Liner Evaluation Report
Inactive CCR Surface Impoundment

City of Ames Steam Electric Plant

Ames Municipal Electric System
502 Carroll Avenue
Ames, Iowa 50010

SCS ENGINEERS

April 16, 2018

SCS Engineers
8450 Hickman Road, Suite 20
Clive, Iowa 50325
515-631-6161

April 16, 2018
File No. 27217425.00

Mr. Brian Trower
Assistant Director – Electric Services
Ames Municipal Electric System
502 Carroll Avenue
Ames, Iowa 50010

Subject: Liner Evaluation Report
Inactive Coal Combustion Residuals (CCR) Surface Impoundment

Dear Mr. Trower:

SCS Engineers has prepared the Liner Evaluation Report for the Inactive CCR Surface Impoundment for the City of Ames Steam Electric Plant in accordance with the requirements set forth in §257.71(a) of the CCR Rule (40 CFR 257.50-107). Based on our review of the provided documents, it is SCS Engineers' opinion the City of Ames CCR Surface Impoundment is considered to be a lined CCR surface impoundment.

If you have any questions regarding this document, please contact the undersigned.

Sincerely,

Patrick M. Goeke
Senior Geotechnical Engineer
SCS ENGINEERS
(913) 681-0030
pgoeke@scsengineers.com

Christine L. Collier, P.E.
Project Manager
SCS ENGINEERS
(515) 631-6161
ccollier@scsengineers.com

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APPENDICIES

PE CERTIFICATION

Certification Statement 40 CFR §257.71(b) – Liner Design Criteria for an Existing CCR Surface Impoundment

This Liner Evaluation Report for the City of Ames Municipal Light & Power Plant CCR Inactive Surface Impoundment was prepared by SCS Engineers. The document and Certification are based on and limited to information that SCS has relied on from the City of Ames and others, but not independently verified, by SCS.

I, Christine L. Collier, hereby certify that this Liner Evaluation Report meets the requirements of 40 CFR §257.71(a) and that it was prepared by me or under my direct supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Christine L Collier Digitally signed by Christine Collier
Date: 2018.04.17 10:21:24 -05'00'

(signature) (date)

Christine L. Collier

(printed or typed name)

License number 17963

My license renewal date is December 31, 2019.

Pages or sheets covered by this seal:
All except Appendices.

1 INTRODUCTION

On April 17, 2015, the Environmental Protection Agency issued the final version of the federal Coal Combustion Residual (CCR) Rule to regulate the disposal of CCR materials generated from the combustion of coal at electric utilities and independent power producers. Inactive power plant ash impoundments containing CCR are regulated under Section 257.100 of the Code of Federal Regulations (CFR) 40 Part 257.

The City of Ames (COA) Steam Electric Plant is subject to the CCR Rule and in accordance with the rule must document the liner construction for the existing CCR surface impoundment as specified in Section §257.71 of the rule. This document provides the liner construction documentation for the existing COA inactive CCR surface impoundment.

An existing surface impoundment is classified as lined if the liner was constructed with any of the following:

1. A liner consisting of a minimum of two feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} centimeters per second (cm/sec).
2. A composite liner that meets the requirements of §257.70(b).
3. An alternative composite liner that meets the requirements of §257.70(c).

2 LINER CONSTRUCTION

The City of Ames Steam Electric Plant disposed of their CCR in a single CCR surface impoundment located approximately 3,000 feet northeast of the power generating station. The CCR surface impoundment was designed by Lutz, Daily & Brain Consulting Engineers in 1980 and was used for disposal of CCR until October 19, 2015.

Available data includes the plans and specifications, construction documentation, and post-construction testing. Specific available information documenting the liner construction meets the requirements for a lined impoundment includes:

1. The design plans, with notation of conformation to construction, (Drawing #76-11-ASH-13, Ash Pond Dike Cross Sections) show a 3-foot thick impervious fill layer placed on the bottom and interior side slopes of the impoundment. (Appendix A)
2. The design specifications indicate the impervious fill soil shall have a minimum of 50 percent of the soil particles passing the #200 sieve and the soil shall be classified as a CL or CH in accordance with the Unified Soil Classification Chart. (Appendix B)
3. Documentation provided to the COA by Patzig Testing Laboratories Co., Inc. (Patzig Testing) on November 18, 1980 documents the ash pond dike construction dates from November 5 through November 10, 1980. It further states in-place density and moisture content was evaluated at 20 locations during that time frame. Per the documentation, densities were 95 percent relative compaction or greater in all cases. (Appendix C)

4. Post-construction permeability tests, performed by Patzig Testing in December 1980, on seven Shelby tube soil samples collected from the impervious fill, indicated the permeability ranged between $7.3x10^{-9}$ and $4x10^{-10}$ cm/sec. (Appendix D)

3 CONCLUSIONS

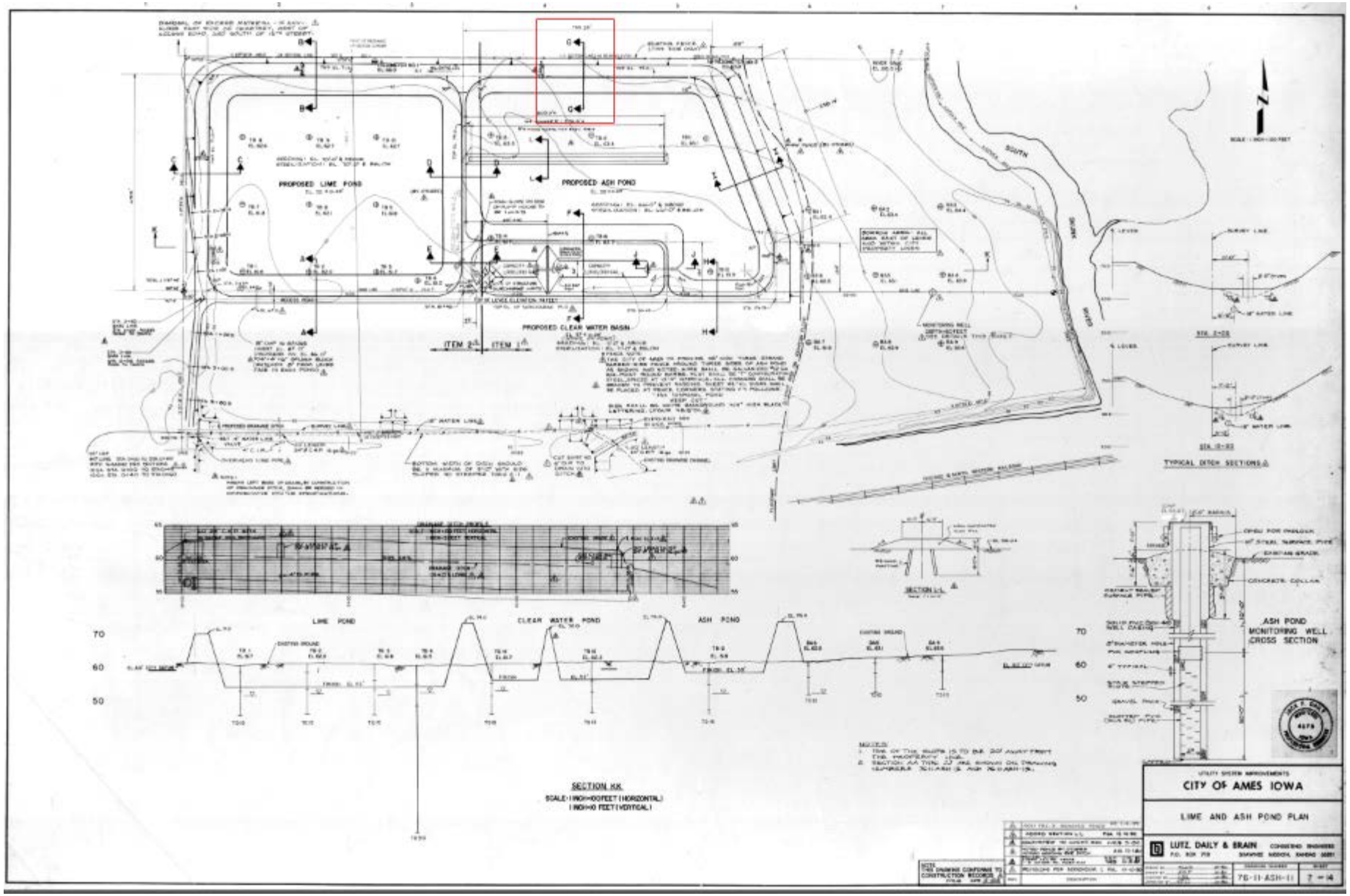
It is SCS Engineers' opinion, based on the historic design and construction records, the City of Ames CCR surface impoundment is considered to be a lined CCR surface impoundment as that term is defined in 40 CFR §257.71 (a)(1)(i), (ii), or (iii).

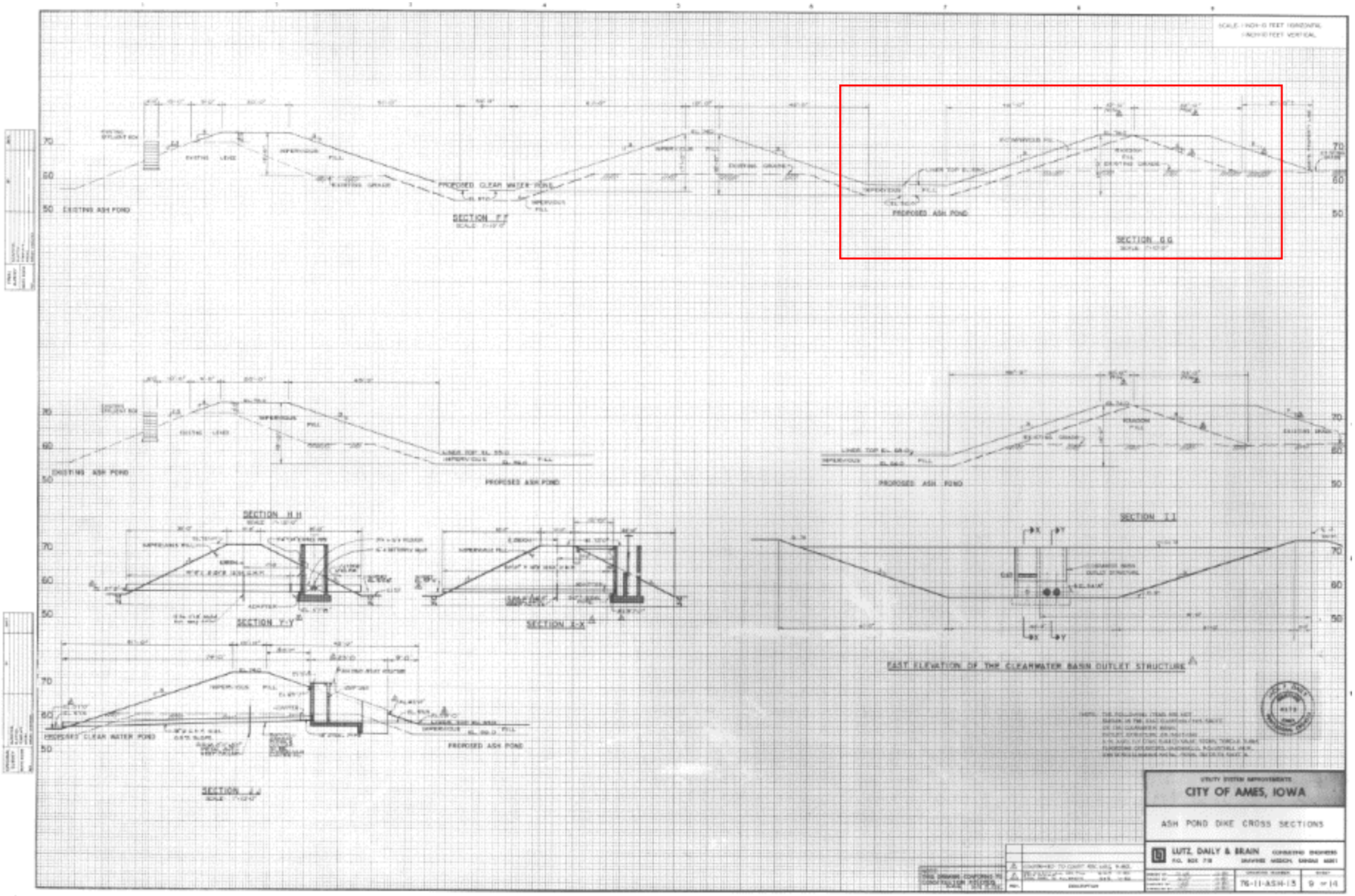
4 REVISIONS, RECORDKEEPING, AND REPORTING

The Liner Evaluation Report will be placed in the facility's operating record (40 CFR §257.105(f)(2)) and on the COA's CCR Rule Compliance Data and Information website (40 CFR §257.107(f)(3)) by April 17, 2018. The COA will notify the Iowa Department of Natural Resources (IDNR) by April 17, 2018 that this report has been completed and placed in the facility's operating record and on the COA CCR Rule Compliance Data and Information website. At this time, no updates, revisions, or periodic reviews are required for this report.

Appendix A

Design Plan/Construction Record Excerpt


PROPOSED LIME POND
PROPOSED ASH POND
PROPOSED CLEAR WATER BASIN
SOUTH
SKUNK
RIVER
LIME POND
CLEAR WATER POND
ASH POND
SECTION KK
SCALE: 1 INCH = 100 FEET (HORIZONTAL)
1 INCH = 10 FEET (VERTICAL)
TYPICAL DITCH SECTIONS
ASH POND MONITORING WELL CROSS SECTION
UTILITY SYSTEM IMPROVEMENTS
CITY OF AMES IOWA
LIME AND ASH POND PLAN
LUTZ, DAILY & BRAIN
CONSULTING ENGINEERS
76-11-ASH-11
7 of 14


SCALE: 1 INCH = 10 FEET HORIZONTAL
1 INCH = 10 FEET VERTICAL
EXISTING ASH POND
PROPOSED CLEAR WATER POND
SECTION F-F
PROPOSED ASH POND
SECTION G-G
EXISTING ASH POND
PROPOSED ASH POND
SECTION H-H
SECTION Y-Y
SECTION X-X
SECTION J-J
EAST ELEVATION OF THE CLEARWATER BASIN OUTLET STRUCTURE
PROPOSED CLEAR WATER POND
PROPOSED ASH POND
SECTION E-E
UTILITY SYSTEM IMPROVEMENTS
CITY OF AMES, IOWA
ASH POND DIKE CROSS SECTIONS
LUTZ, DAILY & BRAIN
CONSULTING ENGINEERS
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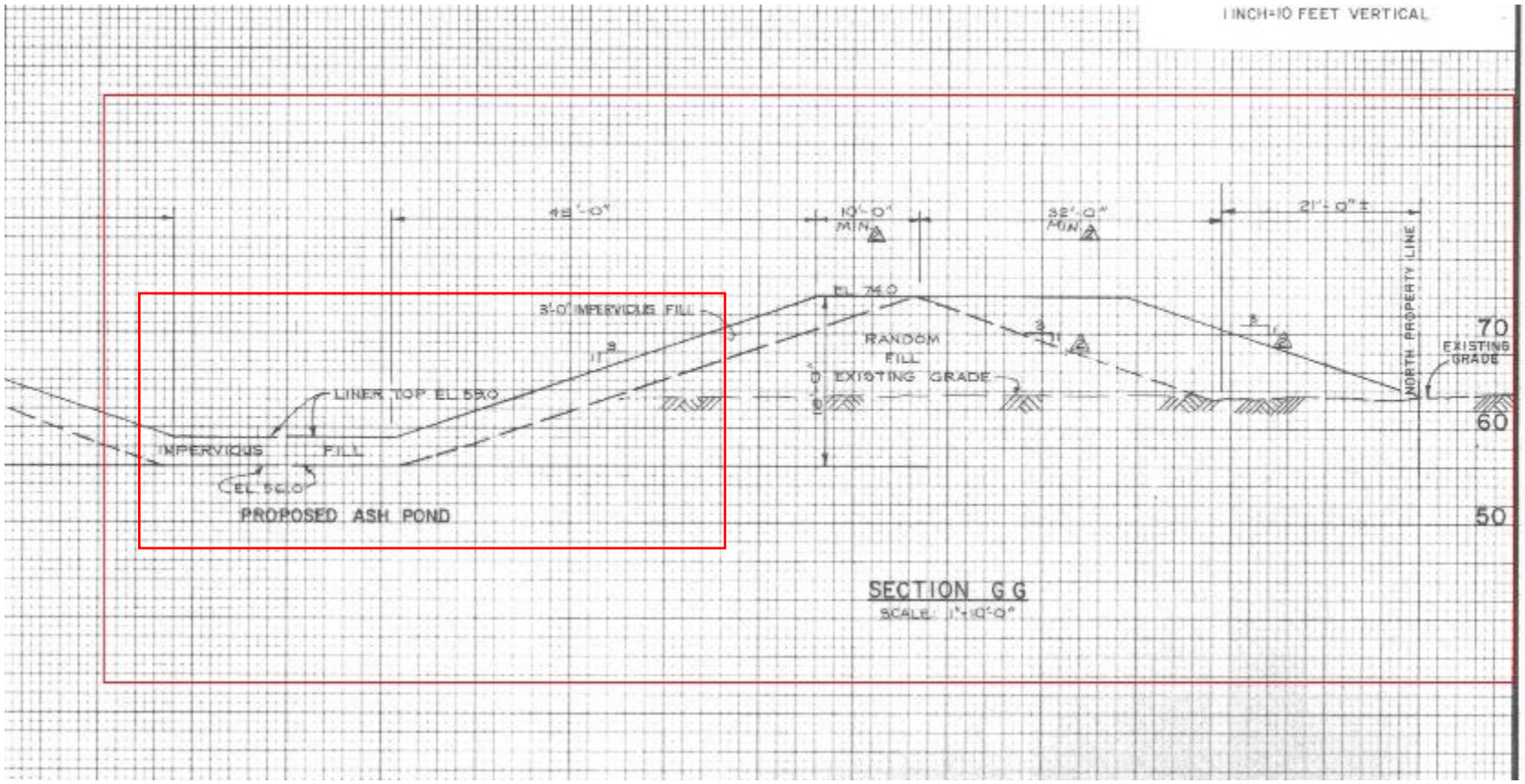
1 INCH=10 FEET VERTICAL
41'-0"
10'-0" MIN.
32'-0" MIN.
21'-0"±
3'-0" IMPERVIOUS FILL
EL. 74.0
RANDOM FILL
EXISTING GRADE
LINER TOP EL 59.0
IMPERVIOUS FILL
EL. 56.0
PROPOSED ASH POND
NORTH PROPERTY LINE
70
EXISTING GRADE
60
50
SECTION G G
SCALE 1"=10'-0"

Appendix B

Liner Specification Excerpts

EMBANKMENT

SCOPE OF WORK: The work covered by this section consists of furnishing all plant, equipment, tools, labor and materials and performing all operations necessary for constructing all required fills, embankments and any other required fill as shown on the drawings and/or as specified herein.

The natural and existing ground surfaces as shown on the drawings are approximate only. Embankments and fills shall be constructed to the net grade and cross section shown and except as otherwise specified without additional allowance for shrinkage of the fill.

MATERIALS: Embankment materials shall be obtained from required pond excavations and if necessary from the designated borrow area as shown on the drawings and as specified in the EXCAVATION AND BACKFILL section of the specification. All impervious embankment and fill materials shall be obtained from required pond excavations. Material shall be free of roots, stone, debris, or similar objects larger than two inches in diameter.

Pervious materials shall be free-draining sand or gravelly sand consisting of sound durable particles and shall contain not over 10% passing the U.S. standard No. 200 sieve.

Impervious materials shall be fine-grained materials of low permeability consisting of clays, clay silts, or silts, and shall be free of plant growth, roots, and humus. In general, the particle size of impervious material shall be such that a minimum of 50 percent of the soil particles shall pass a U. S. Standard No. 200 screen and, where possible, shall be material classified as CL or CH on the plasticity chart of the Unified Soil Classification Chart, revised 1960 and published in Vicksburg Experiment Station Technical Memorandum 3-357.

Random materials shall consist of pervious materials, impervious materials or any combination thereof.

Natural blanket soils (or materials) refers to the natural deposit of fine-grained soils. The surface soils encountered by the test borings primarily consist of silty clays and clayey silts varying in thickness and containing a slight to moderate sand content at various locations. The silty clayey surface soil is principally underlain by a brown silty medium fine textured sand which may contain clayey levels and seams and becoming courser with depth, altering to a course textured sand. These soils are typically stratified having been water-deposited and reworked many times. The natural moisture of these materials varies generally with the season of the year and stage of the river.

Waste fill is any existing sanitary and trash landfill excavated. The waste fill shall be removed to a licensed sanitary landfill approved by the Engineer.

COVERAGE:

a. Tamping Rollers. A complete pass shall consist of complete coverage of the area to be compacted with each trip of the roller overlapping the adjacent trip by not less than one foot.

b. Crawler Tractor. One pass shall consist of complete coverage by the tractor with sufficient overlap of successive tread paths to ensure complete coverage.

c. Power Tampers. Surfaces to be compacted in confined areas inaccessible for rolling shall be tamped uniformly with power tampers to obtain densities equal to that obtained by rollers or crawler tractors as applicable.

PLACEMENT AND COMPACTION: Layers shall be started full width out to the slope stakes and shall be carried substantially horizontal with sufficient slope to provide satisfactory drainage during construction. Portions of the fill, which are inaccessible to rolling, shall be compacted in three inch uncompacted lifts with power tampers. Hauling equipment shall be operated to avoid tracking insofar as practicable. When ruts appear in the surface of any layer of material to be rolled, the surface shall be scarified so that all ridges and bridging between ruts are broken down and the surface of the layer regraded and made uniform before compaction. Where the surface of any layer in the impervious fill or random fill has been made too smooth to bond properly with the succeeding layer, it shall be loosened by scarifying and recompacted. If the work is stopped for 24 hours or more, or if rainfall is imminent and is anticipated in sufficient amounts to cause temporary shutdown of operations, the impervious or random zones (except where the random fill is pervious material) shall be smooth bladed to drain and sealed with rubber-tired rollers, or other acceptable equipment as required to inhibit absorption of rainfall. Embankment and fills shall be scarified and recompacted after becoming unduly wet or after freezing before additional fill material is placed. Finished slopes shall present a uniform appearance without pronounced irregularities.

An overbuild of 0.5 foot above the prescribed grades will be permitted in the final dressing, provided any excess material is so distributed that there are no abrupt humps or depressions in the surfaces or bulges in the width of the crown. The above grade tolerance may be modified at locations where such modifications will not impair the design or appearance of the embankment. Fill material shall not be placed upon frozen surfaces nor shall frozen earth, snow, or ice be placed in the fill.

Impervious materials shall be placed in impervious fill zones in approximately horizontal layers not exceeding eight inches in thickness. Each layer shall be compacted to at least 95 percent of maximum density at optimum moisture. Before rolling is started, each layer shall be dried by aeration or have moisture added as necessary to obtain a uniform moisture content within the limits of three percent above and three percent below the optimum moisture for maximum density.

Appendix C

Construction Density Testing

Patzig Testing Laboratories Co., Inc.

'2 DELAWARE AVENUE DES MOINES, IOWA 50313 (515) 266-5101

November 18, 1980

City of Ames
Carroll & E. 5th
Ames, Iowa 50010

Re: Ames Lagoons
Ames Power Plant
Lab No. 199869

Attn: Merlin Hove

Gentlemen:

This letter summarizes the test results and conversation pertaining to the above project to date.

Construction commenced October 31, 1980, and a representative of this firm visited the site as requested by Jim Townsend of Lutz, Daily & Brain. The lime pond basin and dike fill areas had been stripped prior to the visit. Jim Townsend verified that stripping and discing was performed prior to fill placement on the south, west and north dikes. The east dike area was stripped; however, discing and filling had not commenced. The stripping material was used for the toe slope fill of the west dike exterior, and for the centerline fill of the south dike. This material had been accepted as suitable random fill.

The major portion of the lime pond dike was constructed from October 31 thru November 6, 1980, and in-place density and moisture content was determined at 51 locations throughout this interval, with some additional testing at later dates. In-place densities were approximately 95 percent relative compaction or greater in all cases. Moisture content in the south dike random fill (strippings) was relatively high as determined by the nuclear gauge, however. Samples were submitted to the laboratory to evaluate oven-dry moisture of this material, and the high moisture content was confirmed. Lutz, Daily & Brain considered this material acceptable, however, as a suitable density had been obtained. High and low moisture contents at other locations were also accepted by Lutz, Daily & Brain through Jim Townsend where adequate density was achieved.

On November 3, 1980, three samples of fill material were submitted to the laboratory to determine plasticity indexes. The sample locations are shown on the site plan, and test results are enclosed.

The ash pond dikes were primarily constructed from November 5 thru November 10, 1980. In-place density and moisture content was evaluated at 20 locations during this interval. The number of random fill density tests in relation to liner density tests was decreased on the basis of job history and construction observations. Densities were 95 percent relative compaction or greater in all cases.

-continued-

(2)
ty of Ames
Ames Lagoons
Lab No. 199869

On November 7, 1980, nine soil samples were obtained at locations shown on the site plan to evaluate gradation and plasticity indexes. The samples were selected primarily from marginal areas to define the limits of suitable liner materials. Results of these tests are enclosed.

On November 17, 1980, construction of the lagoon bottom liner, and our acceptance testing, is continuing. Also, sampling for as-built liner permeability is underway. We will submit a record of further field and laboratory test results as they are developed.

If you have questions concerning this report, please contact us at your convenience.

Respectfully submitted,

PATZIG TESTING LABORATORIES CO., INC.

Craig A. Carradus

Craig A. Carradus, E.I.T.

CAC/dkb

2 cc above
1 cc above, Attn: Jim Townsend
1 cc Lutz, Daily & Brain, Attn: Lee Seybert
1 cc McAninch Corp.
1 cc James Thompson & Son

I hereby certify that this plan, specification or report was prepared by me or under my direct personal supervision and that I am a duly registered Professional Engineer under the laws of the State of Iowa.

Signed Date

Byron A. Marks 11-18 1980

Byron A. Marks, P.E., Iowa Reg. No. 4923

Appendix D

Construction Permeability Testing

Patzig Testing Laboratories Co., Inc.

1922 DELAWARE AVENUE DES MOINES, IOWA 50313 (515) 266-5101

December 11, 1980

City of Ames
Carroll & E. 5th
Ames, Iowa 50010

Re: Ames Lagoons
Ames Power Plant
Lab No. 199869-T

Attn: Merlin Hove

Gentlemen:

This letter presents the results of the lagoon seal tests for the above project. Nine tests were conducted on undisturbed samples, 3-inch diameter Shelby tubes, collected in essential compliance with ASTM D1587.

The coefficient of permeability (hydraulic conductivity) for each sample was evaluated using a falling head permeameter. Sample permeabilities calculated from the test results appear on the enclosed table.

The most permeable sample has been selected to calculate the maximum seepage rate that may occur under both 6 and 20 foot lagoon water levels. The calculations, using Darcy's law, are shown on the enclosed computation sheet, and the calculated maximum seepage does not exceed the IDEQ limitation of 1/16-inch per day.

Respectfully submitted,

PATZIG TESTING LABORATORIES CO., INC.

Craig A. Carradus

Craig A. Carradus, E.I.T.

CAC/dkb

1 cc above
2 cc Lutz, Daily & Brain
Attn: Lee Seybert

Encls.

Lagoons
Power Plant
b No. 199869-1

PERMEABILITY TESTS

Sample No.	Grid Location	Cell Designation	Permeability Foot/Day X 10^{-5}	Permeability Cm/Sec X 10^{-9}
1	100' W. 200' N. of SE Corner	Ash Pond	0.9	3.2
2	100' S. 25' E. of NW Corner	Ash Pond	0.5	1.9
3	200' N. 200' E. of SW Corner	Ash Pond	2.1	7.3
4	100' W. 100' S. of NE Corner	Ash Pond	1.9	7.0
5	330' E. 200' N. of SW Corner	Ash Pond	0.1	0.4
6	400' E. of NW Corner-45' Up Dike	Ash Pond	1.1	3.9
7	200' E. 50' N. of SW Corner	Ash Pond	0.4	1.5
8	300' E. 10' N. of SW Corner	Clearwater Basin	6.4	23
9	125' E. 35' N. of SW Corner	Clearwater Basin	8.5	30