GOLDER

REPORT

Annual Inspection

Coal Creek Station - Southeast Section 16 CCR Landfill

Submitted to:

Great River Energy
2875 Third Street SW
Underwood, North Dakota 58576

Submitted by:

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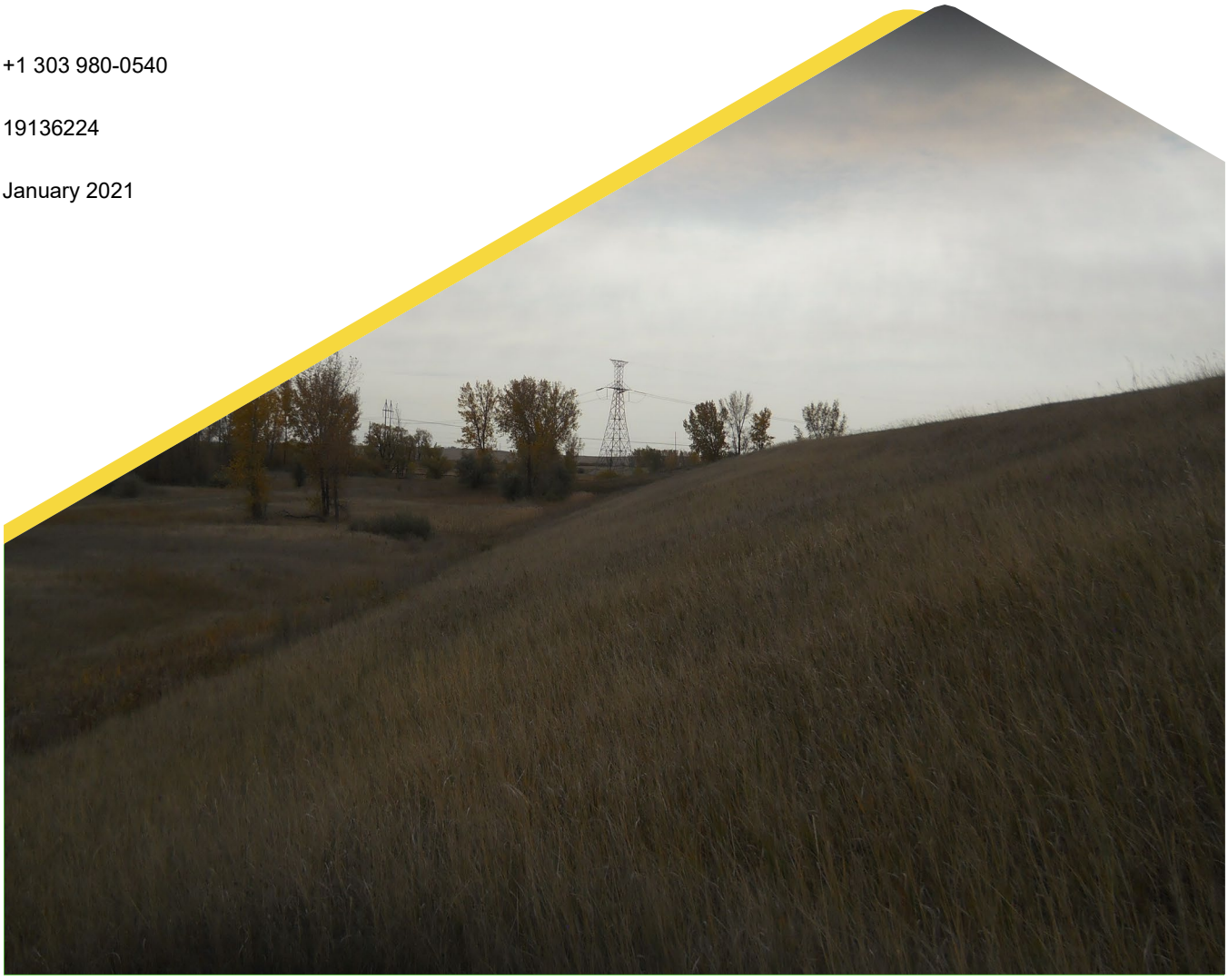
19136224

January 2021



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1.0 INTRODUCTION

As part of 40 CFR Part 257 of the Subtitle D solid waste provisions under the Resource Conservation and Recovery Act (RCRA), utilities are required to complete annual inspections for surface impoundments and landfills containing Coal Combustion Residuals (CCR). This report has been prepared by Golder Associates Inc. (Golder) for Great River Energy (GRE) to satisfy the annual inspection requirements for CCR landfills under 40 CFR Part 257.84.

Coal Creek Station (CCS) is located in McLean County, approximately 10 miles northwest of Washburn, North Dakota. There are four facilities located at CCS that fall under the CCR rule requirements (Figure 1):

- Drains Pond System CCR Surface Impoundment (Drains Pond System)
- Upstream Raise 91 CCR Surface Impoundment (Upstream Raise 91)
- Upstream Raise 92 CCR Surface Impoundment (Upstream Raise 92)
- Southeast Section 16 CCR Landfill (Southeast 16)

Upstream Raise 91 and Upstream Raise 92 both operate as impoundments and will be closed with CCR in-place. The Drains Pond System is currently being used to dewater bottom ash and as a process water impoundment to return conveyance water back to the plant. The Southeast 16 landfill operates as a landfill and is used as a storage/disposal facility for CCRs that do not contain free liquid. This report presents a review of available facility information and findings of the inspection of Southeast 16 at CCS performed October 6, 2020.

2.0 REVIEW OF EXISTING INFORMATION

2.1 Geological Conditions

Southeast 16 is generally constructed over a glacial till layer consisting of sandy and silty-clay soils. Glacial till varies in thickness from 20 feet to several hundred feet near CCS. Silty-sand and sand lenses and discontinuous coal seams are present throughout the glacial till formation, which is underlain by poorly consolidated siltstone/sandstone bedrock (Barr Engineering 1982; CPA and UPA 1989).

2.2 Site History and Liner Systems

Southeast 16 (Figure 2) is located in Section 16, Township 145N, Range 82W and covers approximately 71 acres. The facility is used as a storage/disposal facility for CCRs including fly ash, bottom ash, economizer ash, and flue gas desulfurization (FGD) material as required. Moisture conditioned CCRs are transported to Southeast 16 using haul trucks. The material is placed using a dozer and compacted by routing the haul traffic over placed CCR. In addition, Southeast 16 receives non-CCR materials associated with plant processes and a small construction and demolition (C&D) disposal area receives C&D material from CCS. Contact water at Southeast 16 is routed to the north side of the facility to a contact water collection area and sump. As required, contact water is pumped from the sump to Upstream Raise 92, Upstream Raise 91, or the Drains Pond System. Southeast 16 is adjacent to hay fields and wetland areas to the north and east, Upstream Raise 92 to the west, and is approximately 100 feet north of rail lines.

Southeast 16 was originally part of the East Ash Pond. In 1989, the facility was reclassified as a solid waste disposal area and CCRs disposed of at Southeast 16 were excavated and placed in the Southwest Section 16 Landfill. After being cleaned out, Southeast 16 was re-graded with berms along the east, south, and west sides. The footprint was re-lined in 1994 with a composite liner consisting of 2 feet of compacted clay, a 60-mil

geomembrane liner, a non-woven geotextile cushion, and fly ash protective cover. In 2001, a contact water collection area was defined by construction of an embankment along the north side and installation of a composite liner consisting of a geosynthetic clay liner (GCL) and a 60-mil high density polyethylene (HDPE) geomembrane liner. In 2015 this contact water collection area along the north side of the facility was expanded by approximately 4.5 acres. Protective cover material (bottom ash and fly ash) was constructed over the liner system in the fall of 2020 and the north side of the contact water collection area embankment was covered with soil and seeded to promote vegetative growth. The contact water collection area expansion liner consists of a GCL and 60-mil geomembrane overlain with fly ash and bottom ash protective cover.

Selected construction drawings from the 1994, 2001, 2015, and 2020 work and current permit drawings are included in Appendix A.

2.3 Site Geometry

The design top of embankment surrounding Southeast 16 has an approximate elevation of 1904 feet above mean sea level (amsl) along the south and east sides, and between 1887 and 1892 feet amsl along the north side. The original berm along the west side was at elevation 1901 feet amsl, but CCR storage/disposal along this side extends over this berm onto Upstream Raise 92 slopes. The upstream slopes of the embankment surrounding Southeast 16 were designed with three horizontal units to one vertical unit (3:1) slopes to bottom of landfill elevations between 1887 feet amsl and 1876 feet amsl. The downstream slopes from the soil embankment have 3:1 slopes. The surrounding topography has elevations varying from approximately 1882 feet amsl to 1876 feet amsl. The crest is a gravel surfaced roadway supporting light passenger vehicles. All heavy haul equipment accesses the site from the north and west sides along internal roads constructed on placed CCR material.

2.4 Changes in Geometry

No significant changes to geometry were noted other than the continued placement of CCR materials, non-CCR materials, and C&D debris to the design grades. Based on site documentation of the materials disposed of over the previous year, estimated disposal through the fall of 2020 included approximately 50,000 cubic yards (CY) of CCR and non-CCR material primarily deposited along the south and east sides to bring outside grades up to an approximate elevation of 1940 feet amsl.

2.5 Storage Capacity and Volumes

Based on annual placement estimates and survey placement estimates, the amount of CCR and non-CCR material contained in the facility at the end of 2020 is estimated to be approximately 4,030,000 CY.

2.6 Permits

Southeast 16 is currently permitted with the North Dakota Department of Environmental Quality (NDDEQ) under Permit Number 0033. Previous permit modification documents describe additional historical information about the design of the facility (CPA 1997, CPA and UPA 1989, GRE 2003, GRE 2012, GRE 2015).

2.7 Summary of 2020 Weekly Inspections

Routine weekly inspections of Southeast 16 were performed as a part of the final CCR Rule. Based on a review of the available inspection forms, the following items were noted:

- Generally good site maintenance

- No signs of significant seepage, settlement, or cracking of the berm downstream slopes

2.8 Summary of Previous Inspections

The most recent annual professional engineer inspection of Southeast 16 was performed by Golder in September of 2019 (Golder 2020) and a summary of the observations of that inspection are as follows:

- Generally good vegetation and site maintenance.
- Exposed geomembrane liner along the north berm upstream slope and minor damage to this liner.
- Minor erosion of downstream CCR slopes.
- Minor rutting of access roads on the south and east berm crests.
- Areas of poorly vegetated berm downstream slopes on the north side of the facility constructed with bottom ash.
- Isolated areas of poorly vegetated temporary and final cover placed on CCR downstream slopes.
- Contact water control features (sump, pump, and piping) were in good condition.
- Isolated and minor woody vegetation was growing near the toe of slopes.

3.0 2020 ANNUAL INSPECTION

On October 6, 2020, Addison Darr, Brendan Purcell, and Craig Schuettpelz of Golder performed an inspection of Southeast 16 per United States Environmental Protection Agency (USEPA) Regulation 40 CFR Part 257.84(b) requirements. The inspection consisted of visual observations while walking around the facility traversing up and down the perimeter berm and CCR placement areas. An annual inspection checklist used during the inspection is presented in Appendix B. Photographs were taken and are presented in Appendix C. The following presents a summary of the observations made during the 2020 annual inspection.

3.1 Hydraulic Structures

Contact water is collected in the contact water collection area located in the northeast corner of Southeast 16. As contact water accumulates, it can be pumped from the area to Upstream Raise 92, Upstream Raise 91, or the Drains Pond System through a HDPE pipe (above and below grade). The contact water collection area and pipe observed appeared to be in good condition with no noticeable damage or significant corrosion. Some erosion of bottom ash protective cover in the southeast corner of the contact water control area was observed on October 6. This area was repaired as a part of construction completed in the fall of 2020 and photographs of the area are included in the photograph log (Appendix C). The corrugated metal culvert conveying contact water collected on top of the facility to the north contact water collection area (under the C&D access road) appears to have a slight sag in the middle of the culvert (noted in the 2019 annual inspection report); however, additional deformation in 2020 does not appear to have occurred.

3.2 Perimeter Berm

3.2.1 Berm Upstream Slope

The majority of berm upstream slopes have been covered with CCR, with only the berm upstream slope along the north side visible at the time of inspection on October 6, 2020. The slopes appeared to match the design slopes of 3:1 with no observed cracks, sloughs, settlement, or seepage. Shortly after the annual inspection was completed,

the geomembrane liner along much of the north berm upstream slope and a minor area on the floor of the contact water collection area was inspected for damage and repaired, and CCR was placed in the area as protective cover over the exposed geomembrane liner system. Golder personnel were onsite during repairs and construction of protective cover and after construction was complete, the berm upstream slopes of Southeast 16 appear to be in good condition.

3.2.2 Berm Crest

The berm crest around the east and south sides of Southeast 16 is surfaced with gravel and used for light vehicle traffic. The berm crest along the north side is narrow and rarely used for light vehicle traffic. Heavy haul traffic bringing CCR to the site use an internal road constructed over previously placed CCR. The road on the berm crest of Southeast 16 appears to be in good condition, with no noticeable cracking or settlement, and appears to be well maintained. When wet, the road surface can become rutted and slippery. Ruts that develop on the road surface should be repaired as soon as practical to maintain access.

3.2.3 Berm Downstream Slope

The berm downstream slopes on the south and east side had good vegetation. Some small animal burrows were identified along the berm downstream slope. The north berm downstream slope west of the contact water collection area was constructed of bottom ash. Shortly after the inspection was performed, growth medium and topsoil were placed on this slope to cover the bottom ash berm and improve vegetative success. Golder did not observe indications of seepage, sloughing, cracking, or excessive settlement on the berm downstream slopes. The berm downstream slopes appeared to be in fair condition.

3.2.4 Toe

The environment at the toe of the berm slope varies surrounding Southeast 16. A poorly draining area exists at the toe along the north side and surface water drainages exist along the toe on the south and east sides. Golder did not observe indications of sloughing, cracking, significant erosion, excessive settlement, or vegetation that seemed to be thriving abnormally along the toe. No signs of seepage were noted. The toe appeared to be in good condition. There were a few small trees and bushes near the toe along the east and south sides. Although these trees and bushes were not on the berm downstream slopes, Golder recommends that they be removed to keep all woody vegetation clearly off the berm downstream slopes and toe.

3.3 CCR Placement

3.3.1 CCR Downstream Slope (no Cover)

Uncovered CCR downstream slopes appeared to be in fair condition with no noticeable cracks, settlement, sloughing, seepage, or other signs of structural distress. The uncovered CCR downstream slopes appeared to match the design slopes with only minor erosion noted, particularly of fly ash along the north CCR downstream slope. Erosion of fly ash on the south downstream CCR slope has led to the collection of minor amounts of fly ash in the contact water ditch. Golder recommends that the contact water ditch be periodically cleaned out to allow contact water to flow unobstructed through the ditch.

3.3.2 CCR Downstream Slope (with Cover)

Portions of CCR downstream slopes on the north, east and south sides of Southeast 16 have temporary cover installed as of late 2016. These areas had fair vegetation (a combination of grassy vegetation and weeds) and minor erosion on the soil surface below (one area in the northeast corner had a relatively large erosion rill).

However, these CCR downstream slopes with temporary cover appeared to be in generally good condition to aid in controlling erosion of the outer fly ash “shell” and limit wind-blown fugitive dust.

The east and south CCR downstream slopes of Southeast 16 have final cover to an elevation of 1925 feet amsl with terrace channels and downchute drainage channels along the side slopes. This final cover was installed in 2015 and had fair native grass vegetative growth. Golder recommends that isolated areas receive additional topsoil and be re-seeded, especially along the crests of the terrace channels where vegetation appears poorest.

Golder did not observe indications of seepage, sloughing, cracking, settlement, or other signs of structural distress on the covered CCR downstream slopes. The covered CCR downstream slopes appeared to be in fair condition.

3.4 Signs of Structural Weakness or Other Observations that Could Affect Stability

No signs of structural weakness or other observations that could affect the stability of Southeast 16 were observed during the site inspection in September 2019.

4.0 SUMMARY AND CONCLUSIONS

An annual inspection was performed for Southeast 16 at Coal Creek Station on October 6, 2020. The inspection met the requirements for CCR landfills under 40 CFR Part 257.84. Golder observed good vegetation and site maintenance and did not identify significant deficiencies such as seepage, excessive erosion or settlement, or cracking during visual observations of Southeast 16. Shortly after the annual inspection, exposed liner on the north side of Southeast 16 was covered with protective cover material (bottom ash and fly ash) and the north downstream perimeter berm slope was covered with soil and seeded to promote vegetative growth. These construction activities were monitored and documented by Golder personnel.

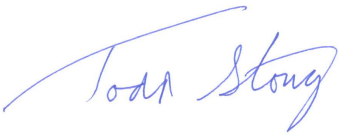
In addition to annual inspections by the Professional Engineer, trained and qualified site personnel perform required weekly facility inspections to look for signs of potential structural weaknesses.

Minor maintenance items that may need to be continually addressed include repairing large animal burrows as they appear, monitoring erosion along CCR slopes, repairing rutted perimeter roads to maintain access, re-seeding poorly vegetated CCR downstream slopes where final cover has been placed, removing woody vegetation growing on the berm downstream slopes and toes, and placing CCR over exposed geomembrane liner.

Golder Associates Inc.

Kevin Cernik
Staff Engineer

Craig Schuettpelz, PE
Senior Engineer



Todd Stong, PE
Associate and Senior Consultant

KAC/TJS/mb

5.0 REFERENCES

Barr Engineering. 1982. Coal Creek Station Hydrogeologic Study, June 3, 1982.

Cooperative Power Association. CPA 1997. Application to Renew Permit SU-033 and Combine with Permit SU-118. Eden Prairie, Minnesota, July 30, 1997.

Cooperative Power and United Power Association. CPA and UPA 1989. *Application to Renew Permit to Operate a Special Use Disposal Site, Coal Creek Station, Permit Number SU-033*. Prepared for the North Dakota State Department of Health and Consolidated Laboratories.

Golder Associates, Inc. Golder 2020. 2019 Annual Inspection Report – Great River Energy – Coal Creek Station – Southeast Section 16 CCR Landfill. January 2020.

Great River Energy – Coal Creek Station. GRE 2003. Permit Modification Document, Permit No. SP-033. Original Permit Modification submitted September 30, 2003. Revised Permit Modification submitted to NDDH on July 8, 2004.

Great River Energy – Coal Creek Station. GRE 2012. Permit Modification Document, Permit No. SP-033. Original Permit Modification dated December 12, 2012.

Great River Energy – Coal Creek Station. GRE 2015. Permit Modification Document, Permit No. SP-033. Original Permit Modification dated February, 2015.

Figures

GOLDER

NOTE(S)

1. AERIAL IMAGE FROM UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AGRICULTURE AERIAL IMAGERY PROGRAM, TAKEN IN 2020.

GREAT RIVER ENERGY - COAL CREEK STATION
2020 ANNUAL CCR FACILITY INSPECTION REPORT
SITE OVERVIEW

FIGURE 1

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REFERENCE(S)

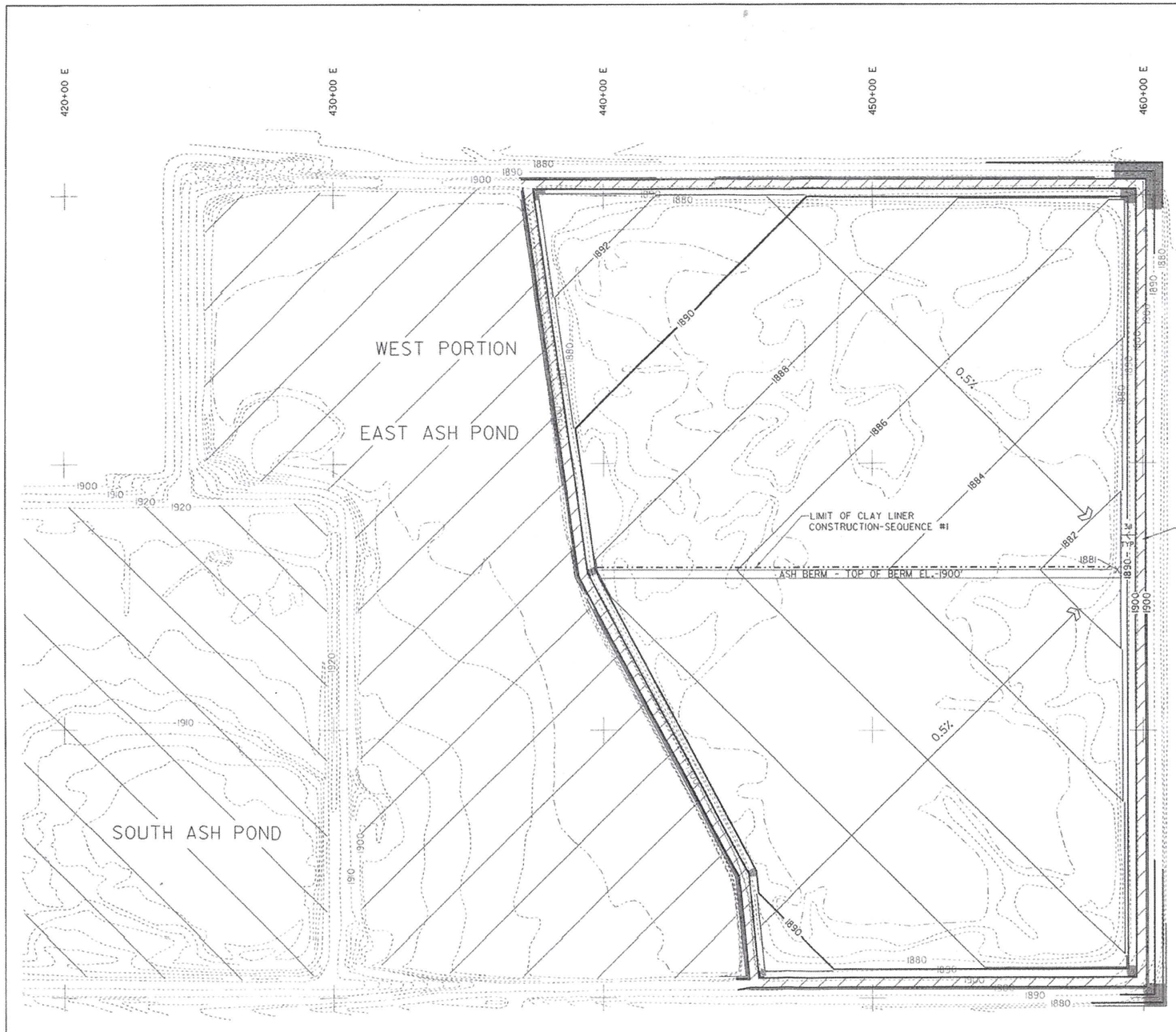
1. FOREGROUND IMAGERY PROVIDED BY GREAT RIVER ENERGY, NOVEMBER 2020.
2. BACKGROUND IMAGERY FROM UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AGRICULTURE AERIAL IMAGERY PROGRAM, TAKEN 2020.

GREAT RIVER ENERGY - COAL CREEK STATION
2020 ANNUAL CCR FACILITY INSPECTION REPORT
SOUTHEAST 16 - SITE OVERVIEW

FIGURE 2

APPENDIX A

Selected Construction Drawings and Permit Drawings



N

LEGEND

- 1900 — EXISTING GROUND CONTOUR
- EXISTING EDGE OF WATER
- 1900 — PROPOSED BASE GRADE CONTOUR
- 3:1 PROPOSED SLOPE RATIO
- 4% PROPOSED SLOPE
- 1876 × PROPOSED SPOT ELEVATION
- TOP OF BERM

NOTES:

1. SITE LOCATION: SECTION 16, T45N, R82W, MC LEAN COUNTY, NORTH DAKOTA.
2. TOPOGRAPHIC MAP PREPARED FROM AERIAL SURVEY BY KBM, INC., GRAND FORKS, NORTH DAKOTA. DATE OF PHOTOGRAPHY - SEPTEMBER 30, 1987.
3. ELEVATIONS BASED ON MEAN SEA LEVEL DATUM. CONTOUR INTERVAL IS TWO FEET.
4. HORIZONTAL DATUM BASED ON NORTH DAKOTA STATE PLANE COORDINATE SYSTEM AS FOLLOWS:

   SITE GRID N = N STATE PLANE COORD MINUS 150,000
   SITE GRID E = E STATE PLANE COORD MINUS 1,830,000

5. THIS DRAWING SHOWS CONTOURS DEPICTING THE BASE GRADES (TOP OF CLAY LINER).

WEST PORTION OF E.A.P

OWNER TO PLACE AN INTERIM COVER OF A MINIMUM OF 6" OF COMPACTED SELECT MATERIAL OVER EXISTING RESIDUE. OWNER TO PERIODICALLY COLLECT SURFACE WATER RUNOFF, AS REQUIRED, FOR DISPOSAL IN AN ACCEPTABLE MANNER.

SECTION MANAGER		
PROJECT COORD.		
DESIGN COORD.		
TECHNICAL COORD.		
RELEASES	BY:	DATE
ENGINEERING REVIEW		
SECTION MANAGER		
HYDRO.		
TECHNICAL COORD.		
RELEASES	BY:	DATE
HYDROGEOLOGIC REVIEW		
PROJECT REVIEW		
6		
5		
4		
3		
2		
1		
NO.	BY:	DATE
DESCRIPTION		
REVISIONS		

PLAN OF OPERATION FOR THE COAL CREEK STATION EAST ASH POND DISPOSAL AREA MC LEAN COUNTY, NORTH DAKOTA

BASE GRADES

Foth & Van Dyke
Geoscience and Environmental Management Division
P.O. Box 1902
Green Bay, WI 54307-1902
(414) 497-2500

DRAWN BY	MRS
DATE	DECEMBER, 1988
BOOK NO	
JOB NO.	87C61
FILE NO	
SURVEYED BY	
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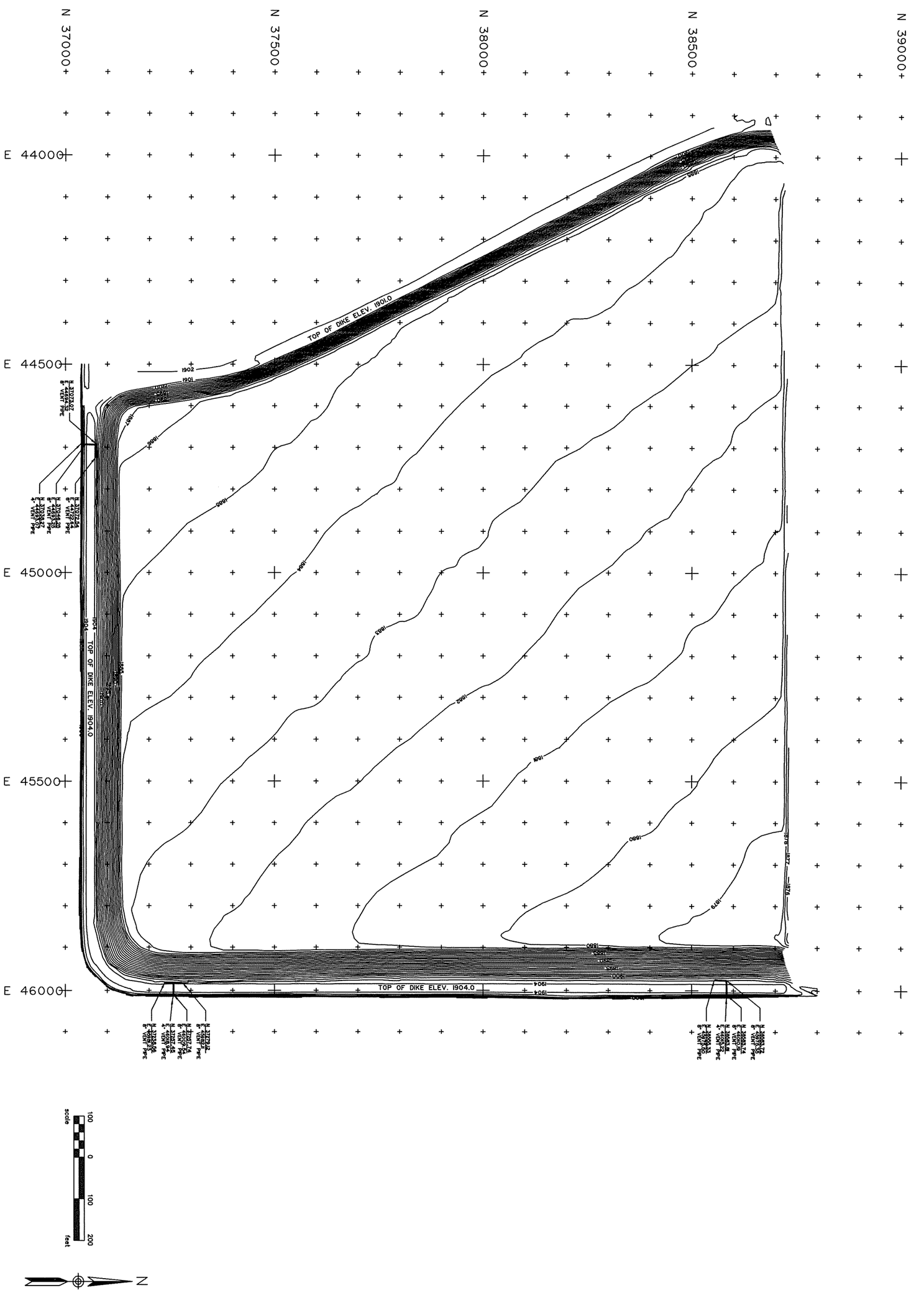
DRAWING NO.

A-4



SHEET NO. 4

interstate engineering, inc.

Engineering – Surveying – Planning

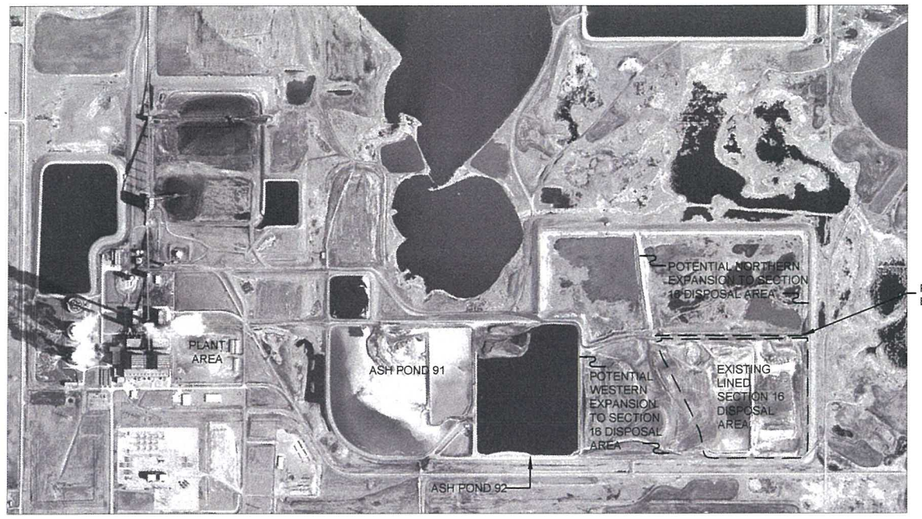
COOPERATIVE POWER ASSOCIATION
UNDERWOOD, NORTH DAKOTA

SECTION 16 FINAL CONTOURS
WITH GAS VENT PIPING
SECTION 16, T145N, R82W.

Drawn By D.JONASSON | Project No. B94-23(01)

Checked By L.H.K | Date 10/01/94

Revision No.	Date	By	Description



LOCATION PLAN

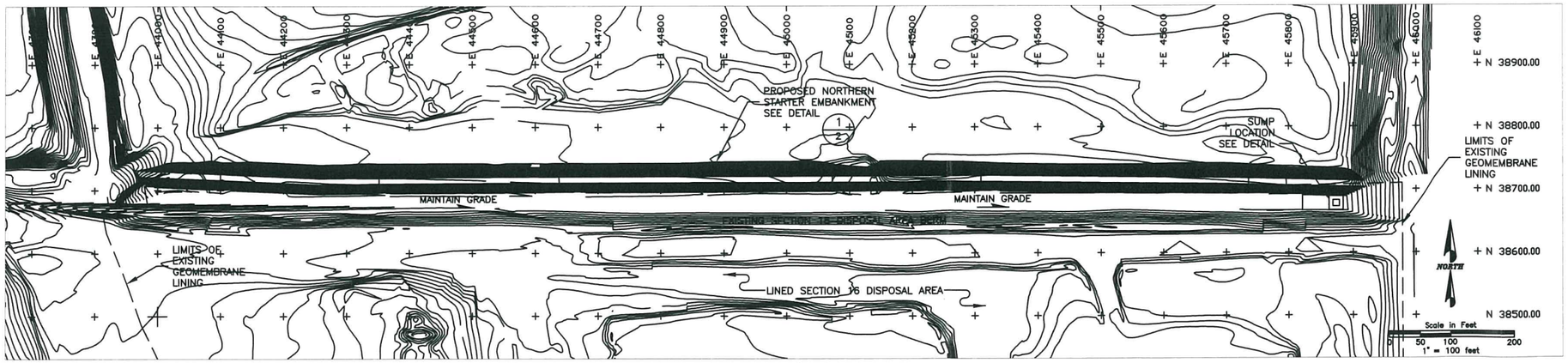
NOTES

1. TOPOGRAPHY AND AERIAL PHOTOGRAPH PROVIDED BY GREAT RIVER ENERGY (GRE) 9/2000.
2. GRE SHALL PROVIDE SOIL MATERIALS, GEOSYNTHETIC CLAY LINER (GCL), AND GEOMEMBRANE LINER.
3. EARTHWORKS CONTRACTOR RESPONSIBLE FOR BERM CONSTRUCTION, INCLUDING SOIL EXCAVATION, TRANSPORTATION, STOCKPILING AND PLACEMENT TO THE LINES AND GRADES ON THESE DRAWINGS; AND DEPLOYMENT OF GCL AND GEOMEMBRANE LINER; AND GCL SEAMING.
4. LINER SEAMING CONTRACTOR RESPONSIBLE FOR SEAMING GEOMEMBRANE PANELS.
5. GCL REQUIRED FOR CONSTRUCTION SHALL CONSIST OF A LAYER OF SODIUM BENTONITE BETWEEN WOVEN OR NON-WOVEN NEEDLE-PUNCHED GEOTEXTILES.
6. GEOMEMBRANE LINER REQUIRED FOR CONSTRUCTION SHALL BE 60-MIL SMOOTH HIGH-DENSITY POLYETHYLENE (HDPE).
7. SOIL MATERIALS USED FOR BERM CONSTRUCTION SHALL BE CLEAN, GRANULAR BOTTOM ASH FREE OF ORGANIC MATERIALS.
8. THE EXISTING LINER IN THE AREA SHOWN ON THE DRAWINGS SHALL BE CUT IF REQUIRED AND ROLLED AWAY FROM CONSTRUCTION ACTIVITIES TO PROTECT IT FROM DAMAGE.
9. NATURAL GROUND WITHIN THE LIMITS OF BERM CONSTRUCTION SHALL BE STRIPPED OF TOPSOIL, AND SCARIFIED IN PREPARATION FOR PLACEMENT OF SOIL CONSTRUCTION MATERIALS.
10. SOIL MATERIALS SHALL BE PLACED IN MAXIMUM 12-INCH THICK HORIZONTAL LIFTS AND COMPACTED USING METHODS APPROVED BY THE OWNERS REPRESENTIVE.
11. PORTIONS OF THE BERM TO BE COVERED BY GCL AND GEOMEMBRANE LINER SHALL BE SMOOTH-DRUM ROLLED TO PROVIDE A FLAT SURFACE.
12. OVERSIZED SOIL MATERIALS LOCATED WITHIN PORTIONS OF THE BERM THAT WILL BE COVERED WITH GCL AND GEOMEMBRANE SHALL BE REMOVED AS DETERMINED BY THE OWNERS REPRESENTIVE.
13. GEOSYNTHETICS SHALL BE DEPLOYED FROM EAST TO WEST TO PROVIDE OVERLAP IN THE DOWNSTREAM DIRECTION.
14. GCL SHALL BE DEPLOYED USING MANUFACTURER-RECOMMENDED METHODS, AVOIDING UNNECESSARY FOLDS OR IRREGULARITIES.
15. GCL PANEL OVERLAP SHALL BE ACCORDING TO THE MANFUCTURES RECOMMENDATIONS.
16. GEOMEMBRANE LINER SHALL BE DEPLOYED USING MANUFACTURER-RECOMMENDED METHODS, AVOIDING UNNECESSARY FOLDS OR IRREGULARITIES.
17. GEOMEMBRANE OVERLAP SHALL BE ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS AND COORDINATED WITH THE SEAMING CONTRACTOR.
18. GEOMEMBRANE SHALL BE TEMPORARILY ANCHORED USING SANDBAGS FILLED WITH BOTTOM ASH.
19. THE EXISTING GEOMEMBRANE SHALL BE RE-DEPLOYED AND EDGE CLEANED (TOP AND BOTTOM) AND DRIED IN PREPARATION FOR SEAMING TO THE NEW LINER, AS DIRECTED BY THE OWNER.
20. THE GEOMEMBRANE LINER PANELS SHALL BE SEAMED USING FUSION OR EXTRUSION WELDING PROCESSES.
21. GEOMEMBRANE LINER CQA SHALL CONSIST OF DESTRUCTIVE AND NON-DESTRUCTIVE TESTING.
22. FUSION SEAMS SHALL BE TESTED USING AIR CHANNEL TESTS WITH A PRESSURE OF 30 PSI FOR 5 MINUTES. PASSING TESTS SHALL CONSTITUTE A PRESSURE DROP OF LESS THAN 3 PSI WITHIN 5 MINUTES.
23. EXTRUSION WELDS SHALL BE TESTED USING A VACUUM BOX AND AN APPLIED PRESSURE OF 5 PSI FOR 10 SECONDS.
24. DESTRUCTIVE TESTING SHALL BE CONDUCTED FOR SHEAR AND PEEL.
25. LINER CQA SHALL BE OBSERVED AND DOCUMENTED BY THE OWNER'S REPRESENTATIVE.

ESTIMATED MATERIAL QUANTITIES

MATERIAL	UNIT	QUANTITY
BOTTOM ASH*	YD^3	15,000
60mil SMOOTH GEOMEMBRANE LINER	FT^2	50,000
GEOSYNTHETIC CLAY LINER (GCL)	YD^2	6,400

* DENOTES IN-PLACE VOLUME



SECTION 16 NORTHERN STARTER EMBANKMENT PLAN

LEGEND

- EXISTING GROUND CONTOURS
- PROPOSED BERM CONTOURS
- EXISTING LIMITS OF SECTION 16 GEOMEMBRANE LINER

IF THE ABOVE BAR DOES NOT SCALE 1 INCH THE DRAWING SCALE IS ALTERED

CLIENT _____ DATE _____

ENGINEER'S STAMP

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0	ISSUED FOR CONSTRUCTION				
B	ISSUED WITH DESIGN REPORT	10/23/00			
A	ISSUED FOR CLIENT REVIEW	10/10/00			

PRINT ISSUE RECORD

CLIENT/PROJECT
GREAT RIVER ENERGY
COAL CREEK STATION

TITLE
SECTION 16 ASH DISPOSAL FACILITY
NORTHERN STARTER EMBANKMENT PLAN

Golder Associates
Denver, Colorado

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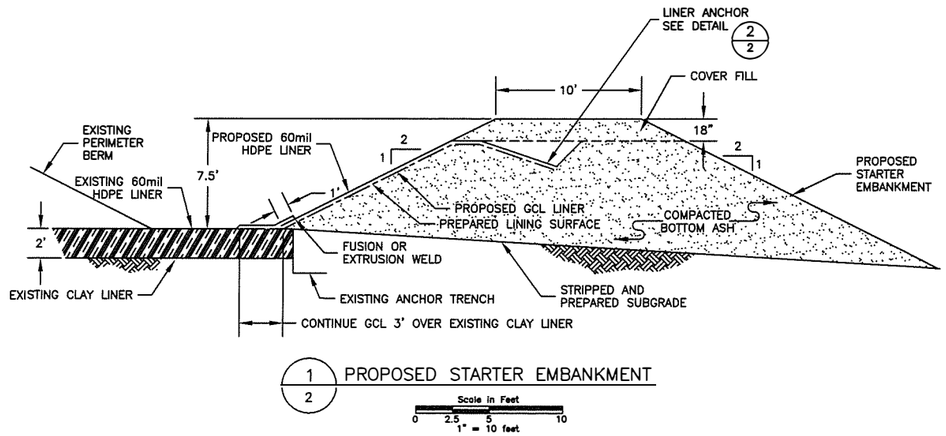

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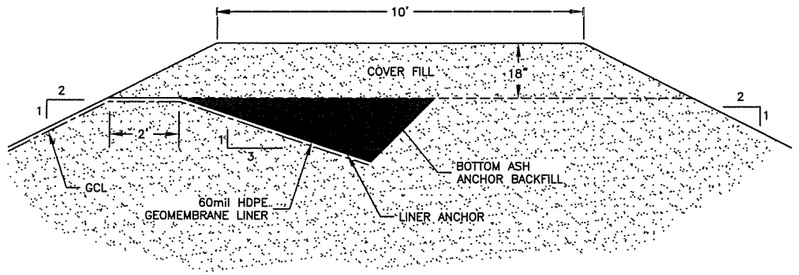
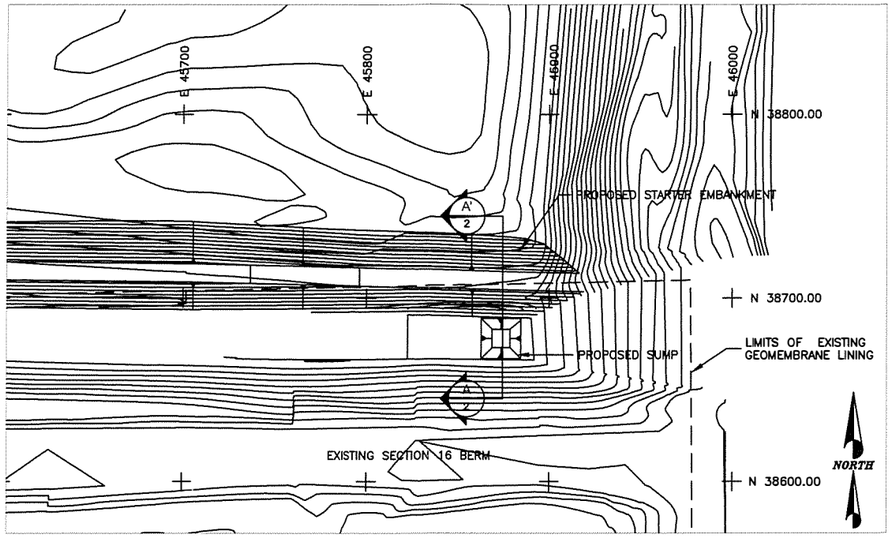


2/2 LINER ANCHOR DETAIL
N.T.S.



SUMP PLAN

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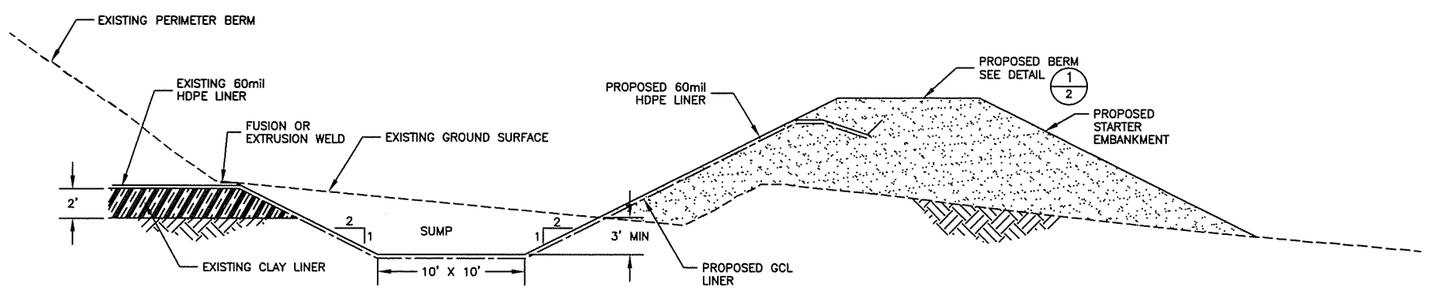

A/2 SECTION A–A'

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CLIENT DATE

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PRINT ISSUE RECORD

CLIENT/PROJECT
GREAT RIVER ENERGY
COAL CREEK STATION

TITLE
SECTION 16 ASH DISPOSAL FACILITY
NORTHERN STARTER EMBANKMENT - DETAILS

Denver, Colorado

Golder Associates

DRAWN	DBS	DATE	OCT. 2000
CHECKED	GE	SCALE	AS SHOWN
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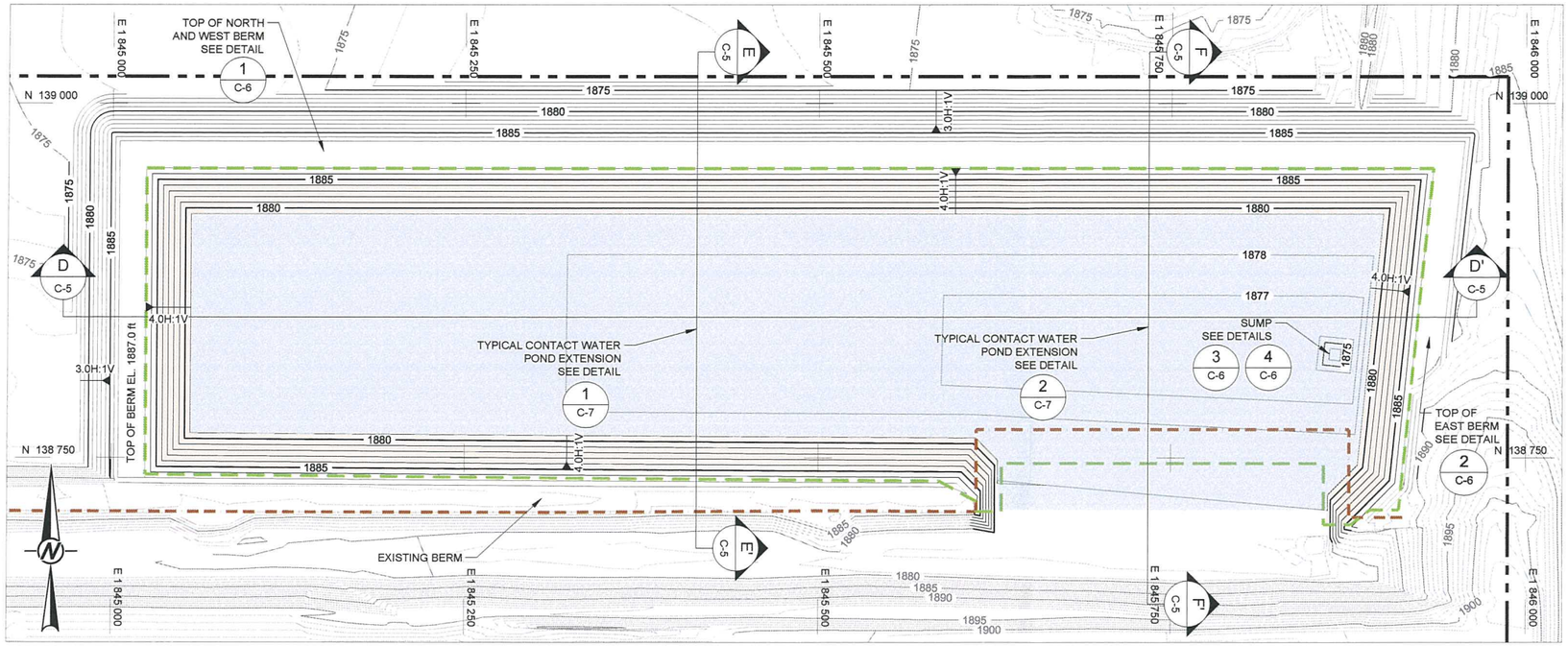
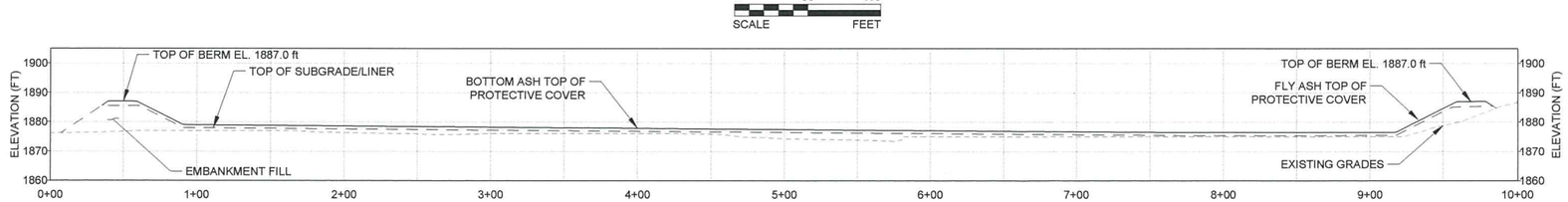
APPROVED	RRJ	DWG. NO.	C003
FILE NO.	2178C003	DRAWING	2



1 C-5 PLAN VIEW - TOP OF PROTECTIVE COVER

SCALE 0 50 100 FEET



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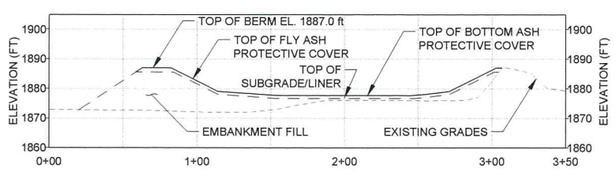
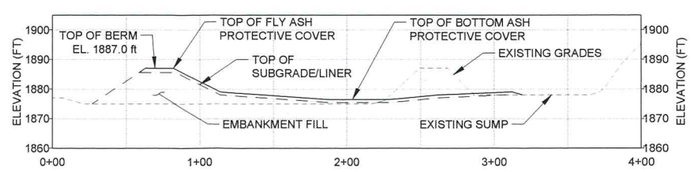
SCALE 0 50 100 FEET



2X VERT. EXAGGERATION E C-5 SECTION E - E'

SCALE 0 50 100 FEET



2X VERT. EXAGGERATION F C-5 SECTION F - F'

SCALE 0 50 100 FEET

LEGEND

- EXISTING GROUND TOPOGRAPHY (SEE REFERENCE 2)
- TOP OF PROTECTIVE COVER OR EMBANKMENT (NOTE 2)
- FLY ASH PROTECTIVE COVER (NOTE 5)
- BOTTOM ASH PROTECTIVE COVER (NOTE 5)
- PERMITTED LIMIT OF CCR FACILITY (NOTE 1)
- APPROXIMATE EXISTING LINER BOUNDARY
- APPROXIMATE NEW LINER BOUNDARY

NOTES

1. THE PERMIT BOUNDARY IS APPROXIMATE.
2. PROPOSED GRADES REPRESENT THE TOP OF PROTECTIVE COVER AND EMBANKMENT.
3. FOUR MONITORING WELLS ARE LOCATED IN A LINE ORIENTED EAST-WEST APPROXIMATELY 200 FEET NORTH OF THE NORTH BOUNDARY OF THE WORK AREA AND A PIEZOMETER IS LOCATED APPROXIMATELY 40 FEET WEST OF THE WORK AREA. EXERCISE CAUTION WHEN WORKING AROUND OR NEAR THE MONITORING WELLS AND PIEZOMETER. CONTRACTOR IS RESPONSIBLE FOR PROTECTING THESE WELLS/PIEZOMETERS DURING CONSTRUCTION ACTIVITIES.
4. A MINIMUM OF 12 INCHES OF PROTECTIVE COVER SHALL BE PLACED OVER THE NEW AND EXISTING GEOMEMBRANE, AS DIRECTED BY OWNER'S REPRESENTATIVE.
5. BOTTOM ASH SHALL BE USED ON THE FLOOR AS PROTECTIVE COVER AND FLY ASH SHALL BE USED ON THE INTERIOR SLOPES AS PROTECTIVE COVER.

REFERENCE(S)

1. SITE LOCATION: SECTION 16, T145N, R82W, MCLEAN COUNTY, NORTH DAKOTA.
2. EXISTING GROUND TOPOGRAPHY WAS PROVIDED BY GREAT RIVER ENERGY. THE SURVEYS WERE PERFORMED BETWEEN 1996 AND 2011.
3. COORDINATES ARE BASED ON THE PLANT GRID SYSTEM.
4. THE CONTOUR INTERVAL IS ONE FOOT.
5. ALL PROPERTY SHOWN ON THIS MAP IS OWNED BY GREAT RIVER ENERGY.

Rev.	YYYY-MM-DD	DESCRIPTION	PREPARED	DESIGN	REVIEW	APPROVED
0	2015-06-24	ISSUED FOR CONSTRUCTION	AMS	AMS	RFS	TJS
A	2015-06-02	ISSUED FOR BID	AMS	AMS	RFS	TJS

SEAL

REGISTERED PROFESSIONAL ENGINEER — TODD J. STONG — PE-6144 — DATE 6/24/15 — NORTH DAKOTA

CLIENT

GREAT RIVER ENERGY

GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA

CONSULTANT

GOLDER ASSOCIATES, INC.
44 UNION BLVD, SUITE 300
LAKEWOOD, COLORADO
USA
[+1] (303) 980-0540
www.golder.com

PROJECT
2015 COAL COMBUSION RESIDUAL FACILITY CONSTRUCTION
SCOPE OF WORK C
SOUTHEAST SECTION 16 CONTACT WATER POND

TITLE
TOP OF PROTECTIVE COVER

PROJECT No. 1523661 | Rev. 0 | C-5 of C-7 | DRAWING C-5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 1 in

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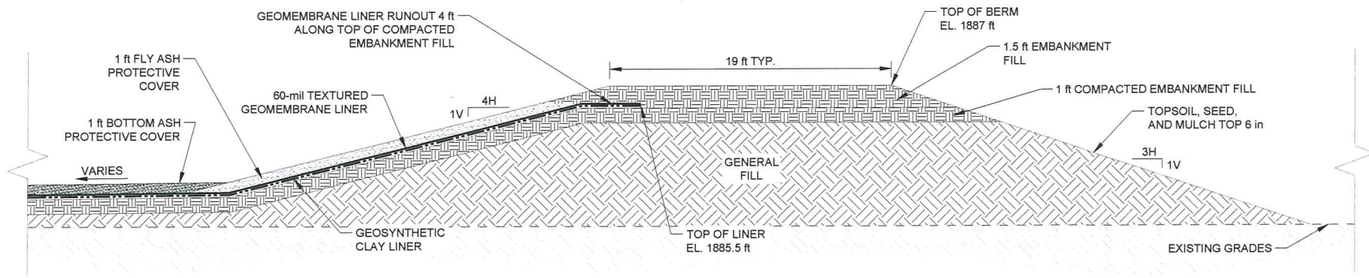
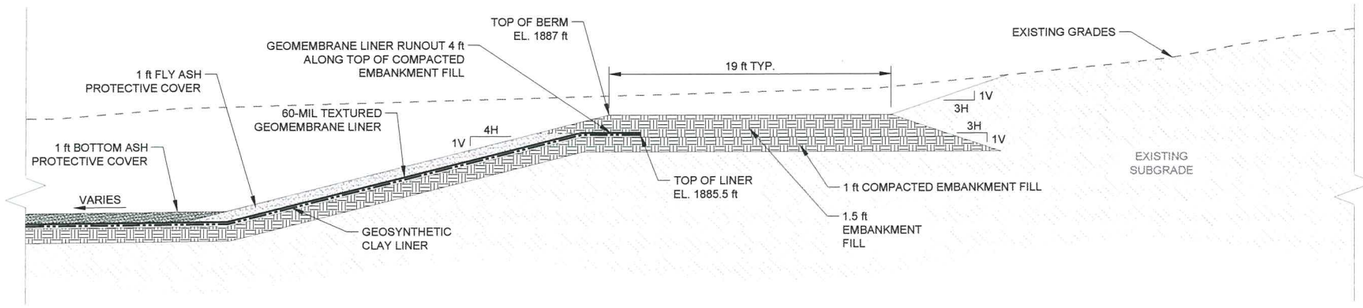
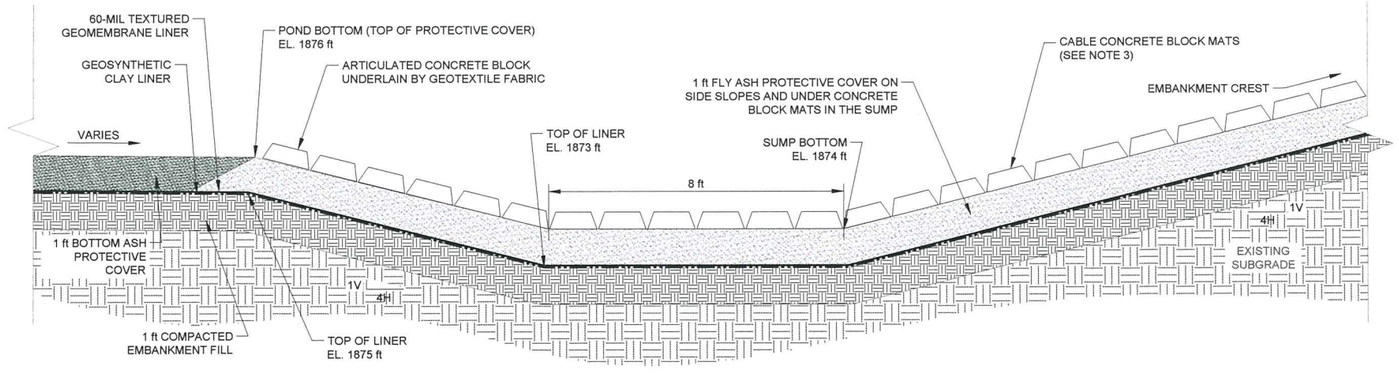


N.T.S. 1 C-6 TYPICAL BERM DETAIL (NORTH AND WEST BERMS)



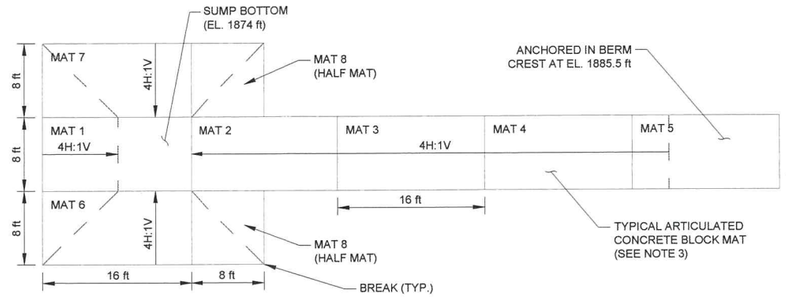
N.T.S. 2 C-6 TYPICAL BERM DETAIL (EAST BERM)



N.T.S. 3 C-6 POND SUMP DETAIL (PROFILE VIEW)

NOTES

1. PRIOR TO PLACEMENT OF GENERAL FILL OR EMBANKMENT FILL, UNSUITABLE MATERIAL TO BE REMOVED AND PLACED NORTH OF THE WORK AREA. AREAS AT GRADE SHALL BE SUBCUT TO ALLOW FOR 1-FOOT OF EMBANKMENT PLACEMENT.
2. A MINIMUM OF 12 INCHES OF PROTECTIVE COVER SHALL BE PLACED OVER THE NEW AND EXISTING GEOMEMBRANE, AS DIRECTED BY OWNER'S REPRESENTATIVE.
3. CLOSED CELL CABLE CONCRETE BLOCK MATS SHALL BE PROVIDED IN 8-FOOT BY 16-FOOT SECTIONS (OR APPROVED ALTERNATIVE) TO BE PLACED IN THE POND SUMP BOTTOM AND SLOPES AND UP THE UPSTREAM SLOPE EAST OF THE SUMP TO THE BERM CREST. MATS SHALL BE UNDERLAIN BY GEOTEXTILE FABRIC, 12 INCHES OF PROTECTIVE COVER, AND THE LINER SYSTEM.



N.T.S. 4 C-6 POND SUMP ACB PLACEMENT DETAIL (PLAN VIEW)

Rev.	YYYY-MM-DD	DESCRIPTION	PREPARED	DESIGN	REVIEW	APPROVED
0	2015-06-24	ISSUED FOR CONSTRUCTION	AMS	AMS	RFS	TJS
A	2015-06-02	ISSUED FOR BID	AMS	AMS	RFS	TJS

SEAL

REGISTERED PROFESSIONAL ENGINEER — TODD J. STONG — PE-5144 — DATE 6/24/2015 — NORTH DAKOTA

CLIENT

GREAT RIVER ENERGY

GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA

CONSULTANT

Golder Associates

GOLDER ASSOCIATES, INC.
44 UNION BLVD, SUITE 300
LAKEWOOD, COLORADO
USA
[+1] (303) 980-0540
www.golder.com

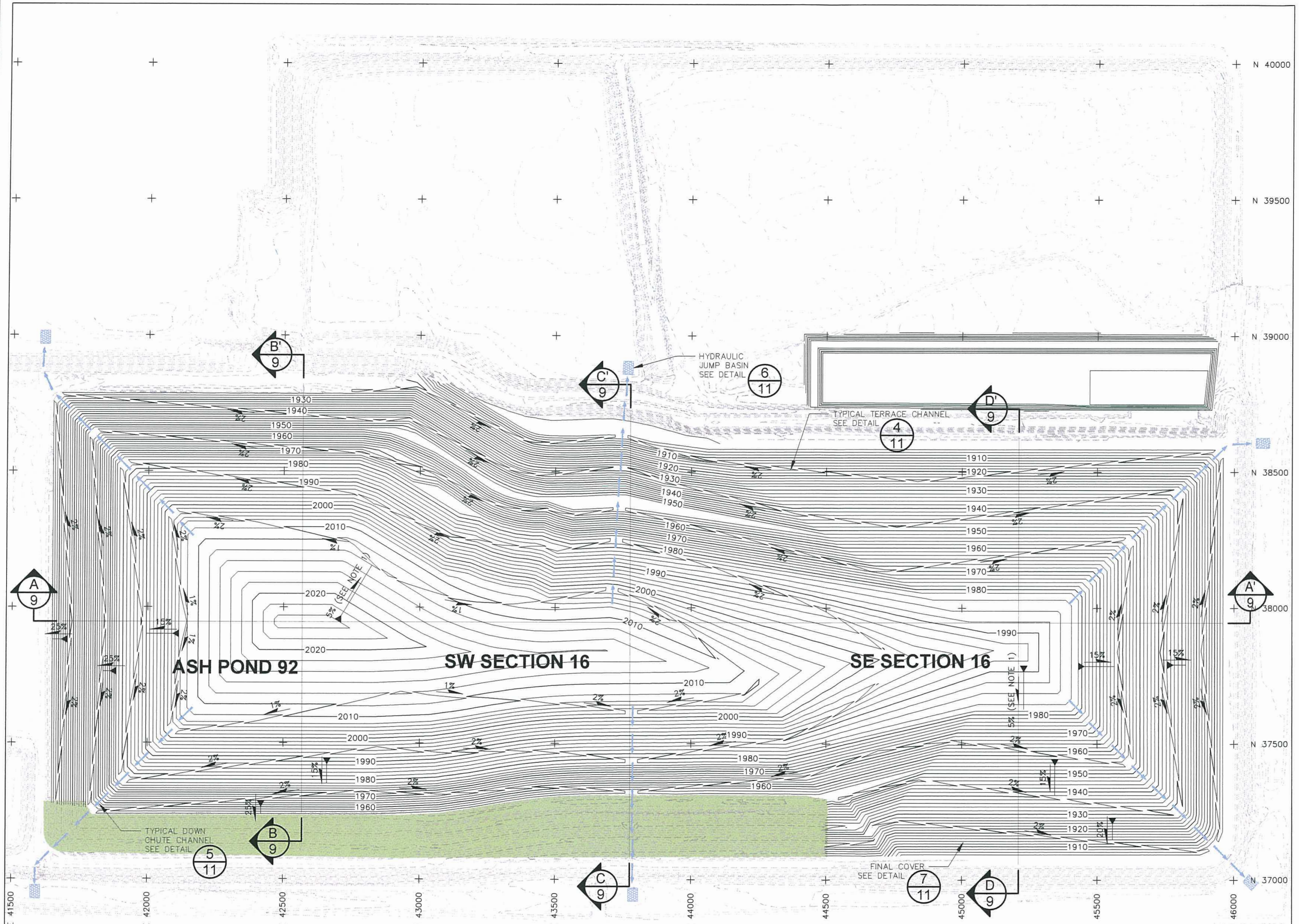
PROJECT

2015 COAL COMBUSION RESIDUAL FACILITY CONSTRUCTION
SCOPE OF WORK C
SOUTHEAST SECTION 16 CONTACT WATER POND

TITLE

DETAILS 1 OF 2

PROJECT No. 1523661 | Rev. 0 | C-6 of C-7 | DRAWING C-6



LEGEND

1980	EXISTING GROUND TOPOGRAPHY
1980	PROPOSED TOP OF COVER TOPOGRAPHY
	FINAL COVER PLACED
	DOWNCHUTE/OUTLET CHANNEL

NOTES

1. TOP OF COVER GRADES OF THE CROWN OF THE FACILITY ARE SHOWN AT 5%, BUT MAY BE CONSTRUCTED BETWEEN 3% AND 5%.
2. SEE THE SURFACE WATER ENGINEERING WORKSHEET FOR FURTHER DETAILS CONCERNING THE SURFACE WATER CONTROL PLAN.

REFERENCES

1. SITE LOCATION: SECTION 16, T145N, R82W, MCLEAN COUNTY, NORTH DAKOTA.
2. EXISTING GROUND TOPOGRAPHY PROVIDED BY GREAT RIVER ENERGY PERFORMED BETWEEN 1996 AND 2011.
3. COORDINATES BASED ON PLANT GRID SYSTEM.
4. CONTOUR INTERVAL IS TWO FEET.
5. ALL PROPERTY SHOWN ON THIS MAP IS OWNED BY GREAT RIVER ENERGY.

200 0 200
SCALE FEET

PROJECT

GREAT RIVER ENERGY
COAL CREEK STATION
PERMIT NO. SP-033 PERMIT MODIFICATION

TITLE

FINAL COVER GRADES AND SURFACE WATER PLAN

ENGINEER'S STAMP

ORIGINAL DRAWING STAMPED BY TODD STONG, REGISTERED PROFESSIONAL ENGINEER IN THE STATE OF NORTH DAKOTA (PE #6144), IS ON FILE AT GOLDER ASSOCIATES' LAKEWOOD, COLORADO, OFFICE.

NO.	REVISION DESCRIPTION	DATE	DESIGN	CADD	CHECK	REVIEW
B	ISSUED FOR PERMIT MODIFICATION	11/30/12	CCS	CCS	TJS	RRJ
A	ISSUED FOR CLIENT REVIEW	10/24/12	CCS	CCS	TJS	RRJ

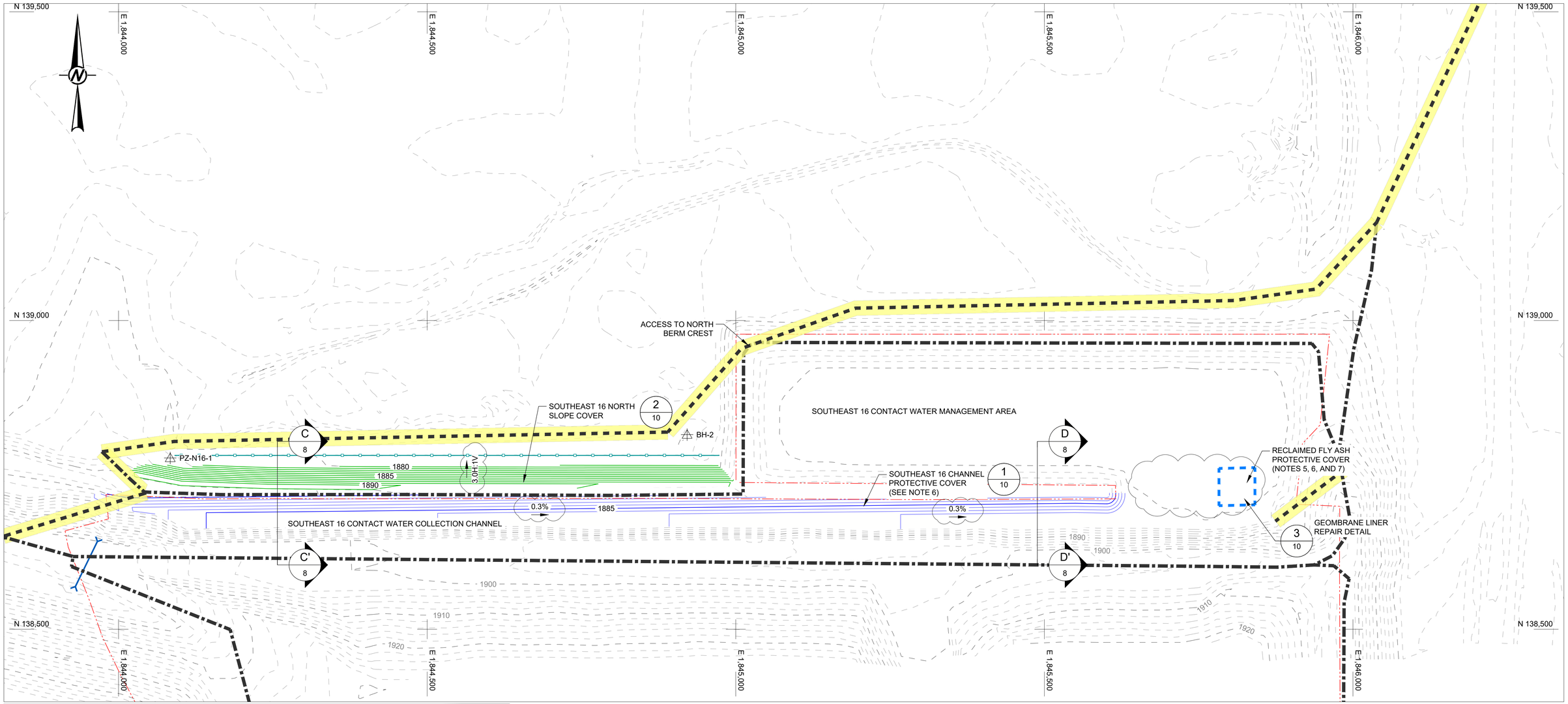
Golder Associates

GREAT RIVER ENERGY

FILE No. 11381519A009
PROJECT No. 113-81519

8

DRAFT
FOR CLIENT REVIEW



LEGEND

- EXISTING TOPOGRAPHY
- 1885 — PROPOSED TOP OF SOIL COVER
- 1885 — PROPOSED BOTTOM ASH PROTECTIVE COVER
- PIEZOMETER (SEE NOTE 3)
- POTENTIAL ACCESS/HAUL ROUTE
- TEMPORARY ACCESS ROAD (SEE NOTE 1)
- EXISTING LINER EXTENTS (SEE NOTE 4)
- SILT FENCE EROSION CONTROL
- WATER BENEATH EXPOSED GEOMEMBRANE LINER (SEE NOTE 5 AND 7)
- EXISTING CONCRETE CULVERT

NOTE(S)

1. CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTING ANY TEMPORARY ROADS OR RAMPS AND FOR WORKING WITH THE OWNER TO PROVIDE ADEQUATE SAFETY FEATURES (SIGNAGE, BERMS, BARRIERS, ETC.) APPROVED BY THE OWNER FOR POTENTIAL INTERSECTIONS WITH EXISTING HAUL ROADS. TEMPORARY ROADS FOR SITE ACCESS AND STOCKPILE ACCESS TO BE APPROVED BY OWNER'S REPRESENTATIVE.
2. CARE SHALL BE TAKEN WHILE EQUIPMENT IS OPERATING NEAR THE EXPOSED LINER.
3. MONITORING WELL/PIEZOMETERS ARE LOCATED NORTH OF THE SOUTHEAST 16 LANDFILL AND WEST OF THE SOUTHEAST 16 CONTACT WATER POND. CARE SHALL BE TAKEN WHEN WORKING NEAR OR AROUND THESE PIEZOMETERS.
4. THE EXTENTS OF THE EXISTING LINER ARE APPROXIMATE AND ARE BASED ON AS-BUILT INFORMATION OR SITE OBSERVATIONS.
5. GEOMEMBRANE LINER ON THE FLOOR OF THE SOUTHEAST 16 CONTACT WATER COLLECTION CHANNEL IS TO BE CUT OPEN TO ALLOW DRAINAGE OF CONTACT WATER FROM BENEATH THE LINER AND REPAIRED OF ALL DEFECTS BY EXTRUSION WELDING.
6. EXPOSED GEOMEMBRANE SHALL BE INSPECTED BY OWNER AND ANY IDENTIFIED DEFECTS SHALL BE REPAIRED (EXTRUSION WELDING) BY CONTRACTOR PRIOR TO PLACEMENT OF BOTTOM ASH AND RECLAIMED FLY ASH PROTECTIVE COVER STOCKPILED WITHIN THE SOUTEAST SECTION 16 LANDFILL AREA BY THE OWNER.
7. THE AREA OF EXPOSED GEOMEMBRANE LINER SHALL BE COVERED BY APPROXIMATELY 2 FEET OF RECLAIMED FLY ASH PROTECTIVE COVER AS DIRECTED BY OWNER'S REPRESENTATIVE (DO NOT RESTRICT FLOW FROM THE SOUTHEAST 16 CONTACT WATER COLLECTION CHANNEL TO THE SOUTHEAST 16 CONTACT WATER MANAGEMENT AREA).

REFERENCE(S)

1. SITE LOCATION: SECTION 16, T145N, R82W, MCLEAN COUNTY, NORTH DAKOTA.
2. AERIAL IMAGERY FROM UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AERIAL IMAGERY PROGRAM, TAKEN 2018.
3. CONTOUR INTERVAL IS 2 FEET.
4. TOP OF SOIL PROTECTIVE COVER AND BOTTOM ASH PROTECTIVE COVER GRADES CONTOUR INTERVAL IS 1 FOOT.

0 80 160
1" = 80' FEET

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2020-09-16	ISSUED FOR CONSTRUCTION	KAC	AGD	CCS	TJS
C	2020-08-06	ISSUED FOR BID	KAC	KAC	CCS	TJS
B	2020-07-31	REVISED ISSUED FOR CLIENT REVIEW	KAC	KAC	CCS	TJS
A	2020-07-23	ISSUED FOR CLIENT REVIEW	KAC	KAC	CCS	TJS

SEAL
REGISTERED PROFESSIONAL ENGINEER
TODD J. STONG
PE-6144
DATE 9/16/2020
NORTH DAKOTA

CLIENT
GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA 58576

CONSULTANT
GOLDER ASSOCIATES, INC.
7245 W ALASKA DR., STE 200
LAKEWOOD, COLORADO 80226
USA
[+1](303)-980-0540
www.golder.com

PROJECT
2020 PARTIAL FINAL COVER
UPSTREAM RAISE 92

TITLE
PROPOSED SOUTHEAST 16 CONTACT WATER CHANNEL

PROJECT NO. 20141272 | REV. 0 | 7 of 10 | DRAWING 7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI D

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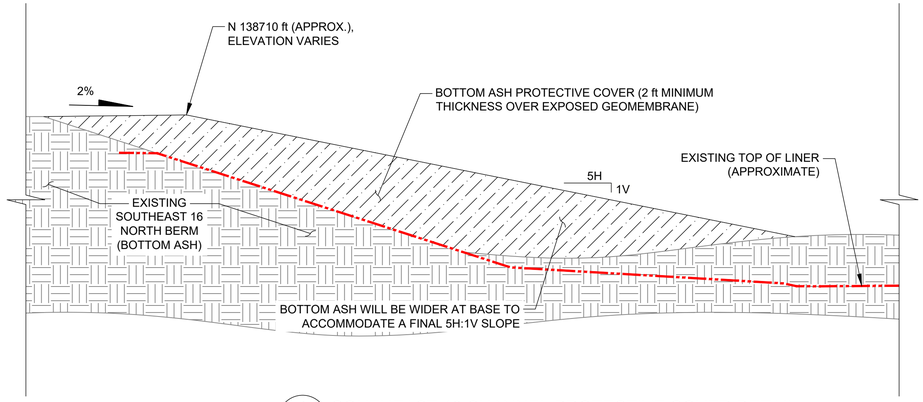

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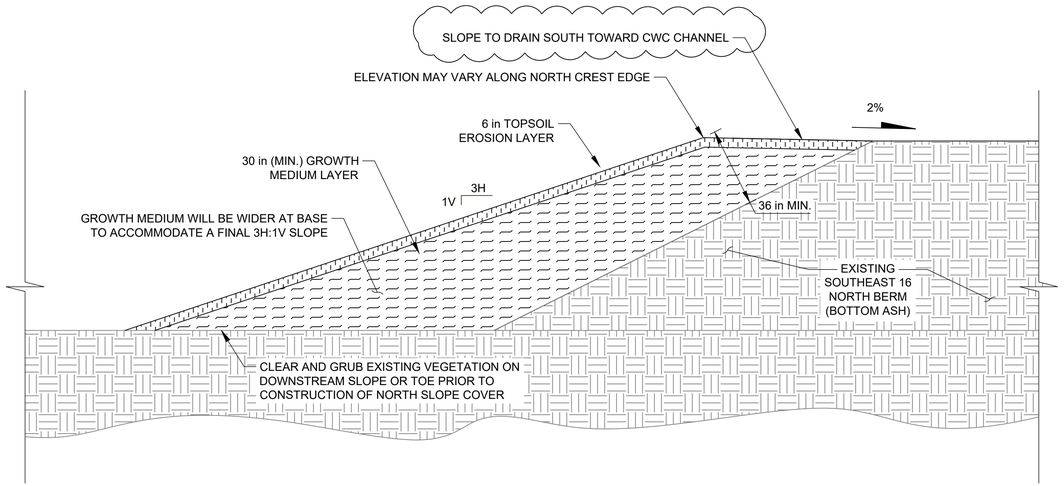

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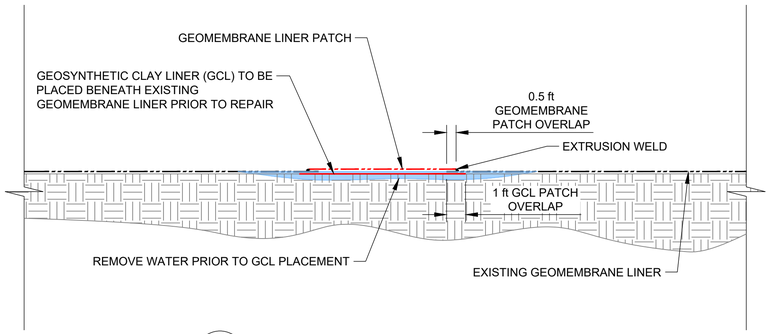

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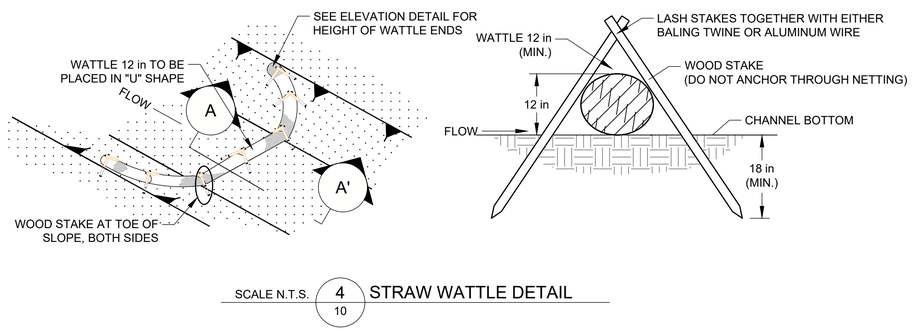
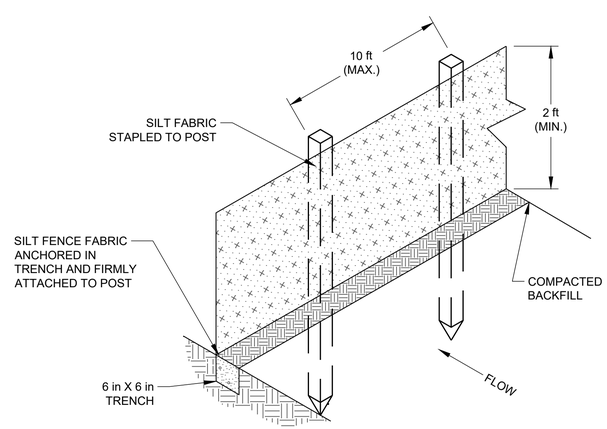
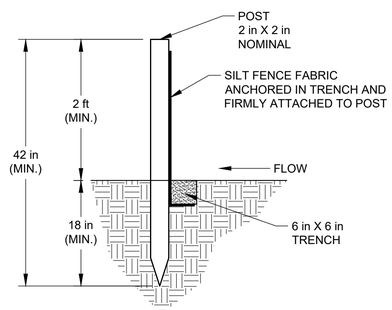


SCALE N.T.S. 4/10 STRAW WATTLE DETAIL





SCALE N.T.S. 5/10 SILT FENCE DETAIL

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
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C	2020-08-06	ISSUED FOR BID	KAC	KAC	CCS	TJS
B	2020-07-31	REVISED ISSUED FOR CLIENT REVIEW	KAC	KAC	CCS	TJS
A	2020-07-23	ISSUED FOR CLIENT REVIEW	KAC	KAC	CCS	TJS

SEAL

REGISTERED PROFESSIONAL ENGINEER
TODD J. STONG
PE-6144
DATE 9/16/2020
NORTH DAKOTA

CLIENT
GREAT RIVER ENERGY
COAL CREEK STATION
UNDERWOOD, NORTH DAKOTA 58576

CONSULTANT
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GOLDER ASSOCIATES, INC.
7245 W ALASKA DR., STE 200
LAKEWOOD, COLORADO 80226
USA
[+1](303)-980-0540
www.golder.com

PROJECT
2020 PARTIAL FINAL COVER
UPSTREAM RAISE 92

TITLE
DETAILS 2

PROJECT NO. 20141272 | REV. 0 | 10 of 10 | DRAWING 10

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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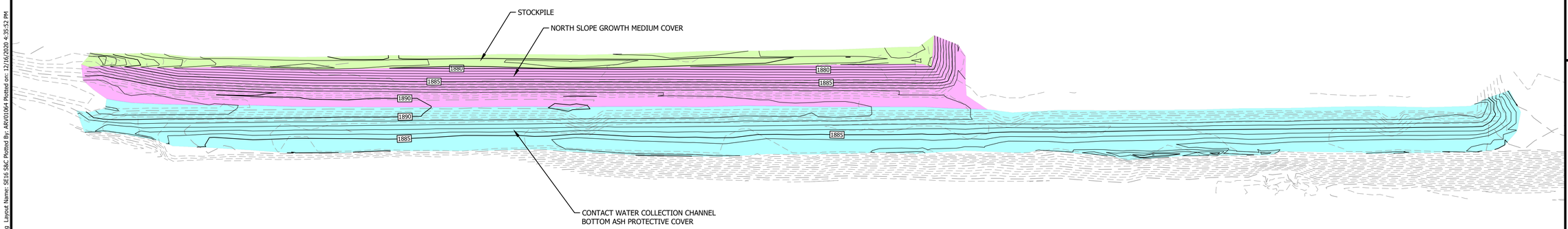
SCALE: 1" = 60'



QUANTITIES	
ITEM	QUANTITY
GROWTH MEDIUM	1,971 CY
BOTTOM ASH PROTECTIVE COVER	5,344 CY
STOCKPILE	440 CY

#	DATE	DESCRIPTION	BY

Bartlett&West
3456 E CENTURY AVENUE - BISMARCK ND 58503
PHONE 701.258.1110 - FAX 701.258.1111
www.bartlettwest.com

SE16 NORTH SLOPE GROWTH MEDIUM AND CONTACT WATER COLLECTION CHANNEL PROTECTIVE COVER AS-BUILT

NORTHERN IMPROVEMENT CO.
2020 PARTIAL FINAL COVER UPSTREAM RAISE 92
GREAT RIVER ENERGY, COAL CREEK STATION

REGISTERED PROFESSIONAL LAND SURVEYOR
KEVIN J. MARTIN
LS-7062
DATE 12-17-20
NORTH DAKOTA

DESIGNED BY:	ARV
DRAWN BY:	ARV
APPROVED BY:	KM
DESIGN PROJ:	18594.014
CONST PROJ:	18594.014
SCALE:	AS NOTED
DATE:	DEC. 2020
DRAWING NO:	C01
SHEET NO:	1 of 6

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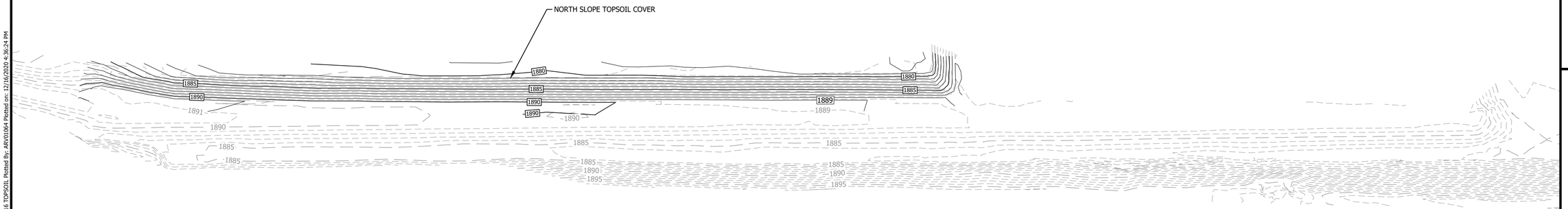
SCALE: 1" = 60'



BARTLETT & WEST, INC. CERTIFIES THAT THE FINAL COVER OF GROWTH MEDIUM AND TOPSOIL THICKNESS MEET THE REQUIRED MINIMUM 36" COVER, AS STATED IN THE PROJECT SPECIFICATIONS

QUANTITIES	
ITEM	QUANTITY
TOPSOIL COVER	1,016 CY

#	DATE	DESCRIPTION	BY

Bartlett&West
3456 E CENTURY AVENUE - BISMARCK ND 58503
PHONE 701.258.1110 - FAX 701.258.1111
www.bartlettwest.com

SE16 NORTH SLOPE TOPSOIL AS-BUILT

NORTHERN IMPROVEMENT CO.
2020 PARTIAL FINAL COVER UPSTREAM RAISE 92
GREAT RIVER ENERGY, COAL CREEK STATION

REGISTERED PROFESSIONAL LAND SURVEYOR
KEVIN J. MARTIN
LS-7062
DATE 12-17-20
NORTH DAKOTA

DESIGNED BY:	ARV
DRAWN BY:	ARV
APPROVED BY:	KM
DESIGN PROJ:	18594.014
CONST PROJ:	18594.014
SCALE:	AS NOTED
DATE:	DEC. 2020
DRAWING NO:	C02
SHEET NO:	2 of 6

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APPENDIX B

Visual Observations Checklist

INSPECTION CHECKLIST

Facility Name: Southeast Section 16 Landfill

Owner and Address: Great River Energy – Coal Creek Station

Purpose of Facility: CCR Storage and Disposal

Legal: Section 16 **Township:** 145N **Range:** 82W

County: McLean

Inspected By: Craig Schuettpelz, Brendan Purcell, Addison Darr **Inspection Date:** October 6, 2020

Weather: 60-75ºF, mostly sunny, windy

ITEM	Y	N	N/A	REMARKS
1. Contact Water Controls				
a. Water level in contact water control area	X			Depth: 0.5 feet
b. Sump & pump in good condition	X			Pump not present at time of inspection
c. Containment controls working	X			
d. Ponding water outside of control area		X		
e. Erosion protection in control area	X			Fly ash protective cover and ACB at pump suction piping, minor erosion of bottom ash protective cover in the contact water control area (repaired fall 2020)
2. CCR Placement – Downstream Slope (no cover)				
a. Significant erosion		X		Minor erosion on north and south downstream slopes
b. Cracking/settlement		X		
c. Seepage		X		
3. CCR Placement – Downstream Slope (with cover)				
a. Erosion/liner exposed		X		
b. Rodent burrows	X			Small burrows
c. Vegetation		X		Portions of final covered slopes require re-seeding and continued vegetation development
d. Cracks/settlement/seepage/sloughing		X		
4. Perimeter Berm – Upstream slope				
a. Erosion (exposed liner)		X		Protective cover constructed over exposed liner shortly after 2020 inspection
b. Vegetation		X		
c. Rodent burrows		X		
d. Seepage/sloughing/cracking/settlement		X		
5. Perimeter Berm - Crest				
a. Surfacing/Soil conditions	X			Gravel surfaced
b. Comparable to design width	X			
c. Vegetation		X		
d. Rodent Burrows		X		
e. Exposed to heavy traffic		X		
f. Damage from vehicles/machinery	X			Minor rutting
6. Perimeter Berm – Downstream Slope				
a. Erosion		X		
b. Vegetation	X			Grass
c. Rodent burrows	X			Small burrows
d. Seepage/sloughing/cracking/settlement		X		
7. Perimeter Berm – Toe				
a. Erosion		X		
b. Vegetation	X			Grass, some woody vegetation near toe
c. Rodent burrows		X		
d. Seepage/sloughing/cracking/settlement		X		
e. Drainage conditions	X			

General Remarks: Generally good condition with limited maintenance required, such as filling in animal burrows, repairing erosion of CCR slopes and temporary cover, maintaining gravel roads, and re-seeding areas where final cover vegetation is sparse.

Name of Engineer (Engineer Firm):

Craig Schuettpelz, PE (Golder Associates, Inc.)

Date: 10/06/2020

Signature:

APPENDIX C

Photographs

Path: \\Denver\acad\GREAT RIVER ENERGY\COAL CREEK\99_PROJECTS\19136224\2020 Annual Inspections\ | File Name: 2020 Annual Inspection - Photolog - SE16_0.dwg

GOLDER

LEGEND

1 PHOTOGRAPH ID AND LOCATION

NOTE(S)

1. FOREGROUND AERIAL IMAGES FROM GREAT RIVER ENERGY PHOTOGRAPHS TAKEN IN 2020.
2. BACKGROUND AERIAL IMAGE FROM THE UNITED STATES DEPARTMENT OF AGRICULTURE NATIONAL AGRICULTURE AERIAL IMAGERY PROGRAM, TAKEN IN 2020.

GREAT RIVER ENERGY - COAL CREEK STATION
2020 ANNUAL CCR FACILITY INSPECTION REPORT
SOUTHEAST 16 - PHOTOGRAPH LOCATIONS

FIGURE 1

Southeast 16

Photograph 1 (East berm crest)
Perimeter access road on the berm crest, good condition. (IMG_DSCF1659.JPG)

Photograph 2 (East CCR downstream slope (Temporary cover))
Animal burrows on temporary cover. (IMG_DSCF1664.JPG)

Southeast 16

Photograph 3 (East final cover slope)
Sparse vegetation along terrance channel. (IMG_DSCF1666.JPG)

Photograph 4 (Contact Water Collection Channel)
Panoramic view of contact water collection area. (IMG_DSCF1671-1674.JPG)

Southeast 16

Photograph 5 (North CCR downstream slope (Temporary cover))
Erosion rill from contact water ditch. (IMG_DSCF1675.JPG)

Photograph 6 (North CCR downstream slope)
Minor erosion of fly ash slope. Upper temporary cover in good condition.

Southeast 16

Photograph 7 (C&D Area)
C&D disposal area. (IMG_DSCF1695.JPG)

Photograph 8 (Northwest entrance)
Erosion around culvert outlet to Contact Water Collection Channel. (IMG_DSCF1689.JPG)

Southeast 16

Photograph 9 (Northwest entrance)
Concrete culvert and surface water drainage ditch. (IMG_DSCF1691.JPG)

Photograph 10 (Northwest access ramp)
Minor erosion along road to SE16 deposition area. (IMG_DSCF1693.JPG)

Southeast 16

Photograph 11 (Contact water collection area perimeter berm upstream slope)
Minor erosion of fly ash slope. (IMG_AD7P.JPG)

Photograph 12 (Haul Road)
Protective cover (bottom ash) placed over exposed liner within the contact water collection channel. (IMG_RIMG0551.JPG)

Southeast 16

Photograph 13 (North CCR downstream slope (no cover))
Erosion of fly ash on SE16 north CCR downstream slope. (IMG_AD15P.JPG)

Photograph 14 (South final cover slope)
Sparse vegetation on the crest of the southern terrace channel. (IMG_4581.JPG)

Southeast 16

Photograph 15 (South final cover slope)
Well vegetated final cover (typical final covered slopes) (IMG_4582.JPG)

Photograph 16 (East CCR downstream slope)
Contact water containment ditch. (DSCF1655.JPG)

Southeast 16

Photograph 17 (Southeast perimeter berm downstream slope)
Southeast downchute channel. (DSCF1657.JPG)

Photograph 18 (East perimeter downstream slope and toe)
Well vegetated perimeter berm downstream slope. (3.JPG)

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