7

MAR 1 2 1986

Mr. David McKinney, Manager
Knoxville Basin Office
Division of Water Management
Tennessee Department of Health
  and Environment
1605 Prosser Road
Knoxville, Tennessee   37914-3434

Dear Mr. McKinney:

KINGSTON STEAM PLANT - NPDES PERMIT NO. TN0005452 - RED WATER DISCHARGE

Enclosed are three sets of construction drawings with accompanying
narrative material describing a proposed wetlands treatment system for
treatment of acidic ash pond seepage and runoff at TVA's Kingston Steam
Plant (KIF). This proposal is in response to EPA Administrative Order No.
85-188. The proposed treatment system is a replacement to the temporary
pumping system placed into operation on March 19, 1985. It has
considerable promise as a permanent, low cost, and essentially maintenance
and operational free pollution abatement method.

Wetlands treatment is an emerging, innovative treatment technology.
Although there is little information available in terms of engineering
design guidelines, this treatment technique has been successfully
demonstrated on acidic drainage at TVA's Fabius Coal Plant Reclamation
Project in northern Alabama. It has also been proposed to the Alabama
Department of Environmental Management (construction drawings submitted in
December 1985) for treatment of acidic ash pond seepage at TVA's Widows
Creek Steam Plant. However, design parameters are different in each
case. TVA recognizes the uncertainty involved but believes that the
application of wetlands technology at KIF has a high potential for
success. As a compliance backup, however, the existing temporary pumping
system to return collected seepage to the ash pond will be retained until
the KIF wetlands technology has been proven successful.

Please review the enclosed material for construction approval. We are
planning to initiate construction this spring. Should you have any
questions concerning this proposal or would like to observe the operating
wetlands at Fabius, please call Wally G. Carpenter at 632-6654 in
Knoxville.

Mr. David McKinney

Appropriate NPDES permit application pages are being prepared and will be forwarded to EPA in the near future.

Sincerely,
Original signed by
Alvan Bruch

Martin E. Rivers, Director
Environmental Quality

JGM:AKS
Enclosures
cc: Mr. Douglas K. Lankford (Enclosures)
    U.S. Environmental Protection
      Agency, Region IV
    345 Courtland Street, NE.
    Atlanta, Georgia 30365

    B. J. Bond, 1E61 OCH-K
    B. W. Brown, 140 EB-K
    H. F. Clayton, Kingston
    C. L. Massey, BR 4N 39A-C
    G. G. Park, MR 2N 52A-C
    W. M. Pearse, W7 A68 C-K
    H. S. Sanger, Jr., E11 B33 C-K
    P. Wade, LP 3S 58K-C

Prepared by Jimmy G. Mantooth (OE) with concurrence by Wallace G. Carpenter

B44 '86 0409   001

WMP:EWL
cc: C. A. Chandley, W7 C126 C-K

CAC:EWL
cc: RIMS, SL 26 C-K
    O. P. Thornton, W3 D224 C-K

UNITED STATES GOVERNMENT

Memorandum

TENNESSEE VALLEY AUTHORITY

FCP '84 0814 001

TO : C. C. Schonhoff, Director of Fossil and Hydro Power, 716 EB-C

FROM : R. W. Cantrell, Manager of Engineering Design (Acting), W11A9 C-K

DATE : AUG 14 1984

SUBJECT: KINGSTON STEAM PLANT - ACIDIC DRAINAGE - ASH POND EAST DIKE

Please refer to the memorandum from H. S. Fox to me dated July 12, 1984 (DES 840713 005).

Attached for your review is an authorization level estimate for the subject project which you requested in the referenced memorandum. The estimate is a total project cost estimate containing actual total project costs through May 1985 combined with costs for remaining work.

Remaining work includes a contractor-constructed Bentonite slurry trench and a CSB-constructed earth cap and crushed stone surface on top of the embankment. CSB will also cover the exterior slope with 12 inches of earth and seed and mulch.

The total project estimate is $958,000. A total of $239,900 has already been expended, and an additional $718,100 will be required to complete the project. The estimate assumes construction of the slurry trench will begin in March 1985, and all work will be completed in FY 1985. In order to support this proposed construction schedule, design must begin by September 1, 1984.

Please provide us with the necessary authorization and funding to proceed with this work as soon as possible.

Original Signed By
Daryl R. Armentrout

R. W. Cantrell

OPT:RSH:EFS
Attachment
cc (Attachment):
    R. O. Barnett, W9D224 C-K
    C. Bonine, E7B24 C-K
    MEDS, W5B63 C-K
    R. A. Painter, W5D181 C-K
    O. P. Thornton, 102 SPT-K
    F. Van Meter, 500 SPT-K (3)

Principally Prepared By: R. S. Harris, Extension 3875

ES4222.03

Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

TENNESSEE VALLEY AUTHORITY
POWER AND ENGINEERING
PLANNING AND BUDGET BRANCH

PBB '84 07 30 004

COST ESTIMATE   Date July 27, 1984

ENR Building Cost Index 2417.92

PROJECT: Kingston Steam Plant

FEATURE: Acidic Drainage Ash Pond East Dike

PURPOSE AND SCOPE: Estimate the total project cost to complete construction of the Ash Pond East Dike. Actual total project costs through May 1984 as well as all work remaining are included in this estimate. All remaining work is to be done during FY 1985. Renovation of the existing haul bridge deck is completed. Work remaining includes a scope addition consisting of a contract-constructed Bentonite slurry trench and a CSB-constructed earth cap and crushed stone surface on top of the embankment. The exterior slope will be covered with approximately 12 inches of earth and seeded. This estimate supersedes 84-69 R3 (CPS 840119-201).

ESTIMATE REQUESTED BY O. P. Thornton   **DATE** June 15, 1984

REFERENCE MEMO (IF ANY) O. P. Thornton to R. A. Painter, July 6, 1984 (FDP 840706 004)

EN DES Cost Estimate Request (if any) AFDPKIF84-0602 (FDP 840615 005)

DCR NO. _____   **IJ/ECN NO.** _____   **PII NO.** _____

CLASSIFICATION OF ESTIMATE

____ 1. Order of Magnitude--Variable accuracy usually based on previous similar cost information.

____ 2. Preliminary Estimate--Accuracy insufficient for budgeting, but a guide to further interest.

_X_ 3. Budget or Authorization Estimate--Suitable for budgeting.

____ 4. Detailed Estimate--Prepared from complete engineering specifications, drawings, and site surveys.

____ 5. Contract Bid Estimate - For purchase requisition or bid award evaluation.

____ 6. Other -

ESTIMATED COST: $ 958,000

COMMENTS: Total project cost based on actual expenditures from September 1983 through May 1984 and remaining work to begin in March 1985 and be completed in July 1985.

Attachment:
cc: J. W. Binkley, E7C37 C-K
    C. Bonine, Jr., E7B24 C-K
    R. W. Cantrell, W11A9 C-K
    MEDS, W5B63 C-K
    Frank Van Meter, 500 SPT-K
    O. P. Thornton, 102 SPT-K

Submitted: _J. A. Johnson_
J. A. Johnson

Reviewed: _R. A. Painter_
R. A. Painter

KINGSTON STEAM PLANT

ASH POND EAST DIKE

Estimate of Cost[a]

	Actual Expenditures Thru May 1984					Estimated Remaining Work					Total
	Material	Labor MH	Labor Amount	Equip. Oper. & Other	Total	Material	Labor MH	Labor Amount	Equip. Oper. & Other	Total	
Bentonite Slurry Trench	$ ---	---	$ ---	$ ---	$ ---	$450,000	---	$ ---	$ ---	$ 450,000	$ 450,000
Earth Borrow	---	---	---	---	---	1,800	1,254	20,900	45,900	68,600	68,600
Crushed Stone Surface	---	---	---	---	---	3,000	48	700	600	4,300	4,300
Seeding and Mulching	---	---	---	---	---	2,100	192	2,500	500	5,100	5,100
Renovation of Haul Bridge	28,100	5,527	85,500	9,800	123,400	---	---	---	---	---	123,400
Construction Facilities	---	592	8,400	16,400	24,800	---	395	6,100	6,800	12,900	37,700
Field General Expense	---	371	9,100	12,800	21,900	---	14	200	25,300	35,600	57,500
Total Construction	$ 28,100	6,490	$ 103,000	$ 39,000	$ 170,100	$456,900	1,903	$ 30,400	$ 79,100	$ 576,500	$ 746,600
Engineering					61,700					45,400	107,100
General Engineering and Construction Expense					---					25,300	25,300
Other TVA Expenses and Overheads					8,100					22,900	31,000
Contingency Construction					---					21,500	21,500
Design					---					4,700	4,700
Other Organizations					---					7,600	7,600
AFUDC					---					14,200	14,200
Total Project Cost[a]					$ 239,900					$ 718,100	$ 958,000

[a]Total project cost for Estimated Remaining Work based on construction beginning March 1985 and completed July 1985.
Actuals are for the renovation of the haul bridge.

Some items that need to be — Kingston

Considered and worked out by FDP — Slurry Trench

COMPUTED _RGS_ DATE _____

* Note: Please provide written replys where possible CHECKED DATE _____

for inclusion in official contract file.

MHM

~~1. Need emergency justification. This was promised by

May 4 in PR.~~

JPHS

to CEB Geo
5-16-84

Need CSB's comments

2. Is TVA to furnish soil for backfill? If so <u>write</u>

up a section to include in spec covering all details

of borrow. such as TVA-contractor interfaces, restrictions

on removing, hauling etc. Do we know soil properties of borrow?

Can we guarantee that it is suitable for slurry

trench backfill. Do we want disclaimer clause relative

to providing acceptable backfill? ~~If~~ so write up.

MHM 3. Dike c option — quote on all that work or schedule of prices

R.C. Anderson

(probably best to
add later

Gene Tilley [arrow]

up to Geotechnical [arrow]

Find out specifically how we can handle the option

to include dike c. Try & find a sample requisition

to go by that covered an option. Find out from

purchasing exactly how handled throughout bid

and award process so as to make sure it is

properly covered in requisition. Find out from purchasing

if this option can be included under emergency

justification contract. Get all the information for dike c

that we need to include in requisition. Rush up soil data;

need square feet of trench, permeant data etc.

$25,000/day

beginning

4. Liquidated damages; Find out amount, written

justification / how calculated etc to satisfy purchasing.

Consider the need for some type of escalating

clause. Find out if permissable by purchasing

to put in if need. (escalating clause)

Get a date to tie liquidated damages to that we can

back up to OGC if required.

no problem
sure

DRG

5. Get all dwgs to GEG — half size — we actually

needed with PR.

DRG

no prob
on dwg

6. Ensure that TVA will provide a work
   surface sufficiently wide for slurry trench method.
   Show how the min width determined.
   - Need this for both dikes

MHM

memo typed
(holding)

7. Site Availability date
   Get written documentation as to when work
   surfaces will be ready for contr. This should include
   work surface survey.

MHM

8. Estimated contract cost
   Provide calculations
   Quantity breakdown above/below 60'
   126-2745 (WIM HOSKINS)

9. Water source for slurry mixing

OK JPHS
   write up details to include in spec./dwgs

OK
   Get all necessary clearances/agreements in writing

WILL GET
   Do we have chemical analysis for water source.

OK
   Consider direct access to river ie most
   feasible source

DRG

OK
   10. Contractors work, storage, trailer location,
       utilities provided work out details. Get
       agreements in writing.

OK
       Also-drinking water - Do we provide or
       provide access only?

OK
       Permissable areas for mixing ponds

OK
       Access Restrictions etc to site, parking requirements
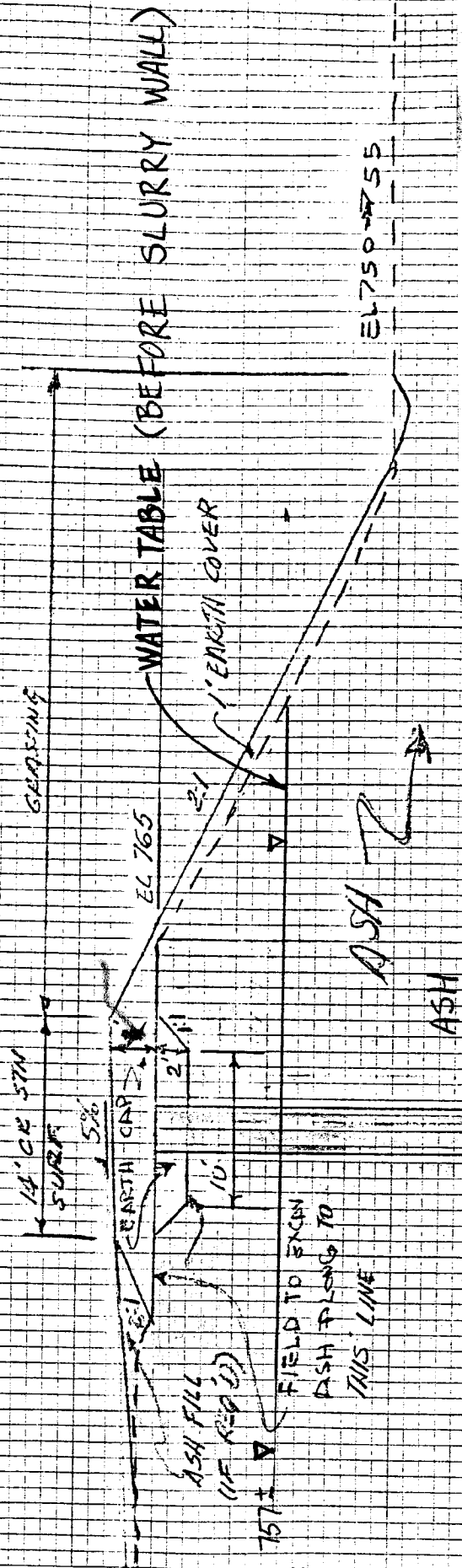   etc

DRG

OK
   12. Coordinate waste disposal with Pearse/mayfield
       Write up any requirements and get their initials.

KINGSTON S.P. SCURRY)

EAST DIKE

SS-3 TYPICAL

WATER TABLE (BEFORE SLURRY WALL)

EL 750-755

14' CR STN

GRASSING

EL 765

2:1

1' EARTH COVER

SURF
5%

EARTH CAP

2:1

10'

FIELD TO EXCAN
ASH FLANG TO
THIS LINE

ASH FILL
(IF F=Ø?)

157±

LOW BLDW
C BUNIT

ASH

ASH

FLY ASH

740

ASH-CLAY MIX 724

EL 720± CLAY

722

46 EL070

CLEAN SAND

ALLUVIAL 708

703

ROCK

KINGSTON STEAM PLANT - ACIDIC DRAINAGE - SOILS EXPLORATION - EN DES SOIL

SCHEDULE 82.2

The work requested in FDP 840425 012 has been completed. Its purpose is to

provide information to allow design of a barrier to control permeation of

acidic drainage.

The field exploration was completed between April 16 and May 11, 1984. A

total of 753 lin ft was drilled and sampled at 10 SPT and 3 undisturbed

locations. Borings were advanced with a Mobile B-50 drill equipped with

3-3/8-in. and 6-in. id hollow stem augers. Sampling conformed to ASTM

D 1586, D 1587, and D 2488. Progress was slowed by drilling difficulties

in the nonplastic alluvial sands and by numerous electrical and rain

storms.

Site Conditions

The explored area covers an area along the east dike approximately 1900 ft

long with an average surface elevation of 769. Borings were typically 200

ft on center. Borings SS-25 and SS-34 on the southwestern and

northeastern site margins, respectively, intersect relatively impervious

materials. Boring SS-25 intersects the original saprolitic weathered shale

at a depth of 10 ft (el 757). Boring SS-34 penetrates a normally oriented

rolled earthfill dike at a depth of about 18 ft (el 748).

The area of main concern is covered by borings SS-26 through SS-33. These borings show an essentially continuous and uniform profile sequence averaging 64 ft in thickness. The upper portion consists of equipment or hydraulically placed bottom ash or fly ash fill some 40 ft thick. The bottom ash is typically a silty sand, SM, and exhibits a wide range of N values. Near el 757 very high N values persist across the site, possibly indicating an old equipment compacted surface. The fly ash is typically a sandy silt, ML, and shows low N values, particularly below the water table.

Underlying the ash fill are alluvial soils averaging some 23 ft in thickness. The ash-alluvium interface rises from about el 720 on the southwest end to el 733 on the northeast end of the site. The upper portion of the alluvium is silty clay, CL, of medium plasticity. N values indicate soft to very stiff consistencies. This clay stratum varies from 4 to 15 ft in thickness. It is thinnest at borings SS-29 and SS-30 near the center of the explored area. The basal alluvium consists of nonplastic silty sands, SM, which extend to residuum or bedrock. These sands typically exhibit low N values. They vary in thickness from about 4 ft at boring SS-26 to 20 ft near the middle of the explored area. The alluvium rests directly on weathered bedrock (shale or siltstone) or saprolitic residuum about 1 ft in thickness. The residuum, where encountered, classifies as a silty clayey sand, SM-SC, although in-place it could be more accurately described as weathered bedrock. Details are shown on the general cross section and individual boring profiles.

Groundwater Levels

Water levels vary from el 754.7 to 757.5 and average 755.8. The average

rise in water level from the 1-hour to 24-hour reading was only 0.2 ft

indicating relatively rapid adjustment. Water levels are somewhat higher

at the site margins than near the center.

Laboratory Testing

Laboratory testing included moisture content determinations (ASTM D 2216)

for all split-spoon and undisturbed samples. Index tests for specific

gravity (ASTM D 854), Atterberg limits (ASTM D 423 and D 424), and

grain-size distribution (ASTM D 422) were performed for representative SPT

and undisturbed samples. Horizontal permeability tests were requested for

undisturbed samples selected by representatives of SME and the Geological

and Geotechnical Engineering Group. Water for the permeability tests was

sampled from the project site and has a measured pH of 5.2.

Chemical analyses, including determinations of pH and mineral content, were

performed on fly ash and water samples and on bottom ash from above and

below the water table. Analyses of water samples will be forwarded upon

completion.

Classifications of SPT samples in accordance with ASTM D 2487 were used to

develop the attached generalized cross section.

Undisturbed samples range in natural moisture content from 19.6 to 30.8 percent with dry densities ranging from 87.3 to 107.5 pcf. Coefficients of horizontal permeability (K_h) overall vary from 5.0×10^{-8} to 2.1×10^{-5} cm/sec. At US-2, only one sample was tested, resulting in a K_h of 7.1×10^{-7} cm/sec. At US-4, permeability decreases from 1.5×10^{-7} to 5.0×10^{-8} cm/sec with an increase of approximately 8 ft in depth within the silty clay, CL, layer. The CL sample tested from US-8 has a K_h of 6.0×10^{-8} cm/sec; and within the silty sand, SM, layer, permeability ranges from 2.7×10^{-7} to 2.1×10^{-5} cm/sec, depending on density and grain size. Test results are summarized in table 1.

Chemical test results, summarized in table 2, show the pH of bottom ash above and below the water table are similar at about 3.4 compared with fly ash at a pH of 5.2. In general, chemical content is similar among the three sampled groups, averaging 45 percent silicon dioxide (SiO_2), 23 percent ferric oxide (Fe_2O_3), and 19 percent aluminum oxide (Al_2O_3).

Summary

The site is supported by overburden averaging 64 ft in thickness. The upper 40 ft consists of fly ash or bottom ash fill classifying respectively as sandy silt, ML, or silty sand, SM. Under the ash, alluvial silty clay, CL, and silty sand, SM, some 23 ft thick extend to weathered bedrock. Groundwater levels across the site are relatively constant.

The coefficients of horizontal permeability range from 10^{-5} to 10^{-7} cm/sec for silty sand and from 10^{-7} to 10^{-8} cm/sec for silty clay. This low permeability indicates the soil has poor to practically impervious draining characteristics.

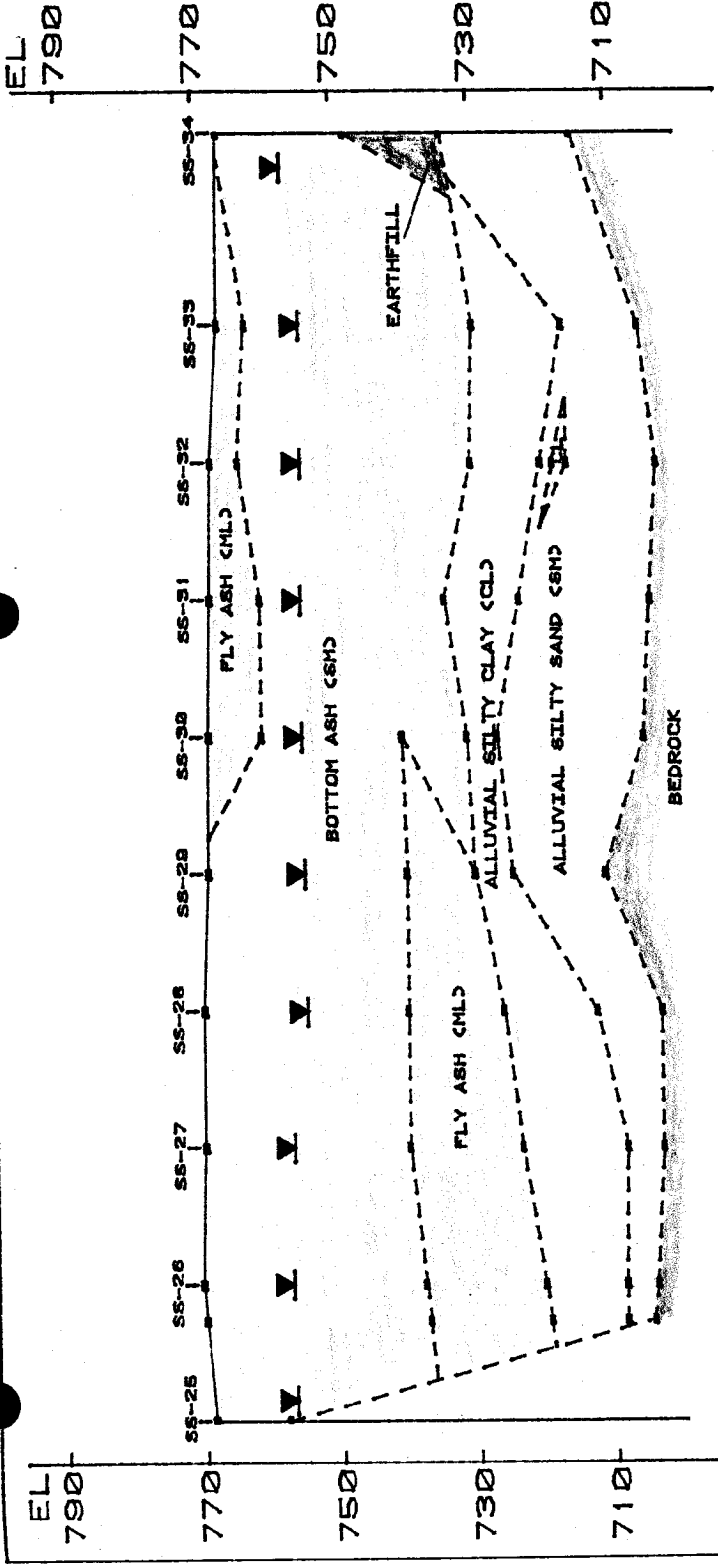A34142.7

Table 1

KINGSTON STEAM PLANT

ACIDIC DRAINAGE

SUMMARY OF LABORATORY TEST DATA

| Elevation | Soil Symbol | Nat. Moist. % | % Sat. | Grain-Size Analysis | | | | | Atterberg Limits | | Dry Dens. pcf | Void Ratio | Coefficient of Permeability K_h cm/sec |
				Gravel %	Sand %	Silt %	Clay %	D_{10} mm	Liq. Limit %	Plastic. Index %			
Boring US-2, Station East Dike, Surface El 770.4													
714.0-711.9	CL	30.8	93.4	4	41	40	15	--	27	10	87.3	0.856	7.1×10^{-7}
Boring US-4, Station East Dike, Surface El 769.7													
722.7-721.1	CL	23.8	98.1	0	6	57	37	--	32	12	101.4	0.652	1.5×10^{-7}
714.7-713.3	CL	19.6	95.9	0	25	51	24	--	28	10	107.5	0.546	5.0×10^{-8}
711.7-709.5	SM	25.6	96.7	0	82	12	6	0.021	NP	NP	96.8	0.697	
708.7-707.3	SP-SM	25.2	98.2	0	90	7	3	0.073	NP	NP	98.5	0.679	
Boring US-8, Station East Dike, Surface El 768.0													
726.0-724.0	CL	21.8	88.8	0	37	37	26	--	26	10	100.6	0.657	6.0×10^{-8}
722.0-719.9	SM	19.8	96.0	0	50	33	17	--	NP	NP	107.1	0.548	2.7×10^{-7}
714.0-712.8	SM	25.9	99.2	0	86	9	5	0.057	NP	NP	97.7	0.693	2.1×10^{-5}

A34142.2

Table 2

KINGSTON STEAM PLANT

ACIDIC DRAINAGE

CHEMICAL ANALYSIS OF ASH

	Bottom Ash Above Water Table	Bottom Ash Below Water Table	Fly Ash
pH	3.34	3.42	5.15
Loss-on-ignition, %	8.7	5.9	7.1
Silicon dioxide (SiO_2), %	46.9	42.6	46.3
Calcium oxide (CaO), %	1.0	1.5	1.6
Ferric oxide (Fe_2O_3), %	18.5	27.9	23.2
Aluminum oxide (Al_2O_3), %	20.3	18.8	19.4
Magnesium oxide (MgO), %	1.0	0.8	1.1
Sulfur trioxide (SO_3), %	1.8	1.9	0.2
Chlorides (Cl^-), ppm	62	55	40
Nitrates (NO_3^-), ppm	3	3	3

EL
790

770

750

730

710

EL
790

770

750

730

710

SS-34 SS-33 SS-32 SS-31 SS-30 SS-29 SS-28 SS-27 SS-26 SS-25

EARTHFILL

FLY ASH (ML)

BOTTOM ASH (SM)

ALLUVIAL SILTY CLAY (CL)

ALLUVIAL SILTY SAND (SM)

FLY ASH (ML)

BEDROCK

LEGEND

▼ 24 h WATER TABLE

NOTE : STRATA CONTINUITY
BETWEEN BORINGS ASSUMED

SCALE : VERT. 1'' = 20'
HORIZ. 1'' = 200'

KINGSTON STEAM PLANT

EAST DIKE
ACIDIC DRAINAGE
GENERALIZED CROSS SECT

TENNESSEE VALLEY AUTHORITY
MATERIALS ENGINEERING LABORATORY

SUBMITTED BA	RECOMMENDED HPM	APPROVE 9-9
KNOXVILLE	051784	36	CS	3'	884

604B2044 R0

— — — — — — — — — Fold here for return — — — — — — — — —

NAME		EXTENSION
F R O M ADDRESS	TOM WILLIAMS	3517
	800 CST2	☒ Chatta ☐ M.S. ☐ Knox ☐ Nor.

KINGSTON FOSSIL PLANT - ACID DRAINAGE

THE ATTACHED SITE PLAN, (WD&I 840515)
IDENTIFIED. THE AREA TO BE USED BY
THE CONTRACTOR. THE EAST END of THE WORK AREA
CAN BE USED BY THE CONTRACTOR FOR HIS STORAGE,
TRAILER LOCATION AND EMPLOYEE PARKING. NO UTILITIES ARE
AVAILABLE WITHIN THE WORK AND STAGING AREA. THE
CLOSEST TELEPHONE AND ELECTRICAL POWER IS ACROSS
SWAN POND ROAD AT THE PLANT ENTRANCE.
DRINKING AND UTILITY WATER CAN BE
OBTAINED AT THE YARD OPERATION BUILDING.
THE AREA ADJACENT TO THE SLURRY TRENCH
CAN BE USED FOR PONDS.

PLEASE CALL JOEL PARIS AT EX 3510-C IF ADDITIONAL
INFORMATION IS NEEDED.
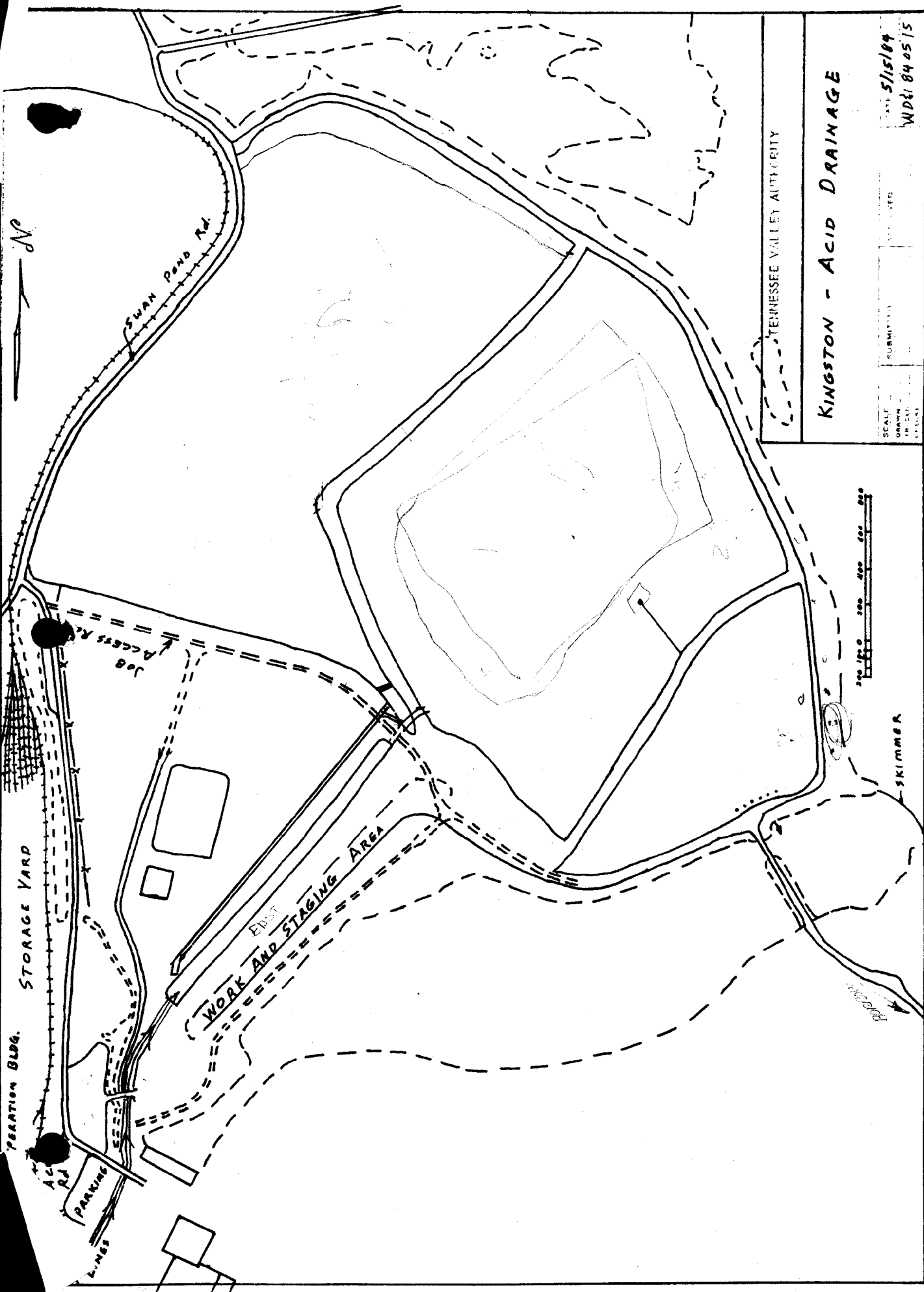
Kingston - Acid Drainage

TENNESSEE VALLEY AUTHORITY

WD&I 84 0515

DATE 5/15/84

SWAN POND RD.

N°

STORAGE YARD

OPERATION BLDG.

JOB ACCESS RD.

WORK AND STAGING AREA

SKIMMER

PARKING

ACCESS RD.

TVA-00010856

MHM

FDP '84 0615   005

TO   : Those listed below
FROM   : O. P. Thornton, Project Manager, Fossil Design Projects, 102 SPT-K
DATE   : JUN 1 5 1984
PROJECT: Kingston Steam Plant

Feature: <u>Ash Pond East Dike</u>

Purpose: <u>To estimate total project cost by combining actual expenditures through</u>
  and   <u>June 1, 1984, with the estimated cost to design and construct a slurry</u>
Scope: <u>trench approximately 2000-feet long and 60-feet deep with an earth</u>

<u>cap and a crushed stone surface at the top of the existing ash pond embankment</u>

<u>(elevation 765). The exterior slope would be covered with approximately 12 inches</u>

<u>of earth and seeded. For special instructions, see attachment A and for organizational</u>
responsibilities, see attachment B.
Requested by: <u>O. P. Thornton</u>   Date of Request: _____

Reference Memo (if any): <u>None</u>
Type of Estimate: Order-of-magnitude _____   Detailed _____
  (Check one. See   Preliminary   _____   Comparison _____
  Attachment No. 2   Authorization   <u>X</u>   Other   _____
  in EN DES-EP 1.18.)
Dates: Design: Construction:
        Start <u>September 1984</u>   Start <u>March 1985</u>   PII No. _____
        Complete <u>December 1984</u>   Complete <u>July 1985</u>

Lead Engineer: <u>R. E. Harris/R. S. Harris</u>   Extension: <u>4631/3875</u>
Final estimate required from OEDC Costs   Project Code: <u>36B</u>
and Estimating Section by (date): <u>July 27, 1984</u>

Submit input data to EN DES lead
organization and OEDC Costs and Estimating Section by (date): <u>June 25, 1984</u>

Account No. for EN DES personnel preparing estimate: <u>P19E-540-30-25808.XXX</u>

Comments: <u>The activity for preparing the cost estimate is D⁴36B4E0602</u>.

Original signed by
O. P. Thornton
O. P. Thornton

*	**
*	__	R. O. Barnett, W9D224 C-K
__	__	G. L. Buchanan, W3C126 C-K
__	__	F. W. Chandler, W8C126 C-K
__	__	C. A. Chandley, W7C126 C-K
__	__	G. R. Hall, 6204 MIB-K
__	__	J. E. Holladay W2D224 C-K
__	__	J. A. Johnson, W12C82 C-K
__	__	R. M. Parker, W4C126 C-K
__	__	J. A. Raulston, W10C126 C-K
__	__	O. P. Thornton, 102 SPT-K
__	__	R. G. Johnson, 301 SPT-K
__	__	R. H. Herndon, 226 SPT-K
*	__	R. E. Harris, 338 SPT-K
__	__	R. E. Fehling, W4C174 C-K

RSH:EFS
cc (Attachments):
    R. A. Painter, W5D181 C-K
    MEDS, W5B63 C-K
    F. Van Meter, 500 SPT-K (3)
       Note CSB's responsibilities.

   *Estimate data required
  **Information only
 ***Have a rep attend the meeting

Attachments: Yes <u>X</u> No __
                              S64164.03

Special Instructions

Please provide the following information for your input:

1. Verifications of your overall scope of work. Note any additions or deletions.

2. Your assumptions.

3. List of activities, scope for each activity, and all drawing numbers (new and revised) for each activity.

4. Estimated start, duration, and completion for each design activity.

5. Estimated start, duration, and completion for your procurements from PR to delivery (procurement branches only).

6. Material estimate for each design activity (TVA form 5198).

7. Man-hours by task for each activity. Include the man-hours required for preparation of this estimate. Drafting man-hours are to be listed separately.

8. The number of purchase requisitions that will be forwarded to each procurement branch for material or equipment purchasing. Copies of material estimate sheets should be forwarded to EEB for the determination of material costs. Other procurement branches will estimate procurement man-hours only. This information should be available ten working days prior to estimate input due date.

9. Please use the attached estimate summary sheet for submitting your input.

S64164.03
FDP 6/13/84

Oranizational Responsibilities

Civil

- Provide quantities of material for site work

- Obtain estimate of cost for constructing a slurry trench from a
    private contractor

- Man-hours required for the estimate, detailed design contract
    drawings, requisition, award and contract administration

CONST

- Site preparation and completing the earth cap including final
    grading, seeding, etc.

S64164.03
FDP 6/13/84

TVA 5198 (6-4-57)

DIVISION OF DESIGN COST ESTIMATE

FDP

BRANCH _____

SECTION _CIVIL C_

PROJECT _KINGSTON_

DESCRIPTION _ACID DRAINAGE - CUT-OFF WALL_

ACCOUNT NO. _PIPE-SAO-30-23808.202_

ESTIMATE NO. _0602_

SHEET No. _1_ of _1_

DATE _6-21-84_

QUANTITIES BY _WHG_ CHECKED BY _____ PRICED BY _____ APPROVED _____

Item	Description	Quantity	Unit	Rate	Material	Labor	Total Amounts
1	EARTHEN SLOPE COVER	15,000	C.Y.				
2	SEEDING & MULCHING	17,500	S.Y.				
3	CRUSHED STONE SURFACING	450	Tons				

ACTIVITY LEVEL ESTIMATE WORKSHEET

Project _____

Branch/Project _____

Prepared By _____

Feature _____

Section Supervisor _____

Date _____

CER Number _____

Project Code _____

B. Procurement Items

| WBS Item Activity No. | Procurement Durations | | | | Man-hours by Task | | | | | Detailed Description of Activity |
	PR to RQ	RQ to AW	AW to Del	RQ	AW	CA	VR	AD	

ACTIVITY LEVEL ESTIMATE WORKSHEET

Project __KINGSTON__

Branch/Project __FOP - C02__

Prepared By __ORG__

Feature __OUT-OF-WALL-ACIDIC DRN__ CER Number __FOP KIK84-0602__

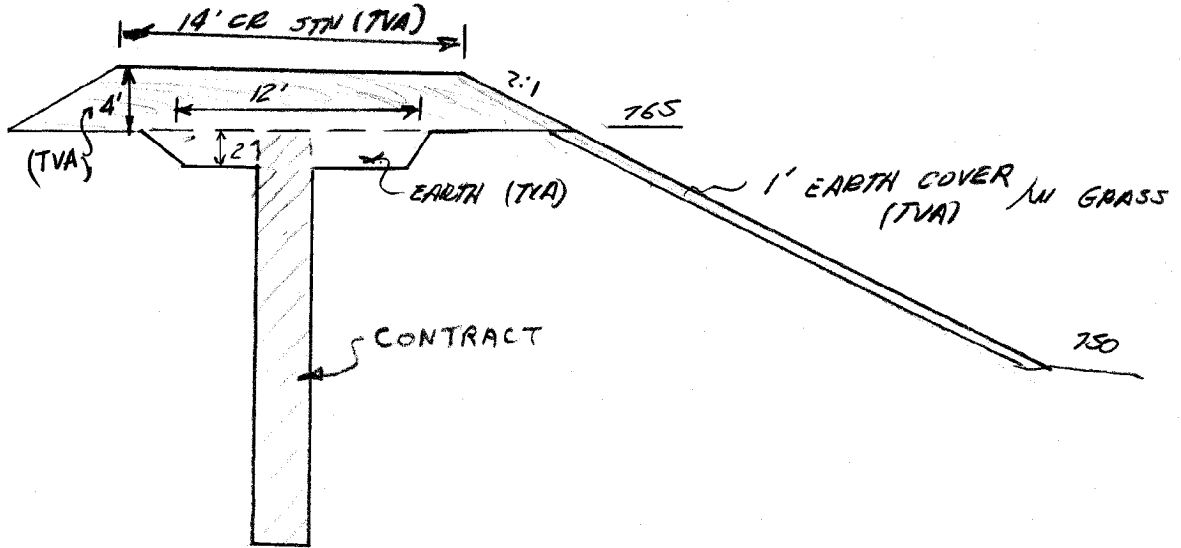Section Supervisor __MARVIN MILLER__   Project Code __36 B__

Date __6-21-84__

A. Design Items   June 1st '84 to completion

WBS Item No.	Activity Number	Drawing Number	New	Rev	Start Date	Finish Date	Man-hours by Task					Detailed Description of Activity
							AD	EN	DF	DR		
		10W430		✓	9-84	12-84		40	40	40	DESIGN EXTERIOR SLOPE EARTH COVER/W
		10W432	✓	✓	"	"		40			VEGETATIVE REGIMENTS / EARTH PREP. PAD
		10H431-1		✓	"	"		10			AND FINAL EARTH CAP /W GR. STH SURF.
		10H431-2		✓	"	"		10			
	Field Insp & Changes		✓		4-85	Aug 85		80			
	Supervisor Overhead		✓		Sept 84	Sept 85	60				
	Cost Estimate		✓					10			
	Spec. Input & Review		✓		9-84	Dec 84		50			

TOTALS = 60 240 40

KINGSTON - ACIDIC DRAINAGE

$$EARTH: \frac{(1')(2000')(\sqrt{5})(15)}{27} = 2485 \ c.y. \ (SLOPE) \qquad CAP: \frac{(4')(22')(2000)}{27 \times 0.8} = 8150 \ c.y.$$

$$\frac{12' \times 2' \times 2000}{0.8 \times 27} = 2225 \ c.y. \ (PAD)$$
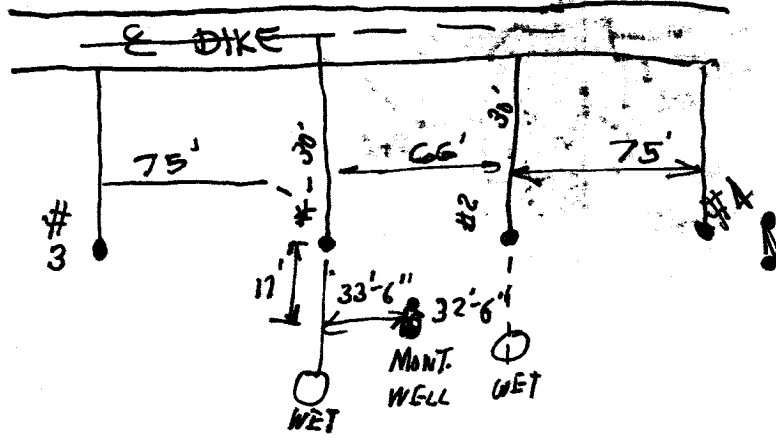
$$TOTAL = 12,860 \ c.y. \quad USE \ \underline{15,000 \ c.y.}$$

$$SEED \ \& \ MULCH: \quad \frac{15\sqrt{5} \ (2000)}{9} = 7455 \ s.y. \ (SLOPE)$$

$$\frac{2 \ AC \times 43560}{9} = 9680$$

$$TOTAL = 17,135 \ s.y. \quad USE \ \underline{17,500 \ s.y.}$$

$$CR. \ STN: \ 14' \times 1900' \times \frac{4}{12}' \times \frac{100}{c.f.} \times \frac{TON}{2000\#} = 443 \ TON \quad USE \ \underline{450 \ TON}$$

TVA-00010863

KINGSTON   4-30-84

₵ DIKE

75'   30'   ← 66'   30'   75' →

#3   #1   #2   #4

17'   33'-6"   32'-6"

WET   MONT.   WET
       WELL

PROCUREMENT REQUEST FORM   PR No. _22-KIF-C2102_ R _0_

PROJECT _KINGSTON S.P. 36B_

REFERENCE: EN DES-EP 5.20   Date _APR 30 1984_

CPM ACTIVITY NO. `D 4 3 6 B - - S L U R R Y` Section Supervisor _M.H. MILLER_ Ext. _2956_

Originator _DONALD GALLOWAY_ Ext. _2272_

1. Descriptive Title: `BENTONITE SLURRY CUTOFF WALL-ASH POND`

   Additional   _DESIGN & CONSTRUCT — APPROX 1900 LF OF TRENCH_
   Description   _TO STOP ACIDIC DRAINAGE_
   If Needed   _WITH OPTION FOR ADDITIONAL 150' ± for Dike C leak_

   Equipment Location
   A. Building or Area: _ASH POND_   C. Column Lines: _N/A_
   B. Elevation: _____   D. System: _ASH HANDLING_

2. Attachment(s): _N/A_

3. Procurement item number(s): `P 1 3 6 B - - C 2 1 0 2 -` `P`
   `P`   % complete: _____
   RQ/AW activity No. `[          ]`

4. Construction item number(s): _N/A_

5. ECN number(s): _N/A_

6. (A) ANS Safety Class _N/A_   (B) TVA Quality Group _N/A_
   (C) ASME Section III Class _N/A_   (D) IEEE Class _N/A_
   (E) Design Criteria No. (list ref. paragraphs) _N/A_

7. Standards and/or codes: _____

8. Seismic required: Yes _____ No _X_ Category _N/A_

9. Identical or similar item and/or material was purchased on contract
   No. _84K51-834340_ File No. _P155105_ Project _WIDOWS CREEK FOSSIL_

10. (Scheduled dates from CPM dated _N/A_)   Scheduled   Expected
    a. Procurement Request issue date   _MAY 1, 1984_   _____
    b. Requisition issue date (date released to PURCH)   _July 2, 1984_   _____
    c. Award of contract   _August 15, 1984_   _____
    d. Submittal of technical data*   _Sept 20, 1984_   _____
    e. Delivery to site (enter need date if unscheduled)   Start _OCT 5 1984_   _____
                              Complete _Nov 30, 1984_   _____

11. (a) Quality Assurance required: Yes___ No _X_ Part 21 Required: Yes_____ No _X_
    (b) QA requirement reviewed by _M.H. Miller_

12. Design bases verified by _Donald P. Galloway_

13. Shipping destination: Plant site _X_ Vendor _____ Other _____

14. Remarks: _APPROXIMATELY 94,000 S.F. OF BENTONITE SLURRY CUTOFF WALL TO
    BE DESIGNED, FURNISHED AND CONSTRUCTED BY VENDOR. VENDOR WILL ALSO
    DESIGN A ROLLED EARTH FILL CAP WITH APPROXIMATELY 20,000 CUBIC YARDS
    OF EARTH FURNISHED AND PLACED BY TVA_
    Drawings will be supplied by FDP-Civils
    _Emergency Requisition - F&HPR is preparing memo for justification - Additional info
    will be provided by May 4, 1984._

15. P. A. No._____ W. O. No. _20674_ Work Authorization No._____

*List (as attachment) specific technical information and date required from vendor in order to continue
and to complete TVA design.

TVA-00010865

DIVISION OF DESIGN COST ESTIMATE

BRANCH _____
SECTION _____
ESTIMATE NO. _____
SHEET NO. ___ of ___
DATE _____

PROJECT __KINGSTON S.P.__
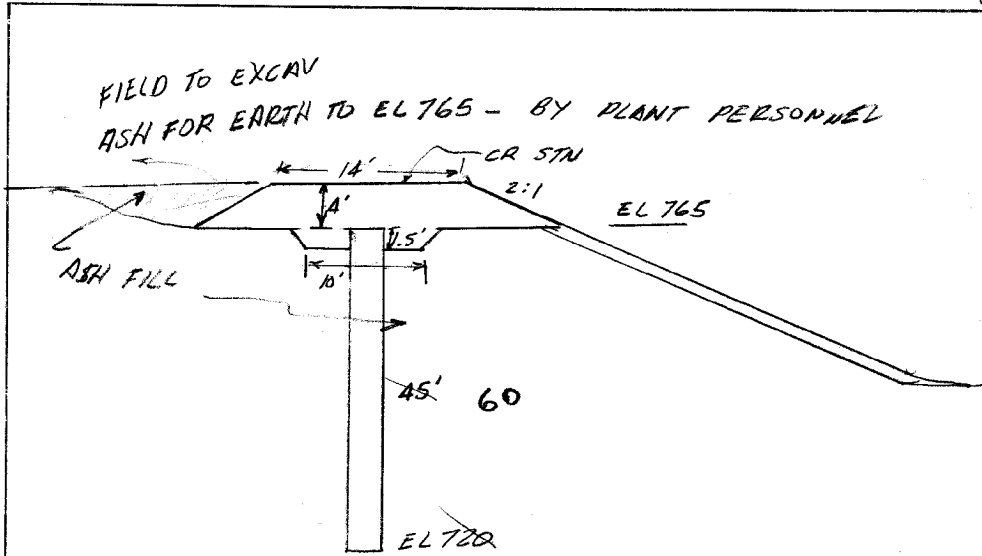DESCRIPTION __ACTUAL DAM - SLURRY @ EL 765   SCHEME IV__
    └ bottom EL 720±
ACCOUNT NO. _____
QUANTITIES BY __ORG__   CHECKED BY _____   PRICED BY _____   APPROVED _____

Item	Description	Quantity	Unit	Rate	Material	Labor	Total Amounts
1.	EARTH BORROW	15,000	C.Y.	4.00			60,000.00
2.	SLURRY	84,000	S.F.	2.00			168,000.00
3.	SEEDING & MULCH	10,360	S.Y.	0.15			1,550.00
4.	GR. STN.	435	Ton	7.00			3,300.00
	DESIGN SLURRY & BACKFILL						
5.	MOBILIZATION (SLURRY WALL CONTRACT)						15,000.00
							50,000.00
6.	DEMOBILIZATION & CLEANUP						15,000.00
7.	SUB INVEST.						20,000.00
	CONST. FAC.					+10,000	14,000.00
	TOTAL DIRECT COST						321,850.00
	FIELD GEN. EXP (7%)						22,550.00
	CONTINGENCY (20%)						64,400.00
	TOTAL FIELD CONST.						408,800.00
	EN. DES (?) - ?						35,000.00
	TOTAL O&DC COST						431,300.00
	POWER, GEN, AFUDC (7%)						30,200.00
	TOTAL						461,500.00
							+15,000
							+12,500
							+10,000
							567,...

SCHEME IV SLURRY @ EL 765

FIELD TO EXCAV
ASH FOR EARTH TO EL 765 - BY PLANT PERSONNEL

CR STN
14'
2:1
EL 765
4'
1.5'
10'
ASH FILL
45' 60
EL 720
EL 780

REV 6-21-84 DRS   SEE NEXT SH.

BORROW: CAP

$$\left[(10)(1)' + (14+8)(4) + (12)(1.5) \right] \frac{1865}{0.8 \times 27} \doteq 15,000 \ C.Y.$$

EARTH COVER - 765 - 730 = $1\sqrt{5}(1) = 33'$ USE 40

$$PREP. \ PAD = 200' \times 2 \ '(12) \over 27 \times 0.8$$

$$\frac{40 \times 2000}{27 \times 0.8} = 3700 \ C.Y.$$

SLURRY TRENCH:

$$(1865 \times 45) = \frac{94,000}{84,000 \ S.F.'}$$

2000 × 60

COVER SLOPE
$$\frac{40 \times 2000}{9} = 9000 \ S.Y.$$

BORROW AREA:
$$\frac{2 Ac. \times 43560}{9} = 9700 \ S.Y.$$

SEEDING & MULCH:

$$50 \times \frac{1865}{9} = \frac{11,116 \ S.Y.}{10,360 \ S.Y.}$$

SEED & MULCH = 18,700 S.Y.

CR STN: OK.

$$14' \times 1865' \times \frac{4}{12} \times \frac{100^{\#}}{C.F.} \times \frac{TON}{2000^{\#}} = 435 \ TON \ OK.$$

10 Test Holes @ 200' CC = 1800.00'

5°42'
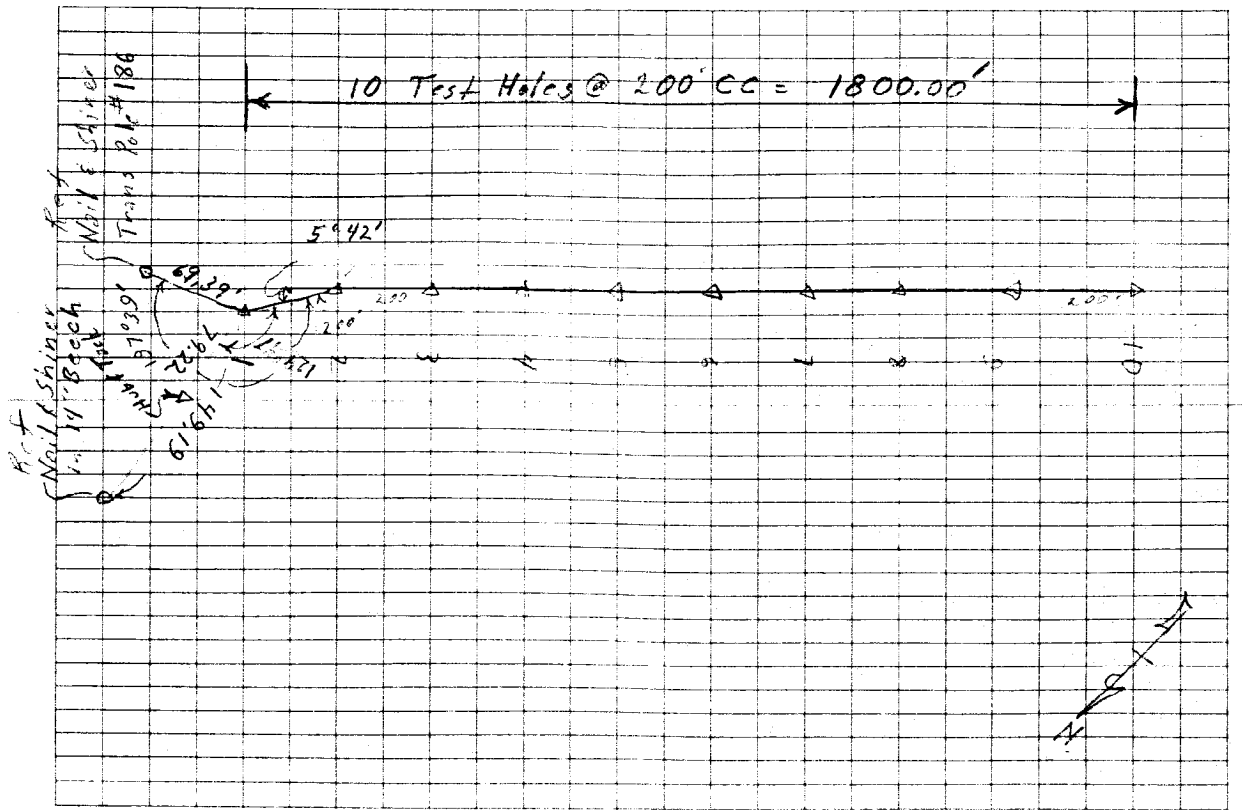
Kingston Steam Plant — Test Hole Location

Kingston Steam Plant

Top Intake Pumping Sta. Deck
App. Strike in 14" Beech Tree 50' from Edge
... in f... edge of Pier Thickener

Sta.	BS	HI	FS	Rod	Elev.
TBM	10.31	768.31			758.00
TP	6.96	772.68	2.59		765.72
TBM @ Beck	0.04	771.37	1.35		771.33
Tie Back to BS Deck			13.37		758.00
TBM @ Beech	3.38	774.71			771.33
1				5.9	768.8
2				4.3	770.4
3				4.9	769.8
4				5.0	769.7
TP	2.50	773.15	4.06		770.65
5			4.3	4.3	768.9
6				4.5	768.7
7				4.9	768.3
8				5.2	768.0
9				6.4	766.8
10				7.7	765.5
	5.21	775.94	2.42		770.73
			4.62		771.32

TVA-00010869
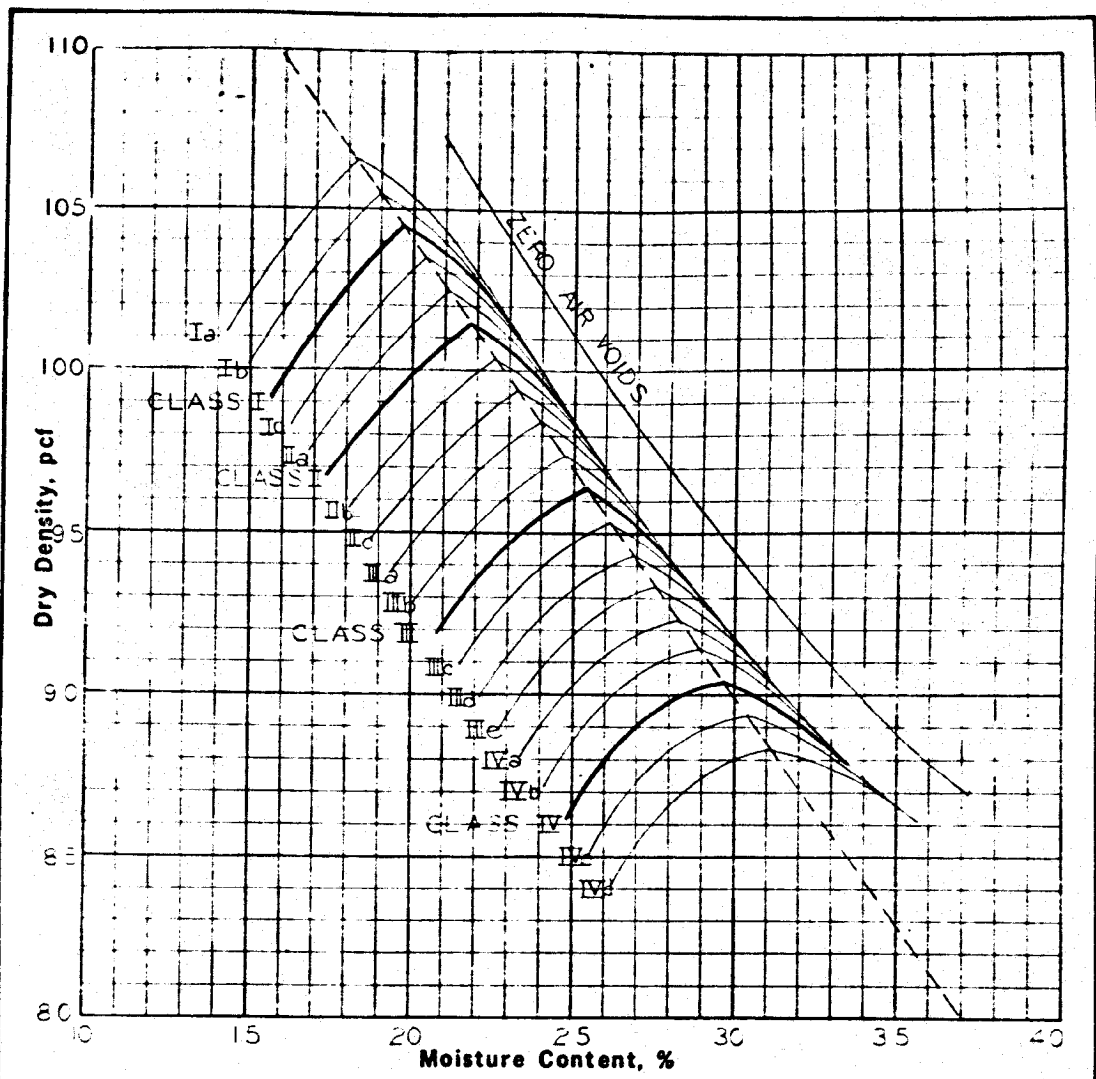
Soil Class	Gravel %	Sand %	Silt %	Clay %	Specific Gravity	LL %	PI %	Optimum Moisture, %	Maximum Density, pcf
I-CL	0	23	34	43	2.70	42.8	22.8	19.7	104.5
II-CH	0	22	26	52	2.73	58.3	32.5	21.8	101.5
III-CH	0	18	20	62	2.77	68.5	40.5	25.4	96.4
IV-CH	0	13	14	73	2.76	88.0	54.4	39.6	90.4

Plus No. 4 Specific Gravity, S S D	
Plus No. 4 Absorption, %	

Remarks:

Project KINGSTON STEAM PLANT

Feature BORROW AREAS A, B, C

ASTM Designation D-698

Date Tested 8-21-75

COMPACTION TEST (FAMILY OF CURVES)

Soil Form 14

Acidic Drainage - Between Ash Dike & intake Channel

Rain Fall Intensity Chart

Year	5 min (0.37×12)	10 min (0.57×6)	15 min (0.72×4)	30 min	1 hr	2 hr	3 hr	6 hr	12 hr	24 hr
1	4.4	3.4	2.9	$1 \times 2 = 2\,''/hr$	1.3	$\frac{1.6}{2} = 0.8$	$\frac{1.7}{3} = 0.6$	$\frac{2}{6} = 0.33$	$\frac{2.5}{12} = 0.21$	$\frac{2.8}{24} = 0.12$
2	5.3	4.1	3.5	$1.2 \times 2 = 2.4$	1.5	$\frac{1.8}{2} = 0.9$	$\frac{2}{3} = 0.7$	$\frac{2.5}{6} = 0.42$	$\frac{2.8}{12} = 0.29$	$\frac{3.1}{24} = 0.13$
5	7.1	5.5	4.6	$1.6 \times 2 = 3.2$	1.9	$\frac{2.4}{2} = 1.2$	$\frac{2.5}{3} = 0.83$	$\frac{3}{6} = 0.50$	$\frac{3.5}{12} = 0.29$	$\frac{4.1}{24} = 0.17$
10	7.5	5.8	4.9	$1.7 \times 2 = 3.4$	2.2	$\frac{2.6}{2} = 1.3$	$\frac{2.9}{3} = 1.0$	$\frac{3.5}{6} = 0.58$	$\frac{4}{12} = 0.33$	$\frac{4.8}{24} = 0.20$
25	8.9	6.8	5.8	$2 \times 2 = 4$	2.5	$\frac{3}{2} = 1.5$	$\frac{3.4}{3} = 1.1$	$\frac{4}{6} = 0.67$	$\frac{4.8}{12} = 0.4$	$\frac{5.5}{24} = 0.23$
50	9.7	7.5	6.3	$2.2 \times 2 = 4.4$	2.8	$\frac{3.4}{2} = 1.7$	$\frac{3.7}{3} = 1.2$	$\frac{4.8}{6} = 0.80$	$\frac{6.2}{12} = 0.43$	$\frac{6}{24} = 0.25$
100	10.9	8.4	7.1	$2.46 \times 2 = 4.9$	3.05	$\frac{3.8}{2} = 1.9$	$\frac{4}{3} = 1.3$	$\frac{4.9}{6} = 0.82$	$\frac{5.8}{12} = 0.48$	$\frac{6.5}{24} = 0.27$

To:
SBJ ( )
RHH (✓)
REH ( )
JCL ( )

FROM: MEMason, Coordinating Engineer

Project: Kingston Steam Plant

Feature: Acidic drainage

Technical Lead Engineer: Marvin Miller

Reference: Memo from Fox to Sprouse 6/4/82, memo from Sprouse to Fox 6/14/82.

Please review the attached references and coordinate with the technical lead engineer to determine your involvement in the modification. When coordination is complete, please provide me with a draft description of your activities along with any support branch activities that will be required. This information will be used to develope a cost estimate request (CER) according to EP1.18. Please reply by Sept. 24, 1982.

Mike
coordinator

cc: BJ Cole

Kingston Steam Plant

Acidic drainage between ash pond dike and plant intake canal

The work scope has changed from the two alternatives discussed in the attached memo to the following:

Repair seepage by constructing a clay dike/berm, approximately 1800 feet along and adjacent to the existing ash pond and intake canal. A seepage/runoff collection pond will be incorporated at the northeast end of this diked area. The seepage will be pumped back into the ash pond from this collection pond.

UNITED STATES GOVERNMENT

Memorandum

TENNESSEE VALLEY AUTHORITY

CDB '82 0614 011

TO : H. S. Fox, Director of Fossil and Hydro Power, 716 EB-C

FROM : M. N. Sprouse, Manager of Engineering Design, W11A9 C-K

DATE : June 14, 1982

SUBJECT: KINGSTON STEAM PLANT - ACIDIC DRAINAGE BETWEEN ASH POND DIKE AND PLANT INTAKE CHANNEL - COST ESTIMATE

This is an interim reply to your memorandum to me dated June 4, 1982 (DES 820607 023), requesting a cost study for various alternatives for containing the acidic drainage between the ash pond dike and the plant intake channel and then pumping this drainage into the ash pond.

We are proceeding to prepare cost estimates (±30 percent) for the various schemes. These estimates will include ditches, dikes, pumps, pump platform, power supply, etc. We will forward this information to you (around) the first of September 1982.

Original Signed By
D. B. Bowen

M. N. Sprouse

GLB:JLG:TLT
cc: G. L. Buchanan, W3C126 C-K
    F. W. Chandler, W8C126 C-K
    C. A. Chandley, W7C126 C-K
    J. P. Darling, 546 CST2-C
    J. E. Holladay, W2D224 C-K
    S. B. Jack, 5100 MIB-K
    J. A. Johnson, W12C82 C-K
    MEDS, W5B63 C-K
    H. H. Mull, E7B24 C-K
    Frank Van Meter, 500 SPT-K (3)

Principally prepared by: J. L. Glover, extension 2857.

UNITED STATES GOVERNMENT

Memorandum

TENNESSEE VALLEY AUTHORITY

M54 820524

	Rm 410	N
	Sprouse	
✓	Bowen	
	Burroughs	
	Contrell	
	Domer	
✓	MEDS	

TO : M. N. Sprouse, Manager of Engineering Design, W11A9 C-K

FROM : H. S. Fox, Director of Fossil and Hydro Power, 716 EB-C

DATE : JUN 4 1982   DES '820607 023

SUBJECT: ACIDIC DRAINAGE BETWEEN ASH POND DIKE AND PLANT INTAKE CANAL – KINGSTON STEAM PLANT

Kingston General

A plant visit was made on May 6, 1982, by G. L. Wimberly and G. D. McBryar, of this division, and D. R. Galloway, of your division. The acidic drainage area is parallel to and between the ash pond dike and the plant intake canal over a length of 800 feet to 1,000 feet. The above persons surveyed the area and discussed the problem with L. B. Kennedy, the plant superintendent.

As discussed, two possible alternatives were (1) to ditch and drain at the top of the original ash pond dike (before the initial raising) and drain to a collection sump and pump back to the ash pond, and (2) to excavate near the intake canal to clay and key in a clay dike with the upper dike edge acting as the lower edge of a drainage ditch which would be graded to drain to a collection sump for pumping.

The natural topography of the area in question lends itself to the drainage sump being placed on the end of the ditch furtherest from the powerhouse. However, the distance required for providing power supply on that end would increase the total cost. The additional cost required for placing the sump nearer the powerhouse (closer to power supply source) may offset the power supply cost with the pumps placed on the far end.

As discussed with Mr. Galloway, please prepare a cost study for the above options.

H. S. Fox

START FILE

Received
10 JUN 9 '82

ENVIRONMENTAL DESIGN PROJECT

	Supv	Date	N	S.pv	Date
1	SBJ	10		WAG	
	UPS	11		WAB	
3	JAB	14		RNR	
	DWR			RFS	
2	JAK	10			
	RWJ			LJC	
				KLS	
	RED				
	JAF			BLH	
	DAK				

WHT:JTT:GDM:PCT
cc: ARMS, 810 EB-C
    D. R. Galloway, W3A55 C-K
    L. B. Kennedy, Kingston

xc: 6/7/82 – DBB:SB
     cc: S. B. Jack, 5100 MIB-K – Please handle and reply to Fox for my signature
          by 6/14/82.--MNS

     MEDS, W5B63 C-K

EDP '82 0609 009 – Please handle and prepare reply to H. S. Fox for M. N. Sprouse's signature by June 14, 1982. --SBJ

cc: R. O. Barnett, W9D224 C-K
    G. L. Buchanan, W3C126 C-K
    C. A. Chandley, W7C126 C-K
    F. Van Meter, 500 SPT-K (3)
    MEDS, W5B63 C-K
    M. N. Sprouse, W11A9 C-K

6/9/82 – SBJ:BLH

TO   : Those listed below
FROM   : O. P. Thornton, Fossil Design Projects Manager, 102 SPT-K
DATE   : NOV 3 1982
PROJECT: KINGSTON STEAM PLANT

Feature: Acidic drainage

Purpose: To provide a collection pond for the acidic drainage.

Scope: Two schemes will be estimated. See attachment "B" for the scope of work

and organizational responsibilities for each scheme.

Requested by: F&H PR   Date of Request: June 4, 1982

Reference Memo (if any): H. S. Fox to M. N. Sprouse dated June 4, 1982 (DES 820607 023)

Type of Estimate: Order-of-magnitude _____   Detailed   _____
  (Check one. See   Preliminary   _____   Comparison _____
  Attachment No. 2   Authorization   X   Other   _____
  in EN DES-EP 1.18.)
        Construction   Construction
Dates: Start 10/83   Operation _____   Complete 6/84
Project Coordinating Engineer: M. E. Mason   Extension: 3174
Technical Lead Engineer: M. H. Miller   Extension: 2956
CER Coordinator: C. P. Rochat   Extension: 2641
Final estimate required by (date): 1/14/83   Project Code: DAC

Submit input data to EN DES lead
organization and OEDC Estimates Section by (date): 11/30/82

Account No. for EN DES personnel preparing estimate: 767-30-01.XXX misc. code 105

Comments: _____

_____

for O. P. Thornton

CPR:JAG

*	**		cc:
___	___	R. M. Parker, W4C126 C-K	C. W. Kilgore, W12C74 C-K
___	___	R. O. Barnett, W9D224 C-K	R. A. Painter, E5C80 C-K
___	___	G. R. Hall, 6204 MIB-K	MEDS, W5B63 C-K
___	___	G. L. Buchanan, W3C126 C-K	F. Van Meter, 500 SPT-K (3)
*	___	F. W. Chandler, W8C126 C-K	Note CSB's responsibilities.
*	___	C. A. Chandley, W7C126 C-K	
___	___	J. A. Raulston, W10C126 C-K	
___	___	J. E. Holladay, W2D224 C-K	
*	___	J. A. Johnson, W12C82 C-K	*Estimate data required.
*	___	O. P. Thornton, 102 SPT-K	**Information only; no input required.
___	___		***Have a rep attend the meeting.

Attachments: Yes x   No __   S72302.03

Attachment B

Scheme 1

A dike approximately 1100 feet long will be constructed with the top of the
dike being at elevation 750. The dike will form a collection pond which
will drain into a pump reservoir in the southeast corner of the pond. The
drainage will be pumped back into the ash pond. *An additional 800' section must be
sealed and ditched by excavating and backfilling.*

Organization Responsibilities

FDP-M — Design of pump and piping

FDP-E — Design of pump power supply and controls

FDP-C — Design of pump mounting platform, access walkway, and design
of dike, pond, and pump reservoir.

EEB — Procurement of electrical materials

MEB — Procurement of pump and piping

CSB — Construction and procurement of civil materials

Scheme 2

A dike approximately 2000 feet long with the top of the dike being at
elevation 765. No pumping will be required.

Organization Responsibilities

FDP-C — Design of dike

CSB — Construction and procurement

S72301.01

Attachment A

Special Instructions

Please provide the following information for your input:

1. Verification of your overall scope of work. Note any additions or deletions.

2. Your assumptions.

3. List of activities, scope for each activity, and all drawing numbers (new and revised) for each activity.

4. Estimated start, duration, and completion for each design activity.

5. Estimated start, duration, and completion for your procurements from PR to delivery.

6. Material estimate for each design activity (TVA form 5798).

7. Design man-hours by task for each activity.

8. The number of purchase requisitions that will be forwarded to each branch for material or equipment purchasing.

M. N. Sprouse, Manager of Engineering Design, W11A9 C-K

H. S. Fox, Director of Fossil and Hydro Power, 716 EB-C

JUN 4 1982

ACIDIC DRAINAGE BETWEEN ASH POND DIKE AND PLANT INTAKE CANAL - KINGSTON
STEAM PLANT

A plant visit was made on May 6, 1982, by G. L. Wimberly and G. D. McBryar,
of this division, and D. R. Galloway, of your division. The acidic
drainage area is parallel to and between the ash pond dike and the plant
intake canal over a length of 800 feet to 1,000 feet. The above persons
surveyed the area and discussed the problem with L. B. Kennedy, the
plant superintendent.

As discussed, two possible alternatives were (1) to ditch and drain at
the top of the original ash pond dike (before the initial raising) and
drain to a collection sump and pump back to the ash pond, and (2) to
excavate near the intake canal to clay and key in a clay dike with the
upper dike edge acting as the lower edge of a drainage ditch which would
be graded to drain to a collection sump for pumping.

The natural topography of the area in question lends itself to the
drainage sump being placed on the end of the ditch furtherest from the
powerhouse. However, the distance required for providing power supply
on that end would increase the total cost. The additional cost required
for placing the sump nearer the powerhouse (closer to power supply
source) may offset the power supply cost with the pumps placed on the
far end.

As discussed with Mr. Galloway, please prepare a cost study for the
above options.

H. S. Fox

WHT:JTT:GDM:PCT
cc: ARMS, 810 EB-C
     D. R. Galloway, W3A55 C-K
     L. B. Kennedy, Kingston

Memorandum

Rout.	10		Not
✓	Sprouse		
✓	Bowen	✓	
	Burroughs		
	Contrell		
	Domer		
✓	MEDS		

TO : M. N. Sprouse, Manager of Engineering Design, W11A9 C-K

FROM : H. S. Fox, Director of Fossil and Hydro Power, 716 EB-C

DATE : JUN 4 1982   DES '820607 023

SUBJECT: ACIDIC DRAINAGE BETWEEN ASH POND DIKE AND PLANT INTAKE CANAL – KINGSTON
STEAM PLANT

Reply by 5/14 (Interim)

A plant visit was made on May 6, 1982, by G. L. Wimberly and G. D. McBryar,
of this division, and D. R. Galloway, of your division. The acidic
drainage area is parallel to and between the ash pond dike and the plant
intake canal over a length of 800 feet to 1,000 feet. The above persons
surveyed the area and discussed the problem with L. B. Kennedy, the
plant superintendent.

As discussed, two possible alternatives were (1) to ditch and drain at
the top of the original ash pond dike (before the initial raising) and
drain to a collection sump and pump back to the ash pond, and (2) to
excavate near the intake canal to clay and key in a clay dike with the
upper dike edge acting as the lower edge of a drainage ditch which would
be graded to drain to a collection sump for pumping.

The natural topography of the area in question lends itself to the
drainage sump being placed on the end of the ditch furtherest from the
powerhouse. However, the distance required for providing power supply
on that end would increase the total cost. The additional cost required
for placing the sump nearer the powerhouse (closer to power supply
source) may offset the power supply cost with the pumps placed on the
far end.

As discussed with Mr. Galloway, please prepare a cost study for the
above options.

H. S. Fox

WHT:JTT:GDM:PCT

cc: ARMS, 810 EB-C
    D. R. Galloway, W3A55 C-K
    L. B. Kennedy, Kingston

xc: 6/7/82 – DBB:SB
    cc: S. B. Jack, 5100 MIB-K – Please handle and reply to Fox for my signature
        by 6/14/82.--MNS

    MEDS, W5B63 C-K

6/9/82 – SBJ:BLH

cc: R. O. Barnett, W9D224 C-K
    G. L. Buchanan, W3C126 C-K – Please hand and prepare reply to H. S. Fox
        for M. N. Sprouse's signature by June 14, 1982. --SBJ
    C. A. Chandley, W7C126 C-K
    F. Van Meter, 500 SPT-K (3)
    MEDS, W5B63 C-K
    M. N. Sprouse, W11A9 C-K

EDP 820609 007

X3548

	NAME	DATE
F O R	Bob Anderson	2-17-83 ☐ Chatta ☐ M.S. ☐ Knox ☐ Nor.

– – – – – – fold here for return – – – – – –

	NAME	EXTENSION
F R O M	Marvin H. Miller	2956
	ADDRESS 333 SPT	☐ Chatta ☐ M.S. ☒ Knox ☐ Nor.

Kingston Steam Plant – Acidic Drainage
Cost Estimate No. 83-69 rev 2

Scheme 3.   Slurry wall

Please estimate mh's to prepare
and administer contract for design
and construction of a slurry wall (see
attachments). FDP will prepare a drawing
to go with the contract.

CSB will cover the outside of the
dike with 12" earth + seeding & mulching.

RQ – 120 m-hrs *   — Anderson reduced this to 225 m-h
AW – 100 m-hrs   2-18-82. Phone conversation with
CA – 80 m-hrs   M. Miller 2-26-82

* Includes time req'd. for Sam Stone
to review requisition.
                          2-18-83
                          RHA

SUBJECT _Acidic Drainage – Between Ash_   PROJECT _Kingston S.P_
Dike & Intake Channel   Scheme 3.

COMPUTED BY _WBS_ .   DATE _2-16-83_   CHECKED BY   DATE

Scheme 3 –
   Consists of a Bentonite slurry Trench and
The out side slope of the Dike covered with
12" of earth and seeded.

① _Trench_

Depth = 25'

Length = 1800'

Wall Area = 25' × 1800' = 45,000 ft^2

② _Earth Cover_

   1' depth

Width - (A) = 280' ;   Width B = 170

Length A = 900 ;   Length B = 900'

$$\text{Volume} = \frac{(280 \times 900' \times 1) + (170 \times 900 \times 1)}{27} = 15,000 \text{ yd}^3 \text{ Borrow}$$

(9333 yd^3) (5,667 yd^2)

Seeding and Mulching

$$\frac{(280 \times 900) + (170 \times 900)}{9} = 45,000 \text{ yd}^2 \qquad 218,800$$

(28,000) (17,000)

SUBJECT *Acidic Drainage–Between Ash Dike And Intake Channel – Scheme - 3*   PROJECT *Kingston S.P.*

COMPUTED BY *JPHS*   DATE *2-17-83*   CHECKED BY   DATE

NO.	ITEM	QUANTITY	UNIT	PRICE	AMOUNT	TOTAL
	Bentonite Slurry Trench*	45,000	Ft^2			
	Earth Borrow (uncompacted)	15,000	Yd^3			
	Seeding & Mulching	45,000	Yd^2			
	EN DES					
	Prepare and administer contract					
	(include soil spec. review) CEB	225	mh	**		
	FDP	100	EN			
	Prepare procurement dwg FDP	100	mh EN			
	Drafting Support	40	DF			
	FDP Civil Overhead	20	mh			
*	Design and construction by contract.					
	Inspection by CSB.					
**	Per Bob Anderson & Sam Stone					
	50 hrs requistion, 100 hrs award (incl pre bid mtg), 75 hrs contract administration = 225 total					

SUBJECT *Acidic Drainage - Between Ash*   PROJECT *Kingston S.P.*
Dike and Intake Channel -

COMPUTED BY   DATE   CHECKED BY   DATE

Top of Dike El. 765±

1' Earth Cover

Road

W.S. El. 741

Slurry Trench

2.0' to 2.5'

740

Original Ground El. 741±

TYPICAL SECTION

NTS.

TVA-00010884
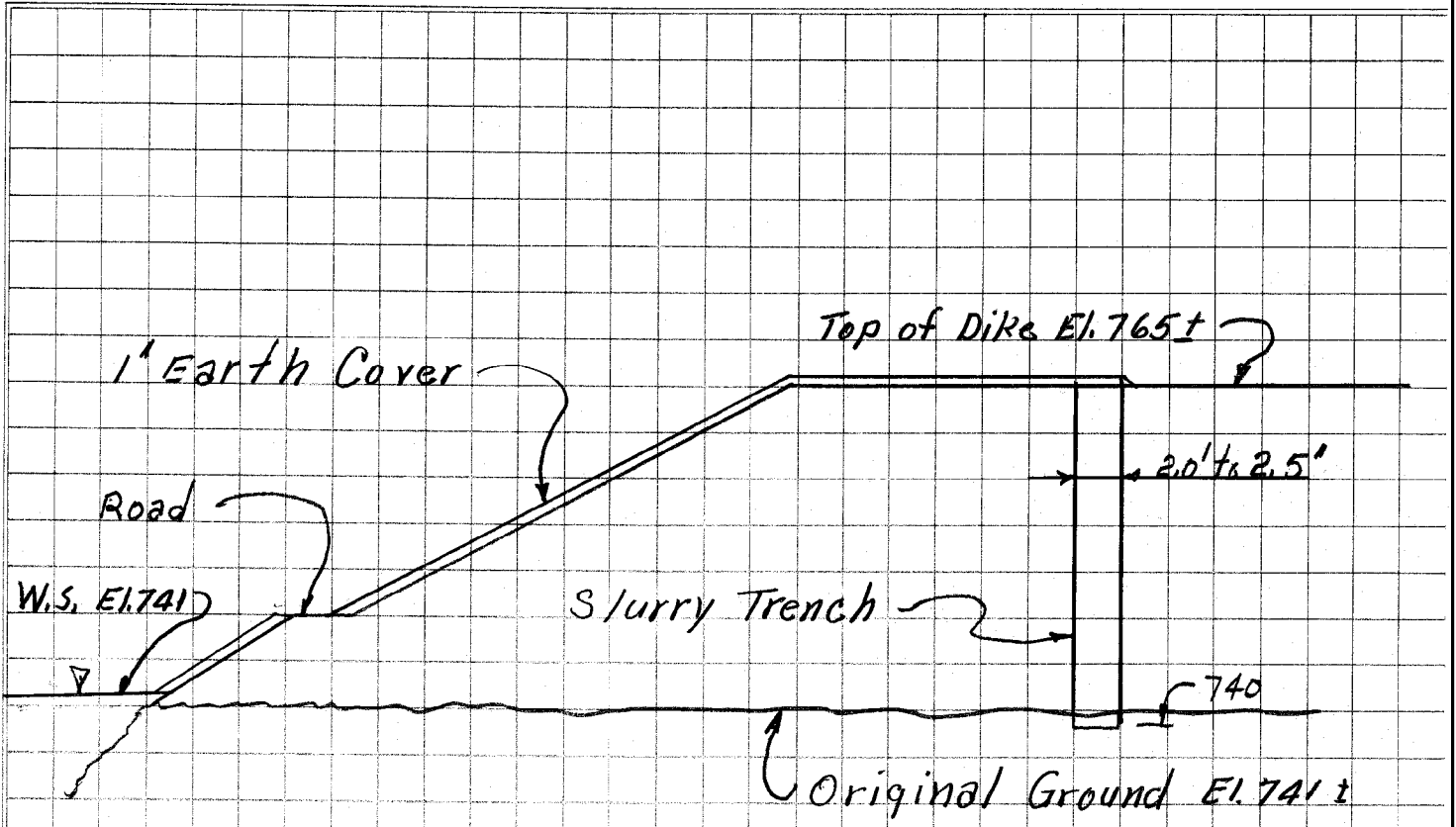
Kingston S.P.

Acidic Drainage - Between Ash

Dike & Intake Channel - Scheme 3.

Scheme 3, consists of a Bentonite Slurry Trench

Trench* 2' to 2.5' wide, 1800' long, and extending from

elevation 765 to elevation 740, covering the outside

slope of the dike with 12" of earth, and seeding

and mulching the earth cover. The top of the dike

will be sloped to the inside to prevent surface

water from flowing over the slope.

* Design and construction by contract.
Inspection by CSB.

NAME	DATE
Bob Anderson	**2-17-83**
ADDRESS	☐ Chatto ☐ N.S. ☐ Knox ☐ Nor.

- - - - - - - - - - Fold here for return - - - - - - - - - -

NAME	EXTENSION
Marvin H. Miller	2956
ADDRESS 333 SPT	☐ Chatto ☐ N.S. ☒ Knox ☐ Nor.

Kingston Steam Plant - Acidic Drainage
Cost Estimate No. 83-69 rev 2

Scheme 3.   Slurry wall

Please estimate mh's to prepare
and administer contract for design
and construction of a slurry wall (see
attachments). FDP will prepare a drawing
to go with the contract.

CSB will cover the outside of the
dike with 12" earth + seeding & mulching.

KINGSTON RED WATER
Sections

₵ DRAIN

350'±

195'

600'±

BLDG.

ACTIVE
ASH DISPOSAL AREA

WATTS BAR LAKE
NORMAL FULL POOL 741

CHANNEL

740.25
6/13/93

Metal
Storage Bldg

Storage
Yard

Line A

Horz: 1"=40'
Vert: 1"=4'

2 of 4

Top of water: 740.25   6/13/83

Top 775.3 ±

¢ Rd.

720

766

750

740

0+00

1+00

2+00

LINE B

Top water 780.25   6/13/83

t Rd

770

766

750

740

770.5

0+00 1+00 2+00 3+00 4+00

LINE C

4+14

Water 740.25 - 6/13/93

¢ Rd.

772
770
760
750
740

4+00
3+00
2+00
1+00
0+00
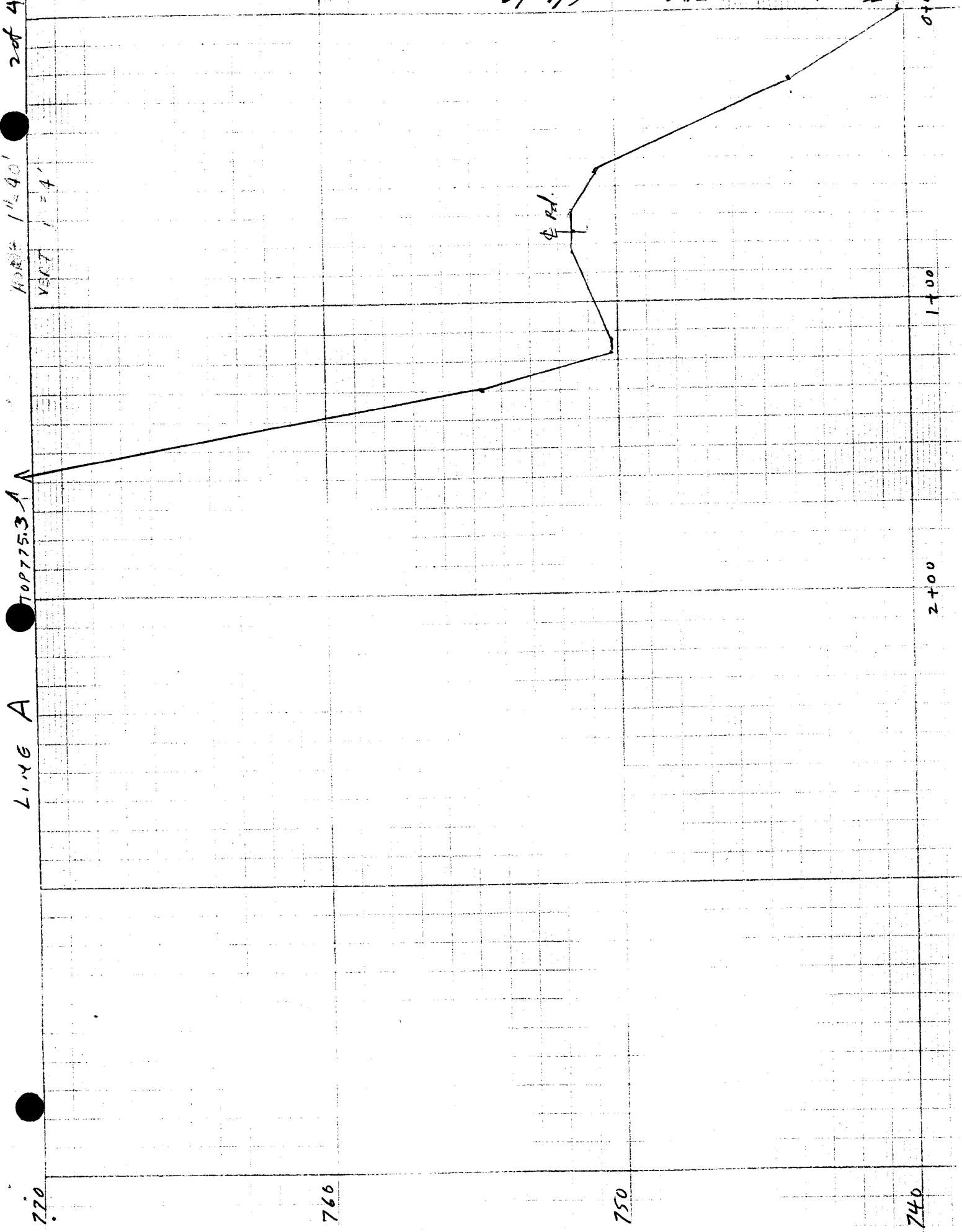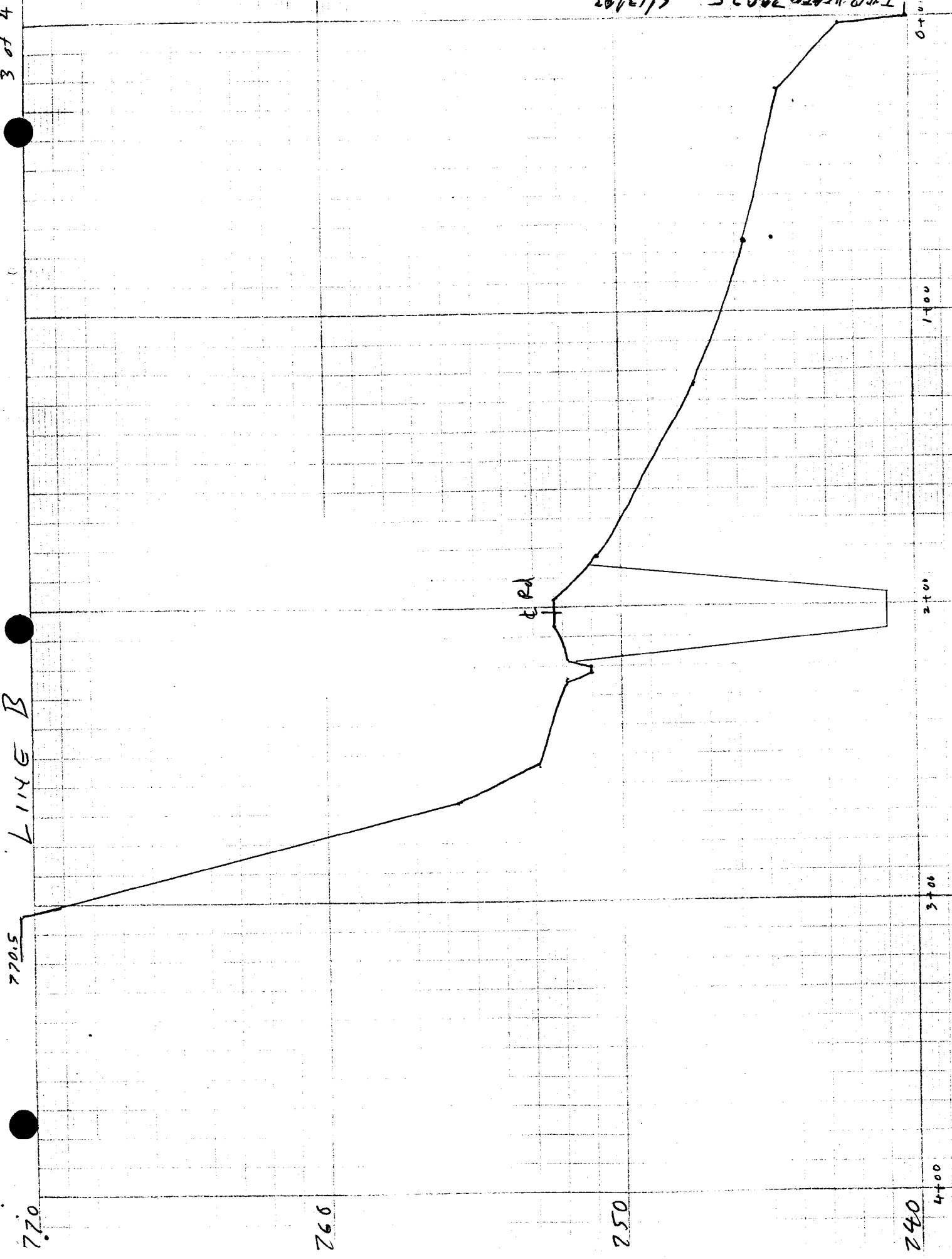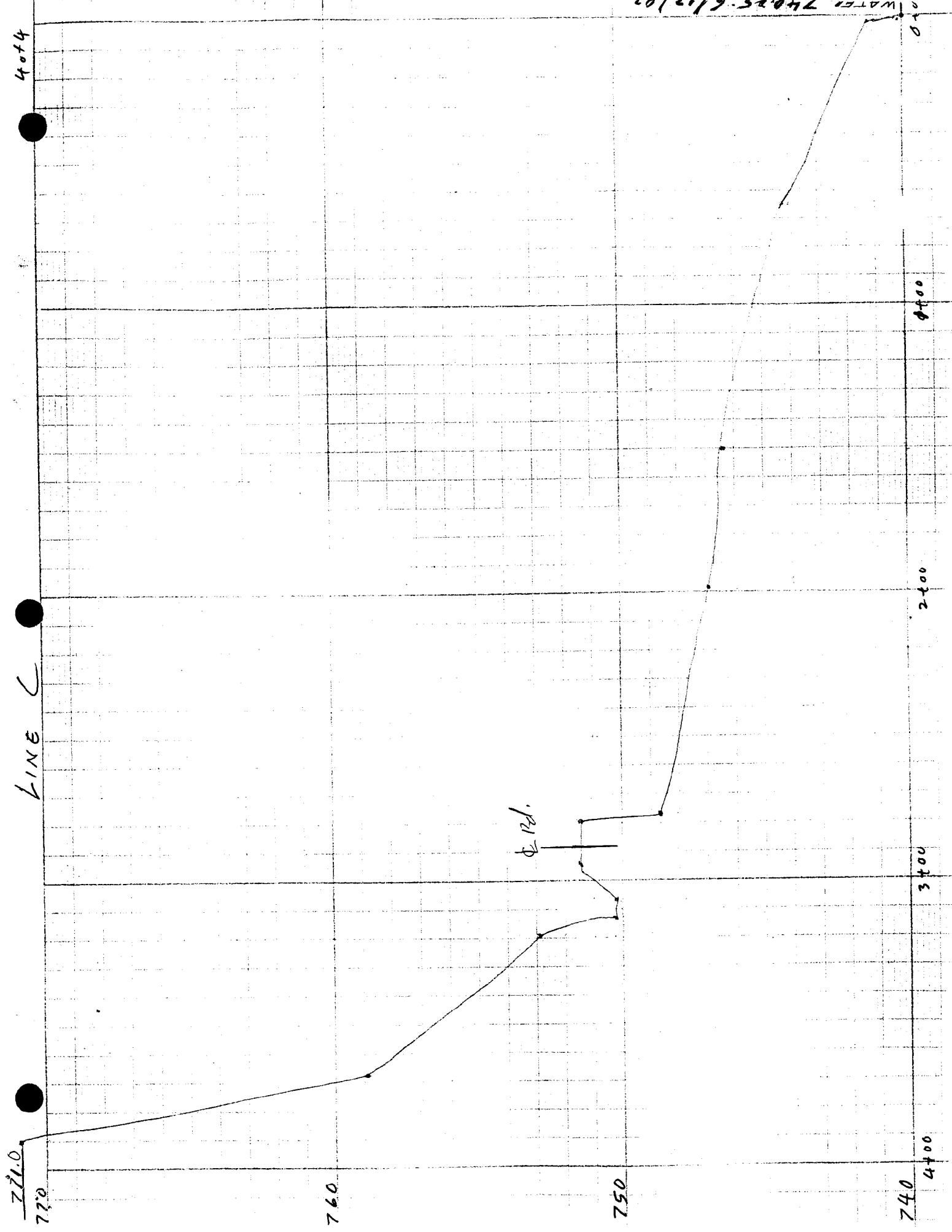
Kingston Steam Plant

Summary

Unclassified Excavation	$2.00/cy
Earth Borrow	$4.00/cy
Crushed Stone Surfacing	$7.50/Ton
Filter Blanket	$8.00/Ton
Riprap	$8.00/Ton
Seeding & Mulching	$0.15/sy

1983 prices

Kingston

To J.P Stivers 2/25/83 COMPUTED _LK_ DATE _2/24/83_
CHECKED _____ DATE _____

<u>Unclassified Excavation</u>   (7,100 cy)

<u>Assume</u> - 2 - 633 - Pans   20 cy/load ,   3 loads/hr.

∴ 6 loads/hr x 20 cy/load = 120 cy/hr

120 cy/hr x 8 hrs = 960 cy/day -

7,100 cy ÷ 960 cy/day = 7.39 days

<u>Say 8 days (64 hrs)</u>

<u>Equip</u> - 2 - 633 Pans   2 x 64 hrs x $70.00/hr = $8,960
              1 - D-8 Dozer   1 x 64 hrs x $42.00/hr = 2,688

                                Total Equip = 11,648

<u>Labor</u>   3 - Class A operators = 3 x $16.28/hr x 64 hrs = $3,126
              1 - Equip. Foreman   = 1 x 17.77/hr x 64 hrs = 1,137

                                Total Labor   4,263

Equip $11,648
Labor   4,263
         14,911 ÷ 7,100 cy = $2.10/cy → Say $2.00/cy

<u>Earth Borrow</u> — (18,250 cy)

Assume — 2 - 633 Pans — 20 cy/load 2 loads/hr

∴ 4 loads/hr × 20 cy/load = 80 cy/hr.

80 cy/hr × 8 hrs = 640 cy/day

18,250 cy ÷ 640 cy/day = 28.5 days

Say 30 days. (240 hrs)

Equip — 2 - 633 Pans   2 × 240 hrs × $70/hr = 33,600
1 - D-8 Dozer   1 × 240 hrs × 42/hr = 10,080
1 - Rex Compactor 1 × 240 hrs × 50/hr = 12,000
                                                 ─────────
                                                  55,680

Labor — 4 class A Oper. - 4 × 240 × 16.28 = 15,629
1 Equip Foreman · 1 × 240 × 17.77 = 4,265
                                           ──────
                                            19,894

Equip   55,680
Labor   19,894
          ──────────
$ 75,574 ÷ 18,250 cy = $4.14

Say $4.00/cy

Crushed Stone surfacing - (700 Tons)

First Cost delivered & Spread -   #6.00/Ton -

Blade Off & Compact -
    Rex Compactor - 2 day @ #530/day
                Say #1000

            #1000 ÷ 700 Ton =   #1.42/Ton

                                7.42
                          Say #7.50/Ton

Filter Blanket (31 Tons)

        Say   #8.00/Ton

Riprap   (55 Tons)

    Same as Filter Blanket   #8.00/Ton

Seeding & Mulching   34,600 yds

    34,600 yds ÷ 4,840 sy/Ac = 7.2 Acres

            Say 8 Acres

Assume 1Ac/load x 1½/load =

        Say 1 day

Matl.   Seed - 60#/Acre K-31 x 8 - 480# x 1⁰⁰ = #500
        Fertilizers - 600#/Ac. x 8 = 5000# x   = 600
        Lime (Ag) - 2 Tons/Ac x 8 = 16 Tons x 40⁰⁰ = 640
        Straw = Guess Say #100/Ac x 8 -   800
                                                2540

TVA-00010895

<u>Seeding & Mulching Cont.</u>

<u>Labor</u> - 1 truck driver - 8 hr x 11.78 =   94.24
     1 - Operator D - 8 hrs x 10.87 =   86.96
     2 - Laborer - 28 hr x 10.25 =   164.00

                        345.92

            Say ≈ $350/day

<u>Equip</u>
Hydro Seeder - Non Rated Equip -
Truck - $20/hr x 8 hrs $160/day

Material   -   2540
Labor   -   350
Equip   -   160
          3050 ÷ .09/sy ≈ Say $.15/sy

SUBJECT *Acidic Drainage - Between Ash Dike & Intake Channel - Scheme 1*　　　PROJECT *Kingston S. P*

COMPUTED BY *JPHS*　　　DATE *9-23-82*　　　CHECKED BY　　　DATE

NO.	ITEM	QUANTITY	UNIT	PRICE	AMOUNT	TOTAL
120	Unclassified Excav. Waste	7,100	yd^3			
123	Earth Borrow	18,250	yd^3			
305	Crushed Stone Surfacing	700	Ton			
570	Filter Blanket	31	Ton			
575	Riprap	41	yd^3			
580	Seeding	34,600	yd^2			
582	Mulching	34,600	yd^2			
	Civil Design Dwgs.					
	Plan	1	dwg			
	Sections	1	dwg			
	Civil Design Man hours	225 EN	hours			
		75 DF	hours			
		30 AD	hours			
	Notes:					
	1. See page 3 for typical section					
	2. Item Numbers Refer to the T-1 specifications					
	3. No Structural Items Required.					
	4. No borrow investigation required. Plant Has an Approved & Tested Source.					

SUBJECT *Acidic Drainage-Between Ash Dike & Intake Channel- Scheme 2*   PROJECT *Kingston S.P.*

COMPUTED BY *JPHS.*   DATE *9-23-82*   CHECKED BY   DATE

NO.	ITEM	QUANTITY	UNIT	PRICE	AMOUNT	TOTAL
120	Unclassified Excav. Waste	15,000	yd^3			
123	Earth Borrow	35,000	yd^3			
305	Crushed Stone Surfacing	635	Ton			
580	Seeding	11,600	yd^2			
582	Mulching	11,600	yd^2			

Notes:

   1. See Page 3 for Typical Section.

   2. Item Numbers Refer to the T-1 Specifications.

SUBJECT *Acidic Drainage-Between Ash*   PROJECT *Kingston S.P.*
Dike & Intake Channel-Scheme 1&2
COMPUTED BY *JPH*   DATE *9-23-82*   CHECKED BY   DATE

TYPICAL SECTIONS

Existing Ground Line

16'

El. 750

2:1   Rolled   Fill   2:1

1:1   1:1

El. 741

This Area
Excavated & Wasted
To be replaced with
Rolled Filled

10'

Scheme 1
NTS

16'

El. 765

Existing Ground Line

2:1

Rolled

1:1   Fill   1:1

El. 741

This Area Excavated,
& Wasted. To Be Replaced
With Rolled Fill

10'

Scheme 2
NTS
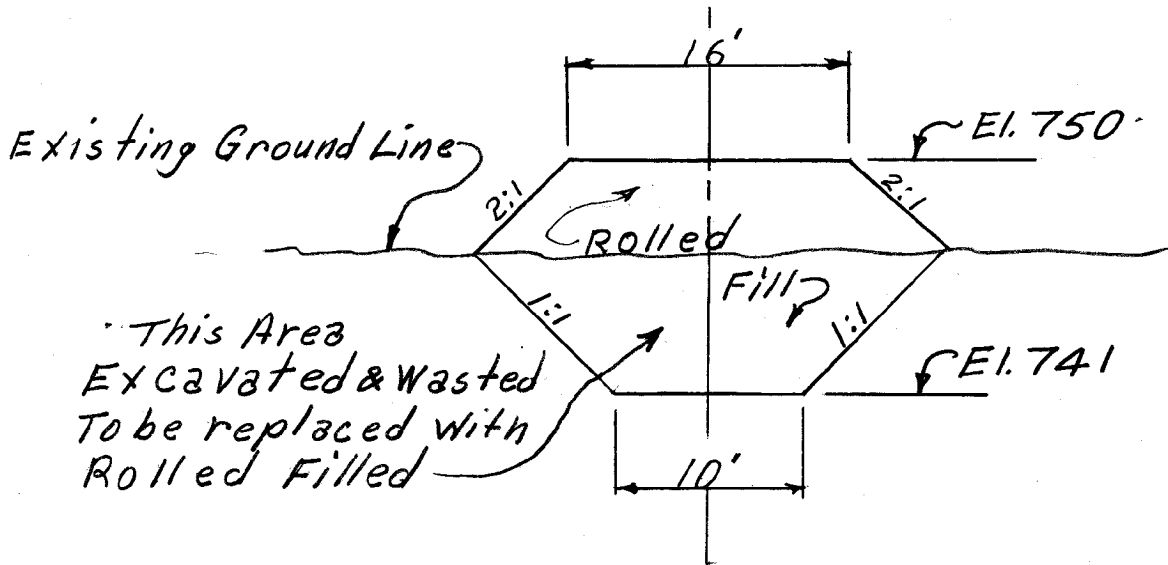
ACTIVITY LEVEL ESTIMATE WORKSHEET
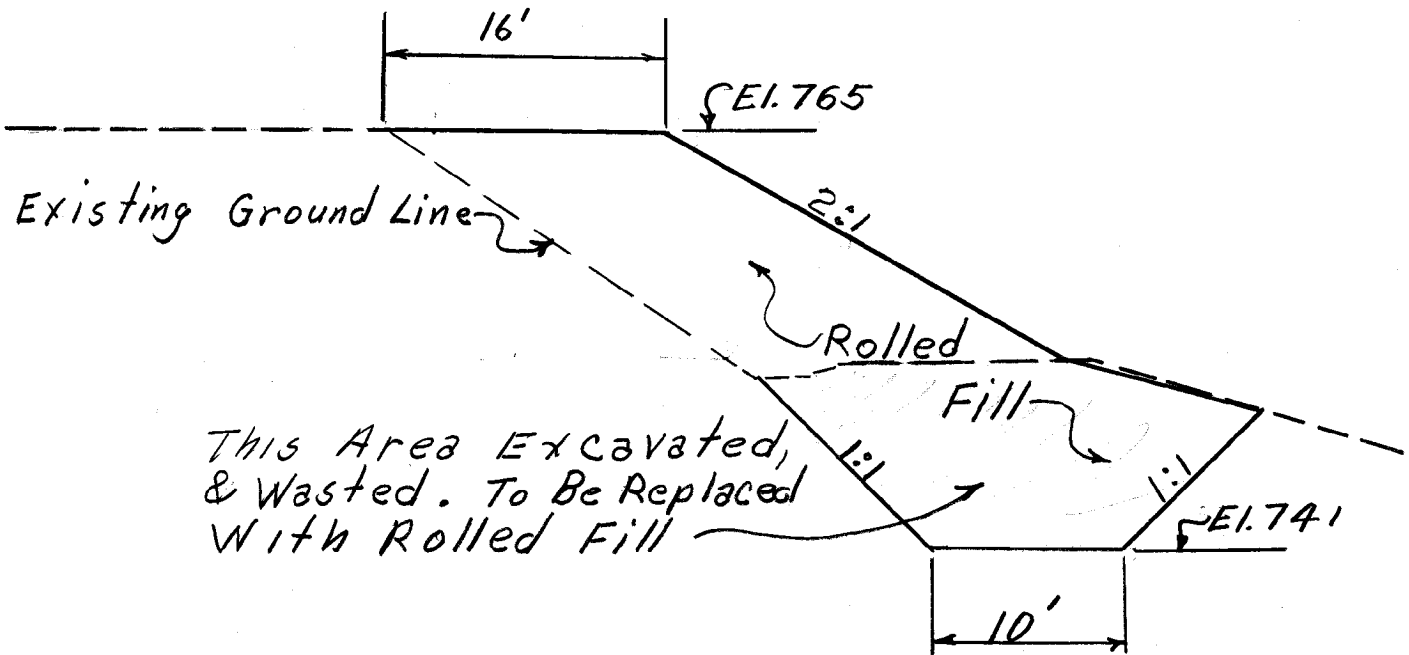
PROJECT Kingston
FEATURE Acidic Drainage
COST ESTIMATE REQ NO. FDPX82-110

ITEM NO.	DRAWING NUMBER	NEW DWG	DWG REV	DWG	DUR (WKS)	START DATE	FINISH DATE	MAN HOURS BY TASK EN	DF	AD	DETAILED DESCRIPTION OF ACTIVITY
* I	10W430-01	0			15	5-2-82	8-15-82	115	40	15	Repair Of Acidic Drainage Plan of Dike
	10W430-02	0			15	5-2-82	8-15-82	110	35	15	Repair Of Acidic Drainage Sections & Details of Dike

* Scheme I

* Note: Scheme II entries are same as Scheme I

	NAME	DATE
F O R	Mike Mason	3-2-83
	ADDRESS	☐ Chatta ☐ M. S.
	110 SPT-K	☐ Knox ☐ Nor.

- - - - - - - - - - Fold here for return - - - - - - - - - -

	NAME	EXTENSION
F R O M	Larry Knott	7390
	ADDRESS	☐ Chatta ☐ M. S.
	441 SPT-K	☐ Knox ☐ Nor.

Attached is the construction duration per scheme.
Please note our assumptions, equipment usage, and
time of year factor. If you have any questions,
please call me or Buddy Edging.

Larry Knott

BRE:MEJ
Attachment

KINGSTON STEAM PLANT
ACIDIC DRAINAGE – DIKE AND INTAKE CHANNEL

Summary

			Duration In Wks	
			I	II
Unclassified Excavation	7,100 cy	15,000 cy	2.2	4.6
Earth Borrow	18,250 cy	35,000 cy	9.2	18.0
Crushed Stone Surfacing	700 TN	635 TN	.6	
Filter Blanket	31 TN		.8	-
Riprap	41 yd³		.8	-
Seeding & Mulching	34,600	11,600 yd²	.4	.2
Misc Elect & Mech After Earth & Final Cleanup			1.0	1.0
			15.0	24.4

Equipment: (2) 633 pans, (1) D-8 dozer, (1) Rex compactor

Assuming normal weather conditions and construction in Fall or Spring. If in
Summer substract: I 1 week   If in Winter add: I 2 weeks
                    II 2 weeks   II 4 weeks

Spring is after March
Winter is after November

MHM/REH - Please review + comment + return to me by
2/7. If looks OK I will transmit to F+H Pu...

Est. No. 83-69
Rev. No. R1

OFFICE OF ENGINEERING DESIGN AND CONSTRUCTION
COST PLANNING AND CONTROL STAFF   CPS '830211 -202

COST ESTIMATE

Date February 8, 1983

ENR Building Cost Index 2310.58

PROJECT: Kingston Steam Plant

FEATURE: Collection Pond for Acidic Drainage

PURPOSE AND SCOPE: See Attachment

ESTIMATE REQUESTED BY O. P. Thornton   **DATE** November 3, 1982

REFERENCE MEMO (IF ANY) O. P. Thornton to J. A. Johnson 9/30/82 (FDP 821230 001)

EN DES Cost Estimate Request (if any) FDXP82-1101 (FDP 821101 315)

DCR NO. _____   **IJ/ECN NO.** _____   **PII NO.** _____

CLASSIFICATION OF ESTIMATE AND ACCURACIES

____ 1. Order of Magnitude--Variable accuracy usually based on previous similar cost information over ± 30%.

____ 2. Preliminary Estimate--Accuracy insufficient for budgeting, but a guide to further interest up to ± 30%.

_X_ 3. Budget or Authorization Estimate--Data ample for ± 10% accuracy. Suitable for budgeting.

____ 4. Detailed Estimate--Accuracy ± 5%. Prepared from complete engineering specifications, drawings, and site surveys.

_X_ 5. Other--Comparative

ESTIMATED COST:
Scheme I - $253,000
Scheme II - $259,000

COMMENTS: Total Project cost based on construction in FY 84.

Attachment:

Submitted: _J. A. Johnson_

Reviewed: _Charles W. Kilgore_

KINGSTON STEAM PLANT

COLLECTION POND FOR ACIDIC DRAINAGE

PURPOSE AND SCOPE: Estimate the Design and Construction cost to prevent acid drainage from the ash disposal pond from seeping into the condenser water intake channel. The estimate is in two schemes. Scheme I is a dike approximately 1,100 feet long (top elevation 750), forming a collection pond which will drain into a pump reservoir in the southeast corner of the pond. The drainage is pumped from the reservoir back into the ash pond. Scheme II is an earth dike liner approximately 2,000 feet long (top elevation 765), forming a barrier to prevent acid drainage from seeping from the ash pond into the condenser water intake channel. No pumping is required. Estimate 83-69RO is revised to reflect a review of dike fill and seeding and mulching.

OEDC--CP&CS
Costs and Estimating Section
February 8, 1983
J13039.4

KINGSTON STEAM PLANT

COLLECTION POND FOR ACIDIC DRAINAGE

Estimate of Cost

Scheme I - R1

	R_0	R_1	
Unclassified Excavation	2.11	$ 15,000	@ $2.11/cy
Earth Borrow			
Dike Fill	4.65	63,400	@ 3.47/cy
Restoration of Borrow Area		2,900	
Crushed Stone Surfacing	12.00	8,400	@ 12.00/Ton
Filter Blanket	19.35	600	@ 19.35/Ton
Riprap	21.95	900	@ 21.95/yd3
Seeding & Mulching	0.58	7,000	@ 0.20/sy
Pipe & Fittings, Valves & Pump		15,000	
Electrical Equipment		2,000	
Area Lighting		1,200	
Cable and Termination		13,200	
Conduit & Grounding		6,000	
Instrumentation		1,600	
Construction Facilities		8,400	
Total Direct Construction		145,600	
Field General Expenses		11,000	7.5%
Contingency Allowance		29,400	20%
Total Field Construction		186,000	
Engineering Design		50,000	27%
Total OEDC Cost		236,000	
POWER General and Administrative and TVA General and Corporate Expenses		7,000	3%
Subtotal Project Cost		243,000	
AFUDC		10,000	4%
Total Project Cost[1]		$253,000	

[1] Total Project cost based on construction in FY 84.

OEDC--CP&CS
Costs and Estimating Section
February 8, 1983
J13039.4

KINGSTON STEAM PLANT

COLLECTION POND FOR ACIDIC DRAINAGE

Estimate of Cost

Scheme II - R1

	A_0		B_1
Unclassified Excavation	2.11	$ 31,600	@ 2.11/cy
Earth Borrow			
Dike Fill	4.65	121,600	@ 3.4 1/cy
Restoration of Borrow Area		5,900	
Crushed Stone Surfacing	12.13	7,700	@ 12.13/Ton
Seeding & Mulching	0.59	2,400	@ 0.21/s.y
Construction Facilities		9,600	
Total Direct Construction		178,800	
Field General Expense		12,700	7%
Contingency Allowance		37,300	21%
Total Field Construction		228,800	
Engineering Design		12,500	5.5%
Total OEDC Cost		241,300	
POWER General and Administrative and			
TVA General and Corporate Expenses		7,500	3%
Subtotal Project Cost		248,800	
AFUDC		10,200	4%
Total Project Cost[1]		$259,000	

[1] Total Project cost based on construction in FY 84.

OEDC--CP&CS
Costs and Estimating Section
February 8, 1983
J13039.4

SUBJECT *Acidic Drainage - Between Ash Dike & Intake Channel - Scheme 1*   PROJECT *Kingston S.P*

COMPUTED BY *JPHS*   DATE *9-23-82*   CHECKED BY   DATE

NO.	ITEM	QUANTITY	UNIT	PRICE	AMOUNT	TOTAL
120	Unclassified Excav. Waste	7,100	yd³	2⁰⁰	14,200⁰⁰	15,000
123	Earth Borrow	18,250	yd³	4⁰⁰	73,000⁰⁰	63,400
305	Crushed Stone Surfacing	700	Ton	7.⁵⁰	5,250⁰⁰	6,400
570	Filter Blanket	31	Ton	8⁰⁰	248⁰⁰	600
575	Riprap	41	yd³	8⁰⁰	328⁰⁰	900
580	Seeding	34,600	yd²	0.15	5190	7000
582	Mulching	34,600	yd²			
					98,216	95,300
	Civil Design Dwgs.					
	Plan		1 dwg			
	Sections		1 dwg			
	Civil Design Man hours	225 EN	hours		CSB	C&E
		75 DF	hours			
		30 AD	hours			

Notes:

   1. See page 3 for typical section

   2. Item Numbers Refer to the T-1 specifications

   3. No Structural Items Required.

   4. No borrow investigation required. Plant Has an Approved & Tested Source.

SUBJECT *Acidic Drainage- Between Ash*   PROJECT *Kingston S.P.*
Dike & Intake Channel- Scheme 2

COMPUTED BY *JPHS.*   DATE *9-23-82*   CHECKED BY   DATE

NO.	ITEM	QUANTITY	UNIT	PRICE	AMOUNT	TOTAL
120	Unclassified Excav. Waste	15,000	yd^3	2^{00}	30,000^{00}	31,600
123	Earth Borrow	35,000	yd^3	4^{00}	140,000^{00}	121,600
305	Crushed stone Surfacing	635	Ton	7.50	4,762.50	7,700
580	Seeding	11,600	yd^2			
582	Mulching	11,600	yd^2	0.15	1,740^{00}	2,400
					176,503^{00}	163,300

CSB

C&E

Notes:

  1. See Page 3 for Typical Section.

  2. Item Numbers Refer to the T-1 Specifications.

	NAME		DATE		
F O R	*MHM*			☐ Chatta ☐ Knox	☐ M. S. ☐ Nor.
	ADDRESS				

— — — — — — — — Fold here for return — — — — — — — —

	NAME		EXTENSION		
F R O M	*JPHS.*			☐ Chatta ☐ Knox	☐ M. S. ☐ Nor.
	ADDRESS				

See scheme 1 for unit costs.

They seem to be high in

my opinion. Perhaps we should

check on them.

REH/MNM - Please review and let me know if *estimate looks OK and is ready to transmit to* *F.H.Pr*

Return to JPHS please
See Scheme 1

OFFICE OF ENGINEERING DESIGN AND CONSTRUCTION
COST PLANNING AND CONTROL STAFF
COST ESTIMATE

CPS '830126 202

Date January 20, 1983

ENR Building Cost Index 2306.39

PROJECT: Kingston Steam Plant

FEATURE: Collection Pond for Acidic Drainage

PURPOSE AND SCOPE: See Attachment

ESTIMATE REQUESTED BY O. P. Thornton   **DATE** November 3, 1982

REFERENCE MEMO (IF ANY) O. P. Thornton to J. A. Johnson 9/30/82 (FDP 821230 001)

EN DES Cost Estimate Request (if any) FDXP82-1101 (FDP 821101 315)

DCR NO.   **LJ/ECN NO.**   **PII NO.**

CLASSIFICATION OF ESTIMATE AND ACCURACIES

    1. Order of Magnitude--Variable accuracy usually based on previous similar cost information over $\pm$ 30%.

    2. Preliminary Estimate--Accuracy insufficient for budgeting, but a guide to further interest up to $\pm$ 30%.

X 3. Budget or Authorization Estimate--Data ample for $\pm$ 10% accuracy. Suitable for budgeting.

    4. Detailed Estimate--Accuracy $\pm$ 5%. Prepared from complete engineering specifications, drawings, and site surveys.

X 5. Other--Comparative

ESTIMATED COST:
Scheme I - $307,000
Scheme II - $339,000

COMMENTS: Total Project cost based on construction in FY 84.

Attachment:
CC: D. R. Armentrout, W12A12 C-K
J. W. Binkley, E7C37 C-K
C. Bonine, Jr., E7B24 C-K
C. A. Chandley, W7C126 C-K
B. H. Hixson, W12B66 C-K
MEDS, W5B63 C-K
R. A. Painter, E5C80 C-K
S. A. Shipman, W12D131 C-K
M. N. Sprouse, W11A9 C-K
Frank Van Meter, 500 SPT-K
O. P. Thornton, 102 SPT-K

Submitted: _Robert Egan_
for J. A. Johnson

Reviewed: _C W Kilgore_
Charles W. Kilgore

KINGSTON STEAM PLANT

COLLECTION POND FOR ACIDIC DRAINAGE

PURPOSE AND SCOPE: Estimate the Design and Construction cost to prevent acid drainage from the ash disposal pond from seeping into the condenser water intake channel. The estimate is in two schemes. Scheme I is a dike approximately 2,000 feet long (top elevation 750), forming a collection pond which will drain into a pump reservoir in the southeast corner of the pond. The drainage is pumped from the reservoir back into the ash pond. Scheme II is an earth dike liner approximately 2,000 feet long (top elevation 765), forming a barrier to prevent acid drainage from seeping from the ash pond into the condenser water intake channel. No pumping is required.

OEDC--CP&CS
Costs and Estimating Section
January 20, 1983
J13020.3

KINGSTON STEAM PLANT

COLLECTION POND FOR ACIDIC DRAINAGE

Estimate of Cost

Scheme I

Unclassified Excavation	$ 15,000	2.11/cy
Earth Borrow		
Dike Fill	84,800	4.65
Restoration of Borrow Area	8,300	
Crushed Stone Surfacing	8,400	12.00
Filter Blanket	600	19.35 Ton
Riprap	900	21.95
Seeding & Mulching	20,200	0.58/yd²
Pipe & Fittings, Valves & Pump	15,000	
Electrical Equipment	2,000	
Area Lighting	1,200	
Cable and Termination	13,200	
Conduit & Grounding	6,000	
Instrumentation	1,600	
Construction Facilities	10,000	
Total Direct Construction	187,200	
Field General Expenses	13,000	7%
Contingency Allowance	35,800	19%
Total Field Construction	236,000	
Engineering Design	50,000	
Total OEDC Cost	286,000	
POWER General and Administrative and		
TVA General and Corporate Expenses	8,900	3%
Subtotal Project Cost	294,900	
AFUDC	12,100	4%
Total Project Cost[1]	$307,000	

[1]Total Project cost based on construction in FY 84.

OEDC--CP&CS
Costs and Estimating Section
January 20, 1983
J13020.3

KINGSTON STEAM PLANT

COLLECTION POND FOR ACIDIC DRAINAGE

Estimate of Cost

Scheme II

Unclassified Excavation	$ 31,600
Earth Borrow	
Dike Fill	162,600
Restoration of Borrow Area	16,900
Crushed Stone Surfacing	7,700
Seeding & Mulching	6,800
Construction Facilities	12,300
Total Direct Construction	237,900
Field General Expense	16,100
Contingency Allowance	49,200
Total Field Construction	303,200
Engineering Design	12,500
Total OEDC Cost	315,700
POWER General and Administrative and	
TVA General and Corporate Expenses	9,800
Subtotal Project Cost	325,500
AFUDC	13,500
Total Project Cost[1]	$339,000

[1]Total Project cost based on construction in FY 84.

OEDC--CP&CS
Costs and Estimating Section
January 20, 1983
J13020.3

SUBJECT _A cidic Drainage - Between Ash_ PROJECT _Kingston S.P._
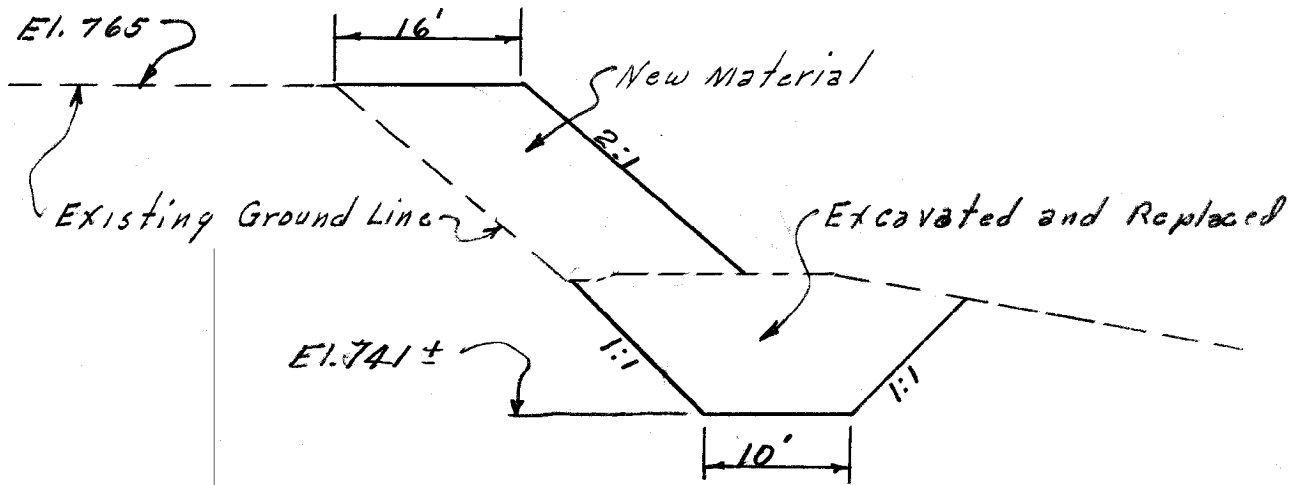_Dike and Intake Channel - Cost Estimate - Scheme 2_
COMPUTED BY _JPK_   DATE _9-22-82_   CHECKED BY   DATE

Unclassified Excavation

TYPICAL SECTION
NTS

* Rounded to nearest 5 yd^3

1. Unclassified Excavation

Station	Area in^2	Area ft^2	Ave Area ft^2	Dist ft	* Volume yd^3
10+00	0	0			
			177	300	1965
13+00	3.53	353			
			314	200	2325
15+00	2.75	275			
			260	200	1925
17+00	2.44	244			
			240	200	1780
19+00	2.35	235			
			216	700	5600
26+00	1.97	197			
			198	200	1465
28+00	1.98	198			

Total Unclassified Excavation   15,060 yd^3
(Waste)

Say 15,000 yd^3

SUBJECT *Acidic Drainage - Between Ash* PROJECT *Kingston S.P.*
Dike & Intake Channel - Cost Estimate - Scheme 2
COMPUTED BY *jphs*   DATE 9-22-82   CHECKED BY   DATE

See Sheet 1 for Typical Section.

2. Earth Borrow   * Rounded to Nearest 5 yd³

Station	Area m²	Area ft²	Ave Area ft²	Dist ft	*Volume yd³
10+00	0	0			
			84	300	935
13+00	1.68	168			
			180	200	1335
15+00	1.91	191			
			198	200	1465
17+00	2.05	205			
			215	200	1595
19+00	2.25	225			
			218	700	5650
26+00	2.10	210			
			210	200	1555
28+00	2.10	210			
			105	100	390
29+00	0	0			

Sub Total Earth Borrow   = 12,925 yd³

From page 1 Borrow to replace Excavated waste = 15,060 yd³

Total Net Earth Borrow   = 27,985 yd³

Total Gross Earth Borrow ∴ Assume 20% Shrinkage factor

$$\frac{27,985}{0.80} = 34,981 \quad \text{Say } \underline{35,000 \text{ yd}^3} \text{ Earth Borrow.}$$

SUBJECT *Acidic Drainage Between Ash* PROJECT *Kingston S.P.*
Dike & Intake Channel – Cost Estimate – Scheme 1

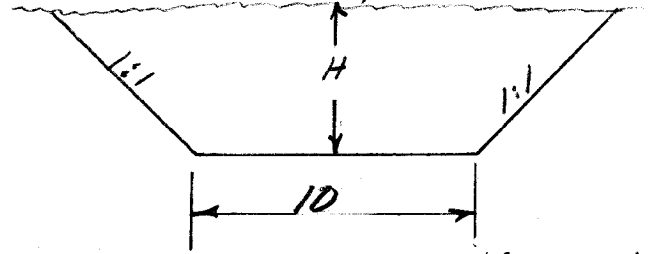COMPUTED BY *JWS*   DATE *9-15-82*   CHECKED BY   DATE

1. Unclassified Excavation   Existing Ground ⌐

+ - H   from cross sections

* H   from profile.

Typical Excavation Sect
Nts

Station	Height	Area ft^2	Ave Area ft^2	Dist.	Volume yd^3
10+00 +	0	0			
			100	300	1111
13+00 +	10	200			
			172	200	1274
15+00 +	8	144			
			144	200	1067
17+00 +	8	144			
			144	200	1067
19+00 +	8	144			
			132	110	538
20+10 *	7'	119			
			88	350	1140
23+60 *	4'	56			
			56	140	290
25+00 *	4'	56			
			48	190	338
26+90 *	3	39			
			19	110	77
28+00 *	0	0			
			19	40	28
28+40 *	3	39			
			79	50	146
28+90 *	7	119			

Total Excavation   7076 yd^3
Say 7100 yd^3

SUBJECT *Acidic Drainage Between Ash* PROJECT *Kingston SP*
Dike & Intake Channel - Cost Estimate - scheme 1
COMPUTED BY *JPH.*   DATE 9-17-82   CHECKED BY   DATE

(2.) Earth Borrow

* Rounded to nearest 5 yd^3

Typical section
NTS

Existing Ground
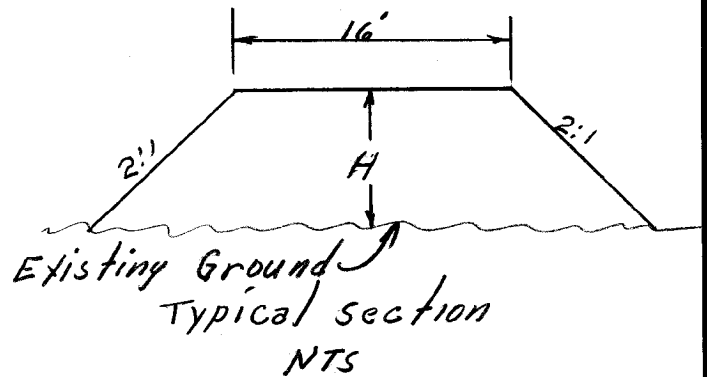
Station	Height	Area ft^2	Ave Area ft^2	DIST	Volume yd^3 *
19+00	0	0			
			33	110	135
20+10	3	66			
			66	140	340
21+50	3	66			
			98	210	760
23+60	5	130			
			130	140	675
25+00	5	130			
			140	100	520
26+00	5.5	149			
			180	90	600
26+90	7	210			
			408	110	1660
28+00	14	616			
			581	10	215
28+10	13	546			
			563	50	1045
28+60	13.5	580			
			443	40	655
29+00	9	306			
			362	50	670
29+50	11	418			
			209	30	230
29+80	0	0			

546 total   Borrow net   7505 yd^3

SUBJECT _Acidic Drainage Between Ash_ PROJECT _Kingston SP_
Dike & Intake Channel — Cost Estimate scheme 1
COMPUTED BY _JPH_   DATE _9-20-82_   CHECKED BY   DATE

(2) Continued - Borrow

From page 1 - Excavated Material will

Be replaced with Earth Borrow   Net 7076 yd^3

From page 2 - Borrow   Net 7505 yd^3

   Total Net Borrow $14,581 \text{ yd}^3$

   Assume 20% shrinkage factor.

   $\dfrac{14,581 \text{ yd}^3}{0.80} = 18,226.3$ Say $18,250 \text{ yd}^3 \text{ Borrow}$

(3) Drainage + Runoff

Area = $22.84 + 13.60 + 17.0 = 53.44\ in^2$

Scale $1' = 100'$ ∴ $1\ in^2 = 10,000\ ft^2/in^2$

∴ $\dfrac{53.44\ in^2 \times 10,000\ ft^2/in^2}{43,560\ ft^2/Acre} = 12.268$ Say 12.3 Acres

Maximum Elevation of Area = 772

$\underline{\text{Minimum Elevation @ sump} = 742}$

Elevation difference = 30'

Maximum Dist of water Travel = 2150'

Time of Concentration = 15 min

Use Rainfall intensity for 10 + 25 years — i_{10} + i_{25}

$i_{10} = 4.9\ ''/hr$

$i_{25} = 5.8\ ''/hr$

Use Rational method for calculation of Q

$Q = CiA$; C = Runoff Factor; i = intensity; A = Area in Acre

$Q_{10} = 0.4 \times 4.9 \times 12.3 = 24\ cfs = \underline{10,770\ gpm}$

$Q_{25} = 0.4 \times 5.8 \times 12.3 = 29\ cfs = \underline{13,000\ gpm}$

From Field Measurement — Acido Drainage = 50 gpm App.

The ≈ 50 gpm is a constant flow.

SUBJECT _Acidic Drainage - Between Ash_   PROJECT _Kingston S.P_
Dike and Intake channel - Cost Estimate - scheme - 1
COMPUTED BY ~~JCK~~   DATE 9-21-82   CHECKED BY   DATE

4 - Miscellanous Quantities

A. Dike surfacing - Assume 16' wide 4" thick - crushed stone

$$2100' \times 16' \times 0.33' \times \frac{125}{2000} = 693 \text{ say } \underline{700 \text{ Ton}}$$

B. Seeding + Mulching

station	Dist	width	Ave width	Area · yd²
10+00		35		
	300		35	1165
13+00		35		
	200		33	735
15+00		30		
	200		30	665
17+00		36		
	200		29	645
19+00		27		
				3,210 yd²

station 19+00 to station 31+00

Ave Height = 10' (See page 2 for Typical section)

Side slopes @ 2:1 ∴ Width to be grassed = 45'

$$\text{Area} = (31+00 - 19+00) \times \frac{45}{9} = \qquad\qquad 6000 \text{ yd}^2$$

Bottom of pond Area =

$$\frac{22.84 \text{ in}^2 \times 10,000 \text{ ft}^2/\text{in}^2}{9} \qquad\qquad 25,400 \text{ yd}^2$$

Total Seeding and Mulching - = 34,610 say 34,600 yd²

SUBJECT *Acidic Drainage - Between Ash* PROJECT *Kingston S.P*
Dike & Intake Channel - Cost Estimate - Scheme 1
COMPUTED BY *JPHS*   DATE *9·23·82*   CHECKED BY   DATE

5 | Sump for Pump.
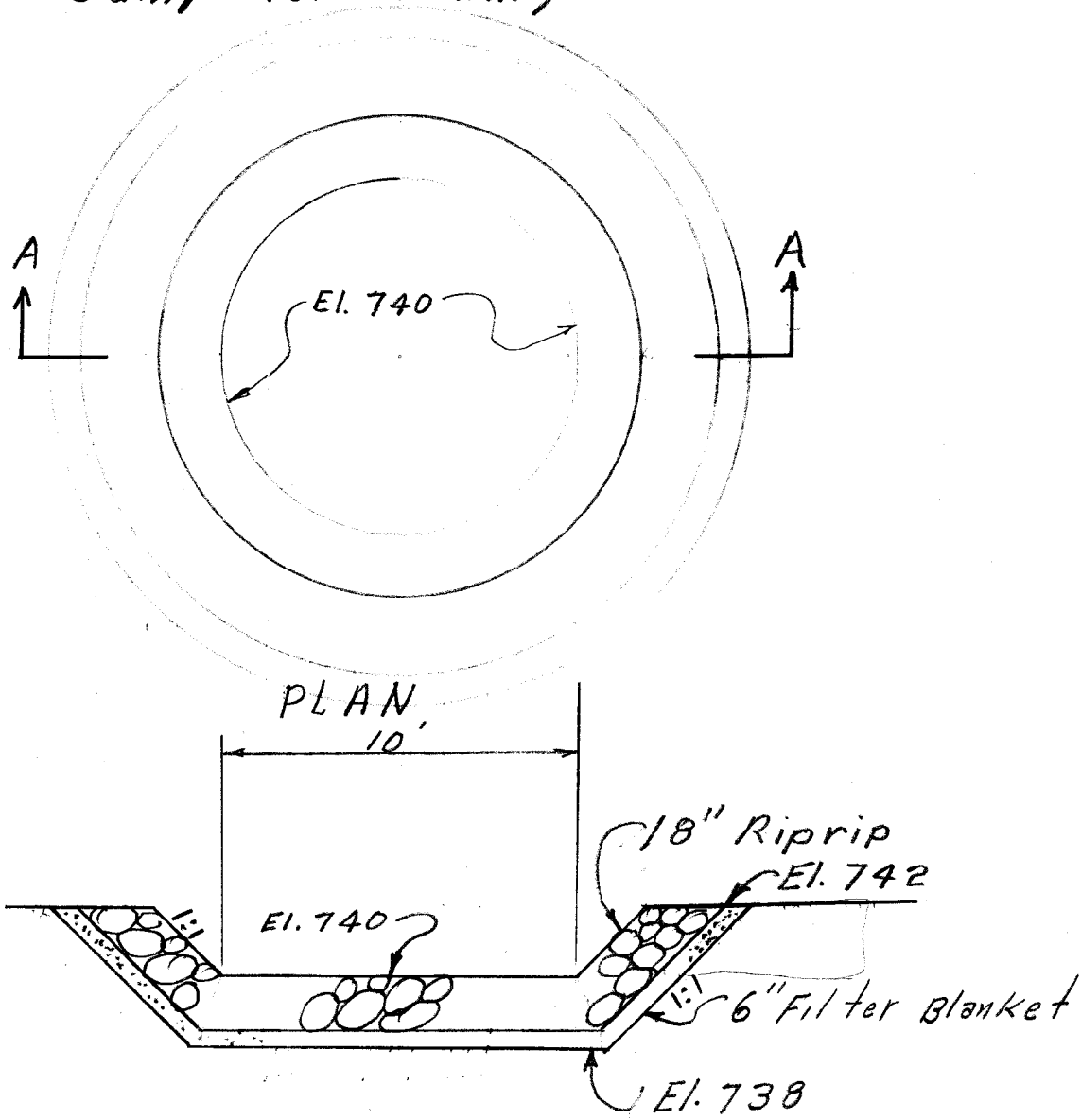
PLAN
10'

SECTION A-A

El. 740

18" Riprap
El. 742
6" Filter Blanket
El. 738
El. 740

TVA-00010921

SUBJECT _Acidic Drainage Between Ash_ PROJECT _Kingston S.P_
Dike and Intake Channel - Cost Estimate - Scheme 1
COMPUTED BY _JMS_ DATE _11-16-82_ CHECKED BY DATE

Volume of water storage.

El.	Area in²	Ave Area n²	Area ft²	Height	Volume ft³	Accu ft³
742		314 ft²				
	2.3		1,657	2'	23,314	23,314
744	2.3 ^{23000}					
		4.75	47,500	2'	95,000	118,314
746	7.2					
		10.65	106,500	2'	213,000	331,314
748	14.1					
		15.45	154,500	2'	309,000	640,314
750	16.80					

El.	Vol. ft³	Volume gal	Accum. Vol. gal.
742			
	23,314	174,389	
744			
	95,000	710,600	884,988
746			
	213,000	1,593,240	2,478,228
748			
	309,000	2,311,320	4,789,548
750			

Total Drainage Area = 53.44 in² = 534,400 ft²

10 yr 24 hr Rainfall = 4.8" ∴ $\frac{4.8}{12}$ × 534,400 = 213,760 ft³ = 1,598,924 gal

SUBJECT _Acidic Drainage Between Ash_ PROJECT _Kingston S.P._
Dike & Intake Channel - cost Estimate - Scheme 1
COMPUTED BY _JPH_ 　　　DATE _11-18-82_ 　　CHECKED BY 　　　DATE

Storage Volume El. 742 to El. 748 = 2,478,228 gal.

　　　　　　　　　　　　　　　Say 2,478,000 gal

Total Drainage Area = 534,400 ft² = 12.27 Say 12.3 Acres

10 yr 24 hour Rainfall = 4.8"

$\therefore \dfrac{4.8}{12} \times 534,400 = 213,760$ ft³ $\times 7.48 = 1,598,924.8$ gal/24 hrs

　　　　　　　　　　$\therefore$ Say 1,598,900 gal/24 hrs.

Average inflow from 10 yr - 24 hr Rain $= \dfrac{1,598,900 \text{ gal/24 hr}}{60 \text{ min/hr} \times 24 \text{ hr}} = 1,110$ gal/min

Total inflow gal/min (gpm)

　　1,110 gpm Rainfall
　　　50 gpm Seepage
　1,160 gpm

Note

An Additional 2,311,300 gal storage is Available

for _Emergency Use Only_ Between El. 748 & El. 750

　　　Copy Given to Harry Henery　11-18-82 JPH

SCHEME 1

KINGSTON ACIDIC DRAINAGE

SECTION 28

Kingston Acidic Drain

Scheme 1

750

740

730

50

50

0

2:1

2:1

740
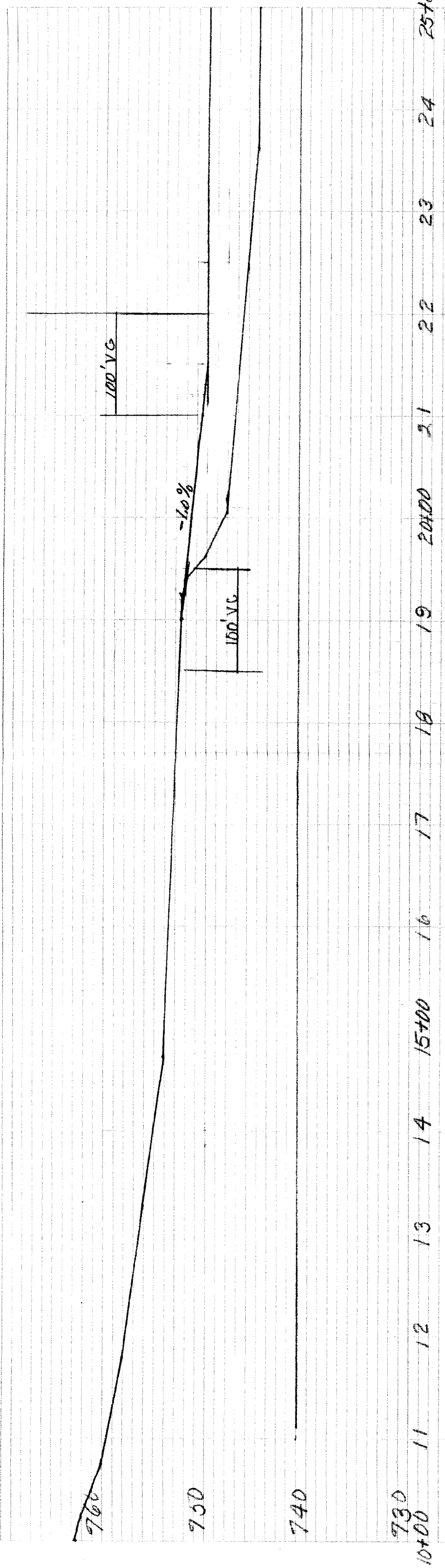
730

740

730

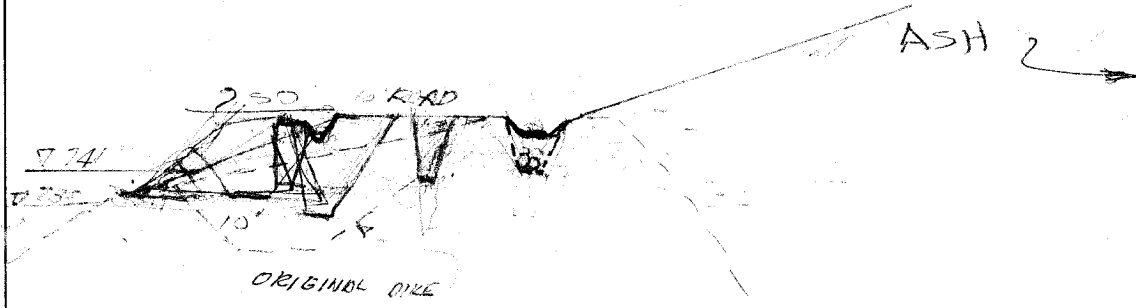10+00 11 12 13 14 15+00 16 17 18 19 20+00 21 22 23 24 25

25+00 26 27 28 29 30+00

KINGSTON LEAKAGE

ASH →
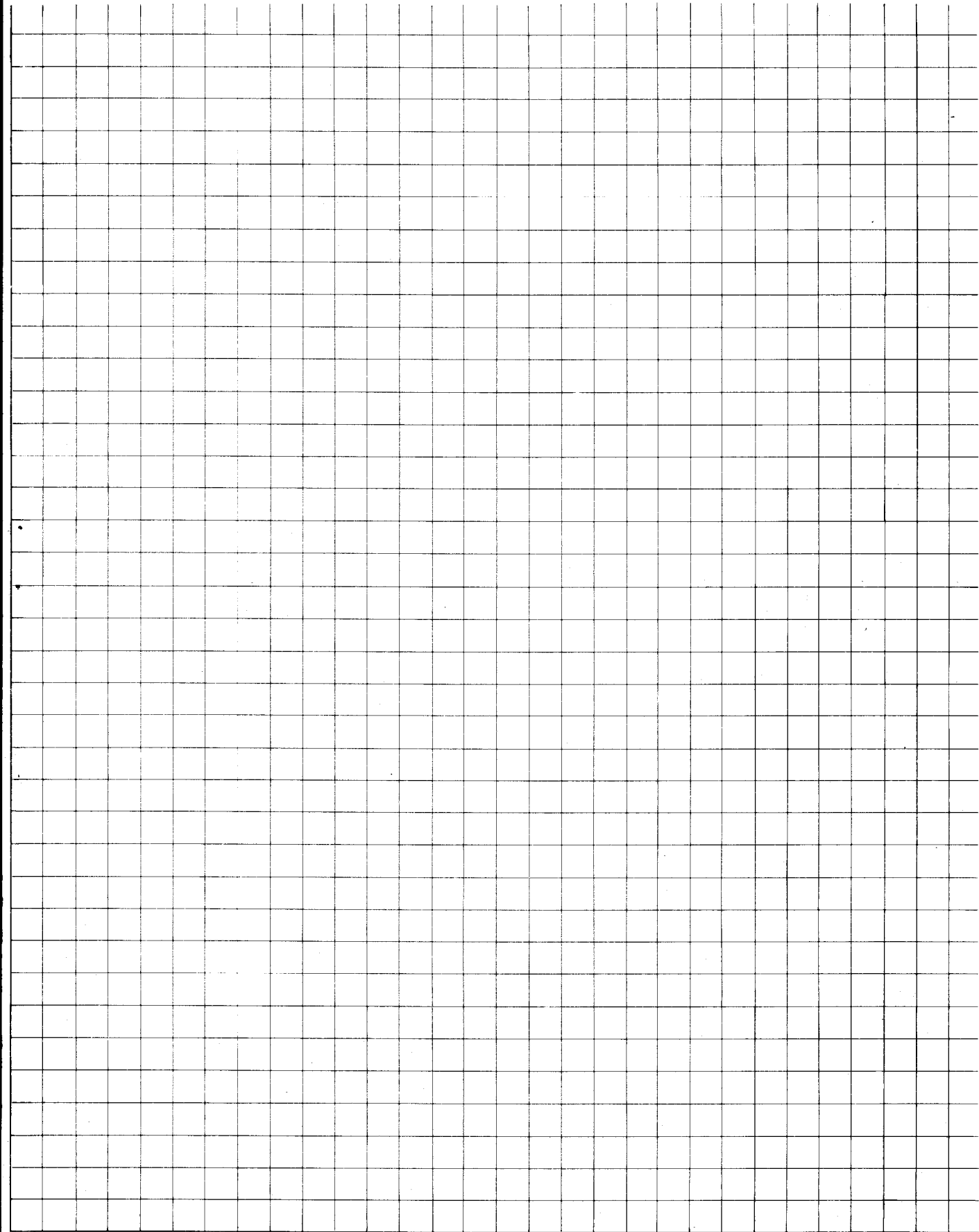
ORIGINAL DIKE

*1. DITCH DEEPER TO CUT OFF WATER

(MIGHT USE PERF. PIPE SCHEME)

— PROBABLY CAN'T GET DITCH DEEP ENOUGH
DUE TO 741 LIMIT.

— NO GUARANTEE THIS WOULD WORK DUE TO
UNDERGROUND ROUTING & HEAD

*2. PUT CLAY CORE IN @ EXIST. ROAD
(MAX DEPTH 735± , LOW WATER).

— ORIGINAL GROUND GOES TO 725±
— FILL MATL MAY BE OF SHALE
— NO GUARANTEE WILL STOP SEEPAGE LINE)
ONLY SEEPAGE LINE CHANGE.

*3. PUT IN CLAY DIKE @ LOW WATER

FILL.
(30,000 C.Y.)

DIKE
WASTE EXCAV
(10,500 C.Y.)

GRADING
2,500 C.Y.

— ANY SEEPAGE SHOULD GO UNDER DIKE;
MORE EARTH COSTS.

*ALL DRAINAGE WILL GO TO A SUMP
TO BE PUMPED INTO ASH POND.
ELECTRICITY WILL BE NECESSARY.

POND ONLY / CLAY BOTTOM (2') - 8,000 C.Y.
EXCAV - 7,500 C.Y.

TVA-00010927