

Memorandum

TO: Programs, Project and Operations Subcommittee

SUBJECT: Papillion Creek Watershed Structure W-2 Repair Project Design Services Contract

DATE: February 3, 2009

FROM: Martin P. Cleveland, Construction Engineer

The referenced grade stabilization structure (dam) was built in 1972 by the Soil Conservation Service on an unnamed left bank tributary to Big Papillion Creek in Washington County, Nebraska at a location 2 miles north and 1 mile west of Kennard, NE. See attached location map.

Several recent Nebraska Department of Natural Resources Dam Safety Section Inspections have noted pipe distress (elongation of principal spillway joints) and foundation seepage. The elongation of the joints (separation of pipe sections) has reached 2.2 inches at two joints and this is close to maximum elongation permitted by DNR and it is now prudent to repair the joints.

In 2008, HDR Engineering performed a preliminary geotechnical evaluation of the pipe distress and foundation seepage (attached).

The next step in the repair process is to have a repair design prepared, permit applications (section 404) prepared and submitted and construction administration/observation. Attached is a proposed contract with HDR Engineering to provide these services.

This work will be funded via Project Maintenance Professional Services (Account 0103-124400) and as of January 6, 2009 there is \$232,760 left in this account.

- **It is Management's recommendation that the Subcommittee recommend to the Board of Directors that the General Manager be authorized to execute a professional services contract with HDR Engineering for Papio Creek Watershed Structure W-2 repairs for a maximum cost not to exceed \$60,569.**



HDR

Project Location Map
Papillion Creek Watershed Structure W-2
Washington County, NE

Geotechnical Assessment

DATE

May 2008

FIGURE

1



Papio Creek Watershed Structure W-2 ---principal spillway outlet





Papio Creek Watershed Structure W-2 ---principal spillway outlet pipe joint



**AGREEMENT BETWEEN OWNER AND HDR ENGINEERING, INC. FOR
PROFESSIONAL SERVICES**

THIS AGREEMENT is made as of this _____ day of _____, 2009, between Papio-Missouri River Natural Resources District ("OWNER") a local form of government, with principal offices at 8901 South 154th Street, Omaha, NE, and HDR ENGINEERING, INC., ("ENGINEER") a Nebraska corporation, with principal offices at 8404 Indian Hills Drive, Omaha, Nebraska, 68114 to provide professional engineering services for preparation of Section 404 permit, development of drawings and technical specifications, and on-call construction consultation in connection with the project known as W-2 in Washington County, Nebraska. ("Project");

WHEREAS, OWNER desires to engage ENGINEER to provide professional engineering, consulting and related services ("Services") in connection with the Project; and

WHEREAS, ENGINEER desires to render these Services as described in SECTION I, Scope of Services.

NOW, THEREFORE, OWNER and ENGINEER in consideration of the mutual covenants contained herein, agree as follows:

SECTION I. SCOPE OF SERVICES

ENGINEER will provide Services for the Project, which consist of the Scope of Services as outlined on the attached Exhibit A.

SECTION II. TERMS AND CONDITIONS OF ENGINEERING SERVICES

The "HDR Engineering, Inc. Terms and Conditions for Professional Services," which are attached hereto in Exhibit B, are incorporated into this Agreement by this reference as if fully set forth herein.

SECTION III. RESPONSIBILITIES OF OWNER

The OWNER shall provide the information set forth in paragraph 6 of the attached "HDR Engineering, Inc. Terms and Conditions for Professional Services."

SECTION IV. COMPENSATION

Compensation for ENGINEER'S services under this Agreement shall be an amount equal to ENGINEER's Direct Labor Costs times a Factor of 3.15 for the services of ENGINEER's employees engaged on the Project, plus Reimbursable Expenses. The total payment for services is not to exceed the amount of \$60,569, unless authorized in writing by OWNER. The fee proposal for this Agreement is included as Attachment "B".

Reimbursable Expenses include the following categories: transportation and subsistence incidental thereto; toll telephone calls; a computer technology fee, use of other highly

specialized equipment and reproduction of documents. Reimbursable Expenses will also include the amount of any sales tax, excise tax, value added tax, or gross receipts tax or similar tax that may be imposed on this agreement. A markup of 10% will be added to reimbursable expenses.

The amount of any sales tax, excise tax, value added tax (VAT), or gross receipts tax that may be imposed on this Agreement shall be added to the ENGINEER'S compensation as Reimbursable Expenses.

SECTION V. PERIOD OF SERVICE

Upon receipt of written authorization to proceed, ENGINEER shall perform the services over an anticipated 9-month project period from February to October 2009.

Unless otherwise stated in this Agreement, the rates of compensation for ENGINEER'S services have been agreed to in anticipation of the orderly and continuous progress of the project through completion. If any specified dates for the completion of ENGINEER'S services are exceeded through no fault of the ENGINEER, the time for performance of those services shall be automatically extended for a period which may be reasonably required for their completion and all rates, measures and amounts of ENGINEER'S compensation shall be equitably adjusted.

SECTION VI. SPECIAL PROVISIONS

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the day and year first written above.

PAPIO-MISSOURI RIVER NATURAL
RESOURCES DISTRICT

"OWNER"

BY: _____

NAME: John Winkler

TITLE: General Manager

ADDRESS: 8901 S. 154th Street
Omaha, NE 68138-3621

PHONE (402) 444-6222

FAX: (402) 895-6543

EMAIL jwinkler.papionrd.org

HDR ENGINEERING, INC.
"ENGINEER"

BY: _____
NAME: Matthew Tondl, P.E.
TITLE: Senior Vice President
ADDRESS: 8404 Indian Hills Drive
Omaha, NE 68114
PHONE (402) 399-1070
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EMAIL Matt.tondl@hdrinc.com

EXHIBIT A

SCOPE OF SERVICES

**Papillion Creek Watershed Grade Stabilization Structure W-2
for Papio-Missouri River Natural Resources District
Washington County, NE**



ENGINEERING PROPOSAL



BACKGROUND AND BASIS OF PROPOSAL

The purpose of this effort is to provide engineering services to design repairs for the observed settlement of the principal spillway conduit and the foundation seepage along the downstream toe of Papillion Creek Watershed Structure W-2. Structure W-2 is a grade stabilization structure that was constructed in 1970. Papio-Missouri River Natural Resources District (P-MRNRD) is responsible for the operation and maintenance of Structure W-2. Annual inspections have observed settlement of the principal spillway conduit and seepage. The dam is located in Section 30, T 18 N, R 11 E, in Washington County, Nebraska.

A preliminary geotechnical evaluation was conducted in 2008 to evaluate the subsurface conditions.

SCOPE OF SERVICES

HDR will perform design services to repair the structure. The Phase II scope of work is segmented into 2 task series:

- Task Series 100 – Project Management
- Task Series 200 – Section 404 Permitting
- Task Series 300 – Design Services
- Task Series 400 – Construction Monitoring

The HDR Team proposes to provide the following professional services over an anticipated 6-month project period from the time of contract authorization.

TASK SERIES 100 – PROJECT MANAGEMENT

Task Objective: Confirm that Project elements are being completed.

HDR Activities: **Task 110 Conduct Project Management.** Includes preparation of project guide, project schedule and administration and coordination activities on the project. Also included is the preparation of monthly invoices and progress reports. Progress reports will summarize work that has been completed since the previous report and anticipated progress to be made in the next reporting period. The progress report will also include any concerns or relevant information on the Project.

Internal HDR Project Team meetings will be conducted to discuss tasks, provide project updates and review deliverables. QA/QC will be conducted by senior level professionals on all deliverables.

Task 120 Conduct Kick off Meeting. A kick-off meeting will be conducted at the beginning of the project to discuss the administration and proposed project designs and to provide an overview of the task

order. P-MRNRD and HDR representatives will attend. Agenda, handout materials, and minutes will be prepared by HDR.

Task Deliverables:

- Project Guide
- Meeting agenda, handouts and minutes
- Monthly invoices with progress reports

Key Understandings:

- Kick-off meeting will be held at the offices of HDR

TASK SERIES 200 – SECTION 404 PERMITTING

Task Objective: Conduct design and analysis.

HDR Activities: **Task 210 Prepare Section 404 Nationwide Permit.** Prepare documentation for Nationwide Permit No. 3, Maintenance. This includes preparation of USACE Form 4345 along with a wetland delineation report.

Task 220 Respond to USACE Comments. Respond to USACE comments on Section 404 permit application.

Task 230 Vegetation Establishment Monitoring. A condition of the Section 404 permit will be for vegetation monitoring. HDR will conduct 2 site visits to monitor the re-establishment of disturbed vegetation. The first site visit will occur after construction has been completed and the second site visit will occur within 6 months after construction. A monitoring report will be prepared and provided to P-MRNRD for submittal to USACE.

Task Deliverables:

- Section 404 Nationwide Permit application

Key Understandings:

- Wetland delineation was conducted on December 2, 2008 by HDR. It is assumed that no additional delineations will be required.
- It is assumed that no meetings will be required with USACE.
- It is assumed that the impacts to wetlands will be less than 0.1 acre and therefore no wetland mitigation will be required.

TASK SERIES 300 –DESIGN SERVICES

Task Objective: Conduct design and analysis.

HDR Activities: **Task 310 Conduct Site Visits.** Conduct site visits to reaffirm design.

Task 320 Conduct Final Foundation and Embankment Design. Analyze the foundation and embankment. The design includes:

- Finalize stability analyses for end of construction, rapid drawdown, steady seepage without seepage, and steady seepage with seismic forces design conditions.
- Finalize size and locate the foundation drains and drain outlets.

Task 330 Review Joint Repair Methods. Review methods to repair the joints.

Task 340 Prepare Preliminary Construction Drawings. Prepare preliminary drawings in MicroStation or AutoCAD.

Preliminary Drawing List (Number of sheets shown in parentheses)

Cover Sheet (1)
General Notes (1)
Site Plan (1)
Grading Plan (1)
Foundation Drainage System (1)
Pipe Profile (1)
Joint Repair Details (1)
Subsurface Geologic Information (1)

Task 350 Prepare Preliminary Technical Specifications. Prepare preliminary NRCS construction and material specifications. A preliminary list of specifications may include:

Construction Specifications

Site Preparation

2 – Clearing and Grubbing

5 – Pollution Control
6 – Seeding, Sprigging, and Mulching
8 – Mobilization and Demobilization

Foundation Work

11 – Removal of Water

Earthwork

21 – Excavation
23 – Earthfill
24 – Drainfill
26 – Topsoiling

Nonmetal Pipe Conduits and Drains

45 – Plastic Pipe

Material Specifications (not to be edited)

Aggregates and Rock

521 – Aggregates for Drainfill and Filters

Nonmetal Pipe and Fittings

547 – Plastic Pipe

Miscellaneous Structural Materials

581 – Metal

Task 360 Prepare Cost Estimate. Prepare cost estimate with preliminary quantities and unit costs.

Task 370 Compile and Submit Preliminary Design Deliverable.

Compile and submit preliminary construction drawings, technical specifications, and cost estimate. P-MRNRD to conduct review on preliminary design submittal. Written comments are to be compiled and provided to HDR for review and comment.

Task 380 Prepare Final Construction Drawings and Technical Specifications. Complete final drawings and technical specifications.

Task 390 Prepare Final Cost Estimate. Prepare cost estimate with final quantities and unit costs.

Task 395 Compile and Submit Final Deliverable. Compile and submit final construction drawings, technical specifications, and cost estimate.

Task Deliverables:

- Preliminary and Final Construction Drawings, Technical Specifications, Cost Estimate (.pdf format and 1 hard copy)
- CD of design calculations and documents

Key Understandings:

- Additional survey will be conducted by P-MRNRD.
- No hydrologic/hydraulic or dam breach evaluations will be performed.
- It is estimated that the disturbed area will be less than 1 acre; therefore, a NPDES permit for construction activity will not be needed. If erosion and sediment control plans are required, it will be conducted as Additional Services.
- Preparation of legal descriptions or surveying property lines is not included, but can be conducted as Additional Services.
- P-MRNRD will coordinate with Nebraska DNR on permit requirements.
- P-MRNRD will be responsible for preparation of Divisions 0 & 1 (bidding documents) and HDR will prepare the technical specifications.
- P-MRNRD will be responsible for pre-bid and bidding activities.
- It is assumed that the construction activity will disturb less than 1 acre of land; therefore, an NPDES construction activity permit will not be required.
- P-MRNRD is responsible for payment of any permit fees.
- Preliminary design is approximately an 80% design.
- Preliminary and final construction drawings will scale to fit 11" x 17" paper.

TASK SERIES 400 –CONSTRUCTION CONSULTATION

Task Objectives: To provide on-call construction consultation services during construction of the subdrainage system.

HDR Activities: **Task 410 Shop Drawing Review.** Review shop drawings submittals.

Task 420 Construction Consultation. Provide consultation during the construction of the Project. Document observations and actions taken in a one-page field visit report. Consultation will be provided at the following key milestones:

- Excavation and replacement of the foundation drain and blanket drain
- Prior to fabrication of the pipe joints to discuss work
- During repair of initial joint
- Final walk through
- Other visits as specifically directed by P-MRNRD

Task Deliverables:

- Field visit reports

Key Understandings:

- Anticipated construction is the spring 2008 for a duration of 2-months.
- P-MRNRD will provide full range of construction contract administration and construction observation functions. HDR's services to P-MRNRD are only intended to augment those functions.
- P-MRNRD will provide a minimum of 48 hours notice to HDR for consultation at the key milestones referenced above.
- 40 hours for senior level technical support is allotted for this level of construction consultation.
- HDR will not supervise, direct or manage the Contractor's forces or Contractor's means and methods. HDR will not assume responsibility for health and safety of Contractor's personnel or others on the site of the work.
- Testing of materials during placement will be conducted by Others.
- Technical review of Change Orders shall be performed, if requested, as Additional Services.

PROPOSED SCHEDULE

The following schedule is proposed:

Notice to Proceed	February 13, 2009
Section 404 Permit Submittal	February 25, 2009
Preliminary Design	March 13, 2009
Final Design	March 31, 2009
Construction	Spring 2009

ESTIMATED FEE

The following estimate fee includes labor and reimbursable expenses are as noted in Attachment B.

ATTACHMENT "B"
PAPIO - MISSOURI RIVER NATURAL RESOURCES DISTRICT
GSS W-2 DESIGN REHABILITATION SERVICES
FEE ESTIMATE - February 3, 2009

TASKS		Labor					Expenses					Est. Total Cost		
		Project Manager	Sr Engr/ Technical	Engineer	Technical Support	Clerical	Total Hours	Total Labor Cost	Tech. Fee	Printing	Travel		Misc.	Total Expenses
TASK SERIES 100 – PROJECT MANAGEMENT														
Task 110	Conduct Project Management	20	2	2		6	28	\$4,266	\$104				\$104	\$4,370
Task 120	Conduct Kickoff Meeting	4	4	2		2	12	\$1,894	\$44		\$28		\$122	\$2,016
	Estimated Task Hours Subtotal	24	6	2	0	8	40							
	Estimated Task Cost Subtotal	\$4,704	\$1,788	\$268	\$0	\$600		\$6,160	\$148	\$0	\$28	\$50	\$226	\$6,586
TASK SERIES 200 – SECTION 404 PERMITTING														
Task 210	Prepare Section 404 Nationwide Permit		2	4	40	6	52	\$4,422	\$192				\$192	\$4,614
Task 220	Respond to USACE Comments		2	2	16	2	20	\$1,880	\$74				\$74	\$1,954
Task 230	Vegetation Establishment Monitoring		2	2	16	2	20	\$1,762	\$74		\$28		\$152	\$1,914
	Estimated Task Hours Subtotal	0	6	6	72	8	92							
	Estimated Task Cost Subtotal	\$0	\$1,188	\$804	\$5,472	\$600		\$8,064	\$340	\$0	\$28	\$50	\$418	\$8,482
TASK SERIES 300 – DESIGN SERVICES														
Task 310	Conduct Site Visits		8	4			12	\$2,120	\$44		\$83		\$128	\$2,248
Task 320	Conduct Final Foundation and Embankment Design		16		8		24	\$3,776	\$89				\$89	\$3,865
Task 330	Review Joint Repair Methods		8	4			12	\$2,120	\$44				\$44	\$2,164
Task 340	Prepare Preliminary Construction Drawings	4	12	30	80		126	\$13,160	\$466				\$466	\$13,626
Task 350	Prepare Preliminary Technical Specifications	2	8	8	4		22	\$3,298	\$81				\$81	\$3,379
Task 360	Prepare Cost Estimate	1	2	4	2		9	\$1,253	\$33				\$33	\$1,286
Task 370	Compile and Submit Preliminary Design Deliverable	1		4	2		7	\$857	\$26			\$50	\$76	\$933
Task 380	Prepare Final Construction Drawings and Technical Specs.		8	8	40		56	\$5,696	\$207	\$20			\$227	\$5,923
Task 390	Prepare Final Cost Estimate		2	2	4		4	\$664	\$15				\$15	\$679
Task 395	Compile and Submit Final Deliverable			4		2	6	\$686	\$22			\$50	\$92	\$778
	Estimated Task Hours Subtotal	8	64	68	128	10	278							
	Estimated Task Cost Subtotal	\$1,368	\$12,672	\$9,112	\$9,728	\$750		\$33,630	\$1,029	\$40	\$83	\$100	\$1,252	\$34,882
TASK SERIES 400 – CONSTRUCTION CONSULTATION														
Task 410	Review Shop Drawings		8	4		4	16	\$2,420	\$59				\$59	\$2,479
Task 420	Construction Consultation		40				40	\$7,920	\$148		\$222	\$50	\$420	\$8,340
	Estimated Task Hours Subtotal	0	48	4	0	4	56							
	Estimated Task Cost Subtotal	\$0	\$9,604	\$536	\$0	\$300		\$10,340	\$207	\$0	\$222	\$50	\$479	\$10,819
	TOTAL HOURS	32	124	80	200	30	466							
	TOTAL COST	\$ 5,472	\$ 24,652	\$ 10,720	\$ 15,200	\$ 2,250		\$ 58,194	\$ 1,724	\$ 40	\$ 361	\$ 260	\$ 2,375	\$ 60,569

Reimbursable Expenses Markup (excludes Tech. Fee)

10%

EXHIBIT B

TERMS AND CONDITIONS

HDR Engineering, Inc.

Terms and Conditions for Professional Services

1. STANDARD OF PERFORMANCE

The standard of care for all professional engineering, consulting and related services performed or furnished by ENGINEER and its employees under this Agreement will be the care and skill ordinarily used by members of ENGINEER's profession practicing under the same or similar circumstances at the same time and in the same locality. ENGINEER makes no warranties, express or implied, under this Agreement or otherwise, in connection with ENGINEER's services.

2. INSURANCE

ENGINEER agrees to procure and maintain, at its expense, Workers' Compensation insurance as required by statute; Employer's Liability of \$250,000; Automobile Liability insurance of \$2,000,000 combined single limit for bodily injury and property damage covering all vehicles, including hired vehicles, owned and non-owned vehicles; Commercial General Liability insurance of \$1,000,000 combined single limit for personal injury and property damage; and Professional Liability insurance of \$2,000,000 per claim for protection against claims arising out of the performance of services under this Agreement caused by negligent acts, errors, or omissions for which ENGINEER is legally liable. Upon request, OWNER shall be made an additional insured on Commercial General and Automobile Liability insurance policies and certificates of insurance will be furnished to the OWNER. ENGINEER agrees to indemnify OWNER for the claims covered by ENGINEER's insurance.

3. OPINIONS OF PROBABLE COST (COST ESTIMATES)

Any opinions of probable project cost or probable construction cost provided by ENGINEER are made on the basis of information available to ENGINEER and on the basis of ENGINEER's experience and qualifications, and represents its judgment as an experienced and qualified professional engineer. However, since ENGINEER has no control over the cost of labor, materials, equipment or services furnished by others, or over the contractor(s)' methods of determining prices, or over competitive bidding or market conditions, ENGINEER does not guarantee that proposals, bids or actual project or construction cost will not vary from opinions of probable cost ENGINEER prepares.

4. CONSTRUCTION PROCEDURES

ENGINEER's observation or monitoring portions of the work performed under construction contracts shall not relieve the contractor from its responsibility for performing work in accordance with applicable contract documents. ENGINEER shall not control or have charge of, and shall not be responsible for, construction means, methods, techniques, sequences, procedures of construction, health or safety programs or precautions connected with the work and shall not manage, supervise, control or have charge of construction. ENGINEER shall not be responsible for the acts or omissions of the contractor or other parties on the project. ENGINEER shall be entitled to review all construction contract documents and to require that no provisions extend the duties or liabilities of ENGINEER beyond those set forth in this Agreement. OWNER agrees to include ENGINEER as an indemnified party in OWNER's construction contracts for the work, which shall protect ENGINEER to the same degree as OWNER. Further, OWNER agrees that ENGINEER shall be listed as an additional insured under the construction contractor's liability insurance policies.

5. CONTROLLING LAW

This Agreement is to be governed by the law of the state where ENGINEER's services are performed.

6. SERVICES AND INFORMATION

OWNER will provide all criteria and information pertaining to OWNER's requirements for the project, including design objectives and constraints, space, capacity and performance requirements, flexibility and expandability, and any budgetary

limitations. OWNER will also provide copies of any OWNER-furnished Standard Details, Standard Specifications, or Standard Bidding Documents which are to be incorporated into the project.

OWNER will furnish the services of soils/geotechnical engineers or other consultants that include reports and appropriate professional recommendations when such services are deemed necessary by ENGINEER. The OWNER agrees to bear full responsibility for the technical accuracy and content of OWNER-furnished documents and services.

In performing professional engineering and related services hereunder, it is understood by OWNER that ENGINEER is not engaged in rendering any type of legal, insurance or accounting services, opinions or advice. Further, it is the OWNER's sole responsibility to obtain the advice of an attorney, insurance counselor or accountant to protect the OWNER's legal and financial interests. To that end, the OWNER agrees that OWNER or the OWNER's representative will examine all studies, reports, sketches, drawings, specifications, proposals and other documents, opinions or advice prepared or provided by ENGINEER, and will obtain the advice of an attorney, insurance counselor or other consultant as the OWNER deems necessary to protect the OWNER's interests before OWNER takes action or forebears to take action based upon or relying upon the services provided by ENGINEER.

7. SUCCESSORS AND ASSIGNS

OWNER and ENGINEER, respectively, bind themselves, their partners, successors, assigns, and legal representatives to the covenants of this Agreement. Neither OWNER nor ENGINEER will assign, sublet, or transfer any interest in this Agreement or claims arising therefrom without the written consent of the other.

8. RE-USE OF DOCUMENTS

All documents, including all reports, drawings, specifications, computer software or other items prepared or furnished by ENGINEER pursuant to this Agreement, are instruments of service with respect to the project. ENGINEER retains ownership of all such documents. OWNER may retain copies of the documents for its information and reference in connection with the project; however, none of the documents are intended or represented to be suitable for reuse by OWNER or others on extensions of the project or on any other project. Any reuse without written verification or adaptation by ENGINEER for the specific purpose intended will be at OWNER's sole risk and without liability or legal exposure to ENGINEER, and OWNER will defend, indemnify and hold harmless ENGINEER from all claims, damages, losses and expenses, including attorney's fees, arising or resulting therefrom. Any such verification or adaptation will entitle ENGINEER to further compensation at rates to be agreed upon by OWNER and ENGINEER.

9. TERMINATION OF AGREEMENT

OWNER or ENGINEER may terminate the Agreement, in whole or in part, by giving seven (7) days written notice, if the other party substantially fails to fulfill its obligations under the Agreement through no fault of the terminating party. Where the method of payment is "lump sum," or cost reimbursement, the final invoice will include all services and expenses associated with the project up to the effective date of termination. An equitable adjustment shall also be made to provide for termination settlement costs ENGINEER incurs as a result of commitments that had become firm before termination, and for a reasonable profit for services performed.

10. SEVERABILITY

If any provision of this agreement is held invalid or unenforceable, the remaining provisions shall be valid and binding upon the parties. One or more waivers by either party of any provision, term or condition shall not be construed by the

other party as a waiver of any subsequent breach of the same provision, term or condition.

11. INVOICES

ENGINEER will submit monthly invoices for services rendered and OWNER will make prompt payments in response to ENGINEER's invoices.

ENGINEER will retain receipts for reimbursable expenses in general accordance with Internal Revenue Service rules pertaining to the support of expenditures for income tax purposes. Receipts will be available for inspection by OWNER's auditors upon request.

If OWNER disputes any items in ENGINEER's invoice for any reason, including the lack of supporting documentation, OWNER may temporarily delete the disputed item and pay the remaining amount of the invoice. OWNER will promptly notify ENGINEER of the dispute and request clarification and/or correction. After any dispute has been settled, ENGINEER will include the disputed item on a subsequent, regularly scheduled invoice, or on a special invoice for the disputed item only.

OWNER recognizes that late payment of invoices results in extra expenses for ENGINEER. ENGINEER retains the right to assess OWNER interest at the rate of one percent (1%) per month, but not to exceed the maximum rate allowed by law, on invoices which are not paid within forty-five (45) days from the date of the invoice. In the event undisputed portions of ENGINEER's invoices are not paid when due, ENGINEER also reserves the right, after seven (7) days prior written notice, to suspend the performance of its services under this Agreement until all past due amounts have been paid in full.

12. CHANGES

The parties agree that no change or modification to this Agreement, or any attachments hereto, shall have any force or effect unless the change is reduced to writing, dated, and made part of this Agreement. The execution of the change shall be authorized and signed in the same manner as this Agreement. Adjustments in the period of services and in compensation shall be in accordance with applicable paragraphs and sections of this Agreement. Any proposed fees by ENGINEER are estimates to perform the services required to complete the project as ENGINEER understands it to be defined. For those projects involving conceptual or process development services, activities often are not fully definable in the initial planning. In any event, as the project progresses, the facts developed may dictate a change in the services to be performed, which may alter the scope. ENGINEER will inform OWNER of such situations so that changes in scope and adjustments to the time of performance and compensation can be made as required. If such change, additional services, or suspension of services results in an increase or decrease in the cost of or time required for performance of the services, an equitable adjustment shall be made, and the Agreement modified accordingly.

13. CONTROLLING AGREEMENT

These Terms and Conditions shall take precedence over any inconsistent or contradictory provisions contained in any proposal, contract, purchase order, requisition, notice-to-proceed, or like document.

14. EQUAL EMPLOYMENT AND NONDISCRIMINATION

In connection with the services under this Agreement, ENGINEER agrees to comply with the applicable provisions of federal and state Equal Employment Opportunity, and other employment, statutes and regulations.

15. HAZARDOUS MATERIALS

OWNER represents to ENGINEER that, to the best of its knowledge, no hazardous materials are present at the project site. However, in the event hazardous materials are known to be present, OWNER represents that to the best of its knowledge it has disclosed to ENGINEER the existence of all such hazardous materials, including but not limited to asbestos, PCB's, petroleum, hazardous waste, or radioactive

material located at or near the project site, including type, quantity and location of such hazardous materials. It is acknowledged by both parties that ENGINEER's scope of services do not include services related in any way to hazardous materials. In the event ENGINEER or any other party encounters undisclosed hazardous materials, ENGINEER shall have the obligation to notify OWNER and, to the extent required by law or regulation, the appropriate governmental officials, and ENGINEER may, at its option and without liability for delay, consequential or any other damages to OWNER, suspend performance of services on that portion of the project affected by hazardous materials until OWNER: (i) retains appropriate specialist consultant(s) or contractor(s) to identify and, as appropriate, abate, remediate, or remove the hazardous materials; and (ii) warrants that the project site is in full compliance with all applicable laws and regulations. OWNER acknowledges that ENGINEER is performing professional services for OWNER and that ENGINEER is not and shall not be required to become an "arranger," "operator," "generator," or "transporter" of hazardous materials, as defined in the Comprehensive Environmental Response, Compensation, and Liability Act of 1990 (CERCLA), which are or may be encountered at or near the project site in connection with ENGINEER's services under this Agreement. If ENGINEER's services hereunder cannot be performed because of the existence of hazardous materials, ENGINEER shall be entitled to terminate this Agreement for cause on 30 days written notice. To the fullest extent permitted by law, OWNER shall indemnify and hold harmless ENGINEER, its officers, directors, partners, employees, and subconsultants from and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) caused by, arising out of or resulting from hazardous materials, provided that (i) any such cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or injury to or destruction of tangible property (other than completed Work), including the loss of use resulting therefrom, and (ii) nothing in this paragraph shall obligate OWNER to indemnify any individual or entity from and against the consequences of that individual's or entity's sole negligence or willful misconduct.

16. EXECUTION

This Agreement, including the exhibits and schedules made part hereof, constitute the entire Agreement between ENGINEER and OWNER, supersedes and controls over all prior written or oral understandings. This Agreement may be amended, supplemented or modified only by a written instrument duly executed by the parties.

17. LIMITATION OF LIABILITY -- Not Used

18. LITIGATION SUPPORT

In the event ENGINEER is required to respond to a subpoena, government inquiry or other legal process related to the services in connection with a legal or dispute resolution proceeding to which ENGINEER is not a party, OWNER shall reimburse ENGINEER for reasonable costs in responding and compensate ENGINEER at its then standard rates for reasonable time incurred in gathering information and documents and attending depositions, hearings, and trial.



**PRELIMINARY
GEOTECHNICAL EVALUATION
OF PIPE DISTRESS AND
FOUNDATION SEEPAGE**

**PAPILLION CREEK
WATERSHED STRUCTURE W-2**

NOVEMBER 2008

Prepared for:

**PAPIO-MISSOURI RIVER
NATURAL
RESOURCES
DISTRICT**



www.papionrd.org

Prepared by:

HDR | **ONE COMPANY**
Many Solutions™

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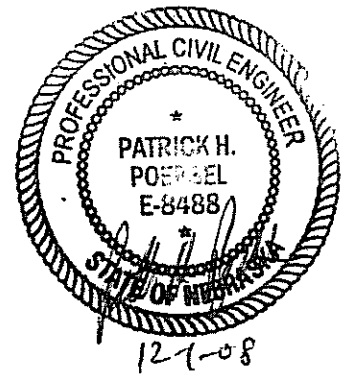
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Appendix B - Logs of Soil Borings
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**PRELIMINARY GEOTECHNICAL EVALUATION OF
PIPE DISTRESS AND FOUNDATION SEEPAGE
PAPILLION CREEK WATERSHED STRUCTURE W-2
WASHINGTON COUNTY, NEBRASKA**



1.0 BACKGROUND

Papio-Missouri River Natural Resources District (P-MRNRD) requested HDR investigate the observed pipe distress and foundation seepage at Papillion Creek Watershed Structure W-2 (W-2). W-2 is located 2 miles north and 1 mile west of Kennard, Nebraska in Washington County on an unnamed left bank tributary to Big Papillion Creek in Washington County, Nebraska. See Figure 1, General Location Map, for the location of W-2. W-2 is a grade stabilization dam that was constructed for the purpose of stabilizing the channel so that continued upstream migration of degradation, or downcutting, does not occur.

This report presents the results of a preliminary geotechnical evaluation of observed pipe distress and foundation seepage that has occurred at the dam. The purposes of this study are to: (1) review existing information, (2) perform visual inspection of the dam and features, and (3) conduct a geotechnical investigation consisting of field and lab work, all performed to assist in the evaluation of the potential cause(s) of these occurrences. In particular, this report presents our findings and preliminary conclusions regarding:

- Geologic setting of the site;
- Subsurface soil and groundwater conditions;
- Evaluation of the engineering characteristics of the foundation soils;
- Identification of potential cause(s) of the observed distress of the principal spillway;
- Discussions of the potential cause(s) of the observed seepage along the downstream toe of the dam; and
- Development of preliminary recommendations to remediate these issues.

A limited topographic survey of the dam, including the principal spillway and the configuration of the dam section and crest, was performed by the P-MRNRD.

2.0 DESCRIPTION OF EXISTING DAM AND FEATURES

The dam is located on an unnamed left bank tributary of the Big Papillion Creek that flows in a southerly direction. The structure is situated in Section 30, Township 18 North, Range 11 East just to the west of the town of Kennard in Washington, County, Nebraska. The Site Plan for the existing dam and features is presented on Figure 2. Photographs of the pipe distress and the wet areas along the downstream toe are presented on Figure 3.

The **existing dam** is a compacted, homogeneous earthen structure that was completed in July of 1972. The dam has a crest length of about 500 feet. The maximum height of the dam above the stream channel is about 35 feet. The dam has 2.5: 1 (horizontal: vertical) side slopes with a 12-foot crest width. A berm and 4:1 side slope leading to the pool area was constructed on the upstream portion of the dam. A cutoff trench was excavated and recompacted along the axis of the dam that has a base width of about 10 feet and is about 5 feet in depth.

Internal drainage for the dam is provided by a **foundation drain system** consisting of a trench type drain extending across the old channel and a 4-inch solid PVC outlet pipe. The existing foundation drain is 4-foot high, 3-foot wide and the drain extends about 60 feet in length along the axis of the dam. The drain material is comprised of Nebraska Department of Roads (NDOR) road gravel. A 4-inch perforated PVC collector pipe is present along the base of the trench drain which is situated at elevation 1212 feet. The outlet for the foundation drain is provided by a solid 4-inch PVC pipe with an invert elevation of 1213.95 feet. The outlet drain was not found during the site investigation. A schematic of the existing foundation drain system is presented on Figure 4.

The **intake structure** is a standard open riser comprised of reinforced concrete with a galvanized metal trash rack. The weir elevation, or normal pool, is set at 1240 feet. The reservoir level (plus ice) at the time of the site survey was at elevation 1240.59 feet.

The **principal spillway** consists of a 36-inch diameter reinforced concrete pipe consisting of seven 16-foot sections of pipe and one 8-foot section. Three anti-seep collars were placed at 19-foot intervals along the pipe. Structural pipe supports are provided at two locations where the pipe daylight the embankment section.

The **auxiliary spillway** is a grassed-lined channel that is situated at the right (west) abutment. The crest elevation of the auxiliary spillway is set at 1242.5 feet. Side slopes of the excavated channel are inclined at about 3:1.

Copies of the as-built plans for the dam and features are provided for reference in Appendix A.

3.0 GEOTECHNICAL INVESTIGATIONS

3.1 Original SCS Investigation

The original geotechnical investigation was completed by the SCS in October of 1970. A total of eight (8) auger borings were advanced at the site; six (6) along the axis of the dam and two (2) within the reservoir area. The lab testing was understood to consist of moisture-density (compaction) testing of potential borrow soils.

Copies of the original boring plan and subsurface profile along the axis of the dam are shown on the as-built drawings provided in Appendix A.

3.2 Supplemental Investigation

Field Work

The supplemental investigation for the project consisted of drilling six (6) exploratory test borings and two (2) cone penetration test (CPT) soundings. The approximate location of the borings and CPT's are shown on Figure 2. The logs of borings and CPTs are provided in Appendices B and C, respectively. A Schedule of Borings presenting the station, offset, and depth of each boring and CPT is provided in Table 1 below.

Table 1 - Schedule of Borings and CPTs

Boring/ CPT #	Top of Boring/CPT Elevation	Date of Drilling	Depth of Boring/CPT (feet)
B-1 (well)	1232.25	2-27-08	40
B-2	1240.45	2-27-08	55
B-3	1218.80	2-27-08	25
B-4 (well)	1233.31	2-27-08	40
B-5	1238.21	2-27-08	45
B-6	1246.05	2-28-08	60
CPT-1	1232.70	3-3-08	35
CPT-2	1233.75	3-3-08	35

The field investigation was conducted by Thiele Geotech, Inc., of Omaha, Nebraska, under the direction of a senior geotechnical engineer. The locations and elevations of the borings were surveyed by the P-MRNRD.

The borings were advanced with a truck-mounted drill rig equipped 6-inch ID hollow-stem augers. Borings remained open during drilling, and stabilization methods were not required to advance each boring. Cone Penetration Test soundings were advanced in the areas of the observed seepage. Measurements of point resistance (q_c), local sleeve friction (q_s) and pore pressure (u) were made for each of the CPT soundings.

Soil samples from the auger borings were obtained using push sampling at intervals shown on the boring logs. Undisturbed samples, designated as "U" samples on the logs, were obtained with thin-walled tube samplers, 3-inch outside diameter, hydraulically pushed in general accordance with ASTM D 1587-83, "Thin Walled Tube Sampling of Soils." Pocket penetrometer measurements were taken at the end of each "U" sample prior to extrusion in the laboratory.

Groundwater monitoring wells were installed in Borings B-1 and B-4. The wells consisted of 2-inch slotted PVC pipes placed in the drill holes and backfilled with filter sand and auger cuttings. Stabilized water level readings were made in the drill holes at the dates and under the conditions stated on the boring logs.

Laboratory Materials Testing

The lab testing program was developed to investigate the engineering properties of selected samples and to substantiate the soil classifications made in the field. The testing consisted of moisture content/dry density determinations, gradation tests (sieves with hydrometer), plasticity tests, and consolidation tests.

The results of the lab testing are provided in Appendix D.

4.0 SITE CONDITIONS

4.1 Geologic Setting

The surficial geology of the Papillion Creek Watershed is Pleistocene in age and consists of eolian (wind blown) deposits primarily of Peoria, Loveland and Sappa loess. The loess formed in dune shaped hills situated between the Elkhorn and Missouri Rivers. The Peoria loess typically consists of silty lean clays that are stiff when dry but become softer with increasing moisture content. The Peoria loess can exhibit low unit weight and may be susceptible to collapse upon wetting or loading. The Peoria loess can also be relatively pervious depending on its silt and sand content. The Loveland loess typically consists of lean clays and generally exhibits higher unit weights and shear strengths than the Peoria. The Sappa loess is an older deposit of lean clays with variable strength and compressibility characteristics.

The loess overlies Pleistocene glacial deposits of Kansan till. The till consists of lean to flat clays mixed with occasional sand, gravel, and occasional cobbles. The glacial deposits are generally fairly deep, but are sometimes near the surface at lower elevations on steep slopes. Cretaceous sandstone or Pennsylvanian limestone and shale form the bedrock unit below the glacial deposits. The depth to bedrock is normally great, and rock is rarely encountered in construction within the Papillion Creek Watershed.

Along drainageways, alluvial and colluvial deposits are typically present. These soils were formed by erosion of the adjoining loess-mantled hills. Alluvial deposits are generally present along creeks and in major drainageways. The upper several feet of alluvium are usually stiffer due to the effects of desiccation. Colluvial soils are usually located at the base of steep slopes and in upland draws, and are formed by local creep and sloughing.

4.2 Subsurface Conditions

The project site is underlain by existing fill soils, alluvium/colluvium, loess, and glacial till to the maximum depths explored. Brief descriptions of these materials are provided below. Subsurface profiles along the downstream toe of the dam and along the principal spillway are presented in Figure 5.

Existing Fills

Existing fill soils were encountered in Boring B-6 that was advanced near the maximum fill section at Station 2+65. The thickness of the fill was estimated to be about 38 feet at this location. The fill soils were found to consist of light to dark brown and olive gray, moist to very moist, firm to hard, lean clay (CL). No lenses or seams of sand, silt or excessively wet soils were noted in this material.

Pocket penetrometer measurements ranged from 0.25 to over 4.5 tons per square foot (tsf) in this material (8 tests). Moisture contents of the fill ranged from 17.4 to 27.8% and averaged 23.6% (8 tests). Total unit weights varied from 118.2 to 130.7 pcf and averaged 125.0 pcf (8 tests).

Alluvium/Colluvium

Alluvium and colluvium were encountered in Borings B-1 and B-6 located within the valley. These soils were found to consist of dark grayish brown and gray, very moist to wet, very soft to soft, lean clay (CL). No lenses or seams of sand or silt were noted in this material.

Pocket penetrometer measurements ranged from 0 to 3.25 tsf in these materials (8 tests). Moisture contents ranged from 24.9 to 50.1% (8 tests). The results of a consolidation test performed on the alluvium indicated that this material is slightly over-consolidated and is considered compressible when normally consolidated.

Loess

Several deposits of loess soils were identified from the geotechnical investigations, including in increasing age; Peoria, Loveland and Sappa loess.

Peoria loess was encountered in the upper portion of the left (east) abutment of the dam. The Peoria loess was found to consist of soft to hard, moist to wet, lean clay (CL) with some carbon staining and mottling. Thickness of the Peoria loess varied from about 15 to 22 feet in Borings B-4 and B-5, respectively. Pocket penetrometer measurements ranged from 0 to 1.25 tsf in this material (7 tests).

Loveland loess was encountered in Borings B-2 and B-5 at the east and west abutments of the dam. The Loveland loess was found to consist of reddish brown, firm to hard, moist, lean clay (CL). Thickness of the Loveland ranged from 3.5 to 5 feet. Pocket penetrometer measurements ranged from 1.75 to 2.75 tsf in this material (2 tests).

Sappa loess was encountered in several borings completed at the site and is the predominant loess deposit at the site. The Sappa loess was found to consist of light gray and grayish brown, very moist to wet, soft to hard, lean clay. Thickness of the Sappa ranged from 15 to 47 feet at the boring locations. Pocket penetrometer measurements ranged from 0 to 3.0 tsf in this material (19 tests). The results of a consolidation test performed on the Sappa indicated that this material is slightly over-consolidated and considered compressible when normally consolidated.

No lenses or seams of sand or silt were noted in any of the loess deposits.

Glacial Till

The entire project site was underlain by glacial till of Kansan (Pleistocene) age. The Kansan till consists of grayish to yellowish brown, hard, wet, fat clay with some zones of lean clay. Pocket penetrometer measurements ranged from 1.25 to 4.5+ tsf in this material (8 tests). No layers of outwash sand were identified in this material.

Groundwater

Groundwater was encountered in all borings completed at the site. The depth to groundwater was found to be variable but consistent with the development of a phreatic surface through the embankment. The groundwater depths ranged from at the surface in Boring B-3 near the plunge pool

to 37 feet in Boring B-6. The measured depths and elevations of the groundwater are provided in Table 2 below.

Table 2 - Groundwater Measurements

Boring	Top of Boring Elevation	Date of Drilling	Depth to Groundwater After Drilling	Depth to Stabilized Groundwater	Date of Reading	Groundwater Elevation
B-1 (well)	1232.25	2-27-08	6.5	1.54	3-28-08	1230.71
B-2	1240.45	2-27-08	9.5	7.38	3-28-08	1233.07
B-3	1218.80	2-27-08	1.5	0.00	3-28-08	1218.80
B-4 (well)	1233.31	2-27-08	10.0	6.71	3-28-08	1226.59
B-5	1238.21	2-27-08	9.8	8.25	3-28-08	1229.96
B-6	1246.05	2-28-08	37.0	17.60	3-28-08	1228.45

The estimated gradient of seepage through the dam between the pool level and Boring B-3 (near principal spillway) is about 0.15 feet/foot.

4.3 Past Inspections of Dam

Several inspections of the dam have taken place since its construction in 1972. A summary of the inspections and findings are presented below.

- August 20, 2007 – Nebraska Department of Natural Resources made joint measurements of the principal spillway conduit at four downstream locations. The date of the measurements was May 1, 2007. The measured joint elongations ranged from 0.6 to 2.75 inches.
- July 28, 1998 - Nebraska Department of Natural Resources performed an inspection of the dam. The report recommended that the seepage at the toe of the dam be monitored.
- September 11, 1984 - Nebraska Department of Water Resources inspected the dam on August 4, 1984 and no deficiencies were observed.
- February 14, 1972 – A "Contractor's Inspection" was performed by the SCS on February 11, 1972. According to the memorandum inspection, no particular problems were noted.

Copies of these inspection reports are included in Appendix E.

5.0 ENGINEERING EVALUATIONS

5.1 Comments on Soil Characteristics

The subsurface investigation completed for this study and the originally SCS investigation revealed that the foundation soils and embankment fills present at the site consist entirely of relatively firm, lean clays from alluvium, loess and glacial tills. Although some zones of soft and wet clay were encountered in isolated areas, the foundation soils are generally considered capable of supporting the imposed load from the earth fill and structures without resulting in excessive settlements.

The foundation soils are also considered relatively water-tight, with no obvious indications of the presence of pervious strata that may have transmitted the seepage that led to the wet condition along the toe of the embankment. Typically, these pervious lenses show up on CPT logs, but are often masked in soil borings due to borehole smearing of the sidewalls.

5.2 Condition of Existing Dam

At the time of our site reconnaissance and field investigations, the surface of the existing dam was observed to be in good condition with no observable signs of cracking, settlement or distressed areas. The embankment had a healthy cover of grass with no observable erosion or rutting.

The exposed portion intake structure was observed to be in good condition with no signs of deterioration. The exposed portion of the principal spillway was observed in relatively good condition with no signs of spalling or cracking of the concrete.

5.3 Description of Pipe Distress

As described above, the exposed portion of the principal spillway has experienced distress in the form of differential settlement and elongation of joints. The survey data showed that the measured elongation of the pipe joints is in excess of acceptable standards. A photograph of the principal spillway is presented on Figure 3.

In the August 20, 2007 Nebraska Department of Natural Resources inspection report, it was noted that Joint Nos. 2, 3 and 4 were elongated. Joint No. 2 has exceeded the maximum joint elongation of the manufactured joint, Joint No. 3 has elongation of 2.2 inches, with approximately 0.5 inches of remaining water tightness and Joint No. 4 has elongation of 2.2 inches, with approximately 0.5 inches of remaining water tightness. These joints were measured and recorded over a year ago and with the extreme amounts of rainfall in 2008, there is reason to assume additional rotation and elongation of the joints may occur. NRCS TR-60 requires a margin of safety of not less than 0.5 inches. Joints No. 3 and No. 4 are at their extreme limits and it would be prudent to repair these at this time.

According to the as-built plans, the existing principal spillway was installed at a camber to account for the settlement of the foundation soils. The total settlement of the principal spillway under the weight of the new fill was predicted to be less than 1 foot.

The existing pipe is supported by pipe supports or bents at two locations. The existing footings are 3 feet in width along the axis of the pipe and about 6 feet in length. No bearing pressure information was provided on the as-built plans.

It appears from the survey data of the joints and our visual observation of the pipe segments that the observed distress has resulted from either (1) a bearing failure of the downstream pipe support, or (2) settlement of the foundation soils from the weight of the embankment fill. Both of these scenarios are considered plausible as an explanation of the downward movement of the downstream section of pipe.

5.4 Description of Foundation Seepage

The presence of wet ground conditions that was noted in past inspection reports was confirmed from the results of the geotechnical investigation. The wet areas are characterized by the growth of a local phreatophyte called snake grass, which is prevalent in continuous wet areas. The approximate location of the wet ground is shown on Figure 3. In addition to the wetness, an area of foundation seepage was identified and is noted on the referenced figure.

Observation of the wet area did not show any signs of sloughing or slope instability at the time of our work.

6.0 FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Based on our review of the existing information, our site visits and the supplemental geotechnical investigation, the findings and conclusions from this work are summarized below.

- The joint gap exceeds the minimal allowable joint gap in the last 3 joints. A metal collar can be inserted into the interior of the pipe that will bridge the excessive joint gap.

- Despite the observed wetness and seepage along the toe of the embankment, the dam is not considered to be in imminent danger of failure.
- The existing dam has a non-standard outlet system consisting of a solid pipe with a diameter of only 4 inches. The outlet of the pipe could not be located in the field and it should be assumed that it is either (1) overloaded or (2) not functioning properly (clogged or crushed). A sand drain outlet, which is typically provided as a part of the drain system, was not included as a part of the original construction.
- The existing 4-inch solid pipe drain outlet should be completely removed and replaced. The installation of a new outlet drain system is recommended as a means to increase the capacity of the foundation drain system.
- Preliminary seepage analyses indicate that the proposed outlet drain should consist of a trench type drain that is dimensioned as 8 feet in width and 4 feet in height. A 6-inch perforated PVC pipe should be included to provide additional capacity to the outlet system. A schematic of the proposed modifications to the drain system is presented on Figure 4.
- The existing perforated pipe should be inspected to verify its ability to collect and transmit seepage intercepted. The existing foundation drain should be inspected for signs of clogging at the time of excavation. The proposed perforated pipe should be spliced into the existing perforated foundation drain pipe and wrapped with a non-woven geotextile.
- A drainage blanket should be installed to provide drainage to the entire area of the observed wetness and seepage. The blanket should be a minimum of 2 feet in thickness and should drain into the proposed outlet drain and the plunge pool. The approximate limits of the proposed blanket are shown on Figure 3. The actual plan dimensions of the blanket will be determined during final design.
- The interior of the entire existing principal spillway should be inspected with a camera to verify its integrity prior to the development of the final recommendations for the pipe.
- The exterior of the exposed portion of the principal spillway should be inspected at the time of excavation of the new outlet drain.
- The scope of the geotechnical investigation completed for this study is considered adequate to properly characterize the subsurface conditions at the site and that no additional borings, CPT's or lab work are needed to complete the evaluation.

7.0 RECOMMENDATIONS FOR CONSTRUCTION

7.1 Foundation Preparation

Prior to any excavations at the site, the reservoir level should be drawdown to minimize the water pressure head acting in the embankment and foundation soils. This task should be completed as soon as practical to allow the dissipation of pore pressures and to minimize seepage into excavations.

Dewatering will be needed to perform this work in the dry and to provide a stable base for the placement of new fill and drainage system. Groundwater levels along the toe of the embankment will be encountered at or near the ground surface during construction.

The exposed subgrade along the new outlet drain will be inspected for signs of soft or wet soils that may require removal and replacement prior to the construction of the drain.

7.2 Off-Site Borrow Areas

Contractor supplied off-site borrow for structural areas shall meet the following soil requirements:

- CL Material - Liquid Limit less than 50
- Plasticity Index greater than 15
- Percent clay greater than 25

The Contractor shall have an independent soil mechanics laboratory determine that the soil meets the above requirements and will also determine the proposed soil, maximum dry density and optimum moisture content for fill placement in accordance with ASTM D 698 Method A. Up to two additional lab compaction tests will be performed on potential borrow soils prior to construction.

7.3 Earthwork and Compaction Requirements

Prior to general fill placement, all topsoil and organic matter will be removed to a minimum depth of 6 inches from areas to receive fill. The exposed surface will be scarified and mixed with the first lift of fill. All fill will be placed in 9-inch loose lifts and compacted using sheepsfoot compaction equipment. All fill will be compacted to at least 95% of the maximum dry density as determined by ASTM D 698-91 (Standard Proctor test) within a corresponding 0 and +5% of the optimum water content as determined by the referenced test.

Materials for the new outlet drain and drainage blanket will meet the requirements for "Nebraska NRCS Concrete Specification for Fine Aggregate". All granular materials will be compacted in accordance with Construction Specification 24 – Drainfill Paragraph 9.b.(3).

Proper bonding of the new fill into the existing fill is extremely important to the long-term performance of the dam. The exposed surface of the existing fill will be benched and roughened to facilitate bonding and compaction.

7.4 New Drain Construction

Observation of the existing embankment and foundation indicates that the existing drainage system is not functional and nor performing satisfactorily. As a part of the new construction, the existing outlet drain should be exposed and inspected for sign of clogging or segregation that may affect its ability to pass future seepage into the new outlet drain. The need for modifications to the drain system will be evaluated based on the observed conditions in the field.

7.5 Temporary Excavation Slopes

The temporary excavation for the replacement of the outlet drain should be inclined at no steeper than 3:1 (horizontal: vertical). The exposed faces of the excavated slopes should be roughened and/or benched to promote bonding of the new fill to the in-place fill soils.

Soils that are observed to be excessively wet or soft should be completely removed and replaced with approved fill meeting the requirements in the Specifications. Areas of seepage exposed on the face of the excavation should be allowed to completely drain out prior to the placement of fill.

7.6 Instrumentation

No instrumentation is proposed for the project. Neither problems of excessive total and differential settlements nor the generation of pore pressures during fill excavation and placement is anticipated.

The existing wells at Borings B-1 and B-4 will be abandoned prior to construction by removing the PVC pipe and sealing the hole with a lean grout. Removal and/or sealing of the existing wells will be performed in accordance with Nebraska Revised Statute 46-1201 to 46-1241, known as the Water Well Standards and Contractor's Licensing Act, and all current revisions.

8.0 LIMITATIONS

This report presents the findings and preliminary conclusions for the geotechnical aspects of the pipe distress and foundation seepage. It has been prepared in accordance with generally accepted engineering practice and in a manner consistent with the level of care and skill for this type of project within this geographical area. No warranty, expressed or implied, is made.

The preliminary geotechnical evaluation presented herein are based on information provided to us, our field reconnaissance, the results of supplemental field exploration and laboratory materials testing, and the results of engineering evaluations.

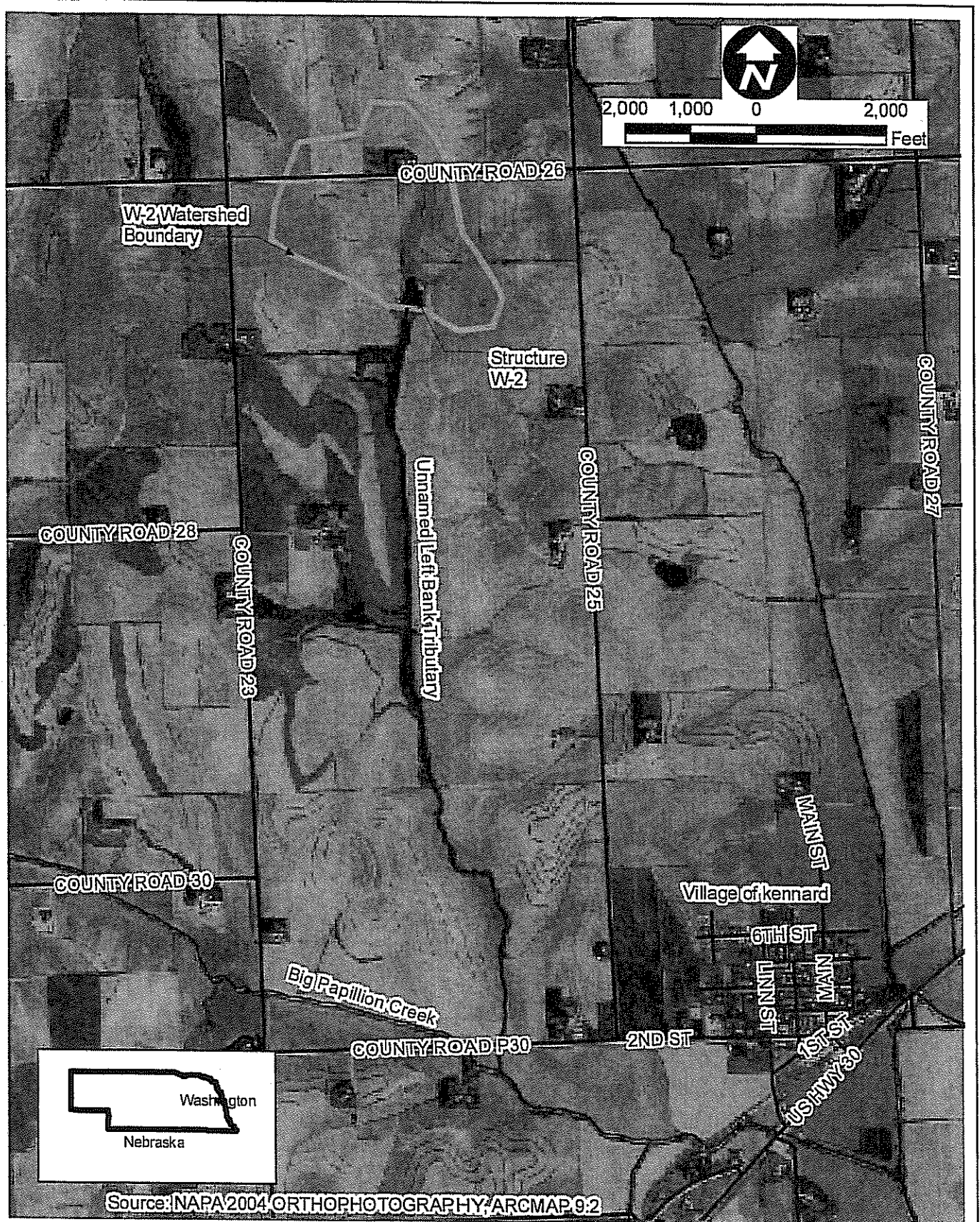
Geotechnical engineering and the geologic sciences are characterized by uncertainty. Professional judgments presented herein are based partly on our understanding of the proposed construction, partly on our general experience and the state-of-the-practice at the time of this writing.





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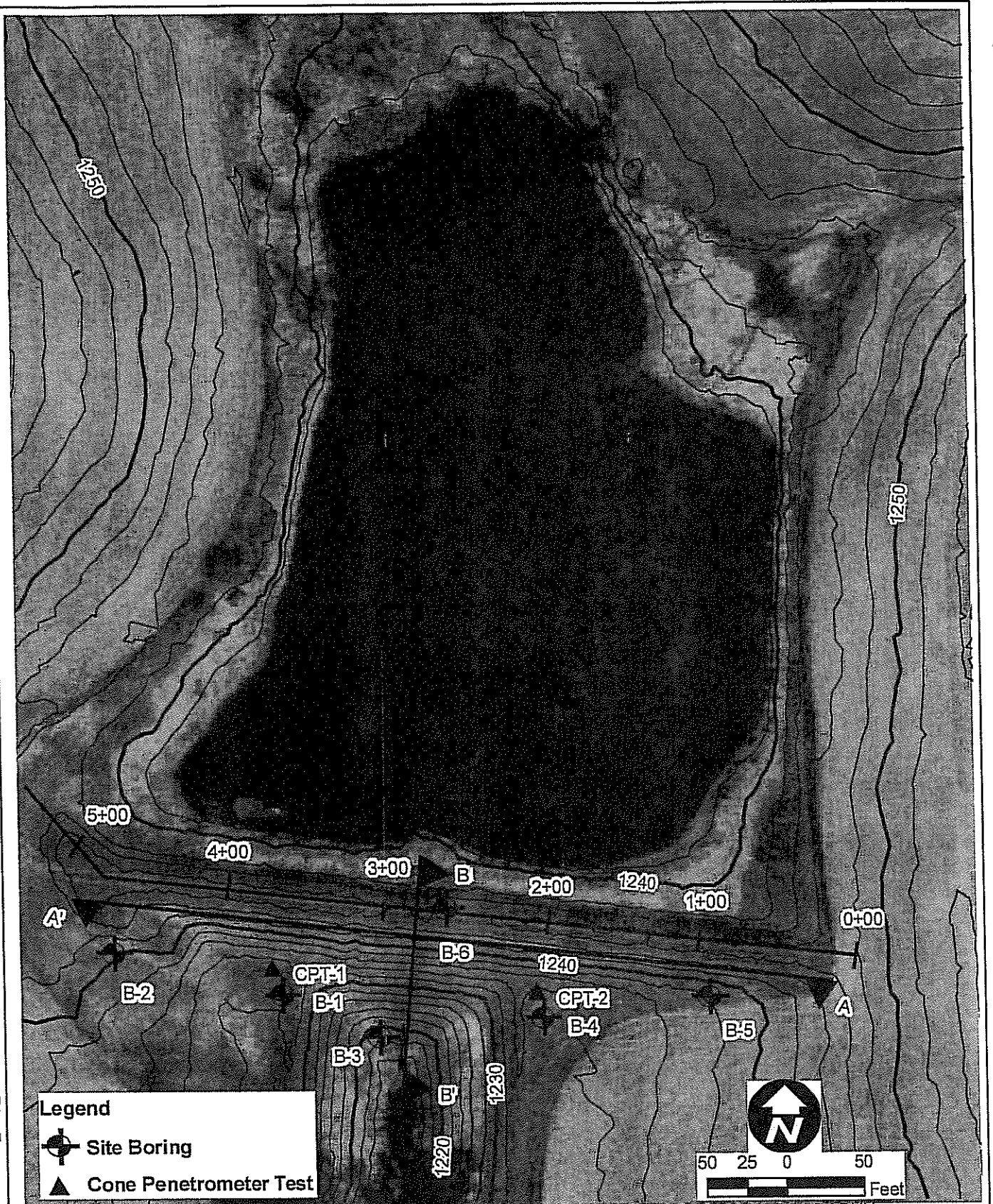
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Papillion Creek Watershed Structure W-2
Washington County, NE

Geotechnical Assessment

DATE
May 2008

FIGURE
1

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Source: MAPA 2004 ORTHOPHOTOGRAPHY, ARCMAP 9.2, AND MAPA 2006 TOPOGRAPHY

HDR

**Site Plan and Boring Plan
Papillion Creek Watershed Structure W-2
Washington County, NE**

Geotechnical Assessment

DATE

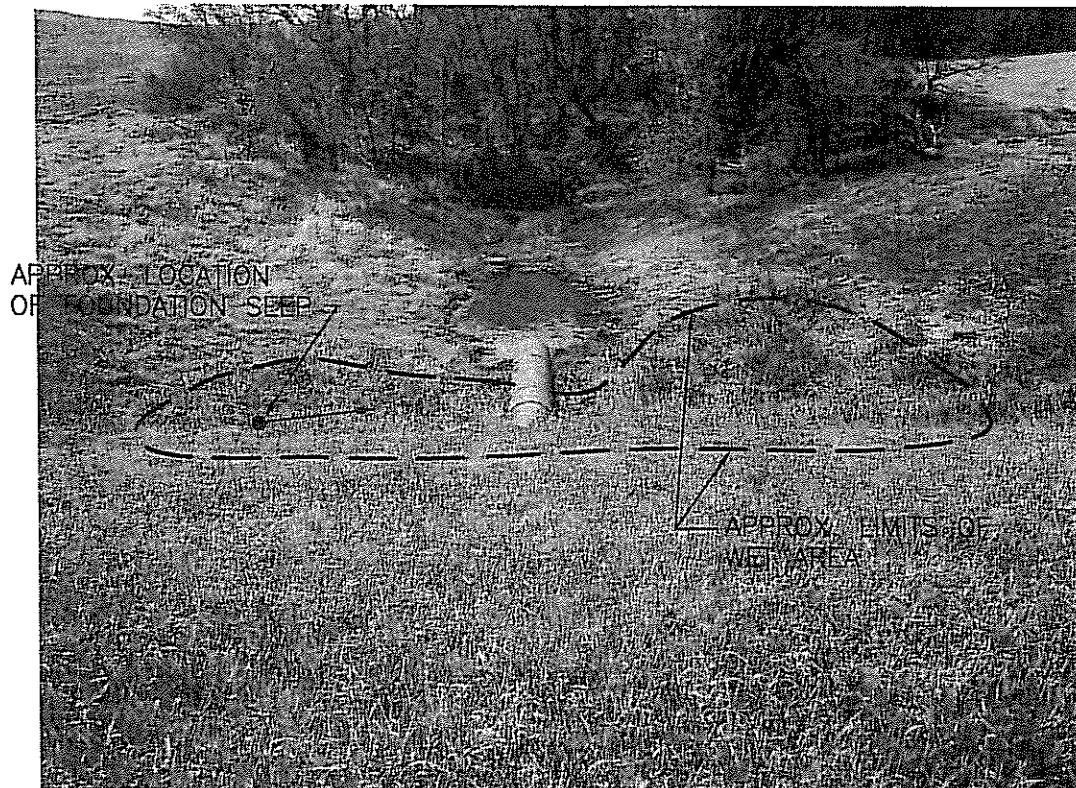
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FIGURE

2



View of Pipe Distress in Principal Spillway



View Looking Downstream of Wet Area and Seepage

HDR

**Photos of Foundation Seepage and Pipe Distress
Papillion Creek Watershed Structure W-2
Washington County, NE**

Geotechnical Assessment

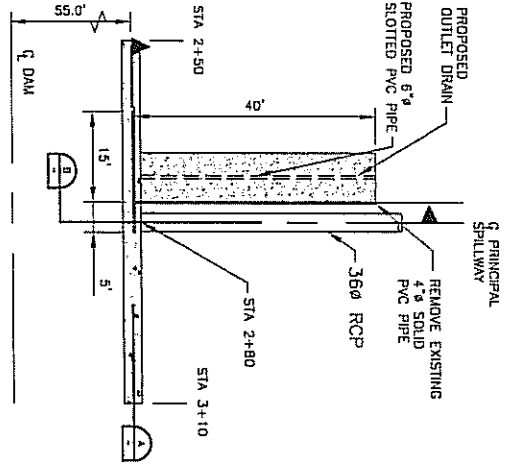
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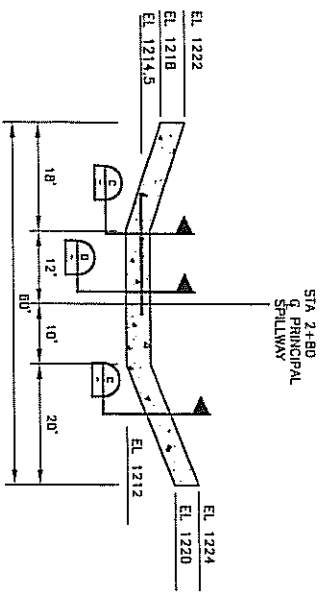
FIGURE

3

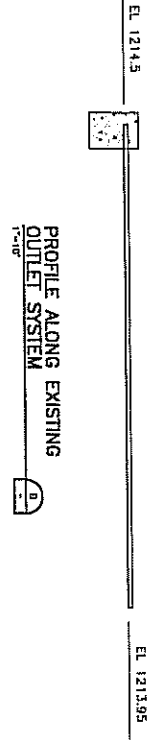
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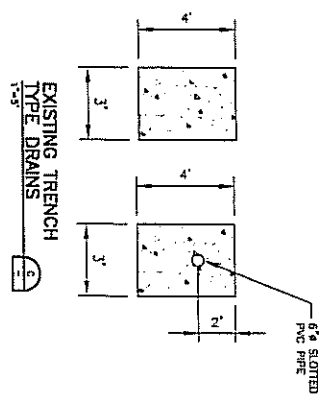
PLAN VIEW OF
FOUNDATION DRAIN SYSTEM
1\"/>



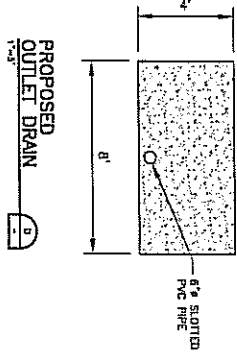
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PROFILE ALONG EXISTING
OUTLET SYSTEM
1\"/>



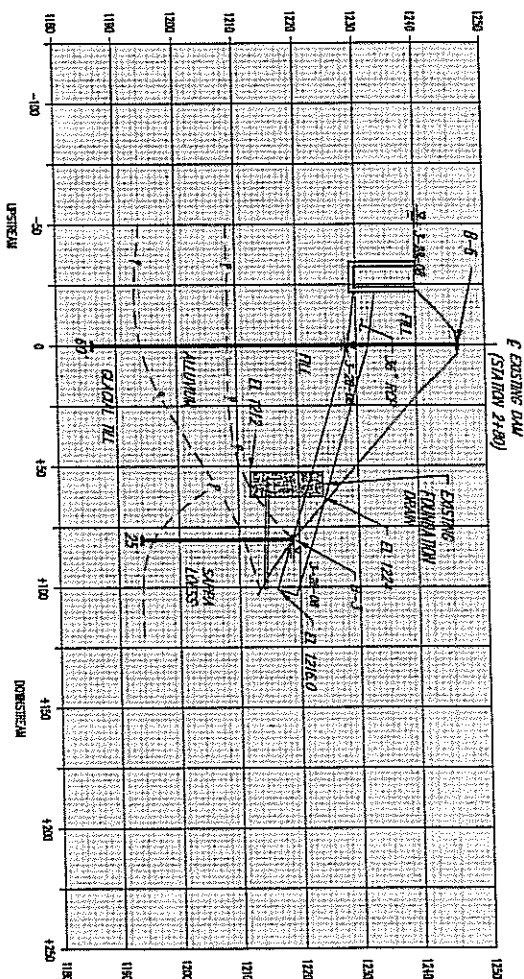
EXISTING TRENCH
TYPE DRAINS
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PROPOSED
OUTLET DRAIN
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NOT FOR CONSTRUCTION

HDR	Foundation Drain System Papillion Creek Watershed Structure W-2 Washington County, NE	DATE
		May 2008
Geotechnical Assessment	FIGURE	4

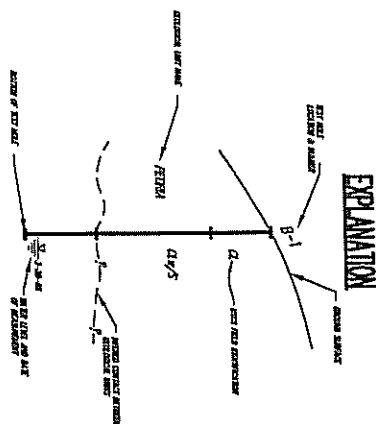


NOTES:
1. SEE FIGURE 2 FOR LOCATION OF SECTIONS A-A' AND B-B'
2. ~~2~~ READINGS TAKEN ON MARCH 28, 2008.

H2R

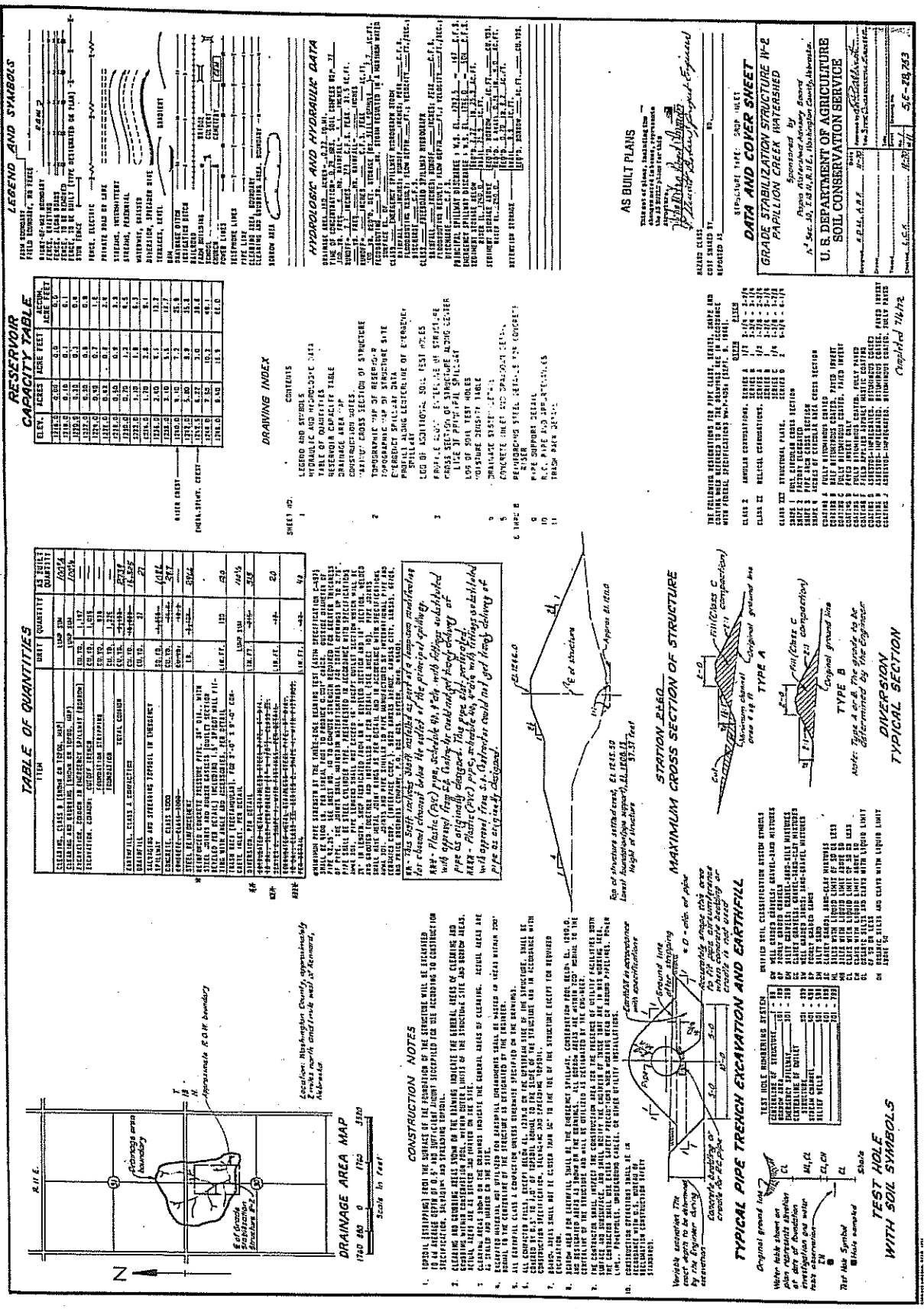
**Subsurface Profile Along Downstream
Toe of Dam and Principal Spillway
Papillion Creek Watershed Structure W-2
Washington County, NE
Geotechnical Assessment**

DATE	May 2008
FIGURE	5

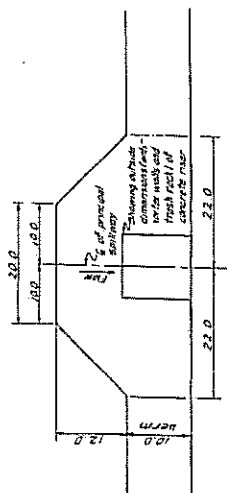
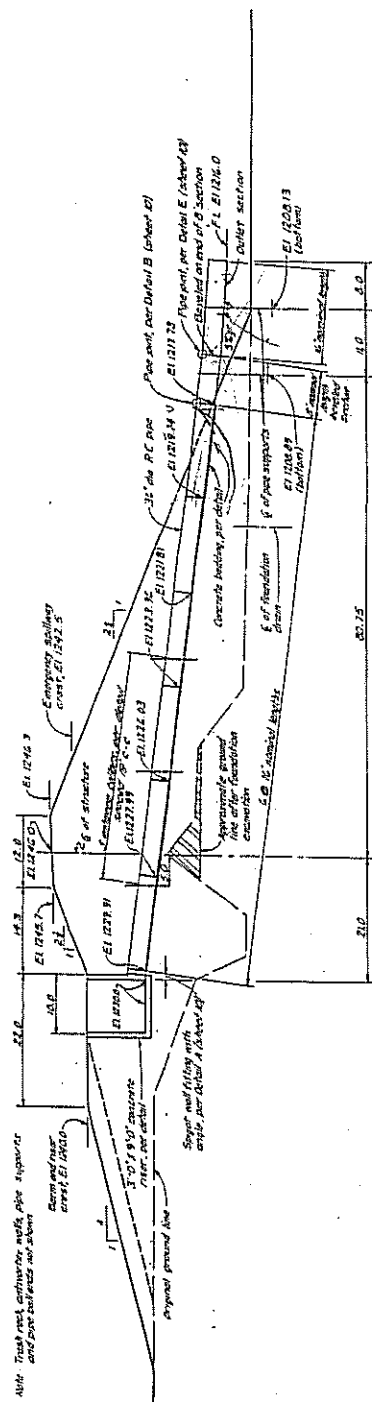


ATTACHMENT A: As-Built Plans (SCS, 1972)

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Completed 7/6/72

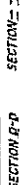
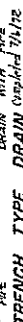
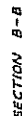
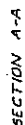
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AS BUILT PLANS

STABILIZATION STRUCTURE W-2
RAPID CREEK WATERSHED

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

24/9/2 7/6/73

TABLE OF QUANTITIES

AS BUILT PLANS

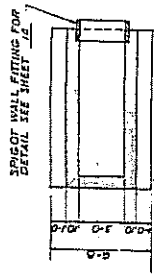
STABILIZATION STRUCTURE W-2

PILLION CREEK WATERSHED

DEPARTMENT OF AGRICULTURE
HERRINGBORN COUNTY, NEW JERSEY

1934

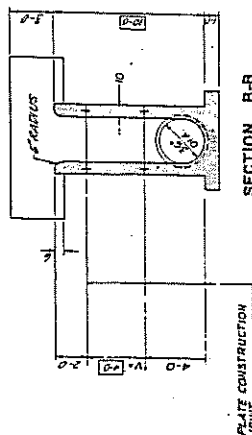
Project	Start Date	End Date	Status
Project A	2023-01-01	2023-03-31	Completed
Project B	2023-04-01	2023-06-30	In Progress
Project C	2023-07-01	2023-09-30	Planned



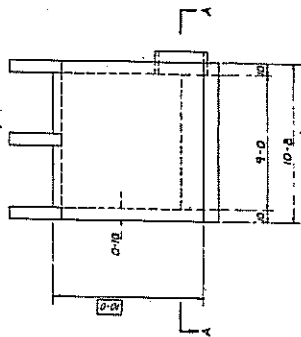
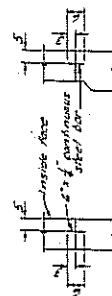
SECTION A-A

FOR DETAIL OF TRASH-
BACK ANGLES AND
SLEEVES SEE SHEET "I"

TOP PLAN



SECTION B-B

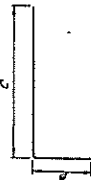
**SIDEWALL ELEVATION**

DETAILS OF PLATE CONSTRUCTION JOINTS

STEEL										SCHEDULE									
MAJOR	SIZE	QUANTITY	LENGTH	TYPE	D	C	TOTAL	LENGTH	MAJOR	SIZE	QUANTITY	LENGTH	TYPE	D	C	TOTAL	LENGTH		
R1	12	3-2	1	—	—	—	30-8	—	R1	12	3-2	1	—	—	—	30-8	—		
R2	12	3-2	1	—	—	—	30-8	—	R2	12	3-2	1	—	—	—	30-8	—		
R3	12	3-2	1	—	—	—	30-8	—	R3	12	3-2	1	—	—	—	30-8	—		
R4	12	3-2	1	—	—	—	30-8	—	R4	12	3-2	1	—	—	—	30-8	—		
R5	12	3-2	1	—	—	—	30-8	—	R5	12	3-2	1	—	—	—	30-8	—		
R6	12	3-2	1	—	—	—	30-8	—	R6	12	3-2	1	—	—	—	30-8	—		
R7	12	3-2	1	—	—	—	30-8	—	R7	12	3-2	1	—	—	—	30-8	—		
R8	12	3-2	1	—	—	—	30-8	—	R8	12	3-2	1	—	—	—	30-8	—		
R9	12	3-2	1	—	—	—	30-8	—	R9	12	3-2	1	—	—	—	30-8	—		
R10	12	3-2	1	—	—	—	30-8	—	R10	12	3-2	1	—	—	—	30-8	—		
R11	12	3-2	1	—	—	—	30-8	—	R11	12	3-2	1	—	—	—	30-8	—		
R12	12	3-2	1	—	—	—	30-8	—	R12	12	3-2	1	—	—	—	30-8	—		
R13	12	3-2	1	—	—	—	30-8	—	R13	12	3-2	1	—	—	—	30-8	—		
R14	12	3-2	1	—	—	—	30-8	—	R14	12	3-2	1	—	—	—	30-8	—		
R15	12	3-2	1	—	—	—	30-8	—	R15	12	3-2	1	—	—	—	30-8	—		
R16	12	3-2	1	—	—	—	30-8	—	R16	12	3-2	1	—	—	—	30-8	—		
R17	12	3-2	1	—	—	—	30-8	—	R17	12	3-2	1	—	—	—	30-8	—		
R18	12	3-2	1	—	—	—	30-8	—	R18	12	3-2	1	—	—	—	30-8	—		
R19	12	3-2	1	—	—	—	30-8	—	R19	12	3-2	1	—	—	—	30-8	—		
R20	12	3-2	1	—	—	—	30-8	—	R20	12	3-2	1	—	—	—	30-8	—		
R21	12	3-2	1	—	—	—	30-8	—	R21	12	3-2	1	—	—	—	30-8	—		
R22	12	3-2	1	—	—	—	30-8	—	R22	12	3-2	1	—	—	—	30-8	—		
R23	12	3-2	1	—	—	—	30-8	—	R23	12	3-2	1	—	—	—	30-8	—		
R24	12	3-2	1	—	—	—	30-8	—	R24	12	3-2	1	—	—	—	30-8	—		
R25	12	3-2	1	—	—	—	30-8	—	R25	12	3-2	1	—	—	—	30-8	—		
R26	12	3-2	1	—	—	—	30-8	—	R26	12	3-2	1	—	—	—	30-8	—		
R27	12	3-2	1	—	—	—	30-8	—	R27	12	3-2	1	—	—	—	30-8	—		

[illegible]

BAR TYPES



173411

(1) -

AS BUILT PLANS
No Changes!

No Charge!

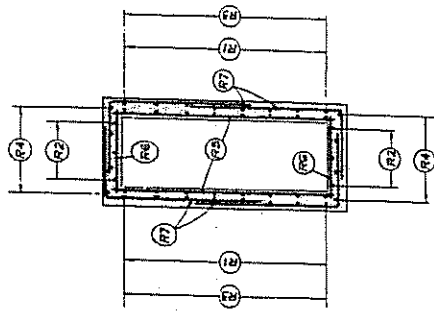
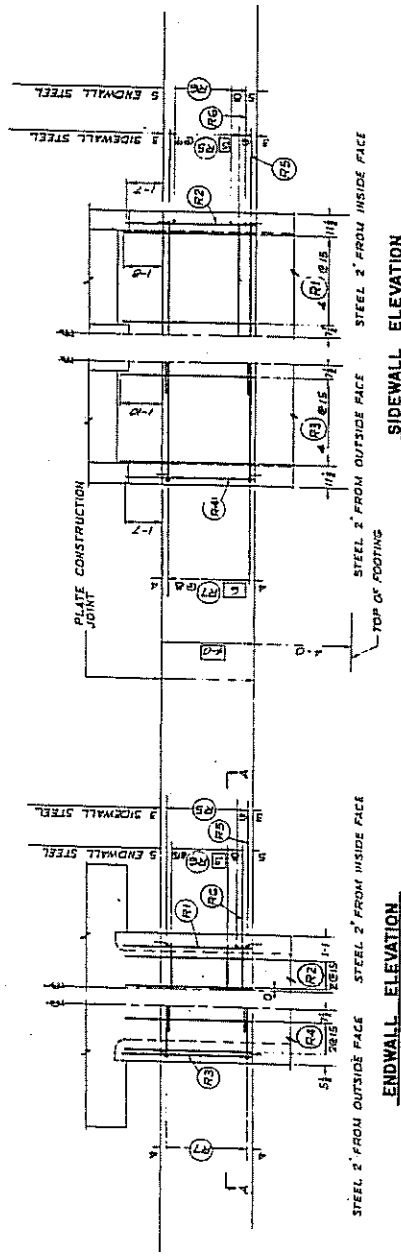
GRADE STABILIZATION STRUCTURE W-2
PAYLLION CREEK WATERSHED

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed by	Approved by
Drawn by	Checked by
Reviewed by	Project No.
Project Name	Sheet No.
Scale	Revision
Notes	5-28-75

24/9/77

STANDARD OPEN RISER	STANDARD COVERED RISER
STANDARD DIMS: MD ES-3136-11010E	STANDARD DIMS: MD ES-4036-11510E
DATE 12-87	DATE 4-85
SHEET 1 OF 4	SHEET 1 OF 4



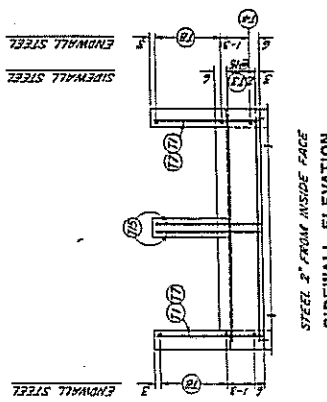
SECTION A-A
OTHER SECTIONS SIMILAR

AS BUILT PLANS
NO CHANGE

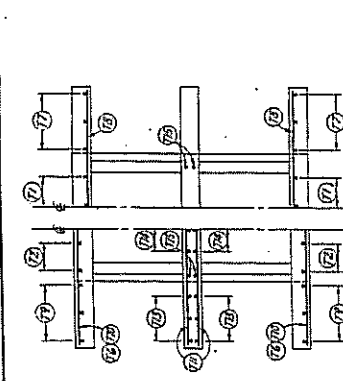
GRADE STABILIZATION STRUCTURE W-2	
PAPILLION CREEK WATERSHED	
Washington County, Nebraska	
U. S. DEPARTMENT OF AGRICULTURE	
SOIL CONSERVATION SERVICE	
Drawn by	Checked by
Date	Date
Project	Sheet
56-28-355	56-28-355

Completed 7/1/92

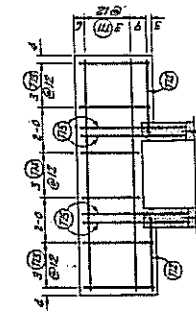
DRAWING ADJUSTED	
STANDARD OPEN RISER	
STRUCTURE NO. ES-3136-1010E	
DATE 12-87	SHEET 3 OF 4
ADAPTED FROM	
STANDARD COVERED RISER	
DESIGN CODE UNIT	1' - 1000 psi
n = 8	1' - 20,000 psi
STANDARD CODE UNIT	ES-3036-1510 E
DATE 4-85	SHEET 3 OF 4



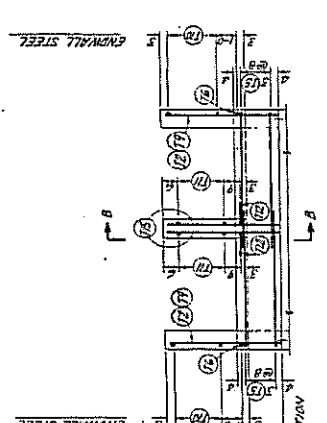
STEEL 2' FROM INSIDE FACE
SIDEWALL ELEVATION



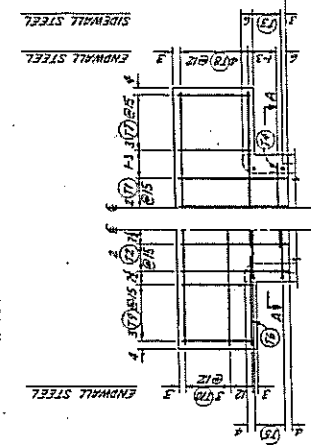
STEEL 2' FROM OUTSIDE FACE
SIDEWALL ELEVATION



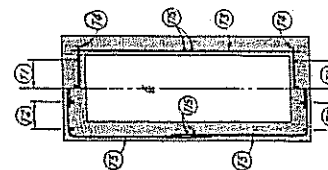
STEEL 2' FROM INSIDE FACE
ENDWALL ELEVATION



STEEL 2' FROM OUTSIDE FACE
ENDWALL ELEVATION



STEEL 2' FROM INSIDE FACE
ENDWALL ELEVATION



STEEL 2' FROM OUTSIDE FACE
ENDWALL ELEVATION

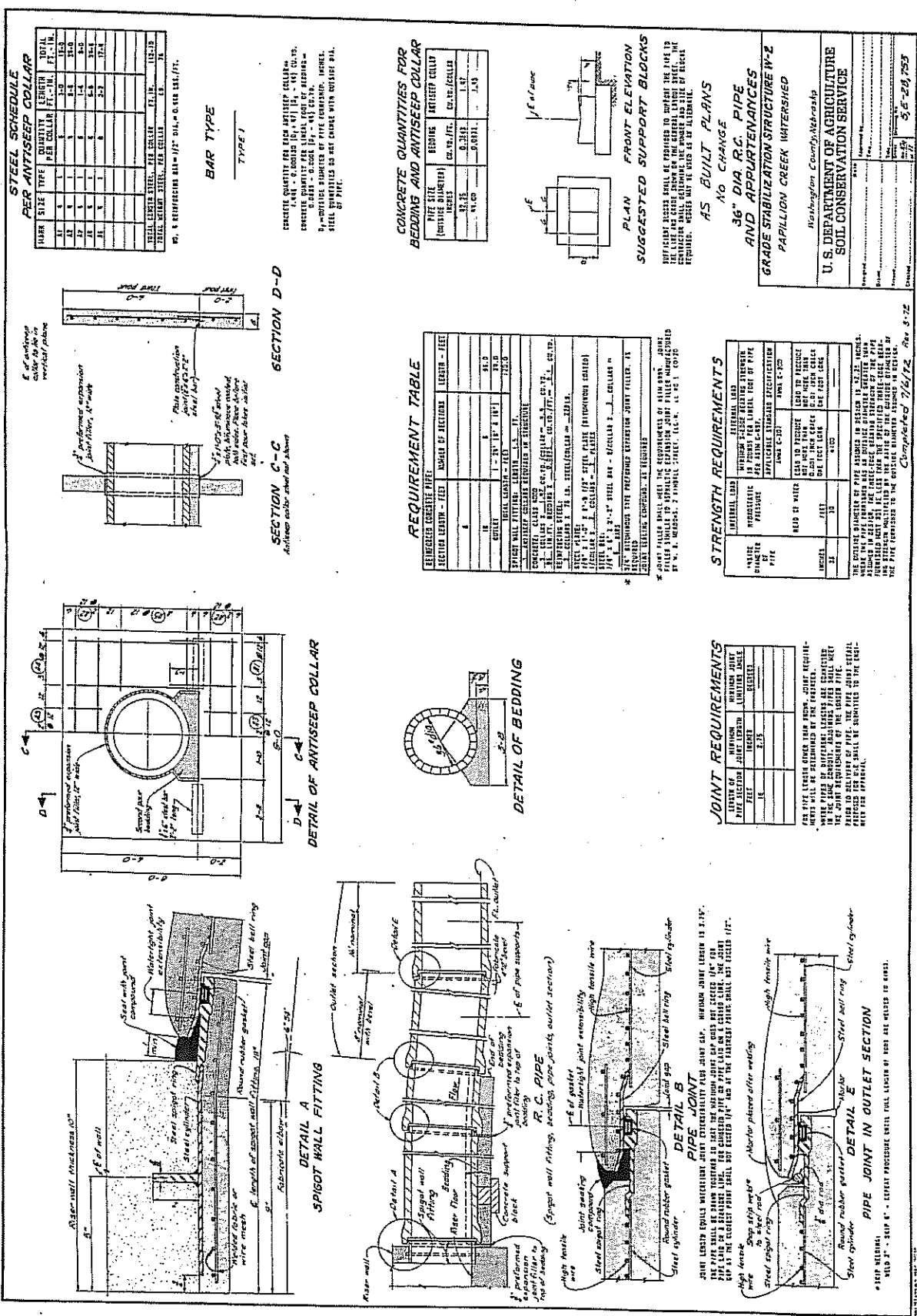
AS BUILT PLANS
NO CHANGE

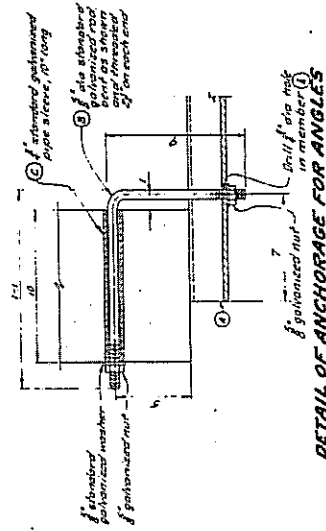
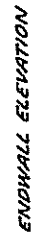
GRADE STABILIZATION STRUCTURE W-2
PAPILLION CREEK WATERSHED
Washington County, Nebraska
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Copyright 1972

DESIGNER	STANDARD OPEN RIB
DESIGN CONTRACT	1-1000 psi 15-1800 psi
DESIGN CONTRACT	0-8 15-20,000 psi
STANDARD P.O. NO.	ES-3136-1010E
DATE	3-67
SHEET	4 OF 4







DETAIL OF ANCHORAGE FOR ANGLES

TABLE OF QUANTITIES

MARK	ITEM	QUANTITY
A	ANGLE 3" x 3" x 3/16" 10'-0" LONG	10
B	W/6 GALVANIZED AND GUE STEEL OF AN ASSORTED SIZE	10
C	2 1/2" x 1/2" GALVANIZED PIPE 10' LONG (CONTAINED IN CASKET)	20
	WALTS, 5/8" x 1/2" PL. GALVANIZED	20
	WALTS, 5/8" PL. GALVANIZED	20

NOTE: ALL STEEL MEMBERS (WITH EXCEPTION OF STABILIZED MEMBERS) TO BE FABRICATED WITH MINIMUM 3/16" THICK PLATE.

AS BUILT PLANS
NO CHANGE

TRASH RACK FOR 3'-0" x 9'-0"
STANDARD OPEN RISER

GRADE STABILIZATION STRUCTURE N-2

PAPILLION CREEK WATERSHED

Abenigbolan County, Alabama

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Completed 7/6/82

[illegible]