ITEM # 27
DATE 10-09-12

COUNCIL ACTION FORM

SUBJECT: HEARING AND REQUEST FOR APPROVAL OF THE IOWA DEPARTMENT OF NATURAL RESOURCES ENVIRONMENTAL IMPACT DOCUMENT FOR THE WATER TREATMENT PLANT PROJECT

BACKGROUND:

The City of Ames retained the consulting team of FOX Engineering Associates, HDR Engineering, and BARR Engineering in 2009 to perform an Infrastructure and Capacity Needs Assessment to form the basis for decisions about the future of the Ames Water Treatment Plant. Five alternative solutions were explored, with the most favorable option being to build a new lime softening treatment plant at a new site. The site is at 1800 East 13th Street within the city limits of Ames. The new site, along with other properties associated with interconnecting utilities and the existing plant site, is the subject of the Iowa Department of Natural Resources (IDNR) environmental impact review.

A public hearing on the environmental impact of the project construction is one of the first steps to meeting requirements of the State Revolving Fund (SRF) loan program. The City of Ames intends to obtain an SRF loan to finance the construction of the water treatment plant. A separate hearing will be held before the City enters into any financial agreements with the SRF loan program.

An Environmental Information Document (EID) has been prepared by the IDNR evaluating the impact of constructing a new water treatment plant. The conclusion of the EID is the project will have no significant environmental impact. Staff has reviewed the EID and found no errors or omissions and agrees with the conclusions offered. The IDNR requires that the Mayor of Ames sign the EID, indicating that it is accurate to the best of her knowledge.

ALTERNATIVES:

1. Authorize the Mayor of Ames to sign the IDNR Environmental Information Document on behalf of the City of Ames.

2. Do not approve the Environmental Information Document.

MANAGER'S RECOMMENDED ACTION:

The City hopes to take advantage of low interest funding from the State to finance our new water treatment plant. A public hearing on the environmental impact of this construction project is one of the first steps to meeting requirements of the State

Revolving Fund (SRF) loan program**.** An Environmental Information Document (EID) has been prepared by the IDNR evaluating the impact of constructing a new water treatment plant. The conclusion of the EID is the project will have no significant environmental impact. Therefore, it is the recommendation of the City Manager that the City Council adopt Alternative No. 1, thereby authorizing the Mayor, acting on behalf of the City of Ames, to approve the IDNR Environmental Information Document with her signature.

Executive Summary

To: Ames Water and Pollution Control Department

Re: **Executive Summary -**
Ames Water Treatment Plant Infrastructure and Capacity Needs Assessment

From: FOX Engineering Associates, Inc. with HDR Engineering and Barr Engineering

Date: July 10, 2009

EXECUTIVE SUMMARY

AMES WATER TREATMENT PLANT
INFRASTRUCTURE AND CAPACITY NEEDS ASSESSMENT

1.0 Introduction

The City of Ames retained the consulting team consisting of FOX Engineering Associates, HDR Engineering, and Barr Engineering to conduct an Infrastructure and Capacity Needs Assessment to form the basis for decisions about the long-range future of the Ames Water Treatment Plant. The Infrastructure and Capacity Needs Assessment is the initial concept development phase for anticipated rehabilitation, replacement, or expansion of the Water Treatment Plant.

The existing water treatment plant is a conventional lime-softening plant. Portions of the plant were originally constructed in 1927. Over the years significant expansions and modifications were made to the treatment facilities in 1931, 1962, 1971, 1988. The major efforts included in the Infrastructure and Capacity Needs Assessment include the consideration and evaluation of the following:

1. Capacity and condition of the existing Water Treatment Plant,
2. Water demands,
3. Water quality needs,
4. Feasible treatment process technologies,
5. Alternatives for upgrade and expansion of the existing facilities,
6. Alternatives for replacement of the existing facilities with a new plant, including phasing.

Care was taken throughout the project to include a cross-section of stakeholders in the evaluation process. To this end the City of Ames staff appointed a Concept Advisory Team to participate in the process. This team included several individuals from throughout the community representing large water customers, the University, other water plants in the region, chamber of commerce and interested citizens. The consulting team and City staff met with the Concept Advisory Team three times throughout the process to seek input, assess assumptions, evaluate the process and share ideas.

In addition to the Concept Advisory Team, three public meetings were held over the course of the project. These meetings were planned and scheduled by the City staff and attended by the consulting team. PowerPoint presentations and posters were used to communicate to the public about the project. The purpose of the public meetings was to inform and seek input and to ensure that public concerns were addressed. In addition, the City staff maintained the latest project information on the City's website so interested citizens could track progress of the project as it developed.

Figure E-1.0 graphically represents the work flow that was executed for the project. The work flow was broken down into four major areas and resulted in four technical memoranda.

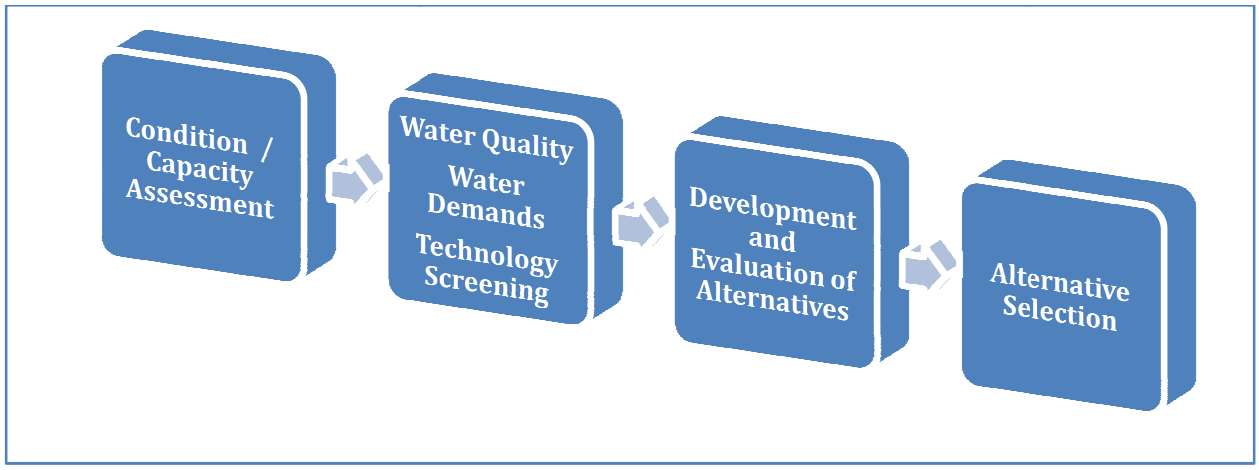


Figure E-1.0 – Work Flow

2.0 Capacity and Condition Assessment

The capacity and condition assessment was described in Technical Memorandum No. 1 and included review of the existing plant's treatment capacity and condition. The existing capacity of the plant was evaluated based on Iowa Department of Natural Resources (IDNR) design criteria, hydraulic limitations and operational considerations. The Ames Water Treatment Plant has a rated nominal capacity of 12 million gallons per day (MGD). Because of certain processes and hydraulic limitations, the actual capacity is probably closer to 11 MGD. Operation beyond 11 MGD for a short period of time may be feasible but would require significant exceptional care and effort. Table E-2.0 summarizes the capacities of process treatment units. Source water supply, finished water storage and elevated storage appear to be adequate for the projected future demands.

Table E-2.0
Treatment Capacity by Process Unit

Treatment Unit	Capacity
Aeration	10 MGD
Coagulation/Flocculation	11 MGD
Clarification	12.5 MGD
Recarbonation	11.5 MGD
Filtration	12 MGD
High Service Pumping	13 MGD

A key finding of the capacity analysis was many parts of the facility lack adequate redundancy and reliability. There are critical portions of the plant that have only one treatment unit or one conveyance pipe resulting in potential points of plant failure. If one of those treatment units were to go offline, the entire plant would be out of operation until repairs could be made. Reliability deficiencies include critical

piping to and from the aerator, the existence of only one rapid mix basin, and a single filtration system backwash pump.

The physical condition of the Ames Water Treatment Plant was assessed by a team of personnel with expertise in architecture, structural engineering, mechanical engineering, electrical engineering, process engineering and plant operations. The assessment was completed during an on-site investigation conducted September 2 through 4, 2008, and included visual reviews of structures, process equipment, mechanical systems, and electrical systems. Interviews with plant staff provided needed information on maintenance history and operational issues. The following paragraphs summarize the condition of the plant.

The plant has limited physical access for safety and maintenance throughout. If modifications are made at the existing facility, certain building code requirements would become applicable and many of the existing building features would be non-compliant and the deficiencies would have to be remedied. This is problematic because the surrounding buildings and structures are critical in keeping the plant operating. Installation of code compliant stairs in the filter galleries, for example, would be extremely difficult while keeping the filters in operation. Also, resolution of the many dead end corridors would be difficult as the current facility does not provide access for exits. Chemical storage is located throughout the facility without secondary containment and is not isolated from the other building functions.

Due to structural issues, there are several structures on site that are in need of immediate replacement or extensive repair. These include:

- Mix Tank No. 1 with the Aeration Tank
- Recarbonation Tank No. 1
- ¾ million gallon reservoir

In general, there has been significant damage and deterioration of the concrete over time due to the freeze-thaw cycle. In addition, many of the concrete structures have shrinkage cracks that are allowing leakage to occur.

From a treatment process perspective, many of the plant components are in fair to good condition in spite of age due to the diligence of the operations and maintenance staff. Several items will need to be replaced due to lack of parts availability. The following items have five years or less of estimated useful life without major overhaul or repair.

- Mixer No. 4
- Middle lime slaker
- Aeration influent piping
- Mix Tank No. 1 mixers
- Clarifier Nos. 1 and 2
- Hypochlorite feed tanks
- Hypochlorite feed pumps

Mechanical plumbing and ventilation systems are in relatively good condition as many items have been replaced or upgraded in the past 20 years. The only items that need attention are the boilers and one unit

heater serving the entrance to the East pipe gallery. In addition, the high service pump diesel day tank size requires fire protection if major modifications are made to that structure.

The supervisory control and data acquisition (SCADA) system is new and in good condition. The general power distribution uses original raceways (conduits) in many locations. The integrity of the electrical conduit system is suspect and in many cases the existing circuitry should be replaced. All of the electrical equipment such as panelboards, motor control centers , starters, signal transmitters and similar devices located in process areas should be relocated to dedicated electrical space with appropriate ventilation and dehumidification systems.

The condition of the existing facility is noted as a key driver for the project. Sustained use of the existing facilities cannot occur without some significant modifications. Furthermore, code requirements that would become effective as the result of such modifications would require extensive rebuilding of the facilities.

3.0 Water Quality, Water Demands and Technology Screening

Water quality, water demands and treatment technology options were summarized in two separate technical memoranda Technical Memorandum No. 2a outlined the water quality and demand requirements. Technical Memorandum No. 2b described available treatment technologies and served as the basis for screening technologies for additional consideration and development of solution alternatives.

Two critical components to any drinking water planning project are the quantity and quality of the water to be provided to the utilities' customers. Of these two planning components, the question of future quantity demands is the most difficult to answer with certainty because it involves projecting future needs. The consulting team reviewed water demand projections prepared by the Ames Water and Pollution Control staff. The Ames staff projection was 16 MGD for peak day design capacity. The consulting team considered two similar forecasting techniques and, with a somewhat more conservative approach to reserve capacity, arrived at a recommended peak day capacity of 15 MGD for the planning period ending in 2038. The recommended design capacity includes an allowance for additional industrial demand of 1.5 MGD. In addition, the consulting team also recommended that any new or expanded plant should provide for a firm capacity (the capacity with any single treatment unit out of operation) greater than the average day demand of 7.54 MGD.

The consulting team also reviewed Ames' current water conservation program, Smart Water, and estimated the potential reduction in the water demand that may be expected from successful implementation of the program.

With regard to water quality, the current untreated source water utilized by the City meets all federally mandated primary and most secondary treatment standards with the possible exception of iron content. Through treatment, the water is softened and disinfected in a way that produces a high quality finished water that meets all chemical, biological, and aesthetic standards. Duplicating Ames' current finished water quality in any new or expanded treatment plant is the primary goal of the planning effort. The following general water quality treatment goals were established for the project:

- Comply with Safe Drinking Water Act and state and federal drinking water quality standards for chemical, microbiological, and radiological contaminants
- Protect the distribution system through proper water treatment
- Maintain the exceptional taste of the finished water
- Provide a softened water similar to the existing level of treatment
- Remove nuisance levels of iron and manganese

Based on the projected water demands and quality goals, available treatment technologies were described and reviewed by the project team to produce possible treatment scenarios to meet the stated goals. Multiple systems were reviewed ranging from conventional to emerging treatment technology. A technical memorandum – Technical Memorandum No. 2b -- summarizing the technology options was prepared and a workshop was conducted with the City staff and the consulting team to review the advantages and disadvantages of applicable technologies and formulate options for incorporation in an upgraded and expanded existing plant or a new treatment plant at a different site. As a result of the technology screening, three basic alternatives were advanced for evaluation and further development. A fourth phasing option was also discussed as a variation on one of the basic alternatives.

4.0 Development and Evaluation of Alternatives

In this portion of the assessment, alternatives were identified for providing upgraded and expanded treatment plant capacity for meeting a peak day water demand of 15 MGD. Technical Memorandum No. 3 describes each of the alternatives and conceptual level details for each. Four basic alternatives were identified in the previous phase of this study. The fourth alternative was broken into two parts which included a phased approach for one of the basic alternatives. Overall five alternatives were identified and evaluated in this part of the study, including:

1. Alternative 1 – Rehabilitation/reconstruction of the existing lime softening plant
2. Alternative 2 – Construction of a new lime softening plant at a new location
3. Alternative 3 – Construction of a new membrane softening plant at a new location
4. Alternative 4A – a phased-construction variation of Alternative 2 consisting of a 10 MGD plant as phase 1 and a 5 MGD plant expansion as phase 2
5. Alternative 4B – a phased-construction variation of Alternative 2 involving postponing certain elements of Alternative 2 to a second phase, including the demolition of the old facilities at the existing site and reconstruction of the existing filter building to provide administrative space at the old site.

Specific conceptual designs were developed and discussed for each alternative. Preliminary opinions of costs, both construction costs and operation and maintenance costs, were prepared, as well as an analysis of life-cycle costs. In addition to the cost analysis, non-monetary factors were also considered. These factors include operating requirements, reliability, flexibility, ability to be implemented, expandability, social impacts, and environmental impacts. The conceptual level opinion of construction costs and non-monetary rankings are summarized in Table E-4.0 below.

Table E-4.0
Opinion of Cost and Non-Monetary Evaluation Summary

Alternative	Opinion of Costs			Non-monetary ranking (1 highest, 5 lowest)
	Capital ($)	Operation and Maintenance ($/yr)	Life Cycle ($/yr)	
1	$54,786,000	$3,217,000	$6,459,000	5
2	$48,431,000	$3,186,000	$6,038,000	2
3	$72,032,000	$3,756,000	$7,875,000	3
4A	$36,502,000 – Phase 1 $16,572,000 – Phase 2	$3,186,000	$6,103,000	4
4B	$43,588,000 – Phase 1 $5,907,000 – Phase 2	$3,186,000	$6,027,000	1

It is important to note that this level of planning is conceptual and has a relatively low level of detail relative to the final design documents. Several assumptions were required to estimate the costs, including the general process scheme, types of equipment, layout, type and materials of construction, and site conditions. The costs presented are based on February 2009 conditions and do not include escalation.

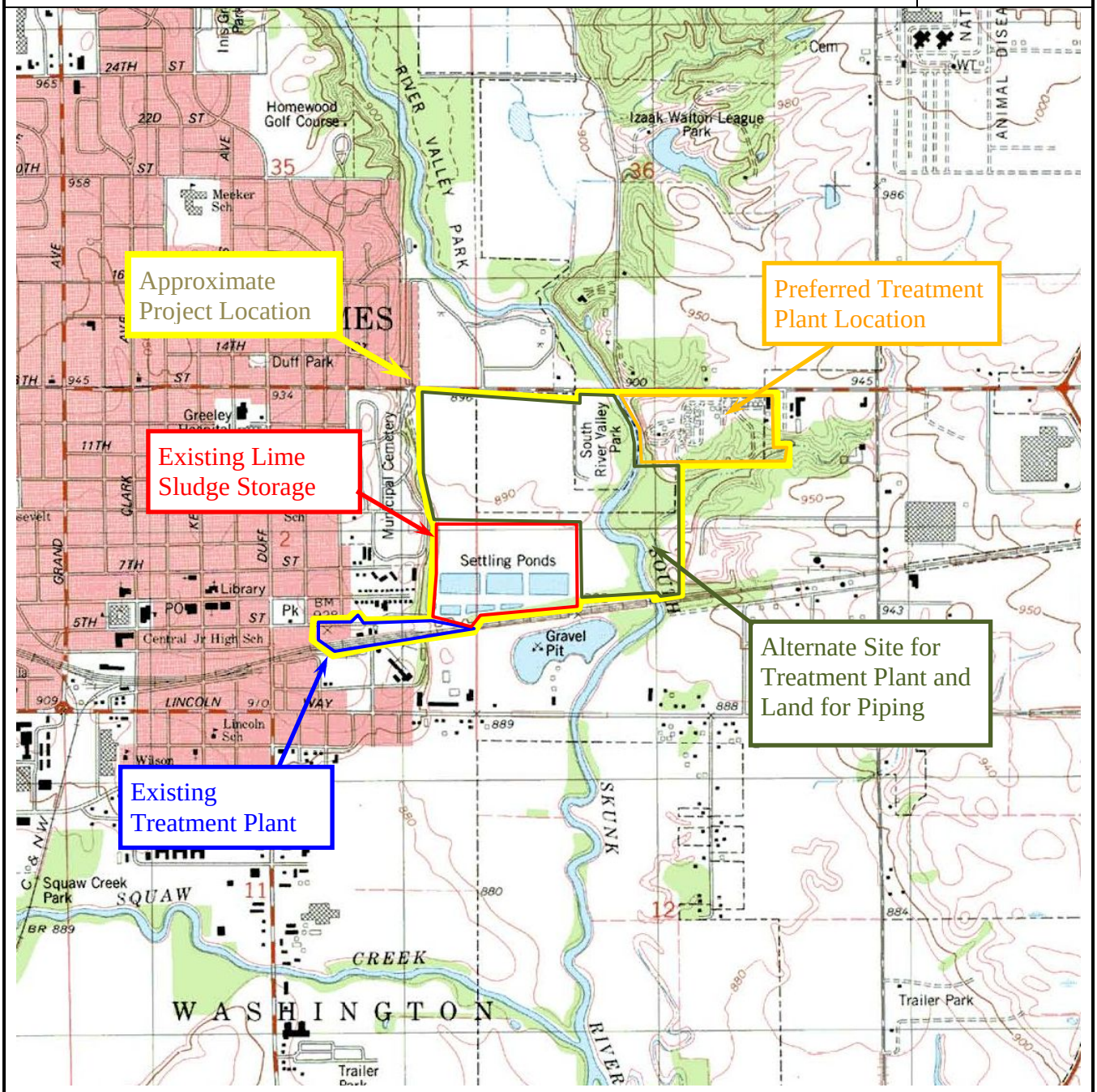
Funding for this significant project will likely be by long-term debt financing such as municipal revenue bonds or the State of Iowa financing program, the Drinking Water State Revolving Fund (DWSRF). The DWSRF has a lower interest rate, 3% + 0.25% administration fee, when compared to revenue bonds. City staff projected water rate increases based on using the DWSRF and concluded that by 2019 the monthly bill of a residential customer will increase about 35% over what would be expected if no project were to be completed.

5.0 Alternative Selection

As a result of the cost and non-monetary evaluation of alternatives developed in this needs assessment effort, and considering the level of uncertainty of opinions of cost developed within this process, Alternative 2 - Construction of a new lime softening plant at a new location - and Alternative 4B – phased construction of a new lime softening treatment plant at a new site – emerged as essentially equal as the most favorable alternatives for meeting the City's water treatment project objectives. Therefore, it is recommended to the City Council that they consider, endorse and implement a project for construction of a new lime softening plant at a new location with decisions related to construction of new administrative offices and timing of demolition of the existing plant left to be decided by Council at a later time based on the Water Department's financial position and other mitigating factors at the time of construction of the new plant.

Ames East Quadrangle
Section: 01 and 02, Township: 83 N, Range: 24 W
Date: 1975
Scale: 1 Inch = 2,000 Feet

North



USGS Topographic Map

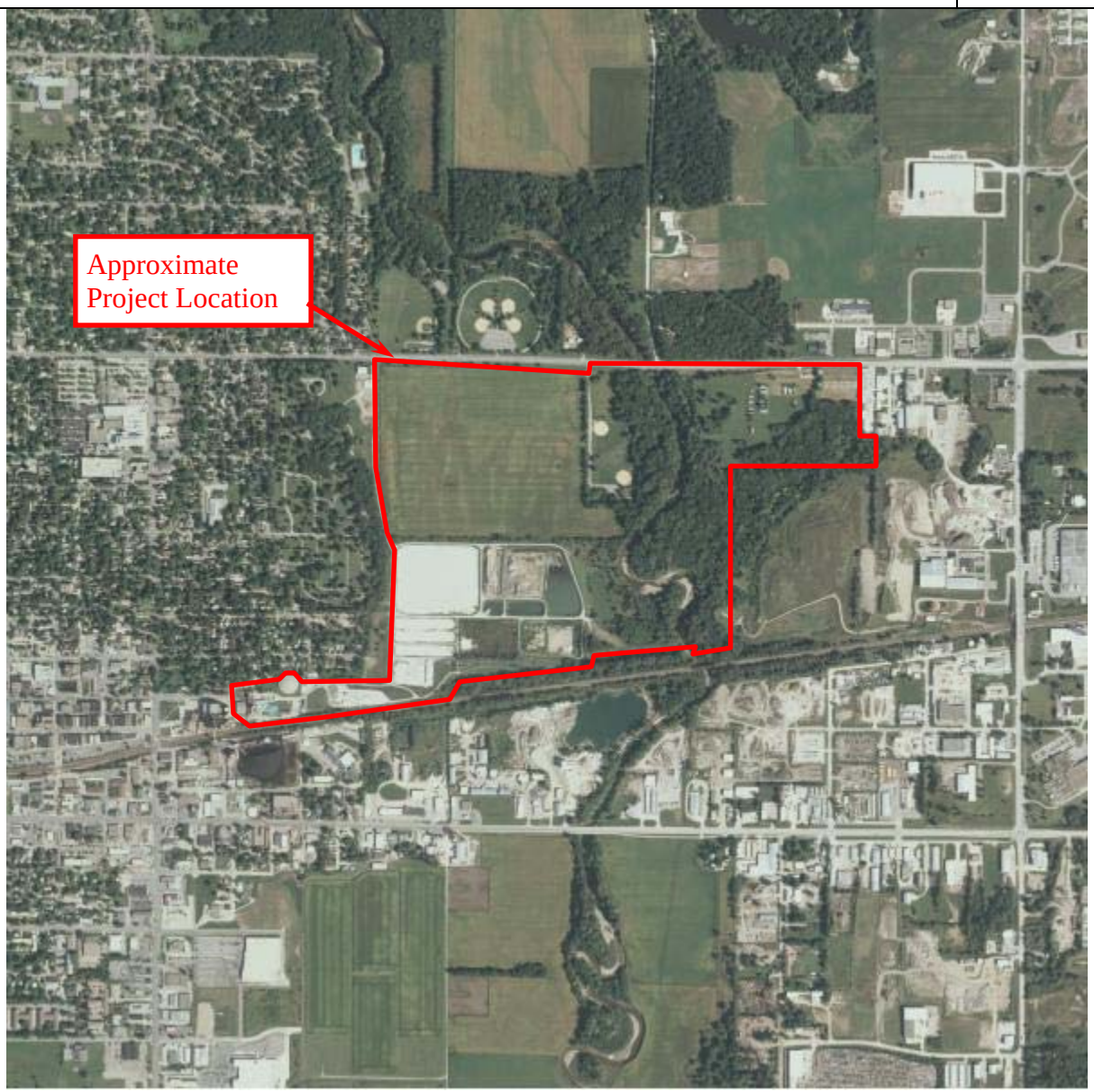
Ames Proposed Water Treatment Facility
Ames, Iowa

State Revolving Fund
401 SW 7th Street, Suite M
Des Moines, IA 50309

2009

Location provided by City of Ames, Water & Pollution Control Dept.

North



Aerial Photograph

Ames Proposed Water Treatment Facility
Ames, Iowa

State Revolving Fund
401 SW 7th Street, Suite M
Des Moines, IA 50309