

Memorandum

To: PPO Subcommittee

Re: Waterloo Levee Improvements Design and Certification

Date: June 2, 2008

From: Paul Woodward, Water Resources Engineer

In March of this year, the District Board approved an agreement with the Village of Waterloo to evaluate the existing levee surrounding their community. As anticipated, this evaluation has determined that the existing levee does not meet the federal requirements to be certified and shown on the flood maps as providing protection from the 1% chance annual flood. The conclusions of this study are summarized in the attached report and include preliminary estimates that it may take as much as \$2 million (including design and construction) to bring the levee up to current standards. The enclosed map shows the areas of the levee that need to be raised or improved.

The Village signed an agreement with the Federal Emergency Management Agency (FEMA) to designate the Waterloo levee as a Provisionally Accredited Levee (PAL) beginning on January 15, 2008. The PAL designation requires that all necessary documentation to support the levee accreditation will be submitted by January 15, 2010. This allows 24 months for the Village to study the existing levee and bring the levee into compliance. During the 2-yr period, the levee will be designated on the DFIRM map as providing protection, but will have a note to map users that the levee certification is in process. If the data and documentation is not provided by January 15, 2010, FEMA will issue a map revision which will likely redesignate the Village as a flood-prone area without levee protection.

Since the existing levee does not have the required amount of freeboard, the next step is to design improvements to the levee necessary for it to meet certification requirements. The Village will be considering a contract with JEO Consulting Group, Terracon, and HDR to provide this design up to the construction phase at its meeting on June 9, 2008. The proposed scope of services, see attached, includes updating the hydraulics on the Elkhorn River, additional geotechnical analysis, preliminary and final designs, and construction bidding. The schedule for completing this analysis and design is to have construction plans and bids ready by March of 2009. This will hopefully allow enough time to complete construction and then submit the as-built information necessary for certification with FEMA by January 2010.

The Village submitted the enclosed letter dated May 16, 2008 requesting that the District consider a 50-50 cost share agreement for this design effort. Based on the enclosed agreement, the maximum cost to the District would be 50% of the maximum fee of \$396,580. In addition to financial assistance, District staff is providing technical assistance throughout this certification process. Due to the financial significance of this study and the potential for more funding needed to implement the improvements, the Village will likely finance their portion of the costs.

- It is management's recommendation that the subcommittee recommend to the Board of Directors that the General Manager be authorized to execute an interlocal agreement, up to a maximum District contribution of \$198,290, with the Village of Waterloo for the design of improvements to their flood control levee.

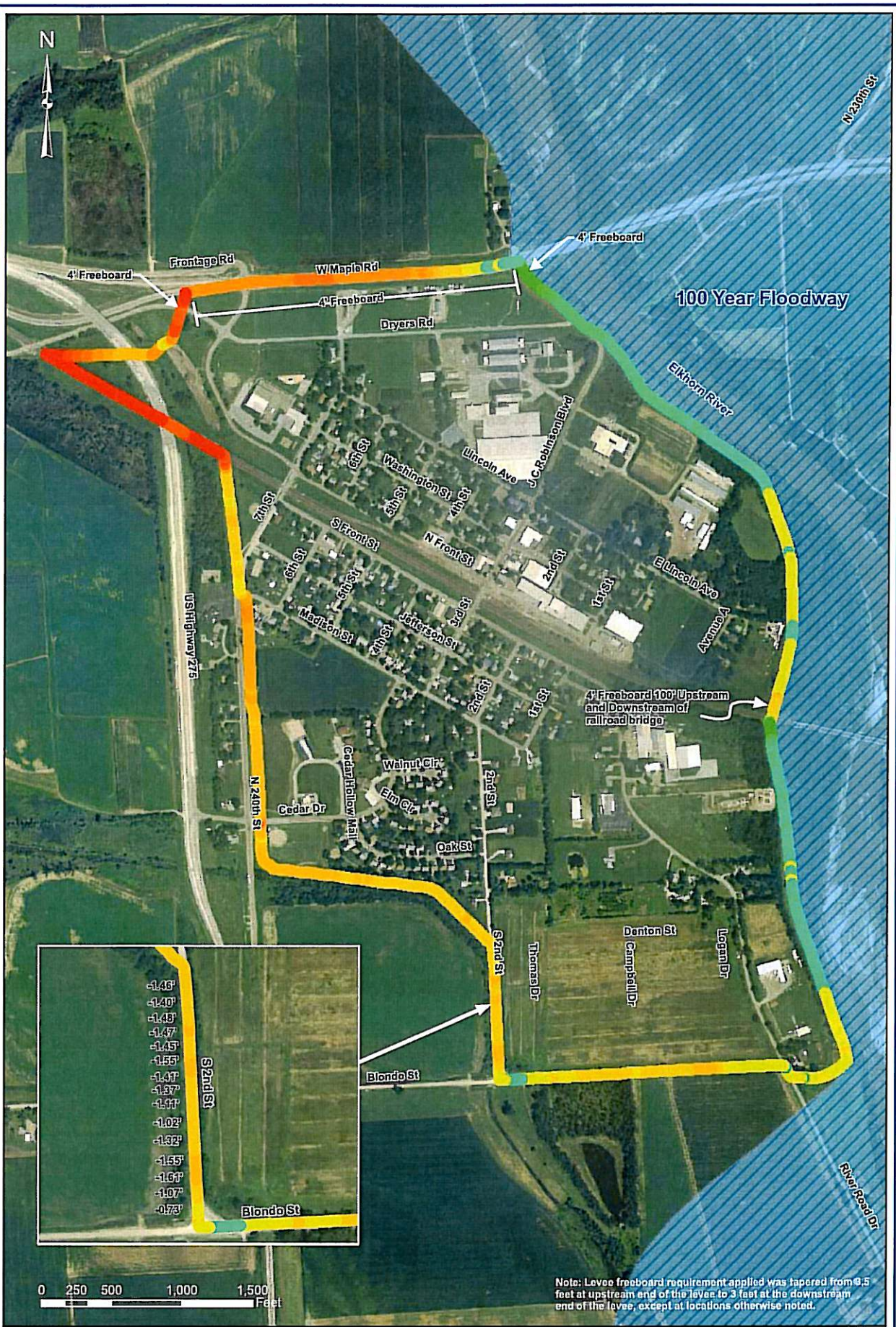


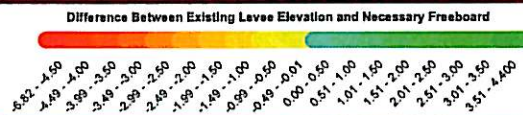
Figure 2

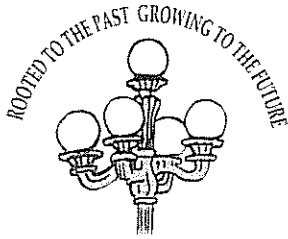
JEO Project # - 613D4
April 14, 2008



Freeboard Sufficiency

DRAFT Levee Feasibility Evaluation
Village of Waterloo, NE





Village of Waterloo

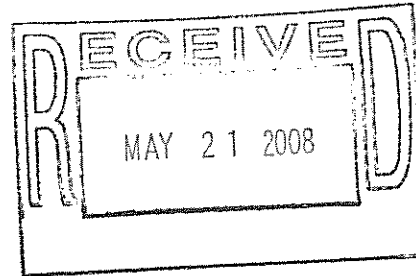
P.O. BOX 127 • WATERLOO, NEBRASKA 68069
(402) 779-2292 • FAX (402) 779-2292

Board of Trustees



May 16, 2008

Mr. John Winkler
Papio-Missouri River
Natural Resource District
8901 S. 154th Street
Omaha, NE 68138-3621



Dear Mr. Winkler,

The Village of Waterloo appreciates the involvement of the Papio-Missouri River NRD in our levee recertification process. Your expertise with levees and flood control has given the Waterloo Village Board of Trustees guidance in making the decisions that will have an impact on all of our citizens.

At the Wednesday, May 14th, 2008 meeting JEO Consulting presented the Waterloo Levee Certification Scope of Services to the Village Board. John Callen with JEO Consulting provided a brief overview of the Scope of Services.

Included in this Scope of Services was the total fee in the amount of \$396,580.00. The Scope of Services was discussed by Rich Tesar, Marlin Petermann and Paul Woodward. On behalf of the Village of the Waterloo Board of Trustees we are asking the Papio-Missouri River NRD to cost share at least 50% of the \$396,580.00 for the Scope of Services. This request would be in the amount of \$148,290.00.

We consider the Papio-Missouri River NRD a key partner in our levee certification process.

Respectfully,

Stanley E. Benke, Jr.
Waterloo Village Board Chairman



Cc: Don Overholt, Village Attorney
Waterloo Trustees
John Callen, JEO Consulting
Marlin Petermann, NRD
Paul Woodward, NRD

Attachment

PROPOSED PROJECT SCHEDULE

Floodplain Study	June 2008 to September 2008
Geotechnical Evaluation	July 2008 to March 2009
Preliminary Design of Levee Improvements	July 2008 to December 2008
Interior Drainage Evaluation	August 2008 to October 2008
Conditional Letter of Map Revision	October 2008 to March 2009
Final Design of Levee Improvements	January 2009 to March 2009
Construction Bidding Services	March 2009

** Note: Project schedule is dependent upon timely reviews by regulatory agencies and stakeholders*

PROJECT FEE⁽¹⁾

FLOODPLAIN STUDY	\$61,330.00
GEOTECHNICAL EVALUATION	\$20,000.00
DESIGN	
PRELIMINARY DESIGN PLANS	\$117,500.00
FINAL DESIGN PLANS	\$70,300.00
SURVEY	\$16,780.00
PERMITTING	\$20,360.00
PROJECT MANAGEMENT	\$18,400.00
MEETINGS	\$20,290.00
PUBLIC INVOLVEMENT	\$6,180.00
TOTAL DESIGN:	\$269,810.00
CONDITIONAL LETTER OF MAP REVISION	\$20,800.00
INTERIOR DRAINAGE EVALUATION	\$14,640.00
CONSTRUCTION BIDDING SERVICES	\$10,000.00
TOTAL FEE:	\$396,580.00

⁽¹⁾ The Standard Hourly Rates will be adjusted annually to reflect equitable changes in the compensation payable to Engineers.

INTERLOCAL COOPERATION AGREEMENT
Between
THE VILLAGE OF WATERLOO, NEBRASKA
And
PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT
For
WATERLOO LEVEE IMPROVEMENTS ENGINEERING SERVICES

THIS AGREEMENT (hereinafter "**THIS AGREEMENT**") is made by and between the **PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT** (hereinafter "the **NRD**") and the **VILLAGE OF WATERLOO, NEBRASKA** (hereinafter "the **VILLAGE** "), pursuant to the authority provided in the Nebraska Interlocal Cooperation Act (§§13-801, R.R.S., 1997, et seq.)

WHEREAS, in circa 1967, the United States Army Corps of Engineers (hereinafter "**USACE**") constructed the Waterloo Flood Control Project (FCP) levee (hereinafter "the **EXISTING LEVEE**") encircling the **VILLAGE** on lands and easements (hereinafter "the **EXISTING RIGHTS-OF-WAY**"), all generally as depicted in the diagram attached hereto as **Exhibit "A"** and incorporated herein by reference; and,

WHEREAS, a recent evaluation of the **EXISTING LEVEE** for conformance with the requirements of 44 CFR 65.10 was made at the request of the Federal Emergency Management Agency (hereinafter "**FEMA**"), and it was thereby determined that the **EXISTING LEVEE** fails to meet current FEMA freeboard requirements and is required to be improved; and,

WHEREAS, it also has been determined that the present map of the floodplain in the vicinity of the VILLAGE has not been up-dated since the early 1980's; that it is inconsistent with current hydraulic features of the floodplain; and, that newer topographic data is available that could be utilized to improve floodplain modeling information; and,

WHEREAS, the VILLAGE desires to replace the EXISTING LEVEE with a new flood control levee (hereinafter "the **NEW LEVEE**"), evaluated for feasibility and engineered as proposed by JEO Consulting Group, Inc. (hereinafter "the **ENGINEERS**"), in a Scope of Services document dated _____, 2008, a copy of which is attached hereto as Exhibit "B" and incorporated herein by reference; and,

WHEREAS, the VILLAGE requests the financial assistance of the NRD in compensating the ENGINEERS for their engineering services and for the services of their sub-consultants, described in Exhibit "B," (hereinafter the "**ENGINEERING SERVICES**") that are a necessary preliminary part of the project to construct the NEW LEVEE (hereinafter "the **NEW LEVEE PROJECT**"); and, the NRD desires to assist the VILLAGE by partially financing such services of the ENGINEERS and their sub-consultants; and,

WHEREAS, the NRD has authority under §2-3229, R.R.S., Neb., 1997, to "develop and execute, through the exercise of powers and authorities granted by law, plans, facilities, works, and programs relating to * * *, (2) prevention of damages from flood water and sediment, (3) flood prevention and control * * * *."

NOW, THEREFORE, in consideration of the foregoing recitals and the mutual covenants of parties hereinafter expressed, the parties hereby agree as follows:

1. PROJECT BENEFITS. The parties do hereby find and determine that the NEW LEVEE PROJECT will be of general benefit to the VILLAGE and the NRD, with only an incidental special benefit.

2. PROJECT PARTICIPANTS. The ENGINEERING SERVICES shall be obtained by the VILLAGE and partially paid by the NRD, as provided herein, without any separate entity being created, and the duties and responsibilities of the parties to each other with respect to the NEW LEVEE PROJECT shall be as defined by THIS AGREEMENT.

3. THE ENGINEERING CONTRACT. On or before _____, 20 __, the VILLAGE may enter into a professional services contract with the ENGINEERS, in the form as determined by the VILLAGE and approved in writing by the NRD (hereinafter the **ENGINEERING CONTRACT**”), pursuant to which the ENGINEERS shall undertake to perform the ENGINEERING SERVICES, such tasks being generally intended to result in the determination of feasibility for the NEW LEVEE PROJECT and preparation of preliminary and final plans and specifications, including bidding documents (collectively hereinafter “the **PLANS AND SPECIFICATIONS** ”) for construction of the NEW LEVEE PROJECT on the NEW RIGHTS-OF-WAY and EXISTING RIGHTS-OF-WAY, as the ENGINEERS shall reasonably determine. The ENGINEERING CONTRACT also shall include, but shall not be limited to, covenants and conditions providing as follows, to-wit:

- a) The ENGINEERS shall submit to the NRD, for its written approval and concurrence, copies of all deliverables that the ENGINEERING CONTRACT provides for submission by the ENGINEERS to the VILLAGE; and,
- b) The NRD shall be named as an additional insured in all insurance provided to the VILLAGE by the ENGINEERS pursuant to the ENGINEERING CONTRACT.

4. **APPROVAL OF THE PLANS AND SPECIFICATIONS.** Upon the ENGINEERS' completion of the PLANS AND SPECIFICATIONS, and after submission to and approval of the same by the VILLAGE, the PLANS AND SPECIFICATIONS shall be submitted to the NRD for its written comments and written approval, such approval to be refused only for good cause, or else granted within 30 days after the VILLAGE'S written submission thereof to the NRD or deemed to have been waived. Such approval(s) shall not for any purpose be construed as participation by the NRD in the VILLAGE'S design processes or other ENGINEERING SERVICES, nor result in liability on the part of NRD for any negligence in the design of the NEW LEVEE.

5. **NRD CONTRIBUTION.** As the sole contribution of the NRD to the VILLAGE towards costs of the ENGINEERING SERVICES for the NEW LEVEE PROJECT (hereinafter "the **NRD CONTRIBUTION**"), the NRD shall pay to the VILLAGE in installments, within 45 days after the VILLAGE'S respective written demands, one-half (50%) of each of the billings rendered to the VILLAGE by the ENGINEERS for the ENGINEERING SERVICES rendered for the NEW LEVEE PROJECT, including, without limitation, billings for the services of the ENGINEER'S sub-consultants, provided, however, the NRD shall not be responsible to pay or

reimburse to the VILLAGE more than one half (50%) of the ENGINEER'S maximum fee of \$396,580, provided in Exhibit "B," and the VILLAGE shall be solely responsible to pay all other costs and expenses of the ENGINEERING SERVICES for the NEW LEVEE PROJECT without any NRD reimbursement. Grants offsetting costs and expenses of the ENGINEERING SERVICES for the NEW LEVEE PROJECT, received by either of the parties, shall be credited to both parties in equal shares against their respective obligations hereunder for costs and expenses of the ENGINEERING SERVICES for the NEW LEVEE PROJECT.

6. INDEMNIFICATION. Except as otherwise specifically provided in THIS AGREEMENT, the VILLAGE shall defend and indemnify the NRD and hold and save the NRD harmless (a) from and against any and all costs and expenses of the ENGINEERING SERVICES for the NEW LEVEE PROJECT that exceed the NRD'S CONTRIBUTION; (b) from and against any and all claims, demands, damages, causes of action, costs and expenses, including court costs and attorneys fees, for personal injuries or property damages in whole or in part caused by, arising out of or resulting from (1) rendition of the ENGINEERING SERVICES for the NEW LEVEE PROJECT; (2) design and construction of the NEW LEVEE or elements thereof; (3) operation, maintenance, repair, replacement, management or regulation of the NEW LEVEE; or (4) negligence or other actions or inactions of the VILLAGE, its employees, officers, contractors and agents in performance of the ENGINEERING SERVICES for the NEW LEVEE PROJECT (except personal injuries or property damages caused solely by the negligence of the NRD or its employees, officers, contractors or agents); and, (c) from and against all claims, demands, causes of action, costs and expenses, including without limitation costs of investigations, court costs and attorneys fees, arising out of or resulting from the

introduction or presence in or on any EXISTING RIGHTS-OF-WAY or any NEW RIGHTS-OF-WAY of asbestos or any form thereof, or any material or substance listed, defined, designated or otherwise regulated as hazardous, toxic, radioactive or dangerous under the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. Sections 9601-9675, or under any other federal, state or local law, rule, regulation, ordinance, code or order now in effect or hereafter enacted to protect the environment; and, from and against any and all costs and expenses of clean-up and response with respect to any such materials or substances in or on any EXISTING RIGHTS-OF-WAY or NEW RIGHTS-OF-WAY, including, without limitation, costs of any studies and investigations necessary to determine an appropriate response to any contamination in or on the EXISTING RIGHTS-OF-WAY or the NEW RIGHTS-OF-WAY (except costs and expenses relating to any such substances or materials introduced by the NRD or its employees, officers, contractors or agents).

7. VILLAGE APPROVALS. Approvals by the VILLAGE and other VILLAGE actions, contemplated or called for by THIS AGREEMENT, are hereby authorized to be provided by the Chairman of the VILLAGE Board.

8. NRD APPROVALS. Approvals by the NRD and other NRD actions contemplated by or called for by THIS AGREEMENT, are hereby authorized to be provided by the General Manager or Assistant General Manager of the NRD.

9. ENTIRE AGREEMENT. THIS AGREEMENT contains the entire agreement between the parties, and each party hereto agrees that neither the other party, nor any of its officers, agents, or employees, have made any representations or promises with respect to the NEW LEVEE PROJECT not expressly contained herein.

10. TIME. Time is of the essence of THIS AGREEMENT.

11. DEFAULT. If either party shall default hereunder, the other party shall be entitled to enforce specific performance of THIS AGREEMENT or may terminate THIS AGREEMENT.

12. NOTICES. All notices herein required shall be in writing and shall be served on the parties at the addresses set out below, or at such other address as either party may hereafter designate to the other party in writing for service of notice to itself. The mailing of a notice by certified or registered mail, return receipt requested, or delivery thereof by messenger, shall be sufficient service hereunder.

13. BINDING EFFECT. The provisions of THIS AGREEMENT shall inure to the benefit of, and shall be binding upon, the successors in interest and assigns of the respective parties hereto.

14. EFFECTIVE DATE. THIS AGREEMENT shall be in force and effect from and after its execution by the parties hereto and shall have permanent duration.

15. APPLICABLE LAW. Each party to THIS AGREEMENT shall follow all applicable federal and state statutes and regulations in carrying out the faithful performance and terms of THIS AGREEMENT.

16. SEVERABILITY. In the event any portion of THIS AGREEMENT is held invalid or unenforceable for any reason, it is agreed that any such invalidity or unenforceability shall not affect the remainder of THIS AGREEMENT, the remaining provisions shall remain in full force and effect, and any court of competent jurisdiction

may so modify any objectionable provision of THIS AGREEMENT so as to render it valid, reasonable and enforceable.

17. **CAPTIONS.** Captions used in THIS AGREEMENT are for convenience and not for use in the construction of THIS AGREEMENT.

IN WITNESS WHEREOF, the parties have executed THIS AGREEMENT, on the respective dates hereinafter indicated, pursuant to authorizing resolutions duly adopted at regularly-called meetings of their governing bodies.

The VILLAGE has executed THIS AGREEMENT on _____, 2008.

THE VILLAGE OF WATERLOO
P. O Box 127, Waterloo, Nebraska 68069

By _____
Chairman, Village Board

Attest:

Village Clerk

The NRD has executed THIS AGREEMENT on _____, 2008.

**PAPIO-MISSOURI RIVER NATURAL
RESOURCES DISTRICT**
8901 South 154th Street, Omaha, NE 68138-3621

By _____
General Manager

Attachment "1" to Exhibit "A"

**WATERLOO LEVEE IMPROVEMENTS
VILLAGE OF WATERLOO
DRAFT SCOPE OF SERVICES
FOR:**

- 1) FLOODPLAIN STUDY**
- 2) GEOTECHNICAL EVALUATION**
- 3) PRELIMINARY DESIGN OF LEVEE IMPROVEMENTS**
- 4) INTERIOR DRAINAGE EVALUATION**
- 5) CONDITIONAL LETTER OF MAP REVISION**
- 6) FINAL DESIGN OF LEVEE IMPROVEMENTS**
- 7) CONSTRUCTION BIDDING SERVICES**

PROJECT DESCRIPTION:

The Waterloo Flood Control Project (FCP) levee, originally constructed by the U.S. Army Corps of Engineers (USACE) in 1967, was recently evaluated versus 44 CFR 65.10 requirements at the request of the Federal Emergency Management Agency (FEMA). It was determined through this evaluation that the FCP does not meet all current FEMA freeboard requirements. In addition to this, a review of the currently mapped floodplain study revealed that the study has not been updated since the early 1980's and that several inconsistencies exist within the floodplain study information that is currently published versus the current improvements and hydraulic features present within the Elkhorn River floodplain. Also, newer topography data is available that could be utilized to improve the floodplain modeling information.

Due to these issues, a floodplain study will be undertaken in conjunction with preliminary and final design of levee improvements. The goal of the floodplain study will be to provide updated, accurate floodplain information utilizing the tools and data currently available in order to provide accurate information for levee design. The intent is to produce floodplain hydraulic modeling information that could be subsequently utilized for a possible future Letter of Map Revision (LOMR) submittal to FEMA. The revised floodplain information will also be utilized to guide the preliminary and final design of levee improvements. Since the purpose of the flood study is to provide not only design guidance but the basis for a possible future LOMR, a Conditional Letter of Map Revision (CLOMR) will be pursued in order to gain FEMA's approval of the flood study data and proposed improvements.

In conjunction with the floodplain study, preliminary design of improvements to the Waterloo levee will be started in order to identify design alternatives and constructability issues for potential levee improvements at the locations of identified freeboard deficiencies. As part of the preliminary design phase, preliminary construction plans will be produced and a preferred

alternative for final design will be selected. In association with preliminary design and the CLOMR submittal process, an interior drainage evaluation will be performed to identify further any interior drainage deficiencies and in order to meet 44 CFR 65.10 criteria. At this stage, final design of improvements and production of final construction plans will begin. Any deficiencies identified will be accommodated by the final design. Finally, once construction plans and specifications are complete, advertisement and letting of the improvements will be completed and bids accepted and reviewed by JEO and the Village.

Task 1: Floodplain Study

As part of this task, JEO will review existing hydrology data and apply the relevant information to an updated hydraulic analysis along the Elkhorn River adjacent to Waterloo. The hydraulic analysis will utilize the USACE developed HEC-RAS modeling program in conjunction with available LiDAR topography data to produce updated flood elevations for the purposes of levee design. The revised floodplain information will be produced in a manner consistent with LOMR requirements, in the event a LOMR is desired to be completed at the end of the project (note that this scope of services does not include a LOMR submittal).

1.1 Hydrology: The existing hydrology information utilized for the Flood Insurance Study (FIS) along with additional relevant background information will be briefly reviewed for potential modeling concerns. It is anticipated that the existing, published flow rates will be utilized for the purposes of the proposed hydraulic modeling.

1.2 Hydraulics: The data necessary to complete updated hydraulic modeling for the Elkhorn River adjacent to Waterloo will be compiled. The study reach is anticipated to extend from approximately the stream crossing structure at West Dodge Road to upstream of the stream crossing structure on West Maple Road, a distance of approximately 3 river miles. The actual boundary of the upstream end of the study may need to be adjusted based on modeling results and requirements. The following tasks will be performed along the study reach:

- 1.2.1 Obtain LiDAR data for Douglas County
- 1.2.2 Using automated GIS processes, produce preliminary cross section data for the Elkhorn River floodplain utilizing the LiDAR data.
- 1.2.3 Review of historical flooding data and floodplain modeling data to identify key data that may be utilized in the updated flood modeling, if appropriate.
- 1.2.4 Compile and execute a HEC-RAS model for the study reach. The steady state version of HEC-RAS will be utilized for the analysis. All profiles and flows included in the FIS will be modeled.

1.3 Field Data Collection: Supplemental data for the hydraulic analysis will be obtained via field survey and field visits.

- 1.3.1 Field survey for the necessary number of cross sections needed to augment LiDAR produced results will be completed.
- 1.3.2 Field survey to gather data on hydraulic structures such as bridges and culverts within the study reach.
- 1.3.3 Utilizing field visits along the study reach in conjunction with available aerial photography and topography data, identify potential split flow locations as well as modeling parameters such as Manning's n values, etc.

1.4 Summary Report: A report summarizing the results of the hydraulic analysis will be compiled and provide to the Village and NRD.

1.5 Meetings: It is anticipated that three meetings will be performed specifically in conjunction with the floodplain study, in order to coordinate with involved parties (Village of Waterloo, Papio-Missouri NRD, Nebraska DNR, USACE). JEO will provide the agenda and minutes for meetings held outside of public Village Board meetings.

1.6 QA/QC: Internal QA/QC will be performed. In addition to this, an external QA/QC review will be performed by HDR Inc.

Task 2: Geotechnical Evaluation

This task will be completed primarily by Terracon Consulting Engineers and Scientists and is intended to expand upon the preliminary evaluation performed by Terracon Consulting Engineers and Scientists for the Levee Feasibility Evaluation report produced by JEO. It requires additional investigation of the current underlying geotechnical condition of the existing levee in order to ensure that proposed construction tasks identified under the preliminary and final design phases are viable alternatives based on the current condition of the levee. This task also includes ongoing coordination of the geotechnical firm with JEO in order to evaluate preliminary and final design phase information for proper compliance with the geotechnical aspects of the USACE publication EM-1110-2-1913, Levee Design and Construction Manual, as well as the requirements of 44 CFR 65.10.

2.1 Existing Levee Investigation: Terracon will perform additional investigation along the existing levee in order to ensure that no underlying geotechnical deficiencies exist. The locations of the additional investigation will be coordinated versus investigations already completed by Terracon Consulting Engineers and Scientists, Inc.

- 2.1.1 Borings will be performed as required to adequately evaluate the existing levee.
- 2.1.2 Impervious clay materials along the side slopes of the existing levee will be verified at selected locations.
- 2.1.3 Appropriate laboratory testing of boring samples will be performed.
- 2.1.4 A summary report of the findings will be provided to JEO, the Village and the NRD. The summary report will include properties of the underlying soil as well

as underseepage, slope stability, and settlement evaluations as required per 44 CFR 65.10. The summary report will include Terracon's previously completed geotechnical evaluation findings and will identify specifically which segments of the existing levee do or do not meet the 44 CFR 65.10 certification requirements. If a segment does not meet the requirements, the deficiencies and necessary improvements will be identified.

2.1.5 HDR Inc will provide QA/QC for the existing levee evaluation.

2.2 Levee Improvement Design Alternatives: Terracon will provide review of JEO design alternatives during preliminary and final design of improvements and will assist JEO with identifying any potential concerns related to the geotechnical information in the summary report, associated USACE design criteria, and associated 44 CFR 65.10 criteria. Field investigations will be performed as required for the design process.

2.2.1 Borings will be performed as required to adequately evaluate proposed levee alignment(s).

2.2.2 Preliminary and final design alternatives will be evaluated for consistency with required USACE and FEMA design criteria.

Task 3: Preliminary Design

During this task, JEO will develop the preliminary design of levee improvements based on the project background information, survey data, geotechnical investigation report, and hydraulic analysis. JEO will then review the preliminary design of the levee with the stakeholders (NRD, NDOR, UPRR, DNR, and Waterloo).

3.1 Kick off meeting: A design phase kick-off meeting will be held with the Village and NRD to discuss the scope and nature of the project, and to refine the goals and objectives. JEO will identify interested public and private agencies or persons who will need to be consulted about various aspects of the project. JEO will provide the agenda and minutes from the meeting(s). Prior to the project kick-off meeting, the JEO team will provide a detailed schedule and project management plan.

3.2 Gather, compile and review background information: Review detailed historical levee information that could impact the design process, including:

3.2.1 Waterloo FCP design memorandum and O&M manual, produced by the USACE.

3.2.2 Available floodplain modeling information, including the updated modeling to be produced by JEO.

3.2.3 Available GIS data, maps and aerial photos.

3.2.4 Review available geotechnical information.

3.2.5 Review available, recent levee inspections by the USACE.

3.3 Field Data Collection: Site visits and field survey will be performed in order to identify all existing levee system features and to profile the existing levee.

- 3.3.1 Site visit by engineering staff to identify any maintenance deficiencies or specific features of note.
- 3.3.2 Field survey by survey crews to provide profiles and cross sections of existing improvements. Field survey efforts will be directed by the project engineer based on design information requirements.
- 3.3.3 Field survey data will be referenced to NAVD 88 vertical datum and state plane horizontal coordinates.
- 3.3.4 Sufficient temporary control points will be established in order to allow for consistency of survey efforts throughout the design and construction process.
- 3.3.5 Conduct a preliminary site evaluation to locate potential wetland sites within the preliminary design evaluation area and identify locations requiring potential USACE 404 permitting. Coordinate with the USACE to obtain jurisdictional determination for identified site(s).

3.4 Preliminary Design Plans: Levee improvements will be designed with the intent of meeting the requirements of 44 CFR 65.10 as well as correcting any deficiencies identified by recent USACE levee inspections. A preferred levee alignment alternative will be identified via discussions with the Village, NRD, UPRR and NDOR. Preliminary design plan sets will be developed for the levee and submitted for review and comments at the 30%, 60% and 90% completion stages. An opinion on the probable construction cost at the 30%, 60% and 90% completion stages will also be prepared and submitted. The review comments will be incorporated into the final design. If necessary, a meeting will be held with the Village, NRD, and other stakeholders to discuss and address the review comments.

- 3.4.1 Coordinate with the Village, NRD, NDOR, UPRR and USACE on all matters affecting the design, including typical design layouts and CADD standards prior to setting up the design sheets.
- 3.4.2 Meeting to discuss possible alignments of the improved levee and identify a preferred alignment.
- 3.4.3 Prepare preliminary layout of proposed improvements.
- 3.4.4 Arrange coordination meetings with Village, NRD, NDOR, UPRR and USACE staff at the 30% submittal, 60% submittal and 90% submittal draft Plans, Specifications and Estimate (PS&E) stages. Submit 5 sets of 11 x 17 size plans approximately 15 days prior to each coordination meeting and an electronic copy if requested. The plans will be also submitted to the Nebraska DNR.
- 3.4.5 An opinion on the probable construction cost at the 30%, 60% and 90% completion stages will also be prepared and submitted.
- 3.4.6 Conduct a field plan-in-hand review of the design with the project team and appropriate stakeholders when plans are at the 30% and 90% submittal stage.

- 3.4.7 Provide a set of 11" x 17" plans to the stakeholders 10 days prior to the scheduled plan-in-hand meetings.
- 3.4.8 Prepare all easement descriptions, as required.
- 3.4.9 Submit easement and right of way descriptions prior to the second plan submittal.
- 3.4.10 HDR Inc will provide QA/QC of the preliminary design plans.

Task 4: Interior Drainage Study

This task involves evaluation of available data to determine drainage performance during the 100-year storm as required by 44 CFR 65.10. It will be performed in conjunction with preliminary design in order to identify any concerns that may impact the design and will be finalized in coordination with the 60% plans for the purposes of providing the interior drainage data with the CLOMR submittal.

- 4.1 Gather, compile and review background information: Existing interior drainage and topography data will be compiled and reviewed.
- 4.2 Drainage Analysis: Interior flooding during the 100-year storm will be evaluated.
 - 4.2.1 Evaluate interior drainage conditions for the 100-year storm and identify any deficiencies.
 - 4.2.2 Identify ponded areas (if applicable) that must be reserved in order for the interior drainage system to function properly during the 100-year storm.
- 4.3 Summary report: Provide a detailed summary report of the drainage analysis findings.

Task 5: Conditional Letter of Map Revision (CLOMR)

This task involves preparation and submittal of the documentation necessary to meet FEMA requirements for submittal of a CLOMR. The purpose of the CLOMR is intended to obtain FEMA's concurrence on the hydraulic modeling of existing and proposed conditions, as well as the proposed levee improvements. It is not expected to require detailed floodplain mapping as part of the submittal requirements. It is anticipated that this task will occur in association with the latter stages of preliminary design.

- 5.1 CLOMR submittal and review: CLOMR documentation will be compiled and submitted to FEMA for processing, via the Village.
 - 5.1.1 Update HEC-RAS model based on 60% preliminary design plans to reflect proposed as-built conditions and overall levee design. The modeling submitted will include the existing conditions hydraulic model and a proposed conditions hydraulic model revised to reflect the proposed levee design improvements.
 - 5.1.2 Run CHECK-RAS program for the hydraulic model as required in order to meet CLOMR submittal requirements.
 - 5.1.3 Provide a draft CLOMR submittal to the NRD and Village for review and comment. Incorporate comments into the final CLOMR submittal. This task includes one meeting with the NRD and Village to review and discuss the components of the CLOMR and procedures for the proposed submittal to FEMA.

- 5.1.4 Provide final CLOMR submittal documentation as required in order to meet FEMA requirements. (Note that this task does not include detailed floodplain mapping. If this task is required by FEMA, an amendment will be necessary.) It is anticipated that the interior drainage evaluation will also be completed for submittal with the CLOMR. Note that updates to the levee O&M manual are not anticipated to be completed for the CLOMR submittal. The final CLOMR package will be provided to the Village for submittal to FEMA for review. It is anticipated that the Village will pay any necessary FEMA CLOMR review fees and these fees are not included JEO's proposed fee for this task.
- 5.1.5 Coordinate with FEMA to discuss review comments, as necessary. This task includes response to review comments that are minor in nature and only requiring additional explanation or details regarding existing analysis data. If significant additional analysis is required by FEMA, an amendment may be necessary.

Task 6: Final Plans, Specifications and Cost Opinion

During this task, JEO will produce final plans based on the preliminary design.

6.1 Final Design Plans and Cost Opinion: Based on the input received from the preliminary design reviews, we will refine the preliminary design and proceed with the development of final construction plans and specifications. These will be supplemented by additional drawings or specification notes on the drawings to provide full installation instructions. Standard drawing sheet sizes will be used. The final plans will be submitted to the Village, NRD, USACE, UPRR and (if applicable) NDOR for final review and approval. The tasks will include, but may not be limited to:

- 6.1.1 Prepare detailed final plans, specifications and special provisions.
- 6.1.2 Elements shown on the plans will include: cross sections where necessary, plan and profiles, removals (including trees), drainage structure details, closure structure details, quantities, and construction phasing. The plans will also include horizontal & vertical control and lateral profile sheets.
- 6.1.3 Utilities and utility conflicts will be shown on the plan and profile sheets.
- 6.1.4 Prepare and show on the plans all easements and ROW acquisitions. The Village will be responsible for negotiating all ROW and land acquisitions required.
- 6.1.5 Submit final signed drawings. Include a copy on a computer disk in Microstation format.
- 6.1.6 Provide final plans and specifications to project stakeholders, funding agencies, and regulatory agencies.
- 6.1.7 Submit any special provisions required on paper and an electronic copy.
- 6.1.8 Submit a final opinion of probable construction cost.
- 6.1.9 HDR Inc will provide QA/QC of the final design plans.

Task 7: Bidding Documents and Bid Letting

This task includes the process of assisting the Village to advertise and let the proposed levee improvements. Necessary associated bidding documents will be prepared.

7.1 Bidding Documents and Bid Letting: The following tasks will be performed:

- 7.1.1 Prepare forms for contract documents including proposals, advertisements for bids, construction contracts, and payment and performance bonds as required, all subject to the approval of the Village Board.
- 7.1.2 Complete the necessary bid documents and contracts.
- 7.1.3 Furnish plans, specifications, and contract documents of the project to prospective bidders at a cost to contractors.
- 7.1.4 Attend the pre-bid meeting & site showing to answer questions.
- 7.1.5 Conduct the bid opening, tabulation of construction bids and recommend the most cost effective bid to the Village.

Task 8: Public Involvement

This task involves participating in Village activities to inform the public of the results of the flood study and the process of the levee improvements design.

8.1 Public Meetings: JEO will assist the Village and the NRD with conducting three (3) public meetings throughout the study and design process.

Task 9: Project Management

This task includes all project duties related to project and schedule management.

9.1 Project Management: A project management plan and monthly progress reports will be produced. Also, routine project management and coordination tasks will be performed during the anticipated time frame for the project per the proposed schedule.

- 9.1.1 A Project Management Plan will be provided to the Village and NRD.
- 9.1.2 Bi-monthly progress reports will be prepared and submitted to the Village and NRD.
- 9.1.3 Perform routine project management tasks and general project coordination (not including meetings) with the Village and relevant stakeholders.

Task 10: Permitting / Regulating agencies

This task involves coordination and paperwork required for obtaining necessary permits for construction of proposed improvements.

10.1 Permits: Appropriate permitting processes and coordination for construction of the project will be completed through the design process.

- 10.1.1 404
- 10.1.2 USACE levee design review
- 10.1.3 NDEQ (NPDES)
- 10.1.4 Local (Floodplain, etc.)
- 10.1.5 NDOR
- 10.1.6 Union Pacific Railroad (UPRR)
- 10.1.7 FEMA

Task 11: Key Design Meetings

This task includes the calculated fee for the estimated number of design meetings required, as shown below (note that meetings for the floodplain study are included in Task 1, a meeting for the CLOMR is included in Task 4, and public meetings are included in Task 9).

11.1 Key Design Meetings: The following meetings will be held.

- 11.1.1 Kick-off meeting (1 meeting)
- 11.1.2 Progress meetings (5 meetings)
- 11.1.3 Presentation of plans to Village Board and NRD (2 meetings)
- 11.1.4 Stakeholder coordination (NDOR, DNR, UPRR, USACE) meetings (8 meetings)
- 11.1.5 Plan in hand review meetings (2 meetings)

Task 12: Deliverables

This task describes the deliverables that JEO will provide throughout the course of the project. The fee for the referenced deliverables is covered under the previously described tasks.

12.1 Deliverables: The following deliverables will be provided.

- 12.1.1 Project Management Plan
- 12.1.2 Bi-monthly Progress Reports
- 12.1.3 Flood Study Report
- 12.1.4 CLOMR Submittal
- 12.1.5 Plans and Specifications
- 12.1.6 Bidding Documents
- 12.1.7 Geotechnical Report (to be completed by geotechnical firm)
- 12.1.8 Design Memorandum
- 12.1.9 Internal Drainage Study Summary Report

PROPOSED PROJECT SCHEDULE

Floodplain Study	June 2008 to September 2008
Geotechnical Evaluation	July 2008 to March 2009
Preliminary Design of Levee Improvements	July 2008 to December 2008
Interior Drainage Evaluation	August 2008 to October 2008
Conditional Letter of Map Revision	October 2008 to March 2009
Final Design of Levee Improvements	January 2009 to March 2009
Construction Bidding Services	March 2009

** Note: Project schedule is dependent upon timely reviews by regulatory agencies and stakeholders*

PROJECT FEE⁽¹⁾

FLOODPLAIN STUDY	\$61,330.00
GEOTECHNICAL EVALUATION	\$20,000.00
DESIGN	
PRELIMINARY DESIGN PLANS	\$117,500.00
FINAL DESIGN PLANS	\$70,300.00
SURVEY	\$16,780.00
PERMITTING	\$20,360.00
PROJECT MANAGEMENT	\$18,400.00
MEETINGS	\$20,290.00
PUBLIC INVOLVEMENT	\$6,180.00
TOTAL DESIGN:	\$269,810.00
CONDITIONAL LETTER OF MAP REVISION	\$20,800.00
INTERIOR DRAINAGE EVALUATION	\$14,640.00
CONSTRUCTION BIDDING SERVICES	\$10,000.00
TOTAL FEE:	\$396,580.00

⁽¹⁾ The Standard Hourly Rates will be adjusted annually to reflect equitable changes in the compensation payable to Engineers.

SERVICES NOT INCLUDED: (If necessary, a fee for these services can be negotiated)

- A. Additional site visits/meeting by ENGINEER.
- B. Detailed floodplain mapping or O&M Manual updates for the CLOMR submittal.
- C. Interior drainage evaluation beyond the minimum required to meet 44 CFR 65.10 requirements.
- D. Coordination of securing funding or agreements from outside parties.
- E. Administration of the project funding.
- F. Negotiation of right-of-way and/or easements.
- G. Production of necessary updates to O&M manuals and procedures.
- H. Construction administration and observation (will be negotiated at a later date).
- I. Project management and coordination tasks beyond the scheduled project completion period.
- J. Significant design alterations due to comments by stakeholder and permitting agencies that occur during review of the final plans and specifications (i.e., after comments from the 90% plan review stage have been responded to).
- K. Final levee certification. Final steps for certification must be taken during and after construction in order for certification to be provided, including O&M manual and procedures updates, final geotechnical evaluation, and production of as-built plans.

OWNER TO PROVIDE:

- A. Provide timely review, all criteria and full information as to project requirements.
- B. Provide all land ownership and right-of-way information and/or deeds.
- C. Village will notify and acquire permission from landowners for surveys and geotechnical work.

DRAFT

Levee Feasibility Evaluation

Waterloo, Nebraska



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JEO Project #613D4
April, 2008

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APPENDICIES

(TO BE INCLUDED WITH FINAL REPORT)

APPENDIX A – PHOTOGRAPHS OF STUDY AREA

APPENDIX B – SUPPORTING BACKGROUND INFORMATION

APPENDIX C – DETAILED OPINIONS OF COST

APPENDIX D – GEOTECHNICAL REPORT (COMPLETED BY TERRACON)

1.0 - INTRODUCTION

As part of floodplain re-mapping efforts for the Village of Waterloo area, the Federal Emergency Management Agency (FEMA) has identified that the Waterloo Flood Control Project (FCP) levee is shown as providing 100-year flood protection on the Flood Insurance Rate Map (FIRM) for the Village of Waterloo. However, it is not known whether or not the Waterloo levee meets the criteria as specified in 44 CFR (Code of Federal Regulations) 65.10 for the purposes of continuing to be shown as providing 100-year flood protection on the updated floodplain maps for Waterloo. Therefore, FEMA is requesting documentation that these criteria are met in order to continue to map the Waterloo levee as providing 100-year flood protection. Due to this, an evaluation of the current available levee data and its ability to meet the requirements of 44 CFR 65.10 was completed by JEO Consulting Group, Inc. An overview of the study area can be seen in the following Figure 1 – Study Area.

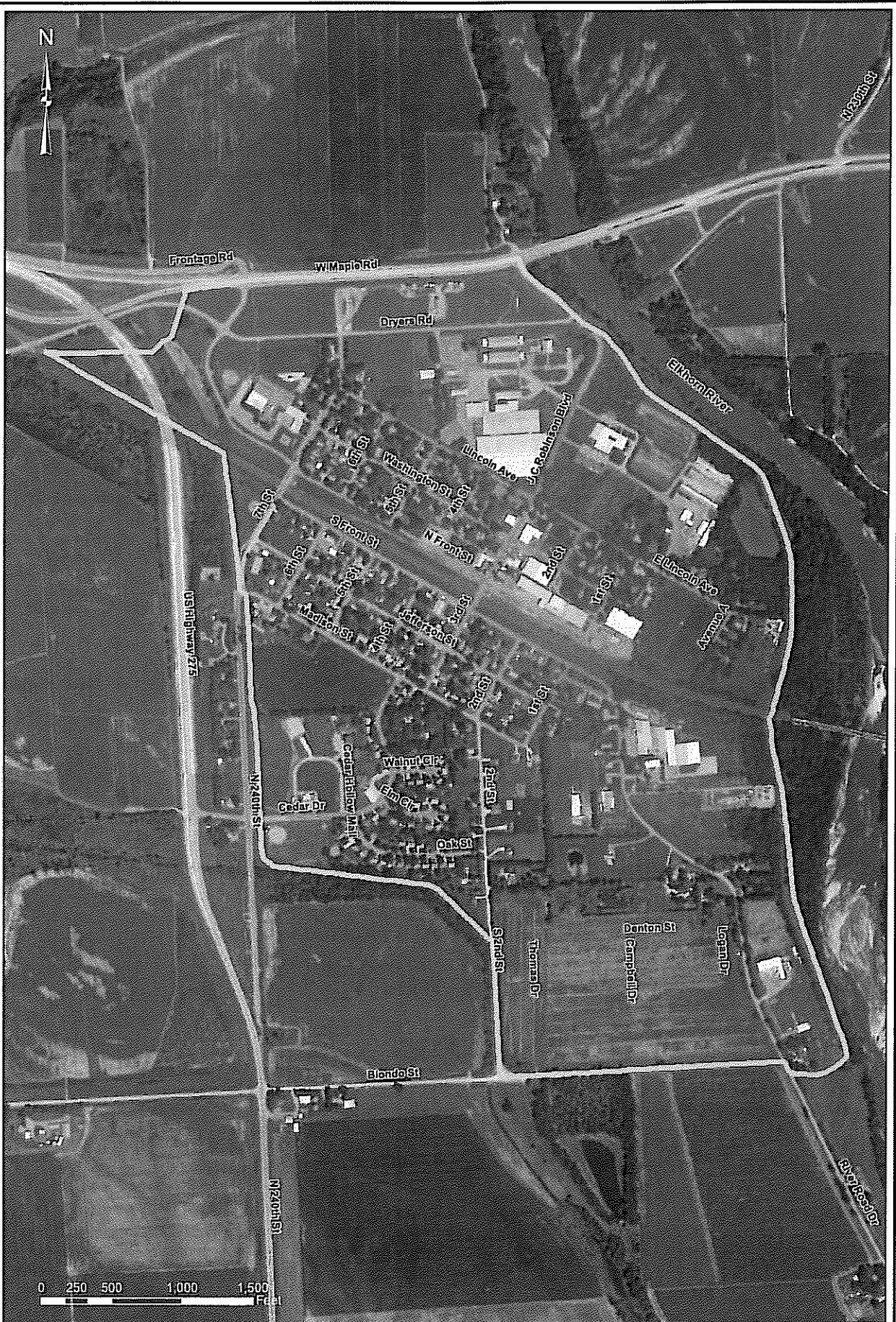
2.0 - LEVEE HISTORY AND BACKGROUND DATA

The Waterloo FCP was designed and constructed by the U.S. Army Corps of Engineers (USACE) in 1967 with as-builts dated February, 1968. After construction, responsibility for maintenance and oversight of the levee was transferred to the Village of Waterloo. Waterloo has been and currently is an active participant in the USACE PL 84-99 program, which provides for annual inspection by the USACE along with general coordination with the USACE regarding levee inspection and maintenance issues.

The Village of Waterloo is currently in the process of evaluating the levee for continuing accreditation on FEMA floodplain maps for the Village. As part of a floodplain mapping update process for the Waterloo area, FEMA identified that there was not enough information about the levee that was immediately available to FEMA in order to determine whether it can continue to be accredited on the Village's Flood Insurance Rate Map (FIRM).

Due to this, Waterloo entered the Provisionally Accredited Levee (PAL) process with FEMA effective January 15th, 2008. This is a prescribed process that FEMA is currently using in association with floodplain map updates where the status of a levee for the purposes of being shown as providing 100-year flood protection on the FIRM is unknown. Under this process, Waterloo was given a two year time window starting January 15th, 2008 to provide the necessary data needed to accredit the levee on the FIRM and provide required certification from a professional engineer. In the meantime, there is a PAL designation placed on the FIRM for the Village that identifies that there are uncertainties to the flood protection information shown. Also, there is a PAL agreement that states that if the required certification information is not provided or cannot be provided, the floodplain will be re-mapped and this will potentially affect areas behind the levee. The end result of this would likely be mandatory purchase of flood insurance requirements for properties behind the levee that have not previously been subject to this requirement. The PAL agreement and associated documentation can be found in Appendix B.

The following information describes briefly the status of the additional background data available that is relevant to the evaluation of the levee.



2.1 - LEVEE DESIGN

Detailed design data is available in the Design Memorandum dated July, 1957 and the supplemental information to the Design Memorandum dated February, 1964. The most current as-built data is available in the Operation and Maintenance Manual produced by the USACE in 1983.

2.2 - LEVEE OPERATION AND MAINTENANCE AND FLOOD WARNING SYSTEMS

Detailed Operation and Maintenance information is available in the Operation and Maintenance Manual produced by the USACE in 1983. There does not appear to be a formal flood warning system installed in conjunction with the levee.

2.3 - LEVEE INSPECTIONS

Levee inspections completed recently by the USACE and the Village of Waterloo under the PL 84-99 program show that under current levee inspection criteria, the Waterloo levee is in generally good condition. There are some areas of concern related to vegetation that have been identified as requiring woody vegetation removal, and a few areas of encroachment on internal drainage paths. The levee was given a rating of Minimally Acceptable during the last inspection by the USACE. The results of the most recent inspection are provided in the attached Appendix B.

2.4 - INTERIOR DRAINAGE

There are not formal areas designated to accommodate interior drainage during a flood event, and a formal interior drainage plan is not available.

2.5 - FLOODPLAIN INFORMATION

Effective December 2, 2005 the FIRM and FIS for Douglas County, including the Waterloo area, was updated by FEMA. FEMA is currently in the process of updating the floodplain maps for streams near the Village of Waterloo on the current FIRM for Waterloo (this does not include the Elkhorn River, immediately adjacent to the Village). These flood map updates triggered the PAL process for Waterloo due to the fact that the streams with floodplain map updates occurring are shown on the same FIRM map panel as Waterloo. It should be noted also that while the FIRM and FIS were updated in certain respects in 2005, these updates did not constitute a complete re-study of the Elkhorn River floodplain. In fact, the updates were primarily to improve the usability of the FIRM and to meet modern FEMA flood mapping standards. They also served to update the vertical datum used for the flood elevations to NAVD 88 from NGVD 29, on older survey standard. Based on the FIS, the basic flood map information is still primarily based on studies completed between 1978 and 1987.

Any floodplain mapping effort involves utilization of hydrology (amount of flow), hydraulics (how the water flows), and topography (shape of the land) information. The type and usage of this information affects the quality and usefulness of the flood study results. Based on the FIS, for the Village of Waterloo area, the 100-year flood flow utilized was 88,500 cfs. The hydraulic modeling was completed using the USACE's HEC-2 computer software and utilized 10-foot contours for the purposes of delineating the floodplain boundaries. Further discussion of how the methods used for floodplain modeling and delineation affects the evaluation of the levee is provided in the Section 5.0 – Alternatives and Recommendations for Improvement.

3.0 - LEVEE CERTIFICATION CRITERIA

The certification criteria defined in 44 CFR 65.10 provide specific requirements that must be met in order for a levee to be accredited as providing protection from the 100-year flood on a community's FIRM. These requirements are broken into several categories, including but not limited to: Design Criteria, Operation Plan, Interior Drainage Plan, and Maintenance Plan. They also provide for specific information that must be submitted in order to accredit the levee on the FIRM for a community. A brief overview of each category and the primary components of the requirements are provided below. Detailed descriptions of the criteria are provided in the FEMA publication 'Meeting the Criteria for Accrediting Levees on Flood Maps: How-to-Guide for Floodplain Managers and Engineers' as well as in the official version of 44 CFR 65.10, both of which can be found in Appendix B.

For the purposes of this report, available background data for the Waterloo levee were reviewed and evaluated for the purposes of determining certifiability of the levee. In order to augment the background data, a walk through was completed on March 3, 2008 and photographs were collected that are provided in Appendix A on the enclosed CD. Field survey of existing levee centerline elevations was also obtained, as well as preliminary geotechnical data which was obtained by Terracon Consulting Engineers and Scientists. Finally, available flood elevation data were obtained from the FIRM and FIS distributed to the Village by FEMA on December 2, 2005 for the purposes of comparing the published flood elevations to the existing elevations of the levee. The following criteria descriptions indicate the items that must be either currently in place or implemented in order for the levee to be certified and subsequently accredited as providing protection from the 100-year flood on the FIRM for Waterloo. Also noted under each category is the basic evaluation approach used for that group of items for the purposes of this report.

3.1 - DESIGN CRITERIA

For the design criteria items, the evaluation was completed via a variety of methods, including review of existing design information in the 1957 USACE design memorandum and associated 1964 supplement, as-built drawings in the USACE 1983 Operation and Maintenance manual documentation for the levee, as well as levee elevation survey data and the best available floodplain information. Also, preliminary geotechnical investigations were completed by Terracon. The level of detail varied based on the importance of each item in terms of its effect on certifiability of the levee.

- Freeboard – Freeboard is additional height of the levee above the 100-year flood elevation. There are two potential ways to evaluate freeboard requirements:
 - Standard method - the amount of freeboard required is 3.5 feet at the upstream end (north in the case of Waterloo) tapering to no less than 3 feet at the downstream end (south). Also, 4 feet of freeboard is required for the 100 feet both up- and downstream of major drainage structures. In the case of Waterloo, this requirement was applied at the bridges on the Elkhorn River along HWY 64 and at the railroad. This is the method that was utilized for this evaluation.
 - Risk analysis method – The USACE has developed a process which can be used to evaluate levee freeboard requirements based on the uncertainties in available floodplain and levee data. This process involves numerous inputs and requires current flood study background information to be effective. The results determined are based on statistical analysis of the inputs and could indicate a lower or higher minimum freeboard requirement for the subject levee. However, per 44 CFR 65.10 the minimum freeboard requirement that FEMA will accept is 2 feet.
- Closures – All openings for roads and railroads must be provided with closure devices (i.e., flood gates) that are structural parts of the system.
- Embankment Protection – Engineering analyses must be submitted that show that the levee will not be eroded during flooding conditions.
- Embankment and Foundation Stability Analyses – Analyses must be submitted that evaluate expected seepage during the 100-year flood and that demonstrate that any seepage will not jeopardize embankment or foundation stability of the levee.
- Settlement Analyses – Analysis must be provided that evaluates future losses of freeboard due to settlement.
- Interior Drainage – Analysis must be provided that assesses interior drainage and flooding based on concurrent interior and exterior flooding.

3.2 - OPERATION PLAN

For the operation plan requirements, all items were evaluated based on existing as-built drawings and the U.S. Army Corps of Engineers 1983 Operation and Maintenance manual documentation for the levee.

- Flood Warning System – Documentation of the flood warning system and procedures used must be supplied and it must be demonstrated that sufficient warning time exists to operate and seal all closure structures.
- Plan of Operation – A formal operation plan with responsibility assignments must be supplied.
- Periodic Operation of Closures – Provisions must be in place to provide for periodic operation of the closure structures at not less than one year intervals.

3.3 - INTERIOR DRAINAGE PLAN

For items related to interior drainage, existing plans and procedures were reviewed to the extent possible and discussed with Village Staff. Also, existing aerial photographs and topography maps were reviewed to identify interior drainage flood storage opportunity areas for future evaluation and potential inclusion in the interior drainage plan.

- Flood Warning System - Documentation of the flood warning system and procedures used must be supplied and it must be demonstrated that sufficient warning time exists to operate the pumping system.
- Plan of Operation - A formal operation plan with responsibility assignments must be supplied.
- Manual Backup – Requires provision for manual backup for automatic systems, if necessary.
- Periodic Inspection – Provisions for periodic inspection and testing of interior drainage systems and equipment on a yearly basis.

3.4 - MAINTENANCE PLAN

For items related to the maintenance plan, existing plans and procedures, as well as the U.S. Army Corps of Engineers 1983 Operation and Maintenance manual were reviewed.

- Levee Operations - Levee systems must be maintained in accordance with an officially adopted maintenance plan that is current.
- Jurisdiction - All maintenance activities must meet certain jurisdictional requirements. As a National Flood Insurance Program (NFIP) participating community, Waterloo meets this requirement.
- Plan Adoption - The official maintenance plan must identify formal procedures for maintenance and specify the required activities, frequency of performing those activities, and personnel responsible for completion of the maintenance.

3.5 - CERTIFICATION

- All certification data submitted must be certified by a Professional Engineer or a Federal agency.
- Certified as-built levee plans must be included in the submittal.

4.0 - LEVEE CERTIFICATION CRITERIA RESULTS

The information obtained during the evaluation of the levee as well as the implications of the findings are presented in detail in this section. Action alternatives, potential levee improvements, and recommended next steps are then discussed in subsequent sections. Finally, a brief discussion of potential future regulatory issues and flood insurance implications and potential related public outreach activities is also provided in later sections to give additional context for the decision making process that the Village of Waterloo will need to complete.

The following Table 1 – Levee Certification Criteria Results provides a summary of the results of the evaluation of each certification criteria category. A detailed description of the results is provided following the table.

Table 1: Levee Certification Criteria Results				
Category	Item	Meets Certification Criteria (Y/N)	Primary Deficiency Areas	Actions Required to Meet Certification Criteria
Design Criteria	Freeboard	N	Below current freeboard requirement at most locations along the south, west, and north; see Figure 2 - Freeboard Sufficiency	Increase levee embankment to meet freeboard requirements
Design Criteria	Closures	N	Closure status in the area of the railroad crossing in the northwest needs to be upgraded	Retrofit of this area to ensure that closures meet the structural requirements and operate properly
Design Criteria	Embankment Protection	Not Known	Not evaluated, this will be evaluated as part of a design and improvement effort	Evaluate during levee improvement process
Design Criteria	Embankment and Foundation Stability	Y (Preliminary)	One area of potential underseepage concern immediately adjacent to the River was identified	Further, more detailed evaluation is needed to provide assurance that these items are acceptable throughout
Design Criteria	Settlement Analyses	Y (Preliminary)	Some areas of minor concern identified, no major concerns noted	Further, more detailed evaluation is needed to provide assurance that these items are acceptable throughout
Design Criteria	Interior Drainage	N	No detailed internal drainage evaluation and plan	Complete evaluation and adopt internal drainage plan
Operation Plan	Flood Warning System	N	No formally adopted plan	Formulate and adopt a formal plan
Operation Plan	Plan of Operation	N	No current formal plan	Formulate and adopt a formal plan
Operation Plan	Periodic Operation of Closures	N	No current formal plan	Formulate and adopt a formal plan
Interior Drainage Plan	Flood Warning System	N	No current formal plan	Formulate and adopt a formal plan
Interior Drainage Plan	Plan of Operation	N	No current formal plan	Formulate and adopt a formal plan
Interior Drainage Plan	Manual Backup	N	No current formal plan	Formulate and adopt a formal plan
Interior Drainage Plan	Periodic Operation of Closures	N	No current formal plan	Formulate and adopt a formal plan
Maintenance Plan	Levee Operations	N	No current formal plan	Formulate and adopt a formal plan
Maintenance Plan	Jurisdiction	Y	None	None
Maintenance Plan	Plan Adoption	N	No current formal plan	Formulate and adopt a formal plan
Certification	Certification Qualifications	TBD	Professional Engineer Certification required	Obtain certification once criteria are met
Certification	Submittal Requirements	N	As-built levee plans required	Produce as-builts following improvements

4.1 - DESIGN CRITERIA

- Freeboard – Freeboard was evaluated by comparing field survey data for the levee elevations to the 100-year flood elevation data to determine the amount of existing freeboard vs. that which is required by 44 CFR 65.10 as described in Section 3.1 – Design Criteria. The results were utilized to produce a levee freeboard sufficiency map, which is provided below in Figure 2 – Freeboard Sufficiency. As is demonstrated by the map, the levee does not meet the 44 CFR 65.10 freeboard requirements at all locations. There are several potential reasons that there is a freeboard deficiency:
 - The levee was originally designed to have two feet of freeboard, but requirements implemented by FEMA with the passage of 44 CFR 65.10 in 1986 require more than three feet at certain locations, as described in Section 3.1 – Design Criteria.
 - Settlement of the levee embankment may have occurred over the past 40+ years since the levee was originally constructed.
- Closures – The area of the railroad in the northwest section of town does not have an adequate closure system.
- Embankment Protection – This analysis was not completed under the scope of this evaluation. Due to the detailed nature of this analysis and the fact that there were freeboard deficiencies identified, it is planned that this step will be completed in conjunction with any levee improvements if any improvement alternatives are selected (the alternatives are described in Section 5.0 – Alternatives and Recommendations for Improvement). Any deficiencies in this area can then be accommodated at that time through the design process.
- Embankment and Foundation Stability Analyses – A preliminary evaluation of these items is included with the geotechnical investigation report provided by Terracon.
- Settlement Analyses – A preliminary evaluation of these items is included with the geotechnical investigation report provided by Terracon.
- Interior Drainage – Interior drainage flood storage opportunity areas were preliminarily identified based on aerial photographs and are shown in Figure 3 – Interior Drainage Opportunity Areas on page 13. It should be noted that these areas show general regions and do not necessarily reflect all specific potential internal drainage conflicts. Village staff is generally aware of what is required to be done to accommodate interior drainage during a flood event; however, there do not appear to be any formally adopted interior drainage studies, plans or procedures.

4.2 - OPERATION PLAN

For the operation plan requirements, all items were evaluated based on existing as-built drawings and the U.S. Army Corps of Engineers 1983 Operation and Maintenance manual documentation for the levee.

- Flood Warning System – Village staff is aware of what is required to be done to obtain the required flood warning information via standard news sources and coordination with adjacent communities as well as the Papio Missouri NRD. They are also aware of the procedures used to install the closure structures. However, there is not a flood warning system or formally adopted procedure in place at this time.
- Plan of Operation – Village staff is aware of what is required to be done to operate and inspect the levee. Inspections are also completed under the PL 84-99 program. However, it does not appear that there is a formal operation plan in place beyond the general recommendations in the 1983 Operation and Maintenance manual.
- Periodic Operation of Closures – Village staff is aware of what is required to be done to periodically inspect and operate closures. Inspections are also completed under the PL 84-99 program. However, it does not appear that there is a formal maintenance and training schedule in place beyond the general recommendations in the 1983 Operation and Maintenance manual.

4.3 - INTERIOR DRAINAGE PLAN

For items related to interior drainage, existing plans and procedures were reviewed to the extent possible and discussed with Village staff. Also, existing aerial photographs and topography maps were reviewed to identify interior drainage flood storage opportunity areas for future evaluation and potential inclusion in the interior drainage plan. A map showing these opportunity areas is provided in Figure 3 – Interior Drainage Opportunity Areas on page 13. It should be noted that these areas show general regions and do not necessarily reflect all specific potential internal drainage conflicts.

- Flood Warning System - Village staff is aware of what is required to be done to obtain the required flood warning information via standard news sources and coordination with adjacent communities as well as the Papio-Missouri NRD. However, there is not a flood warning system or formally adopted procedure in place at this time.
- Plan of Operation - Village staff is aware of what is required to be done to operate interior drainage components of the levee. However, it does not appear that there is a formal operation plan in place beyond the general recommendations in the 1983 Operation and Maintenance manual.
- Manual Backup – There are no automatic systems associated with the levee.
- Periodic Inspection – Village staff is aware of what is required to be done to periodically inspect and operate interior drainage systems. Inspections are also completed under the PL 84-99 program. However, it does not appear that there is a formal maintenance and training schedule in place beyond the general recommendations in the 1983 Operation and Maintenance manual.

4.4 - MAINTENANCE PLAN

For items related to the maintenance plan, existing plans and procedures, as well as the U.S. Army Corps of Engineers 1983 Operation and Maintenance manual were reviewed.

- Levee Operations - Village staff is aware of what is required to be done to periodically inspect and maintain the levee. However, it does not appear that there is a formal maintenance plan adopted beyond the general recommendations in the 1983 Operation and Maintenance manual and the routine yearly USACE inspections.
- Jurisdiction - All maintenance activities must meet certain jurisdictional requirements. As a National Flood Insurance Program (NFIP) participating community, Waterloo meets this requirement.
- Plan Adoption - There is not a formally designed and adopted official maintenance plan that meets the specific recommended FEMA criteria.

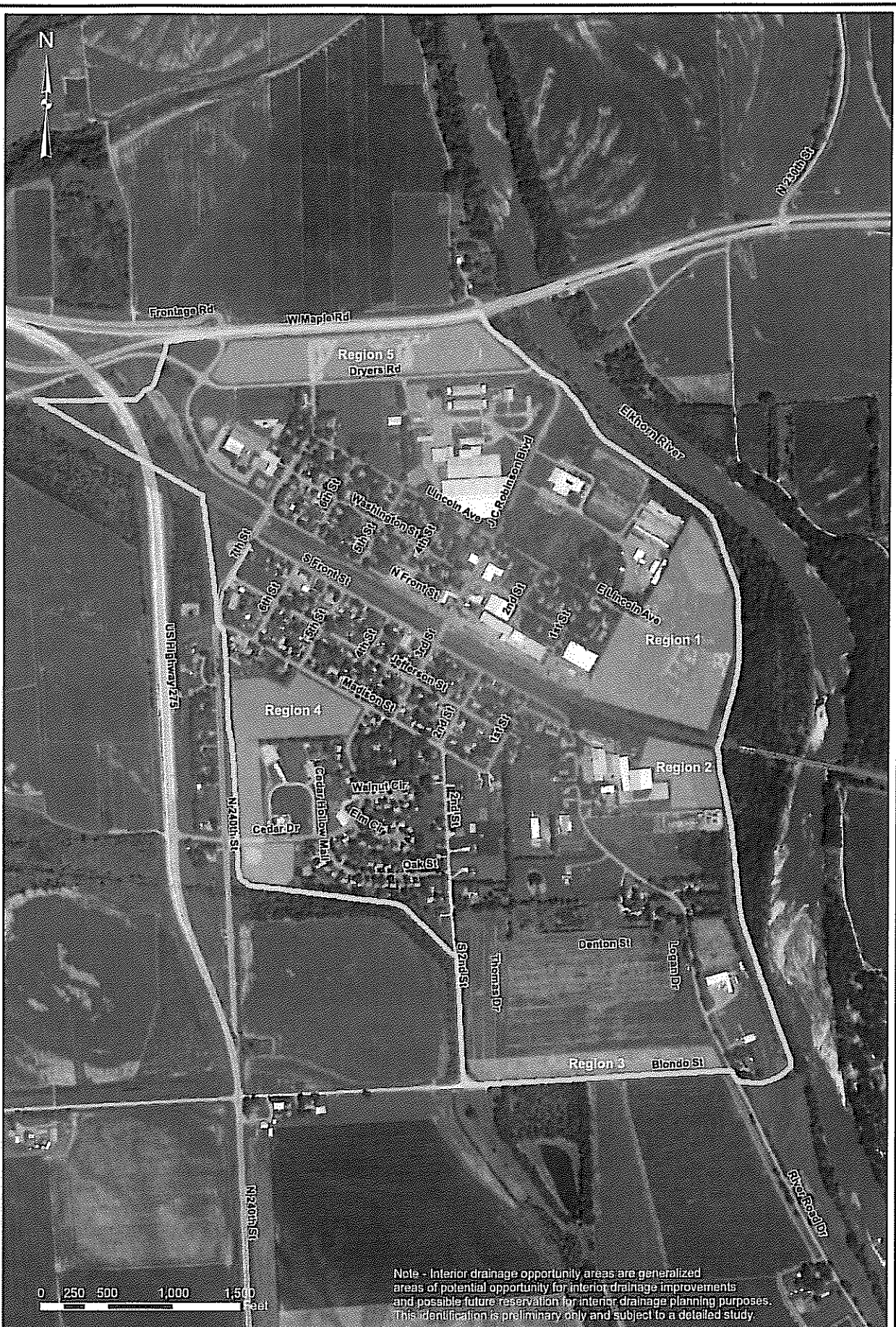


Figure 3

JEO Project # - 613D4
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Interior Drainage Opportunity Areas DRAFT Levee Feasibility Evaluation Village of Waterloo, NE

Existing Levee Project Alignment
Interior Drainage Opportunity Areas

5.0 - ALTERNATIVES AND RECOMMENDATIONS FOR IMPROVEMENT

The following Table 2 – Alternatives and Recommendations for Improvement Summary provides a summary of the action alternatives available to Waterloo. Each alternative is presented in detail in the following section.

Table 2 - Alternatives and Recommendations for Improvement Summary				
Alternative	Description	Impact	Cost*	Certification Time Frame
1	Allow floodplain to be re-mapped at Waterloo (Note: No levee improvements are included)	Mandatory flood insurance purchase will be in effect.	\$7,000 - \$10,000 for public involvement efforts; approximately \$750/year/home for flood insurance; yearly CRS administrative cost is variable	Certification would not be acquired under this option; it could be undertaken immediately if desired.
2A	Improve levee to 100-year flood protection plus freeboard, floodwall along HWY 64	Levee can be certified	\$2.8 - \$3.2 Million	It is intended that certifiability would be obtained before the end of the PAL period, if possible. Therefore, this alternative should be undertaken immediately, if desired. Improvements to Second Street are already being implemented.
2B	Improve levee to 100-year flood protection plus freeboard, new earth embankment levee along north side of town parallel to HWY 64	Levee can be certified	\$1.9 - \$2.3 Million	It is intended that certifiability would be obtained before the end of the PAL period, if possible. Therefore, this alternative should be undertaken immediately, if desired. Improvements to Second Street are already being implemented.
3	Pursue AR Zone designation during levee improvements (Note: this alternative is supplemental to Alternative 2A or 2B)	Allows more time to complete alternative 2A or 2B while also implementing less stringent interim flood insurance requirements	Unknown due to lack of procedural guidance from FEMA	Assumes that improvements may not be completed within the PAL period; this would allow for at least a five year restoration period. Further investigation of this process could start immediately.
4	Floodplain Study (Note: this alternative is supplemental to Alternative 2A or 2B)	Provides updated, detailed floodplain information; allows for the potential use of the risk analysis process; and may provide for reduced costs for Alternatives 2A or 2B if resulting base flood elevations are lower than currently published.	\$65,000 - \$75,000 (Cost for floodplain analysis only; levee improvement design and construction costs will be additional)	The floodplain study could start immediately.
*Note - All costs are preliminary and are in 2008 dollars. Costs for levee improvements do not include ROW or other land acquisition costs.				

5.1 - ALTERNATIVE 1: Allow floodplain mapping to be revised to include areas of Waterloo now shown as protected by the levee system.

This alternative recognizes the high cost of potential improvements while recognizing that residual risk dictates that purchase of flood insurance for these properties provides protection should the levee fail or be overtopped. While this alternative may appear to be a 'do nothing' alternative, it does involve some additional steps that could serve to mitigate the impact of the implementation of mandatory flood insurance purchase requirements for some property owners.

Required Actions:

- Allow floodplain to be re-mapped without protection from the levee being shown.
- Initiate the process of educating the public regarding flood insurance and mandatory purchase of flood insurance requirements.* Encourage impacted residents to purchase flood insurance immediately in order to obtain the potential reduced premium benefits of a grandfathered policy once the re-mapping is complete.
- Take steps to join the CRS program and take advantage of flood insurance discounts that are available through participation in the program.* In particular, investigate applying for CRS credit for the levee in order to gain a flood insurance premium reduction based on the protection level of the existing levee.

** The Nebraska Department of Natural Resources (DNR) floodplain management section is available to assist with implementation of these steps, and may have funding available to support these efforts.*

Pros:

- Recognizes residual risk associated with a levee system and that flood insurance is a wise step for those homes that are behind the levee.
- Low initial cost.
- Levee still provides a benefit via reduction of flood insurance premiums, if CRS option is used.

Cons:

- Mandatory purchase of flood insurance will be required and development restrictions will increase.
- Public perception may not be favorable.
- Cost over time may be high compared to levee improvements due to accumulative cost of premium payments.
- Requires ongoing levee maintenance and additional efforts on behalf of staff to implement the CRS.

Costs:

- Public involvement and education efforts: approximately \$7,000 – \$10,000
- Annual flood insurance premium payments – grandfathered policy on a \$100,000 home (replacement cost coverage) with \$20,000 contents: Approximately \$750/Year
- Yearly CRS administration costs: variable

5.2 - ALTERNATIVE 2A: Improve the levee to meet current 44 CFR 65.10 certification requirements, with a floodwall along HWY 64.

This alternative is intended to restore and upgrade the levee in order to meet the conditions required to certify the levee under 44 CFR 65.10 and would maintain the current condition of no mandatory purchase of flood insurance requirement for those properties currently shown as protected by the levee. The areas of the required physical improvements are preliminarily identified on the following Figure 4 – Potential Improvements. Note that this alternative cannot be implemented exactly as described here if the detailed geotechnical evaluation results are not favorable. It should also be noted that it is not anticipated that FEMA will be favorable to providing any extensions to the PAL agreement the community has entered into. Therefore, the required improvements will need to be completed by January 15, 2010.

Required Actions:

- Proceed with preliminary and final design of levee improvements to achieve the required freeboard vs. the 100-year flood for accreditation of the levee on the FIRM for Waterloo. This may also include incorporation of a closure system at the location of the railroad crossing. This action would upgrade the levee to be consistent with current 44 CFR 65.10 requirements.
- Complete a detailed geotechnical field evaluation and associated analyses to ensure that there are not any underlying deficiencies in the structure of the levee.
- Proceed with construction of levee improvements.
- Produce detailed as-builts of the improved levee.
- Complete detailed analyses required to meet certification requirements, including a detailed interior drainage evaluation.
- Complete necessary updates to the Operation and Maintenance plan, keeping in mind the items that are necessary for certification and ensuring that these criteria are met.
- Complete necessary local ordinance updates to formally implement and adopt flood warning, operations, and maintenance procedures where necessary to obtain certification.

Pros:

- Continues the current conditions of no mandatory purchase of flood insurance.
- Provides additional protection to properties in Waterloo.

Cons:

- High cost may lead to funding issues.
- High cost of floodwall, which is necessary due to existing roadway improvements.
- Timeline for design and construction is very aggressive and may not be feasible to be completed before the end of the PAL period (by January 15, 2010) (additional options related to this concern are noted later under other alternatives).

- Levee design must be consistent with U.S. Army Corps of Engineers design standards and review procedures, which may add time and cost to the project.
- Will likely require additional easement and/or ROW acquisition by the Village.

Time Frame:

- It is intended that these improvements would be completed prior to the end of the PAL period, if possible (by January 15, 2010). However, as noted above this may not be feasible. Due to the short time frame, if this alternative is desired the process of scoping and project execution should be started immediately.

Costs*:

- Engineering for design and construction, including geotechnical services: \$650,000 - \$725,000
- Engineering for interior drainage analyses and operation and maintenance plan updates: \$40,000 - \$50,000
- Survey and engineering for production of as-builts: \$40,000 – \$50,000
- Construction costs: \$2,100,000 - \$2,350,000
- Approximate Total Costs: \$2,800,000 – \$3,200,000

**Notes regarding costs:*

- *Costs are in 2008 dollars.*
- *Costs do not include legal fees or easement/ROW acquisition costs.*
- *Costs are subject to change depending on design parameters (including but not limited to regulatory changes or elective design decisions on the part of the Village) that are not known at this time.*
- *Some engineering services can be phased in an approach that will allow the Village to assess results prior to proceeding with the next phase (i.e., detailed feasibility and preliminary design, and final design phases).*



Figure 4

JEO Project # - 613D4
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Potential Improvements

DRAFT Levee Feasibility Evaluation
Village of Waterloo, NE

Phased Levee Improvements

- Phase 1
- Phase 2
- Phase 3

5.3 - ALTERNATIVE 2B: Improve the levee to meet current 44 CFR 65.10 certification requirements, with a new earthen embankment along the north section, parallel to HWY 64.

This alternative is intended to restore and upgrade the levee in order to meet the conditions required to certify the levee under 44 CFR 65.10 and would maintain the current condition of no mandatory purchase of flood insurance requirement for those properties currently shown as protected by the levee. The areas of the required physical improvements are preliminarily identified on the following Figure 4 – Potential Improvements. Note that this alternative cannot be implemented exactly as described here if the detailed geotechnical evaluation results are not favorable. It should also be noted that it is not anticipated that FEMA will be favorable to providing any extensions to the PAL agreement the community has entered into. Therefore, the required improvements will need to be completed by January 15, 2010.

Required Actions:

- Proceed with preliminary and final design of levee improvements to achieve the required freeboard vs. the 100-year flood for accreditation of the levee on the FIRM for Waterloo. This may also include incorporation of a closure system at the location of the railroad crossing. This action would upgrade the levee to be consistent with current 44 CFR 65.10 requirements.
- Complete a detailed geotechnical field evaluation and associated analyses to ensure that there are not any underlying deficiencies in the structure of the levee.
- Proceed with construction of levee improvements.
- Produce detailed as-builts of the improved levee.
- Complete detailed analyses required to meet certification requirements, including a detailed interior drainage evaluation.
- Complete necessary updates to the Operation and Maintenance plan, keeping in mind the items that are necessary for certification and ensuring that these criteria are met.
- Complete necessary local ordinance updates to formally implement and adopt flood warning, operations, and maintenance procedures where necessary to obtain certification.

Pros:

- Continues the current conditions of no mandatory purchase of flood insurance.
- Provides additional protection to properties in Waterloo.

Cons:

- High cost may lead to funding issues.
- Timeline for design and construction is very aggressive and may not be feasible to be completed before the end of the PAL period (by January 15, 2010) (additional options related to this concern are noted later under other alternatives).
- Levee design must be consistent with U.S. Army Corps of Engineers design standards and review procedures, which may add time and cost to the project.

- Will likely require significant additional easement and/or ROW acquisition by the Village.

Time Frame:

- It is intended that these improvements would be completed prior to the end of the PAL period, if possible (by January 15, 2010). However, as noted above this may not be feasible. Due to the short time frame, if this alternative is desired the process of scoping and project execution should be started immediately.

Costs*:

- Engineering for design and construction, including geotechnical services: \$525,000 - \$600,000
- Engineering for interior drainage analyses and operation and maintenance plan updates: \$40,000 - \$50,000
- Survey and engineering for production of as-builts: \$40,000 – \$50,000
- Construction costs: \$1,300,000 - \$1,600,000
- Approximate Total Costs: \$1,900,000 - \$2,400,000

**Notes regarding costs:*

- *Costs are in 2008 dollars.*
- *Costs do not include legal fees or easement/ROW acquisition costs.*
- *Costs are subject to change depending on design parameters (including but not limited to regulatory changes or elective design decisions on the part of the Village) that are not known at this time.*
- *Some engineering services can be phased in an approach that will allow the Village to assess results prior to proceeding with the next phase (i.e., detailed feasibility and preliminary design, and final design phases).*

5.4 - ALTERNATIVE 3: Pursue the flood zone designation of AR for Waterloo during levee improvements.

This alternative is a potential supplement to either Alternative 2A or Alternative 2B, if either of these alternatives is selected by the Village for further action. The AR flood zone is a designation that is reserved for levees that were accredited as providing 100-year flood protection but no longer meet those criteria. The AR zone designation is an interim flood zone that is used while the levee restoration process is being implemented. Usage of this flood zone is only allowed under a specified process that requires a certain level of involvement from the U.S. Army Corps of Engineers and also requires a designated restoration time frame. AR zones do carry a mandatory purchase of flood insurance requirement, but implementation of this process would allow at least a five year period for the restoration process to be completed.

If Waterloo's floodplain is re-mapped under Alternative 1, the resulting AE flood zone will require implementation of standard flood insurance rates and development requirements. While there would be mandatory purchase of flood insurance under an AR zone, the cost for the insurance during that time may be less overall as there are special rates for AR zones. In addition to this, development restrictions only require new buildings to be constructed three feet above grade rather than one foot above the base flood elevation. The published AR zone requirements are in 44 CFR 65.14, which is provided in Appendix B.

The potential for being able to achieve AR zone designation, however, is somewhat unknown. This flood zone was specifically created for certain circumstances that occurred in California. While the regulations allowing for the flood zone are nationwide, it has not been used to any significant degree outside California and has not been used, to our knowledge, anywhere within FEMA Region VII. Due to this, the potentially involved parties from this area of the country do not have much experience, if any, in dealing with the process required for obtaining the AR zone. Also, the specific steps to go through to achieve this flood zone designation are not widely published. For these reasons, the process of pursuing this avenue may be lengthy and contain uncertainty of success. It may also meet resistance from the Federal agencies involved due to its departure from the standard procedures typically used.

Required Actions:

- Initiate dialogue with FEMA and the USACE to implement the process of AR zone designation.

Pros:

- Provides additional time for Waterloo to complete levee restoration improvements.
- Provides flood insurance at a potentially lower cost during this time.
- Provides less stringent development conditions during the interim period.

Cons:

- Mandatory purchase of flood insurance would be required.
- The AR zone process may be lengthy and costly.

- Potential for success at obtaining the AR zone designation is unknown due to limited past usage nationwide.

Time Frame:

- This alternative assumes that improvements will not be completed within the PAL period (by January 15, 2010) and that alternative actions will need to be taken. The time frame for investigating and confirming the possibility of undertaking the AR zone process is unknown due to limited past usage nationwide. If this alternative is able to move forward, there will be at least a five year restoration period allowed for the levee improvements.

Costs:

- Engineering and coordination costs for obtaining the AR flood zone designation while improvements are completed is unknown at this time, as procedural requirements for the process are not well known.
- Improvement costs are expected to be substantially similar to those described in Alternatives 2A and 2B.

5.5 – ALTERNATIVE 4: Complete a floodplain re-study.

This alternative is a potential supplement to either Alternative 2A or Alternative 2B, if either of these alternatives is selected by the Village for further action. The floodplain study background information and analysis for the Elkhorn River near Waterloo is based on studies completed between 1978 and 1987. The hydrology used for the flows given in the FIS is based on gaging station records from the gaging station on the Elkhorn River at Waterloo, with a period of record from 1929 to 1975. The hydraulic modeling was completed using the USACE's HEC-2 computer software and utilized 10-foot contours for the purposes of delineating the floodplain boundaries. Also, it appears that roadway improvements completed in the mid-1980's may not be accurately reflected in the currently published floodplain modeling information.

All of the basic components of the floodplain mapping adjacent to Waterloo utilize older data and techniques compared to currently accepted standard floodplain mapping practices. There is currently available additional hydrologic data for the period of 1975 – 2007. Also, the common practice of using rainfall-runoff models such as the U.S. Army Corps of Engineers' HEC-HMS program for hydrologic modeling purposes could be implemented. Hydraulic modeling could be upgraded not only by using the more detailed HEC-RAS program for analysis but by also utilizing improved topography data, which is currently available. Utilizing available LiDAR contour data would likely improve not only the hydraulic modeling but the quality of the floodplain boundary mapping as well.

Due to these considerations it is recommended that the flood elevations and floodplain boundaries of the Elkhorn River adjacent to Waterloo be re-studied utilizing modern methods. At this time, detailed hydrologic investigations do not appear to be necessary. This will provide a more accurate picture of the existing flood elevations and will also provide more detailed and useful data for drainage project and levee design purposes. It would also be required in order to adequately complete the USACE risk analysis process for Waterloo, as noted in Section 3.1 – Design Criteria. It should be noted, however, that the possible changes to flood elevations are not known and that they could be positive or negative in terms of impact to the certification review of the Waterloo levee.

As has been previously noted it may not be feasible to complete Alternative 2A or 2B during the remainder of the PAL period established by FEMA (by January 15, 2010). Under the circumstances that it is not feasible to complete one of these alternatives by this time, the levee improvements can still be completed and the levee certified under FEMA's Letter of Map Revision (LOMR) process. This process involves the same certification criteria as currently required (assuming no regulatory changes) but further requires certain forms to be completed and submitted to FEMA in order to follow the prescribed LOMR submittal process. The intended end result of the process would be that the flood maps would be changed back to reflect the 'with levee' condition and mandatory purchase of flood insurance would be removed. The exact cost for the additional tasks required by the LOMR process will have to be determined at the time of application as they will be based on the regulatory and procedural requirements that are in place at that time.

Required Actions:

- Initiate floodplain study in conjunction with levee improvements (Alternative 2A or 2B).

Pros:

- Provides additional, more useful floodplain information.
- If determined flood elevations are lower than currently published flood elevations, a levee design and construction cost benefit could be achieved.
- Provides improved potential to use the USACE Risk Analysis process for evaluating levee freeboard requirements, as noted in Section 3.1 – Design Criteria.

Cons:

- New floodplain elevations may be higher than currently published flood elevations and therefore cause the levee certification efforts to be more difficult.

Time Frame:

- This alternative primarily assumes that improvements will be completed within the PAL period (by January 15, 2010). The floodplain study component of this process could be undertaken immediately and would need to be completed in association with the levee design process moving forward. The results will need to be finalized during preliminary design (as the overall levee design will be based upon the updated floodplain information).

Costs:

- Engineering for floodplain study - \$65,000 - \$75,000 (Note that this cost assumes that existing, published hydrology and flow rates are utilized for this study)
- Improvement costs are expected to be substantially similar to those described in Alternatives 2A and 2B.

**Notes regarding costs:*

- *Costs are in 2008 dollars.*
- *Costs are subject to change depending on design parameters (including but not limited to regulatory changes or elective design decisions on the part of the Village) that are not known at this time.*

6.0 - ADDITIONAL RECOMMENDATIONS AND CONSIDERATIONS

6.1 - FUTURE CONDITIONS AND REGULATORY IMPLICATIONS

There have been some recent preliminary discussions of possible trends toward more stringent levee construction requirements, most notably in the report of the Interagency Levee Policy Review Committee titled "The National Levee Challenge – Levees and the FEMA Flood Map Modernization Initiative" dated September, 2006 and provided in Appendix B on the enclosed CD. If implemented, a number of the recommendations and discussion points could impact the alternative selection process for Waterloo. The primary points of concern are:

1. Potential requirement that the levee be constructed to the 500-year flood level, plus freeboard, for accreditation on floodplain maps.
 - It should be noted that based on currently published 500-year flood elevations and known space restrictions, improving the Waterloo levee to meet this criteria is not considered to be feasible at this time.
2. Potential requirement that the levee be re-certified via engineering and geotechnical review every 10 years.
 - If this is implemented along with (1.) above, then improvements done now to the levee to reach the 100-year flood elevation plus freeboard requirements may not have a lasting benefit.
3. Potential mandatory purchase of flood insurance for structures that are protected by levees, regardless of flood map accreditation status. It is anticipated that the flood insurance premium rates would be lower than standard, AE flood zone rates.
 - If this item is implemented, efforts to avoid flood insurance by doing improvements to the levee to reach the 100-year flood elevation plus freeboard requirements may not be completely successful. This may result in less overall cost savings over time than previously anticipated.
4. Potential requirement that the USACE risk analysis process be used exclusively to determine freeboard requirements for any levee, rather than utilizing a standard amount of freeboard.
 - Risk analysis is a statistical evaluation of levee assessment data that provides a required freeboard amount based on uncertainty.
 - If completed, the outcome of this process may indicate a benefit or a detriment to the current standard levee freeboard requirement being implemented at Waterloo (i.e, it could be more or less than it is currently). The current absolute minimum requirement for accreditation on flood maps is two feet of freeboard, if supported by this process.
 - Updated floodplain study information would be required prior to attempting this analysis.

It is important to emphasize that all of these items are currently report recommendations but are not pending legislation. Therefore they may or may not see future implementation. If implemented, perhaps the most important item for consideration by Waterloo is the potential for mandatory purchase of flood insurance. If this were to come to pass, while flood insurance rates may be less than those that might be implemented if the floodplain is re-mapped and an AE flood zone is implemented, they still may negate much of the direct economic benefit of eliminating flood insurance premiums by completing levee improvements.

6.2 - FLOOD INSURANCE ISSUES AND PUBLIC OUTREACH

Due to the numerous potential concerns regarding flood insurance issues and procedures that may occur under the potential alternative scenarios, it is recommended that the Village consider implementing a flood insurance education and public outreach program in the near future, regardless of the alternative selected. The intent of the program would be to educate property owners about flood insurance purchase procedures and scenarios. In particular, a focus should be placed on the procedure for grandfathering, which may apply to many potentially impacted structures and could provide for lower flood insurance rates for many property owners if the floodplain re-mapping does occur. There are numerous grandfathering scenarios that may come into play and this is an often misunderstood flood insurance alternative for those who qualify. Along with JEO, the State of Nebraska Department of Natural Resources (DNR) Floodplain Management section is available to provide assistance to the City with this educational effort.

7.0 – POTENTIAL FUNDING SOURCES

Implementation of many of the potential alternatives will require substantial funding. Additionally, multiple funding sources may need to be pursued in order to accomplish the objectives of the selected alternative. For the selected alternative, the specific eligibility requirements for the various potential funding sources will need to be investigated further as part of the execution of that alternative. It should be noted that obtaining funding from many of these potential sources requires potentially lengthy grant application processes that may not be conducive to the limited time frame for improvements presented by the PAL process requirements. Those sources identified for potential additional funding are:

- Papio Missouri Natural Resources District: The Papio Missouri NRD has a long history of working on projects relating to flood prevention, erosion control, soil conservation, water quality and other numerous activities in northeast Nebraska. The implementation of the alternatives outlined in this evaluation will fall within the general mission and objectives of the Papio Missouri NRD.
- Nebraska Resource Development Fund (NRDF): The Nebraska Resource Development Fund Act of 1974 created a fund to assist with the development and utilization of Nebraska's water and land resources. The Nebraska Resources Development Fund can be used to provide grants and/or loans to political subdivisions of the state or an agency of the state. Some of the projects recommended in this evaluation may be eligible for funding from the NRDF.
- U.S. Army Corps of Engineers (USACE): Section 14, 22, 205, 206 programs provide authority for the Corps of Engineers to assist states, local governments and other non-federal entities in the preparation of comprehensive plans for the development, utilization, and conservation of water and related land resources.
- Federal Emergency Management Agency (FEMA): FEMA may have limited funding available via established federal grant programs such as the Pre-Disaster Mitigation (PDM) or Hazard Mitigation Planning Grant (HMGP) program. It should be noted that eligibility for these grant programs requires a Hazard Mitigation Plan (HMP) to be in place for the community. Waterloo has an HMP that was completed by the DNR and Papio-Missouri NRD.

8.0 – CONCLUSIONS AND NEXT STEPS

In the near future, the Village of Waterloo will need to select an alternative and proceed forward with implementing that alternative in order to potentially complete improvements prior to the end of the PAL period (by January 15, 2010). Additionally, a progress report will need to be submitted to FEMA by January 15, 2009 outlining the steps that are being taken in the PAL process. If selected, the Village may elect to provide details of the proposed course of action to FEMA at that time.

It is recommended that the Village consider implementing Alternative 4 in conjunction with Alternative 2B in order to proceed with the steps necessary in order to meet levee certification criteria prior to the end of the PAL period. By completing Alternative 4, more reliable floodplain information will be available that can be utilized for the levee design process under Alternative 2B. Portions of these alternatives can be done concurrently; however, the floodplain study results will need to be available prior to completion of the preliminary design phase of the levee design in order to provide the necessary flood elevation design guidance.

ANTICIPATED APPENDICES
(TO BE INCLUDED WITH FINAL REPORT)

Appendix A:

- Photographs of study area from walk through *(On CD)*

Appendix B:

- PAL agreement documentation
- FEMA Publication - 'Meeting the Criteria for Accrediting Levees on Flood Maps: How-to-Guide for Floodplain Managers and Engineers'
- 44 CFR 65.10 (Levee accreditation information)
- 44 CFR 65.14 (AR Zone information)
- Recent USACE inspection records
- Selected historical correspondence related to the levee and past modifications *(On CD)*
- Interagency Levee Policy Review Committee report titled "The National Levee Challenge – Levees and the FEMA Flood Map Modernization Initiative" dated September, 2006 *(On CD)*
- USACE Levee Design and Construction Manual, dated April, 2000 *(On CD)*
- Waterloo Flood Control Project Operation and Maintenance Manual, dated 1983 *(On CD)*
- FEMA Procedure Memorandum 43 *(On CD)*
- Miscellaneous FEMA levee FAQ's and publications *(On CD)*

Appendix C:

- Detailed opinions of cost

Appendix D:

- Geotechnical report, as provided by Terracon