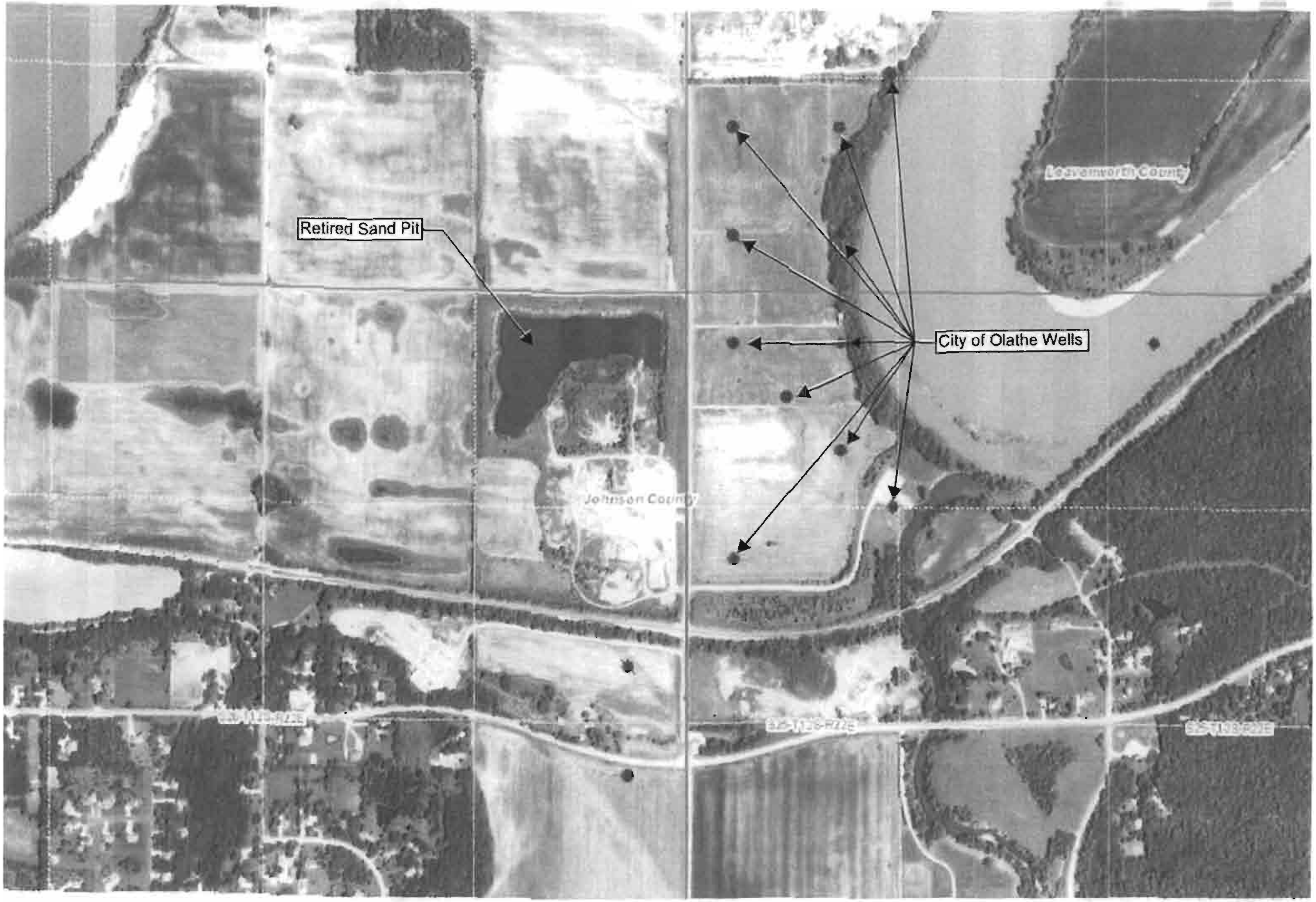
Minnesota Department of Natural Resources

Division of Waters

2005

The Division of Waters, MDNR studied three sand pits in the report, two of which were in saturated alluvial sediments and one was above the water table. The conclusion of this study was that sand mining had minimal impact on aquifer water levels. In one sand pit, ground water temperature changes were noted but were not consistent.




Retired Sand Pit
City of Olathe Wells
Leavenworth County
Johnson County

APPENDIX IV.

RESUME' AND PERSONAL INFORMATION

Name: Carl E. Nuzman, P.E., P.Hg.
3314 NW Huxman Road
Silver Lake, KS 66539

Phone: (785) 582 4054
Cell: (785) 224 9929
cnuzman@embarqmail.com

Position: Consulting Engineer / Hydrogeologist

Academic and Professional Certifications:
Master of Science in Water Resources Engineering, Department of civil Engineering, University of Kansas, 1955.
Bachelor of Science in Agricultural Engineering, Kansas State University, 1053.
Professional Engineer, first licensed in Kansas in 1962, KS-4481. Formerly licensed in the following states: MO-E12525, IA-6334, SC-4099, FL-15102, AL-16858, AZ-23209, IL-062-043392, IN-PE-60880547, LA-23209, MS-10041, MI-33050, NE-E-12525, NC-15121, NM-10625, OH-E-51179, OK-15653, TN-018707, VA-0402-018380, and WI-E-25841.
Professional Hydrogeologist, Certified in 1986 by the American Institute of Hydrology, P.,Hg-385.

Professional Positions:
- Consultant – 1997 to Present
- Layne GeoSciences, Inc. Mission Woods, KS, Vice-president and Principal Hydrologist – 1988 to 1997
- Groundwater Management, Inc. Kansas city, KS, Vice President and Chief Hydrologist, 1985 to 1988
- Layne Western Company, Inc. Hydrology Division Manager and Chief Hydrologist 1970 to 1985
- Layne Western Company, Inc. Kansas City, MO, Sales Engineer 1967 to 1970
- Kansas Water Resources Board, Topeka, KS, Hydrologist III 1966
- Kansas State Board of Agriculture, Division of Water Resources, Topeka, KS, Assistant Engineer 1957 to 1965

Specialized Competence:
- Surface and ground water hydrology
- Project management and supervision
- Water well treatment and rehabilitation/ground water quality
- Well and well field design and construction
- Modeling of ground water aquifers
- Water treatment and distribution piping
- Injection well design and operation
- Water pumps and associated equipment including suction flow control devices

Applicable Experience:
Mr. Nuzman has extensive experience in the areas of ground water modeling, water well and well field design and construction, water well treatment and rehabilitation, and soil and ground water remediation. He served at technical advisor to the Attorney General of Kansas in working with the U.S.Geological Survey Analog Model laboratory in Phoenix, AZ in doing the first model work of the Equus Beds aquifer north of Wichita in 1961. He was the first to model the Ogallala aquifer in SW Kansas using the passive element, steady state, electric analog model technique in 1966.

After joining Layne Western in 1967, he has conducted numerous water well pumping tests, aquifer modeling projects and well field design and construction for multiple Cities and Companies throughout the United States and in some foreign countries. He has consulted on deep disposal wells and designed a ground water recharge facility. He has provided the foundation dewatering design for numerous construction projects. He has provided expert testimony on a variety of hydrologic issues. He has prepared specifications and bidding documents for both municipal and industrial well construction, pumps and controls for a variety of projects.

Publications:

- Nuzman, Carl E. (1989) "Well Hydraulic Flow concept", Published in *Recent advances in Ground-Water Hydrology*, by the American Institute of hydrology pgs 72-77.
- Nuzman, Carl E. (1978, revised 1985) "Ground-Water and Well Efficiency" Published by Doerr metal Products, Larned, KS pgs 67.
- Winslow, John D. and C. E. Nuzman, (1966): "Electric Analog Model of the Kansas River alluvium in the vicinity of Topeka, Kansas", Kansas Geological Survey. Lawrence, KS.
- Contributor to the "Handbook of Ground-Water Development", by Roscoe Moss Company, Los Angeles, CA on Well Rehabilitation. 1990.
- Contributing author "Ground-Water Development handbook M-21" and contributed to the revised edition of Manual M-21 by the American Water Works Association, Denver, CO.
- Other technical papers and numerous client reports of study have been made.

Inventions:

- Co-inventor of a filament wound fiber glass water well screen;
- Inventor of an In-situ Ground Water Treatment System, assigned to Layne Western Company, Inc;
- Co-inventor of a patent of a non-vortexing passive pump intake strained for boiling water reactor nuclear power plants and used on other water resource applications.

Professional Societies:

- American Society of Biological and Agricultural Engineers
- American Society of Civil Engineers
- American Geophysical Union
- American Institute of Hydrology
- American Water Works Association
- National Ground Water Association
- National Society of Professional engineers
- Kansas Society of Professional Engineers

City Of Eudora, Kansas

Mayor Scott Hopson

October 17, 2012

Bruce Liese, Chairman
Lawrence – Douglas County Metropolitan Planning Commission
First floor, 6 E. 6th Street
Lawrence, Kansas 66044

Dear Mr. Liese,

The purpose of this letter is to inform the Douglas County Planning Commission of the vote by the Eudora City Council taken October 8, 2012 concerning the Conditional Use Permit (CUP) application by Penny Sand Company for proposed dredging operations near the Kansas River at the corner of North 1500 and East 1850 roads. The City Council voted unanimously to recommend denial of the CUP application.

The City Council heard two hours of testimony from hydrology experts, for and against the Penny Sand CUP application, and from the general public at their October 8th meeting. Eudora's recommendation for denial is based on public concern for protection of the aquifer and water table that serve as the sole source of water for the City's municipal well supply. Our analysis shows there is potential for surface water to negatively impact our water source should the CUP allow the removal of over-burden soil—built up over decades of natural flooding and silting—and the excavation to bedrock at depths of 50- to 70-feet below current grade at the site. We look forward to presenting this letter and a summary of these hydrology findings to your commission at an upcoming public hearing on this matter. Attached to this letter are several documents that were presented at the City Council meeting on October 8th. Thank you for considering the recommendation of our city council and for cooperating with our planning commission in this and other planning and zoning matters inside Eudora's designated "Planning Area."

Sincerely,

Scott Hopson

Scott Hopson
Mayor

Cc: Douglas County Commission (via e-mail)
Craig Weinaug, County Administrator (via e-mail)
Eudora City Council (via e-mail)
Scott McCullough, Director Planning and Development Services (via-e-mail)

(785)542-4111 (785)542-1237 Fax
4 East Seventh Street P.O. Box 650 • Eudora, Kansas 66025-0650

TERRANE RESOURCES CO

P.O. BOX 173 STAFFORD, KS 67578-0173 620-234-5200

17 September, 2012

Mr. John Harrenstein, City Manager
City of Eudora
P.O. Box 650
Eudora, KS 66025-0650

Re: Penny Sand CUP

Mr. Harrenstein,

This letter and enclosed Exhibit is in response to the City of Eudora's request we review and make recommendations regarding the proposed Penny Sand Facility CUP.

We have reviewed the data prepared by Dr. Carl McElwee, data submitted by Penny Sand, KGS publications, data prepared by Mr. Carl Nuzman and well log information.

Exhibit 1 is a copy of a map we modified from the Nuzman report. It shows the following:

The water table contours from the 1930 and 1974 KGS reports.
The 10 year area of influence delineated by Nuzman.
The 6 and 8 year areas of influence delineated by McElwee.
The proposed Penny Sand Facility
The test borings in the NW portion of the proposed sand facility.
Proposed observation well sites

The data indicates there has been a shift in the local ground water flow direction. The 1930 data indicates a WSW to ENE flow direction. Mr. Nuzman's Source Water Protection Area SWPA delineation tracks to the WSW from the City's well field. The 1974 data used by Dr. McElwee indicates the ground water flow has a more west to east orientation. Additionally, the 1974 shows there is less saturated thickness in the aquifer in and up-gradient of the City's well field. The SWPA delineated by McElwee extends more due west from the City's well field and further up-gradient.

It is important to understand both of these delineations are based on 83 and 39 year old water level data respectively. Both delineations used similar pumping scenarios by the City wells but do not include any potential impact local irrigation systems may have on the overall area of influence. Additionally, there is nothing in the data that suggest the existing sand operation is having any affect on the aquifer.

There are some fundamental aspects of aquifer characterization which need to be addressed. If the pumping of the City's wells remain constant (no decrease in pumping rate) and the saturated thickness decreases (lowering of the water table) then the cones of depression increase around each well. The increase in the size of the cone of depression will increase the area contributing water to the well field. If the saturated thickness continues to decrease due to seasonal or long term lowering of the water table then transmissivity and hydraulic conductivity characteristics of the aquifer can be affected. Therefore, any permanent lowering of the water table can have an impact on the area of influence to the well field which can have a deleterious effect on pumping rates.

The delineations prepared by Mr. Nuzman and Dr. McElwee represent the areas which will contribute water to the well field over time. The immediate cones of depression associated with the wells caused by pumping may not extend much more than ½ mile from the wells.

If the proposed sand pit has no affect on the water table, within the pit area, then it will yield water to the aquifer more readily than the surrounding aquifer and become a recharge area to the aquifer. If the water level in the pit is lower than the existing water level in the aquifer then it becomes a drain on that portion of the aquifer and will impact surrounding water levels in the aquifer.

Any changes to the water table can affect ground water flow direction. It appears there has been an apparent shift in the ground water flow direction by about 20 degrees between 1930 and 1974.

We have no data which indicates what affect the proposed sand pit will have on the water table. If there is no change to the water table then the affects should be minimal. However, if the sandpit caused a permanent lowering of the water table then it can have a negative affect on the recharge area to the City's well field. This will be readily apparent during periods of drought.

According to the conversation from the informal meeting held at Eudora it is our understanding the Division of Water Resources (DWR) assumes there will be no net loss of water from the aquifer under normal conditions due to evaporation. During periods of drought and extend periods of heat it would not be unreasonable for this pit to lose and inch of water in a 24 hour period. That amount of water would equal 27,154 gallons per open acre of water. That value times 300 acres equals 8,146,200 gallons per day. This is the equivalent of 25 acre feet of water per day or a well that pumps 5657 gallons per minute 24/7.

At this time we would tend to agree with DWR's zero net loss on an average year. However, as we are currently seeing there are some years that do not get average rainfall. This is important because when the sandpit will be losing potentially large quantities of water due to evaporation the City will be pumping large quantities of water to meet demands.

Based on the limited data it appears there is the potential for impairment during periods of drought or extreme heat.

It is our understanding the sandpit will be excavated through the entire sand and gravel formation and extend to the bedrock. This process will open the entire saturated thickness to the pit. Should a contaminant enter the pit, whether it is biological or chemical, it will have access to the zone the City wells are completed in. The lower zone of the aquifer in this area is typically more prolific and has better transmissivity characteristics than the upper portions. Therefore, any contamination that makes it to the bottom of the aquifer will move faster than if it entered through the soil profile.

The well logs we rec'd from Penny Sand are informative but of limited use as they are only for a small area in the northwest portion of the sand operation. This area of the operation is remote to the City's well field. The installation of some observation wells around the perimeter of the proposed sand pit would be beneficial. At this time we recommend observation wells near the southwest and the southeast corners and near the middle of the east side of the proposed sand pit.

Additional observation wells between the proposed sand pit and the City's well field should be installed as well. Unless, existing wells can be identified, evaluated and utilized.

We do not have any recent data to evaluate the potential, negative or positive, impact of the proposed sandpit.

In order to evaluate any changes the proposed sand pit will have on the aquifer a comprehensive evaluation of the existing data, the installation of observation wells and collecting current and on going data will be needed.

Quite frankly, the delineations presented indicate the complexity of this area. Without current data, the actual effects on the aquifer are estimates at best.

Using existing wells and adding observation wells to fill in the gaps, data can be collected which will better identify, delineate and evaluate the potential affects to the aquifer.

Below is a brief outline of the proposed process we recommend the City of Eudora consider regarding Source Water Protection Area (SWPA) delineation.

Data Collection and Review

Review City files and select data for copies.
Review KDHE files at Lawrence, Topeka and State Archives as needed.
Compile well database and ground truth existing wells and associated data.
Recommend meeting with KRWA staff and bring them onboard to help with the SWPA plan compilation, implementation, presentation to neighbors and City and County Planning and Zoning Commissions.

Aquifer Testing and Observation Well Installation

Analysis of existing data may provide some of the information needed. We anticipate having to run at least one series of aquifer tests to determine the area of influence and evaluate potential well interference.

The existing data for the City wells and domestic wells can be utilized, additional observation wells may have to be installed. Some of the observation wells should be installed before the aquifer tests are run.

The wells shown in the KGS database will be of limited usage unless their locations are verified.

All wells and surface water access points, utilized in the testing process, will have to be surveyed in by a licensed surveyor.

Aquifer and Testing Data Compilation

Individual well and multiple well data will have to be evaluated.

The projection and plotting of actual areas of influence will be based on actual and current data. Once this is done we can estimate changes to the area of influence based on aquifer variables, changes in pumping rates, additional wells, saturated thickness changes, etc.

Additional Recommendations

We strongly suggest the City ask Penny Sand to postpone their meeting with Planning and Zoning. This would allow the City to obtain clarification of some of the data and present their concerns directly to Penny Sand and their consultants. It has been our experience that direct negotiations will be more beneficial and less expensive than trying to negotiate through the Planning and Zoning Process. If a mutual agreement can be reached between the City and Penny Sand, then the City simply recommends the modified plan be approved by Planning and Zoning.

Historically, it was thought the public should have complete and unrestricted access to a city's data and well field operations. We do not believe going into great detail as to how the City's wells function and the areas which directly impact the viability of the well field need be publicized.

We recommend the City monitor water levels in and around their well field. Either by utilizing existing wells if available or by installing a series of observation wells. From this network a detailed ground water flow regime map can be prepared. Additionally, seasonal variations in ground water flow can be monitored.

Once the City has a detailed Source Water Protection Area (SWPA) delineated then it can be referenced in future planning and zoning determinations.

We suggest requesting Penny Sand install, monitor and analyze samples and data from no less than three observation wells near the southwest and southeast corners and near the center of the east side of the proposed sand pit. If there are existing wells on the property, which can be used, they should be evaluated and used if possible. It would be beneficial if these wells could be installed before excavation begins. Samples should be collected in the spring and late fall to establish a baseline on quality and water levels should be measured monthly.

The main component as to whether this proposed sandpit will be an issue will depend how much impact the City's well field has on the aquifer. It is possible the data to make that determination already exists. Much of the data gathered during the construction of the wells should be available. It is important the wells be evaluated as they are operated, not as a single event or pumping well.

John, this is a complex issue, which may be exactly as Mr. Nuzman and Dr. McElwee have described it. It has been our experience it takes detailed analysis of the data to establish areas of influence and develop a meaningful SWPA delineation.

As Always if you or any of your colleagues have any questions do not hesitate to contact us.

Respectfully submitted

Edward "Ned" T. Marks, Geologist
Terrane Resources Co.
terrane@sbcglobal.net

Encl.

EDWARD T. MARKS
LICENSED
431
KANSAS
GEOLOGIST

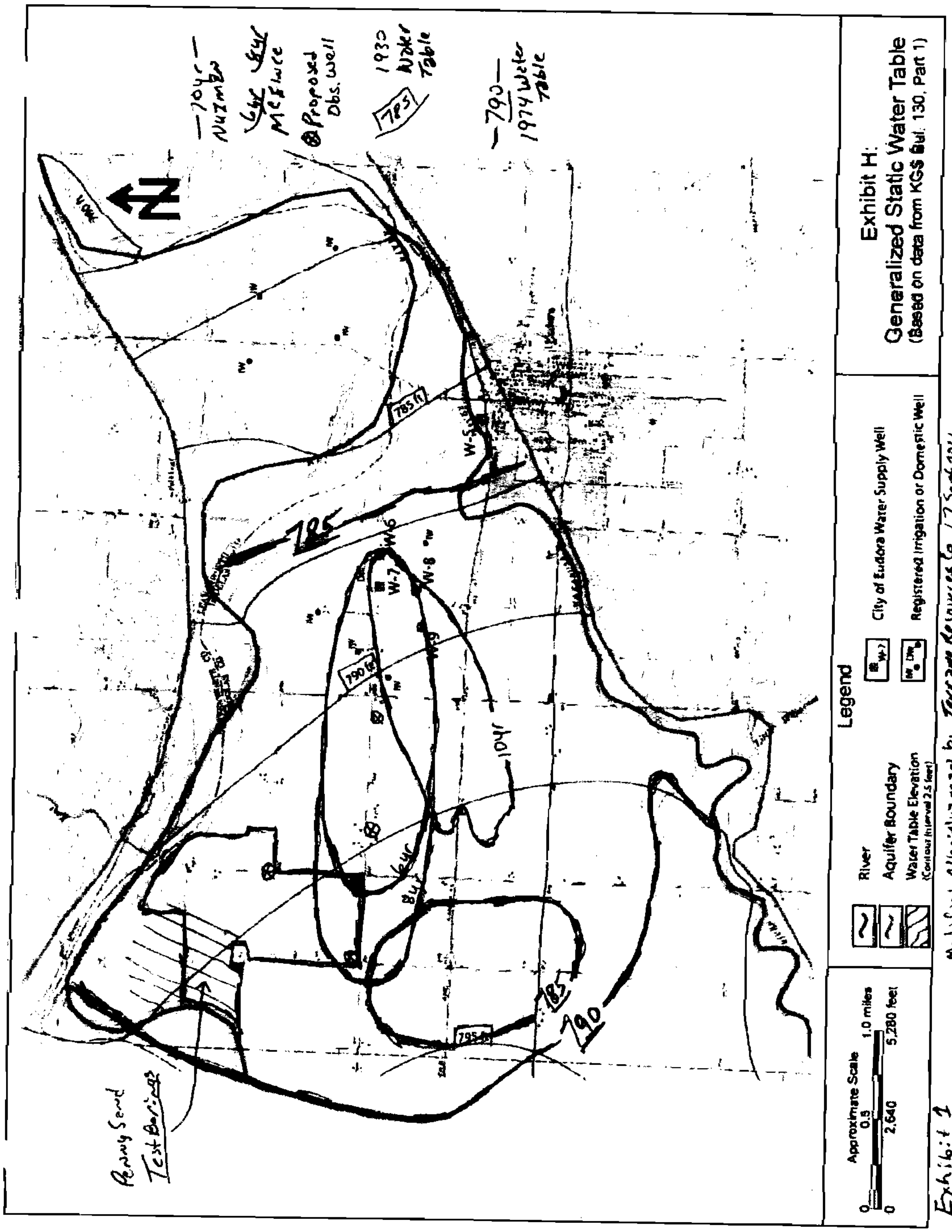


Exhibit H:
Generalized Static Water Table
(Based on data from KGS Bul. 130, Part 1)
Legend
River
Aquifer Boundary
Water Table Elevation
City of Eudora Water Supply Well
Registered Irrigation or Domestic Well
Approximate Scale
0
0.5
1.0 miles
2,640
5,280 feet
Exhibit 1
1930 Water Table
1974 Water Table
Proposed Obs. well
Penny Sand Test Borings

KANSAS
RURAL
WATER
association
Quality water, quality life

P.O. Box 226 • Seneca, KS 66538 • 785/336-3760
FAX 785/336-2751 • http://www.krwa.net

October 11, 2012

Mayor Scott Hopson
City of Eudora
P.O. Box 650
Eudora, Kansas 66025-0650

RE: Sand and Gravel
Dredging Proposal

Dear Mr. Hopson:

Thank you for allowing me the opportunity to present written information and to speak before the city council on October 8, 2012. It was obvious that the city council wanted to take the time to understand the issue and by inviting all of the interested parties to speak, they have a very good understanding of the risks and benefits moving a nearby sand and gravel dredging operation off of the Kansas River and onto the floodplain.

It should be clear to most people that removing material from the river bed will cause the river system to react to the disturbance. Sand and gravel doesn't regenerate in the river. This material in the Kansas River and its alluvium is a mixture of the material deposited from the glaciers and material eroded from the Flint Hills, the Dakota Sandstone and the Rocky Mountains. The likelihood of "new" sand and gravel coming downstream is severely limited by the existing large dams on the Kansas River and its tributaries. Initially, this disturbance will affect the bed upstream and downstream as the river attempts to restore the previous slope with sediment in the channel and / or from the banks. As it is believed that the U.S. Army Corps of Engineers will suspend the permits allowing in-stream dredging on much of the Kansas River in 2013 because of these impacts to the river, companies that use or sell sand and gravel will be looking for new sources of this material.

Unfortunately, not much planning has occurred in the counties where the Kansas River and its associated sand and gravel resources are located. This lack of comprehensive planning to identify the best locations for off-stream sand and gravel dredging operations is causing conflicts between the sand and gravel companies hoping to move onto the floodplain and public water systems that depend on the groundwater in the sand and gravel aquifers. Other interested parties affected by this change in dredging policy are transportation departments, power companies, airports, pipelines, railroads, etc. Until this planning is done, public water systems, especially those water systems that do not have treatment facilities that are capable of treating surface water or groundwater under the direct influence of surface water, will need to be vigilant in protecting their source water supplies. They will have to be actively involved in the planning process.

I believe the city council was correct in reaching a decision to recommend denial of the conditional use permit. While it was speculated in one report that the off-stream sand dredging operation would not cause "contamination" of the aquifer, no evidence was presented in written form or verbally that the proposed pit could not introduce constituents common in surface water to the groundwater supply through the beds of gravel (exposed in the sides of the pit) which extend into the aquifer. Water systems such as yours, do not have a surface water treatment plant because of the natural filtration property of the relatively undisturbed aquifer. Creating a condition that could allow bacteria, viruses, protozoa such as *Cryptosporidium* (a parasite that is resistant to chlorine disinfection), or toxins from decaying algae to enter your water supply is unreasonable and unacceptable. A fact sheet on cryptosporidiosis is enclosed.

You can reach me by telephone at 785/640-4701, by e-mail at dhelmke@krwa.net or by writing to 6847 SE 29th Street, Tecumseh, Kansas 66542-9571. You can follow me on Twitter at @KRWA_WaterRghts. Please be reminded that the KRWA website at http://www.krwa.net has news and information for water and wastewater utilities, including water rights, source water protection and training opportunities.

Sincerely,

Douglas S. Helmke

Douglas S. Helmke, L.G.
Water Rights / Source Water Specialist
Kansas Rural Water Association

DSH
Enclosure
c: KRWA
JOHN HARRENSTEIN

Facts About Cryptosporidiosis

What is cryptosporidiosis?

Cryptosporidiosis is a gastrointestinal illness caused by *Cryptosporidium*, a infectious pathogen that lives in the intestines of humans and mammals. Both the disease and the organism itself are commonly referred to as **Crypto**. Crypto is one of the most common causes of waterborne diseases in the United States: outbreaks related to recreational and drinking water increase every year. It is highly contagious and when left untreated, a person can become re-infected and/or infect others. Crypto is commonly transmitted by swallowing organisms from water, food, hands or other surfaces that have been contaminated with the organism. Crypto is most common during the summer and early fall. It occurs most frequently in young children (under the age of 10) and their caregivers. While anyone can be infected with Crypto, people with weakened immune systems (malnourished children, the elderly, patients receiving cancer chemotherapy patients with HIV/AIDS, etc.) can develop serious, life-threatening illnesses from Crypto.

Symptoms

Crypto symptoms usually begin within 2 to 10 days after exposure and generally last one to two weeks in people with healthy immune systems. Common symptoms include watery diarrhea, stomach cramps or pain, dehydration, nausea, vomiting, fever and weight loss.

Diagnosis

Diagnosis of Crypto can be complex and time-consuming because the organisms are very small and difficult to see under a microscope. Confirming a diagnosis of Crypto normally involves examining multiple stool samples over a period of several days.

Other Facts about Crypto

- The word "Crypto" comes from a Greek word meaning "hidden."
- Crypto is resistant to chlorine and other chemicals commonly used in recreational and drinking water.
- Crypto is not killed by alcohol gels and hand sanitizers.
- People can continue to pass Crypto in their stools for several weeks following illness.
- When doctors suspect Crypto, they sometimes treat patients before a definitive diagnosis is secured.
- If you suspect you or a loved one has Crypto you should consult your doctor or primary care clinician.
- Transmission of Crypto is not limited to ingesting contaminated water. Food and person-to-person transmission may be at least as important as drinking water and may be more likely to transmit higher dose exposures.

How Can Crypto be Prevented and Treated?

You can help to break the chain of transmission of Crypto if you:

- Avoid swallowing water while swimming, boating, or engaging in other recreational activities.
- Wash raw fruits and vegetables thoroughly with clean water before eating them.
- Wash you hands carefully before you eat, after using the restroom or changing diapers, after you have cared for anyone with diarrhea, and any time you may have been in contact with contaminated surfaces.
- Stay away from swimming pools and other recreational waters if you or a family member has had diarrhea.

Supportive Care and Treatment

- Doctors recommend drinking plenty of fluids to prevent dehydration during infection with Crypto and other illness causing diarrhea.
- A prescription medicine called nitazoxanide (Alinia®) may be used to treat Crypto in both adults and children 12 months of age and over.
- Nitazoxanide is available as a tablet for adults and as a liquid suspension. A three-day treatment regimen is recommended.
- Side effects of nitazoxanide are similar to those of a placebo (sugar pill).
- Nitazoxanide has not been shown to be effective for the treatment of diarrhea caused by Crypto in HIV-infected or patients or patients with weak immune systems.

National Foundation for Infectious Diseases
4733 Bethesda Avenue, Suite 750, Bethesda, MD 20814
(301) 656-0003 Web site: www.nfid.org August, 2008

Facts About Cryptosporidiosis

FACT: According to the CDC, Crypto has become one of the most common causes of waterborne diseases (recreational and drinking water) in the United States, with outbreaks increasing annually

FACT: Crypto is a chlorine-resistant pathogen that poses a serious public health threat because contamination of drinking or swimming pool water can lead to large community outbreaks

FACT: Crypto is spread by contact with contaminated water, food and surfaces. Swallowing water during recreational water activities is a common way Crypto is spread.

FACT: The tell-tale sign of Crypto infection is ***frequent, watery diarrhea that is not like other cases of diarrhea***. Other symptoms include dehydration, weight loss, stomach cramps or pain, fever, nausea and vomiting. Symptoms generally begin within two to ten days after exposure and last one to two weeks

FACT: Crypto is highly contagious and when left untreated, a person can become re-infected and/or infect others. Crypto can be shed in the stool for many weeks after symptoms clear

FACT: Dehydration is the most common problem people develop after being infected with Crypto

FACT: Persons with weak immune systems may develop prolonged illness with severe dehydration and other life-threatening complications

FACT: Maintenance of adequate fluid intake is vital for persons with Crypto and other types of diarrhea

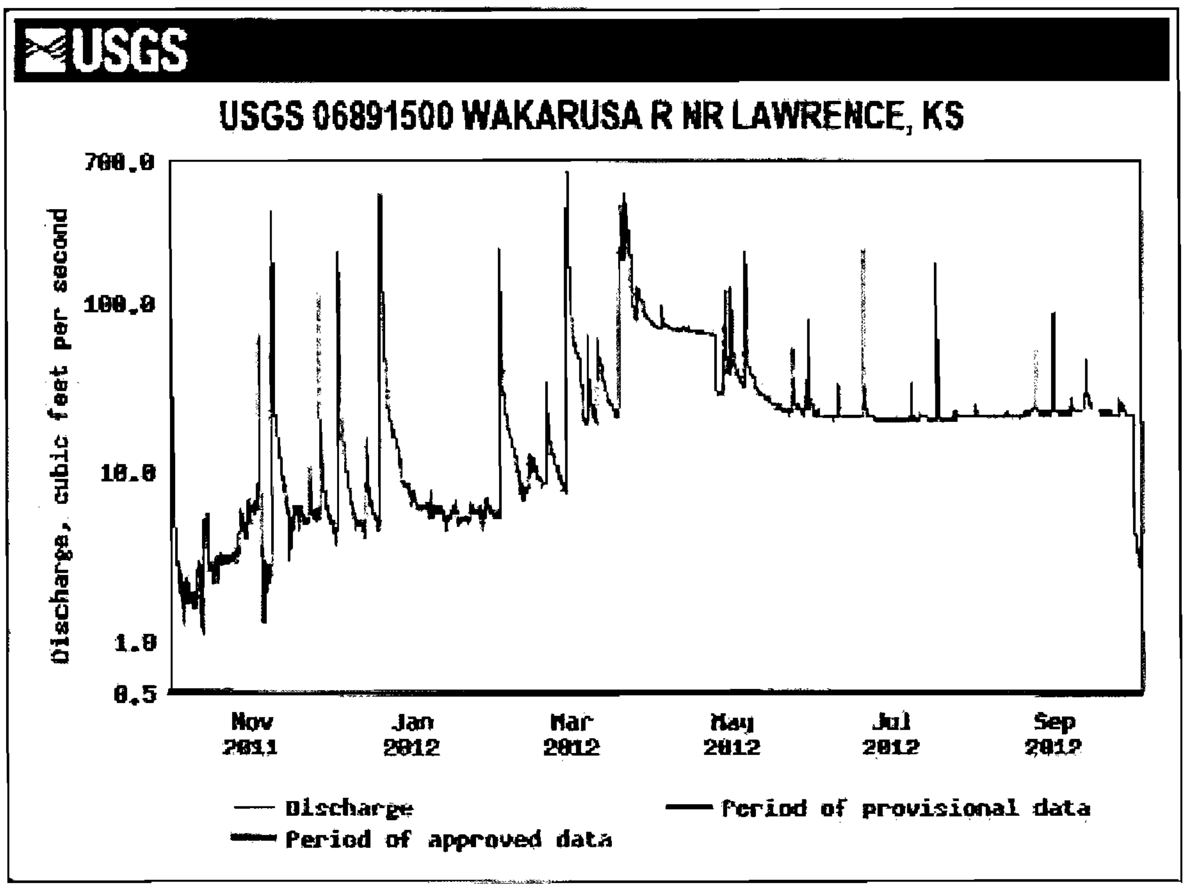
FACT: Persons who suspect diarrhea related to Crypto should consult a health-care provider.

National Foundation for Infectious Diseases
4733 Bethesda Avenue, Suite 750, Bethesda, MD 20814
(301) 656-0003 Web site: www.nfid.org August, 2008

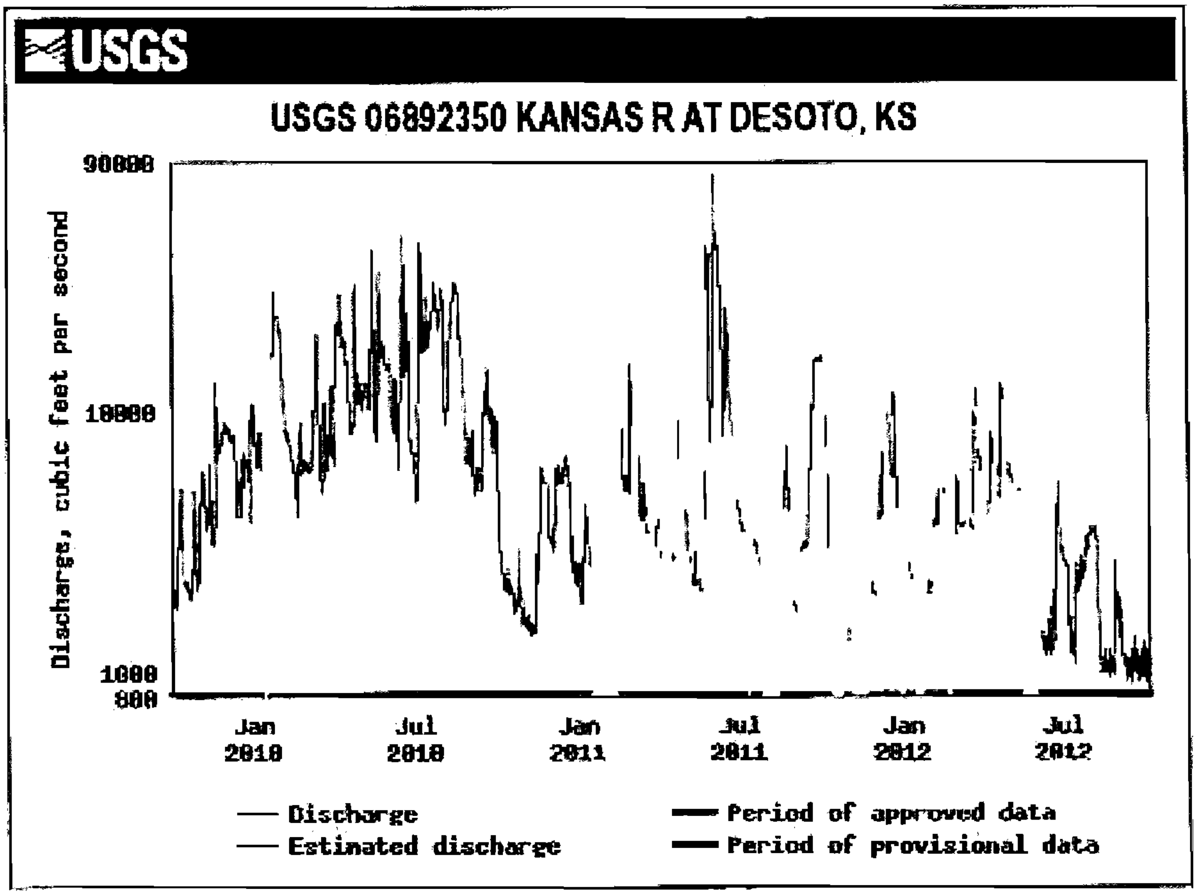
Comments Regarding the *Evaluation of a Sand Pit Operation for Penny's Concrete and Sand LLC* by Carl E. Nuzman

1. In Exhibit B, mentioned on page No. 3 of *Evaluation of Penny's Concrete and Sand LLC Proposed Sand Pit Operation on Ground Water For the Lawrence Facility* dated September 12, 2012, Mr. Nuzman provides a "cross section" of "selected" wells, three with very detailed geologic information and two with incomplete information which do not fully penetrate the aquifer. The detailed well logs show coarse sand and gravel and one of the well logs shows boulders. This kind of material in an aquifer usually allows for high transmissivity, which is a measurement on how water flows through the aquifer formation. His report then discounts the recorded water levels on these well logs due to precipitation, drought, well test pumping, etc. and are therefore unreliable for water level use. His report then relies on "pre-development conditions", which haven't existed since the 1950's.

2. Mr. Nuzman concludes that the Wakarusa River is important to aquifer recharge, but does not supply any data showing flow in the Wakarusa River. Below is a graph showing recent flow. (From http://waterdata.usgs.gov/ks/nwis/rt)



The above graph shows instantaneous water flow in the Wakarusa River near Lawrence since October 1, 2011. Notice that some events of "high" flow have occurred but most was below 10 c.f.s. until March of this year. Releases from Clinton Reservoir contributed to an average flow of about 20 c.f.s. since June of 2012.



This graph shows the measured flow in the Kansas River near De Soto. Note that the average flow is over 100 times greater than the Wakarusa River and therefore more likely to contribute more recharge to the alluvial aquifer. At some times, flow is more than a 1,000 times greater.

3. On Page 5, Mr. Nuzman concludes that the "overappropriated" condition of the aquifer will serve to intercept any contaminants upgradient from the public water supply wellfields. Of the 4,868 acre-feet appropriated in his "effective" area, 3,686 acre-feet is the authorized total (over 75%) of just one water right. Water Right, File No. 9,391, which was last used in 2002, was recently obtained by the City of Lawrence. The City of Lawrence will not be "drawing" contaminants away from the other public water suppliers by the operation of this water right if it draws contaminants toward their wells.

4 In Section 6, no detailed information is given, including the name of the "particle tracking" analysis software that was used to generate the map identified as Exhibit F. Reference is given to K.G.S. Bulletin No. 130, part 1, which was published in 1958, which does not include a particle tracking model. It is likely (but not determined) that water level data from the 1958 report was used when the un-named software was used to generate the map. His previous comments about overappropriation are ignored when he uses the water level data from the 1950's to explain the normal conditions of today.

5. In Section 8, the report seems to contradict previous comments regarding the sand pit's lack of influence on water quality. Mr. Nuzman states that sand pits beneficially support the yield of wells that are down-gradient from a pit that is within the area of influence of a well. If this is true, the quality of the water in the pit will be extended into the aquifer some unknown distance.

6. In Section 9, "Conclusions", it is stated that present regulations require 200 feet of separation between a well and a surface water source. This regulation applies to public water supply wells where the screen of a well is less than 50 feet from the surface of the ground unless approved surface water treatment is employed. This regulation is drafted to account for wells in close proximity to rivers. It was not written to account for wells near pits that fully penetrate the aquifer. If the water being pumped by public water supply wells have biological, chemical or turbidity characteristics similar to surface water, it would be surprising that KDHE would not rule that the water is under the direct influence of surface water.

7. Mr. Nuzman does not mention this conclusion taken directly from Bulletin No. 130, part 1: "Wisconsinan and Recent alluvium in this portion of the Kansas River valley has an average thickness of 55 feet. This alluvium is an excellent aquifer, because the lower portion everywhere consists of several feet of permeable sand or gravel. Surficial silts several feet thick generally overlie the coarse-textured deposits and, where sandy, permit recharge from local precipitation. During periods of heavy pumpage the ground-water body, which normally discharges into Kansas River, receives large quantities of recharge from the river, increasing severalfold the amount of ground water available to properly spaced and constructed wells. Adequate quantities of ground water of fair quality are available for future municipal, irrigational, and industrial expansion in this part of the Kansas River valley."

A fully-penetrating pit likely is a greater contributor of recharge to the aquifer with minimal filtration, than a river that does not fully penetrate the aquifer. How much influence the pit has on groundwater quality has not been adequately determined. No analysis has been performed which will evaluate the behavior of the aquifer during periods of high pumpage by multiple wells, minimal precipitation in the immediate area and high flow in the Kansas River due to upstream reservoir releases, either. This worse-case scenario should be evaluated before making a determination that a sand pit will have no impact on groundwater water quality.

Submitted to the City of Eudora
October 4, 2012
Douglas S. Helmke, L.G.
Kansas Rural Water Association

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GEOLOGIST

Comments on the Carl Nuzman report: "Evaluation of Penny's Concrete and Sand LLC, Proposed Sand Pit Operation on Ground Water"

By

Carl D. McElwee, Ph.D

Emeritus Professor

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Lawrence, KS

September 18, 2012

Introduction

Mr. Nuzman has brought together a considerable amount of data regarding the proposed project. He is a respected member of the scientific community studying groundwater. As is always the case, the data must be interpreted and analyzed to draw conclusions. I would like to point out some places where the data may be interpreted and analyzed in an alternate and reasonable manner to arrive at different conclusions. In addition, I would like to bring out some other points that need to be considered in evaluating the possible impact of this pit mining operation.

Groundwater Gradient direction

The gradient of groundwater is the driving force that causes it to move. Mr.Nuzman mainly uses the water level data of Kansas Geological Survey (KGS) Bulletin 130, Part 1. The generalized static water table map that he uses (Exhibit D) gives too much weight to water moving down the Wakarusa River Valley (which joins the Kansas River Valley just south of the proposed sand pit). This distorts his ground water gradient and leads to the conclusion given in Exhibit F that the capture zone for the Eudora Well Field is south of the proposed pit.

On the other hand, if one considers the newer report KGS Bulletin 206, Part 2, it shows that the Kansas River is the major force and that water moves down the valley generally from west to east more or less parallel to the valley walls. The resulting groundwater gradient and flow direction is shown in Figure 1 below. This data shows that water will move from the proposed sand pit to the Eudora Well Field. I have done calculations of capture curves (area of groundwater capture in a given time by the well) and travel times based on work that I published in *Ground Water* (McElwee, 1991, A copy of that paper has been supplied to the DG CO Planning Office). That work shows that the minimum travel time between the proposed sand pit and the Eudora Well Field could be about 5.5 years. In addition, the 6 and 8 year capture curves significantly overlie the proposed sand pit, as shown in Figure 2 below. Details of this work are given in Appendix I.

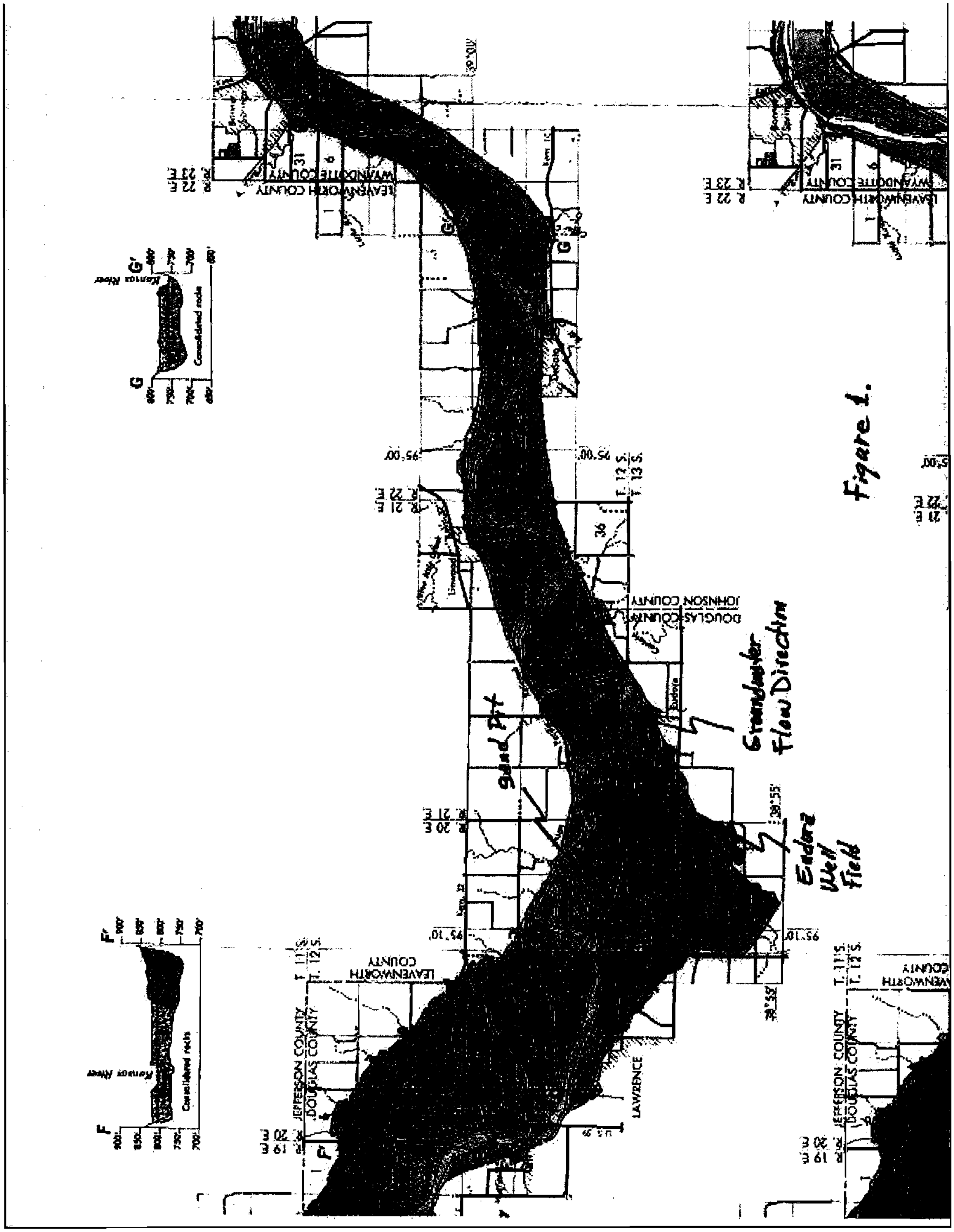
Sand Pit
Groundwater Flow Direction
Eudora Well Field
JOHNSON COUNTY
DOUGLAS COUNTY
LEAVENWORTH COUNTY
WYANDOTTE COUNTY
JEFFERSON COUNTY
DOUGLAS COUNTY
LAWRENCE
Kansas River
Consolidated rocks
R. 22 E
R. 23 E
R. 21 E
R. 20 E
R. 19 E
T. 11 S.
T. 12 S.
T. 13 S.
95°00'
95°10'

Figure 1.

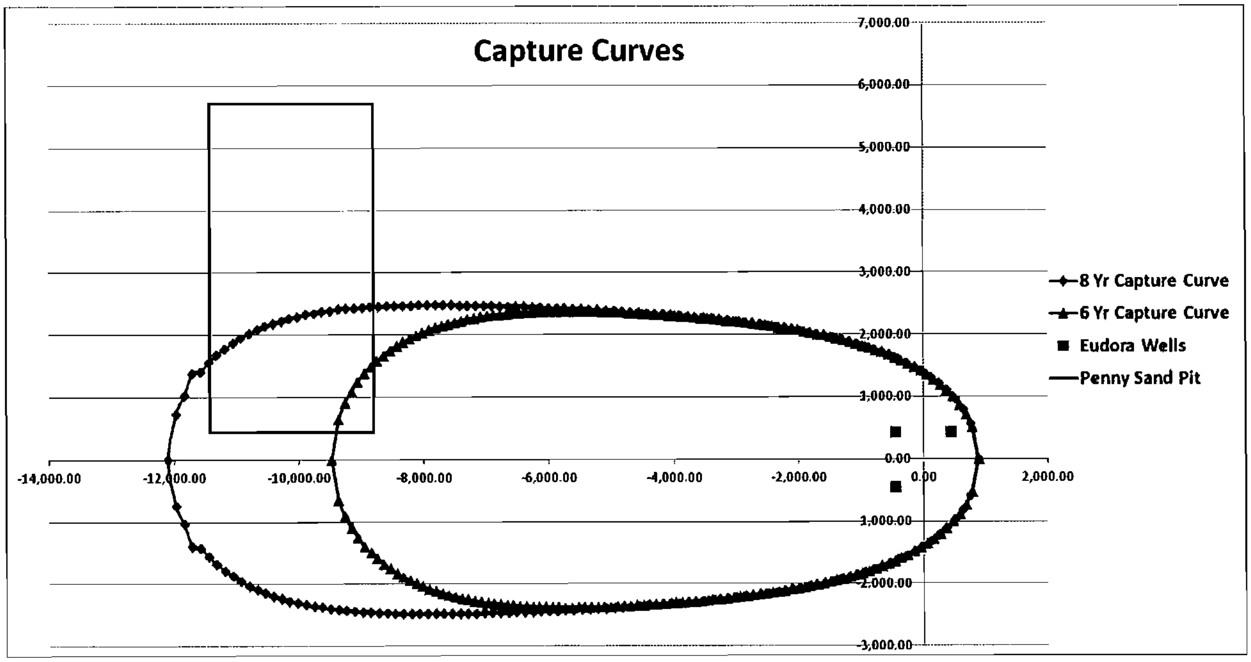

Figure 2.

Both of the KGS reports referred to are old and can't be relied on for absolute numbers. However, they do allow us to reach some general conclusions. In addition, there is a lot of variability in the aquifer (things change with space and time). So, the conclusion must be that one can't state with certainty that the proposed sand pit will have no effect on the Eudora Well Field. Of course there are many other private wells that are down-gradient from the proposed sand pit and much closer that could also be affected.

Effect of Pit on Water Levels and Quality in Aquifer

Mr. Nuzman states on page 8 that "The static water level elevation in the sand pit will be about the same as the water surface elevation in the Kansas River." That is probably true if the pit is close to the river. This means that the water level in the aquifer will be lowered around the pit, because the water levels in the aquifer are generally a little higher than the river level. This could negatively affect some nearby wells. Mr. Nuzman also states that "Sand pits beneficially support the yield of wells that are down-gradient from a pit that is within the area of influence of a well." In other words the well would be pumping water from the pit. This means

that the quality of the well water would depend on the quality of the water in the pit. In general, the quality of surface water in rivers and lakes is much poorer than the quality of groundwater. So there is the potential for pollution.

If this pit is allowed, a huge deep lake (about 70 feet deep on average) will be created. This will be a flow-through lake, which means that groundwater from up-gradient will flow in one side of the lake and flow out the down-gradient side of the lake. The net result is a continual mixing of the groundwater and the surface water from the pit, which then continues to flow down the valley in the aquifer to the next user of the groundwater.

As the well drilling logs in Mr. Nuzman's reports shows, the overburden (soil, silt, and clay) that must be removed to access the sand is substantial. It is in the range of 15-23 feet in most places, in some areas less and some areas more. However, most logs in the vicinity of the proposed sand pit indicate about 23 feet of overburden to be dealt with. This is a major logistics problem that must be dealt with while keeping any surface runoff out of the pit. There is the potential for pollution from surface runoff. This overburden material has been the filter material to keep pollutants out of the deeper aquifer, removing it exposes the aquifer. The resulting piles of surficial material may contain fertilizer and pesticide residue and daughter products from their decay. Apparently, the plan is to emplace at least some of this material back into the pit. If this is done, the overburden material should be extensively tested for possible pollutants before such use.

Mr. Nuzman mentions that a few investigations have been made on the effect of sand pits on groundwater quality and that they have not shown any significant human health effect. However, one can't infer from these few studies that there will never be a problem. In fact, at least one of those studies (KGS OFR 2008-4) did come to the conclusion that there was a measurable interconnection between the sand pit waters and the local aquifer and that there was a potential for pollution. The following is a direct quote from the conclusions of that study.

"The concentration distributions of pesticides and organics other than pesticides at the four pit sites in northwest Wichita, as well as the general pattern in iron, manganese, and ammonium ion concentrations in the downgradient well waters relative to the upgradient well and pit waters, indicate that surface water in the sand pits flows into the ground water in the southeast to south-southeast

direction of the ground-water flow at the study sites. The evidence for connection between the surface and ground waters at the two southern Wichita sites is not as strong as for the four northwest Wichita sites. However, distribution of some constituents and chemical properties do fit the general pattern of entrance of pit water into the ground water. This would be expected to occur most prominently when surface runoff into the pits increases the hydraulic gradient between the pit surface and ground-water levels. Thus, stormwater runoff containing contaminants can enter ground water through the sand pits and impact ground-water quality"

Effect of Pit on the River System

Material has previously been provided that shows the river bank in the vicinity of this proposed sand pit is unstable and has moved over time. Geologic history tells us this river will move again, we just don't know when. During a flood event the river could change course and breach the proposed sand pit. This would have a dramatic effect on the river system. Since the sand pit is deep (about 70 feet) and the river is very shallow, the pit would capture the bed load of the river and cause the river to become unstable. This would result in deepening the channel upstream (head cutting) and degradation of the channel downstream. It would take years for the river to reach a new stable equilibrium. Pits should not be allowed in areas where pit capture is a possibility.

Conclusions

I have shown that a reasonable interpretation of the available groundwater data indicates that the proposed sand pit could indeed have an effect on the Eudora Well Field and other local wells. The net effect will be a flow-through lake that mixes up-gradient aquifer water with sand pit water and sends it down-gradient into the aquifer and further down the valley. This behavior has been documented in studies of sand pits and aquifers. So, the conclusion is that any pollution must be prevented. The huge amount of overburden produced and its handling could be a source of pollution. Finally, the unstable nature of the river bank in this area makes it possible that the sand pit could capture the river during high flows and cause a channel change. If this were to happen, the river bed would be unstable for years until a new equilibrium was reached.

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Resume

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Professional Experience:

Professor of Geology, The University of Kansas, Lawrence, Kansas, 1997-2009, now retired.

Senior Scientist, Special Projects/Office of the Director, Kansas Geological Survey, The University of Kansas, Lawrence, Kansas, 1998-2002.

Senior Scientist, Mathematical Geology Section, Kansas Geological Survey, The University of Kansas, Lawrence, Kansas, 1987-1998.

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Geophysicist, Texaco Inc., Bellaire, Texas, 1970-1974.

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NSF Undergraduate Research Grant (2 years, 1963-1965)

Graduation with Honors, William Jewell College (1965)

NSF Traineeship for Graduate Work (4 years, 1965-1969)

Mobil Oil Fellowship (1 year, 1969-1970)

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Sabbatical leave awarded for groundwater research in the United Kingdom (Jan.- May, 1993)

Center for Teaching Excellence Outstanding Graduate Teaching Award, Dept. of Geology, Univ. of Kansas, 2001.

Sabbatical leave awarded to start writing a book on groundwater modeling, Fall Semester 2002.

Leo M. & Robert M. Orth Water Resources Scholarship, Dept. of Geology, 2008

Present Major Scientific Interests:

Theoretical description of flow systems • Characterization of aquifer heterogeneity by field, laboratory, and modeling activities • Model studies of groundwater availability in Kansas • Sensitivity of groundwater models to variations in transmissivity and storage • Modeling of chemical quality of groundwater systems • Application of seismic techniques to groundwater exploration and evaluation

Professional Journal Articles

McElwee, C.D., and Yukler, M.A., 1978, Sensitivity of groundwater flow models with respect to variations in transmissivity and storage: *Water Resources Research*, v. 14, no. 3, p. 451.

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Appendix I.

This calculations presented here is based on work I did and published back in 1991 in the *Ground Water* journal. I have supplied to the Planning Department a copy of that article for reference. This work shows that the minimum travel time from the Penny sand pit to the Eudora Well Field is about 5.5 years. This is from the closest point of the pit to the center of the well field. I have also calculated the 6 and 8 year capture curves for the Eudora Well field. The work shows that these capture curves include significant portions of the proposed pit.

The important parameters are as follows:

K - hydraulic conductivity - I used 1000ft/day. This is a measure of how fast water moves in the aquifer. The Nuzman report uses data from a well test on Eudora No. 8 and reports 8800 gpd/ft2, which is 1176 ft/day. This also agrees with data I have personally collected from the Kansas River Valley.

I - Hydraulic gradient (slope) of the ground water system - I used .0005, which is about 5ft in 2 miles. Bulletin 130, Part 1 and Bulletin 206, part 2 from the Kansas Geological Survey show head maps of the area in question that support this number.

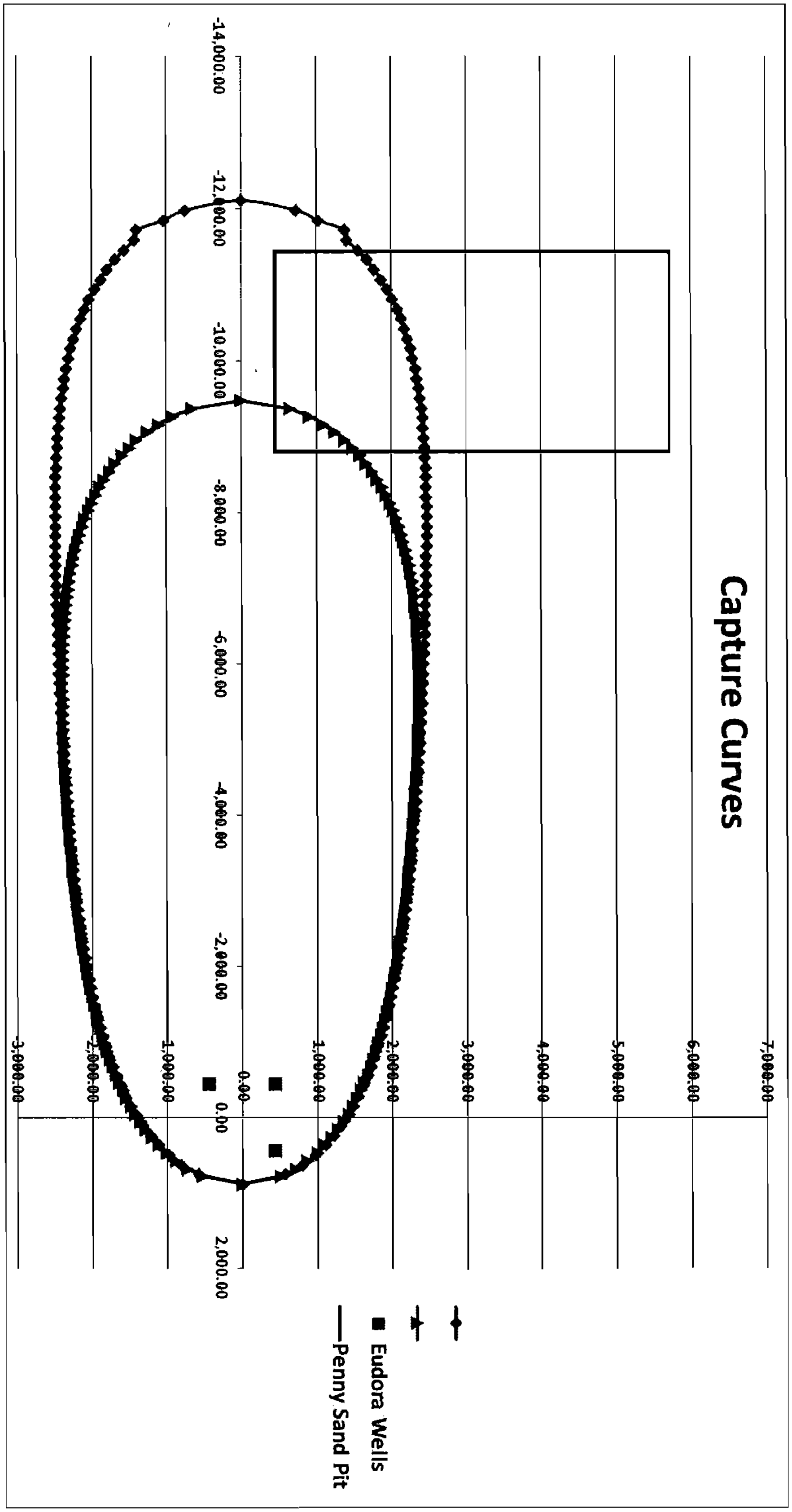
qo = -KI = -0.5 ft/day - average Darcy velocity in the aquifer - Multiplying the above two values gives this result.

B - Effective saturated thickness of aquifer - I used 30 feet. Although the aquifer has greater saturated thickness, the upper part is much finer material and has much less hydraulic conductivity. I have seen this consistently in my field work.

n - effective porosity (a measure of the pore space that water flows through) - I used 0.15 which is an average value suggested by the work of Bull 260, and also is consistent with my field work.

Q - Pump rate of the Eudora Well Field - I used 83425 ft3/day which is the approved water right of 227.77 MGY or about 433gpm.

These parameters can be used to calculate the average travel times and capture curves for parcels of water moving under the influence of the natural groundwater flow system and the influence of the pumping in the Eudora Well Field. The details of the background material to arrive at the formulas used in the following pages are given in the above referenced *Ground Water* article. The pages that follow show the capture curves for 6 and 8 years and the average minimum travel time between the sand pit and the Eudora Well Field. A capture curve outlines the area of groundwater that will flow to the pumping well in a given amount of time.


Capture Curves
-14,000.00
-12,000.00
-10,000.00
-8,000.00
-6,000.00
-4,000.00
-2,000.00
0.00
2,000.00
-3,000.00
-2,000.00
-1,000.00
0.00
1,000.00
2,000.00
3,000.00
4,000.00
5,000.00
6,000.00
7,000.00
Eudora Wells
Penny Sand Pit

qo =	-0.5	Average Darcy Velocity
n =	0.15	Effective Porosity
Q =	83425	Well Discharge
B =	30	Effective Aquifer Thickness
X =	-8800	Distance traveled along X axis
t =		Time of travel

$$X = \frac{qo}{n}t + \frac{Q}{2\pi qoB}ln\left(1 + \frac{2\pi qoB}{Q}X\right)$$

$$t = \left[\frac{n}{qo}\right]\left[X - \frac{Q}{2\pi qoB}ln\left(1 + \frac{2\pi qoB}{Q}X\right)\right]$$

t = 2005 days = 5.49 years

6 yr. Capture Curve Data

X(Ft)	Y(Ft)
8.8508E+02	0.0000E+00
7.8145E+02	-5.1844E+02
6.7783E+02	-7.2470E+02
5.7420E+02	-8.7735E+02
4.7057E+02	-1.0015E+03
3.6694E+02	-1.1069E+03
2.6331E+02	-1.1989E+03
1.5969E+02	-1.2804E+03
5.6059E+01	-1.3536E+03
-4.7568E+01	-1.4198E+03
-1.5120E+02	-1.4802E+03
-2.5482E+02	-1.5357E+03
-3.5845E+02	-1.5867E+03
-4.6208E+02	-1.6340E+03
-5.6571E+02	-1.6778E+03
-6.6933E+02	-1.7187E+03
-7.7296E+02	-1.7568E+03
-8.7659E+02	-1.7925E+03
-9.8022E+02	-1.8259E+03
-1.0838E+03	-1.8573E+03
-1.1875E+03	-1.8869E+03
-1.2911E+03	-1.9147E+03
-1.3947E+03	-1.9410E+03
-1.4984E+03	-1.9659E+03
-1.6020E+03	-1.9894E+03
-1.7056E+03	-2.0117E+03
-1.8092E+03	-2.0328E+03
-1.9129E+03	-2.0529E+03
-2.0165E+03	-2.0720E+03
-2.1201E+03	-2.0901E+03
-2.2238E+03	-2.1074E+03
-2.3274E+03	-2.1239E+03
-2.4310E+03	-2.1396E+03
-2.5346E+03	-2.1546E+03
-2.6383E+03	-2.1689E+03
-2.7419E+03	-2.1825E+03
-2.8455E+03	-2.1956E+03
-2.9491E+03	-2.2081E+03
-3.0528E+03	-2.2200E+03
-3.1564E+03	-2.2314E+03
-3.2600E+03	-2.2423E+03

-3.3637E+03	-2.2527E+03
-3.4673E+03	-2.2627E+03
-3.5709E+03	-2.2722E+03
-3.6745E+03	-2.2813E+03
-3.7782E+03	-2.2899E+03
-3.8818E+03	-2.2982E+03
-3.9854E+03	-2.3060E+03
-4.0891E+03	-2.3135E+03
-4.1927E+03	-2.3206E+03
-4.2963E+03	-2.3272E+03
-4.3999E+03	-2.3335E+03
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-4.9181E+03	-2.3590E+03
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-3.2600E+03	2.2423E+03
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-2.5346E+03	2.1546E+03
-2.4310E+03	2.1396E+03
-2.3274E+03	2.1239E+03

-2.2238E+03	2.1074E+03
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-1.4984E+03	1.9659E+03
-1.3947E+03	1.9410E+03
-1.2911E+03	1.9147E+03
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-4.6208E+02	1.6340E+03
-3.5845E+02	1.5867E+03
-2.5482E+02	1.5357E+03
-1.5120E+02	1.4802E+03
-4.7568E+01	1.4198E+03
5.6059E+01	1.3536E+03
1.5969E+02	1.2804E+03
2.6331E+02	1.1989E+03
3.6694E+02	1.1069E+03
4.7057E+02	1.0015E+03
5.7420E+02	8.7735E+02
6.7783E+02	7.2470E+02
7.8145E+02	5.1844E+02
8.8508E+02	0.0000E+00

8 yr. Capture Curve Data

X(Ft)	Y(Ft)
8.8516E+02	0.0000E+00
7.5519E+02	-5.7893E+02
6.2523E+02	-8.0688E+02
4.9526E+02	-9.7403E+02
3.6530E+02	-1.1087E+03
2.3533E+02	-1.2220E+03
1.0536E+02	-1.3199E+03
-2.4604E+01	-1.4059E+03

-1.5457E+02	-1.4824E+03
-2.8454E+02	-1.5510E+03
-4.1450E+02	-1.6130E+03
-5.4447E+02	-1.6694E+03
-6.7444E+02	-1.7210E+03
-8.0440E+02	-1.7683E+03
-9.3437E+02	-1.8118E+03
-1.0643E+03	-1.8521E+03
-1.1943E+03	-1.8893E+03
-1.3243E+03	-1.9240E+03
-1.4542E+03	-1.9562E+03
-1.5842E+03	-1.9863E+03
-1.7142E+03	-2.0144E+03
-1.8441E+03	-2.0408E+03
-1.9741E+03	-2.0655E+03
-2.1041E+03	-2.0887E+03
-2.2340E+03	-2.1106E+03
-2.3640E+03	-2.1313E+03
-2.4940E+03	-2.1507E+03
-2.6239E+03	-2.1692E+03
-2.7539E+03	-2.1866E+03
-2.8839E+03	-2.2031E+03
-3.0138E+03	-2.2188E+03
-3.1438E+03	-2.2337E+03
-3.2738E+03	-2.2479E+03
-3.4037E+03	-2.2614E+03
-3.5337E+03	-2.2742E+03
-3.6637E+03	-2.2865E+03
-3.7936E+03	-2.2982E+03
-3.9236E+03	-2.3093E+03
-4.0536E+03	-2.3200E+03
-4.1835E+03	-2.3302E+03
-4.3135E+03	-2.3399E+03
-4.4435E+03	-2.3493E+03
-4.5734E+03	-2.3582E+03
-4.7034E+03	-2.3668E+03
-4.8334E+03	-2.3750E+03
-4.9633E+03	-2.3829E+03
-5.0933E+03	-2.3904E+03
-5.2233E+03	-2.3976E+03
-5.3532E+03	-2.4046E+03
-5.4832E+03	-2.4112E+03
-5.6132E+03	-2.4175E+03

-5.7431E+03	-2.4236E+03
-5.8731E+03	-2.4293E+03
-6.0031E+03	-2.4348E+03
-6.1330E+03	-2.4401E+03
-6.2630E+03	-2.4450E+03
-6.3930E+03	-2.4497E+03
-6.5229E+03	-2.4540E+03
-6.6529E+03	-2.4581E+03
-6.7829E+03	-2.4619E+03
-6.9128E+03	-2.4653E+03
-7.0428E+03	-2.4684E+03
-7.1728E+03	-2.4712E+03
-7.3027E+03	-2.4735E+03
-7.4327E+03	-2.4755E+03
-7.5627E+03	-2.4769E+03
-7.6926E+03	-2.4779E+03
-7.8226E+03	-2.4784E+03
-7.9526E+03	-2.4782E+03
-8.0825E+03	-2.4774E+03
-8.2125E+03	-2.4758E+03
-8.3425E+03	-2.4734E+03
-8.4724E+03	-2.4701E+03
-8.6024E+03	-2.4657E+03
-8.7324E+03	-2.4602E+03
-8.8623E+03	-2.4534E+03
-8.9923E+03	-2.4451E+03
-9.1223E+03	-2.4351E+03
-9.2522E+03	-2.4234E+03
-9.3822E+03	-2.4095E+03
-9.5122E+03	-2.3934E+03
-9.6421E+03	-2.3746E+03
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-9.9021E+03	-2.3281E+03
-1.0032E+04	-2.2995E+03
-1.0162E+04	-2.2669E+03
-1.0292E+04	-2.2297E+03
-1.0422E+04	-2.1874E+03
-1.0552E+04	-2.1393E+03
-1.0682E+04	-2.0848E+03
-1.0812E+04	-2.0230E+03
-1.0942E+04	-1.9528E+03
-1.1072E+04	-1.8730E+03
-1.1202E+04	-1.7819E+03

-1.1332E+04	-1.6775E+03
-1.1462E+04	-1.5568E+03
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-1.1202E+04	1.7819E+03
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-1.0942E+04	1.9528E+03
-1.0812E+04	2.0230E+03
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-7.3027E+03	2.4735E+03
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3.6530E+02	1.1087E+03
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6.2523E+02	8.0688E+02
7.5519E+02	5.7893E+02
8.8516E+02	0.0000E+00

Wells X (map in)	Wells Y (map in)	Wells X (ft)	Wells Y (ft)
-0.25	0.25	-440	440
-0.25	-0.25	-440	-440
0.25	0.25	440	440

Pit X (map in)	Pit Y (map in)	Pit X (ft)	Pit Y (ft)
-5	0.25	-8800	440
-6.5	0.25	-11440	440
-6.5	3.25	-11440	5720
-5	3.25	-8800	5720
-5	0.25	-8800	440

Douglas County Planning Commission
6 East 6th Street
Lawrence, Kansas 66044

October 11, 2012

Re: Proposed Conditional Use Permit for extension of sand and gravel extraction in an area adjacent to 1564 E. 1850 Road. This site lies directly south of the Kansas River midway between Lawrence and Eudora.

I recommend that this proposal be DENIED.

This conclusion is based on my many years of study and mapping of the Kansas River, including publication, in 2009, of an atlas of Historical Channel Changes of the Kansas River and its Major Tributaries. In reviewing available data I find several reasons that excavation within the proposed area could have several negative effects for the general public.

1) Potentially most serious would be pollution of the water supply for the city of Eudora. Underlying the flat valley floor in this region is a sequence of interlayered sand and gravel that approaches 100 feet in thickness. A large volume of water occupies the spaces between grains of this sediment. This water seeps slowly eastward in a downvalley direction, some being captured by both private and municipal wells. Less than two miles east of the proposed new excavation site is the well field that supplies potable water for the public water system of the City of Eudora. In other words, Eudora's water supply passes through sands lying beneath the proposed new extraction pit.

Any sand-and-gravel operation requires the presence of at least a few motors and transient vehicles that will inevitably leak contaminating fluids which can seep into and through subsurface sediments and become part of the downstream movement of the ground water. Furthermore, this area on the valley floor is subject to inundation during major floods. The high level surface flow also could pick up contaminants from the new sand pit and carry them downvalley to the Eudora well field.

Inspection of detailed maps or aerial photographs of the Kansas River Valley west of Eudora reveals that the proposed extraction site lies farther north (as well as west) of the Eudora well field. It might therefore be argued that pollutants from the proposed sand pit would pass downvalley north of the well field location and so have no influence on the wells. However, records of the location of the river channel during the past few hundred years show that the stream has locally been flowing from northwest to southeast. That means that sand bodies accumulating in the channel would be elongated in that direction, an orientation that could lead subsurface water movement to go from the pollutant source of the new pit directly to the Eudora well field.

This all means that opening a new sand and gravel extraction pit at the proposed location could seriously endanger the purity and integrity of Eudora's water supply.

2) Data currently available to me do not define the precise location of the well that supplies water to the house at 1564 E 1850 Rd. Excavation on the proposed new site for sand and gravel extraction could seriously impinge on the supply of water from that private well. In fact, opening and deepening of the new pit might divert all local groundwater flow from the well and leave the residence with no water supply at all. The situation certainly requires assessment.

3) At the northwestern corner of the proposed new operation the Kansas River follows a sharp, almost V-shaped bend to the north and then back to the southeast. This bend has been actively shifting shape and location during the past several decades. It can be assumed that this dynamic will continue at least into the near future. The trend suggests that the channel will soon cut off or cut through the sharp bend by eroding through the location of the present sand and gravel operation. This channel move could also cut away at least the northern part of the proposed new operation. Such a shift of channel position would negatively affect the new extraction operation, and might

establish a new channel dynamic that would affect streamflow in both downstream and upstream locations. Final effects and configurations cannot immediately be determined, but could involve unexpected erosion into productive cropland.

Several predictable effects of establishment of a new sand and gravel extraction operation adjacent to 1564 East 1850 Road between Lawrence and Eudora tend to have negative impacts on nearby parts of the local valley floor. However, it is endangerment of the well field for the City of Eudora municipal water supply that demands closest attention. Chance of contamination of that resource is completely unacceptable for the public welfare.

Wakefield Dort Jr.

Wakefield Dort, Jr.

Emeritus Professor Geology
The University of Kansas

Douglas County Planning Commission
6 East 6th Street
Lawrence, Kansas 66044

October 11, 2012

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1) Potentially most serious would be pollution of the water supply for the city of Eudora. Underlying the flat valley floor in this region is a sequence of interlayered sand and gravel that approaches 100 feet in thickness. A large volume of water occupies the spaces between grains of this sediment. This water seeps slowly eastward in a downvalley direction, some being captured by both private and municipal wells. Less than two miles east of the proposed new excavation site is the well field that supplies potable water for the public water system of the City of Eudora. In other words, Eudora's water supply passes through sands lying beneath the proposed new extraction pit.

Any sand-and-gravel operation requires the presence of at least a few motors and transient vehicles that will inevitably leak contaminating fluids which can seep into and through subsurface sediments and become part of the downstream movement of the ground water. Furthermore, this area on the valley floor is subject to inundation during major floods. The high level surface flow also could pick up contaminants from the new sand pit and carry them downvalley to the Eudora well field.

Inspection of detailed maps or aerial photographs of the Kansas River Valley west of Eudora reveals that the proposed extraction site lies farther north (as well as west) of the Eudora well field. It might therefore be argued that pollutants from the proposed sand pit would pass downvalley north of the well field location and so have no influence on the wells. However, records of the location of the river channel during the past few hundred years show that the stream has locally been flowing from northwest to southeast. That means that sand bodies accumulating in the channel would be elongated in that direction, an orientation that could lead subsurface water movement to go from the pollutant source of the new pit directly to the Eudora well field.

This all means that opening a new sand and gravel extraction pit at the proposed location could seriously endanger the purity and integrity of Eudora's water supply.

2) Data currently available to me do not define the precise location of the well that supplies water to the house at 1564 E 1850 Rd. Excavation on the proposed new site for sand and gravel extraction could seriously impinge on the supply of water from that private well. In fact, opening and deepening of the new pit might divert all local groundwater flow from the well and leave the residence with no water supply at all. The situation certainly requires assessment.

3) At the northwestern corner of the proposed new operation the Kansas River follows a sharp, almost V-shaped bend to the north and then back to the southeast. This bend has been actively shifting shape and location during the past several decades. It can be assumed that this dynamic will continue at least into the near future. The trend suggests that the channel will soon cut off or cut through the sharp bend by eroding through the location of the present sand and gravel operation. This channel move could also cut away at least the northern part of the proposed new operation. Such a shift of channel position would negatively affect the new extraction operation, and might

establish a new channel dynamic that would affect streamflow in both downstream and upstream locations. Final effects and configurations cannot immediately be determined, but could involve unexpected erosion into productive cropland.

Several predictable effects of establishment of a new sand and gravel extraction operation adjacent to 1564 East 1850 Road between Lawrence and Eudora tend to have negative impacts on nearby parts of the local valley floor. However, it is endangerment of the well field for the City of Eudora municipal water supply that demands closest attention. Chance of contamination of that resource is completely unacceptable for the public welfare.

Wakefield Dort Jr.

Wakefield Dort, Jr.

Emeritus Professor Geology
The University of Kansas

Oct. 2, 2012

Lawrence Douglas County
Metropolitan Planning Office
6 East 6th Street,
P.O. Box 708,
Lawrence, KS 66044

Ms. Mary Miller,

After reading your staff report which contains the following information:

"Staff contacted a hydrologist with the USGS (United States Geological Survey) Midwest Division, Kyle E Juracek, for his opinion on the impact of the dredging operation and pit on the river channel. Mr. Juracek indicated that the location of a lake could result in channel change in the event of a flood but pointed out that the river channel may change as a result of a flooding event even without a lake in close proximity."

I felt that the situation involved in this request for a CUP had not been made entirely clear to Dr. Juracek. The situation is fairly complex and deserves some more description. After making an appointment to see Dr. Juracek, I showed him Dr. Dort's work characterizing the river bank movement over the last 100 plus years, gave him a plan view map of the proposed sand pit excavation area to create the lake, and explained to him that the sand excavation would proceed to bedrock in the area. We discussed the fact that the river is trying to cut off the meander in this area. I pointed out that the proposed excavation pit (about ¾ mile wide East to West) would nearly connect the two sides of the meander.

Dr. Dort's work shows the river bank in the vicinity of this proposed sand pit is unstable and has moved over time. Geologic history tells us this river will move again, we just don't know when. During a major flood event the river could try to move again and breach the proposed sand pit.

The presence of such a large deep pit as requested at this site would make it much easier (since so much material has been removed) for the river in times of flood to cut off the meander at this site by flowing through the pit area. This would create a huge nick point (deepened point in the river bed about

50-60 feet deep) that would have a destabilizing effect on the river bed, with head cutting upstream and bed degradation downstream for some time to come, until a new stable river bed gradient was created. This erosion of the river bed could propagate upstream to the Bowersock Dam and downstream an unknown distance.

I have sent a copy of this letter to Dr. Juracek for review and he has not disagreed with my statements. I encourage you to contact him and discuss this matter with him and to ask him any questions you may have.

Thank you for your consideration. If I may answer any questions, please contact me.

Carl McElwee
Emeritus Professor of Geology
University of Kansas
Lawrence, KS 66045
785-843-4164
cmcelwee@ku.edu

Sept. 25, 2012

Lawrence Douglas County
Metropolitan Planning Office
6 East 6th Street,
P.O. Box 708,
Lawrence, KS 66044

Ms. Mary Miller:

It is unfortunate that last night's Planning Commission meeting on Item 1 degenerated into a chaotic situation, resulting in deferral for a month before some information could be communicated to the Commissioners. As I have communicated to you some weeks ago I am unable to be at the Oct. 22 Planning Commission meeting due to a commitment scheduled months ago and which is unchangeable. As the property owner most affected by this proposed CUP involving the Penny Sand Pit, as the leader of the local property owner opposition group (see signed petition), and as a qualified groundwater professional (who has submitted material for review) it would seem to be deprivation of due process to hold the meeting to discuss this issue when I can not be present. Therefore, I am respectfully asking the Douglas County Planning Commission to defer this item until the November meeting.

Thank you for your consideration. If I may answer any questions, please contact me.

Carl McElwee
1564 E. 1850 Rd.
Lawrence, KS 66046
785-843-4164
cmcelwee@ku.edu

Virginia Strong
3712 Trail Road
Lawrence, Kansas 66049

RECEIVED
OCT 22 2012
City County Planning Office
Lawrence, Kansas

October 22, 2012

Lawrence-Douglas County Planning Commission
6 East 6th Street
Lawrence, Kansas 66044

Subject: Penny Sand Pit Conditional Use Permit Hearing

To the Commissioners:

I believe that if you approve the Conditional Use Permit (CUP) requested on behalf of William Penny and Van LLC to be considered at tonight's Commisssion meeting, you will be aiding a crime against nature and *demolishing* thousands of cubic yards of prime Kaw Valley soil. I form this belief upon the common sense in continuing to make this land available for farming, and around the unintended consequences of granting the permit. As a member of the family that for several decades owned one of the adjoining parcels (on the southeast corner of the intersection of North 1500 Road and East 1900 Road), my concerns are informed by familiarity with the immediate neighborhood and its history of use, as follows:

- The prospect of a quarry dug deeper than 25 feet below the present ground level makes me question its consequences for the quality of the local aquifer, which already leaves something to be desired.
- For several years copper acetoarsenite (a highly toxic and water-insoluble pesticide and dye) was applied for pest control to some of the land under discussion, at the time planted in potatoes. Can the permit applicants rule out any reasonable possibility that remnants of that pesticide might be disturbed and made airborne by the proposed development?
- The fully excavated gravel pit is proposed to be turned into a lake, which would become a breeding ground for hordes of mosquitoes — as if we need more of those swarming around. There is also the question of how a quarry would fare in the event of a catastrophic flood, which ought to be investigated regardless of any guarantees.
- The parcel under discussion is a well-known and established resting place for migrating geese. The consequences of destroying its present character would presumably be unfortunate for the geese, the neighbors (as such), or both.
- My understanding is that the land purchases making up the parcel under discussion were made at a bargain, a fact that can be verified as a matter of public record. Would Mr. Penny be in a position to apply for the CUP at issue, if he had been called upon to purchase the land at par value? *[Continued on next page]*

- *[Continued from previous page]* If the proposed quarry is dug, how likely is it that the affected land — both that covered by the quarry, and adjoining land — could be sold at par value at any time in the foreseeable future?
- In what time frame does the proposed quarry promise to deliver higher tax revenues to the County than it could if farmed?

Finally, how much of this development process is illuminated by greed, and how much by the desire to put the targeted land to a use about which the residents of Douglas County can feel some pride?

In summary I count a number of concerns about the permit application, including at least two conceivable threats to public health that are peculiar to the area that it covers. Were I to put it more subjectively and succinctly, I could call the development plan behind the permit application hare-brained. However, that would insult the hares. I request that you consider the concerns that led to that judgment.

Sincerely,
Virginia Schaake Strong
(785) 843-2293

CC: Lawrence *Journal-World*

THE LAW OFFICES OF
DANIEL L. WATKINS
901 NEW HAMPSHIRE STREET, SUITE 200
LAWRENCE, KANSAS 66044

TELEPHONE: (785) 843-0181
DANWATKINS@SUNFLOWER.COM
FACSIMILE: (785) 749-5652

October 3, 2012

Mr. Bruce Liese, Chairman
Lawrence/Douglas County Planning Commission
c/o Scott McCullough, Director
6 East 6th Street
Lawrence, KS 66044

Dear Chair and Commissioners:

You have a request from Carl McElwee to defer the hearing regarding Bill Penny's application for a Conditional Use Permit to extract sand from a parcel of land east of Lawrence, Kansas and north of County Road 1500. While we appreciate Mr. McElwee's circumstances, we believe it is important to proceed with consideration of the application. Penny's has been diligent in meeting submittal schedules and delivering additional information to staff on a timely basis. The matter has already been deferred once due to the request of Eudora.

The Corps of Engineers has notified us that river dredging permits in this vicinity will be suspended beginning December 31, 2012. Our application was developed and submitted on a schedule that would allow dredging of sand from an off-river pit coincident with the loss of the river dredging permits if a permit application is considered and approved this fall. Deferral of this application for another month will make this schedule very difficult to meet.

Mr. McElwee has submitted considerable information for the Planning Commission to consider in its deliberations. While his presence could certainly add emotion to the arguments he has presented, the multiple written submissions and petitions fully convey his position.

We respectfully request the Lawrence-Douglas Metropolitan Planning Commission proceed with the public hearing on October 22, 2012.

Sincerely,

Dan Watkins

RECEIVED

OCT 15 2012

City County Planning Office
Lawrence, Kansas

MEMORANDUM

532 Oklahoma Street Lawrence, KS 66046 12 October 2012

To: Lawrence-Douglas County Metropolitan Planning Office

From: Stan Roth, Retired Biology Teacher, USD 497 for 40 years

Re: Penny Sand Company Application for Continual Use Permit

Please deny the Penny Sand Company request for a pit mining operation for sand removal near roads 1500 North and 1850 East. This would negatively impact the surrounding agriculture activity that has sustained the local economy for decades. There are issues relating to environmental degradation that must be taken into account in the long term. The operation would result in displacement of overburden, result in instability of the nearby river channel bank, and negatively impact the ground water aquifer.

Also, the approval of this request would result in the disruption of the contemporary farming economy and adversely affect the Douglas County history of the area.

Douglas County Planning Commission
6 East 6th Street
Lawrence, Kansas 66044

October 11, 2012

Re: Proposed Conditional Use Permit for extension of sand and gravel extraction in an area adjacent to 1564 E. 1850 Road. This site lies directly south of the Kansas River midway between Lawrence and Eudora.

I recommend that this proposal be DENIED.

This conclusion is based on my many years of study and mapping of the Kansas River, including publication, in 2009, of an atlas of Historical Channel Changes of the Kansas River and its Major Tributaries. In reviewing available data I find several reasons that excavation within the proposed area could have several negative effects for the general public.

1) Potentially most serious would be pollution of the water supply for the city of Eudora. Underlying the flat valley floor in this region is a sequence of interlayered sand and gravel that approaches 100 feet in thickness. A large volume of water occupies the spaces between grains of this sediment. This water seeps slowly eastward in a downvalley direction, some being captured by both private and municipal wells. Less than two miles east of the proposed new excavation site is the well field that supplies potable water for the public water system of the City of Eudora. In other words, Eudora's water supply passes through sands lying beneath the proposed new extraction pit.

Any sand-and-gravel operation requires the presence of at least a few motors and transient vehicles that will inevitably leak contaminating fluids which can seep into and through subsurface sediments and become part of the downstream movement of the ground water. Furthermore, this area on the valley floor is subject to inundation during major floods. The high level surface flow also could pick up contaminants from the new sand pit and carry them downvalley to the Eudora well field.

Inspection of detailed maps or aerial photographs of the Kansas River Valley west of Eudora reveals that the proposed extraction site lies farther north (as well as west) of the Eudora well field. It might therefore be argued that pollutants from the proposed sand pit would pass downvalley north of the well field location and so have no influence on the wells. However, records of the location of the river channel during the past few hundred years show that the stream has locally been flowing from northwest to southeast. That means that sand bodies accumulating in the channel would be elongated in that direction, an orientation that could lead subsurface water movement to go from the pollutant source of the new pit directly to the Eudora well field.

This all means that opening a new sand and gravel extraction pit at the proposed location could seriously endanger the purity and integrity of Eudora's water supply.

2) Data currently available to me do not define the precise location of the well that supplies water to the house at 1564 E 1850 Rd. Excavation on the proposed new site for sand and gravel extraction could seriously impinge on the supply of water from that private well. In fact, opening and deepening of the new pit might divert all local groundwater flow from the well and leave the residence with no water supply at all. The situation certainly requires assessment.

3) At the northwestern corner of the proposed new operation the Kansas River follows a sharp, almost V-shaped bend to the north and then back to the southeast. This bend has been actively shifting shape and location during the past several decades. It can be assumed that this dynamic will continue at least into the near future. The trend suggests that the channel will soon cut off or cut through the sharp bend by eroding through the location of the present sand and gravel operation. This channel move could also cut away at least the northern part of the proposed new operation. Such a shift of channel position would negatively affect the new extraction operation, and might

establish a new channel dynamic that would affect streamflow in both downstream and upstream locations. Final effects and configurations cannot immediately be determined, but could involve unexpected erosion into productive cropland.

Several predictable effects of establishment of a new sand and gravel extraction operation adjacent to 1564 East 1850 Road between Lawrence and Eudora tend to have negative impacts on nearby parts of the local valley floor. However, it is endangerment of the well field for the City of Eudora municipal water supply that demands closest attention. Chance of contamination of that resource is completely unacceptable for the public welfare.

Wakefield Dort Jr.

Wakefield Dort, Jr.

Emeritus Professor Geology
The University of Kansas

Oct. 11, 2012

Lawrence Douglas County
Metropolitan Planning Office
6 East 6th Street,
P.O. Box 708,
Lawrence, KS 66044

Ms. Mary Miller:

As you know I will be out of town on Oct. 22, so I can not be at the Planning Commission meeting. So, I want to make sure that all is in readiness for that meeting. I have supplied you with additional information already and I want to alert you to additional incoming information.

First of all, the Eudora City Council meet on Monday Oct. 8 and as part of their regular meeting they held a study session concerning the Penny Sand Pit CUP. Penny Sand presented their plans for the site, then Mr. Nuzman reviewed his report. At that point I presented my report (of which you have a copy) summarizing my comments on Mr. Nuzman's report pointing out alternate interpretations and shortcomings. Then Doug Heimke of the Kansas Rural Water Association gave his thoughts on the project. Next, the Eudora City Council hydrogeology consultant Mr. Ned Marks made a presentation on the pertinent hydrogeology of the valley aquifer. Then Mr. Scott Michie advised them of certain planning considerations. Finally, the Eudora City Council deliberated on their position with regard to the Penny Sand Pit CUP. The net result was that they voted to oppose the CUP application and write a letter to your office to that effect. I must say that they made a great effort to study the situation carefully before making their decision.

We have exchanged emails regarding Dr. Juracek of the USGS. I provided you with a letter summarizing conversations that I had with him concerning the bank stability issue. The net result was that he agreed with what I had said about that. In addition, the other local expert on the Kansas River, Dr. Dort (who is retired from the KU Geology Dept.) is writing a letter opposing the CUP application based on water quality and bank instability issues. You should receive that letter soon.

I hope you will be rewriting the staff report to reflect all this new information. In particular water quality and bank instability issues must be reflected as areas of major concern. Your staff report points out that preservation of quality farm land is also a major consideration. Based on all this new information, I hope your rewritten staff report will recommend denial of the CUP application.

Since I can not be present for the Oct. 22 meeting, I have prepared a 5 minute video presentation which I would like to have played at the meeting. I am no longer asking for the consideration of this Penny Sand Pit CUP to be deferred to the Nov. meeting. I think that would be unfair to the many opponents who will be showing up for the second time, since it was deferred at the Sept. meeting. To defer it again and ask them to keep coming out for meeting after meeting would be wrong. I do ask for a fair hearing of all the available information and that a very thoughtful deliberation be made.

Thank you for your consideration. If I may answer any questions, please contact me.

Carl McElwee
1564 E. 1850 Rd.
Lawrence, KS 66046
785-843-4164
cmcelwee@ku.edu

Oct. 2, 2012

Lawrence Douglas County
Metropolitan Planning Office
6 East 6th Street,
P.O. Box 708,
Lawrence, KS 66044

Ms. Mary Miller,

After reading your staff report which contains the following information:

"Staff contacted a hydrologist with the USGS (United States Geological Survey) Midwest Division, Kyle E Juracek, for his opinion on the impact of the dredging operation and pit on the river channel. Mr. Juracek indicated that the location of a lake could result in channel change in the event of a flood but pointed out that the river channel may change as a result of a flooding event even without a lake in close proximity."

I felt that the situation involved in this request for a CUP had not been made entirely clear to Dr. Juracek. The situation is fairly complex and deserves some more description. After making an appointment to see Dr. Juracek, I showed him Dr. Dort's work characterizing the river bank movement over the last 100 plus years, gave him a plan view map of the proposed sand pit excavation area to create the lake, and explained to him that the sand excavation would proceed to bedrock in the area. We discussed the fact that the river is trying to cut off the meander in this area. I pointed out that the proposed excavation pit (about ¾ mile wide East to West) would nearly connect the two sides of the meander.

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The presence of such a large deep pit as requested at this site would make it much easier (since so much material has been removed) for the river in times of flood to cut off the meander at this site by flowing through the pit area. This would create a huge nick point (deepened point in the river bed about

50-60 feet deep) that would have a destabilizing effect on the river bed, with head cutting upstream and bed degradation downstream for some time to come, until a new stable river bed gradient was created. This erosion of the river bed could propagate upstream to the Bowersock Dam and downstream an unknown distance.

I have sent a copy of this letter to Dr. Juracek for review and he has not disagreed with my statements. I encourage you to contact him and discuss this matter with him and to ask him any questions you may have.

Thank you for your consideration. If I may answer any questions, please contact me.

Carl McElwee
Emeritus Professor of Geology
University of Kansas
Lawrence, KS 66045
785-843-4164
cmcelwee@ku.edu

City Of Eudora, Kansas

Mayor Scott Hopson

October 17, 2012

Bruce Liese, Chairman
Lawrence – Douglas County Metropolitan Planning Commission
First floor, 6 E. 6th Street
Lawrence, Kansas 66044

Dear Mr. Liese,

The purpose of this letter is to inform the Douglas County Planning Commission of the vote by the Eudora City Council taken October 8, 2012 concerning the Conditional Use Permit (CUP) application by Penny Sand Company for proposed dredging operations near the Kansas River at the corner of North 1500 and East 1850 roads. The City Council voted unanimously to recommend denial of the CUP application.

The City Council heard two hours of testimony from hydrology experts, for and against the Penny Sand CUP application, and from the general public at their October 8th meeting. Eudora's recommendation for denial is based on public concern for protection of the aquifer and water table that serve as the sole source of water for the City's municipal well supply. Our analysis shows there is potential for surface water to negatively impact our water source should the CUP allow the removal of over-burden soil—built up over decades of natural flooding and silting—and the excavation to bedrock at depths of 50- to 70-feet below current grade at the site. We look forward to presenting this letter and a summary of these hydrology findings to your commission at an upcoming public hearing on this matter. Attached to this letter are several documents that were presented at the City Council meeting on October 8th. Thank you for considering the recommendation of our city council and for cooperating with our planning commission in this and other planning and zoning matters inside Eudora's designated "Planning Area."

Sincerely,

Scott Hopson

Scott Hopson
Mayor

Cc: Douglas County Commission (via e-mail)
Craig Weinaug, County Administrator (via e-mail)
Eudora City Council (via e-mail)
Scott McCullough, Director Planning and Development Services (via-e-mail)

(785)542-4111 (785)542-1237 Fax
4 East Seventh Street P.O. Box 650 • Eudora, Kansas 66025-0650

TERRANE RESOURCES CO

P.O. BOX 173 STAFFORD, KS 67578-0173 620-234-5200

17 September, 2012

Mr. John Harrenstein, City Manager
City of Eudora
P.O. Box 650
Eudora, KS 66025-0650

Re: Penny Sand CUP

Mr. Harrenstein,

This letter and enclosed Exhibit is in response to the City of Eudora's request we review and make recommendations regarding the proposed Penny Sand Facility CUP.

We have reviewed the data prepared by Dr. Carl McElwee, data submitted by Penny Sand, KGS publications, data prepared by Mr. Carl Nuzman and well log information.

Exhibit 1 is a copy of a map we modified from the Nuzman report. It shows the following:

The water table contours from the 1930 and 1974 KGS reports.
The 10 year area of influence delineated by Nuzman.
The 6 and 8 year areas of influence delineated by McElwee.
The proposed Penny Sand Facility
The test borings in the NW portion of the proposed sand facility.
Proposed observation well sites

The data indicates there has been a shift in the local ground water flow direction. The 1930 data indicates a WSW to ENE flow direction. Mr. Nuzman's Source Water Protection Area SWPA delineation tracks to the WSW from the City's well field. The 1974 data used by Dr. McElwee indicates the ground water flow has a more west to east orientation. Additionally, the 1974 shows there is less saturated thickness in the aquifer in and up-gradient of the City's well field. The SWPA delineated by McElwee extends more due west from the City's well field and further up-gradient.

It is important to understand both of these delineations are based on 83 and 39 year old water level data respectively. Both delineations used similar pumping scenarios by the City wells but do not include any potential impact local irrigation systems may have on the overall area of influence. Additionally, there is nothing in the data that suggest the existing sand operation is having any affect on the aquifer.

There are some fundamental aspects of aquifer characterization which need to be addressed. If the pumping of the City's wells remain constant (no decrease in pumping rate) and the saturated thickness decreases (lowering of the water table) then the cones of depression increase around each well. The increase in the size of the cone of depression will increase the area contributing water to the well field. If the saturated thickness continues to decrease due to seasonal or long term lowering of the water table then transmissivity and hydraulic conductivity characteristics of the aquifer can be affected. Therefore, any permanent lowering of the water table can have an impact on the area of influence to the well field which can have a deleterious effect on pumping rates.

The delineations prepared by Mr. Nuzman and Dr. McElwee represent the areas which will contribute water to the well field over time. The immediate cones of depression associated with the wells caused by pumping may not extend much more than ½ mile from the wells.

If the proposed sand pit has no affect on the water table, within the pit area, then it will yield water to the aquifer more readily than the surrounding aquifer and become a recharge area to the aquifer. If the water level in the pit is lower than the existing water level in the aquifer then it becomes a drain on that portion of the aquifer and will impact surrounding water levels in the aquifer.

Any changes to the water table can affect ground water flow direction. It appears there has been an apparent shift in the ground water flow direction by about 20 degrees between 1930 and 1974.

We have no data which indicates what affect the proposed sand pit will have on the water table. If there is no change to the water table then the affects should be minimal. However, if the sandpit caused a permanent lowering of the water table then it can have a negative affect on the recharge area to the City's well field. This will be readily apparent during periods of drought.

According to the conversation from the informal meeting held at Eudora it is our understanding the Division of Water Resources (DWR) assumes there will be no net loss of water from the aquifer under normal conditions due to evaporation. During periods of drought and extend periods of heat it would not be unreasonable for this pit to lose and inch of water in a 24 hour period. That amount of water would equal 27,154 gallons per open acre of water. That value times 300 acres equals 8,146,200 gallons per day. This is the equivalent of 25 acre feet of water per day or a well that pumps 5657 gallons per minute 24/7.

At this time we would tend to agree with DWR's zero net loss on an average year. However, as we are currently seeing there are some years that do not get average rainfall. This is important because when the sandpit will be losing potentially large quantities of water due to evaporation the City will be pumping large quantities of water to meet demands.

Based on the limited data it appears there is the potential for impairment during periods of drought or extreme heat.

It is our understanding the sandpit will be excavated through the entire sand and gravel formation and extend to the bedrock. This process will open the entire saturated thickness to the pit. Should a contaminant enter the pit, whether it is biological or chemical, it will have access to the zone the City wells are completed in. The lower zone of the aquifer in this area is typically more prolific and has better transmissivity characteristics than the upper portions. Therefore, any contamination that makes it to the bottom of the aquifer will move faster than if it entered through the soil profile.

The well logs we rec'd from Penny Sand are informative but of limited use as they are only for a small area in the northwest portion of the sand operation. This area of the operation is remote to the City's well field. The installation of some observation wells around the perimeter of the proposed sand pit would be beneficial. At this time we recommend observation wells near the southwest and the southeast corners and near the middle of the east side of the proposed sand pit.

Additional observation wells between the proposed sand pit and the City's well field should be installed as well. Unless, existing wells can be identified, evaluated and utilized.

We do not have any recent data to evaluate the potential, negative or positive, impact of the proposed sandpit.

In order to evaluate any changes the proposed sand pit will have on the aquifer a comprehensive evaluation of the existing data, the installation of observation wells and collecting current and on going data will be needed.

Quite frankly, the delineations presented indicate the complexity of this area. Without current data, the actual effects on the aquifer are estimates at best.

Using existing wells and adding observation wells to fill in the gaps, data can be collected which will better identify, delineate and evaluate the potential affects to the aquifer.

Below is a brief outline of the proposed process we recommend the City of Eudora consider regarding Source Water Protection Area (SWPA) delineation.

Data Collection and Review

Review City files and select data for copies.
Review KDHE files at Lawrence, Topeka and State Archives as needed.
Compile well database and ground truth existing wells and associated data.
Recommend meeting with KRWA staff and bring them onboard to help with the SWPA plan compilation, implementation, presentation to neighbors and City and County Planning and Zoning Commissions.

Aquifer Testing and Observation Well Installation

Analysis of existing data may provide some of the information needed. We anticipate having to run at least one series of aquifer tests to determine the area of influence and evaluate potential well interference.

The existing data for the City wells and domestic wells can be utilized, additional observation wells may have to be installed. Some of the observation wells should be installed before the aquifer tests are run.

The wells shown in the KGS database will be of limited usage unless their locations are verified.

All wells and surface water access points, utilized in the testing process, will have to be surveyed in by a licensed surveyor.

Aquifer and Testing Data Compilation

Individual well and multiple well data will have to be evaluated.

The projection and plotting of actual areas of influence will be based on actual and current data. Once this is done we can estimate changes to the area of influence based on aquifer variables, changes in pumping rates, additional wells, saturated thickness changes, etc.

Additional Recommendations

We strongly suggest the City ask Penny Sand to postpone their meeting with Planning and Zoning. This would allow the City to obtain clarification of some of the data and present their concerns directly to Penny Sand and their consultants. It has been our experience that direct negotiations will be more beneficial and less expensive than trying to negotiate through the Planning and Zoning Process. If a mutual agreement can be reached between the City and Penny Sand, then the City simply recommends the modified plan be approved by Planning and Zoning.

Historically, it was thought the public should have complete and unrestricted access to a city's data and well field operations. We do not believe going into great detail as to how the City's wells function and the areas which directly impact the viability of the well field need be publicized.

We recommend the City monitor water levels in and around their well field. Either by utilizing existing wells if available or by installing a series of observation wells. From this network a detailed ground water flow regime map can be prepared. Additionally, seasonal variations in ground water flow can be monitored.

Once the City has a detailed Source Water Protection Area (SWPA) delineated then it can be referenced in future planning and zoning determinations.

We suggest requesting Penny Sand install, monitor and analyze samples and data from no less than three observation wells near the southwest and southeast corners and near the center of the east side of the proposed sand pit. If there are existing wells on the property, which can be used, they should be evaluated and used if possible. It would be beneficial if these wells could be installed before excavation begins. Samples should be collected in the spring and late fall to establish a baseline on quality and water levels should be measured monthly.

The main component as to whether this proposed sandpit will be an issue will depend how much impact the City's well field has on the aquifer. It is possible the data to make that determination already exists. Much of the data gathered during the construction of the wells should be available. It is important the wells be evaluated as they are operated, not as a single event or pumping well.

John, this is a complex issue, which may be exactly as Mr. Nuzman and Dr. McElwee have described it. It has been our experience it takes detailed analysis of the data to establish areas of influence and develop a meaningful SWPA delineation.

As Always if you or any of your colleagues have any questions do not hesitate to contact us.

Respectfully submitted

Edward "Ned" T. Marks, Geologist
Terrane Resources Co.
terrane@sbcglobal.net

Encl.

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431
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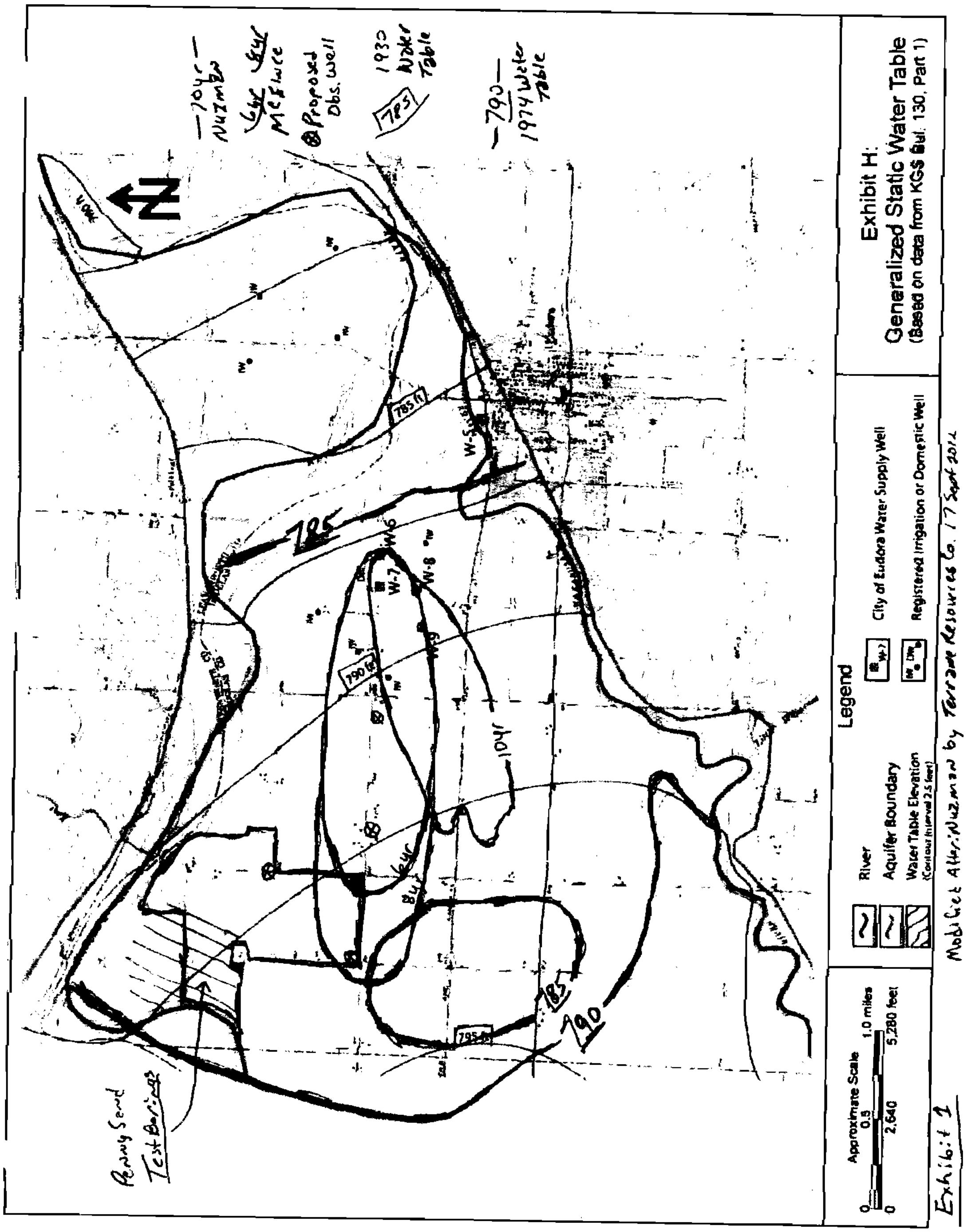
Exhibit H:
Generalized Static Water Table
(Based on data from KGS Bul. 130, Part 1)
Legend
River
Aquifer Boundary
Water Table Elevation (Contour Interval 2.5 feet)
City of Eudora Water Supply Well
Registered Irrigation or Domestic Well
Approximate Scale
0 0.5 1.0 miles
0 2,640 5,280 feet
Modified After Nuzman by Terrane Resources Co. 17 Sept 2012
Exhibit 1
Penny Sand Test Borings
Proposed Obs. well
1930 Water Table
1974 Water Table
785
790

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Quality water, quality life

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October 11, 2012

Mayor Scott Hopson
City of Eudora
P.O. Box 650
Eudora, Kansas 66025-0650

RE: Sand and Gravel
Dredging Proposal

Dear Mr. Hopson:

Thank you for allowing me the opportunity to present written information and to speak before the city council on October 8, 2012. It was obvious that the city council wanted to take the time to understand the issue and by inviting all of the interested parties to speak, they have a very good understanding of the risks and benefits moving a nearby sand and gravel dredging operation off of the Kansas River and onto the floodplain.

It should be clear to most people that removing material from the river bed will cause the river system to react to the disturbance. Sand and gravel doesn't regenerate in the river. This material in the Kansas River and its alluvium is a mixture of the material deposited from the glaciers and material eroded from the Flint Hills, the Dakota Sandstone and the Rocky Mountains. The likelihood of "new" sand and gravel coming downstream is severely limited by the existing large dams on the Kansas River and its tributaries. Initially, this disturbance will affect the bed upstream and downstream as the river attempts to restore the previous slope with sediment in the channel and / or from the banks. As it is believed that the U.S. Army Corps of Engineers will suspend the permits allowing in-stream dredging on much of the Kansas River in 2013 because of these impacts to the river, companies that use or sell sand and gravel will be looking for new sources of this material.

Unfortunately, not much planning has occurred in the counties where the Kansas River and its associated sand and gravel resources are located. This lack of comprehensive planning to identify the best locations for off-stream sand and gravel dredging operations is causing conflicts between the sand and gravel companies hoping to move onto the floodplain and public water systems that depend on the groundwater in the sand and gravel aquifers. Other interested parties affected by this change in dredging policy are transportation departments, power companies, airports, pipelines, railroads, etc. Until this planning is done, public water systems, especially those water systems that do not have treatment facilities that are capable of treating surface water or groundwater under the direct influence of surface water, will need to be vigilant in protecting their source water supplies. They will have to be actively involved in the planning process.

I believe the city council was correct in reaching a decision to recommend denial of the conditional use permit. While it was speculated in one report that the off-stream sand dredging operation would not cause "contamination" of the aquifer, no evidence was presented in written form or verbally that the proposed pit could not introduce constituents common in surface water to the groundwater supply through the beds of gravel (exposed in the sides of the pit) which extend into the aquifer. Water systems such as yours, do not have a surface water treatment plant because of the natural filtration property of the relatively undisturbed aquifer. Creating a condition that could allow bacteria, viruses, protozoa such as *Cryptosporidium* (a parasite that is resistant to chlorine disinfection), or toxins from decaying algae to enter your water supply is unreasonable and unacceptable. A fact sheet on cryptosporidiosis is enclosed.

You can reach me by telephone at 785/640-4701, by e-mail at dhelmke@krwa.net or by writing to 6847 SE 29th Street, Tecumseh, Kansas 66542-9571. You can follow me on Twitter at @KRWA_WaterRghts. Please be reminded that the KRWA website at http://www.krwa.net has news and information for water and wastewater utilities, including water rights, source water protection and training opportunities.

Sincerely,

Douglas S. Helmke

Douglas S. Helmke, L.G.
Water Rights / Source Water Specialist
Kansas Rural Water Association

DSH
Enclosure
c: KRWA
JOHN HARRENSTEIN

Facts About Cryptosporidiosis

What is cryptosporidiosis?

Cryptosporidiosis is a gastrointestinal illness caused by *Cryptosporidium*, a infectious pathogen that lives in the intestines of humans and mammals. Both the disease and the organism itself are commonly referred to as **Crypto**. Crypto is one of the most common causes of waterborne diseases in the United States: outbreaks related to recreational and drinking water increase every year. It is highly contagious and when left untreated, a person can become re-infected and/or infect others. Crypto is commonly transmitted by swallowing organisms from water, food, hands or other surfaces that have been contaminated with the organism. Crypto is most common during the summer and early fall. It occurs most frequently in young children (under the age of 10) and their caregivers. While anyone can be infected with Crypto, people with weakened immune systems (malnourished children, the elderly, patients receiving cancer chemotherapy patients with HIV/AIDS, etc.) can develop serious, life-threatening illnesses from Crypto.

Symptoms

Crypto symptoms usually begin within 2 to 10 days after exposure and generally last one to two weeks in people with healthy immune systems. Common symptoms include watery diarrhea, stomach cramps or pain, dehydration, nausea, vomiting, fever and weight loss.

Diagnosis

Diagnosis of Crypto can be complex and time-consuming because the organisms are very small and difficult to see under a microscope. Confirming a diagnosis of Crypto normally involves examining multiple stool samples over a period of several days.

Other Facts about Crypto

- The word "Crypto" comes from a Greek word meaning "hidden."
- Crypto is resistant to chlorine and other chemicals commonly used in recreational and drinking water.
- Crypto is not killed by alcohol gels and hand sanitizers.
- People can continue to pass Crypto in their stools for several weeks following illness.
- When doctors suspect Crypto, they sometimes treat patients before a definitive diagnosis is secured.
- If you suspect you or a loved one has Crypto you should consult your doctor or primary care clinician.
- Transmission of Crypto is not limited to ingesting contaminated water. Food and person-to-person transmission may be at least as important as drinking water and may be more likely to transmit higher dose exposures.

How Can Crypto be Prevented and Treated?

You can help to break the chain of transmission of Crypto if you:

- Avoid swallowing water while swimming, boating, or engaging in other recreational activities.
- Wash raw fruits and vegetables thoroughly with clean water before eating them.
- Wash you hands carefully before you eat, after using the restroom or changing diapers, after you have cared for anyone with diarrhea, and any time you may have been in contact with contaminated surfaces.
- Stay away from swimming pools and other recreational waters if you or a family member has had diarrhea.

Supportive Care and Treatment

- Doctors recommend drinking plenty of fluids to prevent dehydration during infection with Crypto and other illness causing diarrhea.
- A prescription medicine called nitazoxanide (Alinia®) may be used to treat Crypto in both adults and children 12 months of age and over.
- Nitazoxanide is available as a tablet for adults and as a liquid suspension. A three-day treatment regimen is recommended.
- Side effects of nitazoxanide are similar to those of a placebo (sugar pill).
- Nitazoxanide has not been shown to be effective for the treatment of diarrhea caused by Crypto in HIV-infected or patients or patients with weak immune systems.

National Foundation for Infectious Diseases
4733 Bethesda Avenue, Suite 750, Bethesda, MD 20814
(301) 656-0003 Web site: www.nfid.org August, 2008

Facts About Cryptosporidiosis

FACT: According to the CDC, Crypto has become one of the most common causes of waterborne diseases (recreational and drinking water) in the United States, with outbreaks increasing annually

FACT: Crypto is a chlorine-resistant pathogen that poses a serious public health threat because contamination of drinking or swimming pool water can lead to large community outbreaks

FACT: Crypto is spread by contact with contaminated water, food and surfaces. Swallowing water during recreational water activities is a common way Crypto is spread.

FACT: The tell-tale sign of Crypto infection is ***frequent, watery diarrhea that is not like other cases of diarrhea***. Other symptoms include dehydration, weight loss, stomach cramps or pain, fever, nausea and vomiting. Symptoms generally begin within two to ten days after exposure and last one to two weeks

FACT: Crypto is highly contagious and when left untreated, a person can become re-infected and/or infect others. Crypto can be shed in the stool for many weeks after symptoms clear

FACT: Dehydration is the most common problem people develop after being infected with Crypto

FACT: Persons with weak immune systems may develop prolonged illness with severe dehydration and other life-threatening complications

FACT: Maintenance of adequate fluid intake is vital for persons with Crypto and other types of diarrhea

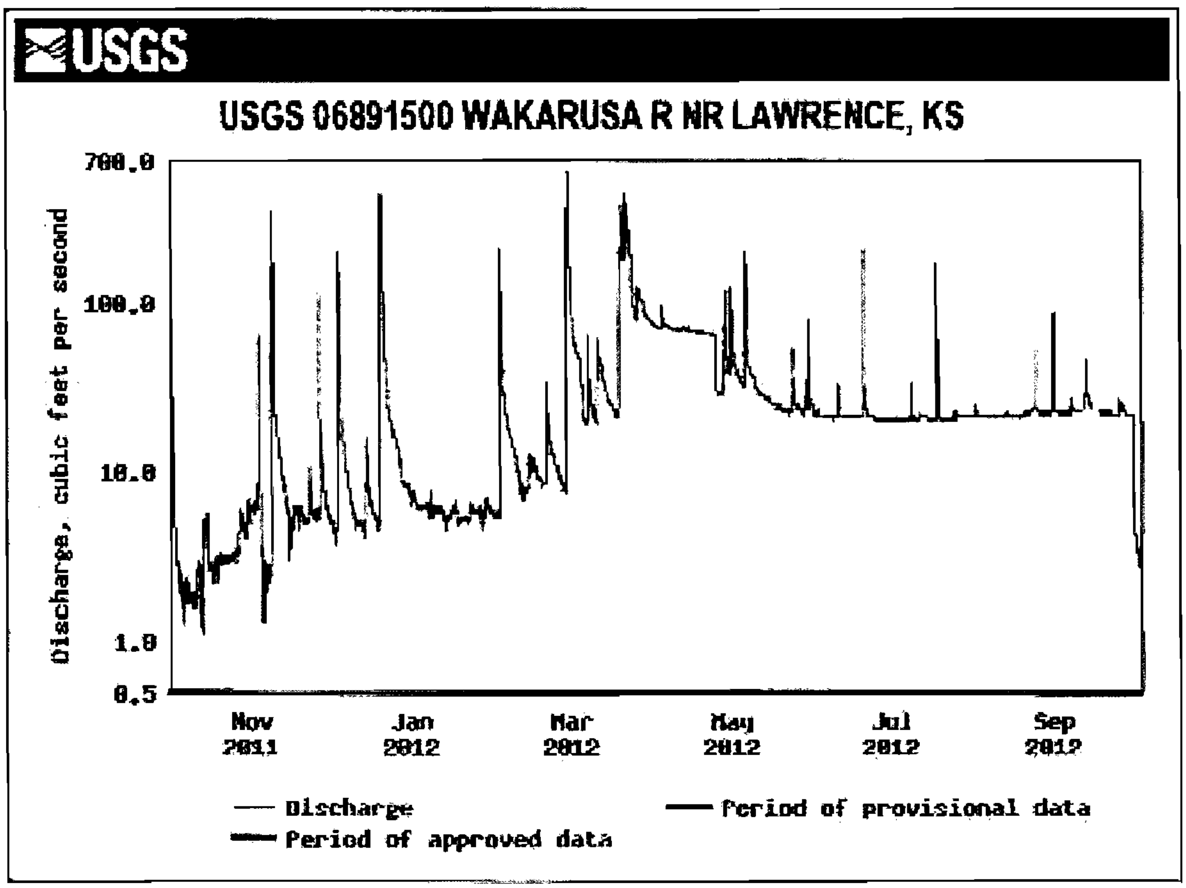
FACT: Persons who suspect diarrhea related to Crypto should consult a health-care provider.

National Foundation for Infectious Diseases
4733 Bethesda Avenue, Suite 750, Bethesda, MD 20814
(301) 656-0003 Web site: www.nfid.org August, 2008

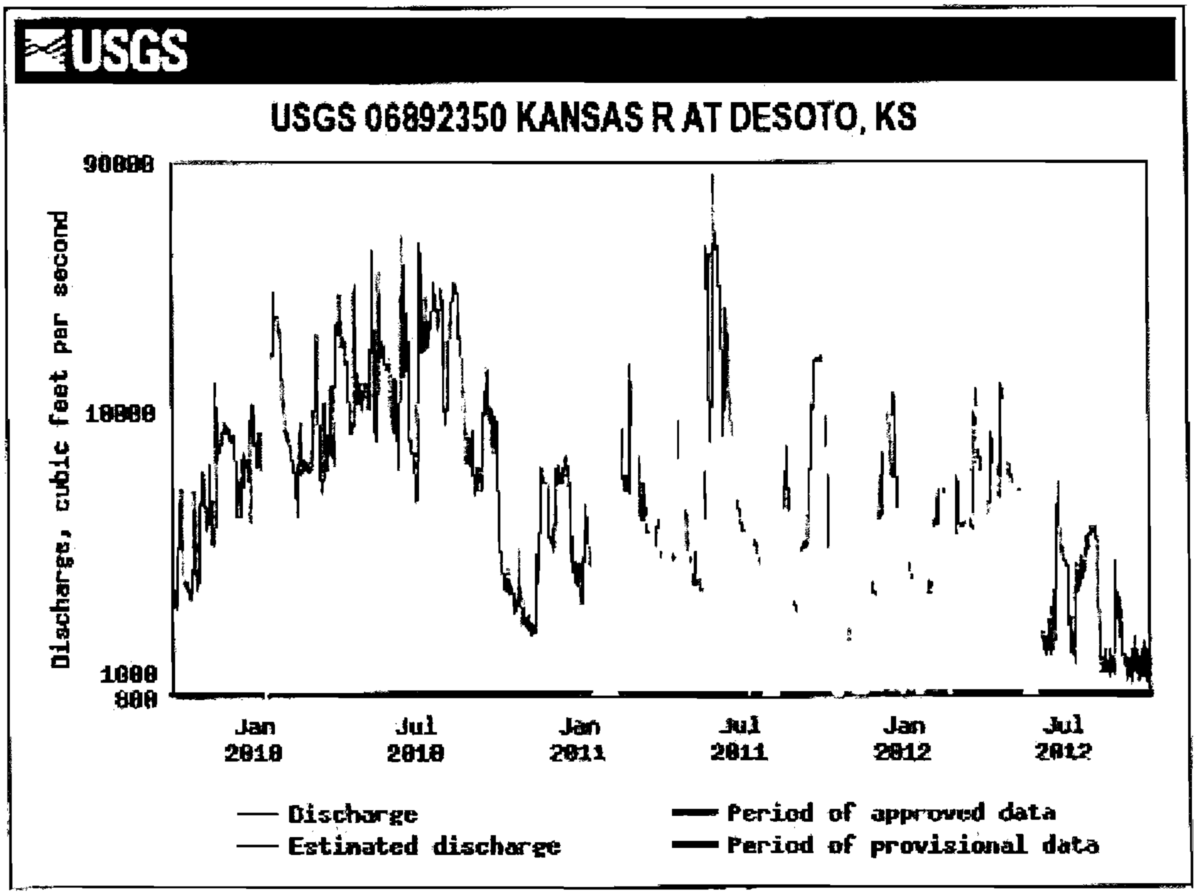
Comments Regarding the *Evaluation of a Sand Pit Operation for Penny's Concrete and Sand LLC* by Carl E. Nuzman

1. In Exhibit B, mentioned on page No. 3 of *Evaluation of Penny's Concrete and Sand LLC; Proposed Sand Pit Operation on Ground Water For the Lawrence Facility* dated September 12, 2012, Mr. Nuzman provides a "cross section" of "selected" wells, three with very detailed geologic information and two with incomplete information which do not fully penetrate the aquifer. The detailed well logs show coarse sand and gravel and one of the well logs shows boulders. This kind of material in an aquifer usually allows for high transmissivity, which is a measurement on how water flows through the aquifer formation. His report then discounts the recorded water levels on these well logs due to precipitation, drought, well test pumping, etc. and are therefore unreliable for water level use. His report then relies on "pre-development conditions", which haven't existed since the 1950's.

2. Mr. Nuzman concludes that the Wakarusa River is important to aquifer recharge, but does not supply any data showing flow in the Wakarusa River. Below is a graph showing recent flow. (From http://waterdata.usgs.gov/ks/nwis/rt)



The above graph shows instantaneous water flow in the Wakarusa River near Lawrence since October 1, 2011. Notice that some events of "high" flow have occurred but most was below 10 c.f.s. until March of this year. Releases from Clinton Reservoir contributed to an average flow of about 20 c.f.s. since June of 2012.



This graph shows the measured flow in the Kansas River near De Soto. Note that the average flow is over 100 times greater than the Wakarusa River and therefore more likely to contribute more recharge to the alluvial aquifer. At some times, flow is more than a 1,000 times greater.

3. On Page 5, Mr. Nuzman concludes that the "overappropriated" condition of the aquifer will serve to intercept any contaminants upgradient from the public water supply wellfields. Of the 4,868 acre-feet appropriated in his "effective" area, 3,686 acre-feet is the authorized total (over 75%) of just one water right. Water Right, File No. 9,391, which was last used in 2002, was recently obtained by the City of Lawrence. The City of Lawrence will not be "drawing" contaminants away from the other public water suppliers by the operation of this water right if it draws contaminants toward their wells.

4 In Section 6, no detailed information is given, including the name of the "particle tracking" analysis software that was used to generate the map identified as Exhibit F. Reference is given to K.G.S. Bulletin No. 130, part 1, which was published in 1958, which does not include a particle tracking model. It is likely (but not determined) that water level data from the 1958 report was used when the un-named software was used to generate the map. His previous comments about overappropriation are ignored when he uses the water level data from the 1950's to explain the normal conditions of today.

5. In Section 8, the report seems to contradict previous comments regarding the sand pit's lack of influence on water quality. Mr. Nuzman states that sand pits beneficially support the yield of wells that are down-gradient from a pit that is within the area of influence of a well. If this is true, the quality of the water in the pit will be extended into the aquifer some unknown distance.

6. In Section 9, "Conclusions", it is stated that present regulations require 200 feet of separation between a well and a surface water source. This regulation applies to public water supply wells where the screen of a well is less than 50 feet from the surface of the ground unless approved surface water treatment is employed. This regulation is drafted to account for wells in close proximity to rivers. It was not written to account for wells near pits that fully penetrate the aquifer. If the water being pumped by public water supply wells have biological, chemical or turbidity characteristics similar to surface water, it would be surprising that KDHE would not rule that the water is under the direct influence of surface water.

7. Mr. Nuzman does not mention this conclusion taken directly from Bulletin No. 130, part 1: "Wisconsinan and Recent alluvium in this portion of the Kansas River valley has an average thickness of 55 feet. This alluvium is an excellent aquifer, because the lower portion everywhere consists of several feet of permeable sand or gravel. Surficial silts several feet thick generally overlie the coarse-textured deposits and, where sandy, permit recharge from local precipitation. During periods of heavy pumpage the ground-water body, which normally discharges into Kansas River, receives large quantities of recharge from the river, increasing severalfold the amount of ground water available to properly spaced and constructed wells. Adequate quantities of ground water of fair quality are available for future municipal, irrigational, and industrial expansion in this part of the Kansas River valley."

A fully-penetrating pit likely is a greater contributor of recharge to the aquifer with minimal filtration, than a river that does not fully penetrate the aquifer. How much influence the pit has on groundwater quality has not been adequately determined. No analysis has been performed which will evaluate the behavior of the aquifer during periods of high pumpage by multiple wells, minimal precipitation in the immediate area and high flow in the Kansas River due to upstream reservoir releases, either. This worse-case scenario should be evaluated before making a determination that a sand pit will have no impact on groundwater water quality.

Submitted to the City of Eudora
October 4, 2012
Douglas S. Helmke, L.G.
Kansas Rural Water Association

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10/04/2012
KANSAS
GEOLOGIST

Comments on the Carl Nuzman report:
"Evaluation of Penny's Concrete and Sand LLC, Proposed Sand Pit Operation on Ground Water"

By

Carl D. McElwee, Ph.D

Emeritus Professor

Geology Department

University of Kansas

Lawrence, KS

September 18, 2012

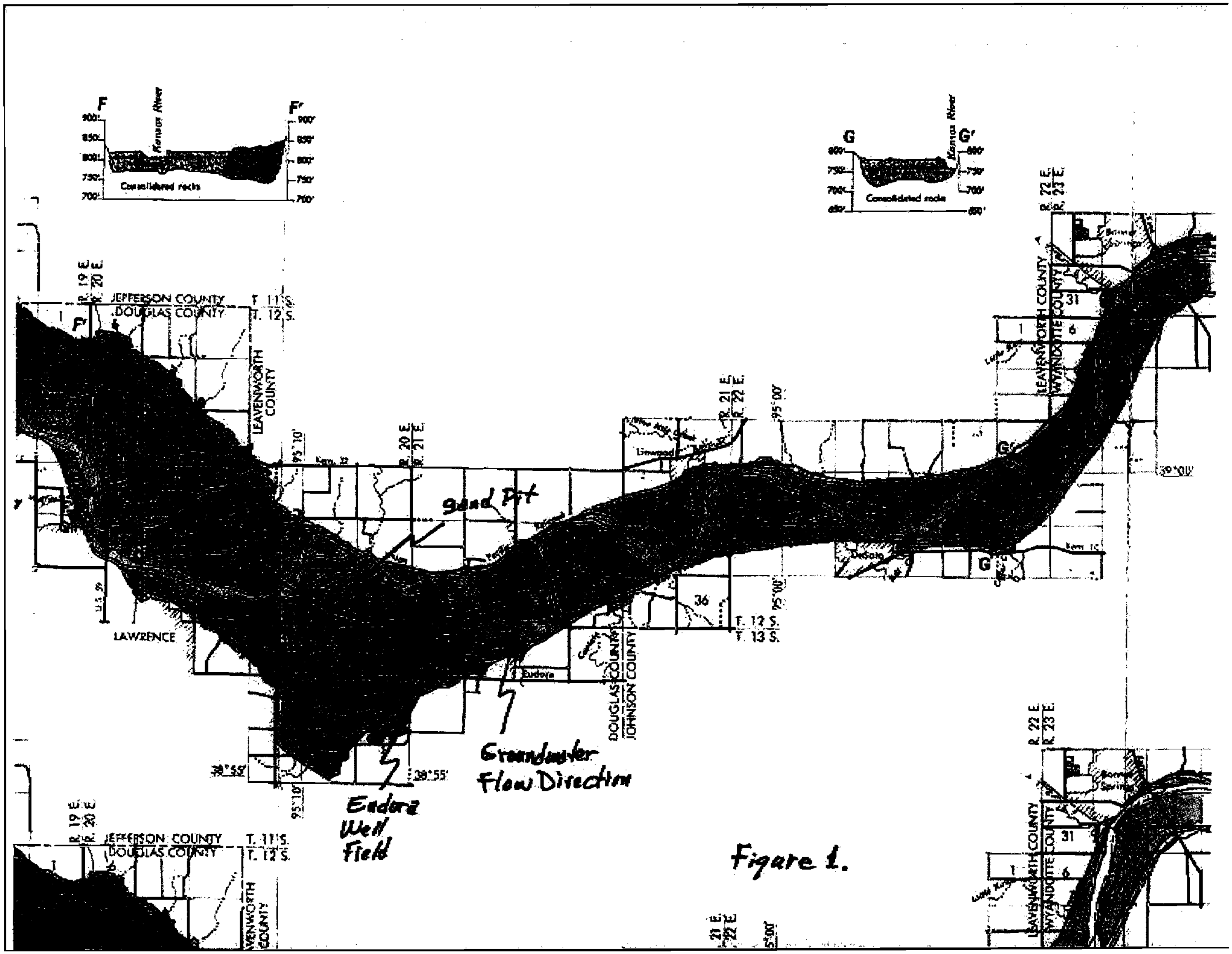
Introduction

Mr. Nuzman has brought together a considerable amount of data regarding the proposed project. He is a respected member of the scientific community studying groundwater. As is always the case, the data must be interpreted and analyzed to draw conclusions. I would like to point out some places where the data may be interpreted and analyzed in an alternate and reasonable manner to arrive at different conclusions. In addition, I would like to bring out some other points that need to be considered in evaluating the possible impact of this pit mining operation.

Groundwater Gradient direction

The gradient of groundwater is the driving force that causes it to move. Mr.Nuzman mainly uses the water level data of Kansas Geological Survey (KGS) Bulletin 130, Part 1. The generalized static water table map that he uses (Exhibit D) gives too much weight to water moving down the Wakarusa River Valley (which joins the Kansas River Valley just south of the proposed sand pit). This distorts his ground water gradient and leads to the conclusion given in Exhibit F that the capture zone for the Eudora Well Field is south of the proposed pit.

On the other hand, if one considers the newer report KGS Bulletin 206, Part 2, it shows that the Kansas River is the major force and that water moves down the valley generally from west to east more or less parallel to the valley walls. The resulting groundwater gradient and flow direction is shown in Figure 1 below. This data shows that water will move from the proposed sand pit to the Eudora Well Field. I have done calculations of capture curves (area of groundwater capture in a given time by the well) and travel times based on work that I published in *Ground Water* (McElwee, 1991, A copy of that paper has been supplied to the DG CO Planning Office). That work shows that the minimum travel time between the proposed sand pit and the Eudora Well Field could be about 5.5 years. In addition, the 6 and 8 year capture curves significantly overlie the proposed sand pit, as shown in Figure 2 below. Details of this work are given in Appendix I.



F
F'
Kansas River
Consolidated rocks
G
G'
Kansas River
Consolidated rocks
JEFFERSON COUNTY
DOUGLAS COUNTY
LEAVENWORTH COUNTY
T. 11 S.
T. 12 S.
R. 19 E.
R. 20 E.
R. 21 E.
R. 22 E.
R. 23 E.
95°10'
95°00'
39°00'
38°55'
LAWRENCE
Linwood
DeSoto
Eudora
36
31
1
6
T. 12 S.
T. 13 S.
DOUGLAS COUNTY
JOHNSON COUNTY
LEAVENWORTH COUNTY
WYANDOTTE COUNTY
Sand Pit
Groundwater Flow Direction
Eudora Well Field

Figure 1.

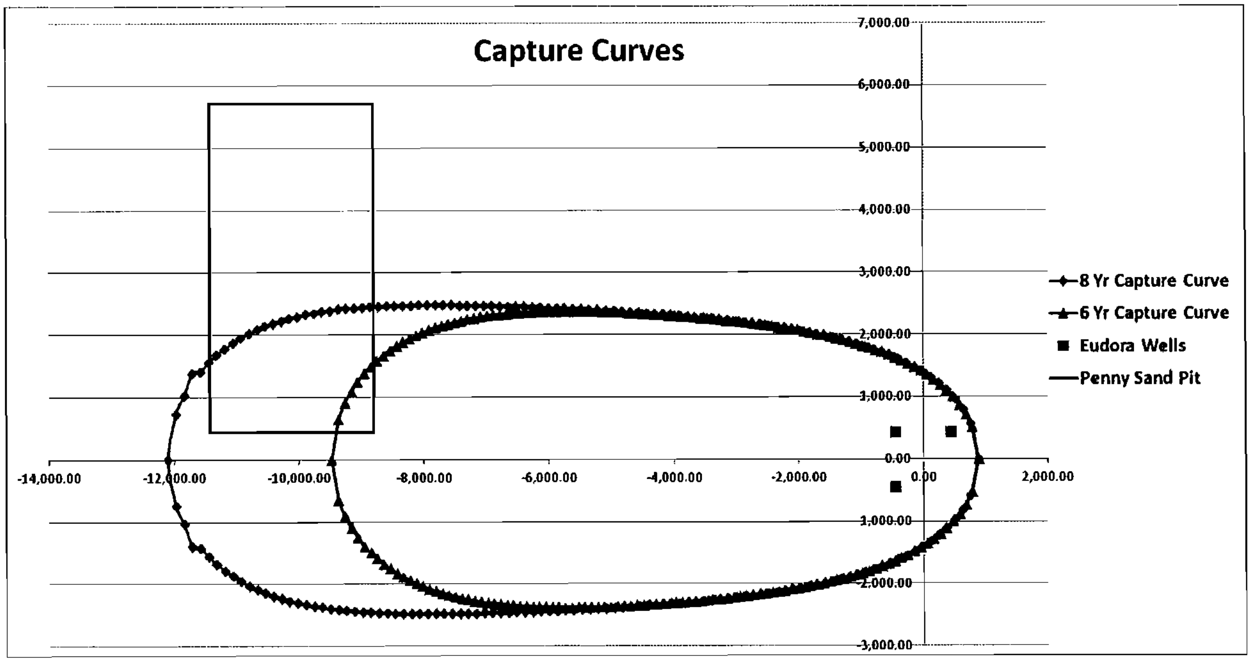


Figure 2.

Both of the KGS reports referred to are old and can't be relied on for absolute numbers. However, they do allow us to reach some general conclusions. In addition, there is a lot of variability in the aquifer (things change with space and time). So, the conclusion must be that one can't state with certainty that the proposed sand pit will have no effect on the Eudora Well Field. Of course there are many other private wells that are down-gradient from the proposed sand pit and much closer that could also be affected.

Effect of Pit on Water Levels and Quality in Aquifer

Mr. Nuzman states on page 8 that "The static water level elevation in the sand pit will be about the same as the water surface elevation in the Kansas River." That is probably true if the pit is close to the river. This means that the water level in the aquifer will be lowered around the pit, because the water levels in the aquifer are generally a little higher than the river level. This could negatively affect some nearby wells. Mr. Nuzman also states that "Sand pits beneficially support the yield of wells that are down-gradient from a pit that is within the area of influence of a well." In other words the well would be pumping water from the pit. This means

that the quality of the well water would depend on the quality of the water in the pit. In general, the quality of surface water in rivers and lakes is much poorer than the quality of groundwater. So there is the potential for pollution.

If this pit is allowed, a huge deep lake (about 70 feet deep on average) will be created. This will be a flow-through lake, which means that groundwater from up-gradient will flow in one side of the lake and flow out the down-gradient side of the lake. The net result is a continual mixing of the groundwater and the surface water from the pit, which then continues to flow down the valley in the aquifer to the next user of the groundwater.

As the well drilling logs in Mr. Nuzman's reports shows, the overburden (soil, silt, and clay) that must be removed to access the sand is substantial. It is in the range of 15-23 feet in most places, in some areas less and some areas more. However, most logs in the vicinity of the proposed sand pit indicate about 23 feet of overburden to be dealt with. This is a major logistics problem that must be dealt with while keeping any surface runoff out of the pit. There is the potential for pollution from surface runoff. This overburden material has been the filter material to keep pollutants out of the deeper aquifer, removing it exposes the aquifer. The resulting piles of surficial material may contain fertilizer and pesticide residue and daughter products from their decay. Apparently, the plan is to emplace at least some of this material back into the pit. If this is done, the overburden material should be extensively tested for possible pollutants before such use.

Mr. Nuzman mentions that a few investigations have been made on the effect of sand pits on groundwater quality and that they have not shown any significant human health effect. However, one can't infer from these few studies that there will never be a problem. In fact, at least one of those studies (KGS OFR 2008-4) did come to the conclusion that there was a measurable interconnection between the sand pit waters and the local aquifer and that there was a potential for pollution. The following is a direct quote from the conclusions of that study.

"The concentration distributions of pesticides and organics other than pesticides at the four pit sites in northwest Wichita, as well as the general pattern in iron, manganese, and ammonium ion concentrations in the downgradient well waters relative to the upgradient well and pit waters, indicate that surface water in the sand pits flows into the ground water in the southeast to south-southeast

direction of the ground-water flow at the study sites. The evidence for connection between the surface and ground waters at the two southern Wichita sites is not as strong as for the four northwest Wichita sites. However, distribution of some constituents and chemical properties do fit the general pattern of entrance of pit water into the ground water. This would be expected to occur most prominently when surface runoff into the pits increases the hydraulic gradient between the pit surface and ground-water levels. Thus, stormwater runoff containing contaminants can enter ground water through the sand pits and impact ground-water quality"

Effect of Pit on the River System

Material has previously been provided that shows the river bank in the vicinity of this proposed sand pit is unstable and has moved over time. Geologic history tells us this river will move again, we just don't know when. During a flood event the river could change course and breach the proposed sand pit. This would have a dramatic effect on the river system. Since the sand pit is deep (about 70 feet) and the river is very shallow, the pit would capture the bed load of the river and cause the river to become unstable. This would result in deepening the channel upstream (head cutting) and degradation of the channel downstream. It would take years for the river to reach a new stable equilibrium. Pits should not be allowed in areas where pit capture is a possibility.

Conclusions

I have shown that a reasonable interpretation of the available groundwater data indicates that the proposed sand pit could indeed have an effect on the Eudora Well Field and other local wells. The net effect will be a flow-through lake that mixes up-gradient aquifer water with sand pit water and sends it down-gradient into the aquifer and further down the valley. This behavior has been documented in studies of sand pits and aquifers. So, the conclusion is that any pollution must be prevented. The huge amount of overburden produced and its handling could be a source of pollution. Finally, the unstable nature of the river bank in this area makes it possible that the sand pit could capture the river during high flows and cause a channel change. If this were to happen, the river bed would be unstable for years until a new equilibrium was reached.

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Resume

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Education:

B.A., William Jewell College, Physics, 1965

M.A., The University of Kansas, Physics, 1967

Ph.D., The University of Kansas, Physics, 1971

Professional Experience:

Professor of Geology, The University of Kansas, Lawrence, Kansas, 1997-2009, now retired.

Senior Scientist, Special Projects/Office of the Director, Kansas Geological Survey, The University of Kansas, Lawrence, Kansas, 1998-2002.

Senior Scientist, Mathematical Geology Section, Kansas Geological Survey, The University of Kansas, Lawrence, Kansas, 1987-1998.

Senior Scientist, Geophysics and Geochemistry Section, Kansas Geological Survey, The University of Kansas, Lawrence, Kansas, 1986-1987.

Associate Scientist, Geohydrology Section and Geophysics and Geochemistry Section, Kansas Geological Survey, The University of Kansas, Lawrence, Kansas, 1974-1986.

Geophysicist, Texaco Inc., Bellaire, Texas, 1970-1974.

Honors, Memberships, and Affiliations:

NSF Undergraduate Research Grant (2 years, 1963-1965)

Graduation with Honors, William Jewell College (1965)

NSF Traineeship for Graduate Work (4 years, 1965-1969)

Mobil Oil Fellowship (1 year, 1969-1970)

Sabbatical leave awarded for groundwater research in The Netherlands (Aug.-Dec., 1984)

Sabbatical leave awarded for groundwater research in the United Kingdom (Jan.- May, 1993)

Center for Teaching Excellence Outstanding Graduate Teaching Award, Dept. of Geology, Univ. of Kansas, 2001.

Sabbatical leave awarded to start writing a book on groundwater modeling, Fall Semester 2002.

Leo M. & Robert M. Orth Water Resources Scholarship, Dept. of Geology, 2008

Present Major Scientific Interests:

Theoretical description of flow systems • Characterization of aquifer heterogeneity by field, laboratory, and modeling activities • Model studies of groundwater availability in Kansas • Sensitivity of groundwater models to variations in transmissivity and storage • Modeling of chemical quality of groundwater systems • Application of seismic techniques to groundwater exploration and evaluation

Professional Journal Articles

McElwee, C.D., and Yukler, M.A., 1978, Sensitivity of groundwater flow models with respect to variations in transmissivity and storage: *Water Resources Research*, v. 14, no. 3, p. 451.

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Appendix I.

This calculations presented here is based on work I did and published back in 1991 in the *Ground Water* journal. I have supplied to the Planning Department a copy of that article for reference. This work shows that the minimum travel time from the Penny sand pit to the Eudora Well Field is about 5.5 years. This is from the closest point of the pit to the center of the well field. I have also calculated the 6 and 8 year capture curves for the Eudora Well field. The work shows that these capture curves include significant portions of the proposed pit.

The important parameters are as follows:

K - hydraulic conductivity - I used 1000ft/day. This is a measure of how fast water moves in the aquifer. The Nuzman report uses data from a well test on Eudora No. 8 and reports 8800 gpd/ft2, which is 1176 ft/day. This also agrees with data I have personally collected from the Kansas River Valley.

I - Hydraulic gradient (slope) of the ground water system - I used .0005, which is about 5ft in 2 miles. Bulletin 130, Part 1 and Bulletin 206, part 2 from the Kansas Geological Survey show head maps of the area in question that support this number.

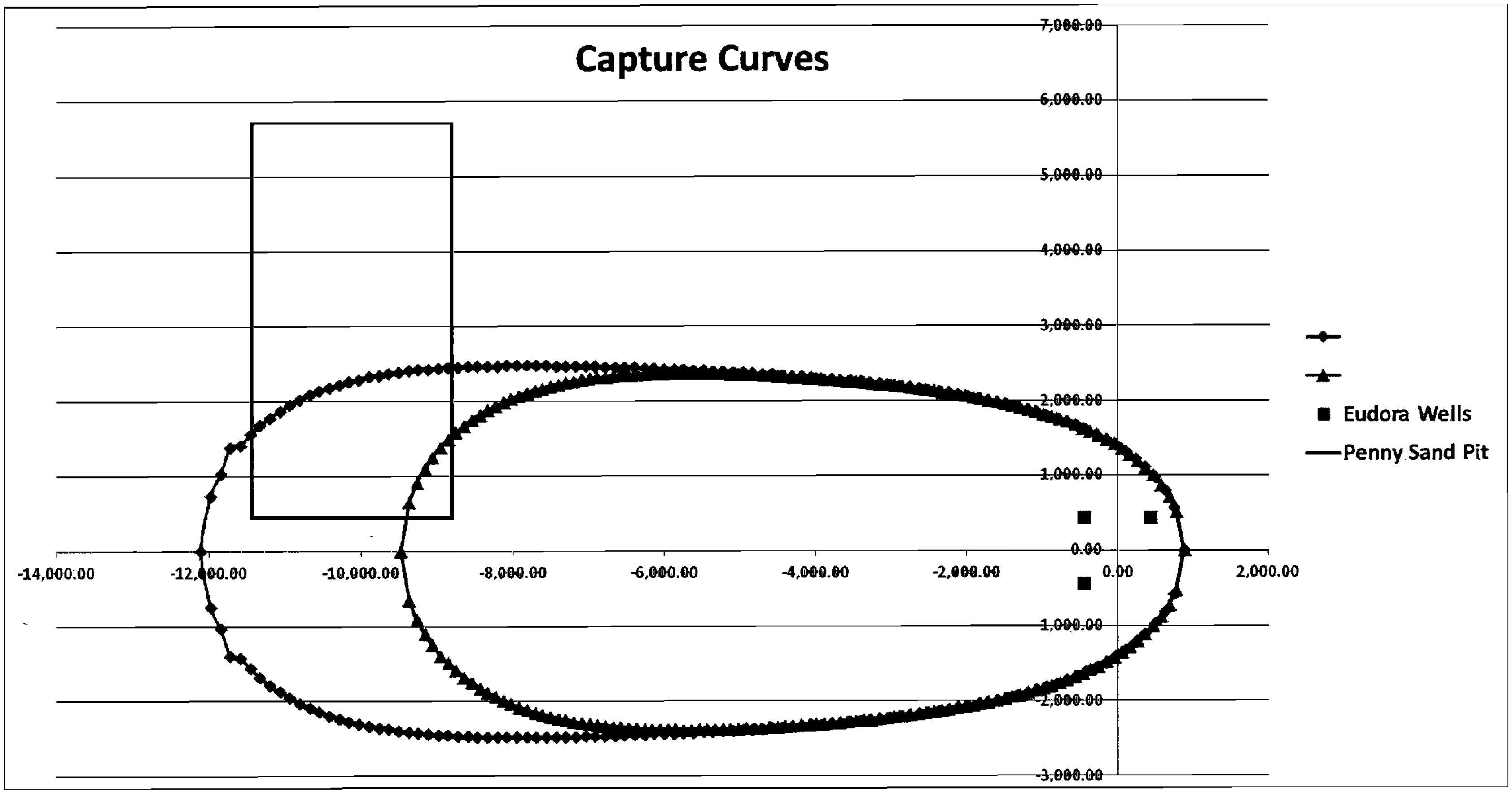
qo = -KI = -0.5 ft/day - average Darcy velocity in the aquifer - Multiplying the above two values gives this result.

B - Effective saturated thickness of aquifer - I used 30 feet. Although the aquifer has greater saturated thickness, the upper part is much finer material and has much less hydraulic conductivity. I have seen this consistently in my field work.

n - effective porosity (a measure of the pore space that water flows through) - I used 0.15 which is an average value suggested by the work of Bull 260, and also is consistent with my field work.

Q - Pump rate of the Eudora Well Field - I used 83425 ft3/day which is the approved water right of 227.77 MGY or about 433gpm.

These parameters can be used to calculate the average travel times and capture curves for parcels of water moving under the influence of the natural groundwater flow system and the influence of the pumping in the Eudora Well Field. The details of the background material to arrive at the formulas used in the following pages are given in the above referenced *Ground Water* article. The pages that follow show the capture curves for 6 and 8 years and the average minimum travel time between the sand pit and the Eudora Well Field. A capture curve outlines the area of groundwater that will flow to the pumping well in a given amount of time.


Capture Curves
7,000.00
6,000.00
5,000.00
4,000.00
3,000.00
2,000.00
1,000.00
0.00
-1,000.00
-2,000.00
-3,000.00
-14,000.00
-12,000.00
-10,000.00
-8,000.00
-6,000.00
-4,000.00
-2,000.00
0.00
2,000.00
Eudora Wells
Penny Sand Pit

qo =	-0.5	Average Darcy Velocity
n =	0.15	Effective Porosity
Q =	83425	Well Discharge
B =	30	Effective Aquifer Thickness
X =	-8800	Distance traveled along X axis
t =		Time of travel

$$X = \frac{qo}{n}t + \frac{Q}{2\pi qoB}ln\left(1 + \frac{2\pi qoB}{Q}X\right)$$

$$t = \left[\frac{n}{qo}\right]\left[X - \frac{Q}{2\pi qoB}ln\left(1 + \frac{2\pi qoB}{Q}X\right)\right]$$

t = 2005 days = 5.49 years

6 yr. Capture Curve Data

X(Ft)	Y(Ft)
8.8508E+02	0.0000E+00
7.8145E+02	-5.1844E+02
6.7783E+02	-7.2470E+02
5.7420E+02	-8.7735E+02
4.7057E+02	-1.0015E+03
3.6694E+02	-1.1069E+03
2.6331E+02	-1.1989E+03
1.5969E+02	-1.2804E+03
5.6059E+01	-1.3536E+03
-4.7568E+01	-1.4198E+03
-1.5120E+02	-1.4802E+03
-2.5482E+02	-1.5357E+03
-3.5845E+02	-1.5867E+03
-4.6208E+02	-1.6340E+03
-5.6571E+02	-1.6778E+03
-6.6933E+02	-1.7187E+03
-7.7296E+02	-1.7568E+03
-8.7659E+02	-1.7925E+03
-9.8022E+02	-1.8259E+03
-1.0838E+03	-1.8573E+03
-1.1875E+03	-1.8869E+03
-1.2911E+03	-1.9147E+03
-1.3947E+03	-1.9410E+03
-1.4984E+03	-1.9659E+03
-1.6020E+03	-1.9894E+03
-1.7056E+03	-2.0117E+03
-1.8092E+03	-2.0328E+03
-1.9129E+03	-2.0529E+03
-2.0165E+03	-2.0720E+03
-2.1201E+03	-2.0901E+03
-2.2238E+03	-2.1074E+03
-2.3274E+03	-2.1239E+03
-2.4310E+03	-2.1396E+03
-2.5346E+03	-2.1546E+03
-2.6383E+03	-2.1689E+03
-2.7419E+03	-2.1825E+03
-2.8455E+03	-2.1956E+03
-2.9491E+03	-2.2081E+03
-3.0528E+03	-2.2200E+03
-3.1564E+03	-2.2314E+03
-3.2600E+03	-2.2423E+03

-3.3637E+03	-2.2527E+03
-3.4673E+03	-2.2627E+03
-3.5709E+03	-2.2722E+03
-3.6745E+03	-2.2813E+03
-3.7782E+03	-2.2899E+03
-3.8818E+03	-2.2982E+03
-3.9854E+03	-2.3060E+03
-4.0891E+03	-2.3135E+03
-4.1927E+03	-2.3206E+03
-4.2963E+03	-2.3272E+03
-4.3999E+03	-2.3335E+03
-4.5036E+03	-2.3394E+03
-4.6072E+03	-2.3449E+03
-4.7108E+03	-2.3500E+03
-4.8144E+03	-2.3547E+03
-4.9181E+03	-2.3590E+03
-5.0217E+03	-2.3628E+03
-5.1253E+03	-2.3662E+03
-5.2290E+03	-2.3691E+03
-5.3326E+03	-2.3715E+03
-5.4362E+03	-2.3733E+03
-5.5398E+03	-2.3746E+03
-5.6435E+03	-2.3753E+03
-5.7471E+03	-2.3754E+03
-5.8507E+03	-2.3747E+03
-5.9544E+03	-2.3733E+03
-6.0580E+03	-2.3712E+03
-6.1616E+03	-2.3681E+03
-6.2652E+03	-2.3642E+03
-6.3689E+03	-2.3592E+03
-6.4725E+03	-2.3531E+03
-6.5761E+03	-2.3458E+03
-6.6797E+03	-2.3372E+03
-6.7834E+03	-2.3272E+03
-6.8870E+03	-2.3156E+03
-6.9906E+03	-2.3024E+03
-7.0943E+03	-2.2873E+03
-7.1979E+03	-2.2702E+03
-7.3015E+03	-2.2510E+03
-7.4051E+03	-2.2293E+03
-7.5088E+03	-2.2051E+03
-7.6124E+03	-2.1781E+03
-7.7160E+03	-2.1480E+03

-7.8196E+03	-2.1145E+03
-7.9233E+03	-2.0773E+03
-8.0269E+03	-2.0360E+03
-8.1305E+03	-1.9903E+03
-8.2342E+03	-1.9396E+03
-8.3378E+03	-1.8833E+03
-8.4414E+03	-1.8209E+03
-8.5450E+03	-1.7515E+03
-8.6487E+03	-1.6740E+03
-8.7523E+03	-1.5871E+03
-8.8559E+03	-1.4891E+03
-8.9596E+03	-1.3913E+03
-9.0632E+03	-1.2478E+03
-9.1668E+03	-1.0945E+03
-9.2704E+03	-9.0492E+02
-9.3741E+03	-6.4783E+02
-9.4777E+03	0.0000E+00
-9.3741E+03	6.4783E+02
-9.2704E+03	9.0492E+02
-9.1668E+03	1.0945E+03
-9.0632E+03	1.2478E+03
-8.9596E+03	1.3913E+03
-8.8559E+03	1.4891E+03
-8.7523E+03	1.5871E+03
-8.6487E+03	1.6740E+03
-8.5450E+03	1.7515E+03
-8.4414E+03	1.8209E+03
-8.3378E+03	1.8833E+03
-8.2342E+03	1.9396E+03
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-6.9906E+03	2.3024E+03
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-6.7834E+03	2.3272E+03

-6.6797E+03	2.3372E+03
-6.5761E+03	2.3458E+03
-6.4725E+03	2.3531E+03
-6.3689E+03	2.3592E+03
-6.2652E+03	2.3642E+03
-6.1616E+03	2.3681E+03
-6.0580E+03	2.3712E+03
-5.9544E+03	2.3733E+03
-5.8507E+03	2.3747E+03
-5.7471E+03	2.3754E+03
-5.6435E+03	2.3753E+03
-5.5398E+03	2.3746E+03
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-5.1253E+03	2.3662E+03
-5.0217E+03	2.3628E+03
-4.9181E+03	2.3590E+03
-4.8144E+03	2.3547E+03
-4.7108E+03	2.3500E+03
-4.6072E+03	2.3449E+03
-4.5036E+03	2.3394E+03
-4.3999E+03	2.3335E+03
-4.2963E+03	2.3272E+03
-4.1927E+03	2.3206E+03
-4.0891E+03	2.3135E+03
-3.9854E+03	2.3060E+03
-3.8818E+03	2.2982E+03
-3.7782E+03	2.2899E+03
-3.6745E+03	2.2813E+03
-3.5709E+03	2.2722E+03
-3.4673E+03	2.2627E+03
-3.3637E+03	2.2527E+03
-3.2600E+03	2.2423E+03
-3.1564E+03	2.2314E+03
-3.0528E+03	2.2200E+03
-2.9491E+03	2.2081E+03
-2.8455E+03	2.1956E+03
-2.7419E+03	2.1825E+03
-2.6383E+03	2.1689E+03
-2.5346E+03	2.1546E+03
-2.4310E+03	2.1396E+03
-2.3274E+03	2.1239E+03

-2.2238E+03	2.1074E+03
-2.1201E+03	2.0901E+03
-2.0165E+03	2.0720E+03
-1.9129E+03	2.0529E+03
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-1.7056E+03	2.0117E+03
-1.6020E+03	1.9894E+03
-1.4984E+03	1.9659E+03
-1.3947E+03	1.9410E+03
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-8.7659E+02	1.7925E+03
-7.7296E+02	1.7568E+03
-6.6933E+02	1.7187E+03
-5.6571E+02	1.6778E+03
-4.6208E+02	1.6340E+03
-3.5845E+02	1.5867E+03
-2.5482E+02	1.5357E+03
-1.5120E+02	1.4802E+03
-4.7568E+01	1.4198E+03
5.6059E+01	1.3536E+03
1.5969E+02	1.2804E+03
2.6331E+02	1.1989E+03
3.6694E+02	1.1069E+03
4.7057E+02	1.0015E+03
5.7420E+02	8.7735E+02
6.7783E+02	7.2470E+02
7.8145E+02	5.1844E+02
8.8508E+02	0.0000E+00

8 yr. Capture Curve Data

X(Ft)	Y(Ft)
8.8516E+02	0.0000E+00
7.5519E+02	-5.7893E+02
6.2523E+02	-8.0688E+02
4.9526E+02	-9.7403E+02
3.6530E+02	-1.1087E+03
2.3533E+02	-1.2220E+03
1.0536E+02	-1.3199E+03
-2.4604E+01	-1.4059E+03

-1.5457E+02	-1.4824E+03
-2.8454E+02	-1.5510E+03
-4.1450E+02	-1.6130E+03
-5.4447E+02	-1.6694E+03
-6.7444E+02	-1.7210E+03
-8.0440E+02	-1.7683E+03
-9.3437E+02	-1.8118E+03
-1.0643E+03	-1.8521E+03
-1.1943E+03	-1.8893E+03
-1.3243E+03	-1.9240E+03
-1.4542E+03	-1.9562E+03
-1.5842E+03	-1.9863E+03
-1.7142E+03	-2.0144E+03
-1.8441E+03	-2.0408E+03
-1.9741E+03	-2.0655E+03
-2.1041E+03	-2.0887E+03
-2.2340E+03	-2.1106E+03
-2.3640E+03	-2.1313E+03
-2.4940E+03	-2.1507E+03
-2.6239E+03	-2.1692E+03
-2.7539E+03	-2.1866E+03
-2.8839E+03	-2.2031E+03
-3.0138E+03	-2.2188E+03
-3.1438E+03	-2.2337E+03
-3.2738E+03	-2.2479E+03
-3.4037E+03	-2.2614E+03
-3.5337E+03	-2.2742E+03
-3.6637E+03	-2.2865E+03
-3.7936E+03	-2.2982E+03
-3.9236E+03	-2.3093E+03
-4.0536E+03	-2.3200E+03
-4.1835E+03	-2.3302E+03
-4.3135E+03	-2.3399E+03
-4.4435E+03	-2.3493E+03
-4.5734E+03	-2.3582E+03
-4.7034E+03	-2.3668E+03
-4.8334E+03	-2.3750E+03
-4.9633E+03	-2.3829E+03
-5.0933E+03	-2.3904E+03
-5.2233E+03	-2.3976E+03
-5.3532E+03	-2.4046E+03
-5.4832E+03	-2.4112E+03
-5.6132E+03	-2.4175E+03

-5.7431E+03	-2.4236E+03
-5.8731E+03	-2.4293E+03
-6.0031E+03	-2.4348E+03
-6.1330E+03	-2.4401E+03
-6.2630E+03	-2.4450E+03
-6.3930E+03	-2.4497E+03
-6.5229E+03	-2.4540E+03
-6.6529E+03	-2.4581E+03
-6.7829E+03	-2.4619E+03
-6.9128E+03	-2.4653E+03
-7.0428E+03	-2.4684E+03
-7.1728E+03	-2.4712E+03
-7.3027E+03	-2.4735E+03
-7.4327E+03	-2.4755E+03
-7.5627E+03	-2.4769E+03
-7.6926E+03	-2.4779E+03
-7.8226E+03	-2.4784E+03
-7.9526E+03	-2.4782E+03
-8.0825E+03	-2.4774E+03
-8.2125E+03	-2.4758E+03
-8.3425E+03	-2.4734E+03
-8.4724E+03	-2.4701E+03
-8.6024E+03	-2.4657E+03
-8.7324E+03	-2.4602E+03
-8.8623E+03	-2.4534E+03
-8.9923E+03	-2.4451E+03
-9.1223E+03	-2.4351E+03
-9.2522E+03	-2.4234E+03
-9.3822E+03	-2.4095E+03
-9.5122E+03	-2.3934E+03
-9.6421E+03	-2.3746E+03
-9.7721E+03	-2.3530E+03
-9.9021E+03	-2.3281E+03
-1.0032E+04	-2.2995E+03
-1.0162E+04	-2.2669E+03
-1.0292E+04	-2.2297E+03
-1.0422E+04	-2.1874E+03
-1.0552E+04	-2.1393E+03
-1.0682E+04	-2.0848E+03
-1.0812E+04	-2.0230E+03
-1.0942E+04	-1.9528E+03
-1.1072E+04	-1.8730E+03
-1.1202E+04	-1.7819E+03

-1.1332E+04	-1.6775E+03
-1.1462E+04	-1.5568E+03
-1.1592E+04	-1.4155E+03
-1.1722E+04	-1.3905E+03
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-1.1982E+04	-7.4132E+02
-1.2111E+04	0.0000E+00
-1.1982E+04	7.4132E+02
-1.1852E+04	1.0325E+03
-1.1722E+04	1.3905E+03
-1.1592E+04	1.4155E+03
-1.1462E+04	1.5568E+03
-1.1332E+04	1.6775E+03
-1.1202E+04	1.7819E+03
-1.1072E+04	1.8730E+03
-1.0942E+04	1.9528E+03
-1.0812E+04	2.0230E+03
-1.0682E+04	2.0848E+03
-1.0552E+04	2.1393E+03
-1.0422E+04	2.1874E+03
-1.0292E+04	2.2297E+03
-1.0162E+04	2.2669E+03
-1.0032E+04	2.2995E+03
-9.9021E+03	2.3281E+03
-9.7721E+03	2.3530E+03
-9.6421E+03	2.3746E+03
-9.5122E+03	2.3934E+03
-9.3822E+03	2.4095E+03
-9.2522E+03	2.4234E+03
-9.1223E+03	2.4351E+03
-8.9923E+03	2.4451E+03
-8.8623E+03	2.4534E+03
-8.7324E+03	2.4602E+03
-8.6024E+03	2.4657E+03
-8.4724E+03	2.4701E+03
-8.3425E+03	2.4734E+03
-8.2125E+03	2.4758E+03
-8.0825E+03	2.4774E+03
-7.9526E+03	2.4782E+03
-7.8226E+03	2.4784E+03
-7.6926E+03	2.4779E+03
-7.5627E+03	2.4769E+03
-7.4327E+03	2.4755E+03

-7.3027E+03	2.4735E+03
-7.1728E+03	2.4712E+03
-7.0428E+03	2.4684E+03
-6.9128E+03	2.4653E+03
-6.7829E+03	2.4619E+03
-6.6529E+03	2.4581E+03
-6.5229E+03	2.4540E+03
-6.3930E+03	2.4497E+03
-6.2630E+03	2.4450E+03
-6.1330E+03	2.4401E+03
-6.0031E+03	2.4348E+03
-5.8731E+03	2.4293E+03
-5.7431E+03	2.4236E+03
-5.6132E+03	2.4175E+03
-5.4832E+03	2.4112E+03
-5.3532E+03	2.4046E+03
-5.2233E+03	2.3976E+03
-5.0933E+03	2.3904E+03
-4.9633E+03	2.3829E+03
-4.8334E+03	2.3750E+03
-4.7034E+03	2.3668E+03
-4.5734E+03	2.3582E+03
-4.4435E+03	2.3493E+03
-4.3135E+03	2.3399E+03
-4.1835E+03	2.3302E+03
-4.0536E+03	2.3200E+03
-3.9236E+03	2.3093E+03
-3.7936E+03	2.2982E+03
-3.6637E+03	2.2865E+03
-3.5337E+03	2.2742E+03
-3.4037E+03	2.2614E+03
-3.2738E+03	2.2479E+03
-3.1438E+03	2.2337E+03
-3.0138E+03	2.2188E+03
-2.8839E+03	2.2031E+03
-2.7539E+03	2.1866E+03
-2.6239E+03	2.1692E+03
-2.4940E+03	2.1507E+03
-2.3640E+03	2.1313E+03
-2.2340E+03	2.1106E+03
-2.1041E+03	2.0887E+03
-1.9741E+03	2.0655E+03
-1.8441E+03	2.0408E+03

-1.7142E+03	2.0144E+03
-1.5842E+03	1.9863E+03
-1.4542E+03	1.9562E+03
-1.3243E+03	1.9240E+03
-1.1943E+03	1.8893E+03
-1.0643E+03	1.8521E+03
-9.3437E+02	1.8118E+03
-8.0440E+02	1.7683E+03
-6.7444E+02	1.7210E+03
-5.4447E+02	1.6694E+03
-4.1450E+02	1.6130E+03
-2.8454E+02	1.5510E+03
-1.5457E+02	1.4824E+03
-2.4604E+01	1.4059E+03
1.0536E+02	1.3199E+03
2.3533E+02	1.2220E+03
3.6530E+02	1.1087E+03
4.9526E+02	9.7403E+02
6.2523E+02	8.0688E+02
7.5519E+02	5.7893E+02
8.8516E+02	0.0000E+00

Wells X (map in)	Wells Y (map in)	Wells X (ft)	Wells Y (ft)
-0.25	0.25	-440	440
-0.25	-0.25	-440	-440
0.25	0.25	440	440

Pit X (map in)	Pit Y (map in)	Pit X (ft)	Pit Y (ft)
-5	0.25	-8800	440
-6.5	0.25	-11440	440
-6.5	3.25	-11440	5720
-5	3.25	-8800	5720
-5	0.25	-8800	440

Douglas County Planning Commission
6 East 6th Street
Lawrence, Kansas 66044

October 11, 2012

Re: Proposed Conditional Use Permit for extension of sand and gravel extraction in an area adjacent to 1564 E. 1850 Road. This site lies directly south of the Kansas River midway between Lawrence and Eudora.

I recommend that this proposal be DENIED.

This conclusion is based on my many years of study and mapping of the Kansas River, including publication, in 2009, of an atlas of Historical Channel Changes of the Kansas River and its Major Tributaries. In reviewing available data I find several reasons that excavation within the proposed area could have several negative effects for the general public.

1) Potentially most serious would be pollution of the water supply for the city of Eudora. Underlying the flat valley floor in this region is a sequence of interlayered sand and gravel that approaches 100 feet in thickness. A large volume of water occupies the spaces between grains of this sediment. This water seeps slowly eastward in a downvalley direction, some being captured by both private and municipal wells. Less than two miles east of the proposed new excavation site is the well field that supplies potable water for the public water system of the City of Eudora. In other words, Eudora's water supply passes through sands lying beneath the proposed new extraction pit.

Any sand-and-gravel operation requires the presence of at least a few motors and transient vehicles that will inevitably leak contaminating fluids which can seep into and through subsurface sediments and become part of the downstream movement of the ground water. Furthermore, this area on the valley floor is subject to inundation during major floods. The high level surface flow also could pick up contaminants from the new sand pit and carry them downvalley to the Eudora well field.

Inspection of detailed maps or aerial photographs of the Kansas River Valley west of Eudora reveals that the proposed extraction site lies farther north (as well as west) of the Eudora well field. It might therefore be argued that pollutants from the proposed sand pit would pass downvalley north of the well field location and so have no influence on the wells. However, records of the location of the river channel during the past few hundred years show that the stream has locally been flowing from northwest to southeast. That means that sand bodies accumulating in the channel would be elongated in that direction, an orientation that could lead subsurface water movement to go from the pollutant source of the new pit directly to the Eudora well field.

This all means that opening a new sand and gravel extraction pit at the proposed location could seriously endanger the purity and integrity of Eudora's water supply.

2) Data currently available to me do not define the precise location of the well that supplies water to the house at 1564 E 1850 Rd. Excavation on the proposed new site for sand and gravel extraction could seriously impinge on the supply of water from that private well. In fact, opening and deepening of the new pit might divert all local groundwater flow from the well and leave the residence with no water supply at all. The situation certainly requires assessment.

3) At the northwestern corner of the proposed new operation the Kansas River follows a sharp, almost V-shaped bend to the north and then back to the southeast. This bend has been actively shifting shape and location during the past several decades. It can be assumed that this dynamic will continue at least into the near future. The trend suggests that the channel will soon cut off or cut through the sharp bend by eroding through the location of the present sand and gravel operation. This channel move could also cut away at least the northern part of the proposed new operation. Such a shift of channel position would negatively affect the new extraction operation, and might

establish a new channel dynamic that would affect streamflow in both downstream and upstream locations. Final effects and configurations cannot immediately be determined, but could involve unexpected erosion into productive cropland.

Several predictable effects of establishment of a new sand and gravel extraction operation adjacent to 1564 East 1850 Road between Lawrence and Eudora tend to have negative impacts on nearby parts of the local valley floor. However, it is endangerment of the well field for the City of Eudora municipal water supply that demands closest attention. Chance of contamination of that resource is completely unacceptable for the public welfare.

Wakefield Dort Jr.

Wakefield Dort, Jr.

Emeritus Professor Geology
The University of Kansas

MEMORANDUM

TO:	City of Eudora Planning Commission
CC:	City of Eudora Staff
FROM:	Scott Michie, City of Eudora Planning Advisory Consultant
SUBJECT:	Staff Findings, Penny Sand Conditional Use Permit to Douglas County
DATE:	**September 10, 2012 County Agenda of 9-24-2012, Sand Pit CUP**

The City of Eudora plans and code requirements are met in the subject sand pit application. These staff findings are submitted based on the three City zoning standards considered for a permit application most similar to the county's CUP:

Eudora Standard 1: Whether the proposed use meets City regulations.
Staff Finding: The subject application does not conflict with City of Eudora regulations, because the sand dredging site is at or beyond the outer northwest edge of the City's Planning Area; and as such, does not impede the City's long-standing public policies for: a) utilization and conservation of the natural resources northwest of the City, b) protection of its planned long term industrial areas, and c) minimization of Industrial traffic through town on Main Street heading south to K-10 Highway.

Eudora Standard 2: Whether the proposed use complies with the Comprehensive Plan.
Staff Finding: The application does not conflict with the City of Eudora Comprehensive Plan. The City plan calls for preservation of the river floodplain natural resources in its planning area, recognizing them as "the most prominent natural features north and west of the City." As the current processing plant is outside of the City's planning area, and the expanded sand dredging would be partially beyond the City's planning area, the operation may be considered outside of the area of City concern for "preservation of the river floodplains in its planning area." In addition, the Penny Sand application complies with the industrial land use recommendation of the City Map by directing industrial traffic west of the City:

> *Industrial areas should have reasonable and convenient access to major arterials and railroad facilities as required. The use of local streets and traffic that cuts through the community off of arterial streets is strongly discouraged as it increases road maintenance and traffic conflicts.*

Eudora Standard 3: Whether the proposed use and site plan will be objectionable or detrimental to the public welfare of the community under the circumstances of the particular case regarding setback, height, density and similar aspects.
Staff Finding: No such objection or detriment is found in this case.

Review and analysis by Terrane Resources Company should be considered before the public can be assured against harm as to long-term potential impacts of the proposed sand pit operation on City of Eudora public water wells.

End of Memorandum

Friends Kaw

September 21, 2012

Douglas County Commission
1100 Massachusetts Street
Lawrence, KS 66044-3040

Friends of the Kaw
P.O. Box 1612,
Lawrence, KS 66044
Kansas City:
913-963-3460;
Lawrence:
785-312-7200

Report River
Pollution:
1-866-RIV-KEEP

Email:
Riverkeeper@KansasRiver.org

Website:
http://KansasRiver.org

RE: CUP for proposed Penny's Concrete Inc. Pit Mine

Friends of the Kaw, Inc. is a 501 c 3, grassroots environmental organization whose mission is to protect and preserve the Kansas River for present and future generations. Towards that end, we have advocated - since our inception in the early 1990's - that in-river sand and gravel operations move out of the river and onto the land (pit mining) due to (a) irreparable harm done to the river's channel, banks and ecosystem; and (b) degradation of our drinking water quality; (c) degradation to public water intake supply systems; and bridge structures.

The Kansas River has been commercially mined (dredged) for sand and gravel since the early 1900's. Past dredging activities are documented to have caused significant damage to riverbed, habitat, and water quality.

The Army Corps is currently considering a proposal from five private dredging companies to increase dredging on the Kaw close to 50%, from 2.2 million tons to 3.2 million tons of sand per year.

The following preliminary findings come from a study funded by the Kansas Department of Wildlife and Parks (KDWP) and carried out by Kansas State University researchers Melinda Daniels and Craig Paukert. The scientists have documented riverbed incision in dredged reaches, which is most likely also causing excessive bank erosion both upstream and downstream of dredge sites.

Private in-channel dredging operations on rivers like the Kansas River cause deepening and widening of the channel and accelerate erosion of the banks. As a result, dredging lowers the water level of the river and the adjacent water table in the floodplain. This creates the risk for harm to public river uses (such as water treatment facilities, municipal wells, bridge footings, etc.) as well as to fish communities throughout the watershed, including endangered species.

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Friends of the Kaw recently interviewed Daniels for its public comment to the U.S. Army Corps of Engineers. "If you take 3.2 million tons from the river bottom, then the river will take 3.2 million tons from the riverbanks, trying to balance the sediment load in the system," Daniels said. "That's the simple physics of how water works in river channels to transport sediment. Landowners along the river, particularly farmers with unforested river banks next to their fields should be worried. So should anyone with a water intake pipe or a creek in their backyard. The effects of in-channel dredging will propagate both upstream and downstream from the dredge site until a hard control point, like a dam or a bedrock outcrop, is reached. That means up tributary streams as well as the main river."

Daniels surveyed major dredge holes on the Kansas River with a sophisticated new measuring technology, an acoustic Doppler instrument that mapped river channel topography and measured water velocity. The researchers discovered that while the Kansas River averages four to five feet deep, active dredge holes can measure up to forty feet deep.

The researchers also discovered that these deep dredge holes can migrate up and down river - sometimes very rapidly, depending on water conditions. Even during small flow increases, researchers documented the upslope lip of a dredge hole traveling upstream.

"People used to think the dredge holes just filled up, but now we know they don't. The holes first cause erosion upstream and downstream and then eventually do fill in, but not before causing a net loss of sediment from the bed and banks of the channel, meaning the channel does not simply go back to its original state," Daniels said. "If there's no bedrock, or physical structure like the Bowersock Dam to stop them, those dredge holes cause channel erosion that will keep on going through the entire river network. Their effects can even travel up the tributaries." Unless a bridge footing or other engineering infrastructure in the river is armored, the migrating hole could erode that physical structure as well.

The technical term for this river phenomenon is a "migrating head cut." Here's how it works:
The Kansas River is a sand bed river. Sand is a light sediment, and water transports it easily. When dredgers excavate into the riverbed, that hole creates a steep wall (or head cut) where the river depth suddenly increases. Water rushes rapidly over that wall, gaining speed and picking up sand from the upstream edge. At the same time, some sand falls into the hole. The water passing over the hole then picks up new sediment downstream, causing erosion there as well. The hole starts to expand, both upstream and downstream.

Over time, repeated dredging deepens and widens the river by removing sediment from the system. The result is that the river bottom lowers, along with the water level. This can leave the intakes for water treatment plants stranded. Dredging on the Missouri River has been scaled back recently because of similar problems propagating into the lower Kansas River and other tributaries to the Missouri.

When the river deepens, the water table in the floodplain lowers. Daniels said that this creates the potential for less water storage, which could affect the many municipal wells along the river. A lower water table also affects river vegetation and forests. For example, the cottonwood – the state tree of Kansas – can't survive unless its roots can reach a good water supply.

The deep dredge holes may affect fish populations, too. "The river's physical habitat is significantly different between dredged and un-dredged areas," noted Daniels.

However, dredging's most major environmental impacts for fish are not limited to the Kaw. Since migrating head cuts can also affect river tributaries, Daniels said the K-State study raises questions about risks to the habitat of endangered species (like the Topeka Shiner) that live in these smaller streams.

Daniels said that knowledge of the environmental impacts of dredging is incomplete without studying dredging's impacts on the entire Kansas River system.

"We need a new environmental impact study that considers the impacts of dredging on fish that live in the tributaries as well," said Daniels. Right now, the U.S. Army Corps of Engineers is depending on an environmental impact statement (EIS) dating from 1991.

Before Daniels and Paukert carried out their study, the effect of sand and gravel dredging on the Kansas River had not been seriously studied. This study was the first time such sophisticated measuring technology has been used.

"The Army Corps has studied similar conditions with sand dredging on the Missouri River," said Daniels. "They are aware of the problems, and if dredging is a problem for the Missouri River, then it's going to be a problem for the Kansas River. Simply shifting the problem from the Missouri to the Kansas is not a good strategy."

How fast will the dredge holes move? Water movement on the Kaw is greatly influenced by how much water the Army Corps releases from upstream reservoirs. Extreme rains plus reservoir releases can add a lot of extra velocity to the Kansas River system. In some circumstances, this may mean the dredge holes have the potential for very rapid movement.

Friends of the Kaw understands that sand is needed for a healthy construction economy and we believe enough geological studies provide evidence that sand can be reasonably and efficiently obtained from "off-river" pit mines in the Kansas River valley. Friends of the Kaw has reviewed the plans drafted by Land Plan Engineering for Penny's Concrete, Inc. proposed pit mine. We support this application for a pit mine by Penny's Concrete, Inc. However, we encourage the Douglas County Commission and Planning Commission to carefully consider and address the residential neighbors' concerns.

Sincerely,

Laura Calwell, Kansas Riverkeeper for Friends of the Kaw

Cc: Phil Struble, Land Plan Engineering

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SEP 24 2012

City County Planning Office
Lawrence, Kansas

Lawrence-Douglas County Planning Commission
Eudora Planning Commission
City Hall
Lawrence, Kansas 66044

RE: ITEM NO. 1: CONDITIONAL USE PERMIT FOR PENNY SAND PIT; N 1500 RD & E 1850 RD (MKM)

Dear Chairman Liese and Planning Commissioners:

The League of Women Voters of Lawrence/Douglas County bases its letters and communications on its adopted Environmental Positions. Based on excerpts from these Positions which read, to "...preserve the social and physical environment...avoid pollution of air, water, and land...[support] the conservation of agricultural land...at the county level...," we are asking that you carefully consider the environmental impact of the Penny Sand Pit excavation operation.

We recognize that the utilization of our natural resources is a necessary feature of human activities, but that we must also do it wisely and with careful consideration for preserving a sustainable environment. Therefore, based on the material available in the Staff Report, we cannot support the pit mining for sand proposed in the current request for **CUP-12-00099** and urge that the Planning Commissions deny the application.

Our reasons are as follows:

1. Contamination of the Eudora water supply is a distinct possibility based on the professional research of Professor Carl McElwee, a recognized authority on groundwater and water resources.

2. Contamination of nearby wells of neighboring properties would likely occur.

3. Chances for the permanent reorientation of the Kansas River course would be increased, especially in a flood, an environmental misfortune that many in Douglas County have attempted to avoid using containment measures.

4. Loss of irreplaceable Capability Class I and II agricultural soils would occur. *This loss would be permanent, whereas the gain from the sand production would be relatively short-lived.*

5. The effects of the mining operation would be counter to several statements and policies that *Horizon 2020* encourages us to follow.

6. Reclaiming the land and providing a safe and stable environment during the 30-year initial approval period of the CUP will be very expensive for the operator of the project. Maintaining the lake will also be someone's financial responsibility. *There is no requirement for providing a bond or other financial guarantee to the County in the event that the owner of the project goes bankrupt or otherwise fails.*

7. Because of the number of conditions required to be met, it can be predicted that these conditions will be costly to monitor and difficult to properly enforce. This will make it less of a positive revenue gain for the County.

For these reasons and others not mentioned here, we urge the Planning Commissions to recommend denial of this open pit mining **CUP-12-00099.** We appreciate the careful consideration that the Planning Commissions give to issues such as this. Thank you.

Best regards,

Melinda Henderson, President
LWV Lawrence/Douglas County

Alan Black

Alan Black, Chair
Land Use Committee

Comments on the Carl Nuzman report:

"Evaluation of Penny's Concrete and Sand LLC,

Proposed Sand Pit Operation on Ground Water"

By

Carl D. McElwee, Ph.D

Emeritus Professor

Geology Department

University of Kansas

Lawrence, KS

September 18, 2012

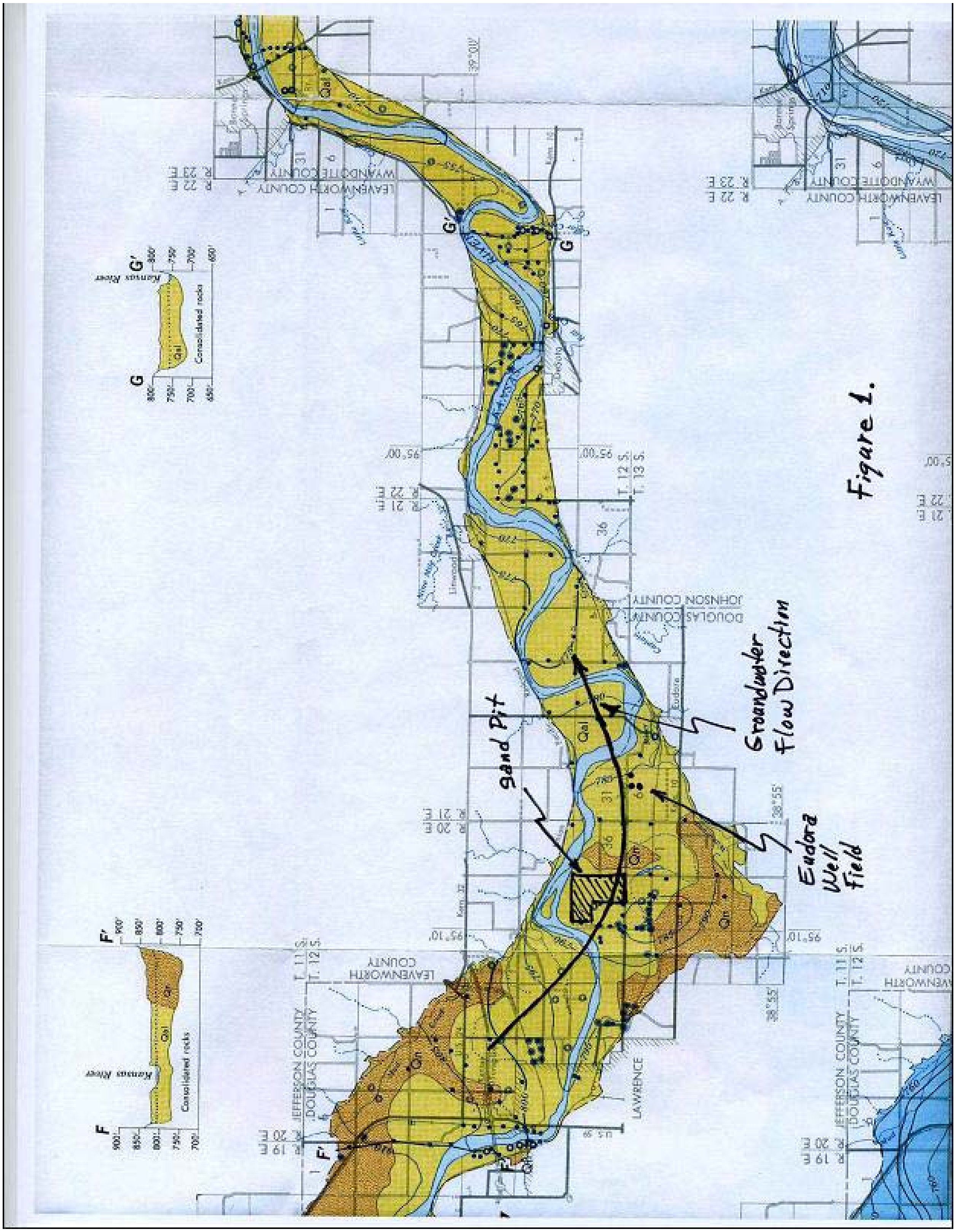
Introduction

Mr. Nuzman has brought together a considerable amount of data regarding the proposed project. He is a respected member of the scientific community studying groundwater. As is always the case, the data must be interpreted and analyzed to draw conclusions. I would like to point out some places where the data may be interpreted and analyzed in an alternate and reasonable manner to arrive at different conclusions. In addition, I would like to bring out some other points that need to be considered in evaluating the possible impact of this pit mining operation.

Groundwater Gradient direction

The gradient of groundwater is the driving force that causes it to move. Mr.Nuzman mainly uses the water level data of Kansas Geological Survey (KGS) Bulletin 130, Part 1. The generalized static water table map that he uses (Exhibit D) gives too much weight to water moving down the Wakarusa River Valley (which joins the Kansas River Valley just south of the proposed sand pit). This distorts his ground water gradient and leads to the conclusion given in Exhibit F that the capture zone for the Eudora Well Field is south of the proposed pit.

On the other hand, if one considers the newer report KGS Bulletin 206, Part 2, it shows that the Kansas River is the major force and that water moves down the valley generally from west to east more or less parallel to the valley walls. The resulting groundwater gradient and flow direction is shown in Figure 1 below. This data shows that water will move from the proposed sand pit to the Eudora Well Field. I have done calculations of capture curves (area of groundwater capture in a given time by the well) and travel times based on work that I published in *Ground Water* (McElwee, 1991, A copy of that paper has been supplied to the DG CO Planning Office). That work shows that the minimum travel time between the proposed sand pit and the Eudora Well Field could be about 5.5 years. In addition, the 6 and 8 year capture curves significantly overlie the proposed sand pit, as shown in Figure 2 below. Details of this work are given in Appendix I.


Sand Pit
Groundwater Flow Direction
Eudora Well Field
Figure 1.

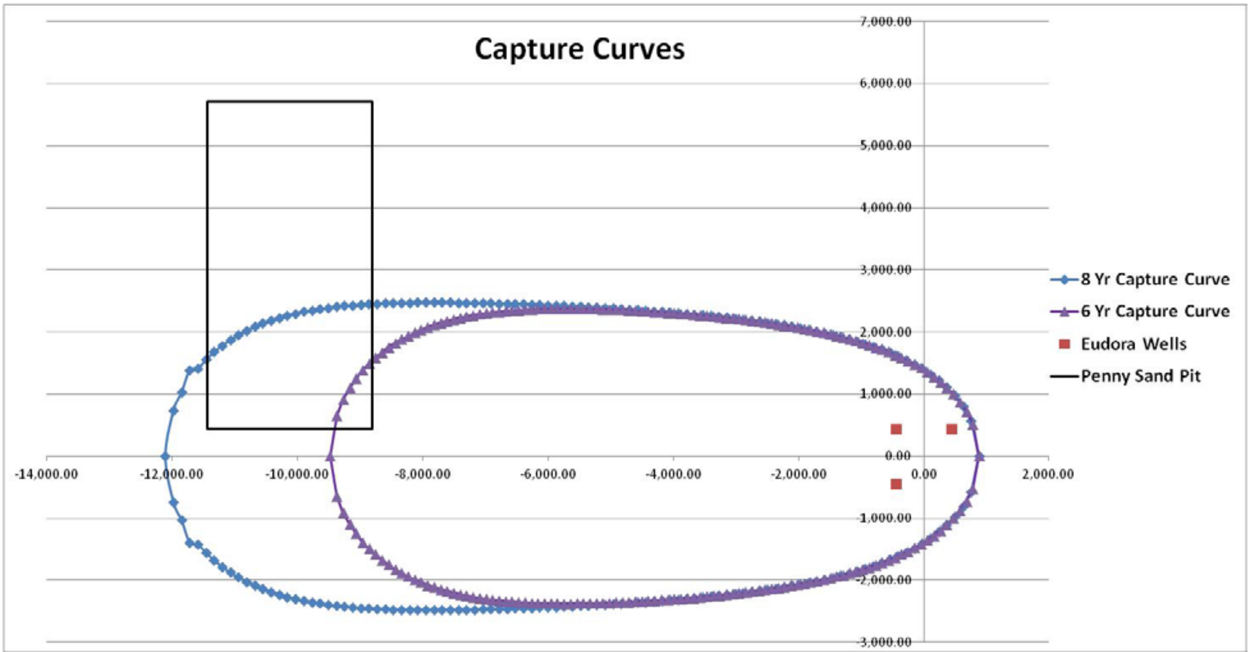


Figure 2.

Both of the KGS reports referred to are old and can't be relied on for absolute numbers. However, they do allow us to reach some general conclusions. In addition, there is a lot of variability in the aquifer (things change with space and time). So, the conclusion must be that one can't state with certainty that the proposed sand pit will have no effect on the Eudora Well Field. Of course there are many other private wells that are down-gradient from the proposed sand pit and much closer that could also be affected.

Effect of Pit on Water Levels and Quality in Aquifer

Mr. Nuzman states on page 8 that "The static water level elevation in the sand pit will be about the same as the water surface elevation in the Kansas River." That is probably true if the pit is close to the river. This means that the water level in the aquifer will be lowered around the pit, because the water levels in the aquifer are generally a little higher than the river level. This could negatively affect some nearby wells. Mr. Nuzman also states that "Sand pits beneficially support the yield of wells that are down-gradient from a pit that is within the area of influence of a well." In other words the well would be pumping water from the pit. This means

that the quality of the well water would depend on the quality of the water in the pit. In general, the quality of surface water in rivers and lakes is much poorer than the quality of groundwater. So there is the potential for pollution.

If this pit is allowed, a huge deep lake (about 70 feet deep on average) will be created. This will be a flow-through lake, which means that groundwater from up-gradient will flow in one side of the lake and flow out the down-gradient side of the lake. The net result is a continual mixing of the groundwater and the surface water from the pit, which then continues to flow down the valley in the aquifer to the next user of the groundwater.

As the well drilling logs in Mr. Nuzman's reports shows, the overburden (soil, silt, and clay) that must be removed to access the sand is substantial. It is in the range of 15-23 feet in most places, in some areas less and some areas more. However, most logs in the vicinity of the proposed sand pit indicate about 23 feet of overburden to be dealt with. This is a major logistics problem that must be dealt with while keeping any surface runoff out of the pit. There is the potential for pollution from surface runoff. This overburden material has been the filter material to keep pollutants out of the deeper aquifer, removing it exposes the aquifer. The resulting piles of surficial material may contain fertilizer and pesticide residue and daughter products from their decay. Apparently, the plan is to emplace at least some of this material back into the pit. If this is done, the overburden material should be extensively tested for possible pollutants before such use.

Mr. Nuzman mentions that a few investigations have been made on the effect of sand pits on groundwater quality and that they have not shown any significant human health effect. However, one can't infer from these few studies that there will never be a problem. In fact, at least one of those studies (KGS OFR 2008-4) did come to the conclusion that there was a measurable interconnection between the sand pit waters and the local aquifer and that there was a potential for pollution. The following is a direct quote from the conclusions of that study.

"The concentration distributions of pesticides and organics other than pesticides at the four pit sites in northwest Wichita, as well as the general pattern in iron, manganese, and ammonium ion concentrations in the downgradient well waters relative to the upgradient well and pit waters, indicate that surface water in the sand pits flows into the ground water in the southeast to south-southeast

direction of the ground-water flow at the study sites. The evidence for connection between the surface and ground waters at the two southern Wichita sites is not as strong as for the four northwest Wichita sites. However, distribution of some constituents and chemical properties do fit the general pattern of entrance of pit water into the ground water. This would be expected to occur most prominently when surface runoff into the pits increases the hydraulic gradient between the pit surface and ground-water levels. Thus, stormwater runoff containing contaminants can enter ground water through the sand pits and impact ground-water quality"

Effect of Pit on the River System

Material has previously been provided that shows the river bank in the vicinity of this proposed sand pit is unstable and has moved over time. Geologic history tells us this river will move again, we just don't know when. During a flood event the river could change course and breach the proposed sand pit. This would have a dramatic effect on the river system. Since the sand pit is deep (about 70 feet) and the river is very shallow, the pit would capture the bed load of the river and cause the river to become unstable. This would result in deepening the channel upstream (head cutting) and degradation of the channel downstream. It would take years for the river to reach a new stable equilibrium. Pits should not be allowed in areas where pit capture is a possibility.

Conclusions

I have shown that a reasonable interpretation of the available groundwater data indicates that the proposed sand pit could indeed have an effect on the Eudora Well Field and other local wells. The net effect will be a flow-through lake that mixes up-gradient aquifer water with sand pit water and sends it down-gradient into the aquifer and further down the valley. This behavior has been documented in studies of sand pits and aquifers. So, the conclusion is that any pollution must be prevented. The huge amount of overburden produced and its handling could be a source of pollution. Finally, the unstable nature of the river bank in this area makes it possible that the sand pit could capture the river during high flows and cause a channel change. If this were to happen, the river bed would be unstable for years until a new equilibrium was reached.

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Fader, S.W., 1974,Ground Water in the Kansas River Valley Junction City to Kansas City, Kansas, Kansas Geological Survey Bull. 206, Part 2.

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Donald O. Whittemore, 2008, Water-Quality Effects of Stormwater Runoff into Sand Pits on Ground Water in Sedgwick County, Kansas, Kansas Geological Survey Open-file Report No. 2008-4.

Resume

Name: **CARL D. McELWEE**

Telephone: 785-864-2728 (Geology Dept. Office)

785-843-4164 (Home)

Present Address: 1564 E. 1850 Rd.

Lawrence, Kansas 66046 USA

Education:

B.A., William Jewell College, Physics, 1965

M.A., The University of Kansas, Physics, 1967

Ph.D., The University of Kansas, Physics, 1971

Professional Experience:

Professor of Geology, The University of Kansas, Lawrence, Kansas, 1997-2009, now retired.

Senior Scientist, Special Projects/Office of the Director, Kansas Geological Survey, The University of Kansas, Lawrence, Kansas, 1998-2002.

Senior Scientist, Mathematical Geology Section, Kansas Geological Survey, The University of Kansas, Lawrence, Kansas, 1987-1998.

Senior Scientist, Geophysics and Geochemistry Section, Kansas Geological Survey, The University of Kansas, Lawrence, Kansas, 1986-1987.

Associate Scientist, Geohydrology Section and Geophysics and Geochemistry Section, Kansas Geological Survey, The University of Kansas, Lawrence, Kansas, 1974-1986.

Geophysicist, Texaco Inc., Bellaire, Texas, 1970-1974.

Honors, Memberships, and Affiliations:

NSF Undergraduate Research Grant (2 years, 1963-1965)

Graduation with Honors, William Jewell College (1965)

NSF Traineeship for Graduate Work (4 years, 1965-1969)

Mobil Oil Fellowship (1 year, 1969-1970)

Sabbatical leave awarded for groundwater research in The Netherlands (Aug.-Dec., 1984)

Sabbatical leave awarded for groundwater research in the United Kingdom (Jan.- May, 1993)

Center for Teaching Excellence Outstanding Graduate Teaching Award, Dept. of Geology, Univ. of Kansas, 2001.

Sabbatical leave awarded to start writing a book on groundwater modeling, Fall Semester 2002.

Leo M. & Robert M. Orth Water Resources Scholarship, Dept. of Geology, 2008

<u>Present Major Scientific Interests</u>:

Theoretical description of flow systems • Characterization of aquifer heterogeneity by field, laboratory, and modeling activities • Model studies of groundwater availability in Kansas • Sensitivity of groundwater models to variations in transmissivity and storage • Modeling of chemical quality of groundwater systems • Application of seismic techniques to groundwater exploration and evaluation

<u>Professional Journal Articles</u>

McElwee, C.D., and Yukler, M.A., 1978, Sensitivity of groundwater flow models with respect to variations in transmissivity and storage: *Water Resources Research*, v. 14, no. 3, p. 451.

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Appendix I.

This calculations presented here is based on work I did and published back in 1991 in the *Ground Water* journal. I have supplied to the Planning Department a copy of that article for reference. This work shows that the minimum travel time from the Penny sand pit to the Eudora Well Field is about 5.5 years. This is from the closest point of the pit to the center of the well field. I have also calculated the 6 and 8 year capture curves for the Eudora Well field. The work shows that these capture curves include significant portions of the proposed pit.

The important parameters are as follows:

K - hydraulic conductivity - I used 1000ft/day. This is a measure of how fast water moves in the aquifer. The Nuzman report uses data from a well test on Eudora No. 8 and reports 8800 gpd/ft2, which is 1176 ft/day. This also agrees with data I have personally collected from the Kansas River Valley.

I - Hydraulic gradient (slope) of the ground water system - I used .0005, which is about 5ft in 2 miles. Bulletin 130, Part 1 and Bulletin 206, part 2 from the Kansas Geological Survey show head maps of the area in question that support this number.

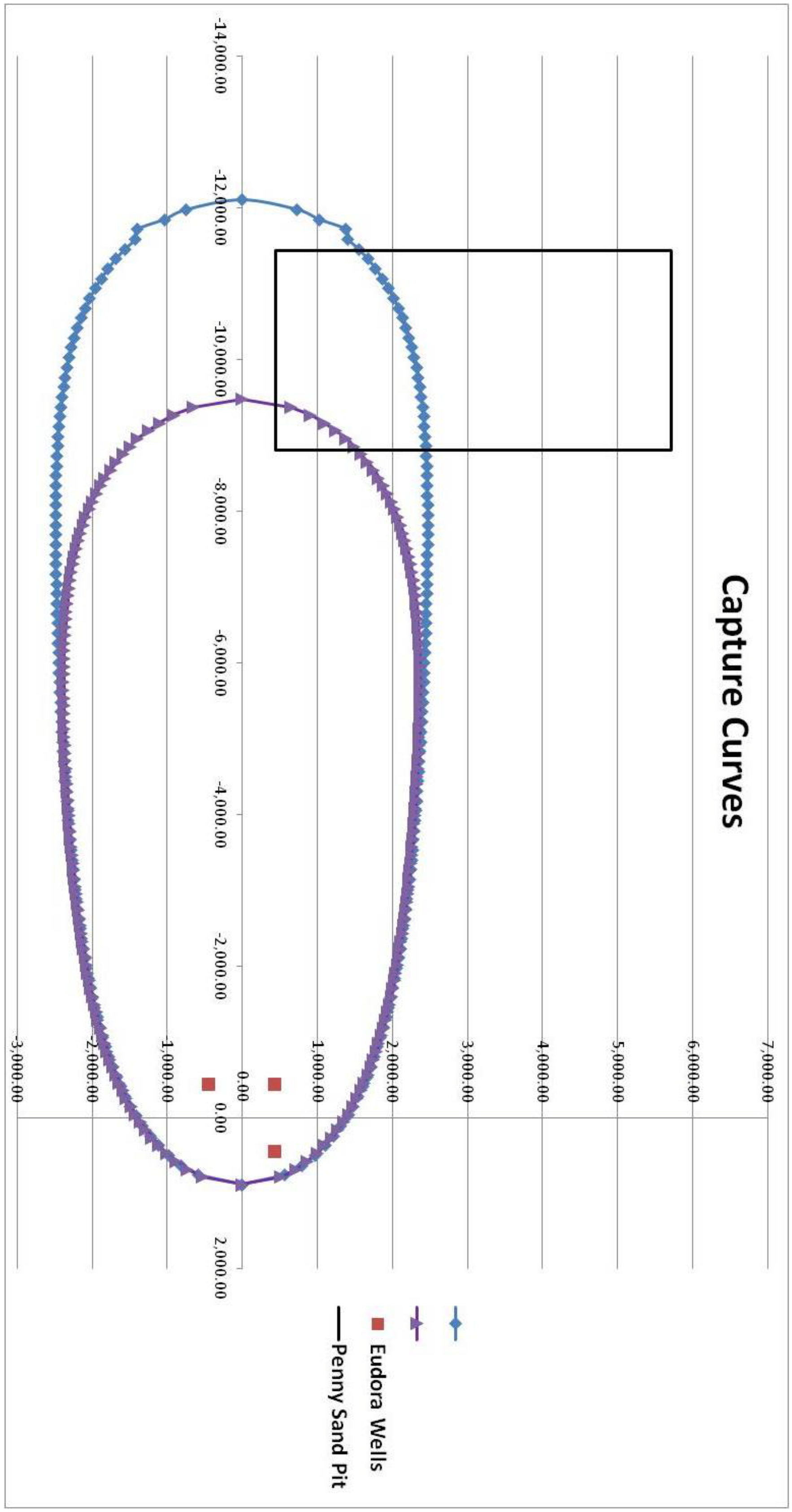
qo = -KI = -0.5 ft/day - average Darcy velocity in the aquifer - Multiplying the above two values gives this result.

B - Effective saturated thickness of aquifer - I used 30 feet. Although the aquifer has greater saturated thickness, the upper part is much finer material and has much less hydraulic conductivity. I have seen this consistently in my field work.

n - effective porosity (a measure of the pore space that water flows through) - I used 0.15 which is an average value suggested by the work of Bull 260, and also is consistent with my field work.

Q - Pump rate of the Eudora Well Field - I used 83425 ft3/day which is the approved water right of 227.77 MGY or about 433gpm.

These parameters can be used to calculate the average travel times and capture curves for parcels of water moving under the influence of the natural groundwater flow system and the influence of the pumping in the Eudora Well Field. The details of the background material to arrive at the formulas used in the following pages are given in the above referenced *Ground Water* article. The pages that follow show the capture curves for 6 and 8 years and the average minimum travel time between the sand pit and the Eudora Well Field. A capture curve outlines the area of groundwater that will flow to the pumping well in a given amount of time.



Capture Curves
-14,000.00
-12,000.00
-10,000.00
-8,000.00
-6,000.00
-4,000.00
-2,000.00
0.00
2,000.00
-3,000.00
-2,000.00
-1,000.00
0.00
1,000.00
2,000.00
3,000.00
4,000.00
5,000.00
6,000.00
7,000.00
Eudora Wells
Penny Sand Pit

qo =	-0.5	Average Darcy Velocity
n =	0.15	Effective Porosity
Q =	83425	Well Discharge
B =	30	Effective Aquifer Thickness
X =	-8800	Distance traveled along X axis
t =		Time of travel

$$X = \frac{qo}{n} t + \frac{Q}{2\pi qoB} ln\left(1 + \frac{2\pi qoB}{Q} X\right)$$

$$\boldsymbol{t = \left[\frac{n}{qo}\right]\left[X - \frac{Q}{2\pi qoB} ln\left(1 + \frac{2\pi qoB}{Q} X\right)\right]}$$

t = 2005 days = 5.49 years

6 yr. Capture Curve Data

X(Ft)	Y(Ft)
8.8508E+02	0.0000E+00
7.8145E+02	-5.1844E+02
6.7783E+02	-7.2470E+02
5.7420E+02	-8.7735E+02
4.7057E+02	-1.0015E+03
3.6694E+02	-1.1069E+03
2.6331E+02	-1.1989E+03
1.5969E+02	-1.2804E+03
5.6059E+01	-1.3536E+03
-4.7568E+01	-1.4198E+03
-1.5120E+02	-1.4802E+03
-2.5482E+02	-1.5357E+03
-3.5845E+02	-1.5867E+03
-4.6208E+02	-1.6340E+03
-5.6571E+02	-1.6778E+03
-6.6933E+02	-1.7187E+03
-7.7296E+02	-1.7568E+03
-8.7659E+02	-1.7925E+03
-9.8022E+02	-1.8259E+03
-1.0838E+03	-1.8573E+03
-1.1875E+03	-1.8869E+03
-1.2911E+03	-1.9147E+03
-1.3947E+03	-1.9410E+03
-1.4984E+03	-1.9659E+03
-1.6020E+03	-1.9894E+03
-1.7056E+03	-2.0117E+03
-1.8092E+03	-2.0328E+03
-1.9129E+03	-2.0529E+03
-2.0165E+03	-2.0720E+03
-2.1201E+03	-2.0901E+03
-2.2238E+03	-2.1074E+03
-2.3274E+03	-2.1239E+03
-2.4310E+03	-2.1396E+03
-2.5346E+03	-2.1546E+03
-2.6383E+03	-2.1689E+03
-2.7419E+03	-2.1825E+03
-2.8455E+03	-2.1956E+03
-2.9491E+03	-2.2081E+03
-3.0528E+03	-2.2200E+03
-3.1564E+03	-2.2314E+03
-3.2600E+03	-2.2423E+03

-3.3637E+03	-2.2527E+03
-3.4673E+03	-2.2627E+03
-3.5709E+03	-2.2722E+03
-3.6745E+03	-2.2813E+03
-3.7782E+03	-2.2899E+03
-3.8818E+03	-2.2982E+03
-3.9854E+03	-2.3060E+03
-4.0891E+03	-2.3135E+03
-4.1927E+03	-2.3206E+03
-4.2963E+03	-2.3272E+03
-4.3999E+03	-2.3335E+03
-4.5036E+03	-2.3394E+03
-4.6072E+03	-2.3449E+03
-4.7108E+03	-2.3500E+03
-4.8144E+03	-2.3547E+03
-4.9181E+03	-2.3590E+03
-5.0217E+03	-2.3628E+03
-5.1253E+03	-2.3662E+03
-5.2290E+03	-2.3691E+03
-5.3326E+03	-2.3715E+03
-5.4362E+03	-2.3733E+03
-5.5398E+03	-2.3746E+03
-5.6435E+03	-2.3753E+03
-5.7471E+03	-2.3754E+03
-5.8507E+03	-2.3747E+03
-5.9544E+03	-2.3733E+03
-6.0580E+03	-2.3712E+03
-6.1616E+03	-2.3681E+03
-6.2652E+03	-2.3642E+03
-6.3689E+03	-2.3592E+03
-6.4725E+03	-2.3531E+03
-6.5761E+03	-2.3458E+03
-6.6797E+03	-2.3372E+03
-6.7834E+03	-2.3272E+03
-6.8870E+03	-2.3156E+03
-6.9906E+03	-2.3024E+03
-7.0943E+03	-2.2873E+03
-7.1979E+03	-2.2702E+03
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-7.4051E+03	-2.2293E+03
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-7.6124E+03	-2.1781E+03
-7.7160E+03	-2.1480E+03

-7.8196E+03	-2.1145E+03
-7.9233E+03	-2.0773E+03
-8.0269E+03	-2.0360E+03
-8.1305E+03	-1.9903E+03
-8.2342E+03	-1.9396E+03
-8.3378E+03	-1.8833E+03
-8.4414E+03	-1.8209E+03
-8.5450E+03	-1.7515E+03
-8.6487E+03	-1.6740E+03
-8.7523E+03	-1.5871E+03
-8.8559E+03	-1.4891E+03
-8.9596E+03	-1.3913E+03
-9.0632E+03	-1.2478E+03
-9.1668E+03	-1.0945E+03
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-8.5450E+03	1.7515E+03
-8.4414E+03	1.8209E+03
-8.3378E+03	1.8833E+03
-8.2342E+03	1.9396E+03
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-6.3689E+03	2.3592E+03
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-6.0580E+03	2.3712E+03
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-4.7108E+03	2.3500E+03
-4.6072E+03	2.3449E+03
-4.5036E+03	2.3394E+03
-4.3999E+03	2.3335E+03
-4.2963E+03	2.3272E+03
-4.1927E+03	2.3206E+03
-4.0891E+03	2.3135E+03
-3.9854E+03	2.3060E+03
-3.8818E+03	2.2982E+03
-3.7782E+03	2.2899E+03
-3.6745E+03	2.2813E+03
-3.5709E+03	2.2722E+03
-3.4673E+03	2.2627E+03
-3.3637E+03	2.2527E+03
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-3.1564E+03	2.2314E+03
-3.0528E+03	2.2200E+03
-2.9491E+03	2.2081E+03
-2.8455E+03	2.1956E+03
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-2.4310E+03	2.1396E+03
-2.3274E+03	2.1239E+03

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-1.0838E+03	1.8573E+03
-9.8022E+02	1.8259E+03
-8.7659E+02	1.7925E+03
-7.7296E+02	1.7568E+03
-6.6933E+02	1.7187E+03
-5.6571E+02	1.6778E+03
-4.6208E+02	1.6340E+03
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-2.5482E+02	1.5357E+03
-1.5120E+02	1.4802E+03
-4.7568E+01	1.4198E+03
5.6059E+01	1.3536E+03
1.5969E+02	1.2804E+03
2.6331E+02	1.1989E+03
3.6694E+02	1.1069E+03
4.7057E+02	1.0015E+03
5.7420E+02	8.7735E+02
6.7783E+02	7.2470E+02
7.8145E+02	5.1844E+02
8.8508E+02	0.0000E+00

8 yr. Capture Curve Data

X(Ft)	Y(Ft)
8.8516E+02	0.0000E+00
7.5519E+02	-5.7893E+02
6.2523E+02	-8.0688E+02
4.9526E+02	-9.7403E+02
3.6530E+02	-1.1087E+03
2.3533E+02	-1.2220E+03
1.0536E+02	-1.3199E+03
-2.4604E+01	-1.4059E+03

-1.5457E+02	-1.4824E+03
-2.8454E+02	-1.5510E+03
-4.1450E+02	-1.6130E+03
-5.4447E+02	-1.6694E+03
-6.7444E+02	-1.7210E+03
-8.0440E+02	-1.7683E+03
-9.3437E+02	-1.8118E+03
-1.0643E+03	-1.8521E+03
-1.1943E+03	-1.8893E+03
-1.3243E+03	-1.9240E+03
-1.4542E+03	-1.9562E+03
-1.5842E+03	-1.9863E+03
-1.7142E+03	-2.0144E+03
-1.8441E+03	-2.0408E+03
-1.9741E+03	-2.0655E+03
-2.1041E+03	-2.0887E+03
-2.2340E+03	-2.1106E+03
-2.3640E+03	-2.1313E+03
-2.4940E+03	-2.1507E+03
-2.6239E+03	-2.1692E+03
-2.7539E+03	-2.1866E+03
-2.8839E+03	-2.2031E+03
-3.0138E+03	-2.2188E+03
-3.1438E+03	-2.2337E+03
-3.2738E+03	-2.2479E+03
-3.4037E+03	-2.2614E+03
-3.5337E+03	-2.2742E+03
-3.6637E+03	-2.2865E+03
-3.7936E+03	-2.2982E+03
-3.9236E+03	-2.3093E+03
-4.0536E+03	-2.3200E+03
-4.1835E+03	-2.3302E+03
-4.3135E+03	-2.3399E+03
-4.4435E+03	-2.3493E+03
-4.5734E+03	-2.3582E+03
-4.7034E+03	-2.3668E+03
-4.8334E+03	-2.3750E+03
-4.9633E+03	-2.3829E+03
-5.0933E+03	-2.3904E+03
-5.2233E+03	-2.3976E+03
-5.3532E+03	-2.4046E+03
-5.4832E+03	-2.4112E+03
-5.6132E+03	-2.4175E+03

-5.7431E+03	-2.4236E+03
-5.8731E+03	-2.4293E+03
-6.0031E+03	-2.4348E+03
-6.1330E+03	-2.4401E+03
-6.2630E+03	-2.4450E+03
-6.3930E+03	-2.4497E+03
-6.5229E+03	-2.4540E+03
-6.6529E+03	-2.4581E+03
-6.7829E+03	-2.4619E+03
-6.9128E+03	-2.4653E+03
-7.0428E+03	-2.4684E+03
-7.1728E+03	-2.4712E+03
-7.3027E+03	-2.4735E+03
-7.4327E+03	-2.4755E+03
-7.5627E+03	-2.4769E+03
-7.6926E+03	-2.4779E+03
-7.8226E+03	-2.4784E+03
-7.9526E+03	-2.4782E+03
-8.0825E+03	-2.4774E+03
-8.2125E+03	-2.4758E+03
-8.3425E+03	-2.4734E+03
-8.4724E+03	-2.4701E+03
-8.6024E+03	-2.4657E+03
-8.7324E+03	-2.4602E+03
-8.8623E+03	-2.4534E+03
-8.9923E+03	-2.4451E+03
-9.1223E+03	-2.4351E+03
-9.2522E+03	-2.4234E+03
-9.3822E+03	-2.4095E+03
-9.5122E+03	-2.3934E+03
-9.6421E+03	-2.3746E+03
-9.7721E+03	-2.3530E+03
-9.9021E+03	-2.3281E+03
-1.0032E+04	-2.2995E+03
-1.0162E+04	-2.2669E+03
-1.0292E+04	-2.2297E+03
-1.0422E+04	-2.1874E+03
-1.0552E+04	-2.1393E+03
-1.0682E+04	-2.0848E+03
-1.0812E+04	-2.0230E+03
-1.0942E+04	-1.9528E+03
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-1.1202E+04	-1.7819E+03

-1.1332E+04	-1.6775E+03
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-1.1722E+04	1.3905E+03
-1.1592E+04	1.4155E+03
-1.1462E+04	1.5568E+03
-1.1332E+04	1.6775E+03
-1.1202E+04	1.7819E+03
-1.1072E+04	1.8730E+03
-1.0942E+04	1.9528E+03
-1.0812E+04	2.0230E+03
-1.0682E+04	2.0848E+03
-1.0552E+04	2.1393E+03
-1.0422E+04	2.1874E+03
-1.0292E+04	2.2297E+03
-1.0162E+04	2.2669E+03
-1.0032E+04	2.2995E+03
-9.9021E+03	2.3281E+03
-9.7721E+03	2.3530E+03
-9.6421E+03	2.3746E+03
-9.5122E+03	2.3934E+03
-9.3822E+03	2.4095E+03
-9.2522E+03	2.4234E+03
-9.1223E+03	2.4351E+03
-8.9923E+03	2.4451E+03
-8.8623E+03	2.4534E+03
-8.7324E+03	2.4602E+03
-8.6024E+03	2.4657E+03
-8.4724E+03	2.4701E+03
-8.3425E+03	2.4734E+03
-8.2125E+03	2.4758E+03
-8.0825E+03	2.4774E+03
-7.9526E+03	2.4782E+03
-7.8226E+03	2.4784E+03
-7.6926E+03	2.4779E+03
-7.5627E+03	2.4769E+03
-7.4327E+03	2.4755E+03

-7.3027E+03	2.4735E+03
-7.1728E+03	2.4712E+03
-7.0428E+03	2.4684E+03
-6.9128E+03	2.4653E+03
-6.7829E+03	2.4619E+03
-6.6529E+03	2.4581E+03
-6.5229E+03	2.4540E+03
-6.3930E+03	2.4497E+03
-6.2630E+03	2.4450E+03
-6.1330E+03	2.4401E+03
-6.0031E+03	2.4348E+03
-5.8731E+03	2.4293E+03
-5.7431E+03	2.4236E+03
-5.6132E+03	2.4175E+03
-5.4832E+03	2.4112E+03
-5.3532E+03	2.4046E+03
-5.2233E+03	2.3976E+03
-5.0933E+03	2.3904E+03
-4.9633E+03	2.3829E+03
-4.8334E+03	2.3750E+03
-4.7034E+03	2.3668E+03
-4.5734E+03	2.3582E+03
-4.4435E+03	2.3493E+03
-4.3135E+03	2.3399E+03
-4.1835E+03	2.3302E+03
-4.0536E+03	2.3200E+03
-3.9236E+03	2.3093E+03
-3.7936E+03	2.2982E+03
-3.6637E+03	2.2865E+03
-3.5337E+03	2.2742E+03
-3.4037E+03	2.2614E+03
-3.2738E+03	2.2479E+03
-3.1438E+03	2.2337E+03
-3.0138E+03	2.2188E+03
-2.8839E+03	2.2031E+03
-2.7539E+03	2.1866E+03
-2.6239E+03	2.1692E+03
-2.4940E+03	2.1507E+03
-2.3640E+03	2.1313E+03
-2.2340E+03	2.1106E+03
-2.1041E+03	2.0887E+03
-1.9741E+03	2.0655E+03
-1.8441E+03	2.0408E+03

-1.7142E+03	2.0144E+03
-1.5842E+03	1.9863E+03
-1.4542E+03	1.9562E+03
-1.3243E+03	1.9240E+03
-1.1943E+03	1.8893E+03
-1.0643E+03	1.8521E+03
-9.3437E+02	1.8118E+03
-8.0440E+02	1.7683E+03
-6.7444E+02	1.7210E+03
-5.4447E+02	1.6694E+03
-4.1450E+02	1.6130E+03
-2.8454E+02	1.5510E+03
-1.5457E+02	1.4824E+03
-2.4604E+01	1.4059E+03
1.0536E+02	1.3199E+03
2.3533E+02	1.2220E+03
3.6530E+02	1.1087E+03
4.9526E+02	9.7403E+02
6.2523E+02	8.0688E+02
7.5519E+02	5.7893E+02
8.8516E+02	0.0000E+00

Wells X (map in)	Wells Y (map in)	Wells X (ft)	Wells Y (ft)
-0.25	0.25	-440	440
-0.25	-0.25	-440	-440
0.25	0.25	440	440

Pit X (map in)	Pit Y (map in)	Pit X (ft)	Pit Y (ft)
-5	0.25	-8800	440
-6.5	0.25	-11440	440
-6.5	3.25	-11440	5720
-5	3.25	-8800	5720
-5	0.25	-8800	440

GROUND WATER

Computer Notes

Capture Zones for Simple Aquifers

by Carl D. McElwee[a]

Abstract. **The protection and cleanup of aquifers is a matter of high priority for all states and the federal government. One concept that is receiving increased attention is that of wellhead protection. Capture zones showing the area influenced by a well within a certain time are useful for both aquifer protection and cleanup. If hydrodynamic dispersion is neglected, a deterministic curve defines the capture zone. Analytical expressions for the capture zones can be derived for simple aquifers. However, the capture zone equations are transcendental and cannot be explicitly solved for the coordinates of the capture zone boundary. Fortunately, an iterative scheme allows the solution to proceed quickly and efficiently even on a modest personal computer. Three forms of the analytical solution must be used in an iterative scheme to cover the entire region of interest, after the extreme values of the x coordinate are determined by an iterative solution. The resulting solution is a discrete one, and usually 100-1000 intervals along the x-axis are necessary for a smooth definition of the capture zone. The presented program is written in FORTRAN and has been used in a variety of computing environments. No graphics capability is included with the program; it is assumed the user has access to a commercial package. The superposition of capture zones for multiple wells is expected to be satisfactory if the spacing is not too close. Because this program deals with simple aquifers, the results rarely will be the final word in a real application. However, the program is useful as a first phase in developing wellhead protection or aquifer cleanup schemes.**

Introduction

The protection and cleanup of aquifers is a matter of high priority for all states and the federal government, as evidenced by the large number of laws and regulations that have been established in recent years. One concept that is receiving increased attention is wellhead protection, where certain potentially polluting activities are banned or regulated within an area that would affect a well within a certain time period. In terms of aquifer cleanup, one would like to know what area of an aquifer will be influenced by a discharge well within a certain time period. These areas are commonly referred to in the literature as capture zones. If hydrodynamic dispersion is neglected, a deterministic curve (sharp front) can be used to define the capture zone. Because real-world aquifers are very complex, exhibiting heterogeneity, anisotropy, and other complicating factors, the calculation of realistic capture zones is difficult. Possible techniques range from simple analytical methods to complex numerical procedures.

The calculation of sharp front movement for wells in infinite aquifers dates at least to Muskat (1937). More recently, Bear and Jacobs (1965) have investigated the movement of water bodies injected into isotropic homogeneous aquifers with uniform regional flow by analytical methods. Most ground-water texts present a steady-state analytical solution for the ground-water divide in an isotropic homogeneous aquifer with one pumping well located in a uniform regional flow field (see for example Todd, 1980, pp. 121-123); this corresponds to an infinite-time capture zone. Javandel et al. (1984, pp. 175-204) present semianalytical methods for calculating pathlines and time-related capture zones for multiple wells in simple aquifers (isotropic, homogeneous, uniform thickness, uniform regional flow, and steady state). However, their computer program is rather complex. EPA (1990) has recently sponsored development of a program to calculate wellhead protection areas (WHPA); but again the program is fairly complex. Javandel and Tsang (1986) propose infinite-time capture zone curves as a tool for aquifer cleanup; again, they use analytical methods for simple aquifers. A few authors have utilized numerical methods to calculate time-related capture zones in the presence of aquifer heterogeneity. Kinzelback (1986, pp. 227-230) presents the formalism for considering a heterogeneous velocity distribution. Shafer (1987) presents the formalism and gives examples of capture zones in heterogeneous aquifers.

The purpose of the present paper is to present a program for calculating time-related capture zones in simple aquifers. The program is short and efficient and adaptable to a range of computing environments from personal computers to mainframes. Because the program assumes simple

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aquifer conditions (isotropic, homogeneous, uniform thickness, uniform regional flow, and steady state), it should be used with care in a real-world situation. However, the program should be a useful initial planning tool for aquifer protection or cleanup.

Basic Equations

The basic equations that are used to describe the capture zone curves are taken from Bear and Jacobs (1965). As mentioned in the introduction, this formulation assumes an aquifer with a constant regional hydraulic conductivity (K). A regional flow direction and magnitude (q_o) also is assumed constant and given by the Darcy equation.

$$q_o = -K \frac{\partial h}{\partial s} \tag{1}$$

h is the regional hydraulic head (without the pumping well), and s is the direction of the head gradient perpendicular to lines of constant head. In what follows, it will be assumed the x axis is parallel (or antiparallel) to the regional flow direction. The aquifer is assumed to be of constant thickness (B) and constant effective porosity (n). At this point, a well pumping at a rate Q is superimposed upon the regional system, and a new steady-state head configuration is established. The object is to calculate the area of the aquifer that will contribute water to the well during a specified time period; or alternatively, to calculate the area affected by injection for a given time interval, after the well is in steady state with the regional system. The curves surrounding these affected areas are loosely called capture curves for a given time period. It is convenient to define three dimensionless parameters:

$$\bar{x} = \frac{2\pi q_o B}{Q} x \tag{2}$$

$$\bar{y} = \frac{2\pi q_o B}{Q} y \tag{3}$$

$$\bar{t} = \frac{2\pi q_o^2 B}{nQ} t \tag{4}$$

q_o, B, Q, and n are the previously defined Darcy velocity, aquifer thickness, pumpage rate, and effective porosity, respectively. x, y, and t are the space and time coordinates in the real world; whereas $\bar{x}$, $\bar{y}$, and $\bar{t}$ are their dimensionless counterparts. Using these dimensionless variables, Bear and Jacobs (1965) show that the capture curves are given by the following equation.

$$\exp(\bar{x} - \bar{t}) = \cos\bar{y} + \frac{\bar{x}}{\bar{y}} \sin\bar{y} \tag{5}$$

Unfortunately, equation (5) is a transcendental equation which cannot be solved explicitly for either $\bar{x}$ or $\bar{y}$.

There are two cases where equation (5) can be simplified somewhat. When $\bar{t} \to \infty$, equation (5) reduces to

$$\bar{x} = -\frac{\bar{y}}{\tan\bar{y}} \tag{6}$$

which is the familiar form for the ground-water divide (Todd, 1980, pp. 121-123). From equation (6), it is seen that as $\bar{x} \to \infty$, the limiting value of $\bar{y}$ is $\pm\pi$. The stagnation point occurs at $\bar{y} = 0$ and $\bar{x} = -1$; this result can be obtained from equation (6) by taking the limit as $\bar{y} \to 0$ (see Figure 1). Another useful simplification of equation (5) results when $\bar{y} = 0$; this corresponds to the two points where the capture curve crosses the $\bar{x}$ axis. Taking the limit as $\bar{y} \to 0$ of equation (5) gives the extreme values $\bar{x}_e$,

$$\exp(\bar{x}_e - \bar{t}) = 1 + \bar{x}_e \tag{7}$$

(See Figure 1 for examples of $\bar{x}_e$.) A slight rearrangement of equation (7) gives the form

$$\bar{t} = \bar{x}_e - \ln(1 + \bar{x}_e) \tag{8}$$

Equations (5) and (8) will form the basis for calculating capture curves at a given normalized time $\bar{t}$. Unfortunately, both are transcendental equations, so iterative techniques will be used to obtain their solution. The resulting curves will enclose the area of the aquifer containing water either injected or discharged by the well up to time $\bar{t}$. The curves represent sharp fronts (deterministic curves) because hydrodynamic dispersion has been neglected. Those who are not interested in the mathematical details of solution may wish to skip to the section describing the computer program availability.

Iterative Solution

The capture curves given by equation (5) are symmetric about the $\bar{x}$ axis; and the x axis is assumed to be parallel to the regional hydraulic gradient with its origin at the well. The requirement that the origin be at the well is relaxed in the computer program. From the discussion in the previous section, the limits on the coordinates are $-1 \leq \bar{x} \leq \infty$ and $-\pi \leq \bar{y} \leq \pi$. The solution that we shall obtain is a numerical one at discrete values of $\bar{x}$. The approach that we shall take involves solving equation (8) for the extreme values of $\bar{x}$ at a certain $\bar{t}$. The region bounded by these two extremes will be discretized to give a certain number of discrete values of $\bar{x}$ (usually between 100 and 1000). Let $\bar{x}_i$ represent one of these values. At that point with $\bar{t}$ and $\bar{x}$ known, equation (5) will be solved to obtain $\bar{y}$. Unfortunately, no single form of equation (5) seems to work well for the full range of coordinates. (Three forms will be used later.)

The extreme values of $\bar{x}$ are found by solving equation (8). Rearranging equation (8) slightly allows an iterative solution scheme to be developed (one-point method, Atkinson, 1989, pp. 76-83).

$$\bar{x}_e^{(m+1)} = \bar{t} + \ln[1 + \bar{x}_e^{(m)}] \tag{9}$$

The m in equation (9) is an iteration index. An initial guess for $\bar{x}_e$ must be known, but $\bar{x}_e = 0$ always seems to work well. Iteration continues on equation (9) until convergence occurs. If the initial guess for $\bar{x}_e$ is zero and $\bar{t}$ is positive, it is clear that equation (9) will converge on a positive value. If $\bar{t}$ is small, then $\bar{x}_e$ also will be small and the logarithmic term of equation (8) can be written as a series expansion to yield

$$\bar{t} = \frac{\bar{x}_e^{\,2}}{2} - \frac{\bar{x}_e^{\,3}}{3} + \frac{\bar{x}_e^{\,4}}{4} - \ldots \qquad (10)$$

Solving for the lowest power of $\bar{x}_e$ gives

$$\bar{x}_e^{(m+1)} = \sqrt{2}\left[\bar{t} + \frac{\bar{x}_e^{(m)3}}{3} - \frac{\bar{x}_e^{(m)4}}{4} + \ldots\right]^{1/2} \qquad (11)$$

Iterating equation (11) works well for small values of $\bar{t}$ and $\bar{x}_e$.

Equations (9) and (11) work well for the positive value of the $\bar{x}$ extremes; however, a slightly different version is needed to find the negative extreme value. Rearranging equation (7) slightly gives the following iterative solution.

$$\bar{x}_e^{(m+1)} = \exp(\bar{x}_e^{(m)} - \bar{t}) - 1 \qquad (12)$$

Clearly, if $\bar{t} \to \infty$, equation (12) gives an extreme value of -1. If the initial guess for $\bar{x}_e$ is zero and $\bar{t}$ is positive, the result for the first iteration will be negative. Experience has shown that equation (12) converges rapidly on the negative value of $\bar{x}_e$.

Now that the extreme values of $\bar{x}$ are known for a particular $\bar{t}$, we can pick a discrete value $\bar{x}_i$ located between these two extremes. The only unknown in equation (5) is now $\bar{y}$, and an iterative solution can be set up. The most obvious iterative form is obtained from equation (5) by multiplying by $\bar{y}$ and $\exp(\bar{t} - \bar{x})$ to obtain

$$\bar{y}_i^{(m+1)} = \exp(\bar{t} - \bar{x}_i) \cdot [\bar{y}_i^{(m)} \cos \bar{y}_i^{(m)} + \bar{x}_i \sin \bar{y}_i^{(m)}] \qquad \ldots (13a)$$

However, numerical experiments show that equation (13a) does not have as wide a region of convergence as we would like. The convergence properties of equation (13a) can be changed by adding $\bar{y}_i$ to each side of the equation (Atkinson, 1989, pp. 76-83). The resulting equation which we shall use is

$$\bar{y}_i^{(m+1)} = \frac{\bar{y}_i^{(m)}}{2} + \frac{1}{2}\exp(\bar{t} - \bar{x}_i) \cdot [\bar{y}_i^{(m)} \cos \bar{y}_i^{(m)} + \bar{x}_i \sin \bar{y}_i^{(m)}] \qquad (13b)$$

As long as $|\bar{y}_i| \leq \pi/2$ and $\bar{x} \geq 1$, equation (13b) works well.

An alternate form of equation (5) can be obtained by solving for $\cos \bar{y}$ and then taking the inverse cosine function.

$$\bar{y}_i^{(m+1)} = \cos^{-1}\left[\exp(\bar{x}_i - \bar{t}) - \frac{\bar{x}_i}{\bar{y}_i^{(m)}} \sin \bar{y}_i^{(m)}\right] \qquad (14)$$

Numerical experiments show that this form works well for all values of $\bar{x}$ and $\bar{y}$ as long as $\bar{t} \leq 1$. For $\bar{t} \geq 1$, equation (14) can be used only for $\bar{x} \leq 1$.

The final form of equation (5) needed to fill in all remaining values of $\bar{x}$, $\bar{y}$, and $\bar{t}$ is given by rearranging and solving for the tangent of $\bar{y}_i$.

$$\tan \bar{y}_i = \left(\frac{\bar{y}_i}{\bar{x}_i}\right) \cdot \left(\frac{\exp(\bar{x}_i - \bar{t})}{\cos \bar{y}_i} - 1\right) \qquad (15)$$

Using the trigonometric identity $\tan(-\theta) = \tan(\pi - \theta)$ allows us to rewrite equation (15) in iterative notation.

$$\bar{y}_i^{(m+1)} = \pi - \tan^{-1}\left[\left(\frac{\bar{y}_i^{(m)}}{\bar{x}_i}\right) \cdot \left(1 - \frac{\exp(\bar{x}_i - \bar{t})}{\cos \bar{y}_i^{(m)}}\right)\right] \qquad \ldots (16)$$

Numerical experiments show that this equation works well for $\bar{t} > 1$ and $\bar{x} > 1$ if $|\bar{y}_i| > \pi/2$. Clearly, equation (16) has a problem at $\bar{y} = \pi/2$ because the cosine function is zero. Therefore, special provision must be made to prevent equation (16) from being used too near the region where $\bar{y} = \pi/2$.

The iterative equations (13), (14), and (16) for $\bar{y}$ require an initial guess for the $m = 0$ iteration. That question was avoided in the above paragraphs where the equations were developed. However, in practice, this presents no problem. Using the extreme values of $\bar{x}$, a discrete set of $\bar{x}_i$'s are calculated by dividing the region between the extremes into an integral number of steps (usually between 100 and 1000). Solution then proceeds sequentially from the negative $\bar{x}$ extreme to the positive $\bar{x}$ extreme. At each of the extreme values of $\bar{x}$, we know that $\bar{y} = 0$. Therefore, as we step through the solution we will always know the value of $\bar{y}$ at the previous $\bar{x}$ value, and we can use this as the initial guess for $\bar{y}$ at the current value of $\bar{x}$. If at least 100 steps in $\bar{x}$ are used, the value of $\bar{y}$ does not change dramatically in one step and the above procedure is very efficient. As the solution proceeds, the appropriate equation (13), (14), or (16) is selected depending on the values of $\bar{t}$, $\bar{x}$, and the current value of $\bar{y}$.

Computer Program

A simple computer program to calculate capture curves based on the material presented here has been written in FORTRAN and is available at nominal cost from the Publication Sales Office of the Kansas Geological Survey. Computer Program Series #90-5 is a publication containing the material of this paper as well as a more detailed description of the program workings, a FORTRAN listing, some sample data sets with output, and an IBM compatible disk containing the program. We commonly run the program on an IBM AT compatible computer; however, it can be adapted easily to a wide variety of computer environments. Usually only the input and output statements need modification.

Results and Application

The results of using the algorithms discussed here are shown in Figure 1 for $\bar{t}$ values of 1, 3, 5, and ∞. The $\bar{t} = \infty$ curve corresponds to the normal ground-water divide. Equations (13), (14), and (16) can be applied only in certain regions of $\bar{t}$, $\bar{x}$, and $\bar{y}$ as discussed earlier. These various regions are shown on Figure 1, each with a different background pattern. Figure 1 was produced with a commercially available graphics package directly from the output file of the program. No graphics capability is included in the program; it is assumed that the user has access to a similar package.

In a real-world application, one will not be dealing with the dimensionless quantities $\bar{t}$, $\bar{x}$, and $\bar{y}$ but with actual time

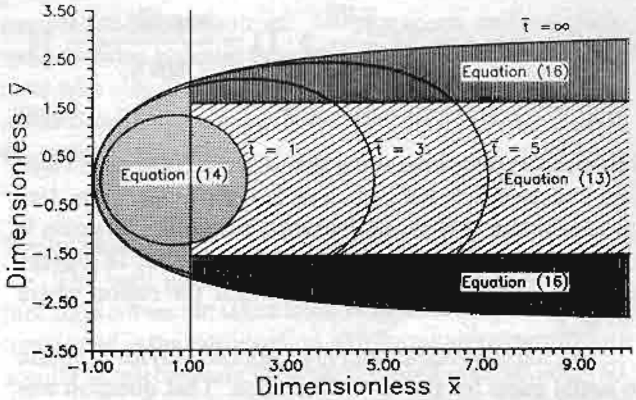

Fig. 1. Capture zones and regions of equation application.

and distances. However, equations (2), (3), and (4) provide the necessary conversions, so the simple user interface in the main program provides the connection to a specific application. Parameters may be given in any consistent set of units. To begin, one must know the average value of hydraulic conductivity and the regional hydraulic gradient vector (direction and magnitude). These quantities are used in equation (1) to calculate the specific discharge or Darcy velocity (q_o). Knowing the average regional thickness of the aquifer (B), the effective porosity (n), and the discharge (or injection) rate of the well (Q), the program can calculate $\bar{t}$ from equation (4) for the actual time of interest. The program then calculates the $\bar{x}_i$ and $\bar{y}_i$ of the capture curve of interest. These values of $\bar{x}$ and $\bar{y}$ are used with equations (2) and (3) to solve for the real-world coordinates x and y, which can then be plotted on an appropriate map base. Currently, the program assumes that the x axis is parallel to the regional hydraulic gradient; but, the well may be located at arbitrary coordinates. If the x axis assumption is not true, an appropriate rotation of coordinates will be needed before plotting on the desired map base.

Discussion

Strictly speaking, the program presented here only deals with one well in a uniform, homogeneous, isotropic aquifer with uniform, steady, regional flow. In practice these conditions are rarely satisfied. However, the type of analysis presented here can be very useful as a first phase in developing wellhead protection or aquifer cleanup schemes (Javandel and Tsang, 1986). If conservative aquifer parameters are used, the analysis presented here should outline a maximum capture zone. The program presented here only deals with one well; however, the approximate result for several wells can be obtained by applying the program once for each well and superimposing the results. As long as the capture zones do not overlap, the approximate result should be very good. As the well spacing gets smaller and the capture zones overlap, the approximate results will deviate more from the correct solution; as long as the well spacing is greater than or equal to $Q/\pi q_o B$, the results are expected to be acceptable (see Javandel and Tsang for details of superimposing multiple wells). For the final analysis, if heterogeneity and nonuniform flow are very important, a more complex program such as that presented by Shafer (1987) should be used.

The program presented here is useful for planning wellhead protection and aquifer cleanup schemes. However, the user must always be mindful of its limitations. The presented program is simple and can be embedded in many computing environments, including personal computers, work stations, and mainframes. We have used the program on a work station interfaced with a geographical information system (GIS) to plot capture zones for several wells in Kansas (Woods et al., 1987; Whittemore et al., 1987; and Merchant et al., 1988). The program is presented here in the hope that it will be useful to others.

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Carl D. McElwee graduated in 1965 from William Jewell College with a B.A. in Physics. He received the M.A. and Ph.D. degrees from the University of Kansas in 1967 and 1971, respectively. His research area was solid-state physics. From 1971 to 1974 he worked for Texaco, Inc., in Houston, Texas, as a Research Geophysicist. Since 1974 he has worked for the Kansas Geological Survey in the Geohydrology, Geophysics, and Advanced Projects Sections. His area of special interest is the quantitative description of aquifer systems by field measurements and modeling.

Sept. 9, 2012

Lawrence Douglas County
Metropolitan Planning Office
6 East 6th Street,
P.O. Box 708,
Lawrence, KS 66044

Planning Staff:

As interested property owners, we are writing this letter to object to the Conditional Use Permit (CUP) that Penny Sand Co. has applied for near 1500N and 1850E. This CUP asks permission for a pit mining operation for sand removal. This would completely change the agricultural setting of the area. If allowed, this CUP would subject the area to dramatically increased industrial activity, including noise, dust, and environment destruction. We ask that you deny the CUP for the following reasons:

(1)The affected area has some interesting Douglas County history associated with it and contains some historic houses.

(2) The river bank in the vicinity of this proposed pit mining operation is unstable and has moved considerably over recent times. If pit mining is allowed in this area, in times of flood the chances of a dramatic river channel change is magnified greatly.

(3) On this proposed 434 acre pit mining site, the majority of the area is covered by some of the highest quality soils as defined by the US Department of Agriculture. It seems very short sighted to produce sand for short term gain and lose the potential for significant food and fiber production indefinitely.

(4)There is a large amount of overburden (unusable soil, silt and clay) that must be removed (typically 23-24 feet). Removing this much overburden will create an environmental nightmare

(5) Opening this pit operation will expose one of the most prolific aquifers in this region to potential pollution. This aquifer is a magnificent resource that must be protected and preserved for the future.

(6)Several neighboring house wells could be affected by this pit. Just down the valley about 1 5/8 miles lies the Eudora Public Water Supply Well Field; it could also be affected by the proposed pit mining operation.

Thank you for your consideration of our concerns.

Penny Sand Pit Petition

Name	Address	Phone Number	email
Print: Carl McElwee Signature: Carl McElwee	1564 E. 1850 Rd. Lawrence, KS 66046	785 843-4164	cmcelwee@ku.edu
Print: MARGERY McELWEE Signature: Margery McElwee	1564 E 1850 Rd Lawrence KS 66046	785 843-4164	
Print: Park Lauber Signature: Park Lauber	1555 E 1850 Rd Lawrence KS	785-393- 9028	
Print: Esther McCabria Signature: E. McCabria	1455 E 1900 Rd Eudora KS 66025	542 2492	BMccabria@aol.com
Print: Robert McCabria Signature: Robert E McCabria	1455 E 1900 Rd Eudora, KS 66025	542 2492	"
Print: [illegible] Signature: Scott Jackson	1964 N 1550 Rd Eudora 66025	785 331 6561	Scottjackson 1964@yahoo.com
Print: Bruce Perkins Signature: Bruce Perkins	Eudor 66025	785 764 6295	BrucePerkins55@ Gmail.Com
Print: Philip R Ernst Ernst Signature:	826 Mass, Lawrence	843-2373	
Print: NORMA L. SCHMILLE Signature: Norma L. Schmille	1610 E GLENN DR. LAWRENCE, KS 66044	843-0943	
Print: AL W DEATHE Signature: Al W Deathe	1918 N 1500 RD EUDORA KS	542-2352	AWDVKD@ SUNFLOWER. Com
Print: ViAnn K. Deathe Signature: ViAnn K Deathe	1918 N 1500 Rd Eudora, KS 66025	542-2352	

Penny Sand Pit Petition

Name	Address	Phone Number	email
Print: Gregory Shipe Signature: Gregory Shipe	1394 E 1900 Rd Eudora, Ks 66025	785 542-2276	KS_wines@ hotmail.com
Print: Virginia S. Strong Signature: Virginia S. Strong	3712 Trail Rd. Lawrence, KS 66049	785 843- 2293	
Print: DAVID VERTAČNIK Signature: [illegible]	1403 E 1850 Road Lawrence, KS	785 842-4428	davidv@ku.edu
Print: Wendy Leet Vertacnik Signature: Wendy Leet Vertacnik	1403 E. 1850 Rd Lawrence KS 66046	785- 842-4428	vertacnik@ sunflower.com
Print: Dr Karen Johnston Signature: K Johnston	1928 N 1500 Rd Eudora KS 66025	785 393 2933	drkarenjohnston @gmail.com
Print: Linda Knabe Signature: Linda Knabe	39460 W 143rd ST Eudora, Ks 66025	785 542 2228	Knabefarms@ wildblue.net
Print: Richard Knabe Signature: Richard Knabe	Same		
Print: PETER SHENOUDA Signature: Peter S	1411 E. 1850 Road Lawrence, KS 66046	785-856- 3999	pshenouda@hotmail.com
Print: Building Blocks Daycare Signature: ~~[illegible]~~	1411 E. 1850 Road Lawrence, KS 66046	785- 856- 3999	buildingblocks@ Sunflower.Com
Print: Steve BOYER Signature: Steve Boyer	EUDORA K.S. 2027 N 1500 RD	785-218- 2491	
Print: Nancy Jackson Signature: Nancy Jackson	1964 N 1550th Rd Eudora, KS 66025	785-331- 8743	nancyjackson66@ gmail.com

Penny Sand Pit Petition

Name	Address	Phone Number	email
Print: Daniel C. Brune	242 E. Cairo Dr.	480-967-8622	dbrune@asu.edu
Signature: Daniel C. Brune	Tempe, AZ 85282		
Print:			
Signature:			
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Signature:			

Penny Sand Pit Petition

Name	Address	Phone Number	email
Print: DOUGLAS GILMORE	826 W 59 Terr KC mo 64113	816 444 3516	
Signature: Douglas Gilmore			
Print:			
Signature:			
Print:			
Signature:			
Print:			
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Signature:			

Building Blocks Daycare Center
1411 E 1850 Road
Lawrence, KS 66046
(785) 865-3999

To: *Lawrence Douglas County*
Metropolitan Planning Office
6 East 6th Street,
P.O. Box 708,
Lawrence, KS 66044

We want to object to the greatly increased heavy truck traffic on 442 due to this application, which will interfere with our customers dripping off and picking up children. We are a licensed daycare center near the proposed Penny Sand Plant. We are licensed for 129 children that can attend our center. We have over 30 teachers that work at the center. Parents and teachers drive daily between 7 AM to 6 PM Monday through Friday. Few years back we requested the Burlington Rail Road and the State of Kansas to review the increased traffic going through 1850 Road. Within a few months of the study both the State and Burlington implemented a railroad crossing due to the increased traffic.

Please realize that we already have the following people using 442 (Old K 10).

- Up to 129 parents dropping children during the day.
- Over 30 teachers coming to our facility during the day.
- Public school buses coming to our facility to drop children at the center.
- Our current vans driving during the day to pick and bring back children from different schools in Lawrence and Eudora.
- Folks visiting Pendleton during the year to purchase vegetables and fruits.
- Folks that work in Eudora and travel to Lawrence for employment.
- Folks that live in KC and work in Lawrence use the back road (442) to get to work.

Currently everyone in the neighborhood have a well for water source to either their house or business. We can't afford to lose our only source of water. I just can't imagine digging that many acres won't affect our only water source to the facility. Without water we would lose our children and would be forced to close the facility as water is a requirement by KDHE and would eliminate over 30 jobs.

We request that you deny the permit for the safety of the children, teachers and everyone traveling on the highway.

Sincerely,

Peter Shenouda

Peter Shenouda

RECEIVED

JAN 25 2013

City County Planning Office
Lawrence, Kansas

January 24, 2013

Lawrence Douglas County
Metropolitan Planning Office
6 E 6th Street
Lawrence, KS 66044

Dear Commissioners,

I am writing to express my concerns regarding the proposed Penny's sand pit. I live across the Kansas River in Leavenworth County just north and east of the current in stream dredging operation. This past fall we were subjected to hours of loud dredging noises that sometimes lasted all night long. It was actually this activity that led those of us who live on this side of the river to question whether we deserved some input regarding the proposed pit. The fact that some of us live slightly outside of the 1000ft area that required notification of the public hearing does not mean we are not affected by the operations across the river. I called the Corps of Engineers to question whether there were any regulated hours for the dredging and learned that there are no limits to the hours that the actual dredge equipment can operate. In the current staff report under Condition 14 it states "Hours of operation are 6:30 AM to 6:30 PM, Monday through Friday… however dredging and extraction of sand may exceed these hours when necessary." This exception in the Corps permits allows the dredge to operate 24 hours a day as well as weekends. The dredge equipment that was used was unusually loud and was heard throughout the area from the river to HWY 32. The noise issue must be addressed. I am requesting a noise study and strict regulations regarding the hours of operation of the actual dredge equipment. One resident was told by the Leavenworth County sheriff that there was nothing he could do as this is "construction" noise. If construction noise can not be regulated then dredging needs to be reclassified.

This should not be dismissed as a case of NIMBY. This is would be better described as a case of indifference on the part of the dredge operators to the residents and environs of the area they in which wish to expand their sand operations.

I am however in agreement with the concerns addressed by Carl McElwee in his very good correspondence with the planning office regarding the loss of prime crop land and the possible problems that would come with a flooding event. I think these issues should be your prime considerations before granting the CUP. On the soil maps these are contiguous tracts of class 1 & 2 soils. These soil types have been identified as a great economic resource to the community in Horizon20/20. This area is also in a FEMA Zone A flood area. This is an appropriate area for farming not industry.

Joanne Bergman

Joanne Bergman
25253 Alexander Road
Lawrence KS 66044

Jan. 23, 2013

Lawrence Douglas County
Metropolitan Planning Office
6 East 6th Street,
P.O. Box 708,
Lawrence, KS 66044

Douglas County Planning Commissioners,

On Jan. 30 you will consider again the CUP for Penny Sand to pit mine over 400 acres. I know that there is a massive amount of information that has been submitted over the months that this request has been considered. I trust that you have looked over that material is some detail, so I only want to summarize the material that indicates the request should be denied.

As I see it, there are three main reasons to deny this request: The river bank in this area is unstable and excavation of a pit would make it easier for the river to cut off the meander; The Kansas River Valley is a magnificent aquifer and the opening of this pit will make the aquifer much more vulnerable to pollution; Finally, the destruction of 400 plus acres of prime farmland for short term sand production is short sighted.

I would like to expand on each of these items in a little more detail. First, I would like to tell you that I am a groundwater professional who has spent 35 years at KU, much of that time studying the Kansas River Valley aquifer. I have done extensive research at a field site Northeast of the Lawrence Airport. So, I am qualified to comment on the aquifer.

The first item I would like to discuss is the instability of the river bank in this area. I have submitted excerpts of Dr. Dort's work showing the river bank positions over the last hundred plus years. The river is trying to cut off the meander in this area. The presence of an open pit the magnitude proposed by Penny Sand would make it much easier for the river to cut off this meander in times of flood. I live out there and observed personally the 1993 flood sweep across this area. If the pit had been present, the river would have been flowing freely through it. If the pit is present and the river cuts into it then two things will occur that are very undesirable: First the pit will become a huge nick point; Second the river water will be in direct contact with the complete thickness of the aquifer over the entire extent of the pit. The presence of the large nick point will produce an unstable river bed and degradation will proceed upstream and downstream a considerable distance until a new stable bed develops. Preservation of river bed at current levels is the reason that dredgers are being thrown off the river in some areas. The flooding of the pit with river surface water of poorer quality than aquifer water would lead to degradation of the aquifer water in this area. As I have documented in other submitted material, the two local experts on the Kansas River Dr. Dort (Retired KU Geology) and Dr. Juracek (USGS) do not dispute what I have said in this paragraph.

The second item is the protection of the Kansas River aquifer. This is an extensive aquifer of high quality water and must be protected for future generations. The opening of this huge pit will make the aquifer much more vulnerable to pollution. The dredging operation will proceed down to the bedrock exposing the coarse high conductivity sands at the bottom of the aquifer. Anything that gets into the pit threatens the quality of the aquifer since it can move very easily in the coarse bottom layer. Once the pit is opened it must be monitored carefully in perpetuity to insure a clean aquifer. This pit will cause a large change in the hydraulic regime and will cause a significant change in water levels in the area. The Penny Sand report indicated the water level in the pit will probably be near that of the river. Currently the water levels in the aquifer are several feet higher than the river, so the result will be lowered water levels in the area and a huge flow-through lake created by the pit. Any user of the aquifer down-gradient of this pit must be concerned with the quality of the water in the pit. Fertilizers are widely and heavily used in this area and would be a potential source of nitrate pollution for the aquifer that could easily travel long distances. The city of Eudora Municipal Well Field is down-gradient from this proposed pit and work that I have submitted shows that the 6 and 8 year capture curves for the well field likely overlie the proposed pit. Of course longer time periods will make the capture curves expand to cover larger portions of the proposed pit.

The third item is the destruction of over 400 acres of prime farmland. Soils maps show this area to contain large contiguous areas of the highest quality soils capable of producing vast quantities of food and fiber indefinitely. It will only take 30 years to destroy this soil, which has taken nature thousands of years to produce. The sand produced in this pit will largely leave Douglas County and the pit operation will not involve many jobs as indicated in the Penny Sand Application. So, it seems the overall benefit to Douglas County is not large for this CUP. On the other hand, the preservation of clean water and highly productive soils for future generations is of great value to Douglas County.

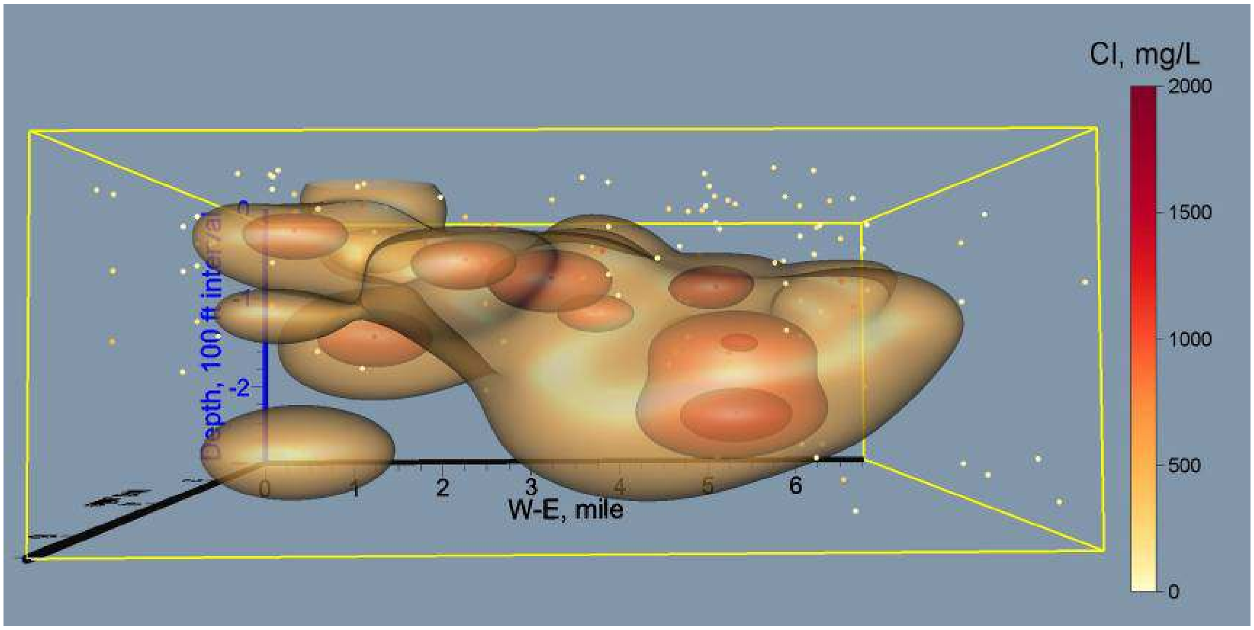
The Douglas County Commissioners requested an independent unbiased third party report reviewing the material submitted for the CUP to give them additional guidance. The report obtained from Conestoga-Rovers and Associates (CRA) is hardly that. CRA states in their information that they widely consult for the aggregate industry, so their lack of bias is questionable. In addition, none of the signers of the report are experts on the Kansas River Valley Aquifer. In fact, their examples of systems studied are in Canada. They say that they see no real problems with the CUP, but proceed to lay out several additional things that need to be done before granting the CUP. For the most part, I agree with the additional work they recommend. Tacitly in requesting this additional work, they are admitting that this CUP makes the aquifer much more vulnerable to pollution. If there was really no potential problem, no additional work would need to be done.

Penny Sand and CRA like to point to various sand pits that have not caused pollution problems. However, you can not prove the point that sand pits never pollute with a few examples. There is always the potential for pollution if pollutants are present and we know that nitrates are prevalent in this area. Sand pits are not greatly different from other surface water bodies and the groundwater literature is full of examples of pollution from surface water bodies that has moved large distances. One example from the state of Kansas is a saltwater plume moving from the town of Burrton toward the Wichita Well Field. This results from the disposal of saltwater in surface water ponds years ago that is continually making its way to the Wichita Well Field. This pollution has travelled miles. Salt and nitrate are called conservative tracers because they are not easily adsorbed and can travel long distances in permeable aquifers. I am including as an appendix to this letter a plot of the mapped pollution in that area. I hope this explains why this proposed pit causes great vulnerability to the aquifer in this area.

For all these reasons, I ask you to deny this request for a pit mining CUP by Penny Sand. Thank you for your consideration. If I may answer any questions, please contact me.

Carl McElwee
Emeritus Professor of Geology
University of Kansas
Lawrence, KS 66045
785-843-4164
cmcelwee@ku.edu

Appendix



3D view of the saline water plume in the Burrton Intensive Groundwater Control Area

January 28, 2013

Lawrence-Douglas County Planning Commission
Dear Chairman Liese,

To prevent further erosion of the Kansas River bank and degradation of bridges and infrastructure upstream and downstream, we support removing sand dredging from the Kansas River. While sand pit extraction also has significant concerns, sand pit mining in **an appropriate location** remains an important improvement over sand dredging in the Kansas River.

After a presentation by Dr. Melinda Daniels summarizing her research on the impacts of sand dredging within the Kansas River, she was asked about the Penny Sand Pit proposal. Dr. Daniels, a Kansas State University Geography Professor, shared concerns that the placement of this sand pit was too close to the Kansas River. She reasoned that if the Kansas River changed course and flowed through this sand pit, it would have the same degradation impacts as in-stream river dredging. Mr. Phil Struble, Landplan Engineering, stated during testimony about this application with the Planning Commission on October 22, 2012, that rivers move and it is hard to control rivers. We are very concerned about the possibility of the Kansas River rechanneling through this proposed sand pit leading to further degradation of the Kansas River threatening bridges, the Bowersock dam, and river stream banks.

The proposed location for this sand pit is composed principally of Class I and II soils. (Please refer to Exhibit A, Page 1 illustrating Class I soils, shaded red, and Class II soils, shaded yellow.) Horizon 2020 states in Chapter 7 that the "preservation of high-quality agricultural land, which has been recognized as a finite resource that is important to the regional economy, is of important value to the community."

According to the USDA Web Soil Survey (Exhibit B, Pages 1 & 3), the majority of the soils in this proposed location are a "poor" source of sand. The only soils identified as a "fair" source of sand are the 30 acres along the Kansas River.

The soils on this property used for an aquifer-fed excavated pond are ranked "very limited". According to the USDA Web Soil Survey (Exhibit C, page 3), "'Very limited' indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected."

The majority of the soils on this property are "very limited" used as embankments, dikes, and levees according to USDA Web Soil Survey (Exhibit D, page 3 & 4). The only soils that differ and are "somewhat limited" are directly along the Kansas River. The use of "very limited" soils as a levee can lead to expected poor performance and high maintenance.

Given that the importance of the preservation of prime soils to our community and the threat of the Kansas River cutting through this sand pit in the future, we recommend rejecting this conditional use permit. We conclude this location is inappropriate as a sand pit. It is a poor source for sand. The existing soils are very limited to serve as an excavated pond and levee. Poor performance and high maintenance costs can be expected in the future. This is excellent farmland. It should remain as prime farmland.

Thank you for your consideration of these comments.

Sincerely,

Jerry Jost
217 North Fifth Street
Lawrence, KS 66044

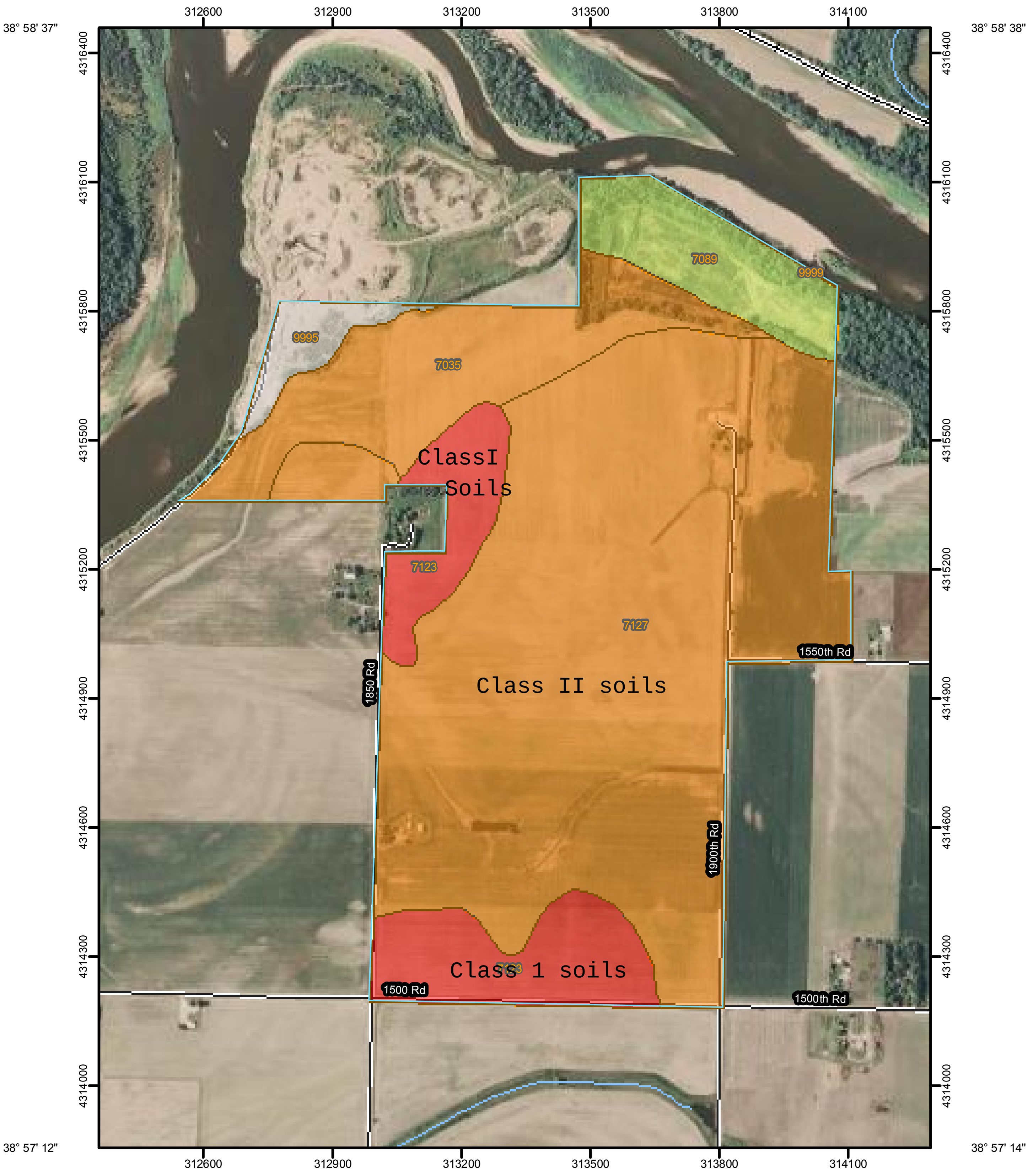
Barbara Clark
2050 East 1550 Road
Lawrence, KS 66044

Charles NovoGradac
945 Ohio Street
Lawrence, KS 66044

Deb Milks
945 Ohio Street
Lawrence, KS 66044

Lane Williams
1735 East 1500 Road
Lawrence, KS 66044-9305

Exhibit A
Soil Classes
Page 1



95° 9' 55" 95° 8' 35"

Map Scale: 1:12,400 if printed on A size (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 450 900 1,800 2,700

Exhibit A
Soil Classes
Page 2

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- Capability Class - I
- Capability Class - II
- Capability Class - III
- Capability Class - IV
- Capability Class - V
- Capability Class - VI
- Capability Class - VII
- Capability Class - VIII
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:12,400 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 15N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas County, Kansas
Survey Area Data: Version 9, Sep 24, 2012

Date(s) aerial images were photographed: 6/15/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Exhibit A
Soil Classes
Page 3

Nonirrigated Capability Class

Nonirrigated Capability Class— Summary by Map Unit — Douglas County, Kansas (KS045)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
7035	Eudora-Bismarckgrove fine sandy loams, overwash, occasionally flooded	2	60.2	13.7%
7089	Stonehouse-Eudora fine sandy loams, overwash, occasionally flooded	4	30.1	6.9%
7123	Eudora silt loam, rarely flooded	1	53.8	12.3%
7127	Eudora-Kimo complex, overwash, rarely flooded	2	284.2	64.8%
9995	Sand Pits		10.3	2.4%
9999	Water		0.1	0.0%
Totals for Area of Interest			**438.7**	**100.0%**

Description

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations that show suitability and limitations of groups of soils for rangeland, for woodland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels-capability class, subclass, and unit. Only class and subclass are included in this data set.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have few limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Rating Options

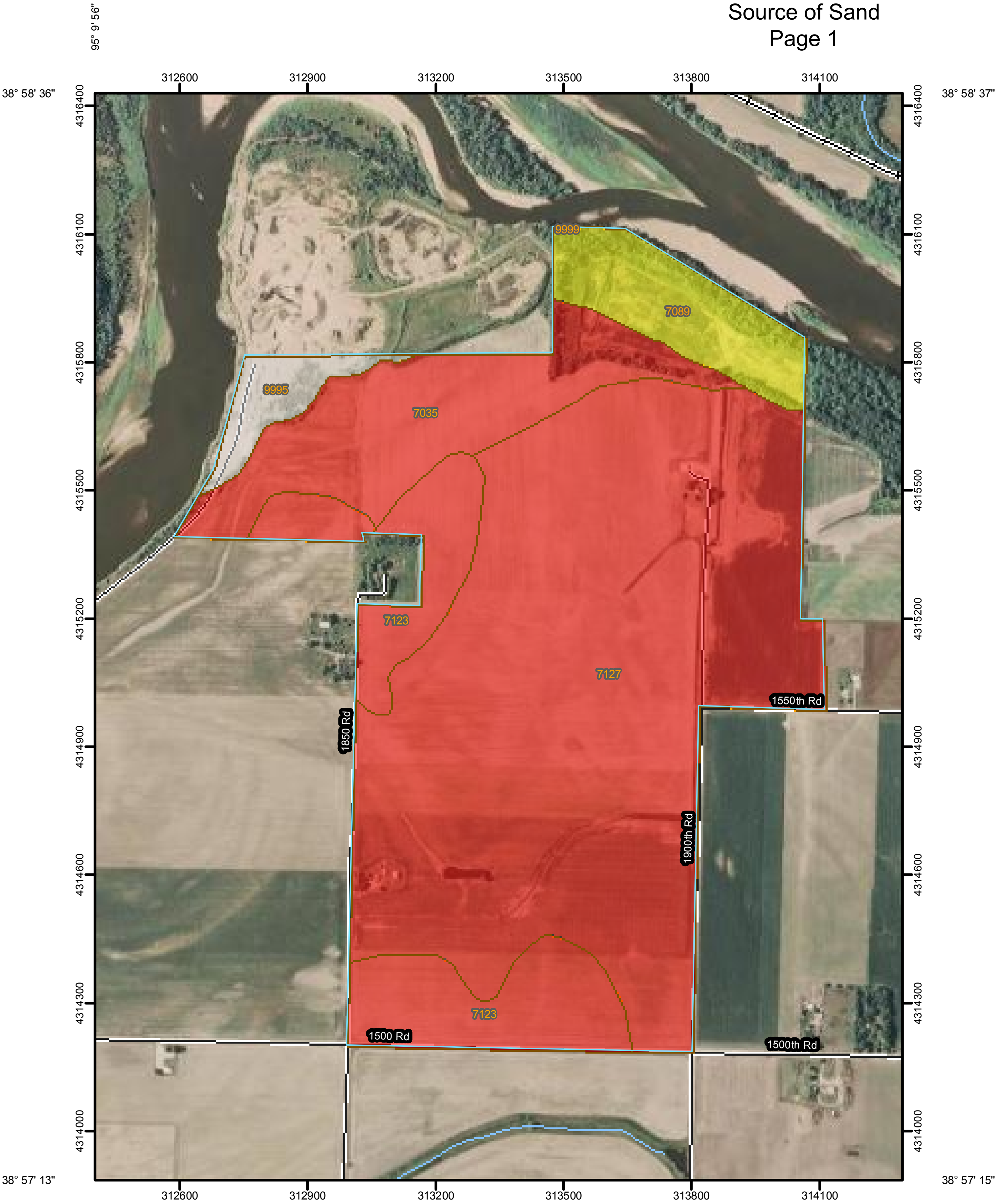
Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Sand Source—Douglas County, Kansas
(Penny Sand Pit Application)

Exhibit B
Source of Sand
Page 1



Map Scale: 1:12,100 if printed on A size (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 450 900 1,800 2,700

Exhibit B
Source of Sand
Page 2

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

Poor

Fair

Good

Not rated or not available

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:12,100 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 15N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas County, Kansas
Survey Area Data: Version 9, Sep 24, 2012

Date(s) aerial images were photographed: 6/15/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Sand Source

Exhibit B
Source of Sand
Page 3

Sand Source— Summary by Map Unit — Douglas County, Kansas (KS045)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
7035	Eudora-Bismarckgrove fine sandy loams, overwash, occasionally flooded	Poor	Eudora (55%)	Bottom layer (0.00)	59.7	13.7%
				Thickest layer (0.00)		
			Bismarckgrove (25%)	Bottom layer (0.00)		
				Thickest layer (0.00)		
7089	Stonehouse-Eudora fine sandy loams, overwash, occasionally flooded	Fair	Stonehouse (50%)	Thickest layer (0.03)	29.6	6.8%
				Bottom layer (0.13)		
7123	Eudora silt loam, rarely flooded	Poor	Eudora (85%)	Bottom layer (0.00)	52.8	12.1%
				Thickest layer (0.00)		
7127	Eudora-Kimo complex, overwash, rarely flooded	Poor	Eudora (60%)	Bottom layer (0.00)	280.8	64.6%
				Thickest layer (0.00)		
			Kimo (30%)	Bottom layer (0.00)		
				Thickest layer (0.00)		
			Wabash (5%)	Bottom layer (0.00)		
				Thickest layer (0.00)		
9995	Sand Pits	Not rated	Pits, sand (100%)		11.8	2.7%
9999	Water	Not rated	Water (100%)		0.0	0.0%
Totals for Area of Interest					**434.7**	**100.0%**

Sand Source— Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
Poor	393.4	90.5%
Fair	29.6	6.8%
Null or Not Rated	11.8	2.7%
Totals for Area of Interest	**434.7**	**100.0%**

Exhibit B
Source of Sand
Page 4

Description

Sand is a natural aggregate (0.05 millimeter to 2 millimeters in diameter) suitable for commercial use with a minimum of processing. It is used in many kinds of construction. Specifications for each use vary widely. Only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand are gradation of grain sizes (as indicated by the Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains sand, the soil is considered a likely source regardless of thickness. The assumption is that the sand layer below the depth of observation exceeds the minimum thickness. The ratings are for the whole soil, from the surface to a depth of about 6 feet.

The soils are rated "good," "fair," or "poor" as potential sources of sand. A rating of "good" or "fair" means that sand is likely to be in or below the soil. The bottom layer and the thickest layer of the soil are assigned numerical ratings. These ratings indicate the likelihood that the layer is a source of sand. The number 0.00 indicates that the layer is a "poor source." The number 1.00 indicates that the layer is a "good source." A number between 0.00 and 1.00 indicates the degree to which the layer is a likely source.

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Rating Options

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: *None Specified*

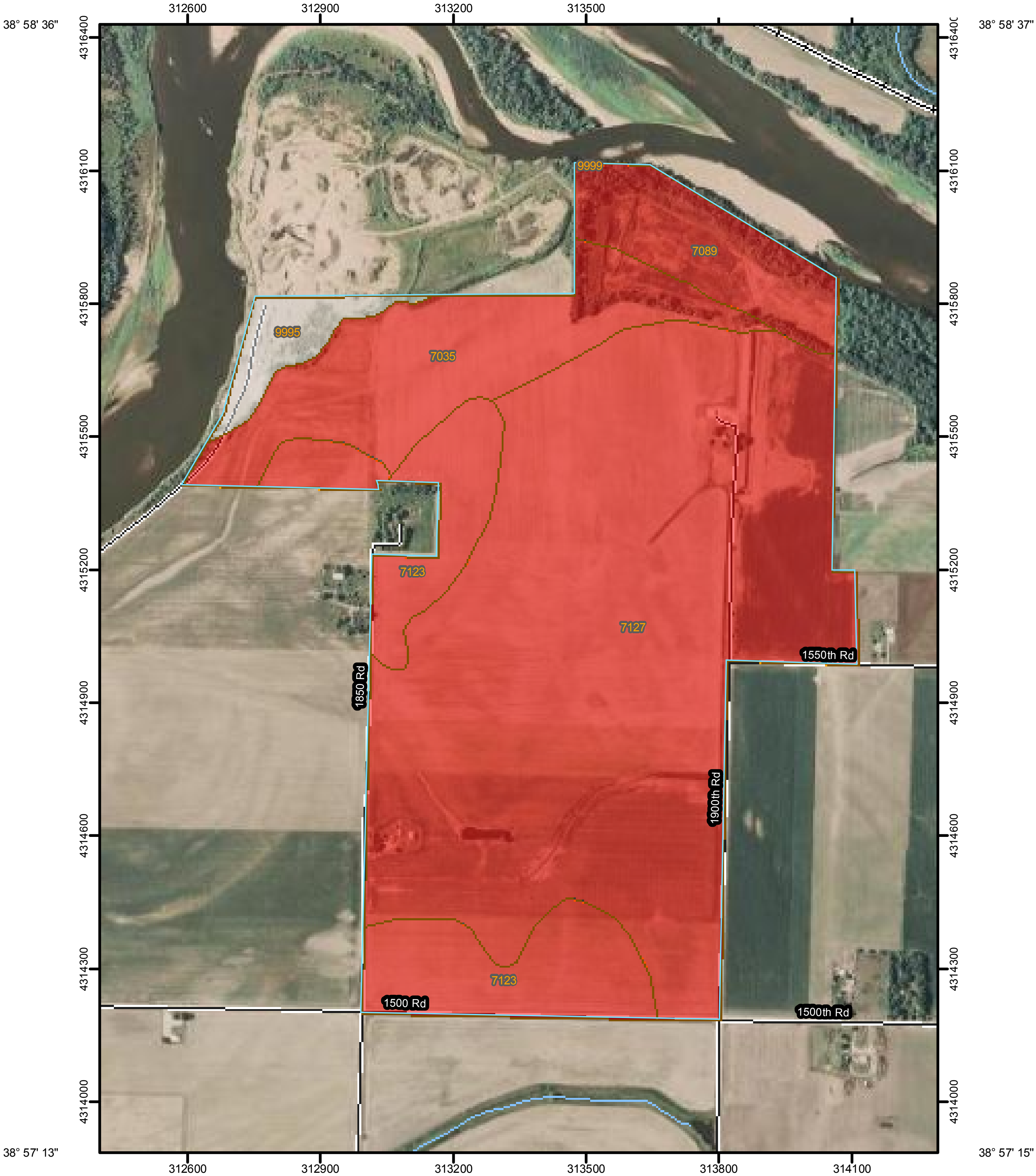
Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Lower

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Exhibit C
Excavated Ponds (Aquifer-Fed)
Page 1

95° 9' 56"



95° 9' 53"

95° 8' 35"

Map Scale: 1:12,100 if printed on A size (8.5" x 11") sheet.

N

Meters
0 100 200 400 600

Feet
0 450 900 1,800 2,700

Exhibit C
Excavated Ponds (Aquifer-Fed)
Page 2

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

Very limited

Somewhat limited

Not limited

Not rated or not available

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:12,100 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 15N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas County, Kansas
Survey Area Data: Version 9, Sep 24, 2012

Date(s) aerial images were photographed: 6/15/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Exhibit C
Excavated Ponds (Aquifer-Fed)
Page 3

Excavated Ponds (Aquifer-Fed)

Excavated Ponds (Aquifer-Fed)— Summary by Map Unit — Douglas County, Kansas (KS045)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
7035	Eudora-Bismarckgrove fine sandy loams, overwash, occasionally flooded	Very limited	Eudora (55%)	Depth to water (1.00)	59.7	13.7%
			Bismarckgrove (25%)	Depth to water (1.00)		
7089	Stonehouse-Eudora fine sandy loams, overwash, occasionally flooded	Very limited	Stonehouse (50%)	Depth to water (1.00)	29.6	6.8%
			Eudora (30%)	Depth to water (1.00)		
7123	Eudora silt loam, rarely flooded	Very limited	Eudora (85%)	Depth to water (1.00)	52.8	12.1%
7127	Eudora-Kimo complex, overwash, rarely flooded	Very limited	Eudora (60%)	Depth to water (1.00)	280.8	64.6%
			Wabash (5%)	Slow refill (1.00)		
				Unstable excavation walls (0.10)		
9995	Sand Pits	Not rated	Pits, sand (100%)		11.8	2.7%
9999	Water	Not rated	Water (100%)		0.0	0.0%
Totals for Area of Interest					**434.7**	**100.0%**

Excavated Ponds (Aquifer-Fed)— Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
Very limited	422.9	97.3%
Null or Not Rated	11.8	2.7%
Totals for Area of Interest	**434.7**	**100.0%**

Description

Excavated ponds (aquifer-fed) are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, saturated hydraulic conductivity (Ksat) of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Exhibit D
Embankments, Dikes, Levees
Page 1

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

Very limited

Somewhat limited

Not limited

Not rated or not available

Political Features

Cities

Water Features

Streams and Canals

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Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:12,100 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 15N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas County, Kansas
Survey Area Data: Version 9, Sep 24, 2012

Date(s) aerial images were photographed: 6/15/2006

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Exhibit D
Embankments, Dikes, Levees
Page 3

Embankments, Dikes, and Levees

Embankments, Dikes, and Levees— Summary by Map Unit — Douglas County, Kansas (KS045)						
Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
7035	Eudora-Bismarckgrove fine sandy loams, overwash, occasionally flooded	Very limited	Eudora (55%)	Piping (1.00)	59.7	13.7%
			Bismarckgrove (25%)	Piping (1.00)		
7089	Stonehouse-Eudora fine sandy loams, overwash, occasionally flooded	Somewhat limited	Stonehouse (50%)	Seepage (0.27)	29.6	6.8%
7123	Eudora silt loam, rarely flooded	Very limited	Eudora (85%)	Piping (1.00)	52.8	12.1%
7127	Eudora-Kimo complex, overwash, rarely flooded	Very limited	Eudora (60%)	Piping (1.00)	280.8	64.6%
			Kimo (30%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Piping (0.07)		
			Wabash (5%)	Depth to saturated zone (1.00)		
				Hard to pack (1.00)		
9995	Sand Pits	Not rated	Pits, sand (100%)		11.8	2.7%
9999	Water	Not rated	Water (100%)		0.0	0.0%
Totals for Area of Interest					**434.7**	**100.0%**

Embankments, Dikes, and Levees— Summary by Rating Value		
Rating	Acres in AOI	Percent of AOI
Very limited	393.4	90.5%
Somewhat limited	29.6	6.8%
Null or Not Rated	11.8	2.7%
Totals for Area of Interest	**434.7**	**100.0%**

Description

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Embankments that have zoned construction (core and shell) are not considered. The soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the suitability of the undisturbed soil for supporting the embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Dear Douglas County Planning Commission,

My name is Nancy Schwarting and my property is at 1706 N 1500 Road, just west of the proposed sand pit CUP. I am writing to express my concern about this proposed CUP that would allow a large open sand pit project to be initiated next to the Kaw River and within a mile of my property on 1500 Road. I've attended the initial Planning Commission co-meeting with Eudora, the Douglas County Commission meeting, and multiple other smaller community meetings to learn more about this project and its possible ramifications for the land and the people who live near it.

I have chosen to assess this project in terms of the good vs. bad that would come out of it.

As far as the water and possible contamination of the aquifer, I have listened to all the discussions of experts, and it is clear that there are no certainties in this picture. Although the risks may be there, I've heard a volley of opposing views on how likely or unlikely various bad things are to happen. We have no ability to predict for sure that the project will contaminate the aquifer or cause the river channel to change. But far more importantly, we have absolutely no assurance that nothing will go wrong. We have no way of even quantifying what those risks might be. Do we assume no risk because we don't know for sure what will happen?

I heard that strictest of measures are taken in the drilling of a single well, a 4" hole into the aquifer, just to protect the aquifer from contamination via that hole. How could there not be multifold more risk for contamination when 'the hole' is several hundred feet across and twice as deep as the aquifer is? Why is equal precaution not mandatory for this hole?

We do know the town officials of Eudora vigorously oppose this CUP due to the unknowns involved in digging a hole through the aquifer. Eudora does not want to play Russian roulette now with their water, to find out in 5 or 10 years what those risks actually are. By the time any contamination reaches the Eudora wells several years from now it will be too late to fix!

One doesn't buy insurance planning to have an accident, but has it in case there is one. An 'accident' in this case would cost Eudora millions. What assurances are in place to address a disaster such as contamination of the water supply and who is liable, should this happen? Is the County accepting this responsibility if they approve this CUP? How can this City or County ethically approve a use that could endanger the water of another County and City downstream?

The risk of aquifer contamination may remain unquantifiable. But there are a lot of things we do know for sure will happen if this project becomes a reality.

We know if this project is approved the prime farmland (and this land IS zoned as agricultural land) will be all gone, and gone for good. It took hundreds of years for this land to form, and once the topsoil is stripped off it will never be there again as it is now. Is this permanent change to the land worth 30 years of profit for one company?

We do know for certain that the aquifer will be left exposed. The hole that is requested will go through the aquifer and more than 30' deeper. We do know that once this 70' hole in the ground and through the aquifer is there, it too will be there forever. Will the berms protecting that hole be there forever? What provisions are in place to maintain the berms after 30 years, or perhaps even sooner, after the land is 'used up' and the owner then sells it? Who will pay for this indefinitely?

We know the truck traffic, dust and machinery noise will be an ongoing entity for the duration of the 30 year project. This will decrease the property values for all of us who live in this area. The truck traffic will necessarily increase the maintenance needs of the roads. Who pays for that? The county, via the people who pay taxes?

We are told that at the end of this project, when there will be a huge hole in the ground from all the topsoil and sand removed, it will be filled with water and called a 'recreational lake'. Does this mean the lake will it be open to the public? Will we, the community actually benefit from this 'lake'? Will that water be safe to swim in? It is my understanding that the water level will be some 20+ feet below the edges of the 'lake'. How will people access the water to recreate there? Also, if the droughts continue, how will the exposure of this lake to evaporation affect the aquifer that it is then integrally connected to?

<u>As far as long term benefits of this CUP to the county, city and community, I can think of none.</u>

I would like to know if there is an urgent need for a new sand source: There are a number of other currently active sites in the area. Penny owns several of these. I would also like to know what percentage of the sand from the proposed CUP would actually even go to Lawrence and Douglas County?

I see no County or City employment opportunities for the area, and no economic gains from this CUP: The income from this project will go to one company. No new jobs are being created – only a few people will run this entire operation.

There certainly are no community gains: we the neighbors will be seeing the traffic, suffering from the dust, and hearing the noise for the next 30 years. None of the profit from this operation is going back into the surrounding community.

There are no agricultural gains, only losses: all the valuable topsoil will be gone, sold off, along with all potential of this land ever being farmable again.

Most important, there are NO environmental gains, and possibly many losses: The pit will jeopardize the water supply and potentiate the river cutting through a new course. There will be noise pollution. There will be dust. This segment of the river habitat and its wildlife will surely be the worse for the project.

Also I am at a loss as to why the Planning Commission would feel obligated to approve this CUP just because they have denied other Penny requests in the past. It is not the City's or County's obligation nor should it be their priority to accommodate the short term financial gains of one man and one company at the expense of the community they serve.

I believe the Planning Commission is entrusted with making decisions that benefit the City and County, ones that perpetuate long term benefits to our community. There are none to be had in this CUP.

This request is called a Conditional Use Permit because it asks permission to deviate from the original zoning and intent for the land. The land involved has been zoned agricultural for very good reasons. USDA reports verify highest quality soils, but <u>poor for sand production</u> due to the depth of the sand underground. This land has been prime farmland for many years. Penny bought this land knowing that it was zoned for agriculture. He is now asking for permission to NOT use it as it is already zoned. If this CUP is denied, this landowner is <u>not</u> being denied fair use of his land for profit, he is only being required to use it as it is already zoned. He is still free to use the land for agriculture.

All of us who live in this area chose <u>our</u> properties because the land as it was zoned as it is now, and for the agricultural nature of the area. It is not fair to change the use of this land for one man when the impact of this change will affect so many, in so many negative ways.

This <u>temporary</u> conditional use permit would result in a <u>permanent</u> change to the land. It makes no sense that this kind of massive <u>permanent</u> damage over several hundred acres, only a few miles from the city limits, and for short term gain could possibly be something the City or County would condone.

I would ask every Commission member, as decision makers for our community, to consider the words of Oren Lyons, Chief of the Onondaga Nation: "We are looking ahead, as is one of the first mandates given us as chiefs, to make sure and to make every decision that we make relative to the welfare and well-being of the seventh generation to come… " " What about the seventh generation? Where are you taking them? What will they have?"

How far ahead is this Commission, entrusted with Planning the very best for the community future, really thinking if they approve a plan that leaves that land gouged, permanently altered, un-farmable and uninhabitable, and even the slightest potential for a contaminated aquifer, all in less than one generation?

Please, for the good of all the people you serve don't approve this CUP.

Sincerely,

Nancy Schwarting

PO Box 901
Lawrence, KS 66044
785-887-6801
nschwarting@ku.edu

RECEIVED

JAN 28 2013

City County Planning Office
Lawrence, Kansas

January 25, 2013

Lawrence/Douglas County Metropolitan Planning Department
6 E. 6th St.
Lawrence, KS 66044

Re: Conditional Use Permit for Penny Sand Pit

Dear Commissioners,

I am a neighbor who lives north of the proposed sand pit.

I urge inclusion of the complete set of recommended conditions provided by the Conestoga-Rovers and Associates' report.

However, there needs to be a condition addressing noise abatement. Condition 14.f.i. as written is not acceptable. Dredging and extraction of sand need to also be restricted to 6:30 AM to 6:30 PM. The noise from the dredging process is excruciating for neighbors to the north. The combination of loudness, pitch, resonance and frequency are intolerable. This is not background noise that is heard outside. It penetrates our homes, even when windows are closed, and bores into one's head. I can best describe it as a low-frequency, constant loud hum that is inescapable. During portions of 2012, the dredging operation would operate essentially 24 hours a day making restful sleep impossible.

The same dredging process is planned for the pit and will create the same noise.

Please make changes to Condition 14.f.i. so that neighbors to the north can continue to have the benefits of full use of their properties including being able to sleep at night.

Thank you,

Bob Yoos
25253 Alexander Rd.
Lawrence, KS 66044

RECEIVED

JAN 28 2013

City County Planning Office
Lawrence, Kansas

January 25, 2013

Lawrence Douglas County
Metropolitan Planning Office
6 E 6th St.
Lawrence, KS 66044

Dear Commissioners:

The Reetz/Cox Family has lived in this area of the Kansas River valley since buying our land from the Delaware families who lived here before us. We are farmers and ranchers and this floodplain soil is some of the best agricultural soil in the state. As an historian I have done extensive research on this entire area that documents the lives of the people who farmed here as well as the Delaware who lived here for about a 50 years before us. The native people hunted and fished along the banks of the river and had fishing huts on the south side of the river. This area is alive with history and the beauty of the Kansas River.

The land here would be ruined by an industrial sand mining operation. The resulting "lake" will be nothing more than a stagnant body of water surrounded by unsightly rip rap for years to come. We are concerned about the sand dust, mosquitoes, noise and the general nuisance of the whole operation in our neighborhood. In late fall of last year our lives were disturbed by a loud droning sound that ran for hours at a time – sometimes 24 hours a day. We later learned from our neighbors that it was the new dredging equipment at the Penny's site on the river. We are all aware of the degradation that is occurring and know the dredging is supposed to end soon. They dredged day and night until they had removed all of the sand they could legally remove by the end of 2012. They were contacted by the Corps of Engineers about the complaints they were getting. Apparently the condition of the river and the quality of life for the people who live in this area is not a concern to the sand operators. Is this the type of operation we want to give a 30 year permit too? I don't think so!

It is true that the Penny Concrete bought the land but they bought agricultural land not industrial land. This is a farm valley that relies on wells for water. This is a food production area on the edge of Lawrence not an undiscovered wasteland waiting to be exploited. This unsightly operation will be seen from K-10 as well as from the river and from the Leavenworth county side. All this is happening just as the Kansas River is being discovered for its beauty and potential tourism opportunities and we read that Douglas County working on the very definition of "agritourism." Do not allow this destruction to occur! This is not a good location for this operation.

Lorene Cox

Lorene Cox
23787 Guthrie Road
Linwood, KS 66052

RECEIVED

JAN 28 2013

City County Planning Office
Lawrence, Kansas

Jan. 27, 2013

To the Douglas County Planning Commission

As you consider the request of Mr. Penny to open a sand operation on his property directly south of our home. We live in Leavenworth County on Alexander Road on the North side of the Kaw River. Last fall the machinery that produces sand ran 24 hours a day for several weeks. It was stressful to sleep at night and irritating to have so much noise at our country home. We request that you plan for some noise abatement to be required of the operators.

I also have a question about where the river is? I walked across a dry river bed from the north side toward the South bank and could only find the water behind "No Treaspassing" signs on the south side. I have never seen the river this dry. We have lived here for 52 years. Will the new channel be in the drainage canal?

Thank you for your consideration.

Charles & Kathy Hagen

843-5093

RECEIVED

JAN 28 2013

City County Planning Office
Lawrence, Kansas

To whom this may concern:

My name is Steve Layman, and I live north east of the proposed sand pit.

There are 35 residences that have been bothered by the noise generated from the dredge in the river. These residences vary in distance from 3,000 feet to over 10,000 feet from the river dredge (as far north as 32 hwy). Several of the persons have complained of not being able to sleep at night, or giving up outdoor activities due to the loud sound.

I have cattle that are usually wintered in the corn field just north of the UP railroad tracks, this year they were acting stressed and always on the north side of the field. I moved them to a field farther north which helped, but cattle would still stay on north side of pasture. I finally moved them to the pasture closest to Alexander Rd. luckily dredging had stopped, cattle calmed shortly thereafter.

1. There needs to be a noise study done to find out the full extent of the issue
2. I would like to have no more than 40 DBA at the North River Bank
3. Hospital grade mufflers installed on all equipment used on the sight
4. Sound abatement enclosures on the dredge engines
5. Dredging done only during NORMAL business hours (6AM to 6PM) Monday through Friday, no holidays
6. An afterhours contact that could stop excessive noise if it happens again (when I called the Douglas County Sherriff at 3:00 am on 12/04/12 I was told dredging was construction work and was not considered a disturbance).
7. Some type of dust study since the wind is predominantly out of the SW, and my residence would be directly in line with silica dust leaving storage piles or excavation sites (silicosis is being discussed as one byproduct of sand quarrying).

I have lived in my house since 2005 and watched the sand piles grow and shrink every year, until this fall the river dredging sound has not been to the point I can't sleep in my own house due to the constant noise.

I have included a slideshow (cd) of various views of the sand pit in Desoto with Google earth views since its first topsoil removal in 1991 to present (pay attention to profile of pit banks they do not look like the "not to scale" reclamation drawing in your supplied prints). There are also views from Gardner rd looking west at the pit same site. Also included are pictures of the dredge at the KAW site that is causing the noise issues (it will give you a reference as to topsoil removal depth, and what dredge pit walls really look like. There are a few pictures of the now empty Kaw River channel that has been replaced by the dredge channel.

Steve Layman

01/27/2013


THE MASTER'S
DREDGING CO.
RESCUE MASTER
AIRBOATS
8220 GARDNER RD.


10


10


NO TRESPASSING
UNDER
PENALTY OF LAW
ALL VIOLATORS WILL BE PROSECUTED
TO THE FULLEST EXTENT OF THE LAW
FEDERAL LAW
PROHIBITS
UNAUTHORIZED
VISITATION


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FEDERAL LAW
PROHIBITS
UNAUTHORIZED
VISITATION


FEDERAL LAW
PROHIBITS
UNAUTHORIZED
VISITATION


RIDGID


DANGER
BOATERS

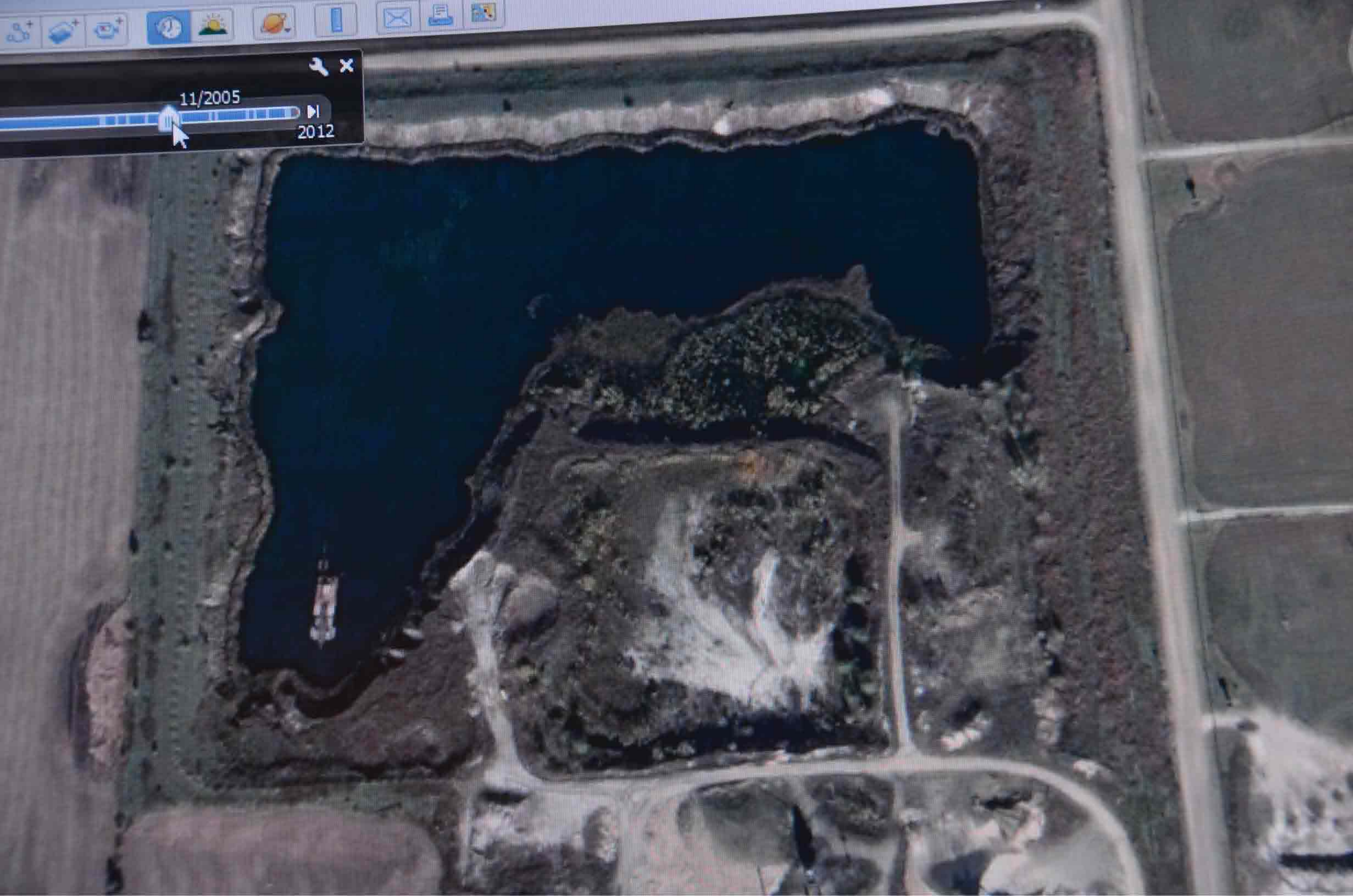

NO TRESPASSING
UNDER
PENALTY OF LAW
ALL VIOLATORS WILL BE PROSECUTED
TO THE FULLEST EXTENT OF THE LAW


FEDERAL LAW
PROHIBITS
UNAUTHORIZED
VISITATION


2012
Image U.S. Geological Survey


2/2002
2012

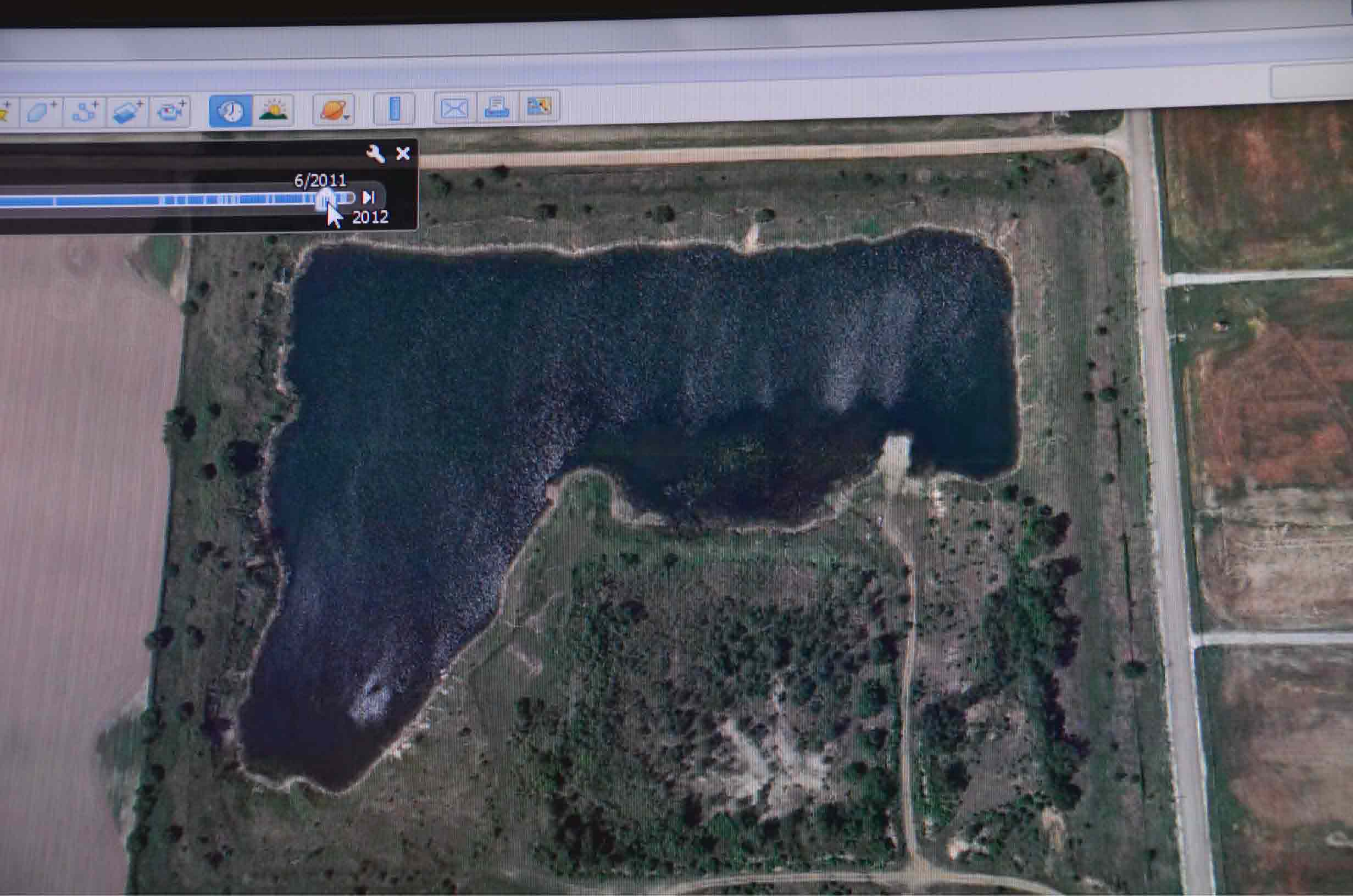

1/2003
2012

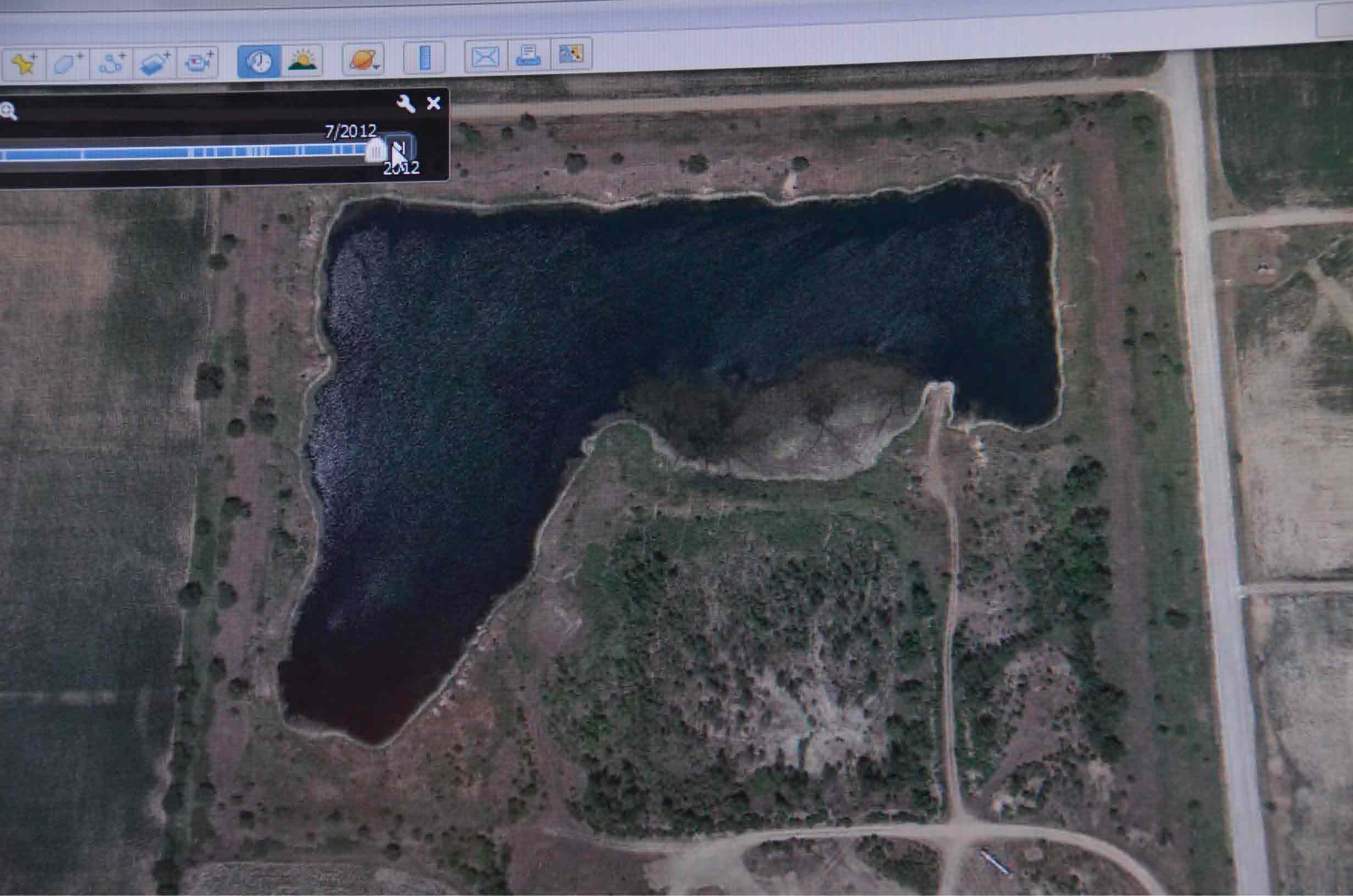

11/2005
2012

8/2006
2012


3/2008
2012
Image U.S. Geological Survey


5/2010
2012


6/2011
2012


7/2012
2012

AD - Crabtree, Robin

From: AD - Crabtree, Robin
Sent: Tuesday, January 22, 2013 11:07 AM
To: AD - Crabtree, Robin
Subject: RE: Sandpits

http://www.huffingtonpost.com/2012/11/30/ohio-sinkhole_n_2218187.html

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From: AD - Weinaug, Craig
Sent: Tuesday, January 22, 2013 10:00 AM
To: AD - Crabtree, Robin
Subject: FW: Sandpits

Please place this with the materials that will go out to the commissioners when the sandpit is back on the agenda.

Craig

From: Gregory Shipe [mailto:ks_wines@hotmail.com]
Sent: Friday, January 18, 2013 5:12 PM
To: AD - Weinaug, Craig
Subject: RE: Sandpits

From: ks_wines@hotmail.com

Administrator Weinaug,
Could you pass this on to the Commissioners.
Thank You,
Greg Shipe
Davenport Orchards, Vineyard and Winery
1394 E 1900 Rd
Eudora, Ks. 66025
cell 785-218-8217

Hello Commissioners,

I have something I want you to look at involving dredging and sinkholes. Particularly dredging in a sand pit in Ohio developing a sinkhole the size of four football fields of pasture comming very close to a farm house and out buildings.

Go to Huff Post Weird News Dec 6, 2012 file:///Users/apple/Desktop/ohio-sinkhole_n_2218187.html. Title is Ohio Sinkhole Devours Four Football Fields of Land, Stretch of State Highway 516 Near Dover.

Mr. Penny is a great man and is backed into a corner by the Army Corps and EPA who are preventing dredging in the river. The river has so much sand in it that the river runs higher cutting away at the banks dropping more sand banks into it. Also go to google map and you can see the amount of sand available in the river.

I am of the side to protect the farmland because when it is gone it is gone, forever. Sand in the river is renewable and dredging actually helps keep the river flowing. Friends of the Kaw were for saving the land in the last sandpit near Eudora until their had to be a choice to make in dredging in the river. They would rather see the land go then the river touched.

In looking at the google map you will find two basic areas that a sandpit will work, in my opinion. This is the same land that is necessary for some speciality crops that do not grow economically on other soils.

Someone needs to get all parties together and work something out. The sand is a necessity and MUST be available close to where it is going to be used. We can't go to New Mexico to get the sand. The land also is a necessity and MUST be available for local growing. There is so little of this kind of soil in Kansas.

Plenty of sand in the river that may last thousands of years. The land could be lost in 30 years of dredging and then we will have to go back to the river for sand. We might as well go to the river now and keep the land for thousands of years.

Thank You,
Greg Shipe