

# Morley and Associates INC

CONSULTING ENGINEERS/LAND SURVEYORS/ARCHITECTS

605 S.E. MARTIN LUTHER KING, JR. BLVD.  
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(812) 464-9585/FAX (812) 464-2514

## LETTER OF TRANSMITTAL

TO Vanderburgh County Drainage Board  
c/o Vanderburgh County Surveyor

DATE June 10, 1996	JOB NO. 96-3251
ATTENTION Mr. Bill Jeffers	
RE: Burkhardt Crossing	

- WE ARE SENDING YOU BY
- |   |                                       |                                 |  |
|---|---------------------------------------|---------------------------------|--|
| <input checked="" type="checkbox"/> MESSENGER | <input type="checkbox"/> US MAIL      | <input type="checkbox"/> UPS    | <input type="checkbox"/> OVERNIGHT SERVICE |
| <input type="checkbox"/> Shop drawings        | <input type="checkbox"/> Prints       | <input type="checkbox"/> Copies | <input type="checkbox"/> Plans             |
| <input type="checkbox"/> Copy of letter       | <input type="checkbox"/> Change order | <input type="checkbox"/> _____  |  |

COPIES	DATE	NO.	DESCRIPTION
3	06/96	1	Supplement to Final Drainage Report (w/ Boundary Survey dwg., revised Drainage Plan and revised Retention Basin - Plan )
3	06/10/96	2	Plan and Profile Drawings - Sheets CS-3, CS-4, CS-5 and CS-6
3	06/10/96	3	Detail Drawings - Sheets CD-9 and CD-10

THESE ARE TRANSMITTED as checked below:

- |  |   |   |
|--|---|---|
| <input checked="" type="checkbox"/> For approval | <input type="checkbox"/> Approved as submitted    | <input type="checkbox"/> Resubmit _____ copies for approval   |
| <input type="checkbox"/> For your use            | <input type="checkbox"/> Approved as noted        | <input type="checkbox"/> Submit _____ copies for distribution |
| <input type="checkbox"/> As requested            | <input type="checkbox"/> Returned for corrections | <input type="checkbox"/> Return _____ corrected prints        |
| <input type="checkbox"/> For review and comment  | <input type="checkbox"/> _____                    |   |

REMARKS

Please incorporate the information contained in the enclosed Supplement to Final Drainage Report and the drawings listed above into the Final Drainage Report, dated May 1996, submitted to your office on May 14, 1996, to be heard for final drainage approval at the Special Drainage Board meeting on June 10, 1996.

COPY TO Woodward Commercial Realty and Auction  
File

SIGNED: Daryl J. Helfert  
Daryl J. Helfert P.E.

*Supplement  
to  
Final Drainage Report  
for:  
Burkhardt Crossing*

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**DEVELOPER:**

*Woodward Commercial Realty and Auction  
2916 E. Morgan Avenue  
Evansville, IN 47715*

**ENGINEER:**

*Morley and Associates, Inc.  
605 S.E. Martin Luther King, Jr. Blvd.  
Evansville, IN 47713-1797  
(812) 464-9585*



*Daryl James Helfert*

**June 1996**



ASSOCIATES

James Q. Morley, P.E., L.S.  
Lee A. McClellan, P.E.  
Danny K. Leek, L.S.

June 10, 1996

Vanderburgh County Drainage Board  
c/o Vanderburgh County Surveyor's Office  
1 N.W. Martin Luther King, Jr. Blvd., Room 325  
Evansville, IN 47708  
Attention: Mr. Bill Jeffers

**RE: BURKHARDT CROSSING  
SUPPLEMENT TO FINAL DRAINAGE REPORT  
OUR PROJECT NO. 96-3251-4**

Dear Sirs:

The information contained in this supplement to the Drainage Report for Burkhardt Crossing is in response to comments from the Vanderburgh County Surveyor's Office dated June 4, 1996. The contents of this letter and the attached drawings are intended to address the issues listed in the surveyor's report. Each item is addressed in the order in which it was listed in the report.

- I. Large Dia. Pipe @ Maxwell Entrance from Burkhardt Road
  - A. The large diameter pipe at Maxwell Avenue entrance is Str. #1020D. The label on the drawing has been corrected.
  - B. The existing 42" pipe under the access drive immediately north of the Maxwell Avenue entrance will be relocated and utilized as Str. #1020A.
  - C. Until the final design for the widening of Burkhardt Road is available, the exact details for the pipe, headwalls/wingwalls, street surface, etc. for the Maxwell Avenue entrance will not be designed. The entrances for Gateway Drive and Cross Pointe Boulevard off of Oak Grove Road will serve as ingress/egress points for Burkhardt Crossing until the final design for the Maxwell Avenue entrance can be completed.
  
- II. Large Dia. Pipe @ N.W. Corner of Project
  - A. The entrance at the N.W. corner of the project will remain as it is. There are no plans to alter or improve it at this time.
  - B. There are no plans to block, fence, or obstruct the entrance in any way.

C. The entrance is owned by Woodward Commercial Realty and Auction and Vanderburgh County. Only the owners have the legal right to use the entrance.

III. 40 SY Application Rip Rap @ S.W. Corner of Project

- A. The 40 foot right-of-way for Oak Grove Road provides sufficient access into the 75 foot right-of-way for Crawford-Brandeis Ditch via the entrance for Gateway Drive. No culvert is planned for the end of Swale No. 2 where it enters Crawford-Brandeis Ditch.
- B. Details of the riprap blanket and/or chute and the bank excavation of the Crawford-Brandeis are included.

IV. Lots Without Stub Outs Provided for Drainage

- A. Storm drainage from Lot 31 may sheet flow directly into Gateway Drive and Swale No. 2, or may directly enter Crawford-Brandeis Ditch via sheet flow or onsite storm sewers and/or swales. Drainage from Lot 40 may sheet flow directly into Gateway Drive or Swale No. 2, or may be conveyed to Swale No. 2 via onsite storm sewers and/or swales. Storm drainage from Lots 3, 4, 5, 6, 8, 9, 24, 39 and 42 may sheet flow directly into the street in front of the lot and, in some instances, directly into the swale provided at the rear of the lot. Some storm water will be collected by onsite storm sewers and/or swales. The onsite storm sewers can be drained directly into pipes running along property lines using a saddle or collar type connection into the side of the pipe. The lots can be drained to the following structures: Lot 3 and 4 storm sewers to Str. No. 1086; Lot 5 and 6 storm sewers to Str. No. 1091; Lot 8 and 9 storm sewers to Str. No. 1101; Lot 24 storm sewers to Str. No. 1036; Lot 39 storm sewers to Str. No. 1074; and Lot 42 storm sewers to Str. No. 1024. A 24" stub out from C.I. 1094 is provided to Lot 37. The area between Lots 40 and 41 is part of Lot 43 being provided for access to Gateway Drive. Two 15" stub outs are provided for this area, one from M.H. 1011 and the other M.H. 1013.

B. The information in IV.A. above addresses how the site drainage for each site will generally be handled. Specific details for each lot cannot be determined until the type of development planned for each is known. Site plans, including drainage control, for each lot or combination of lots must be reviewed and approved by the Site Review Committee before construction may proceed.

V. Lots With Stub Outs Provided

A. The offsite retention basin to be constructed east of I-164 is to provide sufficient detention so that no onsite detention will be required. However, due to the possibility of re-routing drainage to a different inlet or stub out, we are providing the maximum cfs for each stub out below.

<u>C.I./M.H.</u>	<u>Stub Out</u>	<u>Lot(s)</u>	<u>Sub-Basin(s)</u>	<u>CFS</u>
1007	15"	30	3	4.23
1011	15"	43	70	6.00
1013	15"	43	½ 69	4.84
1013	15"	41	½ 69	4.84
1017	15"	29	⅔ 4	4.09
1017	15"	28	⅓ 4	2.04
1019	15"	41	68	4.84
1021A	15"	27	7	4.90
1023	15"	28	5	3.06
1029	15"	25	½ 9	3.53
1029	15"	26	½ 9	3.53
1031	48"x76"	43	72	127.22
1043	12"	23	½ 14	1.56
1043	12"	22	½ 14	1.56
1045	21"	43	63, 64	8.76
1049	12"	22	½ 17	1.60
1049	12"	21	½ 17	1.60
1055	12"	21	½ 18	1.60
1055	12"	20	½ 18	1.60
1057	21"	43	61, 62	8.82
1061	12"	20	½ 21	1.60
1061	12"	19	½ 21	1.60
1067	12"	19	½ 22	1.60
1067	12"	18	½ 22	1.60
1069	21"	43	59, 60	7.23

VANDERBURGH COUNTY DRAINAGE BOARD  
 C/O VANDERBURGH COUNTY SURVEYOR'S OFFICE  
 RE: BURKHARDT CROSSING  
 SUPPLEMENT TO FINAL DRAINAGE REPORT  
 OUR PROJECT NO. 96-3251-4

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1073	12"	18	½ 24	1.60
1073	12"	17	½ 24	1.60
1073A	12"	17	⅓ 26	1.57
1073A	12"	16	⅔ 26	3.15
1077	15"	15	28	4.60
1079	21"	2	33	4.23
1081	21"	1	31	5.88
1089	18"	38	57	6.56
1094	24"	37	½ 56	8.33
1094	24"	36	½ 56	8.33
1112	21"	35	½ 55	9.71
1112	21"	34	½ 55	9.71
1110	15"	7	42	4.17
1115	15"	13	51	5.02
1117	15"	13	51A	3.19
1121	18"	33	54	7.60
1123	27"	14	52	8.64
1127	24"	32	53	7.96
1106	15"	12	½ 50	4.17
1106	15"	11	½ 50	4.17
1104	12"	10	49	2.88

B. The cfs figure for each stub out has been added to the drainage plan.

- VI. All regulated drains shown on the drainage plans have been renamed from "Right-of-Entry" to "Right-of-Way".
- VII. The rectangular shapes shown on Lots 26 and 28 within the Crawford-Brandeis Right-of-Way represent lease areas for billboard signs, similar to the other areas labeled as such. The labels have been added to the drainage plan.
- VIII. Elevation labels have been added to the dashed contour lines at intervals to help identify them more easily. Contour lines are now continuous lines to distinguish from easement lines more clearly.
- IX. Storm Routing of Lot 43
- A. Statements will be included on the subdivision plat that the drainage control for each site to be developed, be it one lot or multiple lots, must comply with the intent of the drainage plan approved by the Vanderburgh County

Drainage Board on the date of record. The statements will also indicate that storm water drainage from one site will not be allowed to drain onto an adjoining site without the consent of its' owner or the presence of a dedicated easement. As we stated previously, the drainage control for each site must be reviewed and approved by the Site Review Committee before construction may proceed.

- B. The majority of storm drainage from Lot 43 is designed to be conveyed, via storm sewers or swales, to Area Drain A.D 1031 to be drained offsite into Kelly Ditch. This includes sub-basin numbers 66 and 72 (including Outlot A), totaling 25.93 acres. The area of Lot 43 between Lots 40 and 41 will drain to the storm sewers along Gateway Drive. The area comprising sub-basin 70 is to drain to Curb Inlet C.I. 1009 or Man Hole M.H. 1011. An area of Lot 43 along the south side of the east-west section of Gateway Drive is to drain to the storm sewer line along the street. The sub-basins are to drain to the inlets/manholes as follows: sub-basin 59 to M.H. 1069A or C.I. 1071A; sub-basin 60 to M.H. 1069 or C.I. 1071; sub-basin 61 to M.H. 1063 or C.I. 1065; sub-basin 62 to M.H. 1057 or C.I. 1059; sub-basin 63 to M.H. 1051 or C.I. 1053; sub-basin 64 to M.H. 1045 or C.I. 1047; and sub-basin 65 to M.H. 1039 or C.I. 1041.
- X. Drainage Easement Between Lots 13/14 and Lot 12
- A. The easement between Lots 13/14 and 12 has been changed from a 20 foot Drainage and Underground Public Utility Easement (20' D. & U.G.P.U.E.) to a 20 foot Public Utility Easement (20' P.U.E.). No storm sewer or paved swale is planned for this area. However, the easement does give the developer(s) of these lots the flexibility to run storm sewer in this easement if necessary.
- XI. Note Stating "16 Inch Concrete Ribbon"
- A. The concrete ribbon in each swale will extend to the end of the flared end section (FES) at all pipes. The riprap apron will be installed on either side of the concrete ribbon.

- B. All swales shown on the plan will have a concrete ribbon in the bottom. This is reflected by the symbol and description in the legend.

XII. Riprap Applications

- A. The notes on the drainage plan have been modified to indicate that each apron is to receive the quantity of riprap listed.
- B. Typical details for the installation of the riprap aprons are included.
- C. The developer has elected to utilize large riprap for the aprons rather than gabion mats. The large riprap can withstand the expected velocities in the swales and at the pipe outlets.

XIII. Outfall of Ditch into Kelly @ N.E. Corner of Project

- A. The area immediately east of the project site is within the I-164 Right-of-Way, the maintenance of which falls to the State of Indiana. Also, there is no room for access on the south side of Kelly Ditch as it passes beneath the I-164 overpass. Because there is no need for maintenance work by the county on the east side of Swale No. 1, a cross pipe will not be installed at this location.
- B. No details of pipe and headwall are needed.
- C. Typical details of riprap aprons are included.

XIV. Twin Pipe Outlet into Kelly at Lot 24

- A. The outlets on Structure Numbers 1036 and 1036A will have flared end sections with riprap aprons. No flapgates are planned for these outlets, so headwalls are not necessary.
- B. Details of the riprap at the outlets of the pipes are included. The plan view of the riprap aprons shown on the drainage plan is drawn to scale and accurately represents the size and extent of them.



XV. Details of FES Structures

The invert elevations for all FES structures are shown on the drainage plan. The I.E.'s for FES structures 1000 and 1006 were added to the drawing; all other FES inverts were previously shown.

Enclosed is a copy of the Storm Details drawing which includes details on the concrete FES structures to be used. Typical details of the riprap mats/aprons are enclosed.

XVI. Details of Curb Inlets, Area Drains, Manholes, Gutters, Curbs, etc.

Enclosed are four plan and profile drawings for the proposed streets which contain information on pavement elevations and grades, storm sewer grades, and rim and invert elevations for curb inlets, area drains and manholes. Also enclosed are copies of the Storm Details and Road Details drawings which contain details on drainage structures and pavement sections.

Notes and elevations have been added to the Drainage Plan drawing showing locations where emergency overflows and depressed sidewalks are to be maintained. Due to the close spacing of some curb inlets and the flat street grades, several emergency overflows have been designated at the gutterline grade of a high point in the road.

XVII. Street Elevation Details That Allow Travel During Periods of High Water

High water elevations of the flooding which occurred between April 28, 1996 and May 15, 1996 were surveyed at several locations on the project site. However, no exact details of expected depths of street flooding can be provided until a determination is made on what flood elevation is to be designed for and what is an acceptable depth of water in the roadway during such flooding. Once this determination is made by the Vanderburgh County Engineer's Office and/or the Vanderburgh County Commissioners, the street elevation details can be provided.

XVIII. Outlot "A"

- A. Outlot "A" is presently owned by an individual other than the developer of this subdivision, Woodward Commercial Realty and Auction. The owner does not wish this property to be developed with the rest of the subdivision at this time, therefore its' designation as an outlot makes it unbuildable unless it is attached to another lot adjacent to it. The developer intends to obtain Outlot "A" at some point in the future and attach it to another lot, probably Lot 43.
- B. No drainage plan details can be developed for Outlot "A" at this time. Although it is presently considered an unbuildable lot, drainage calculations for peak runoff and required detention volume for the subdivision included the area of Outlot "A" at the same assumed percentage of impervious coverage as the rest of the subdivision. The storm water runoff from the outlot was included as part of Sub-basin 72, meaning that the drainage from the area is intended to be drained to structure A.D. 1031. When and if Outlot "A" is attached to another lot to be developed, drainage plans for the site will have to be reviewed and approved by the Site Review Committee as part of the normal approval process.

IXX. 25' Ingress/Egress Easement Between Lots 35/36

- A. There is not a road presently planned for this easement. The easement is being dedicated for the likelihood that whomever develops Lot 43 will desire access off of Cross Pointe Boulevard.
- B. If the developer of Lot 43 desires to have an access road/drive within this easement, the necessity for radii at an entrance off of Cross Pointe Boulevard will be addressed and incorporated into the site plan if needed.
- C. Because Outlot "A" cannot be developed separately, an access easement is not required for it. The ingress/egress easement is strictly for Lot 43.
- D. The part of the ingress/egress easement on Lots 35 and 36 has been included as part of Sub-basins 55 and 56, which are designed to drain to the Cross Pointe Boulevard storm sewer system. A drainage system for the ingress/egress easement would be required to tie in with the east storm

sewer line. However, because it cannot be determined with some certainty that a road/drive will ever occupy the easement, no cross stub is being provided at this time. If the road/drive becomes a reality at some time in the future, a road cut through Cross Pointe Boulevard may become necessary. An alternative to this may be to provide additional detention onsite somewhere upstream of A.D. 1031.

- E. As stated in the preceeding part D., the drainage from the ingress/egress easement on Lots 35 and 36 has been designed to go to the Cross Pointe Boulevard storm sewers. If his easement is used for access when Lot 43 is developed, the drainage planned for this area will have to be reviewed and approved as part of the entire site plan.

XX. Emergency Overflows From Streets

- A. Emergency overflow swales have been added to the drainage plan at strategic locations. Additional emergency overflows are provided at several gutterline high points.

XXI. Offsite Basin on East Side of I-164

- A. Enclosed is a copy of the Boundary Survey drawing locating the property containing the basin relative to the section line/section corner.
- B. The bearings and dimensions of the outside limits of the basin site are indicated on the boundary survey.
- C. The owner of the property in question, Mrs. Margaret Lemmons, has no plans for development of these parcels. Depending on the need for fill material on the Burkhardt Crossing site, the developer may purchase more of this property in the future and expand the proposed basin or construct a completely separate basin.
- D. The developer, Woodward Commercial Realty, specified that this piece of ground be excluded from the proposed basin. He did not indicate what its' intended purpose was to be. It could be utilized as temporary parking for vehicles and equipment during the excavation of the basin.
- E. The concrete headwalls within the legal drain and Nurrenbern Ditch channel have been eliminated and replaced with FES structures and large riprap. The FES

structures will be installed so that they do not extend into the channel beyond the surface of the channel sides to avoid obstructing the flow. After installation of the pipes and FES structures, backfill will be placed around the FES structure to allow placement of the large riprap to maintain the original cross section of the ditch channel and not adversely affect the flow capacity.

- F. An emergency overflow channel will be provided near the northeast corner of the basin, as shown on the Retention Basin Plan drawing. The maximum control elevation will be 384.0 feet to provide overflow access back to Nurrenbern Ditch rather than across adjacent ground. A typical section of the emergency overflow channel is depicted on the Retention Basin Plan.
- G. Based on contour elevations on the Vanderburgh County topographic map and visual site inspection, overflow from Koester's pit will exit to the west through one of two low areas into a ditch at the toe of the fill for I-164 and flows north into the Kelly Ditch. In the event that overflow from Koester's pit does enter the retention basin, there is sufficient excess storage volume available in the basin that it will still perform as desired. The required detention volume for the subdivision and basin sites is 14.17 acres-feet. This volume is attained once the water level in the basin reaches elevation 382.40. The four 48 inch inlet culverts can discharge the design intake flow rate of 440 cfs under the available headwater in Nurrenbern Ditch, with a tailwater depth of 4.0 feet, corresponding to a water level of 383.30 feet. The available surcharge storage volume to elevation 383.30 is 18.62 acre-feet. This amounts to an excess volume of 4.45 acre-feet between 382.40 and 383.30. A worst case scenario for overflow from Koester's pit entering the retention basin would be that Koester's pit is completely full and all storm water draining into it would immediately overflow into the basin. The maximum available drainage area for the pit is 28.5 acres, including the water surface of approximately 8.75 acres. Enclosed drainage calculations for the Koester pit watershed indicate that the total volume of runoff is 2.18 acre-feet for a 25 year storm and 2.77 acre-feet for a 100 year storm. Both of these volumes are well below the available excess volume of

VANDEBURGH COUNTY DRAINAGE BOARD  
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- 4.45 acre-feet in the retention basin. Therefore, overflow from Koester's pit will not adversely effect the performance of the retention basin and no provisions are necessary to prevent overflow from entering the basin.
- H. Because of the tendency of the ditch top of bank to meander, the east property line of the basin site has been moved slightly west so that no part of the site encroaches on the 75 foot right-of-way. The west property line has also been moved to the west to maintain the design size of the basin and the size of the site at 6.5 acres. The volume of the basin and its' performance remains unchanged. The plan view on the Retention Basin Plan has been altered accordingly. The enclosed Boundary Survey of the 6.5 acre cut-out accurately reflects the final dimensions of the site.

We understand that additional storage capacity could become necessary later if proposed development of the projects for individual sites varies from the conditions assumed as part of the plan receiving final drainage approval. The maximum allowable discharge will be determined for each lot and included either on the final plat or in the subdivision restrictions and covenants.

We trust this letter and the attached information adequately addresses the questions and issues outlined in the surveyor's report dated June 4, 1996. We wish our request for final drainage approval for Burkhardt Crossing to remain on the agenda for the special drainage board meeting on June 10, 1996.

Please incorporate this supplemental information into your final report.

Sincerely,



Daryl J. Helfert, P.E.  
Project Manager

DJH/djm

cc: Woodward Commercial Realty and Auction  
File

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## BURKHARDT CROSSING DRAINAGE PLAN

June 4, 1996

TO: Mr. James Q. Morley  
FR: County Surveyor's Office  
RE: Burkhardt Crossing Drainage Plan

Please address the following items with regard to Burkhardt Crossing plans.

Some of the requested details and information may be in the narrative report or on various sheets, but the format in which it was submitted may have obscured it. If it's there, please point it out.

I. LARGE DIA. PIPE @ MAXWELL ENTRANCE FROM  
BURKHARDT ROAD:

- A. Is listed as Str. #1022 A: see first cross pipe east also listed 1022A.
- B. Give source of sizing for large pipe in Crawford Ditch.
- C. Give exact details of big pipe including headwalls/wingwalls, street surfaces above pipe, rip rap installation along north side of pipe, etc.

II. LARGE DIA. PIPE @ N.W. CORNER OF PROJECT:

- A. Is this to remain "AG" type entrance for ditch maintenance equipment? Is it planned to be improved or altered in any way?
- B. Are there plans to block, fence, or otherwise obstruct the entrance?
- C. Who owns the entrance? Who will be allowed to use the entrance?

III. 40 SY APPLICATION RIP RAP @ S.W. CORNER PROJECT:

- A. We need at least a 25 foot run of pipe to cross from Oak Grove Road into the 75' right-of-way for Crawford Brandeis Ditch.

- B. Give exact details of rip rap blanket or gabion mats as well as all excavation of ditch bank, etc.

IV. LOTS WITHOUT STUB OUTS PROVIDED FOR DRAINAGE:

A. The following lots appear not to have plugged stubs for site drainage

into the street system: 31, 40, 42, 24, 39, 37, 8, 9, 6, 5, 4, 3, and the unidentified area between lots 40 and 41.

B. Please provide details of site drainage for lots not having stub outs.

V. LOTS WITH STUB OUTS PROVIDED:

A. Provide maximum cfs for each stub out provided so that as we review site plans we can determine need for detention or re-routing.

B. Print cfs figure for each stub out onto plan at stub out location.

VI. RENAME "RIGHT-OF-ENTRY" AS "RIGHT-OF-WAY" FOR ALL REGULATED DRAINS SHOWN ON DRAINAGE PLANS.

VII. IDENTIFY RECTANGULAR SHAPES FOUND WITHIN CRAWFORD DITCH RIGHT-OF-WAY ON LOTS 26 & 28.

VIII. CLEARLY IDENTIFY ALL DASHED CONTOUR LINES.

IX. STORM ROUTING OF LOT 43:

A. Details how adjoining properties protected from drainage off Lot 43..

B. Narrate details of drainage of Lot 43 to structures shown on this plan.

X. DRAINAGE EASEMENT BETWEEN LOTS 13/14 & LOT 12:

A. Give details of swale with paved bottom or pipe structure.

XI. NOTE STATING "16 INCH CONCRETE RIBBON"

- A. For example the arrow points to a rip rap apron on Lot 9.
- B. Show on plan every swale has a paved bottom or concrete ribbon.

XII. RIP RAP APPLICATIONS:

- A. Notes on plan are unclear whether each apron gets 20 sy rip rap, or whether the 20 sy (or whatever) is split between the two aprons.
- B. Give some real details of the apron installations.
- C. Consider gabion mats to clearly delineate aprons since long term maintenance of such items are real problem in commercial subs.

XIII. OUTFALL OF DITCH INTO KELLY @ N.E. CORNER PROJECT:

- A. We need a minimum 25' wide path atop a cross pipe at this location.
- B. Give exact details of pipe and headwall.
- C. Give exact details of rip rap apron: consider gabion blanket.

XIV. TWIN PIPE OUTLET INTO KELLY AT LOT 24:

- A. Detail installation with headwall.
- B. Details of rip rap. Consider gabion mat.

XV. DETAILS OF FES STRUCTURES: INVERTS, SIZES, MATERIAL, RIP RAP MATS, ETC. (THEY'RE NOT IN THE TABLE)

XVI. ALSO NEED DETAILS OF CI, AD, MH, GUTTERS, CURBS, ETC.

RE: INVERT ELEVATIONS, PAVEMENT ELEVATIONS, GRADES, SAGS, EMERGENCY OVERFLOWS, DEPRESSED SIDEWALKS AND OTHER PAVEMENTS, ETC.



XVII. SHOW STREET ELEVATION DETAILS THAT ALLOW TRAVEL DURING PERIODS OF HIGH WATER USING ELEVATIONS OBTAINED FROM EVIDENCE GATHERED APRIL 28 THROUGH MAY 15, 1996.

XVIII. OUTLOT "A"

A. What is it? Why is it an outlet?

B. Give details of drainage plan for Outlot A especially along lot lines.

IXX. 25' INGRESS/EGRESS EASEMENT BETWEEN LOTS 35/36:

A. Is there a road planned here? If so why not show it now?

B. Will it require radii back at Cross Pointe Blvd.?

C. If a 25' easement is given to Lot 43 from Outlot A, isn't 25' needed by Outlot A from Lot 43?

D. If a drainage systems is to be designed for "ingress/egress" esmt, will it drain into Lot 43 totally; or is some cross stub needed under Cross Pointe Blvd. to take some drainage back to east line of sub?

E. If some of the drainage is taken from "ingress/egress" back to east line of sub. is system in Cross Pointe Blvd. or system along east line sufficient to handle it?

XX. EMERGENCY OVERFLOWS FROM STREETS:

A. None shown as between Lots 8 & 9; Lots 7, 8, and 6; especially between Lots 23 & 24; and other locations where sag inlets, over the curb release, etc. will be needed to convey excess storm water.

XXI. OFF SITE BASIN EAST SIDE OF I-164:

A. Tie basin description to section line/section corner.

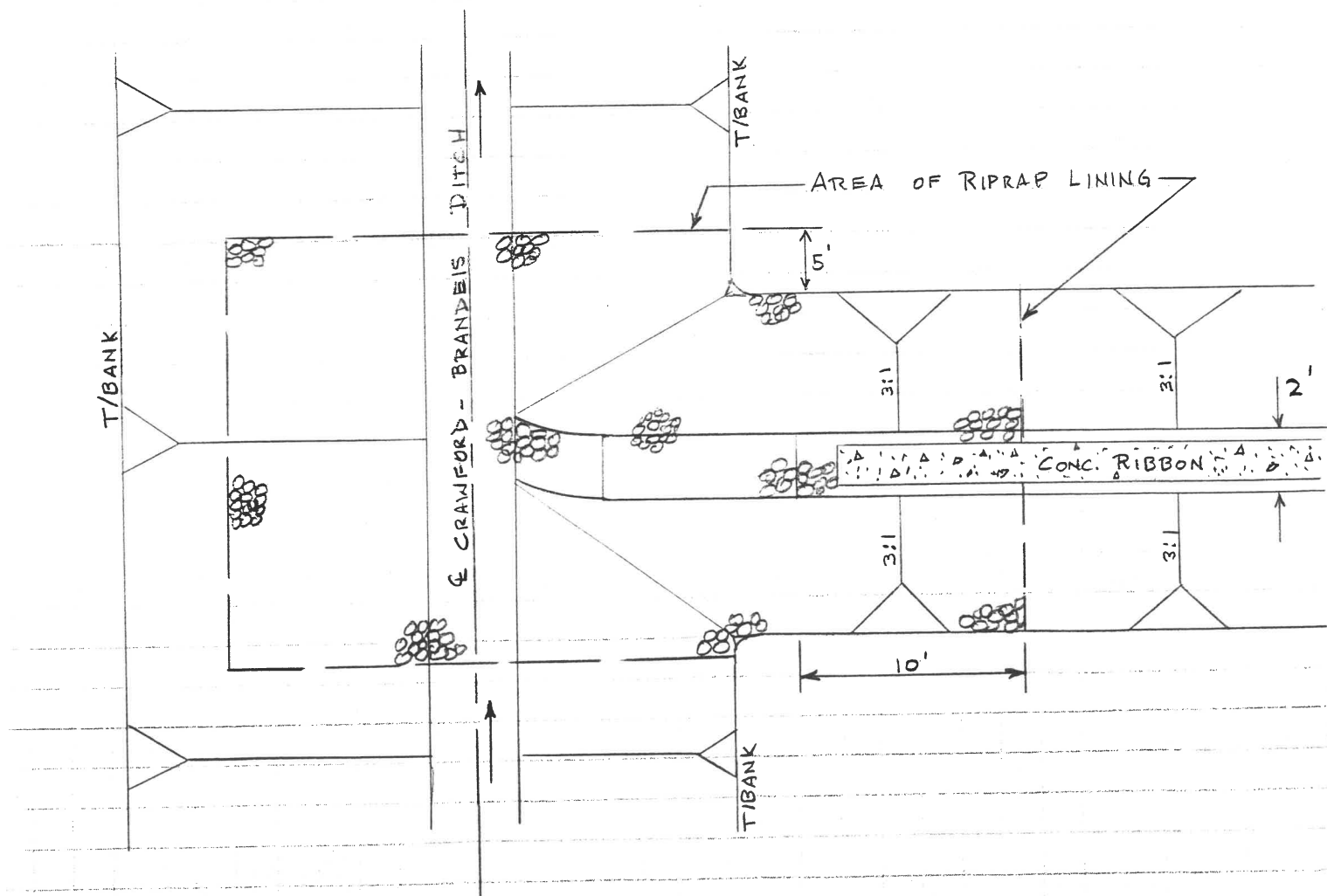
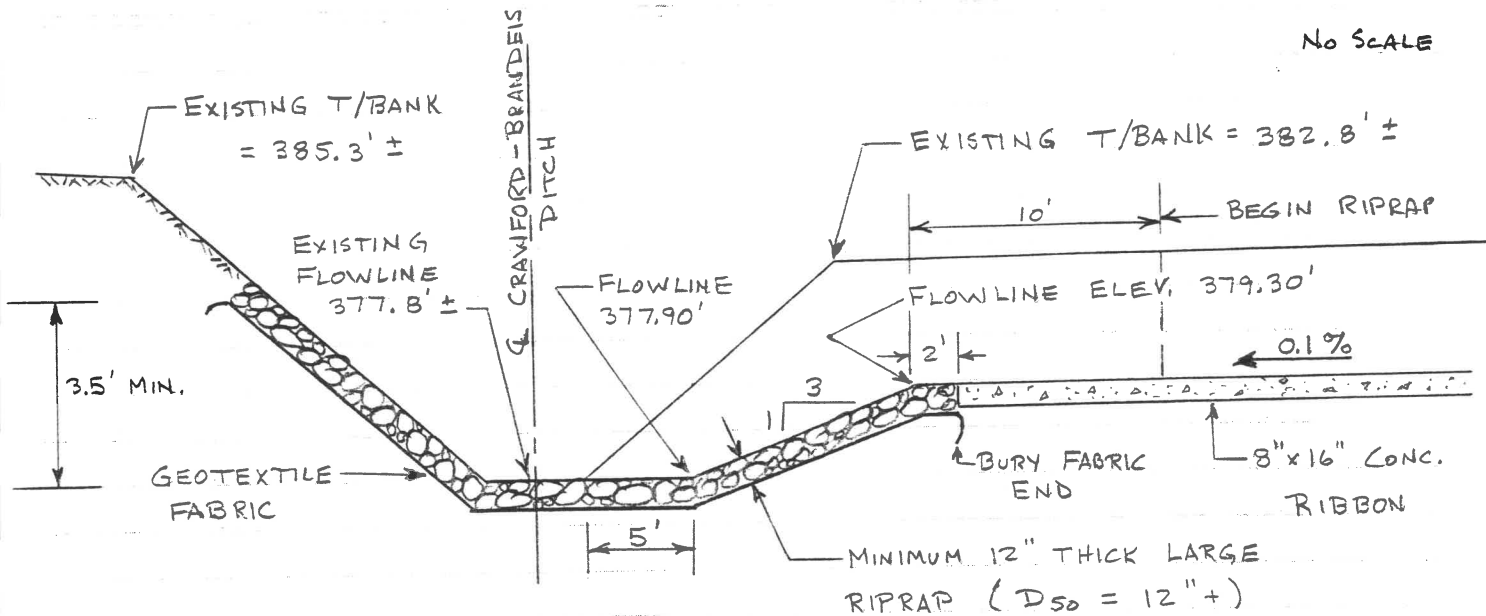
- B. Give bearings and dimensions of outside limits of basin project shown on plan.
- C. Note that present layout appears to block all future access and development of all land north and west of basin lot.

The access right-of-way strip from north end of the cul de sac is an agricultural access and its location within legal drain right-of-way may prevent it from being converted into access for a roadway to other properties north and west of basin.

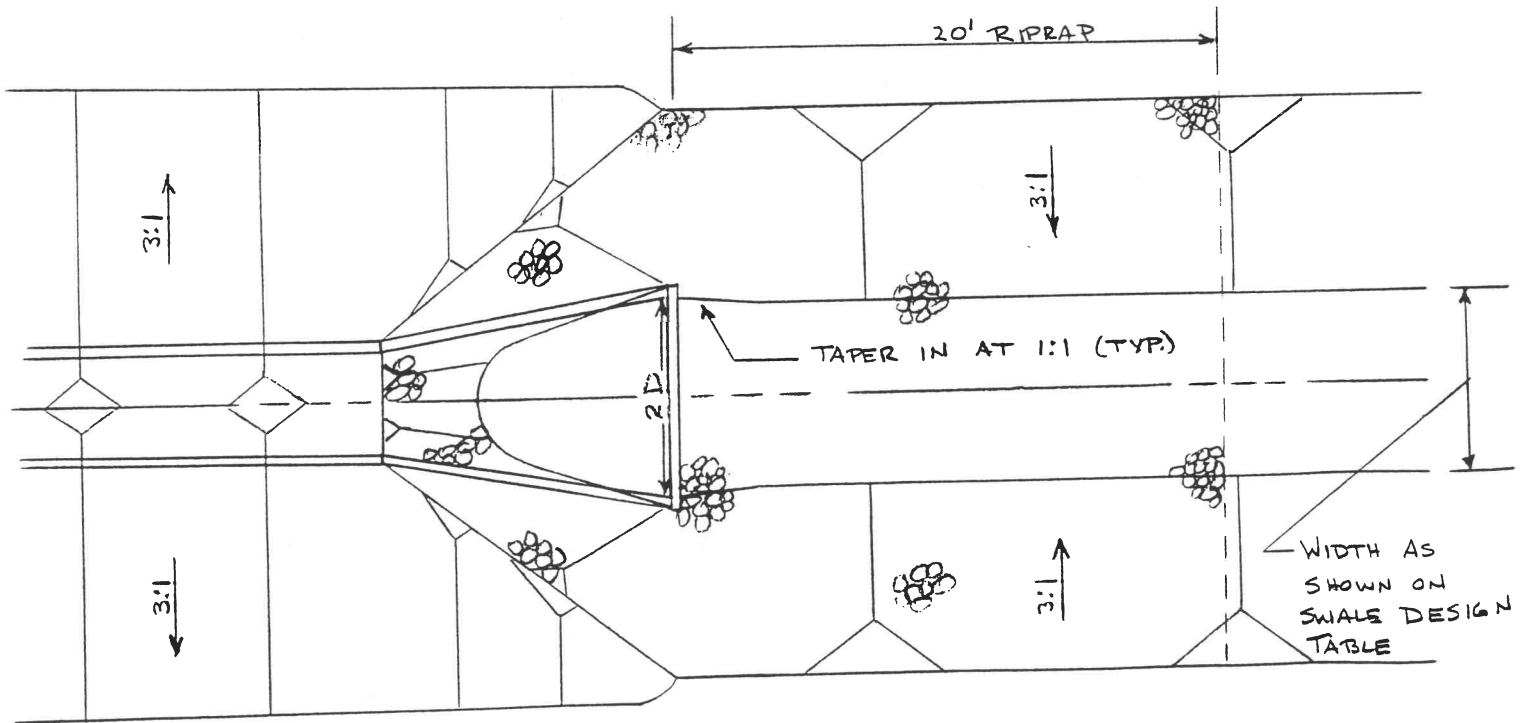
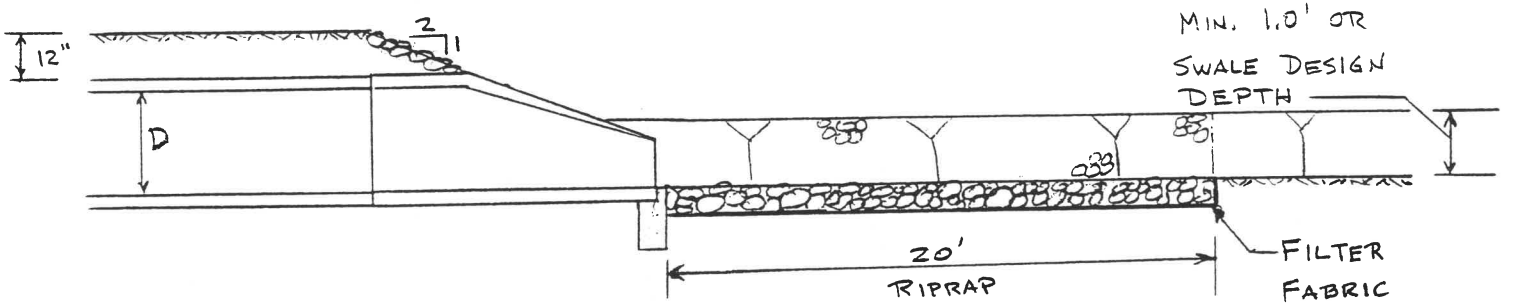
- D. What is the 150' x 150' piece of land at S.E. corner basin lot?
- E. Details of all concrete headwalls in legal drain.
- F. Details of emergency overflow from basin back to ditch designed so that overflowing water does not adversely affect neighboring land.
- G. Details of earthwork or other provisions to prevent overflow from Koester's pit entering and displacing retention in Woodward's basin.
- H. Top of bank of Nurrenbern appears to wander west and closer to basin than the 75' right-of-way line indicates.

We want to append final drainage approval with a provision that we monitor the storage capability of the off site basin and require additional storage if needed as site plans come in for individual projects within the sub. This requires the maximum allowable discharge from each lot to be determined and published on the plat and/or in the restrictions and covenants.

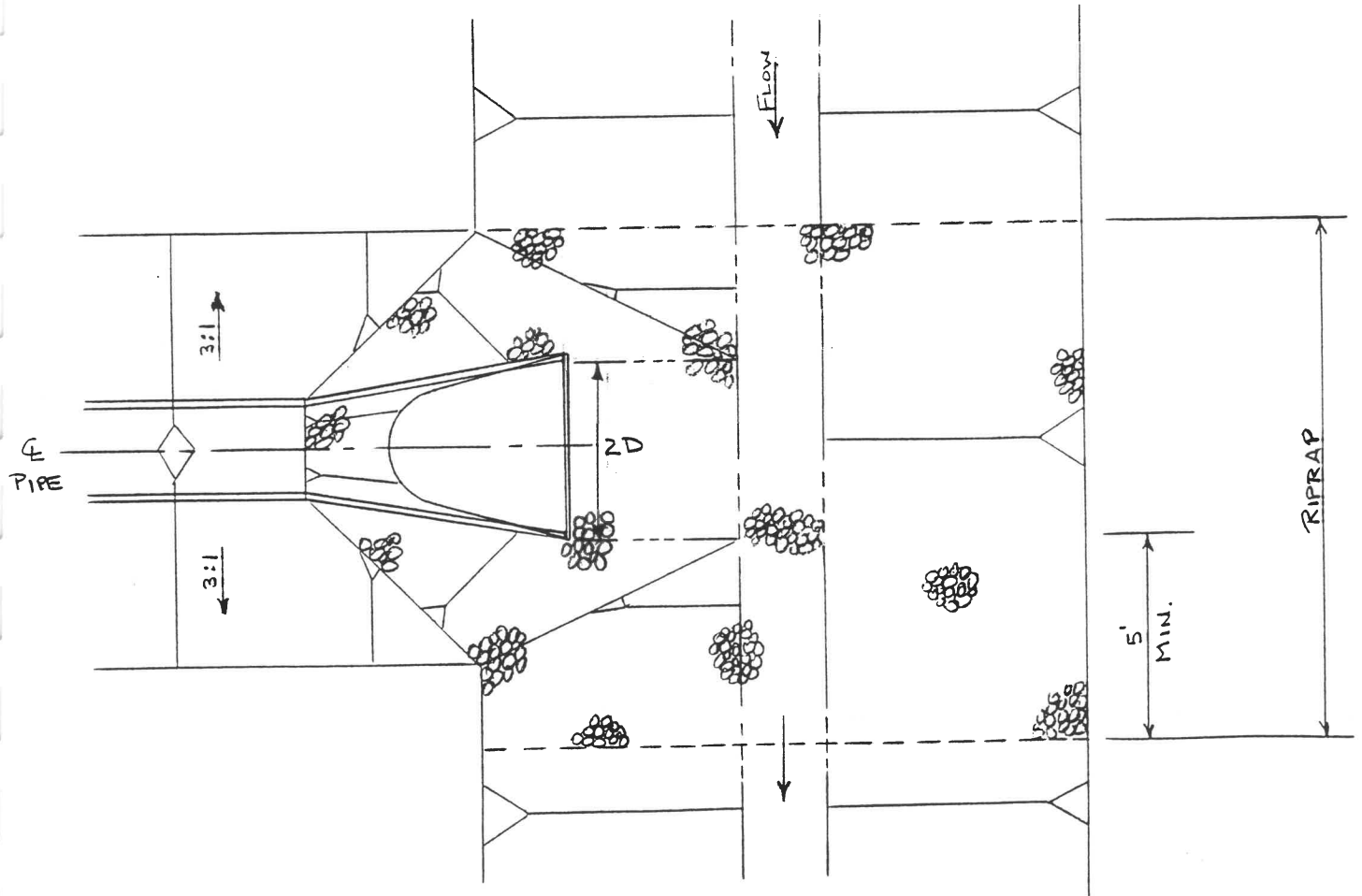
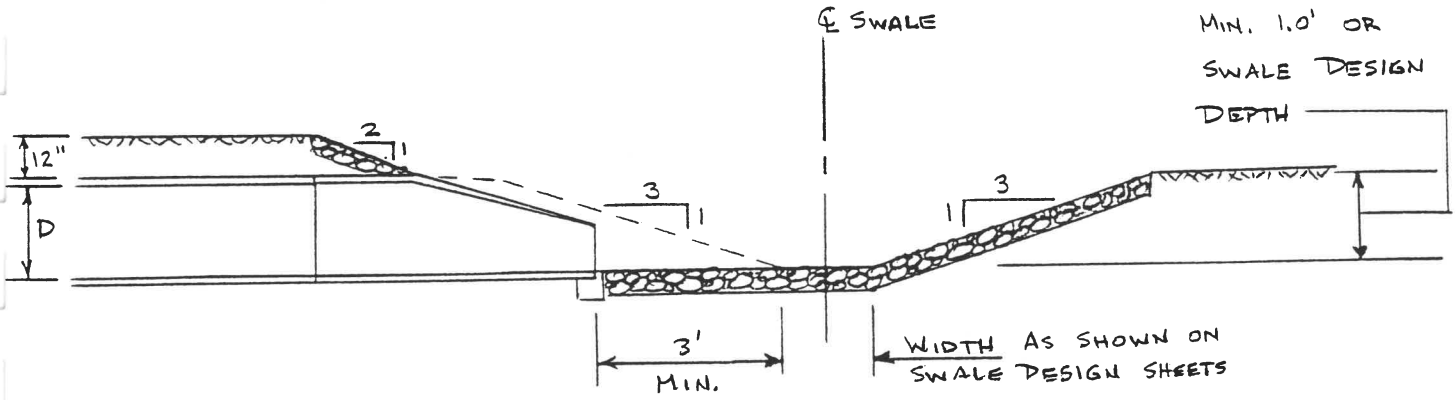
No SCALE



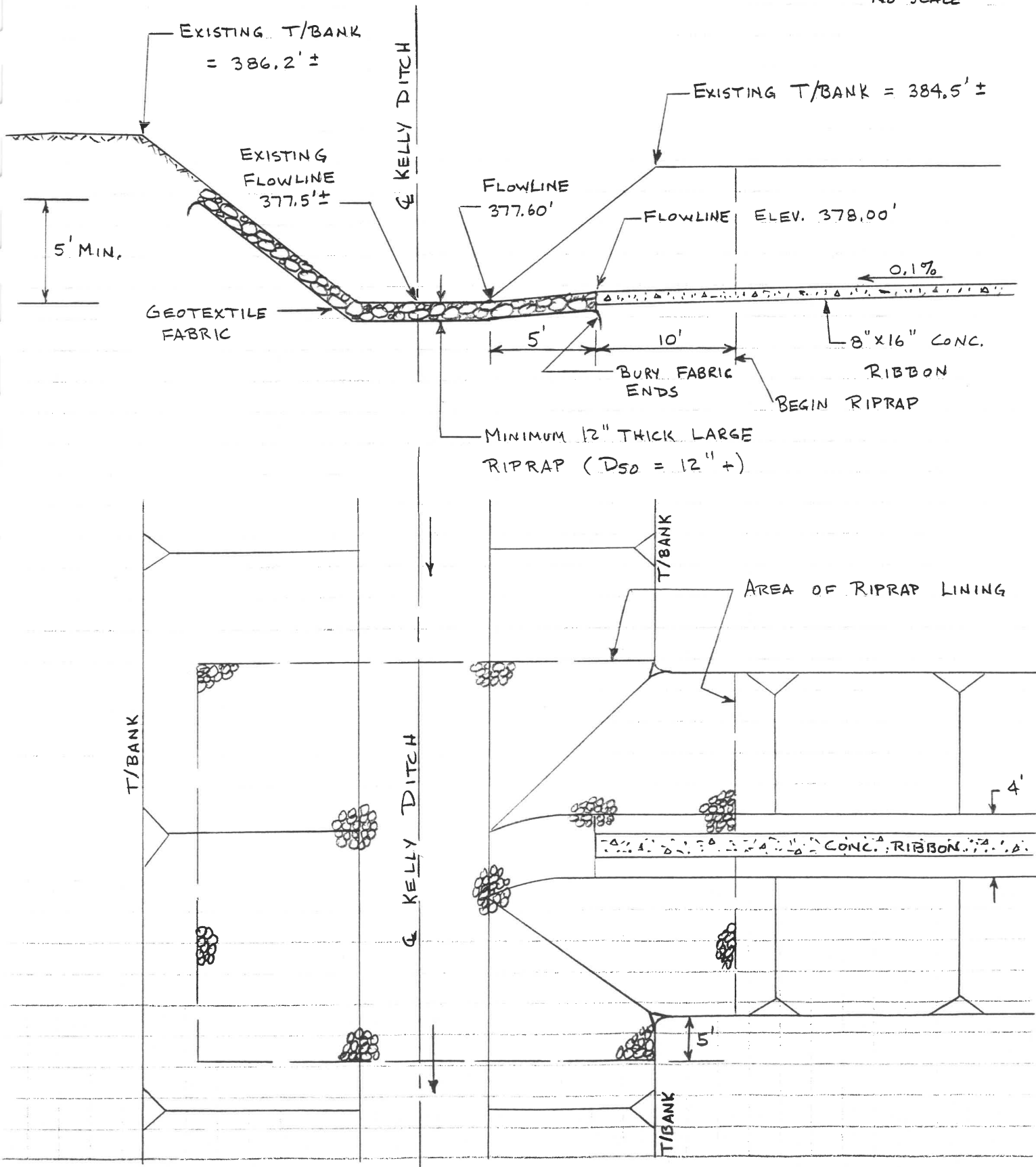
F.E.S. OUTLET DETAIL (Parallel with swale flow)



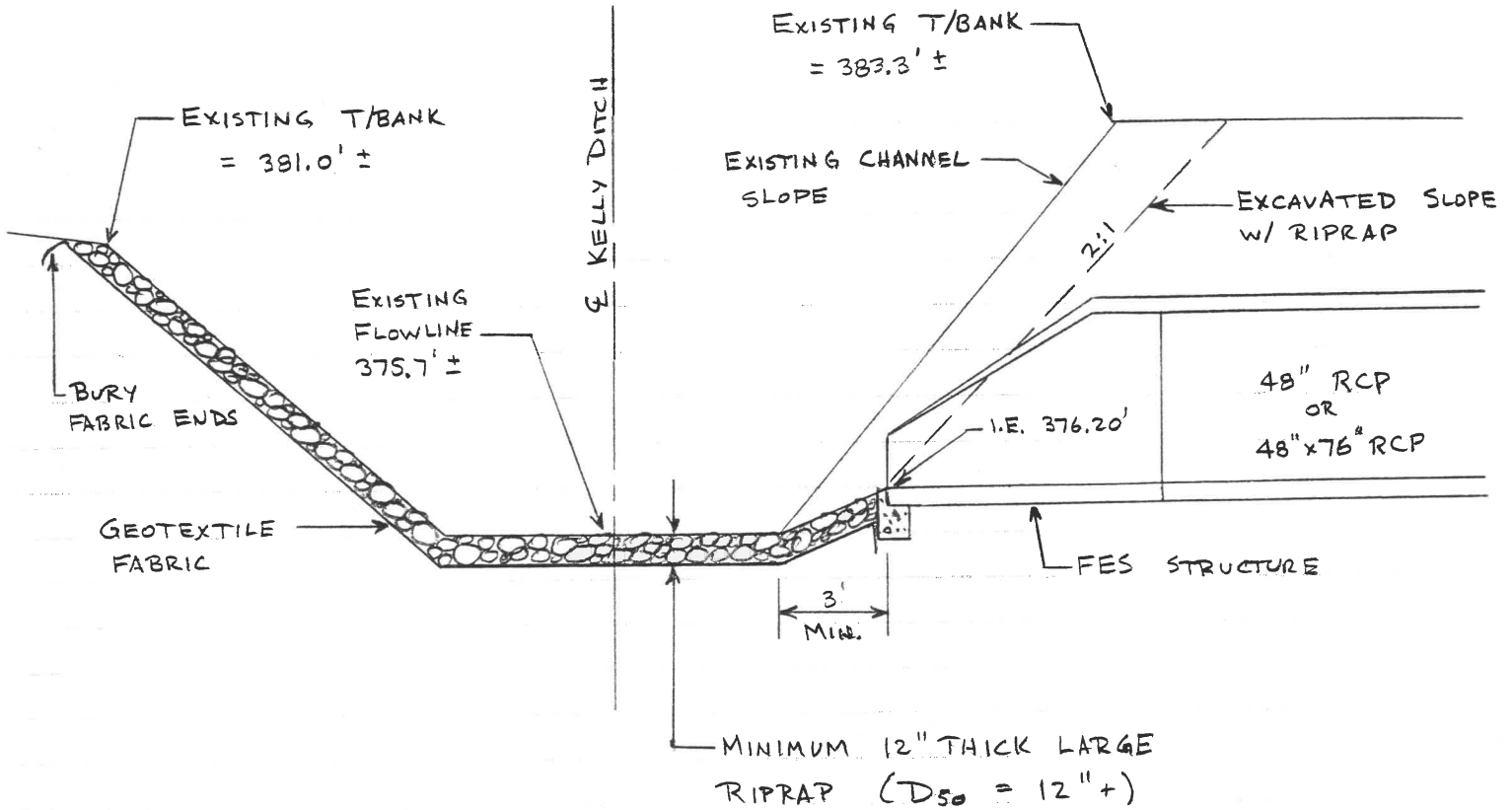
F.E.S. OUTLET DETAIL (PERPENDICULAR TO SWALE FLOW)



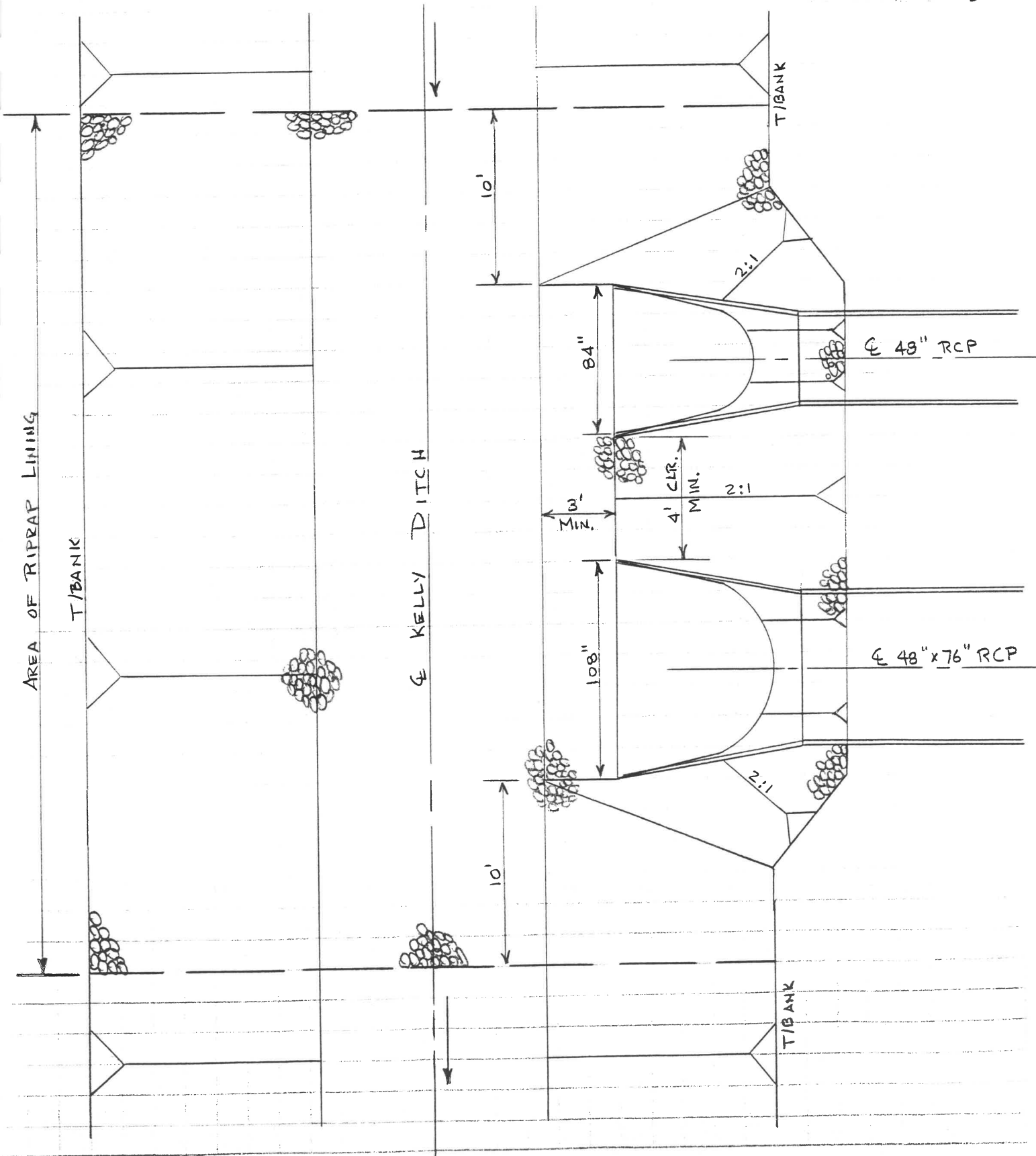
No SCALE



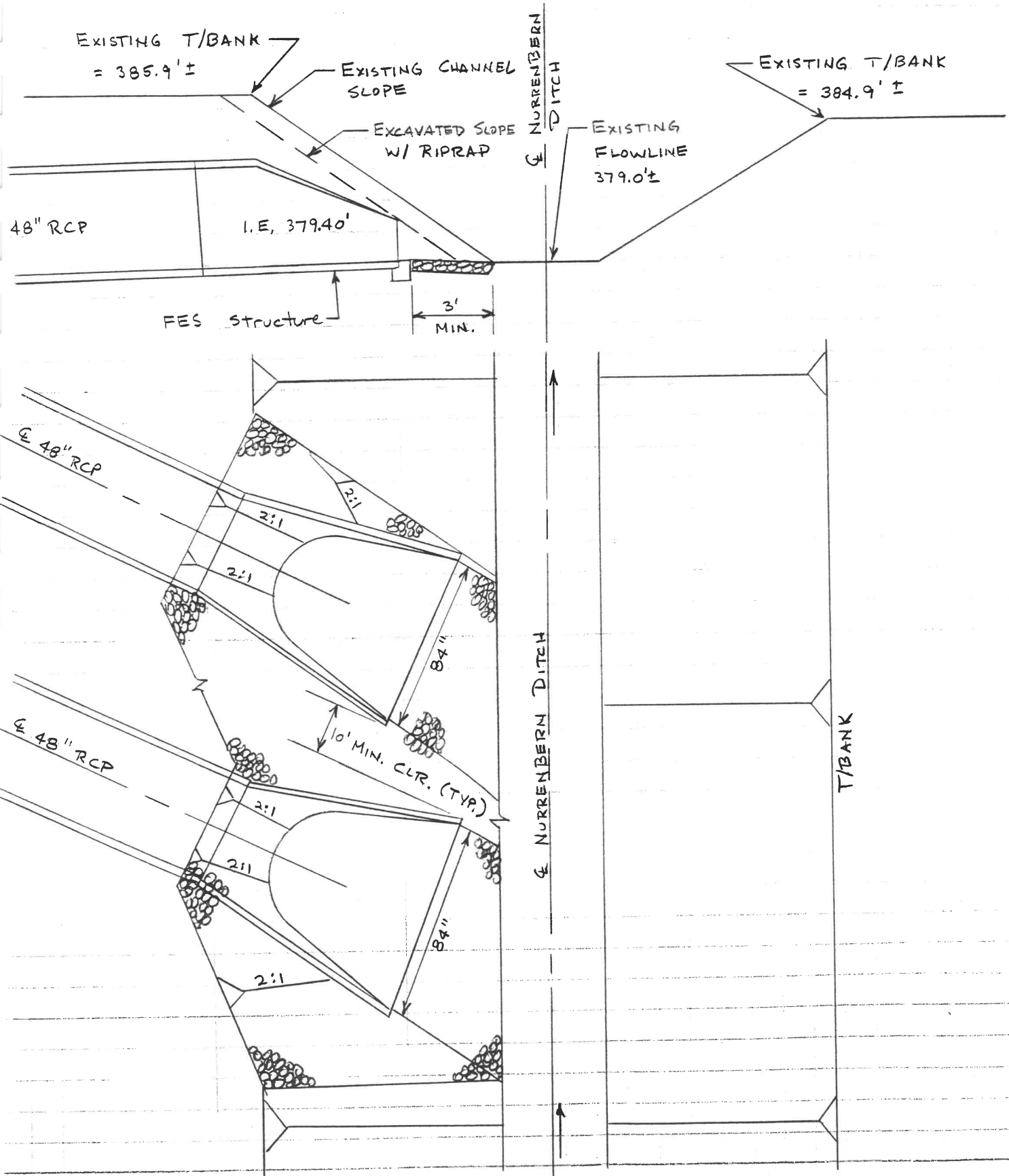
NO SCALE

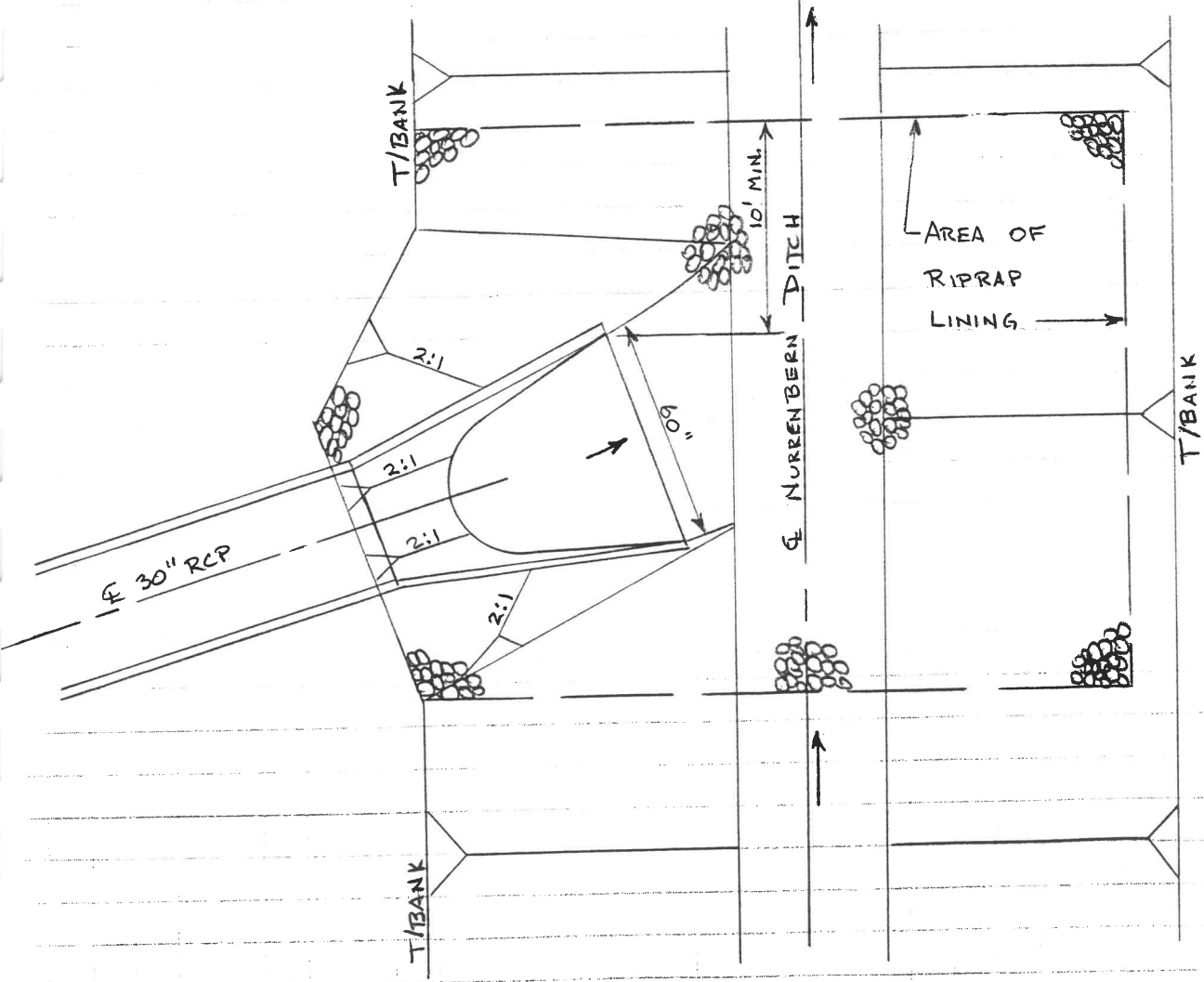
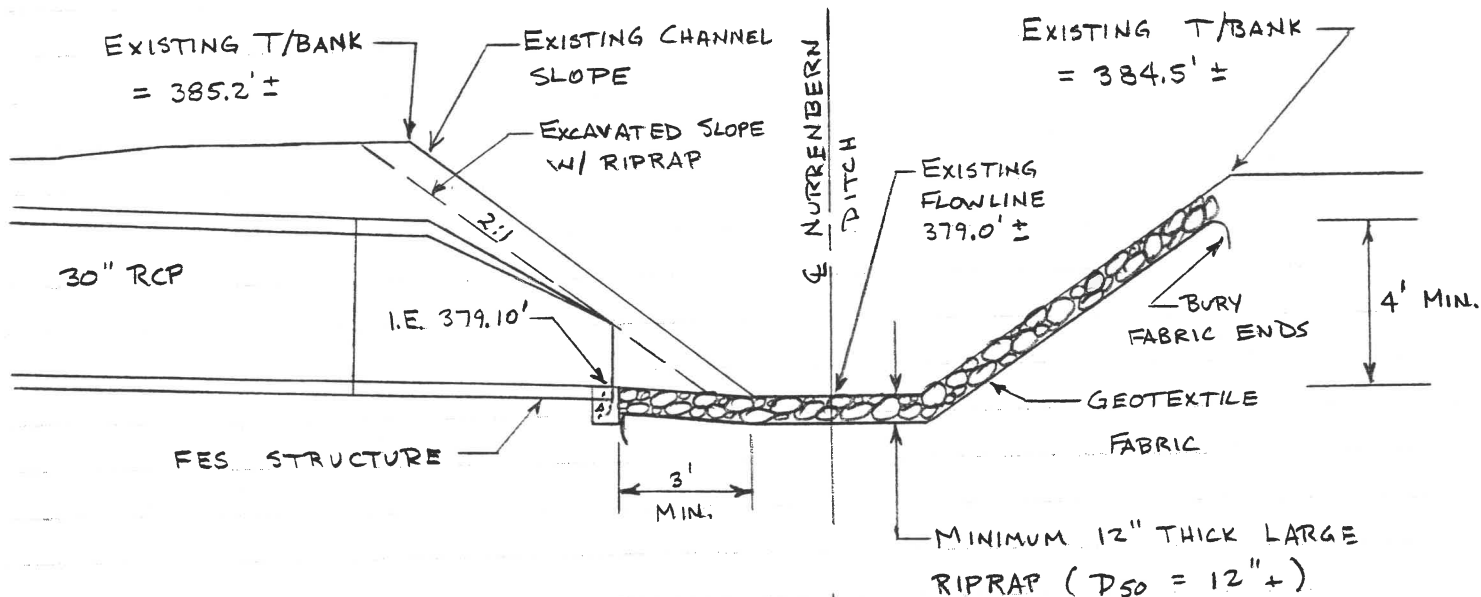


NO SCALE









**BURKHARDT CROSSING****Retention Basin****Overflow from Adjacent Koester Pit**

Drainage Area = 28.5 acres

<u>Surface</u>	<u>Acres</u>	<u>c</u>	<u>N</u>
Agricultural (0-2%)	19.75	0.20	0.20
Water	8.75	1.00	0
		====	====
	Wt'd avg.	0.446	0.139

Time of Concentration, T<sub>c</sub>

L = 600 ft.

H = 2.7 ft.

S = 0.0045

T<sub>c</sub> = 23.0 minutesPeak Runoff Rates and Total Runoff (see following Rational  
Method calculations)

## Peak Runoff Rate

25 Year Storm - 51.46 cfs

100 Year Storm - 65.53 cfs

## Total Runoff

25 Year Storm - 2.18 acre-feet

100 Year Storm - 2.77 acre-feet

Quick TR-55 Ver.5.46 S/N:  
 Executed: 21:13:18 05-18-1996

BURKHARDT CROSSING RETENTION BASIN  
 KOESTER LAKE RUNOFF

\*\*\*\*\* SUMMARY OF RATIONAL METHOD PEAK DISCHARGES \*\*\*\*\*

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres  
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 25 years  
 'C' adjustment, k = 1  
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
AGRICULTURAL								
	0.200	19.75						
LAKE	1.000	8.75						
			23.00	0.446	0.446	4.052	28.50	51.46

Quick TR-55 Ver.5.46 S/N:  
 Executed: 21:13:18 05-18-1996

BURKHARDT CROSSING RETENTION BASIN  
 KOESTER LAKE RUNOFF

\*\*\*\* Rational Method Hydrograph Using Q/Qp Template \*\*\*\*  
 Weighted C = 0.446 Area= 28.500 acres Tc = 23.00 minutes

Adjusted C = 0.446 Tc= 23.00 min. I= 4.05 in/hr Qp= 51.46 cfs

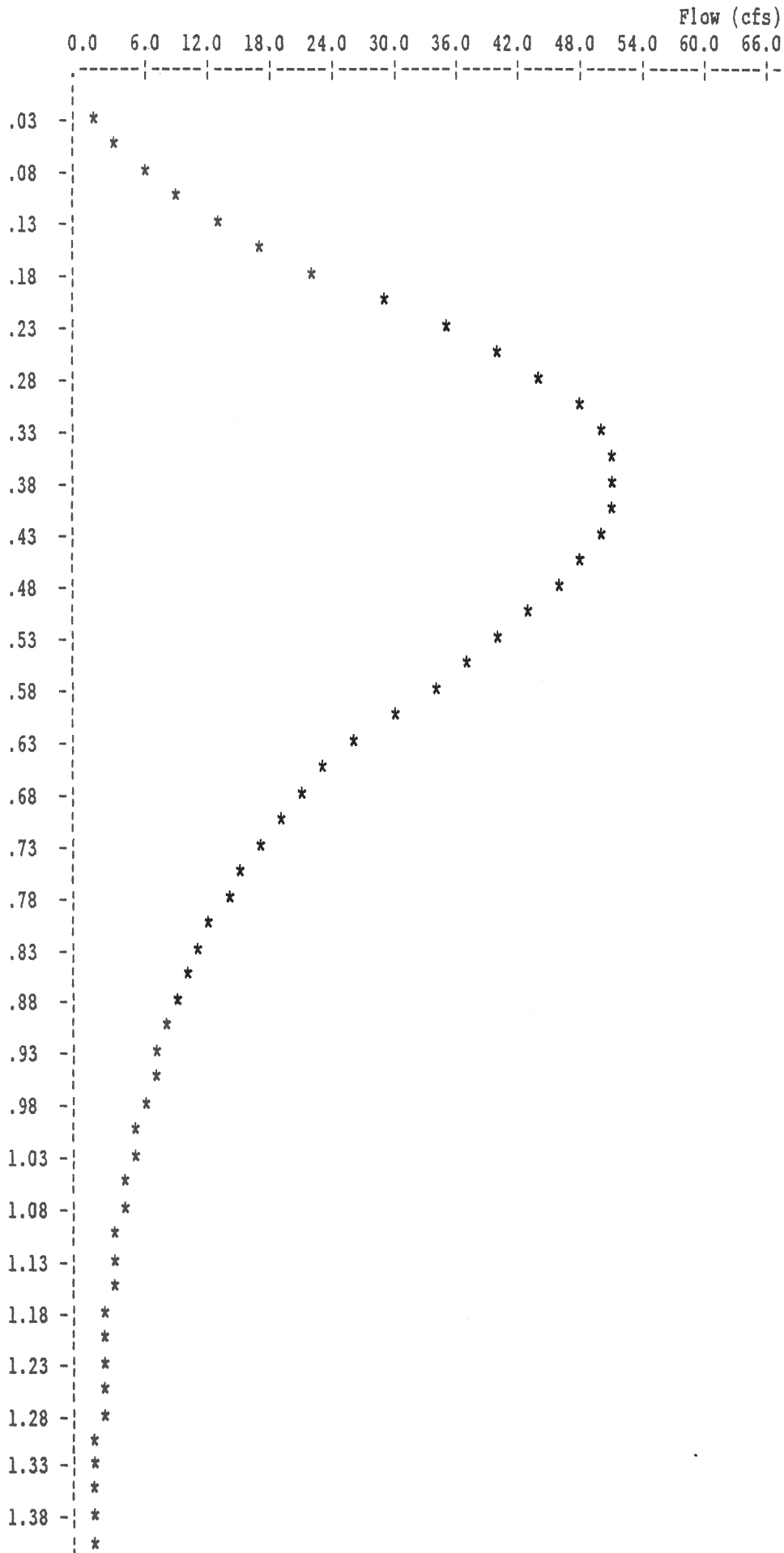
RETURN FREQUENCY: 25 year storm Adj.factor = 1.00  
 Q/Qp Template: VNDRBRG Output file: KSTER25 .HYD

HYDROGRAPH ORDINATES (cfs)

Time increment = 0.017 Hours  
 Time on left represents time for first Q in each row.

Time Hours	0.00	0.67	1.34	2.64	4.21	5.95	7.97
0.000	0.00	0.67	1.34	2.64	4.21	5.95	7.97
0.117	10.05	12.73	15.42	18.82	22.40	26.31	30.56
0.233	34.68	38.26	41.84	44.41	46.87	48.66	50.01
0.350	51.01	51.24	51.46	51.24	51.01	50.01	48.66
0.467	47.23	45.67	44.08	42.29	40.50	38.35	36.11
0.583	33.65	30.97	28.37	26.13	23.90	22.26	20.70
0.700	19.26	17.92	16.65	15.53	14.41	13.59	12.78
0.817	11.96	11.14	10.38	9.71	9.04	8.37	7.70
0.933	7.21	6.76	6.31	5.86	5.44	5.10	4.77
1.050	4.43	4.10	3.81	3.57	3.32	3.08	2.83
1.167	2.66	2.49	2.33	2.16	2.01	1.89	1.76
1.283	1.64	1.52	1.42	1.33	1.24	1.15	1.07
1.400	1.00	0.93	0.87	0.80	0.75	0.70	0.66
1.517	0.61	0.57	0.54	0.51	0.49	0.46	0.43
1.633	0.40	0.38	0.35	0.32	0.30	0.27	0.25
1.750	0.22	0.20	0.18	0.16	0.13	0.11	0.09
1.867	0.07	0.04	0.02	0.00			

Quick TR-55 Version: 5.46 S/N:  
Plotted: 05-18-1996 21:16:44



1.48 - \*  
1.53 - \*  
1.58 - \*  
1.63 - \*  
1.68 - \*  
1.73 - \*  
1.78 - \*  
1.83 - \*

TIME  
(hrs)

\* File: KSTER25 .HYD Qmax = 51.5 cfs

POND-2 Version: 5.17 S/N:  
Executed 05-18-1996 21:19:41

>>>>>> Summary of Hydrograph Volume <<<<<<<

Hydrograph: D:\PONDPACK\KSTER25 .HYD

Volume = 94,888 cu.ft.  
2.18 ac-ft



Quick TR-55 Ver.5.46 S/N:  
Executed: 21:13:18 05-18-1996

BURKHARDT CROSSING RETENTION BASIN  
KOESTER LAKE RUNOFF

\*\*\*\*\* SUMMARY OF RATIONAL METHOD PEAK DISCHARGES \*\*\*\*\*

$Q = \text{adj} * C * I * A$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres  
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years  
'C' adjustment, k = 1  
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
-----								
AGRICULTURAL	0.200	19.75						
LAKE	1.000	8.75						
-----								
			23.00	0.446	0.446	5.160	28.50	65.53

Quick TR-55 Ver.5.46 S/N:  
 Executed: 21:13:18 05-18-1996

BURKHARDT CROSSING RETENTION BASIN  
 KOESTER LAKE RUNOFF

\*\*\*\* Rational Method Hydrograph Using Q/Qp Template \*\*\*\*

Weighted C = 0.446 Area= 28.500 acres Tc = 23.00 minutes

Adjusted C = 0.446 Tc= 23.00 min. I= 5.16 in/hr Qp= 65.53 cfs

RETURN FREQUENCY: 100 year storm Adj.factor = 1.00

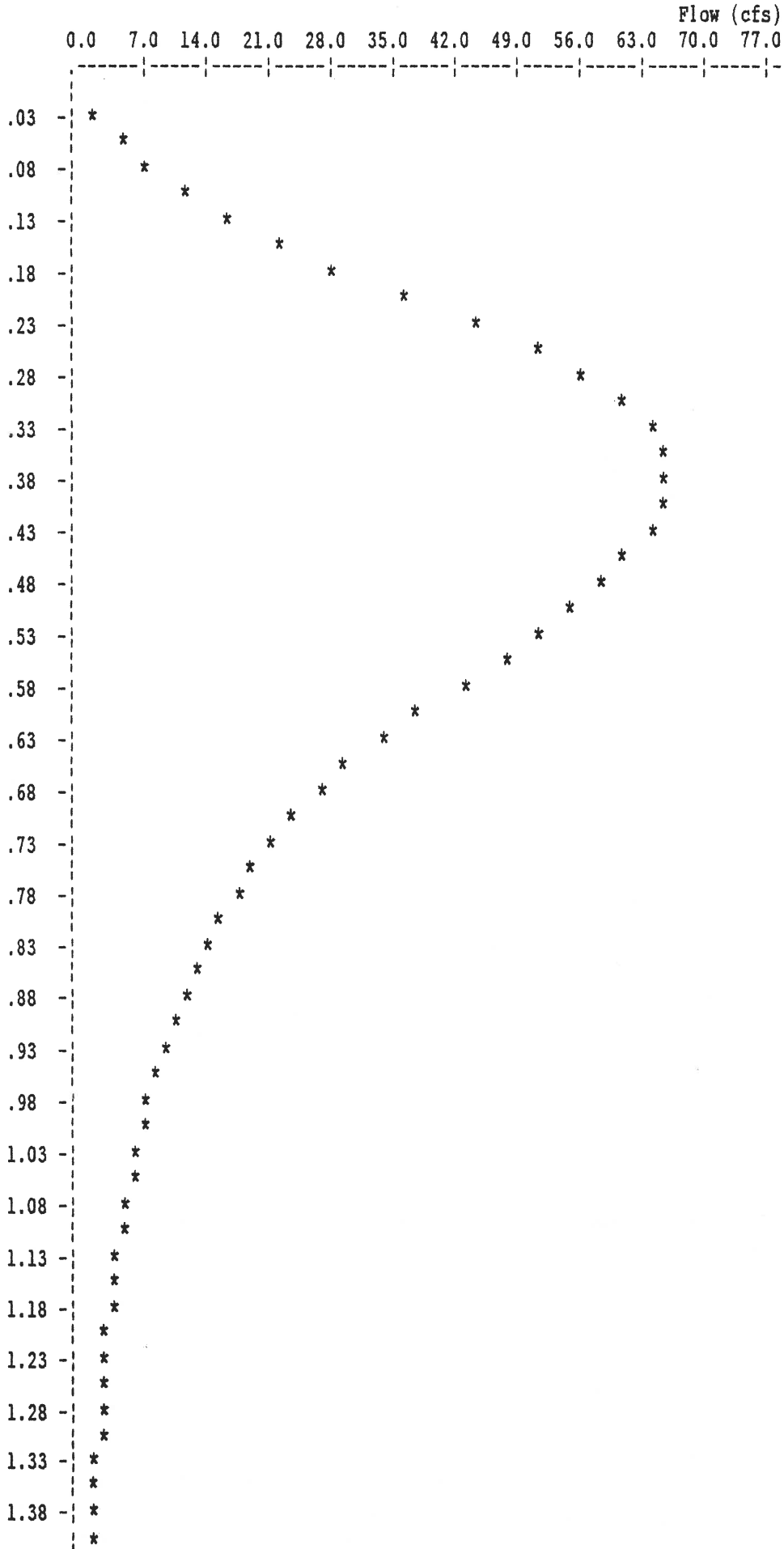
Q/Qp Template: VNDRBRG Output file: KSTER100.HYD

HYDROGRAPH ORDINATES (cfs)

Time increment = 0.017 Hours

Time Hours	Time on left represents time for first Q in each row.						
0.000	0.00	0.85	1.71	3.36	5.36	7.58	10.14
0.117	12.79	16.21	19.63	23.96	28.52	33.51	38.92
0.233	44.16	48.72	53.28	56.56	59.69	61.97	63.68
0.350	64.96	65.25	65.53	65.25	64.96	63.68	61.97
0.467	60.15	58.15	56.13	53.85	51.57	48.84	45.99
0.583	42.85	39.43	36.13	33.28	30.43	28.35	26.36
0.700	24.53	22.82	21.20	19.77	18.35	17.31	16.27
0.817	15.23	14.19	13.22	12.37	11.51	10.66	9.80
0.933	9.18	8.61	8.04	7.47	6.93	6.50	6.07
1.050	5.64	5.22	4.86	4.54	4.23	3.92	3.60
1.167	3.39	3.18	2.96	2.75	2.56	2.40	2.25
1.283	2.09	1.93	1.81	1.70	1.58	1.47	1.36
1.400	1.27	1.19	1.10	1.02	0.95	0.89	0.83
1.517	0.78	0.72	0.69	0.65	0.62	0.58	0.55
1.633	0.52	0.48	0.45	0.41	0.38	0.34	0.31
1.750	0.28	0.26	0.23	0.20	0.17	0.14	0.11
1.867	0.09	0.06	0.03	0.00			

Quick TR-55 Version: 5.46 S/N:  
Plotted: 05-18-1996 21:18:31



1.48 - \*  
1.53 - \*  
1.58 - \*  
1.63 - \*  
1.68 - \*  
1.73 - \*  
1.78 - \*  
1.83 - \*

TIME  
(hrs)

\* File: KSTER100.HYD Qmax = 65.5 cfs

POND-2 Version: 5.17 S/N:  
Executed 05-18-1996 21:19:54

>>>>>> Summary of Hydrograph Volume <<<<<<<

Hydrograph: D:\PONDPACK\KSTER100.HYD

Volume = 120,833 cu.ft.  
2.77 ac-ft