VALUE ENGINEERING SUMMARY
OF
I-75 WIDENING
FROM KY 36 TO KY 491
ITEM NOS. 6-72.00 & 6-72.01
GRANT COUNTY, KENTUCKY

FEBRUARY 2-6, 1998

Prepared by:
William F. Ventry, P.E., C.V.S.

In Association With:

Kentucky Transportation Cabinet

William F. Ventry

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C.V.S. Registration No. 840603 (LIFE)

Date: 2/13/98

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I. EXECUTIVE SUMMARY

INTRODUCTION

This Value Engineering report summarizes the results of the Value Engineering study performed by Ventry Engineering for the Kentucky Transportation Cabinet. The study was performed during the week of
February 2-6, 1998.

The subject of the study was the I-75 Widening from KY 36 to KY 491 (Williamstown to Crittenden).

PROJECT DESCRIPTION

The proposed project is the reconstruction of I-75 by adding an additional lane to the median of the existing I-75 from south of KY 36 to north of Crittenden/Mt. Zion Road. This is proposed to be accomplished by paving the additional new lanes on the inside as well as the entire median with the full depth of the proposed new pavement design. The cut and fill slopes will be flattened in an effort to remove guardrail.

It is proposed to construct a new interchange at Barnes Road and replace the bridges of the existing grade separation on a new alignment.

The project will also raise the existing Sherman/Mt. Zion Road bridge, which also will have to have a new topping placed on it due to deterioration of the deck.

It is also proposed to replace the existing Crittenden/Mt. Zion Road bridge with a new structure and detour traffic during construction.

In addition, the KY 36, Baton Rouge Road and Bannister Pike bridges are proposed to be jacked up to achieve the required vertical clearance over I-75.

METHODOLOGY

The Value Engineering Team followed the basic Value Engineering procedure for conducting this type of analysis.

This process included the following phases:

1. Investigation
2. Speculation
3. Evaluation
4. Development
5. Presentation
6. Report Preparation

Evaluation criteria identified as a basis for the comparison of alternatives included the following:

- Construction Cost
- Maintenance of Traffic
- Construction Time
- Maintenance Cost
- Project Schedule
- Right of Way Impacts
- Service Life
- Salvage Value
- Design Criteria
- Environmental
- Local Access

RESULTS

The following ten areas of focus were analyzed by the Value Engineering team and from these areas the following Value Engineering alternatives were developed and are recommended for Implementation:

1-Pavement

A. Open Graded Wearing Course

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative eliminates the wearing course by changing the staging of construction and maintenance of traffic plan.

If this recommendation can be implemented, there is a possible savings of $1,609,148.

B. New Mainline Pavement and Shoulder, Base and Surface

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative changes the layer thicknesses and material types.

If this recommendation can be implemented, there is a possible savings of $4,571,494.

C. Drainage Blanket

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative changes to untreated stone blanket.

If this recommendation can be implemented, there is a possible savings of $2,071,978.

2-High Mast Lighting ✓

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative meets the department standards for high mast lighting at interchanges only.

If this recommendation can be implemented, there is a possible savings of $400,000.

3-Mainline Roadway Earthwork

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative steepens the cut slopes and flattens the fill slopes only where material and right of way will allow.

If this recommendation can be implemented, there is a possible savings of $872,839.

4-Slope Excavation requiring Right of Way

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative steepens or maintains the existing slopes to eliminate right of way takes.

If this recommendation can be implemented, there is a possible savings of $283,382.

5-Barnes Pike Interchange

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative constructs the proposed ramps to the existing Barnes Pike, uses the ramps for temporary maintenance of traffic, constructs the new bridges at the existing bridge locations and docs not realign Barnes Pike.

If this recommendation can be implemented, there is a possible savings of $474,914.

6-Sherman/Mt. Zion Grade Separation

The Value Engineering Team recommends that Value Engineering Alternative No. 1 be implemented. This alternative replaces the superstructure and uses the existing sub-structure.

If this recommendation can be implemented, there is a possible savings of $27,780.

7-Crittenden/Mt. Zion Grade Separation

The Value Engineering Team recommends that Value Engineering Alternative No. 2 be implemented. This alternative realigns Crittenden/Mt. Zion Rd. to a 90 degree crossing and uses the existing structure for maintenance of traffic.

If this recommendation can be implemented, there is a possible savings of $305,000.

The Value Engineering Team recommends that Value Engineering Alternative No. be implemented. This alternative reconstructs the superstructure and salvages the sub-structure.

If this recommendation can be implemented, there is a possible savings of $587,990.

8-Rest Area

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative does not remove the rest area.

If this recommendation can be implemented, there is a possible savings of $33,911.

9-Northbound Exit to the KY 36 Interchange

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative leaves the ramp as is and makes needed traffic operations improvements.

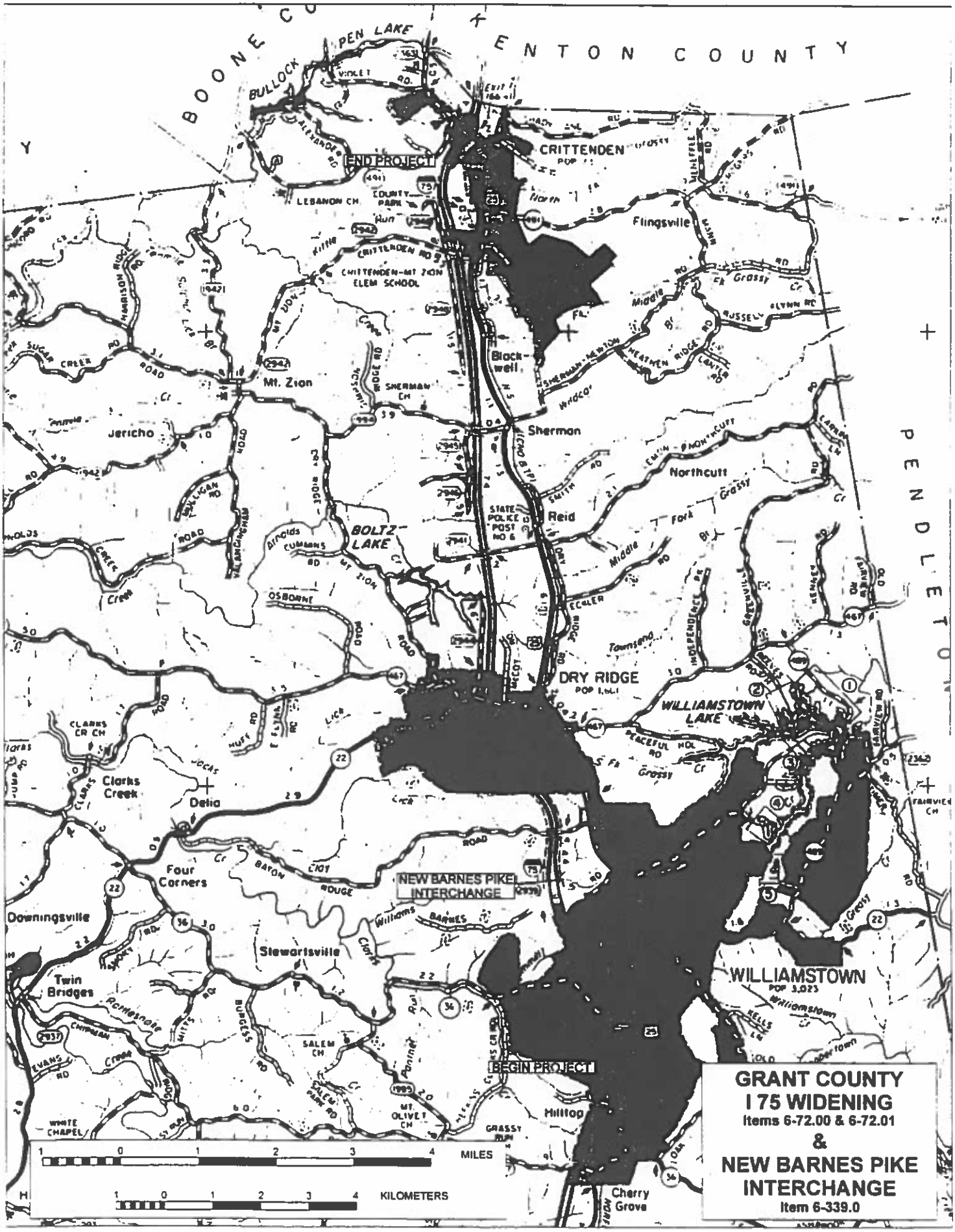
If this recommendation can be implemented, there is a possible savings of $28,631.

10-Mainline and Shoulder Typical Section

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative decreases the inside shoulder widths to 3.6 meters.

If this recommendation can be implemented, there is a possible savings of $486,438.

II. LOCATION OF PROJECT


BOONE COUNTY
KENTON COUNTY
PENDLETON
END PROJECT
CRITTENDEN
POP 71
Flingsville
Blackwell
Mt. Zion
Jericho
Sherman
Northcutt
Reid
BOLTZ LAKE
DRY RIDGE
POP 1,461
WILLIAMSTOWN LAKE
Clarks Creek
Delia
Four Corners
NEW BARNES PIKE INTERCHANGE
Downingsville
Stewartsville
Twin Bridges
WILLIAMSTOWN
POP 3,023
BEGIN PROJECT
Hilltop
Cherry Grove
MILES
KILOMETERS
GRANT COUNTY
I 75 WIDENING
Items 6-72.00 & 6-72.01
&
NEW BARNES PIKE
INTERCHANGE
Item 6-339.0

COUNTY OF	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
GRANT	1997	1	-

COMMONWEALTH OF KENTUCKY
DEPARTMENT OF HIGHWAYS

PLANS OF
PROPOSED PROJECT

GRANT COUNTY
I-75
ITEM NO. 6-72.00 & 6-72.01

GRADE, DRAIN, AND SURFACING PLANS

THIS PROJECT IS A FULLY CONTROLLED ACCESS HIGHWAY

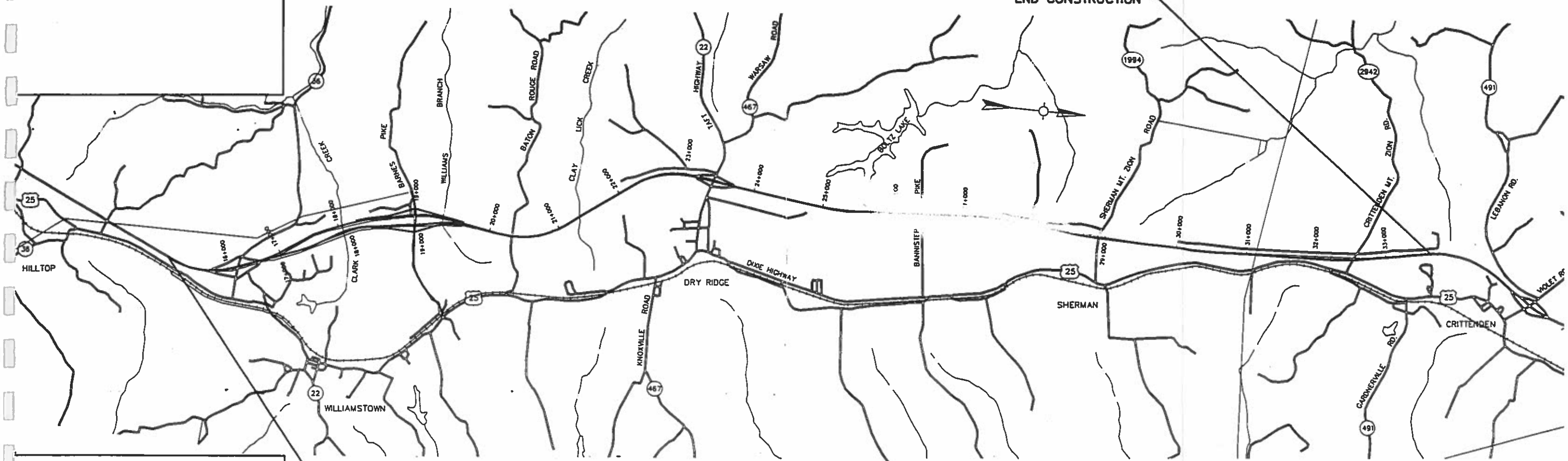
INDEX OF SHEETS

SHEETS NOT INCLUDED IN TOTAL SHEETS

TOTAL BRIDGE SHEETS

STANDARD DRAWINGS

MARKER



DESIGN CRITERIA

CLASS OF HIGHWAY	-
TYPE OF TERRAIN	-
DESIGN SPEED	120 km/h
REQUIRED NPSD	210
REQUIRED PSD	N/A
LEVEL OF SERVICE	-
ADT PRESENT (1995)	2000 - 38100
ADT FUTURE (2010)	2020 - 62400
DHV	
D %	
T %	24%

GEOGRAPHIC COORDINATES

LATITUDE - DEGREES - MINUTES NORTH
LONGITUDE - DEGREES - MINUTES WEST

DESIGNED

% RESTRICTED SD 0%

LEVEL OF SERVICE

MAX. DISTANCE W/O PASSING N/A

GRAPHIC SCALE IN METERS

LAYOUT MAP

GROSS LENGTH	18,389.573 METERS	METERS	METERS	METERS
ADDED DEDUCTED | FOR EQUALITIES	-278.387 METERS	METERS	METERS	METERS
NET LENGTH	18,111.186 METERS NOT INCLUDED	METERS	METERS	METERS
RAILROAD CROSSINGS NO.	METERS	METERS	METERS	METERS
BRIDGES	METERS	METERS	METERS	METERS

KENTUCKY
DEPARTMENT OF HIGHWAYS
GRANT COUNTY

PROJECT NUMBER: GRANT COUNTY I-75 -
LETTING DATE:

SUBMITTED BY ____ 19 ____ BY ASST. DISTRICT ENGINEER FOR PRE-CONSTRUCTION
____ 19 ____ BY
____ 19 ____ BY DIRECTOR OF TRAFFIC
PLAN CHECKED ____ 19 ____ BY CHIEF DRAFTSMAN
PLAN APPROVED ____ 19 ____ BY DIRECTOR OF DESIGN
PLAN APPROVED ____ 19 ____ BY STATE HIGHWAY ENGINEER

PLANS PREPARED BY
PRESNELL ASSOCIATES INC.
717 WEST MAIN STREET
LOUISVILLE, KY. 40202-2633

Signed: ____

Date: ____

III. TEAM MEMBERS AND PROJECT DESCRIPTION

TEAM MEMBERS

NAME	AFFILIATION	EXPERTISE	PHONE
William F. Ventry, P.E., C.V.S.	Ventry Engineering	Team Leader	850/627-3900
Jerry Love	Ventry Engineering	Pavement/ Geometrics	850/627-3900
Don Keenan	Ventry Engineering	Structural	850/627-3900
Ron Whichel	Ventry Engineering	Roadway	850/627-3900
Charlie So	Kentucky Transportation Cabinet	Structures	502/564-4560
Robert Semones	Kentucky Transportation Cabinet	Highway Design	502/564-3280
Joette Fields	Kentucky Transportation Cabinet	Construction	502/564-3280
Daryl Greer	Kentucky Transportation Cabinet	Value Engineer	502/564-3280

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In addition, the KY 36, Baton Rouge Road and Bannister Pike bridges are proposed to be jacked up to achieve the required vertical clearance over I-75.

PERSONS CONTACTED

NAME	AFFILIATION	PHONE
Roger Wade	Presnell Associates	502/585-2222
Larry Trenkamp	Kentucky Transportation Cabinet	606/341-2700
Ed Thompson	Kentucky Transportation Cabinet	606/341-2700
Glenn Givan	Kentucky Transportation Cabinet	502/564-4556
Janet Coffey	Kentucky Transportation Cabinet	502/564-4556
Mike Emark	Kentucky Transportation Cabinet	606/341-2700
Gary Sharpe	Kentucky Transportation Cabinet	502/564-3280
David Kratt	Kentucky Transportation Cabinet	502/564-3280
Dale Carpenter	Kentucky Transportation Cabinet	502/564-4560
Jeff Wolfe	Kentucky Transportation Cabinet	502/564-3020
Dwane Thomas	Kentucky Transportation Cabinet	502/564-3020
John Sacksteder	Kentucky Transportation Cabinet	502/564-3280
Bob Harrison	Kentucky Transportation Cabinet	502/766-5066
John Renfro	Kentucky Transportation Cabinet	502/564-3020
Abe Halburton	Kentucky Transportation Cabinet	502/564-3020
Marke Hayden	Kentucky Transportation Cabinet	502/564-3280

Rob Cooper	Presnell Associates	502/585-2222
Matt Hummel	Acrow Panels	201/933-0450
John Grant	Florida DOT	850/414-4334
Tom Andres	Florida DOT	850/414-4269

IV. INVESTIGATION PHASE

FUNCTIONAL ANALYSIS WORKSHEET, INVESTIGATION PHASE
PROJECT: I-75 WIDENING, GRANT COUNTY (KY 36 TO KY 491)
DATE: FEBRUARY 2-6, 1998

ITEM	FUNCT. VERB	FUNCT. NOUN	TYPE	COST *	WORTH *	VALUE INDEX
Base, New Pavement	Support	Pavement	B	$2,200	$1,225	1.8
Drainage Blanket	Drain	Subgrade	S	$2,800	$1,400	2.0
Surface, New Pavement	Support	Vehicles	B	$ 400	$ 310	1.3
Base, Inside Shoulder	Support	Pavement	B	$7,300	$3,650	2.0
Surface, Inside Shoulder	Protect	Pavement Edge	B	$ 400	$ 200	2.0
Perforated Drain Pipe	Remove	Water	S	$1,000	$1,000	1.0
Milling of Existing Pavement	Remove	Material	B	$ 500	$ 500	1.0
Overlay of Existing Pavement	Support	Vehicles	B	$3,500	$3,000	1.2
Median Drainage System	Convey	Water	B	$ 900	$ 900	1.0
Wearing Course	Protect	Base	S	$1,500	$ 0	
Permanent Barrier Wall	Redirect	Vehicle	B	$2,600	$2,600	1.0
Roadway Earthwork	Achieve	Profile	S	$7,700	$6,000	1.3
KY 36 Bridge	Provide	Clearance	B	$ 260	$ 260	1.0
Baton Rouge Bridge	Provide	Clearance	S	$ 260	$ 260	1.0
Bannister Pike Bridge	Provide	Clearance	S	$ 260	$ 260	1.0
Sherman/Mt. Zion Bridge	Provide	Clearance	S	$ 385	$ 285	1.4
Crittenden/Mt. Zion Bridge	Provide	Clearance	S	$1,000	$ 500	2.0
R/W for Slope Work	Reduce	Maintenance	B	$ 483	$ 100	4.8

Base, Outside Shoulder	Match	Mainline	S	$1,100	$ 500	2.0
Surface, Outside Shoulder	Match	Mainline	S	$ 470	$ 200	2.0
Slope Excavation Requiring R/W	Reduce	Maintenance	S	$1,100	$ 100	11.0
High Mast Lighting	Illuminate	Area	B	$1,200	$ 400	3.0
Barnes Pike Interchange	Local	Access	S	$7,600	$6,000	1.3
Rest Area Removal	Improve	Aesthetics	S	$ 50	$ 0	

B = Basic Function
S = Secondary Function
* = All amounts x 1000

INVESTIGATION

The following have been identified by the Value Engineering Team as areas of focus and investigation for the Value Engineering process:

I. PAVEMENT
   - A. Open Graded Wearing Course
   - B. New Mainline Pavement and Shoulder, Base and Surface
   - C. Drainage Blanket

II. HIGH MAST LIGHTING

III. MAINLINE ROADWAY EARTHWORK

IV. SLOPE EXCAVATION REQUIRING RIGHT OF WAY

V. BARNES PIKE INTERCHANGE

VI. SHERMAN/MT. ZION GRADE SEPARATION

VII. CRITTENDEN/MT. ZION GRADE SEPARATION

VIII. REST AREA REMOVAL

IX. NORTHBOUND EXIT TO THE KY 36 INTERCHANGE

X. MAINLINE AND SHOULDER TYPICAL SECTION

V. SPECULATION PHASE

SPECULATION

Ideas generated, utilizing the brainstorming method, for performing the functions of previously identified areas of focus.

I. PAVEMENT

A. Open Graded Wearing Course

- Eliminate wearing course by changing maintenance of traffic plan

B. New Mainline Pavement and Shoulder, Base and Surface

- Change the layer thicknesses and material types

C. Drainage Blanket

- Change to untreated stone blanket

II. HIGH MAST LIGHTING

- Meet the department standards for high mast lighting at interchanges only

III. MAINLINE ROADWAY EARTHWORK

- Steepen cut slopes
- Flatten fill slopes only where material and right of way will allow

IV. SLOPE EXCAVATION REQUIRING RIGHT OF WAY

- Steepen or maintain existing slopes to eliminate right of way takes

V. BARNES PIKE INTERCHANGE

- Reconstruct the existing bridges only and eliminate the proposed interchange
- Connect existing roads in the area and eliminate the proposed interchange
- Construct the proposed ramps to the existing Barnes Pike, use the ramps for temporary maintenance of traffic, construct the new bridges at the existing bridge locations and do not realign Barnes Pike

VI. SHERMAN/MT. ZION GRADE SEPARATION

- Replace the superstructure, do not jack
- Use the existing sub-structure
- Extend the existing frontage road to the south from Crittenden to connect to Sherman and eliminate the structure completely

VII. CRITTENDEN/MT. ZION GRADE SEPARATION

- Reconstruct the superstructure and salvage the sub-structure
- Extend the existing frontage road to the south from Crittenden to connect to Sherman and eliminate the structure completely

VIII. REST AREA REMOVAL

- Do not remove
- Remove the ramps only

IX. NORTHBOUND EXIT TO THE KY 36 INTERCHANGE

- Leave the ramp as is and make needed traffic operations improvements
- Realign the ramp closer to KY 36 and shorten the ramp
- Extend the ramp beginning past the crest of the mainline vertical curve

X. MAINLINE AND SHOULDER TYPICAL SECTION

- Decrease the inside shoulder widths to 3.6 meters

VI. EVALUATION PHASE

VI.(a) ALTERNATIVES

ALTERNATIVES

The following alternatives were formulated during the "eliminate and combine" portion of the Evaluation Phase.

I. PAVEMENT

A. Open Graded Wearing Course

Value Engineering Alternative-Eliminate wearing course by changing maintenance of traffic plan

B. New Mainline Pavement and Shoulder, Base and Surface

Value Engineering Alternative-Change the layer thicknesses and material types

C. Drainage Blanket

Value Engineering Alternative-Change to untreated stone blanket

II. HIGH MAST LIGHTING

Value Engineering Alternative-Meet the department standards for high mast lighting at interchanges only

III. MAINLINE ROADWAY EARTHWORK

Value Engineering Alternative-Steepen cut slopes and flatten fill slopes only where material and right of way will allow

IV. SLOPE EXCAVATION REQUIRING RIGHT OF WAY

Value Engineering Alternative-Steepen or maintain existing slopes to eliminate right of way takes

V. BARNES PIKE INTERCHANGE

Value Engineering Alternative-Construct the proposed ramps to the existing Barnes Pike, use the ramps for temporary maintenance of traffic, construct the new bridges at the existing bridge locations and do not realign Barnes Pike

VI. SHERMAN/MT. ZION GRADE SEPARATION

Value Engineering Alternative No. 1-Replace the superstructure and use the existing sub-structure

Value Engineering Alternative No. 2-Extend the existing frontage road to the south from Crittenden to connect to Sherman and eliminate the structure completely

VII. CRITTENDEN/MT. ZION GRADE SEPARATION

Value Engineering Alternative No. 1-Reconstruct the superstructure and salvage the sub-structure

Value Engineering Alternative No. 2-Realign roadway, shorten structure and use existing bridge for maintenance of traffic

VIII. REST AREA REMOVAL

Value Engineering Alternative-Do not remove

IX. NORTHBOUND EXIT TO THE KY 36 INTERCHANGE

Value Engineering Alternative-Leave the ramp as is and make needed traffic operations improvements

X. MAINLINE AND SHOULDER TYPICAL SECTION

Value Engineering Alternative-Decrease the inside shoulder widths to 3.6 meters

VI.(b) ADVANTAGES AND DISADVANTAGES

EVALUATION

The following Advantages and Disadvantages were developed for the Value Engineering Alternatives previously generated during the speculation phase. It also includes the Advantages and Disadvantages for the As Proposed.

I. PAVEMENT

A. Open Graded Wearing Course

"As Proposed"-25 MM of open graded wearing course

Advantages

- **Provides interim wearing course for maintenance of traffic**
- **Reduces water infiltration into base**
- **May reduce raveling in base**

Disadvantages

- **High construction cost for benefit**
- **More construction time**
- **May not be required**

Conclusion:
Recommend to be carried forward for further Evaluation

Value Engineering Alternative-Eliminate wearing course by changing maintenance of traffic plan

Advantages

- **Less construction time**
- **Less construction cost**
- **Fewer construction stages**

Disadvantages

- **Grade difference may require temporary barrier**

Conclusion:
Recommend to be carried forward for further Evaluation

B. New Mainline Pavement and Shoulder, Base and Surface

"As Proposed"-1 1/2" of surface and 16 1/2" of base over 6" of drainage blanket on 6" of DGA

Advantages

- **Longer service life**
- **Full depth shoulders**

Disadvantages

- **Exceeds structural number requirements**
- **May not be good life cycle cost**

Conclusion:
Recommend to be carried forward for further Evaluation

Value Engineering Alternative-Change the layer thicknesses and material types

Advantages

- **Less construction cost**
- **Meets structural number requirements**
- **May be better life cycle cost**

Disadvantages

- **None apparent**

Conclusion:
Recommend to be carried forward for further Evaluation

C. Drainage Blanket

"As Proposed"-Use treated stone blanket

Advantages

- **May extend pavement life on a portion of the project**
- **Adds structural support**

Disadvantages

- **High construction cost**
- **Treatment of stone may not be required**
- **Blanket will only be under a portion of the final typical section**

Conclusion:
Recommend to be carried forward for further Evaluation

Value Engineering Alternative-Use untreated stone blanket

Advantages

- **May extend pavement life on a portion of the project**
- **Adds structural support**
- **Medium construction cost**

Disadvantages

- **Blanket will only be under a portion of the final typical section**

Conclusion:
Recommend to be carried forward for further Evaluation

II. HIGH MAST LIGHTING

"As Proposed"-24 high mast systems

Advantages

- **Extensive illumination**

Disadvantages

- **High construction cost**
- **Higher operation cost**

Conclusion:
Recommend to be carried forward for further Evaluation

Value Engineering Alternative-Meet the department standards for high mast lighting at interchanges only

Advantages

- Less construction cost
- Less operating cost
- Less future maintenance

Disadvantages

- None apparent

Conclusion:
Recommend to be carried forward for further Evaluation

III. MAINLINE ROADWAY EARTHWORK

"As Proposed"-Cut slopes on 1:2, fill slopes on 1:4 or 1:3

Advantages

- Reduces guardrail
- Reduces maintenance

Disadvantages

- Higher construction cost
- May have more waste
- Requires revegatation

Conclusion:
Recommend to be carried forward for further Evaluation

Value Engineering Alternative-Steepen cut slopes and flatten fill slopes only where material and right of way will allow

Advantages

- Less construction cost
- Less waste material
- Less construction time
- Less maintenance of traffic
- Less environmental impacts

Disadvantages

- May be higher future maintenance
- May not significantly reduce guardrail elimination

Conclusion:
Recommend to be carried forward for further Evaluation

IV. SLOPE EXCAVATION REQUIRING RIGHT OF WAY

"As Proposed"-Cut slopes to 1:2, Fill slopes to 1:4 or 1:3

Advantages

- Reduces guardrail
- Reduces maintenance

Disadvantages

- Higher construction cost
- May have more waste
- Requires revegatation
- Requires additional right of way
- Possible schedule impacts for right of way and environmental
- May change environmental permit requirements
- Impacts to new pavement for stage construction
- More maintenance of traffic

Conclusion:
Recommend to be carried forward for further Evaluation

Value Engineering Alternative-Steepen or maintain existing slopes to eliminate right of way takes

Advantages

- Less construction cost
- No right of way
- Less environmental impacts
- Less schedule impacts
- Less impacts to frontage roads
- Eliminates sliver cuts and fills
- Less waste material
- Less construction time

- Less impacts to new pavement for stage construction
- Less maintenance of traffic

Disadvantages

- Does not reduce guardrail
- May require future maintenance

Conclusion:
Recommend to be carried forward for further Evaluation

V. BARNES PIKE INTERCHANGE

"As Proposed"-New bridges, new ramps and a new alignment of Barnes Pike

Advantages

- Improves local access
- Ramps could be used for temporary mainline maintenance of traffic
- Reduces traffic on local roads

Disadvantages

- High construction cost
- Higher maintenance cost
- Requires right of way takes

Conclusion:
Recommend to be carried forward for further Evaluation

Value Engineering Alternative-Construct the proposed ramps to the existing Barnes Pike, use the ramps for temporary maintenance of traffic, construct the new bridges at the existing bridge locations and do not realign Barnes Pike

Advantages

- Less construction cost
- Less right of way required
- May be less construction time

Disadvantages

- May require temporary bridge for local access

Conclusion:
Recommend to be carried forward for further Evaluation

VI. SHERMAN/MT. ZION GRADE SEPARATION

"As Proposed"-Raise existing structure for vertical clearance and repair deck

Advantages

- **Less construction time**
- **Less maintenance of traffic**
- **Salvages existing structure**

Disadvantages

- **Requires raising grades**
- **Higher construction cost**

Conclusion:
Recommend to be carried forward for further Evaluation

Value Engineering Alternative No. 1-Replace the superstructure and use the existing sub-structure

Advantages

- **Salvages the existing sub-structure**
- **Less construction cost**
- **Lower service life**

Disadvantages

- **Requires guardrail around piers**
- **Requires detour of local traffic**
- **Increased maintenance of traffic on mainline**

Conclusion:
Recommend to be carried forward for further Evaluation

Value Engineering Alternative No. 2-Extend the existing frontage road to the south from Crittenden to connect to Sherman and eliminate the structure completely

Advantages

- **Would remove all obstructions along mainline**
- **Less maintenance on mainline**

Disadvantages

- **High construction cost**
- **Requires right of way**
- **Some impact to local access**
- **May impact schedule**

Conclusion:
Eliminate from further Evaluation

VII. CRITTENDEN/MT. ZION GRADE SEPARATION

"As Proposed"-New bridge at existing location

Advantages

- **Longer service life**
- **Does not require right of way**
- **No adverse impact to profile**
- **Meets clearzone requirements on mainline**
- **Provide for future expansion on mainline**
- **New bridge typical**

Disadvantages

- **High construction cost**
- **Requires temporary detours**
- **Local Access**
- **May impact school schedule**
- **Does not use the remaining life of the existing bridge**

Conclusion:
Recommend to be carried forward for further Evaluation

Value Engineering Alternative No. 1-Reconstruct the superstructure and salvage the sub-structure

Advantages

- **Less construction cost**
- **Salvages existing substructure**
- **Does not impact profiles**
- **New bridge typical**
- **Less maintenance of traffic**
- **Less construction time**

Disadvantages

- **Does not provide clear zone**
- **Requires detour**
- **Impacts to local access**
- **May impact school schedule**

Conclusion:
Recommend to be carried forward for further Evaluation

Value Engineering Alternative No. 2-Realign roadway, shorten structure and use existing bridge for maintenance of traffic

Advantages

- **No detour**
- **Shorter bridge**
- **Does not impact school schedule**
- **New bridge typical**
- **Local access**
- **Provides clearzone on mainline**
- **Allows for future expansion**

Disadvantages

- **Requires right of way**
- **Less desirable alignment on Crittenden/Mt Zion**

Conclusion:
Recommend to be carried forward for further Evaluation

VIII. REST AREA REMOVAL

"As Proposed"-Remove existing pavement

Advantages

- Aesthetics
- Eliminates guardrail

Disadvantages

- Cost of removal
- Eliminates use as a staging area by school
- Eliminates other uses such as construction staging

Conclusion:
Recommend to be carried forward for further Evaluation

Value Engineering Alternative-Do not remove

Advantages

- No cost
- Future uses
- School use

Disadvantages

- Aesthetics

Conclusion:
Recommend to be carried forward for further Evaluation

IX. NORTHBOUND EXIT TO THE KY 36 INTERCHANGE

"As Proposed"-Extend ramp

Advantages

- May improve ramp exit

Disadvantages

- May not reduce accidents
- Higher construction cost
- More maintenance of traffic

Conclusion:
Recommend to be carried forward for further Evaluation

Value Engineering Alternative-Leave the ramp as is and make needed traffic operations improvements

Advantages

- **Less construction cost**
- **May reduce accidents**
- **Less maintenance of traffic**
- **Less construction time**

Disadvantages

- **None apparent**

Conclusion:
Recommend to be carried forward for further Evaluation

X. MAINLINE AND SHOULDER TYPICAL SECTION

"As Proposed"-Provide 4.2 M median shoulder width

Advantages

- **More lateral clearance to barrier**
- **Provides area for maintenance of traffic**

Disadvantages

- **Higher construction cost**

Conclusion:
Recommend to be carried forward for further Evaluation

Value Engineering Alternative-Decrease the inside shoulder widths to 3.6 meters

Advantages

- **Less construction cost**
- **Better vertical match with outside shoulder**

Disadvantages

- **Would not be consistent with project to the north**

Conclusion:
Recommend to be carried forward for further Evaluation

VII. DEVELOPMENT PHASE

VII.(a) I. PAVEMENT

VII.(a)(1) AS PROPOSED

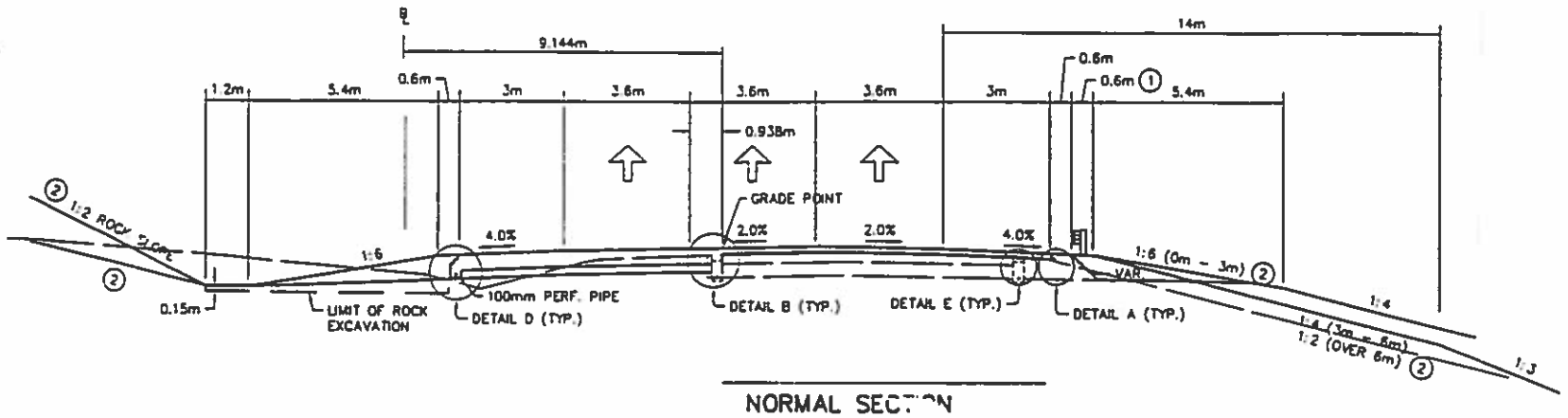
A. OPEN GRADED WEARING COURSE

"As Proposed"

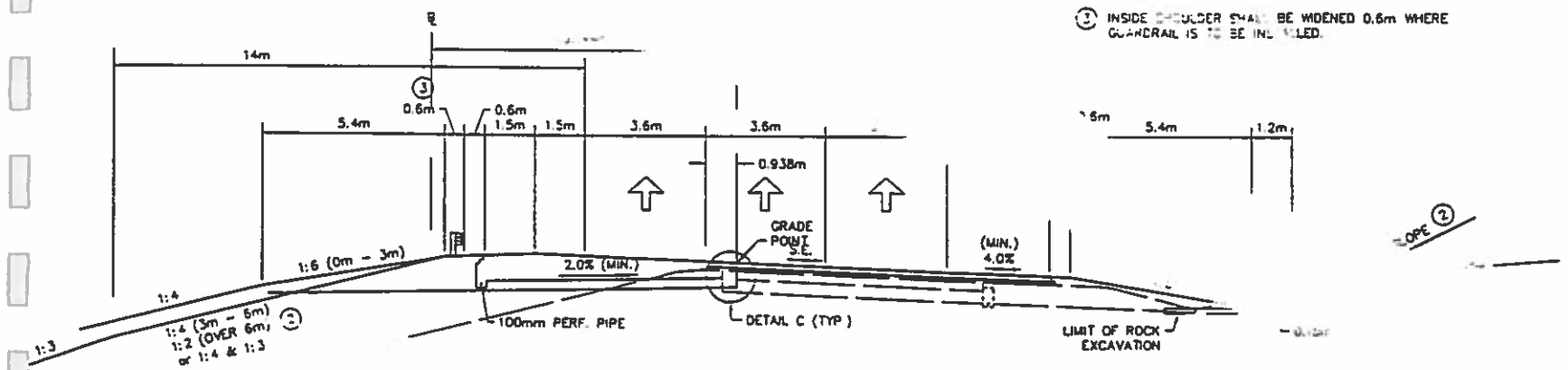
As shown in the typical section detail (Details B, C, & D), a 25mm modified open graded wearing course is to be placed on the bituminous base course. In discussions during the value engineering study, it was indicated that the function of the wearing course is to prevent raveling of the base course and also provide a desirable pavement surface while traffic is being maintained during the stage construction of the pavement section.

COUNTY	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
GRANT	1997	2a	-

TYPICAL SECTIONS



NORMAL SECTION
NORTH BOUND I-75



SUPERELEVATED SECTION
NORTH BOUND I-75

1. TRAFFIC LANES SHALL BE SHIFTED 0.6m TOWARDS THE MEDIAN USING A 100:1 TRANSITION RATE IN ORDER TO PROVIDE A 4.2m OUTSIDE SHOULDER WHERE GUARDRAIL IS TO BE INSTALLED (SEE PLANS FOR ACTUAL LIMITS).
2. SEE CROSS-SECTIONS FOR SLOPES OUTSIDE THE LIMITS OF THE SHOULDER.
3. INSIDE SHOULDER SHALL BE WIDENED 0.6m WHERE GUARDRAIL IS TO BE INSTALLED.

GENERAL PAVING NOTES:

BITUMINOUS SEAL REQUIRED FROM OUTSIDE EDGE OF PAVED SHOULDER TO A POINT 0.6m DOWN THE DITCH OR FILL SLOPE. TWO APPLICATIONS OF THE FOLLOWING:
EMULSIFIED ASPHALT RS-2
BITUMINOUS SEAL AGGREGATE

FOR SUPERELEVATED SECTIONS, THE DRAINAGE BLANKET SHALL BE CONSTRUCTED TO PROVIDE POSITIVE DRAINAGE (2.0% OR GREATER) TO THE 100mm OR 150mm PERFORATED PIPE.

MATERIAL FROM THE REMOVAL OF THE EXIST. INSIDE SHOULDER MAY BE UTILIZED IN THE BOTTOM LIFT OF THE MEDIAN BACKFILL.

PAVEMENT WIDENING FOR EXTENSION OF TAPERS AT RAMP TERMINI SHALL BE THE SAME DESIGN SCHEDULE AS FOR THE ADDITION OF A FULL WIDTH TRAFFIC LANE.

EXIST. SHOULDERS THRU THE WIDENED OR NEW TRAFFIC LANE SHALL BEREMOVED AND REPLACED WITH THE NEW SHOULDER DESIGN.

THE CONTRACTOR HAS THE OPTION OF PROVIDING BIT. CONC. SURFACE CLASS AK/A IN LIEU OF CLASS AK/S FOR SHOULDER PAVING AT THE CONTRACT UNIT BID PRICE FOR CLASS AK/S.

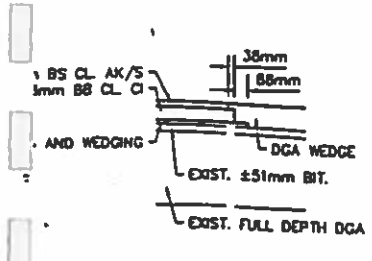
BITUMINOUS CURING SEAL MAY BE ANY OF THE FOLLOWING MATERIALS: RS-1, AE-60, SS-1, SS1-h, CRS-1, CSS-1, CSS-1h, OR PRIMER L.

SAND FOR BLOTTING MAY BE REQUIRED BY THE ENGINEER TO CONTROL TRACKING OF THE BITUMINOUS CURING SEAL. NO DIRECT PAYMENT WILL BE ALLOWED FOR THIS WORK.

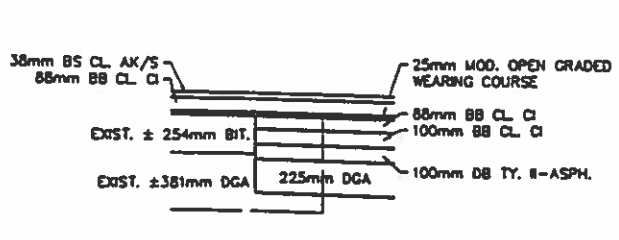
ALL EXIST. OPEN GRADED FRICTION COURSE THAT IS RAVELLED SHALL BE MILLED AS DIRECTED BY THE ENGINEER PRIOR TO THE PLACEMENT OF THE LEVELING AND WEDGING COURSE.

THE SURFACE COURSE AND THE TOP BASE COURSE OF THE TRAFFIC LANES SHALL BE MODIFIED WITH A RUT LESSENING MODIFIER. THE RUT LESSENING MODIFIER SHALL BE PMAC-1D. SEE PROPOSAL FOR MORE DETAILS.

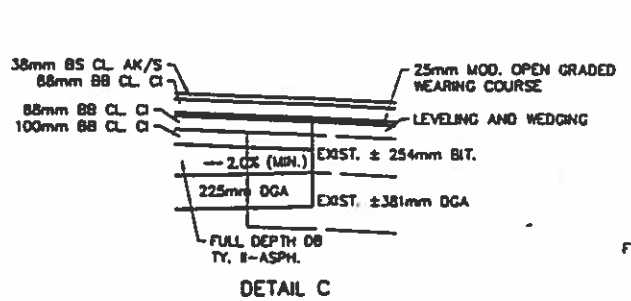
FABRIC AND THE SIZE NO. 57 AGGREGATE SHALL BE INCIDENTAL TO THE PERFORATED PIPE.



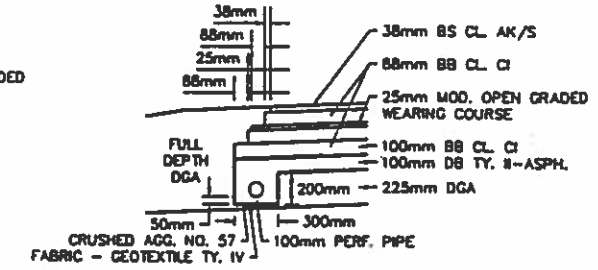
DETAIL A



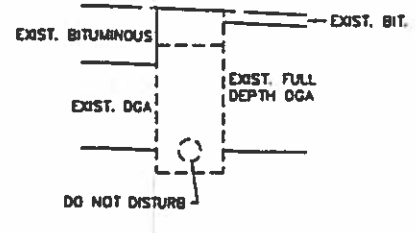
DETAIL B



DETAIL C



DETAIL D



DETAIL E

AS PROPOSED

EXHIBIT 2

VII.(a)(2) V.E. ALTERNATIVES

A. OPEN GRADED WEARING COURSE

Value Engineering Alternative

The Value Engineering Team concluded that the open graded wearing course should be eliminated since the base course should provide an adequate pavement surface for the temporary maintenance of traffic while the pavement section is being stage constructed. If the base course has a history of raveling, a binder course might be desirable which would be more cost effective than the open graded wearing course.

The estimated construction cost savings for eliminating the open graded wearing course is $1,609,148.

A. PAVEMENT OPEN GRADED WEARING COURSE COST COMPARISON

DESCRIPTION	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
OPEN GRADED WEARING COURSE	$43.58/M TON	36,920	$1,609,148	0	0
TOTAL			$1,609,148		0

Possible Savings $1,609,148

Open Graded Wearing Course Quantity Calculations

Width of Pavement - Constant Width Median Section

Median shoulder width	=	4.2m
3 Traffic lanes @ 3.6m	=	10.8m
Outside shoulder width	=	3.0m
Total width (constant Median)		18.0m x 2 = 36m
Length		15,442m

Width of Pavement - Variable Width Median Section

Shoulder widths - 2 @ 3.0m	=	6.0m
3 traffic lanes @ 3.6m	=	10.8m
Total Width (Variable Median)	=	16.8m x 2 = 33.6m
Length	=	3060m
Wt./m^3 = (149)(35.315)	=	4,944lb./m^3

Thickness = 25mm = 0.025m

$$\text{Total Quantity} = \frac{(15{,}442)(36)(0.025)(4{,}944) + (3060)(33.6)(4944)(025)}{2205\#/\text{M Ton}} = 36{,}924/\text{MTon}$$

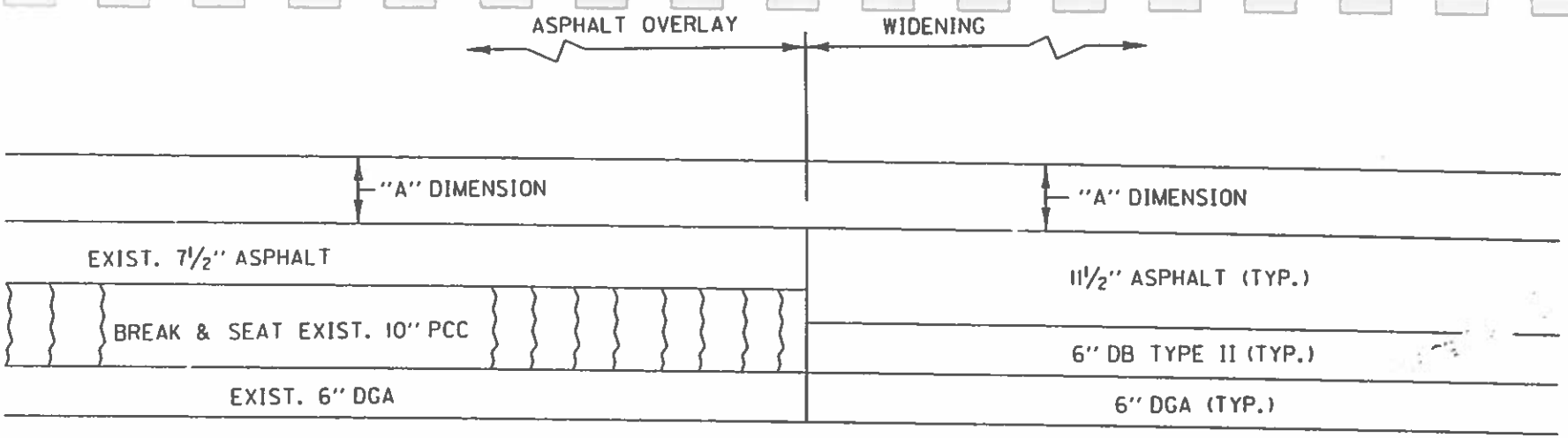
B. NEW MAINLINE PAVEMENT AND SHOULDER, BASE AND SURFACE

"As Proposed"

As shown in the pavement structure sketch (Detail 3A), the proposed overlay thickness, ("A" Dimension), is 6.5 inches, which is adequate for $50x10^6$ ESALS and a CBR of 2. Since the projected design year ESALS for this projects (see ESAL computations) exceed $30x10^6$, the Value Engineering team concluded that the required overlay thickness should be based on $50x10^6$, particularly in view of the fact that only an additional l/2" of pavement thickness is required to provide the necessary pavement structural support for the $50x10^6$ vs $30x10^6$ ESAL requirements. The Value Engineering team was advised that a CBR value of 2 is appropriate for the existing general subgrade conditions on this project.

As shown in the tabulation of SN values, the required SN for the overlay pavement thickness is 8.26 which has been provided with the proposed overlay thickness of 6.5 inches and the existing pavement section. The Value Engineering team accepted this overlay thickness as being reasonable, however, a detailed structural analysis of the SN values for the existing pavement and proposed overlay was not within the scope of this value engineering study.

Also shown on the pavement structure sketch, (Detail 3A) is the proposed pavement thickness for the pavement widening which calls for a total bituminous base and surface thickness of 18 inches (11 1/2" + 6 1/2"). Since the SN value for the proposed widened section as shown in the tabulation is 9.36 vs a required SN value of 8.26, the Value Engineering Team considered alternative pavement thicknesses that would provide the required SN value by varying the different pavement thicknesses, such as increasing the depth of the less expensive drainage blanket material and decreasing the thickness of the more expensive bituminous base material.



REQUIRED OVERLAY THICKNESS

CBR	2	4	7	11
ESAL'S	"A" DIMENSIONS			
30×10^6	6.0"	4.5"	3.0"	1.5"
50×10^6	6.5"	5.5"	3.5"	2.0"
70×10^6	7.5"	6.5"	4.5"	3.0"

AS PROPOSED

TYPICAL ASPHALT OVERLAY DIMENSIONS DETAIL "3A"

FORECAST OF EQUIVALENT AXLE LOAD ACCUMULATIONS - DESIGN

TD 10-1 No... 59416

COUNTY..... GRANT

DATE..... 07/18/96
TIME..... 10:23 am
NAME..... B. Feige

ROUTE ID:

Road Name..... Lexington - Covington Road

Project Nos..... FD48 041 0075 154-166 035 D
0001M 00756 081

Project Limits..... I-75 from KY 491 @ Crittenden
to KY 22 at Dry Ridge

Route No..... I-75
Item No..... 6-072.00
File No..... 96_029AD.WKS
T.E. No..... 96.029
Segment..... A

Ref. Stations..... TVS, TLA Stn P23
PTR Rpt, Stn P23, May 1996

1993 Man'l Class Cnt, Stn P23

COAL94.SEG

FUNCTIONAL CLASS:

Rural -		Urban -	
01 Interstate	X	11 Interstate	
02 Principal Arterl		12 Othr Fre'ws & X-Wys	
06 Minor Arterial		14 Othr Prncpl Arterl	
07 Major Collector		16 Minor Arterial	
08 Minor Collector		17 Collector	
09 Local		19 Local	

DATES:

Constrction Year	Design Period	Year at Mid-term
2003	20	2013

TRAFFIC PARAMETERS:

	Cnstrctn Yr Forecast		Annual Change		Years to Mid-term		Mid-term Incremnt		Cnstrctn Yr Forecast		Mid-term Forecast
Volume (AADT)	43,744	x	1.0250	^	10.0	=	12,252	+	43,744	=	55,996
Percent Trucks (%T)	23.0	x	1.0000	^	10.0	=	.000	+	23.000	=	23.0
Percent Trucks Hauling Coal (%CT)	.2	x	.9756	^	10.0	=	-.043	+	.2	=	.155
Non-Coal Trucks:											
Axles/Truck (A/NCT)	4.495	x	1.0000	^	10.0	=	.000	+	4.495	=	4.495
EALs/Axle (EAL/NCA)	.238	x	1.0200	^	10.0	=	.052	+	.238	=	.290
Coal Trucks:											
Axles/Truck (A/CT)	A/NCT Appld. 4.495	x	1.0000	^	10.0	=	.000	+	4.495	=	4.495
EALs/Axle (EAL/CA)	.810	x	1.0000	^	10.0	=	.000	+	.810	=	.810

DAILY EALs AT MID-TERM:

4-Tired Vehicles:	55,996 AADT	x	.770 1-(%T/100)	x	.005				=	215.583
Non-Coal Trucks:	55,996 AADT	x	.230 (%T/100)x (1)	x	4.495 A/NCT	x	.290 EAL/NCA		=	16,753.648
Coal Trucks:	55,996 AADT	x	.00036 (%T/100)x (%CT/100)	x	4.495 A/CT	x	.810 EAL/CA		=	72.818
			Total Mid-term daily EALs.....						=	17,042.049

DESIGN EALs: 17,042.049 Mid-term Daily EALs x 365 x 20 Design Period x .2752 Lane Adjustment = 34,240,000 Design EAL in Critical Lane

No. of Lanes..... 6 1 or 2 Way..... 2

Form TF93_95.WKS

FORECAST OF EQUIVALENT AXLE LOAD ACCUMULATIONS - DESIGN

TD 10-1 No... 59416

COUNTY..... GRANT

DATE..... 07/18/96
TIME..... 10:48 am
NAME..... B. Feige

ROUTE ID:

Road Name..... Lexington - Covington Road

Project Nos..... FD48 041 0075 154-166 035 D
000IM 00756 081

Project Limits..... I-75 from KY 22 @ Dry Ridge
to KY 36 at Williamstown

Route No..... I-75
Item No..... 6-072.00
File No..... 96_029BD.WKS
T.E. No..... 96.029
Segment..... B

Ref. Stations..... TVS, TLA Stn 251
PTR Rpt, Stn 251, Apr 1996

1993 Man'l Class Cnt, Stn P23

COAL94.SEG

FUNCTIONAL CLASS:

Rural -		Urban -	
01 Interstate	X	11 Interstate	----------
02 Principal Arterl	----------	12 Othr Fre'ws & X-Wys	----------
06 Minor Arterial	----------	14 Othr Prncpl Arteri	----------
07 Major Collector	----------	16 Minor Arterial	----------
08 Minor Collector	----------	17 Collector	----------
09 Local	----------	19 Local	----------

DATES:

Constrction Year	Design Period	Year at Mid-term
2003	20	2013

TRAFFIC PARAMETERS:

	Cnstrctn Yr Forecast		Annual Change		Years to Mid-term		Mid-term Incremnt		Cnstrctn Yr Forecast		Mid-term Forecast
Volume (AADT)	39,000	x	1.0250	^	10.0	=	10,923	+	39,000	=	49,923
Percent Trucks (%T)	24.2	x	1.0000	^	10.0	=	.000	+	24.200	=	24.2
Percent Trucks Hauling Coal (%CT)	.2	x	.9756	^	10.0	=	-.049	+	.2	=	.2
Non-Coal Trucks:											
Axles/Truck (A/NCT)	4.495	x	1.0000	^	10.0	=	.000	+	4.495	=	4.495
EALs/Axle (EAL/NCA)	.238	x	1.0200	^	10.0	=	.052	+	.238	=	.290
Coal Trucks:											
Axles/Truck (A/CT)	A/NCT Appld. 4.495	x	1.0000	^	10.0	=	.000	+	4.495	=	4.495
EALs/Axle (EAL/CA)	.810	x	1.0000	^	10.0	=	.000	+	.810	=	.810

DAILY EALs AT MID-TERM:

4-Tired Vehicles:	49,923 AADT	x	.758 1-(%T/100)	x	.005				=	189.209
Non-Coal Trucks:	49,923 AADT	x	.242 (%T/100)x (1-%CT/100)	x	4.495 A/NCT	x	.290 EAL/NCA		=	15,713.151
Coal Trucks:	49,923 AADT	x	.000 (%T/100)x (%CT/100)	x	4.495 A/CT	x	.810 EAL/CA		=	76.619
			Total Mid-term daily EALs.....						=	15,978.978

DESIGN EALs:

15,978.978 Mid-term Daily EALs	x	365	x	20 Design Period	x	.2906 Lane Adjustment	=	33,902,000 Design EAL in Critical Lane

No. of Lanes..... 6 1 or 2 Way..... 2

Form TF93_95.WKS

FORECAST OF EQUIVALENT AXLE LOAD ACCUMULATIONS - DESIGN

TD 10-1 No... 59416

COUNTY..... GRANT

DATE..... 07/18/96
TIME..... 11:35 am
NAME..... B. Feige

ROUTE ID:

Road Name..... Lexington - Covington Road

Project Nos..... FD43 041 0075 144-155 034 D
000NH 00756 081

Project Limits..... I-75 frm KY 36 @ Williamstown
to KY 330 at Corinth

Route No..... I-75
Item No..... 6-072.00
File No..... 96_029CD.WKS
T.E. No..... 96.029
Segment..... C

Ref. Stations..... TVS, TLA Stn 261
PTR Rpt, Stn 261, Apr 1996

1993 Man'l Class Cnt, Stn P23

COAL94.SEG

FUNCTIONAL CLASS:

Rural -		Urban -	
01 Interstate	X	11 Interstate	
02 Principal Arterl		12 Othr Fre'ws & X-Wys	
06 Minor Arterial		14 Othr Prncpl Arterl	
07 Major Collector		16 Minor Arterial	
08 Minor Collector		17 Collector	
09 Local		19 Local	

DATES:

Constrction Year	Design Period	Year at Mid-term
2003	20	2013

TRAFFIC PARAMETERS:

	Cnstrctn Yr Forecast		Annual Change		Years to Mid-term		Mid-term Incremnt		Cnstrctn Yr Forecast		Mid-term Forecast
Volume (AADT)	36,600	x	1.0250	^	10.0	=	10,262	+	36,600	=	46,862
Percent Trucks (%T)	23.0	x	1.0000	^	10.0	=	.000	+	23.000	=	23.0
Percent Trucks Hauling Coal (%CT)	.2	x	.9756	^	10.0	=	-.052	+	.2	=	.2
Non-Coal Trucks:											
Axles/Truck (A/NCT)	4.495	x	1.0000	^	10.0	=	.000	+	4.495	=	4.495
EALs/Axle (EAL/NCA)	.238	x	1.0200	^	10.0	=	.052	+	.238	=	.290
Coal Trucks:											
Axles/Truck (A/CT)	A/NCT Appld. 4.495	x	1.0000	^	10.0	=	.000	+	4.495	=	4.495
EALs/Axle (EAL/CA)	.810	x	1.0000	^	10.0	=	.000	+	.810	=	.810

DAILY EALs AT MID-TERM:

4-Tired Vehicles:	46,862 AADT	x	.770 1-(%T/100)	x	.005			=	180.418
Non-Coal Trucks:	46,862 AADT	x	.230 (%T/100)x (1)	x	4.495 A/NCT	x	.290 EAL/NCA	=	14,016.606
Coal Trucks:	46,862 AADT	x	.000 (%T/100)x (%CT/100)	x	4.495 A/CT	x	.810 EAL/CA	=	72.818
			Total Mid-term daily EALs.....					=	14,269.842

DESIGN EALs: 14,269.842 Mid-term Daily EALs x 365 x 20 Design Period x .3000 Lane Adjustment = 31,249,000 Design EAL in Critical Lane

No. of Lanes..... 6 1 or 2 Way..... 2

Form TF93_95.WKS

SN Required

ESAL's	CBR=2	CBR=4	CBR=7	CBR=11
30	7.7	7.1	6.46	5.9
50	8.26	7.58	6.94	6.38
70	8.62	7.94	7.3	6.74

Alt "1A"

SN Provided (Widening Portion)

ESAL's	CBR=2	CBR=4	CBR=7	CBR=11
30	8.94	8.54	7.54	6.94
50	9.34	8.94	7.94	7.34
70	9.74	9.34	8.34	7.74

Alt "2A"

SN Provided (Widening Portion)

ESAL's	CBR=2	CBR=4	CBR=7	CBR=11
30	7.74	7.14	6.48	6.28
50	8.28	7.68	7.42	6.42
70	8.82	8.22	7.82	7.42

Alt "3A"

SN Provided (Widening Portion)

ESAL's	CBR=2	CBR=4	CBR=7	CBR=11
30	9.16	8.56	7.96	7.36
50	9.36	8.96	8.16	7.56
70	9.76	9.36	8.56	7.96

Alt "4A"

SN Provided (Widening Portion)

ESAL's	CBR=2	CBR=4	CBR=7	CBR=11
30	8.14	7.54	6.94	6.94
50	8.54	7.94	7.34	7.34
70	8.94	8.34	7.74	7.74

B. NEW MAINLINE PAVEMENT AND SHOULDER, BASE AND SURFACE

Value Engineering Alternative

As discussed in the "As Proposed", the value engineering pavement section provides an overlay thickness of 6.5 inches consisting of a surface layer of 1.5 inches (38m) and 5 inches (127mm) of bituminous base material, which is the same as the proposed overlay thickness.

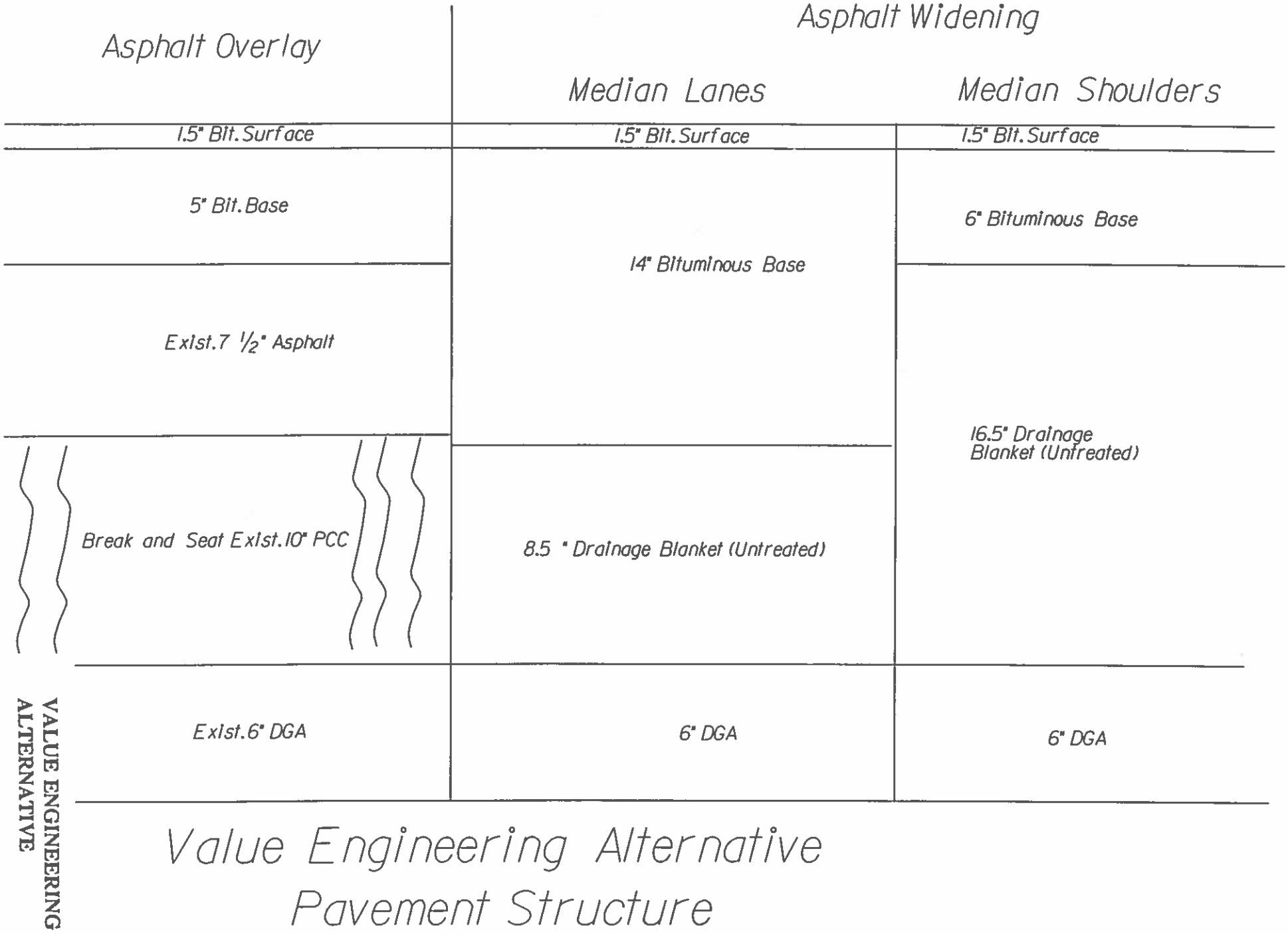
For the widened section, for the additional traffic lane, the recommended value engineering pavement section is as follows.

Pavement Course	Structural Coeff.	Thickness (Inches)	(mm)	SN Value
Bit. Surface	0.44	1.5	38	0.66
Bit. Base	0.40	14.0	356	5.60
Drainage Blanket (untreated)	0.14	8.5	216	1.19
Dense Graded Base	0.14	6.0	152	0.84
Total		30	762	8.29

The recommended Value Engineering pavement structure is shown in the sketch in this section. For the widened section for the median shoulder lanes, the recommended Value Engineering pavement section is as follows.

Pavement Course	Structural Coeff	Thickness (Inches)	(mm)	SN Value
Bit. Surface	0.44	1.5	38	0.66
Bit. Base	0.40	6.0	152	2.40
Drainage blanket (untreated)	0.14	16.5	419	2.31
Dense Graded Base	0.14	6.0	152	0.84
Total		30	761	6.21

The preceding section will provide adequate structural support for use as a through traffic lane for maintaining traffic during the stage construction of the widened and resurfaced pavement.



Value Engineering Alternative
Pavement Structure

B. NEW MAINLINE PAVEMENT AND SHOULDER, BASE AND SURFACE COST COMPARISON

DESCRIPTION	UNIT COST	PROP' DQTY.	PROP'D COST	V.E. QTY.	V.E. COST
BIT. CONC. SURFACE CLASS AK/A	$35.00/M TON	58,813	$ 2,058,455	58,813	$ 2,058,455
BIT CONC. BASE CLASS I	$31.00/M TON	389,539	$12,075,709	276,945	$ 8,585,295
DRAINAGE BLANKET TYPE II ASPHALT	$29.00/M TON	106,693	$ 3,094,097	0	0
DRAINAGE BLANKET (UNTREATED)	$9.58/M TON	0	0	210,127	$ 2,013,017
DENSE GRADED AGG.	$16.00/M TON	122,688	$ 1,963,008	122,688	$ 1,963,008
TOTAL			$19,191,269		$14,619,775

Possible Savings $4,571,494

Quantity calculations are as follows.

Length of Project = 15,442m - Constant width median; 3060m - Variable width median; A total of 18,502m.

Proposed pavement section - quantities:

Bit. Surface Course = 58,813/M Tons

Constant Width Med. Sect. = $\frac{(0.038)(36)(15.442)(35.315)(146.7)}{2205}$ = 49,633/M Tons

Variable Width Median Area = $\frac{(0.038)(33.6)(3060)(35.315)(146.7)}{2205}$ = 9180/M Tons

Bit. Base Course = 389,539/M Tons

Median Traffic Lanes

Base Course = $\frac{(0.419)(7.2)(18.502)(35.315)(146.7)}{2205}$ = 131,143/M Tons

Median Shoulders Base Course = $\frac{(0.419)(8.4)(15.442)(35.315)(146.7)}{2205}$ = 127,696/M Tons =

$\frac{(0.419)(6.0)(3060)(35.315)(146.7)}{2205}$ = 18,075/M Tons

Resurfacing Lanes and Shoulders-Base Course =

$\frac{(0.127)(20.4)(18.502)(35.315)(146.7)}{2205}$ = 112,625/M Tons

Drainage Blanket-Treated = $\frac{(0.152)(15.076)(3060)(35.315)(133.4)}{2205}$ = 14,983/M Tons =

106,693/M Tons

$\frac{(0.152)(18.288)(15.442)(35.315)(133.4)}{2205}$ = 91,711/M Tons

Dense Graded Base = 122,688/M Tons

$\frac{(0.152)(18.288)(15.442)(35.315)(153.4)}{2205}$ = 105,460/M Tons

$\frac{(0.152)(15.076)(3060)(35.315)(153.4)}{2205}$ = 17,228/M Tons

Value Engineering Alternative Quantities

Dense Graded Base = 122,688/M Tons

Bit Surface Course = 58,813/M Tons
Bit Base Course = 276,945/M Tons
Med. Traffic Lanes = $\frac{(03556)(7.2)(18,502)(35.315)(146.7)}{2205}$ = 111,300/M Tons

Med. Shoulder Base Course 53,020/M Tons

$$\frac{(0.1524)(8.4)(15,442)(35.315)(146.7)}{2205} = 46,446/\text{M Tons}$$

$$\frac{(0.1524)(6.0)(3060)(35.315)(146.7)}{2205} = 6,574/\text{M Tons}$$

Resurfaced Lanes & Shoulders = 112,625/M Tons

Drainage Blanket (untreated) = 210,127/M Tons
Median lanes
Width of DB = (3.6+0.938)(2) = 9.076m
Depth = 0.2159m = $\frac{(0.2159)(9.076)(18,502)(35.315)(126.7)}{2205}$ **= 73,569/M Tons**

Median Shoulders - Constant width median
Width = (4.606)(2) = 9.212m
Depth = 16.5' = 0.419m
Length = 15,442m = $\frac{(0.419)(9.212)(15,442)(35.315)(126.7)}{2205}$ **= 120,948/M Tons**

Median Shoulders Variable Width Median = $\frac{(0.419)(6.0)(3060)(35.315)(126.7)}{2205}$ **=**

15,610/MTons

The possible cost savings with the Value Engineering alternative pavement design, as shown in the tabulation is $4,571,494.

C. DRAINAGE BLANKET

"As Proposed"

The proposed plans call for a 152mm(6m) drainage blanket - type II - asphalt, under the widened pavement and median shoulder.

C. DRAINAGE BLANKET

Value Engineering Alternative

The Value Engineering Alternative proposes to utilize an untreated drainage blanket 152mm (6m) in depth in lieu of the asphalt treated material. Since the primary function of the drainage blanket is to drain water percolating through the pavement structure to the perforated underdrain, the untreated crushed and graded material should adequately convey any water that may collect under the pavement surface.

The primary reason for recommending the untreated drainage blanket material is the cost savings that can be realized without adversely impacting the functions of the drainage blanket.

IC. DRAINAGE BLANKET
COST COMPARISON

DESCRIPTION	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
DRAINAGE BLANKET TYPE II ASPHALT	$29.00/M TON	106,693	$3,094,097	0	0
DRAINAGE BLANKET UNTREATED	$ 9.58/M TON	0	0	106,693	$1,022,119
TOTAL			$3,094,097		$1,022,119

Possible Savings **$2,071,978**

The estimated quantity calculations are as follows:

Width = 9.144m x 2 = 18.288m - constant width median
Length = 18,502M = 15.076m - variable median
Depth = 0.152m

Prop. Quantity - Constant width median

$$\frac{(18.288m)(15,442)(0/152m)(35/315)(133.4\#/ft^3)}{2205} = 91,711/M\ Ton$$

Variable Width Median Quantity

$$\frac{(15.076m)(3060m)(0.152m)(35.315)(133.4\#/ft^3)}{2205} = 14,982/M\ Tons$$

Total proposed quantity = 106,693/M Ton
Value Engineering Alternative Quantity = 106,693/M Ton

As shown on the following cost comparison, the possible cost savings with the Value Engineering Alternative (untreated) drainage blanket is @2,071,978.

Surf	0.44	1.5	.66
Base	0.40	16.5	6.6
Blanket	0.14	6	.84
DGA	0.14	6	.84
		SN =	8.94
		Req'd =	8.26

VII.(b) II. HIGH MAST LIGHTING

VII.(b)(1) AS PROPOSED

"As Proposed"

As proposed 1 L.S. $1,200,000 (assumed 8 poles per interchange).

VII.(b)(2) V.E. ALTERNATIVE

Value Engineering Alternative

The Value Engineering Alternative was for high mast lighting only at interchanges to Kentucky Transportation Cabinet standards. KY 36 Interchange - 4 poles @ 50,000 ea., Barnes Pike Interchange - (bifurcated Sect. 8 poles), KY 22 Interchange 4 poles, 16 poles total.

COUNTY OF	FISCAL YEAR	SHEET NO.	TOTAL SHEETS

GENERAL:

All underground conduit shall be 2" or 3" PVC (Schedule 80) unless otherwise specified. Contractor shall run 2" PVC inside each 3½" RS conduit under roadways. Only the PVC conduit need be turned up into the junction boxes. Conduit, junction boxes and road crossing locations are schematic only. Exact locations shall be approved by the engineer and denoted on the as-built plans.

Junction boxes shall be placed in locations to avoid standing water. They are located at the end of road crossings. Splices shall be allowed only in JB necessary and located only in junction boxes. Any additional junction boxes shall be approved by the engineer.

Contractor shall install 35' wood pole and necessary anchors for service. Contractor shall install lighting control equipment on pole. Contractor shall contact local utility company Kentucky Utilities at 606/623-1580) before installing service pole to provide 480 volt single phase service and determine exact pole/meter location.

All cables shall be labeled inside pole bases with circuit numbers. Upon completion of the project all roadway lighting circuits must pass an insulation test of 10 million ohms to ground.

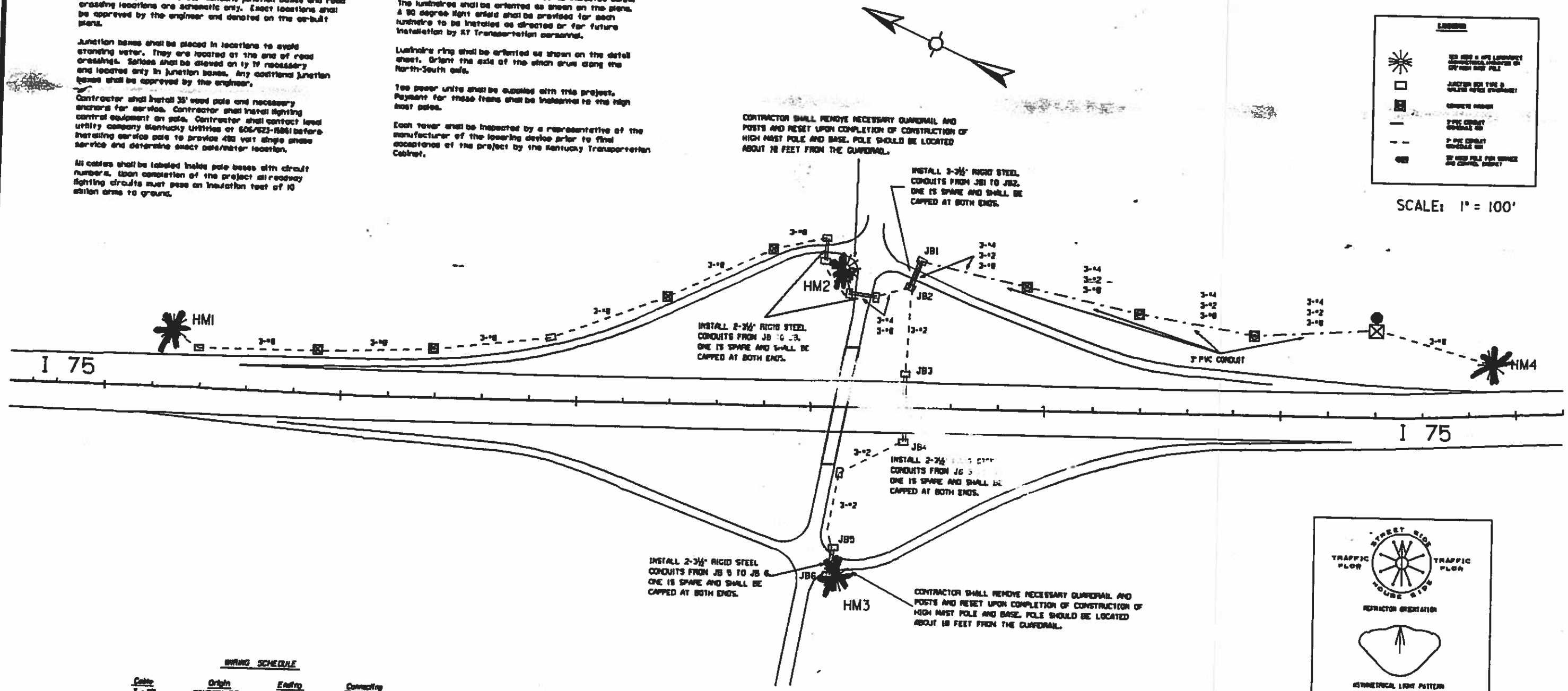
HIGH MAST:

Each pole shall be 120' in length and located as shown on the plans. Each pole shall be on a separate circuit and have ten 1000 W HPS luminaires with asymmetrical light patterns oriented as indicated below. The luminaires shall be oriented as shown on the plans. A 90 degree right angle shall be provided for each luminaire to be installed as directed or for future installation by KY Transportation personnel.

Luminaire ring shall be oriented as shown on the detail sheet. Orient the axis of the short arms along the North-South axis.

Two power units shall be supplied with this project. Payment for these items shall be incidental to the high mast poles.

Each tower shall be inspected by a representative of the manufacturer of the lowering device prior to final acceptance of the project by the Kentucky Transportation Cabinet.



LEGEND

SCALE: 1" = 100'

WIRING SCHEDULE

Cable	Origin	Ending	Connecting
3 - #2	CONTROLLER	HM 1	HM 1 (CKT #1)
3 - #4	CONTROLLER	HM 2	HM 2 (CKT #2)
3 - #2	CONTROLLER	HM 3	HM 3 (CKT #3)
3 - #8	CONTROLLER	HM 4	HM 4 (CKT #4)

VALUE ENGINEERING ALTERNATIVE

HIGH MAST LIGHTING
COST COMPARISON

DESCRIPTION	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
HIGH MAST LIGHTING	LS	1	$1,200,000	1	$800,000
TOTAL			$1,200,000		$800,000

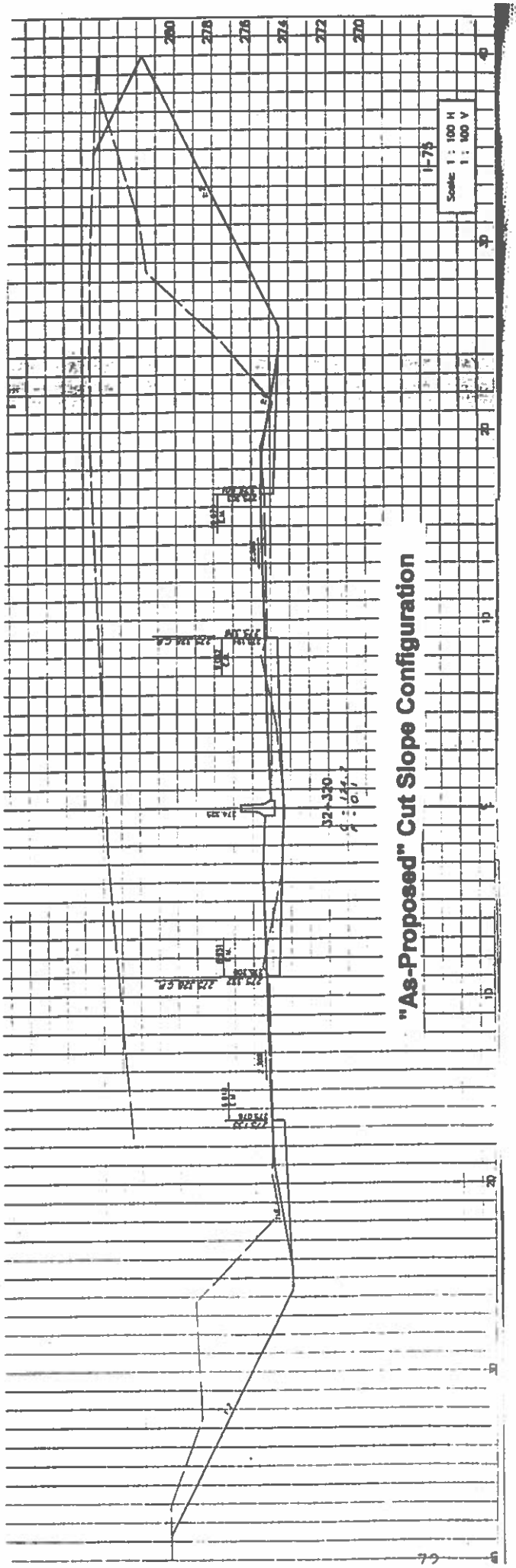
Possible Savings **$400,000**

VII.(c) III. MAINLINE ROADWAY EARTHWORK

VII.(c)(1) AS PROPOSED

"As Proposed"

The "As Proposed" typical cut slope for the project consists of a 1:2 slope from the roadway ditch to original groundline.


"As-Proposed" Cut Slope Configuration
I-75
Scale: 1 : 100 H
1 : 100 V
280
278
276
274
272
270

AS PROPOSED

VII.(c)(2) V.E. ALTERNATIVE

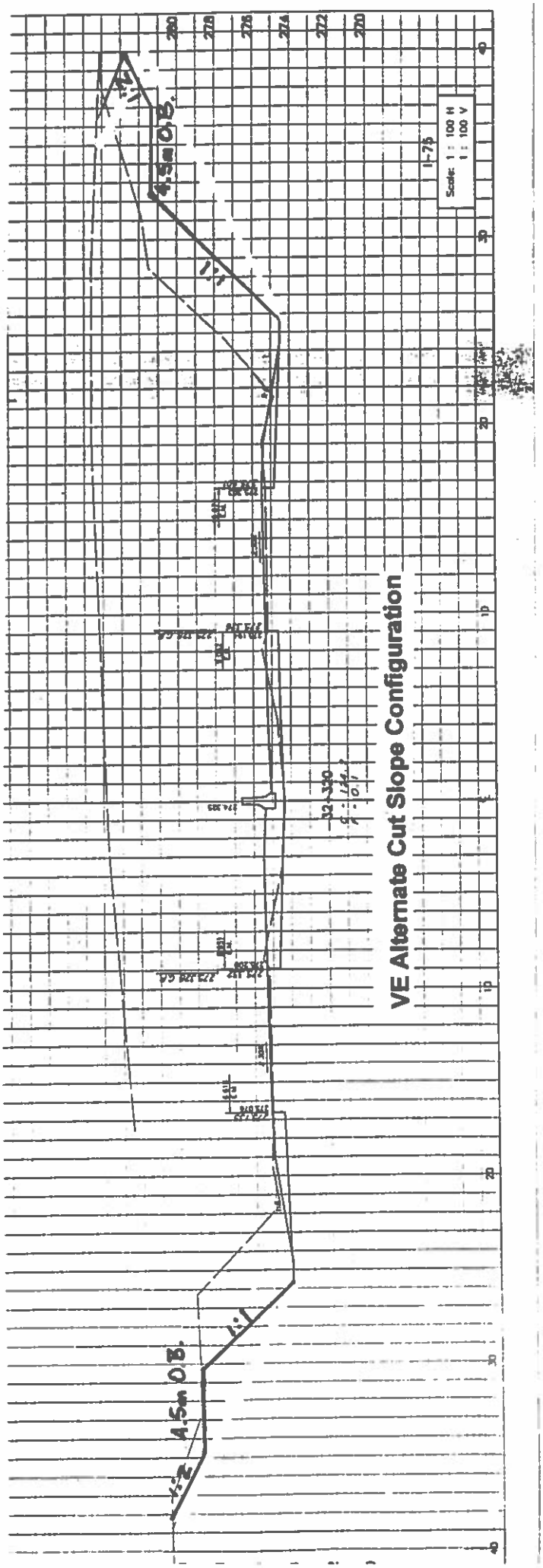
Value Engineering Alternative

The Value Engineering alternative typical cut slope (for selected cut sections) is a 1:1 slope from the roadway ditch to no more than 9m above the ditchline elevation. A 4.5m wide overburden bench would be constructed at that elevation. A 1:2 slope would be constructed from the bench elevation to original groundline.

The selected cut sections are as follows.

16+120 to 16+320	Cut
12+940 to 17+160 NB	Cut
16+980 to 17+160 SB	Cut
18+780 to 18+940 NB	Cut
18+840 to 19+040 SB	Cut
19+680 to 19+960	Cut
20+240 to 20+360	Cut
21+580 to 21+760	Cut
28+000 to 28+160	Cut
29+620 to 29+720	Cut
30+280 to 30+400	Cut
32+280 to 32+600	Cut

Cuts	Orig. Exc. Quantity (CM)	Revised Exc. Quantity (CM)
16+120 to 16+320	36733	20299
12+940 to 17+160 NB	59395	44284
16+980 to 17+160 SB	58285	34971
18+780 to 18+940 NB	48000	29250
18+840 to 19+040 SB	62907	50326
19+680 to 19+960	51181	34470
20+240 to 20+360	14365	8619
21+580 to 21+760	16672	10686
28+000 to 28+160	15841	11419
29+620 to 29+720	8107	4054
30+280 to 30+400	12280	8596
32+280 to 32+600	24902	17431
Total	408688	274405
Difference	134263	



VALUE ENGINEERING
ALTERNATIVE

MAINLINE ROADWAY EARTHWORK
COST COMPARISON

DESCRIPTION	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
ROADWAY EXCAVATION	$6.50/CM	408,688 CM	$2,656,472	274,405/CM	$1,783,633

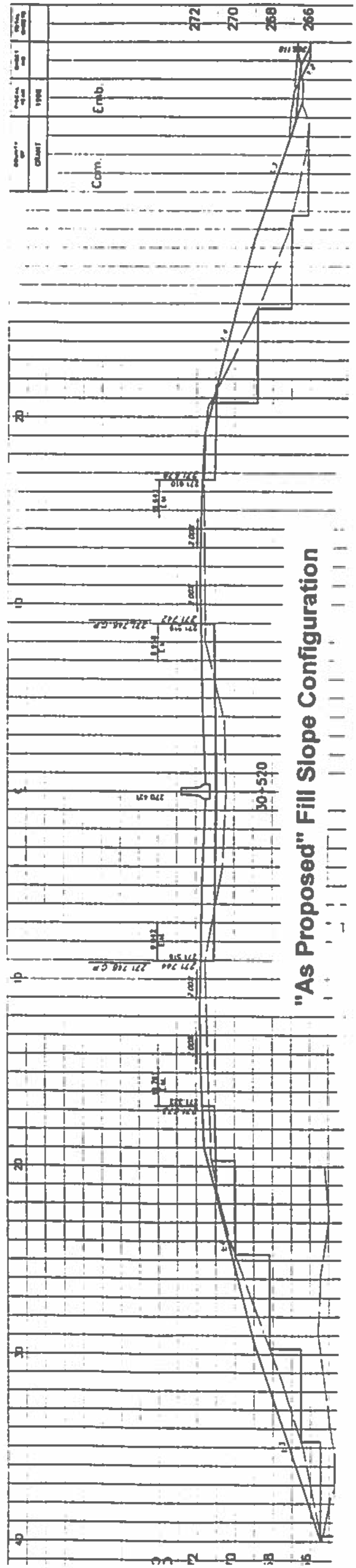
Possible Savings $ 872,839

VII.(d) IV. SLOPE EXCAVATION REQUIRING RIGHT OF WAY

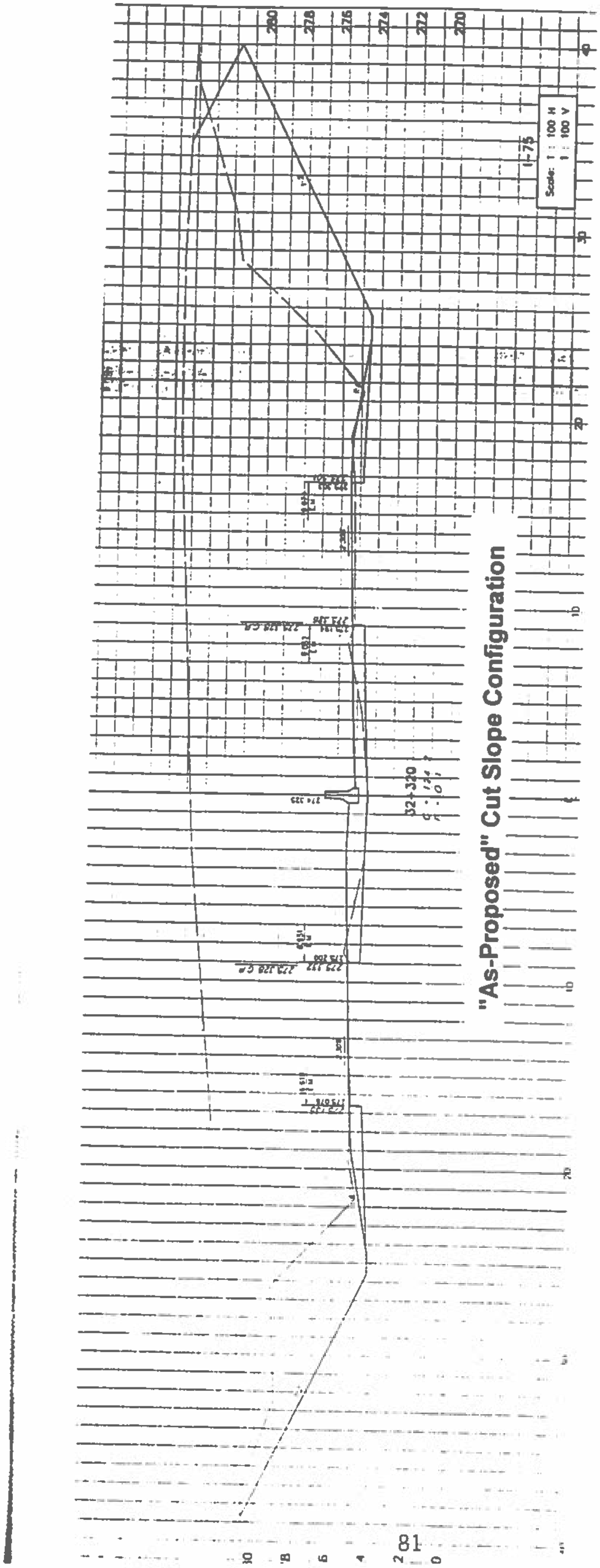
VII.(d)(1) AS PROPOSED

"As Proposed"

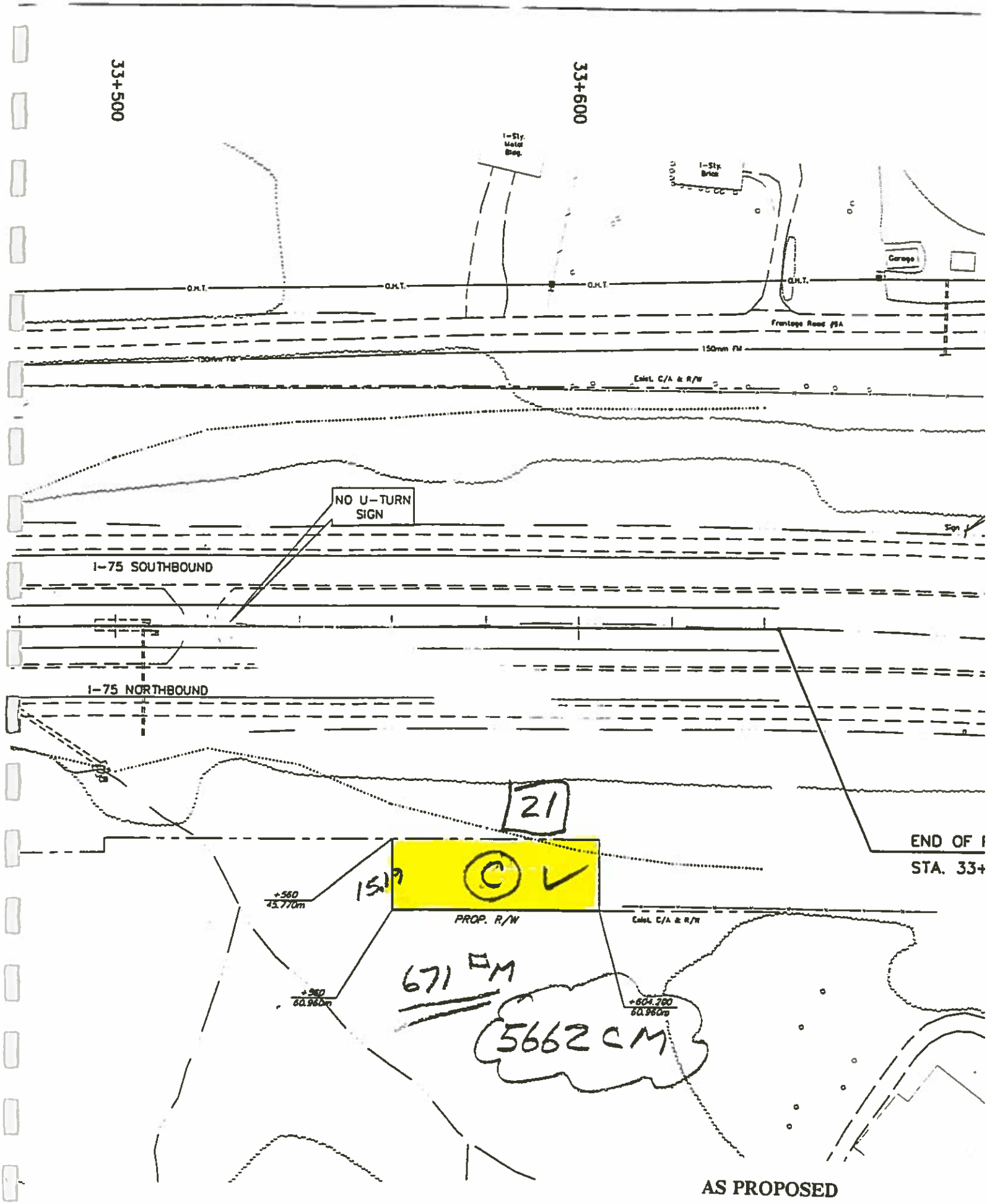
The "As Proposed" design flattens existing fill slopes to 1:4 & 1:3 so as to eliminate existing guardrail. The "As Proposed" also lays back steep cut slopes to 1:2 to minimize maintenance required to keep falling rocks out of the clear zone. Additional R/W will be required to accommodate these new flatter slopes in some areas.

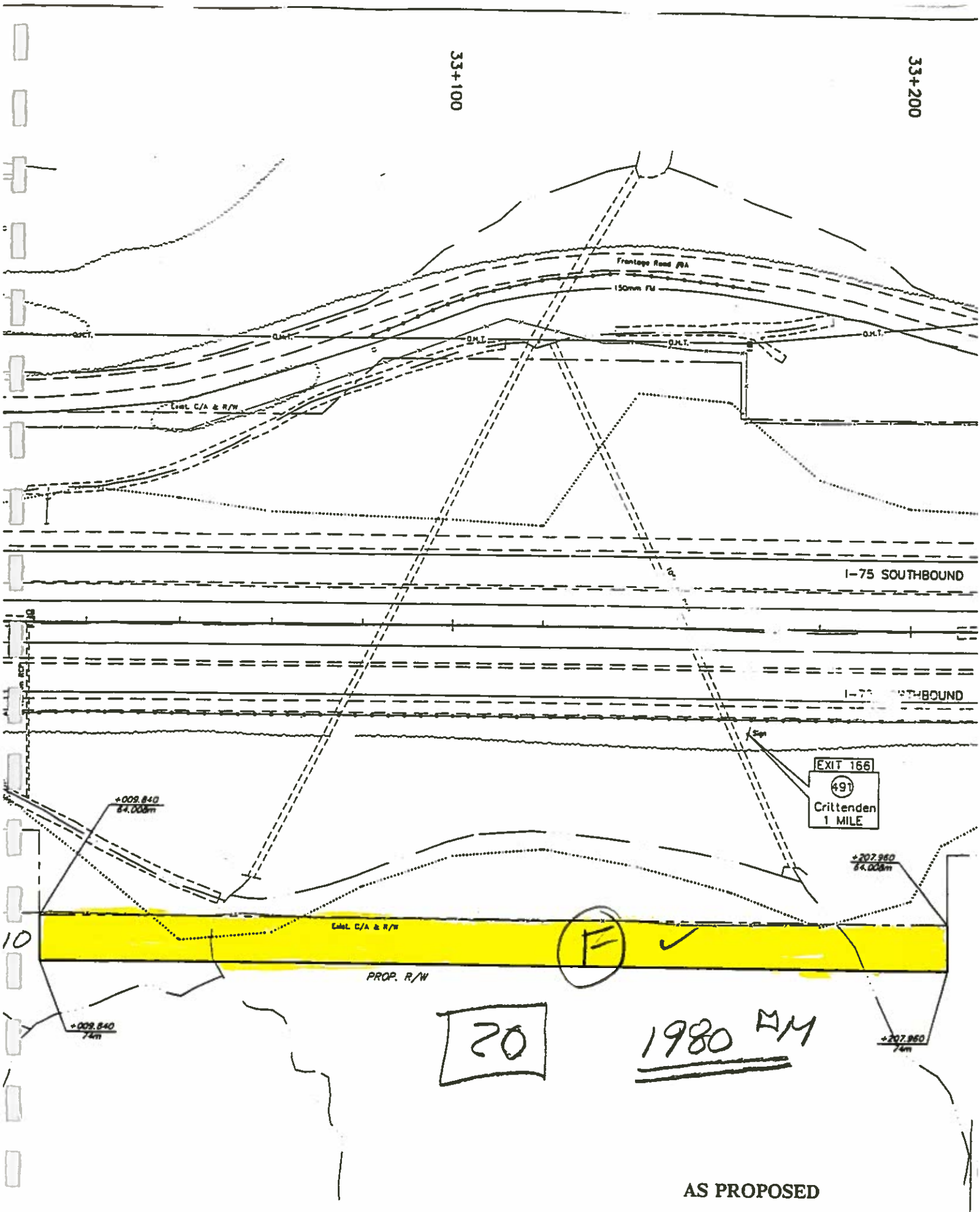

"As Proposed" Fill Slope Configuration
272
270
268
266
Emb.
Com.
30+520
20
10
10
20
30
40

AS PROPOSED


"As-Proposed" Cut Slope Configuration
I-75
Scale: 1 : 100 H
1 : 100 V
32+320
280
278
276
274
272
270

AS PROPOSED

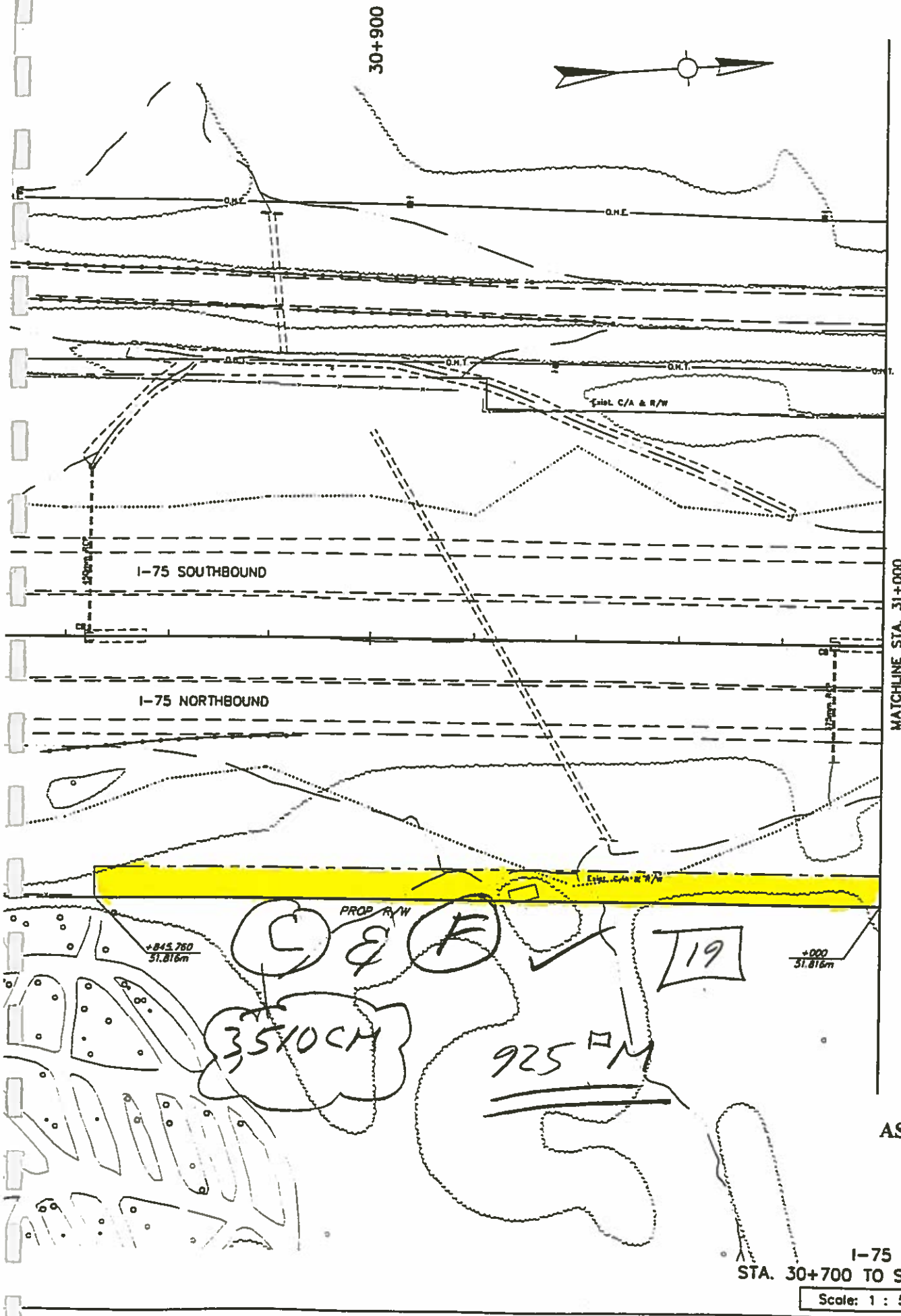

33+500
33+600
1-Sty. Metal Bldg.
1-Sty. Brick
Garage
O.H.T.
Frontage Road #5A
150mm FM
Exist. C/A & R/W
NO U-TURN SIGN
Sign
I-75 SOUTHBOUND
I-75 NORTHBOUND
21
END OF
STA. 33+
+560
45.770m
15.19
PROP. R/W
Exist. C/A & R/W
671 SM
5662 CM
+960
60.960m
+604.200
60.960m
AS PROPOSED


33+100
33+200
Frontage Road #8A
150mm FM
O.H.T.
Estat. C/A & R/W
I-75 SOUTHBOUND
EXIT 166
491
Crittenden
1 MILE
+009.840
84.008m
+207.960
84.008m
10
Estat. C/A & R/W
PROP. R/W
+009.840
74m
+207.960
74m
20
1980 MM

AS PROPOSED

COUNTY OF	FISCAL YEAR
GRANT	1997

ITEM #6-72.(



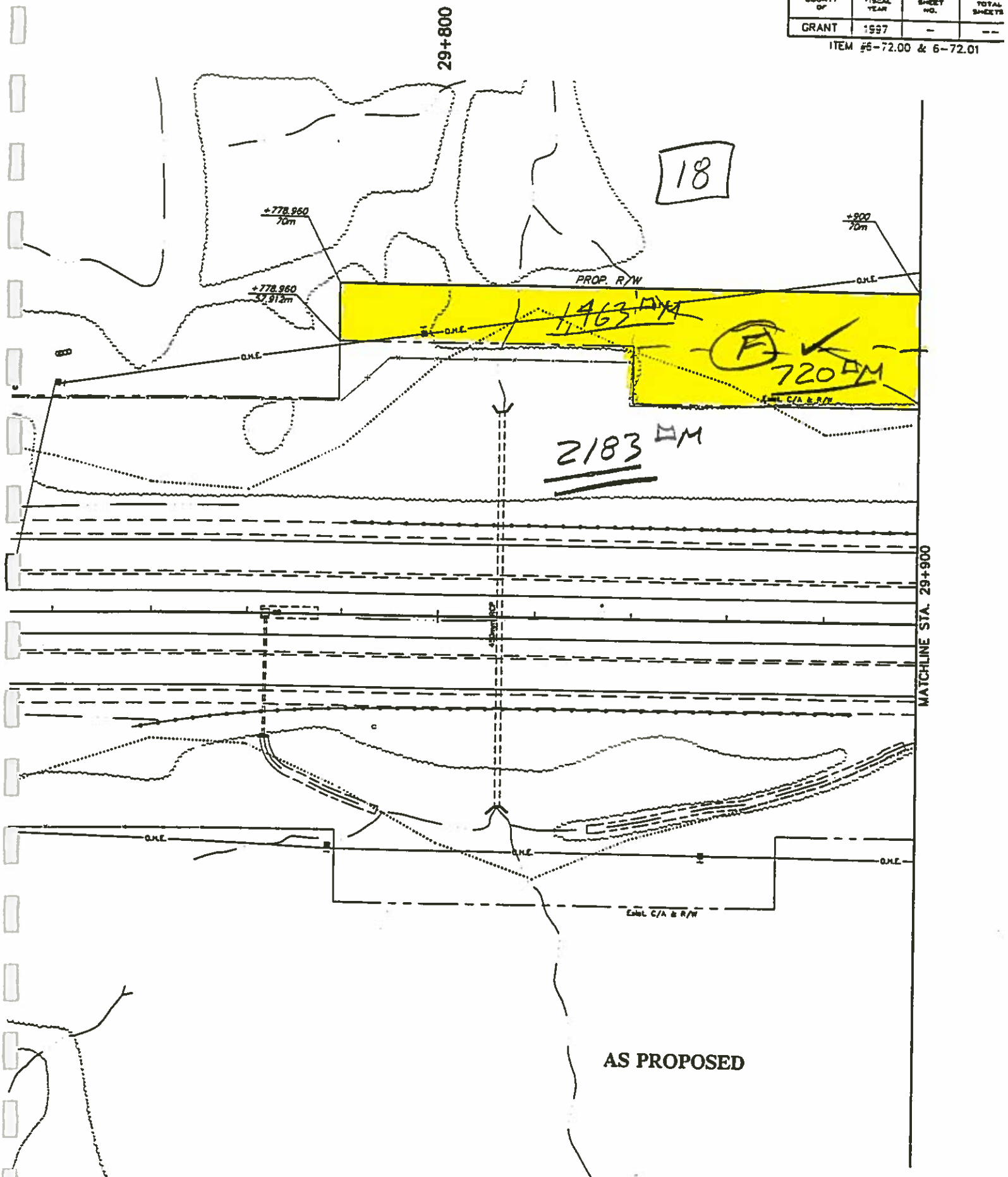
AS PROPOSED

I-75
STA. 30+700 TO STA. 31+000

Scale: 1 : 500

COUNTY OF	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
GRANT	1997	-	--

ITEM #6-72.00 & 6-72.01

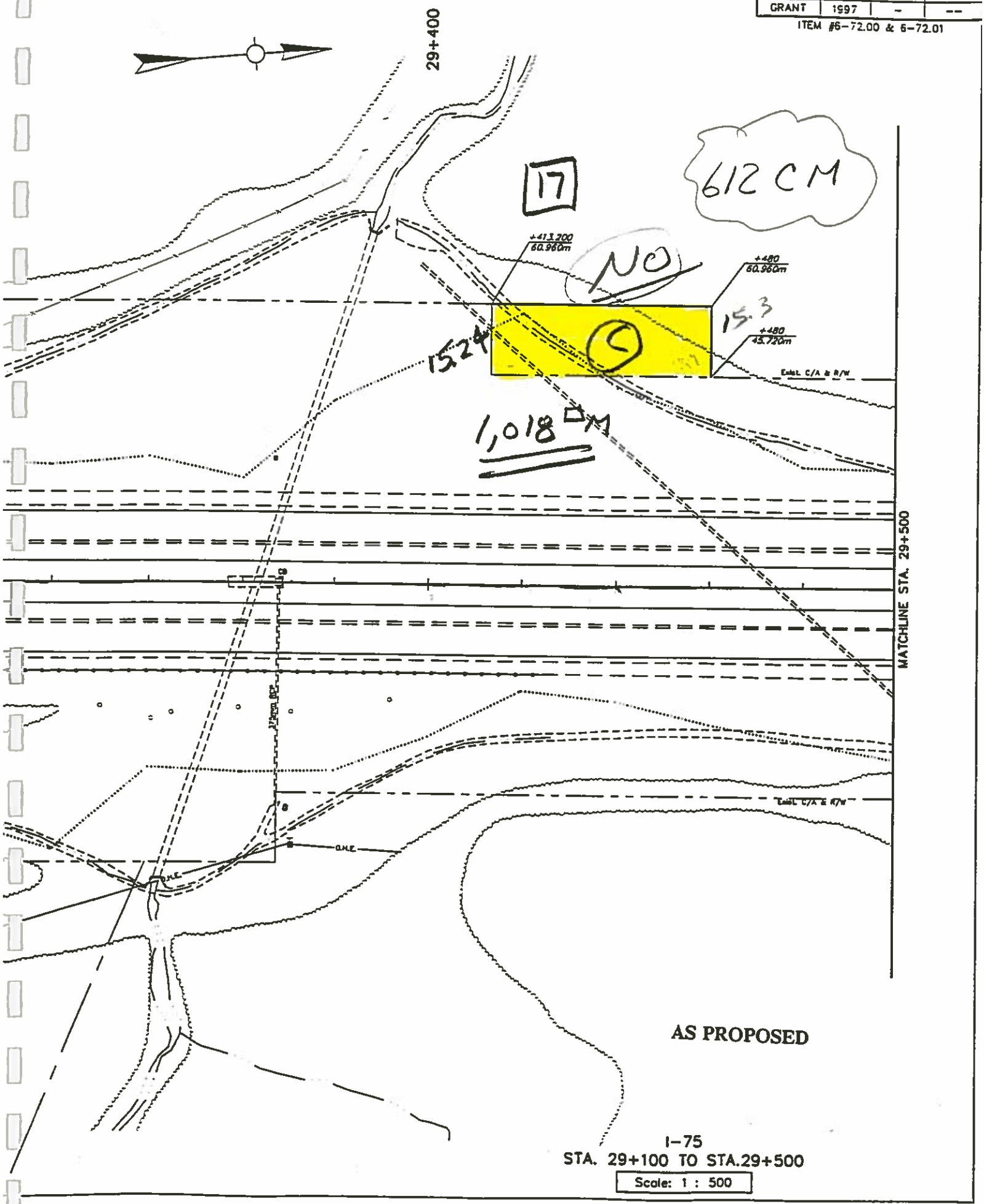


I-75
STA. 29+500 TO STA. 29+900

Scale: 1 : 500

COUNTY OF	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
GRANT	1997	-	--

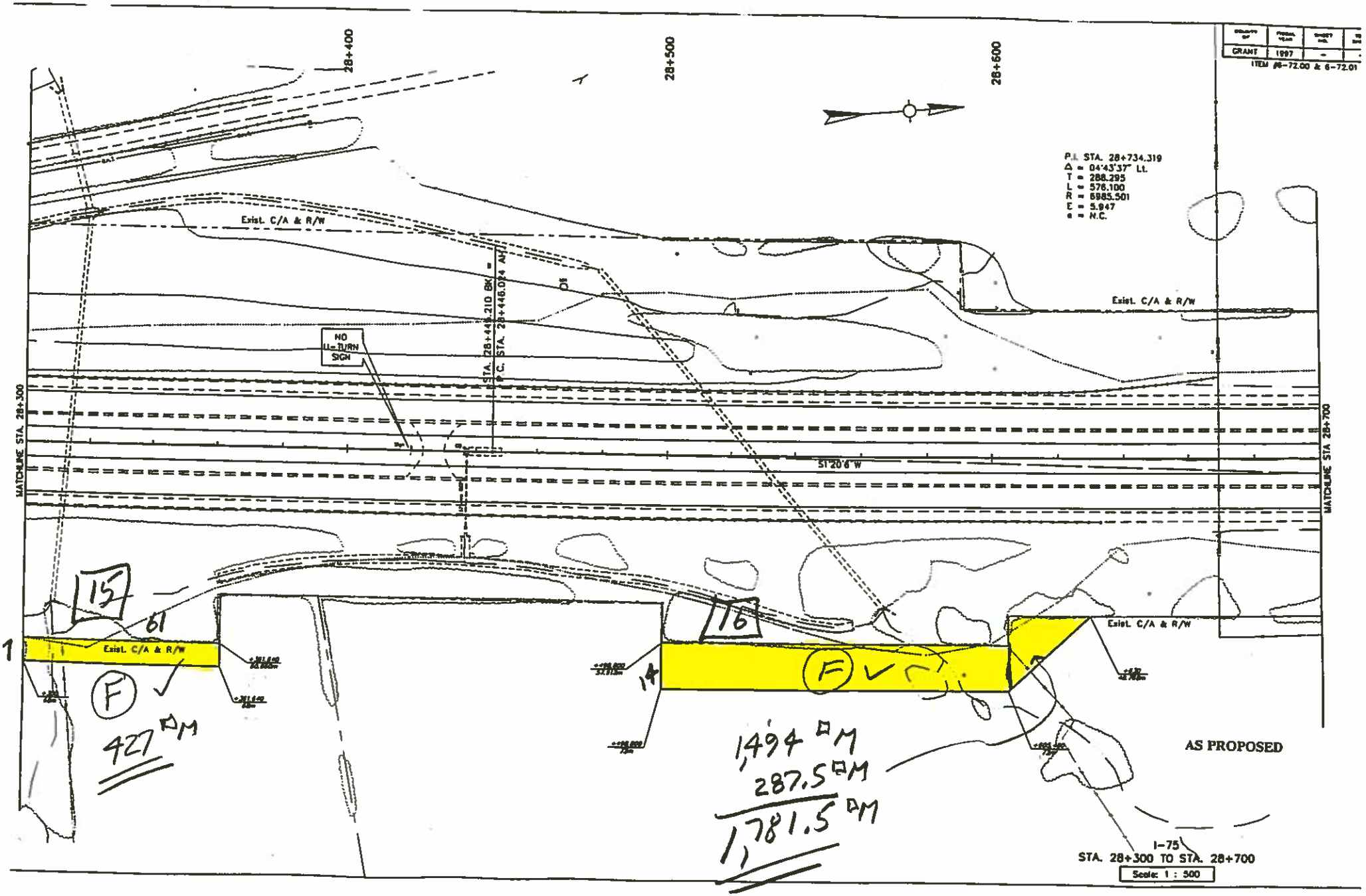
ITEM #6-72.00 & 6-72.01

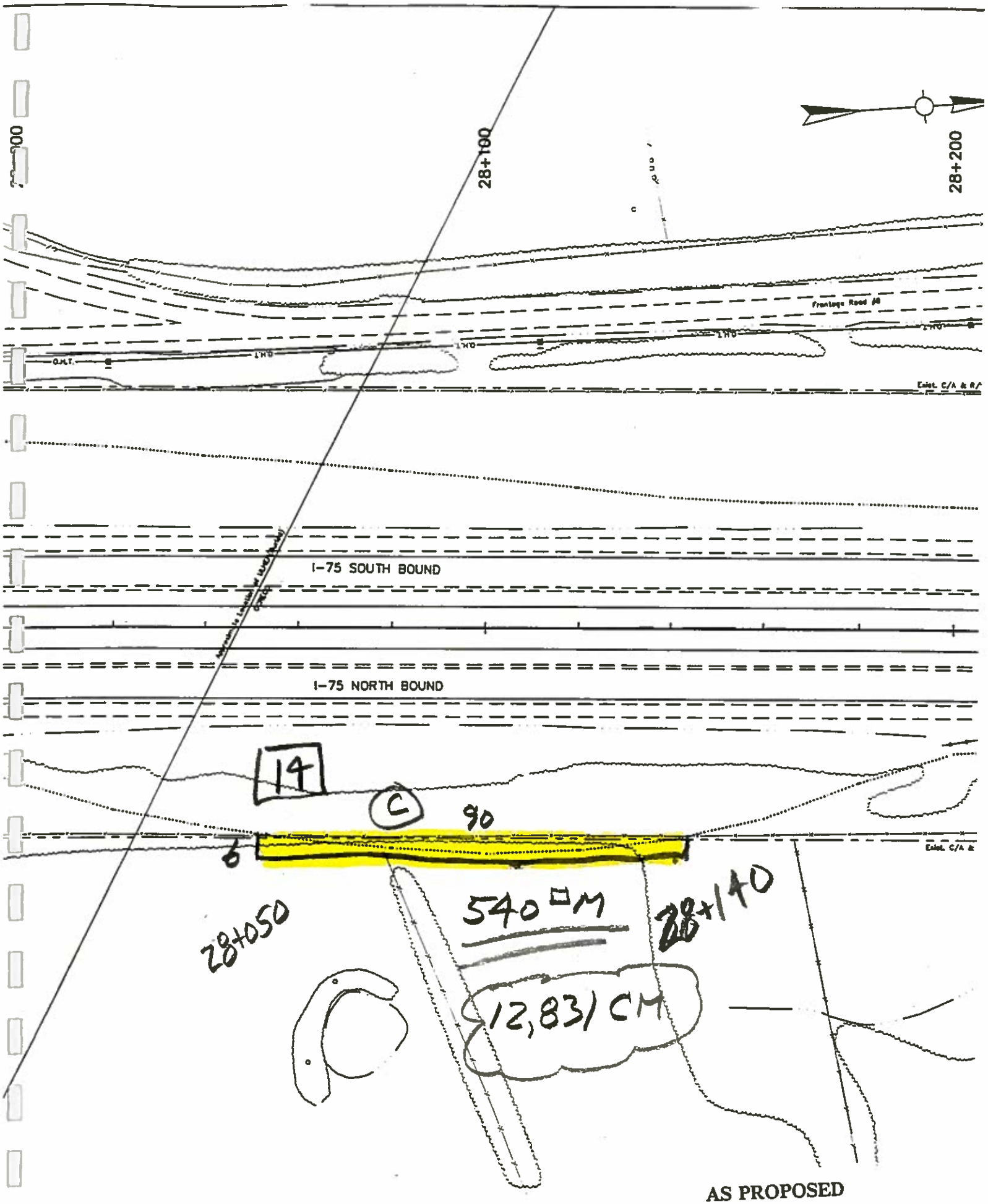


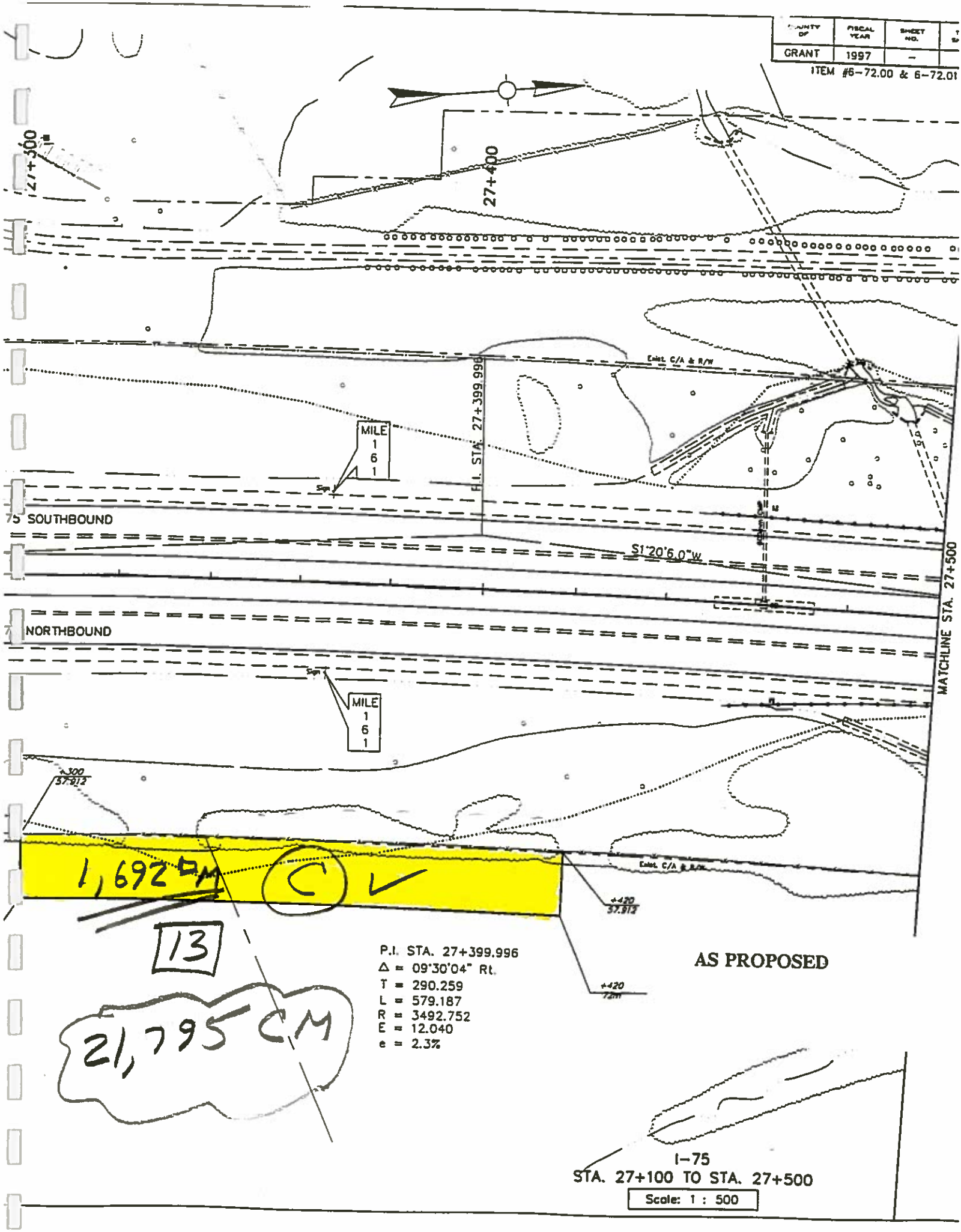
AS PROPOSED

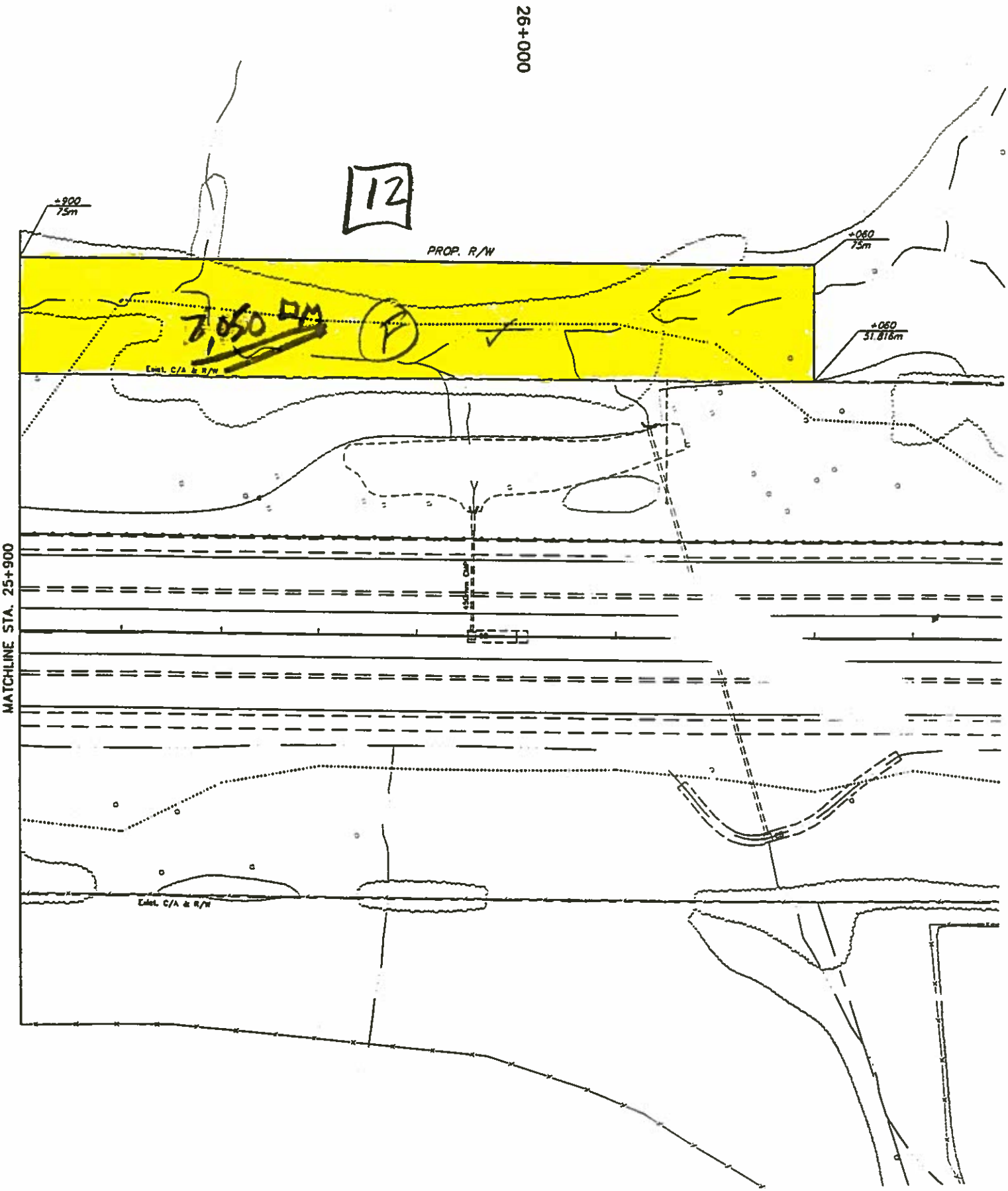
I-75
STA. 29+100 TO STA.29+500

Scale: 1 : 500


28+400
28+500
28+600
GRANT 1997
ITEM #6-72.00 & 6-72.01
P.I. STA. 28+734.319
Δ = 04°43'37" Lt.
T = 288.295
L = 576.100
R = 6985.501
E = 5.947
e = N.C.
Exist. C/A & R/W
Exist. C/A & R/W
Exist. C/A & R/W
Exist. C/A & R/W
NO U-TURN SIGN
P.C. STA. 28+446.210 BK
P.T. STA. 28+446.064 AH
S1°20'6"W
MATCHLINE STA. 28+300
MATCHLINE STA 28+700
15
61
16
14
1
F
F
427 □M
1,494 □M
287.5 □M
1,781.5 □M
AS PROPOSED
I-75
STA. 28+300 TO STA. 28+700
Scale: 1 : 500


28+100
28+200
Frontage Road #8
O.H.T.
Exist. C/A & R/
I-75 SOUTH BOUND
I-75 NORTH BOUND
19
C
90
28+050
540 □M
28+140
12,831 CM
AS PROPOSED

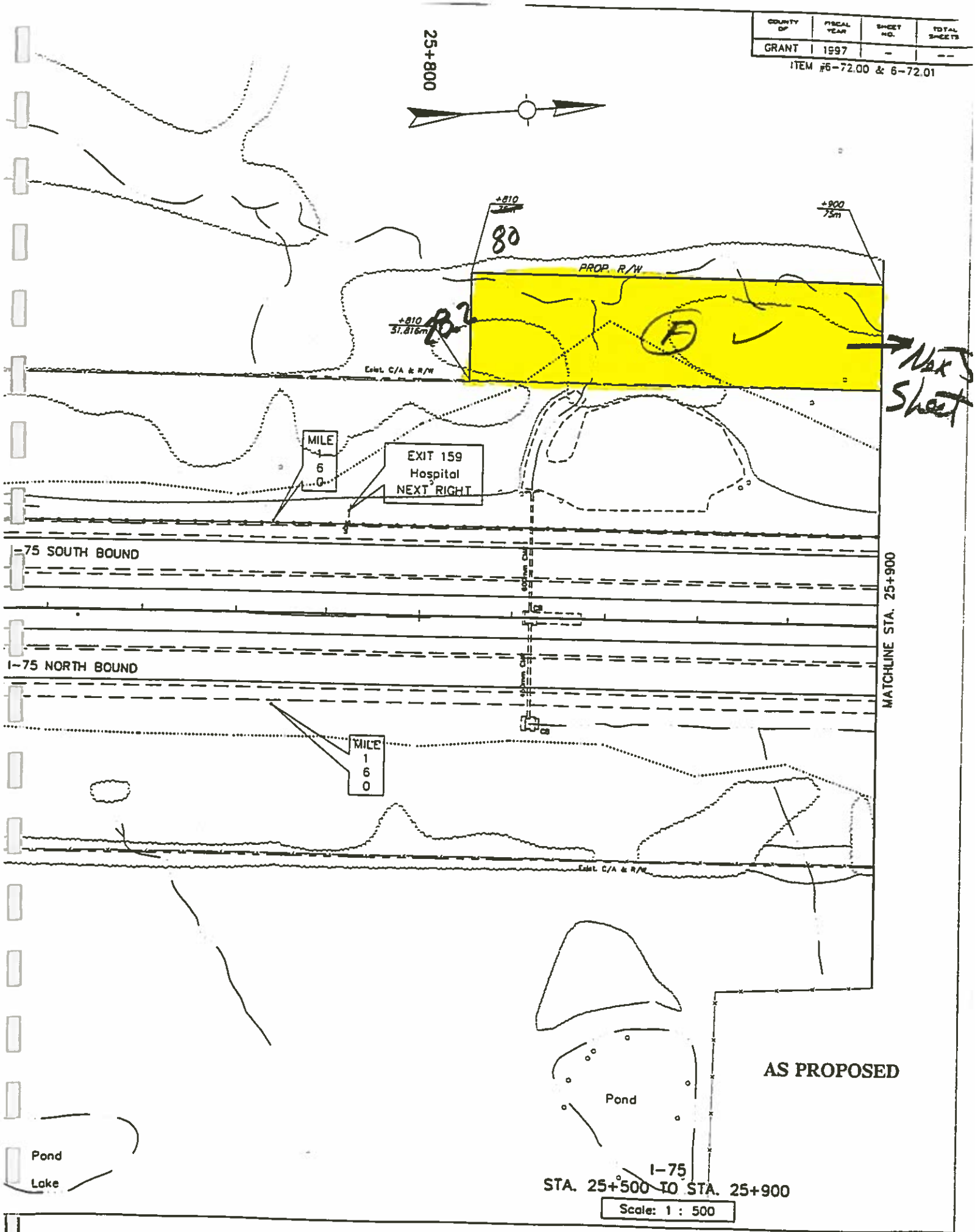

COUNTY OF
FISCAL YEAR
SHEET NO.
GRANT
1997
ITEM #6-72.00 & 6-72.01
27+300
27+400
Exist. C/A & R/W
P.I. STA. 27+399.996
MILE
1
6
1
75 SOUTHBOUND
S1°20'6.0"W
NORTHBOUND
MATCHLINE STA. 27+500
+300
57.912
1,692 SM
C
V
13
+420
57.912
+420
72m
21,795 CM
P.I. STA. 27+399.996
Δ = 09°30'04" Rt.
T = 290.259
L = 579.187
R = 3492.752
E = 12.040
e = 2.3%
AS PROPOSED
I-75
STA. 27+100 TO STA. 27+500
Scale: 1 : 500

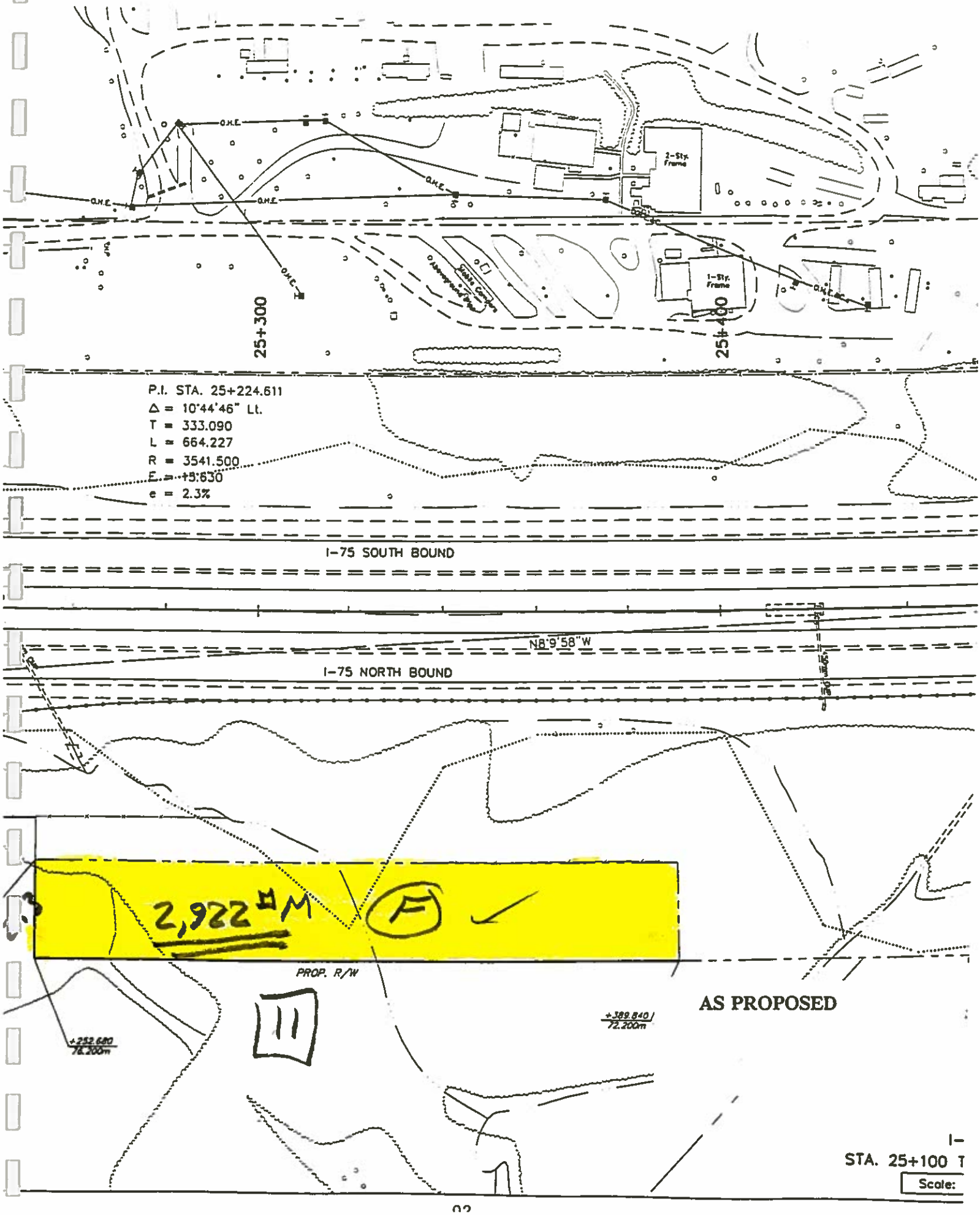

26+000
12
+900
75m
PROP. R/W
+060
75m
7,050 SM
+060
51.816m
Exist. C/A & R/W
MATCHLINE STA. 25+900
Exist. C/A & R/W

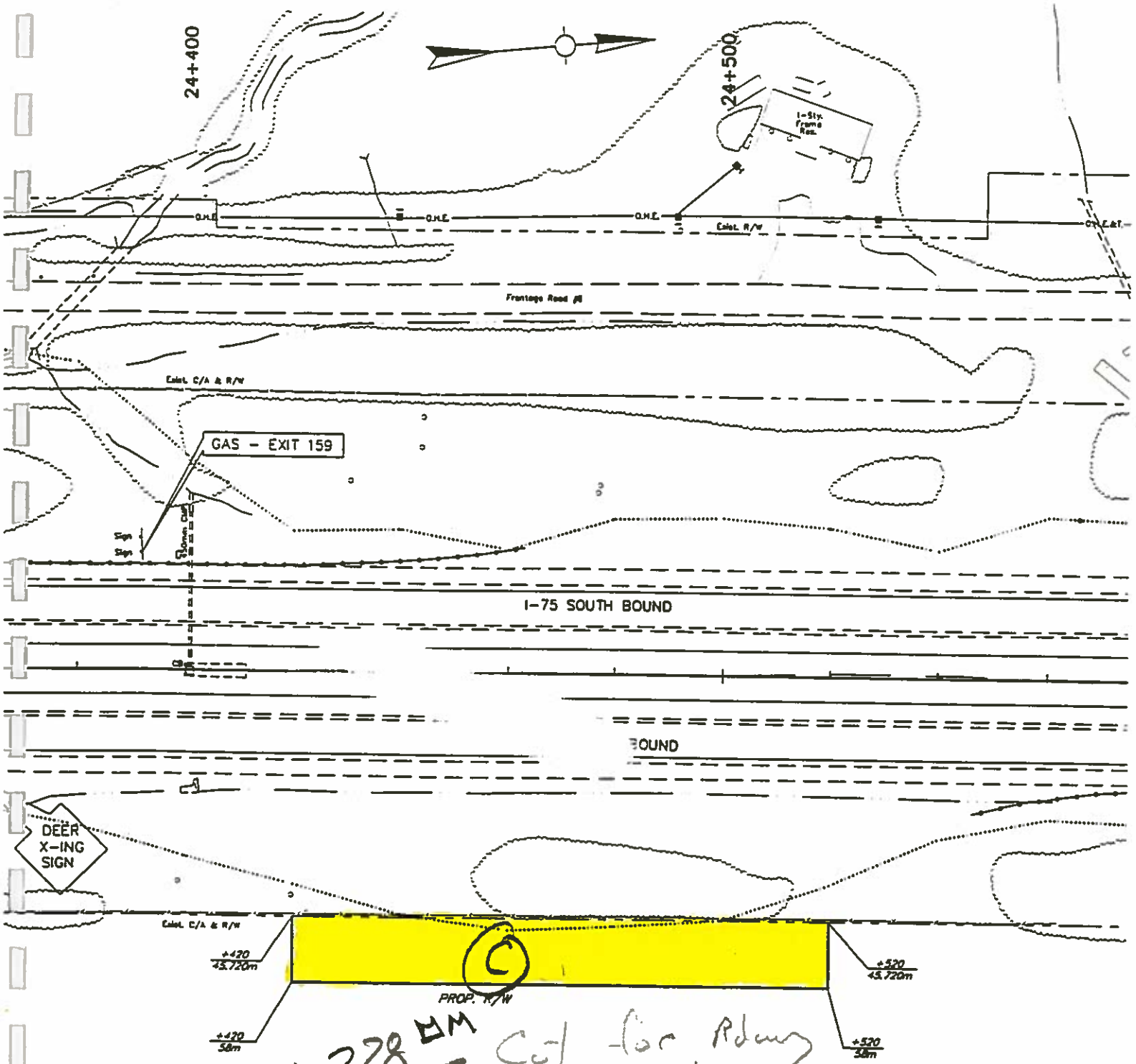
AS PROPOSED

COUNTY OF	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
GRANT	1997	-	--

ITEM #6-72.00 & 6-72.01




O.H.E.
2-Sty. Frame
1-Sty. Frame
25+300
25+400
P.I. STA. 25+224.611
Δ = 10°44'46" Lt.
T = 333.090
L = 664.227
R = 3541.500
E = +15.630
e = 2.3%
I-75 SOUTH BOUND
N8°9'58"W
I-75 NORTH BOUND
2,922 SQ M
F
PROP. R/W
AS PROPOSED
+252.680
76.200m
+389.840
72.200m
STA. 25+100
Scale:

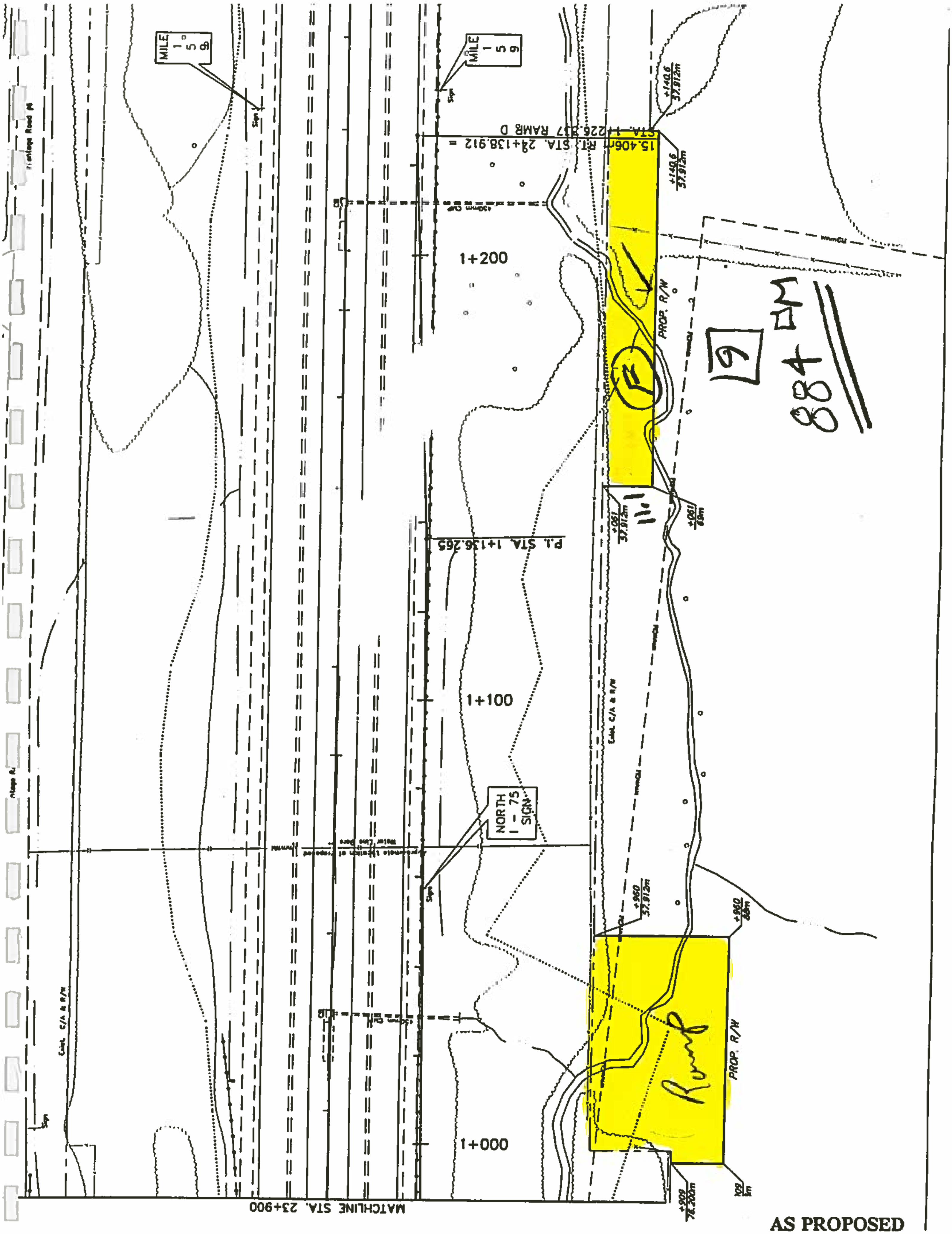


1,228 CM Cut for Rdwy Ditch

10

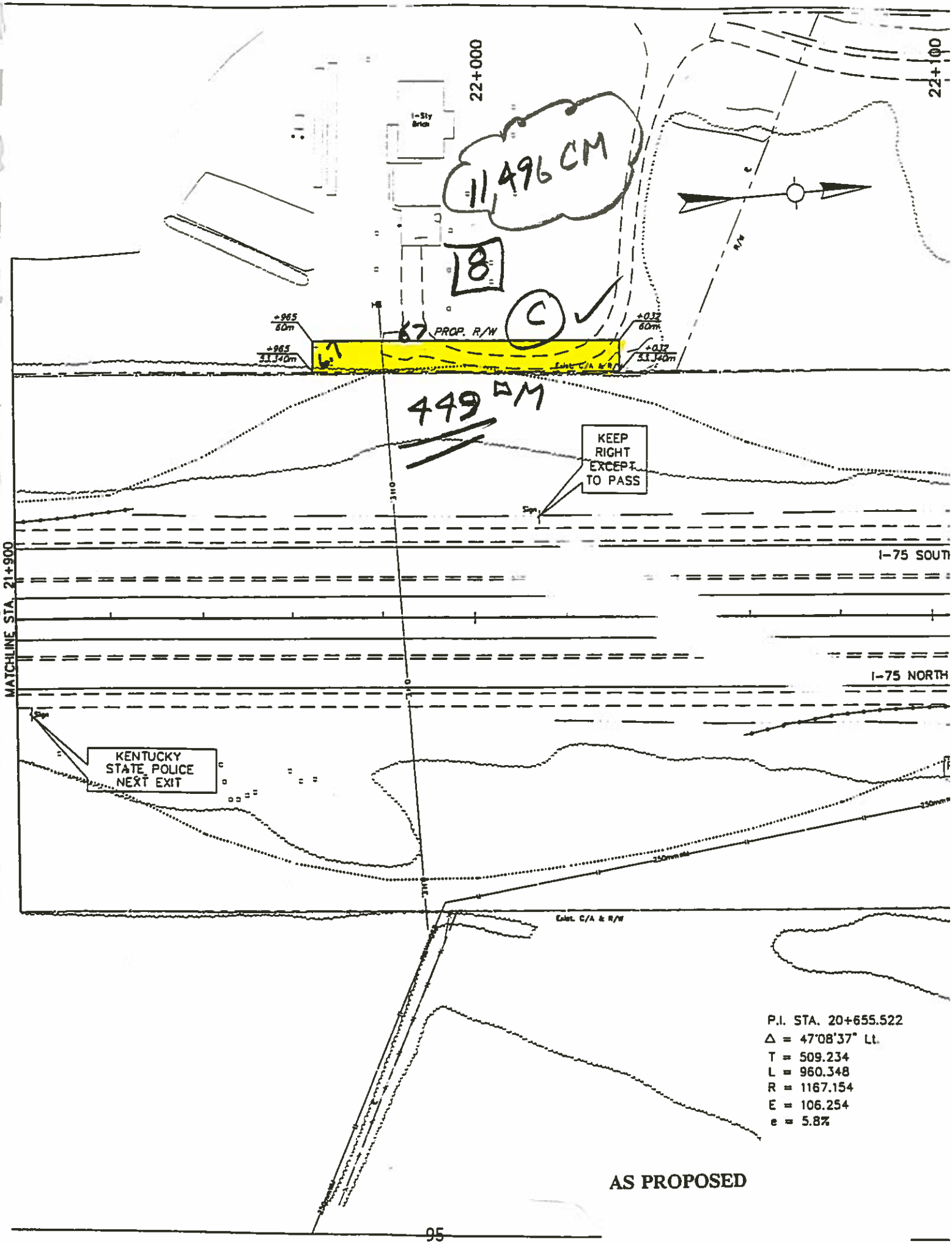
3,989 CM

AS PROPOSED

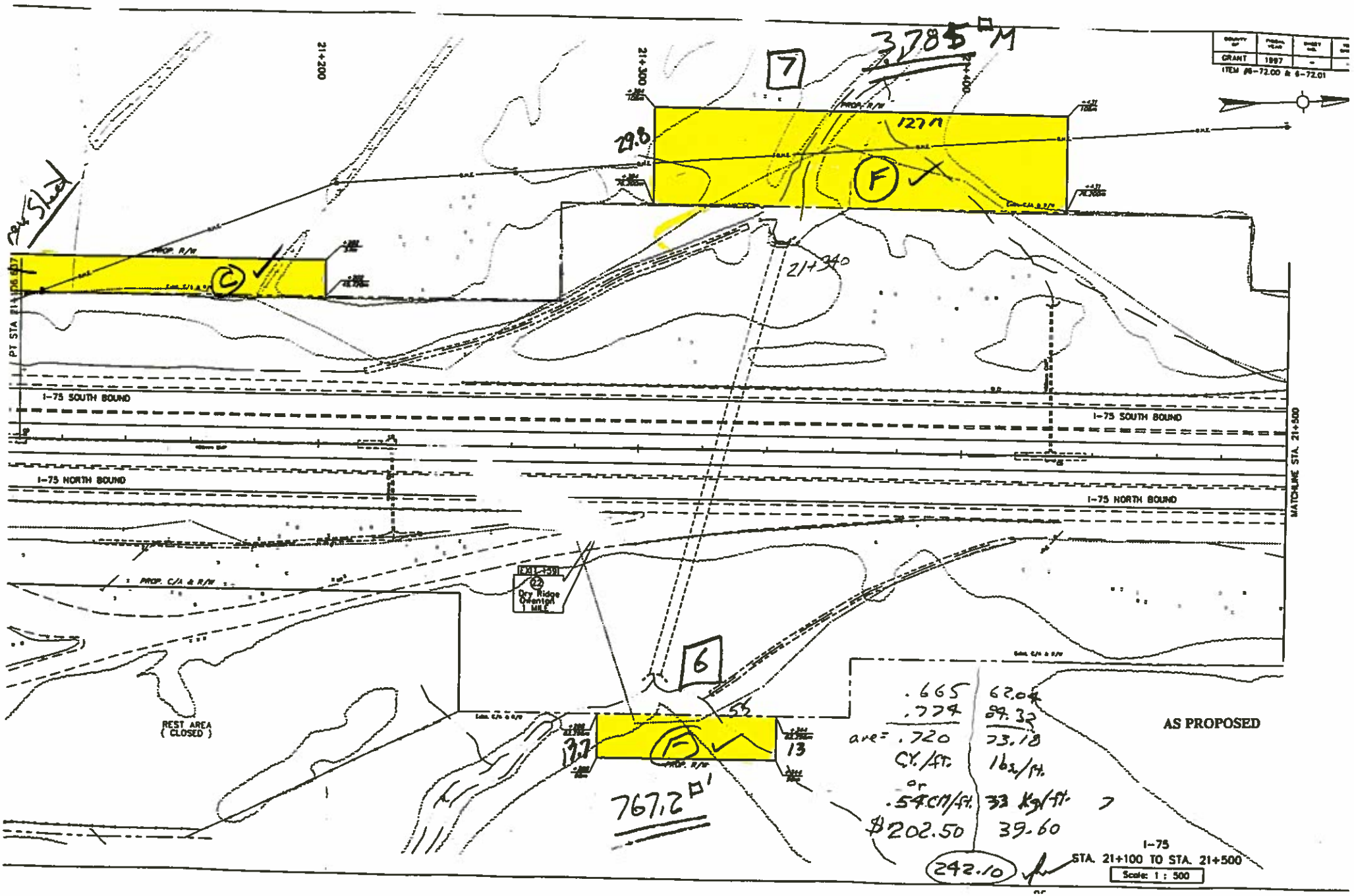


MILE 159
1+200
1+100
1+000
NORTH I - 75 SIGN
P.I. STA. 1+136.265
MATCHLINE STA. 23+900
PROP. R/W
Exist. C/A & R/W
884 DM

AS PROPOSED


22+000
22+100
11496 CM
18
C
PROP. R/W
449 M
KEEP RIGHT EXCEPT TO PASS
I-75 SOUTH
I-75 NORTH
MATCHLINE STA. 21+900
KENTUCKY STATE POLICE NEXT EXIT
Exist. C/A & R/W
P.I. STA. 20+655.522
Δ = 47°08'37" Lt.
T = 509.234
L = 960.348
R = 1167.154
E = 106.254
e = 5.8%

AS PROPOSED


GRANT 1997
ITEM #6-72.00 & 6-72.01
3785 M
7
127 M
29.6
F
C
21+200
21+300
21+340
294 Shed
PT STA 21+206.07
I-75 SOUTH BOUND
I-75 NORTH BOUND
MATCHLINE STA. 21+500
PROP. C/L & R/W
EXIT 159
Dry Ridge
Crittenden
1 MILE
REST AREA
(CLOSED)
6
E
37
13
767.2 □'
.665
.774
ave= .720
CY./FT.
or
.54 CM/FT.
$202.50
62.04
89.32
73.18
16 1/2 LB/FT.
33 Kg/M.
39.60
242.10
AS PROPOSED
I-75
STA. 21+100 TO STA. 21+500
Scale: 1 : 500

COUNTY OF	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
GRANT	1997	-	--

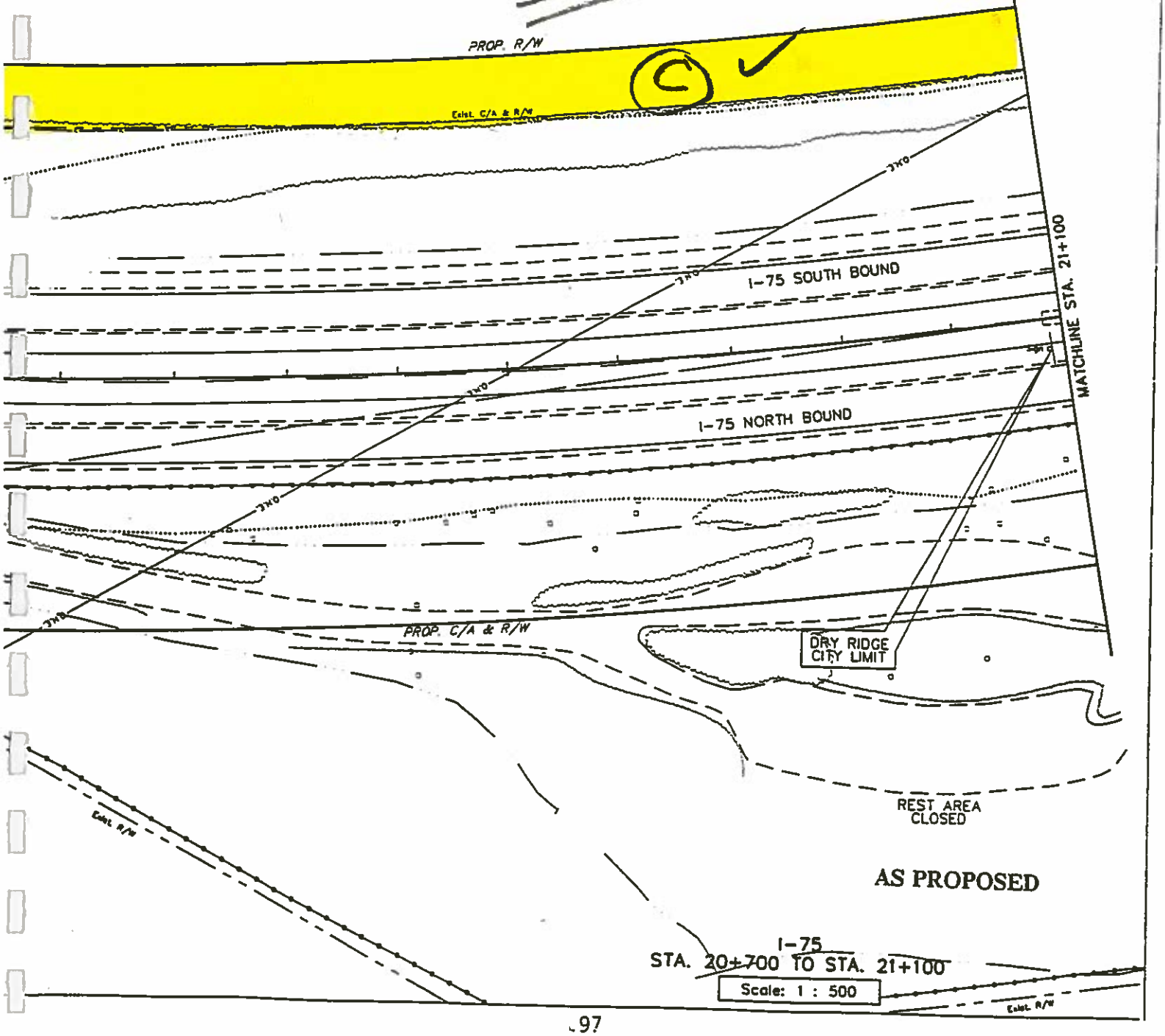
ITEM #6-72.00 & 6-72.01

21+000

5

3,345 CM

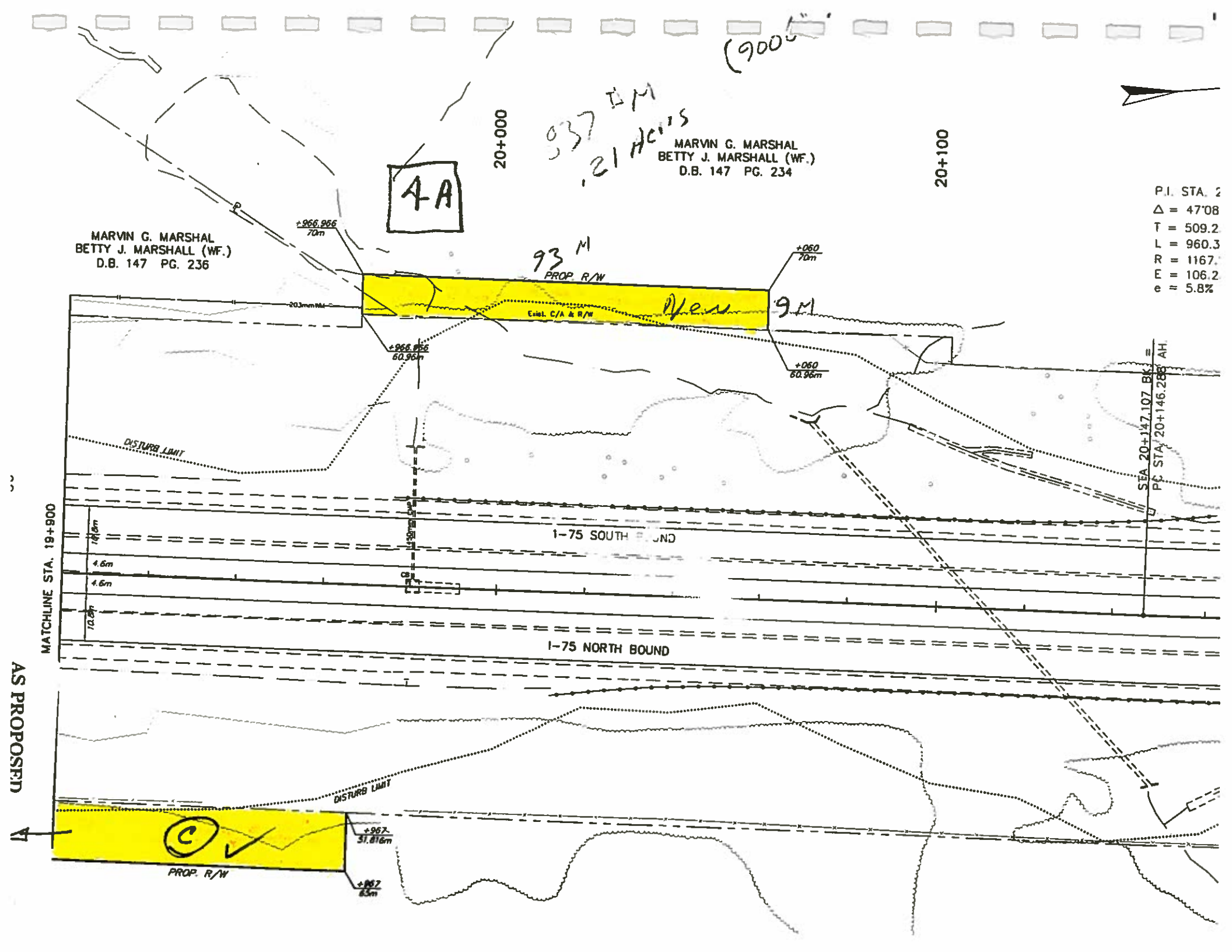
14,975 CM



AS PROPOSED

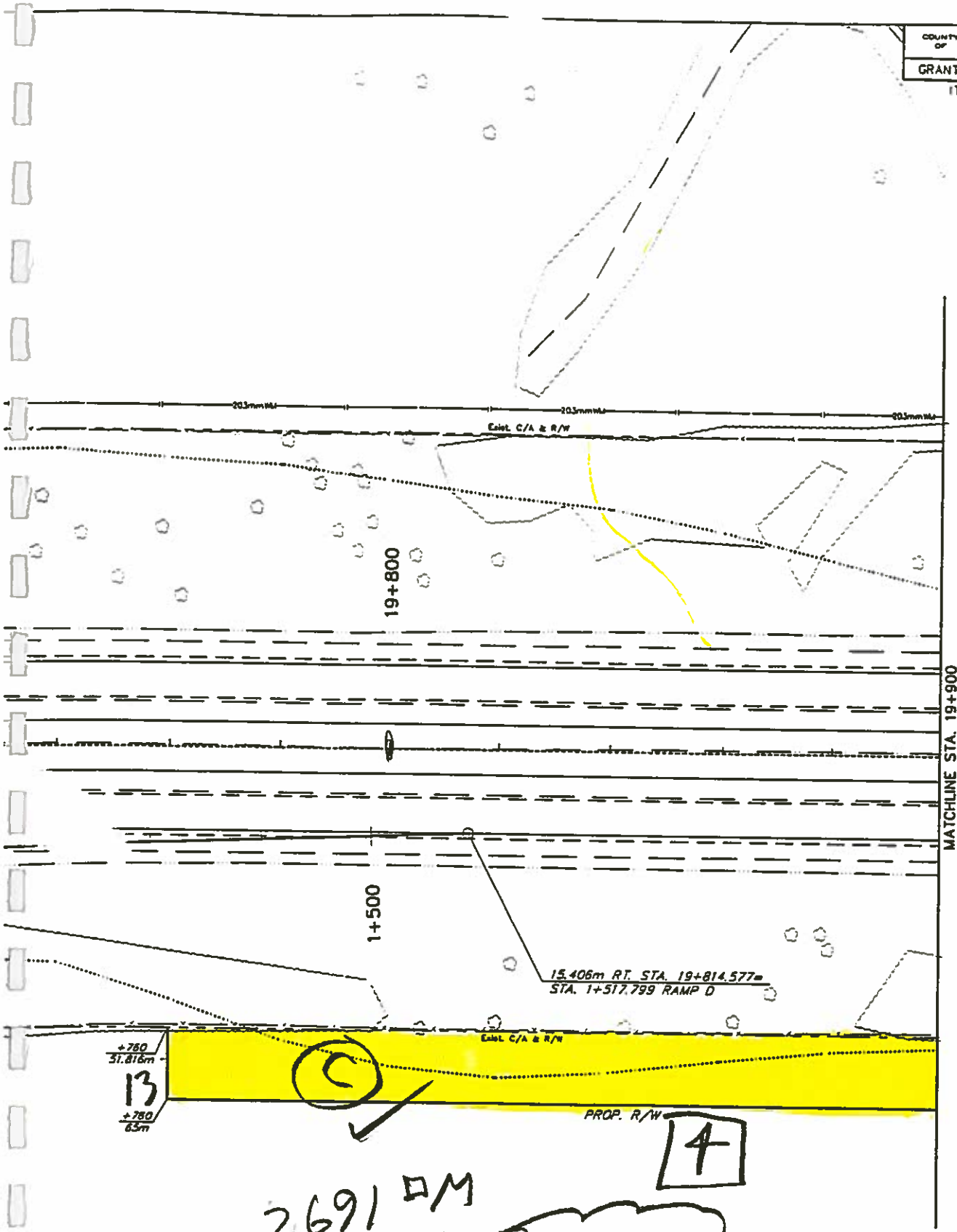
I-75
STA. 20+700 TO STA. 21+100

Scale: 1 : 500


4A
20+000
20+100
MARVIN G. MARSHAL
BETTY J. MARSHALL (WF.)
D.B. 147 PG. 234
MARVIN G. MARSHAL
BETTY J. MARSHALL (WF.)
D.B. 147 PG. 236
PROP. R/W
Exist. C/A & R/W
DISTURB LIMIT
1-75 SOUTH BOUND
1-75 NORTH BOUND
MATCHLINE STA. 19+900
AS PROPOSED
PROP. R/W
DISTURB LIMIT
P.I. STA. 2
Δ = 47°08
T = 509.2
L = 960.3
R = 1167.
E = 106.2
e = 5.8%

COUNTY OF	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
GRANT	1997	--	--

ITEM #6-72.00 & 6-72.01



AS PROPOSED

I-75
SBL BASELINE
STA. 19+600 TO STA. 19+799.619

Scale: 1 : 500

COUNTY	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
GRANT	1997	–	–

ITEM #6-72.00 & 6-72.01

480 SM

7,150 C

C 60

PROP. R/W

+340 66m

+400 66m

+340 57.912m

+400 57.912m

3

LODGING & FOOD EXIT

P.I. STA. 1+501.563

1+500

18+300

1+400

N17°00'55"W

MATCHLINE STA. 18+400

18+200

18+300

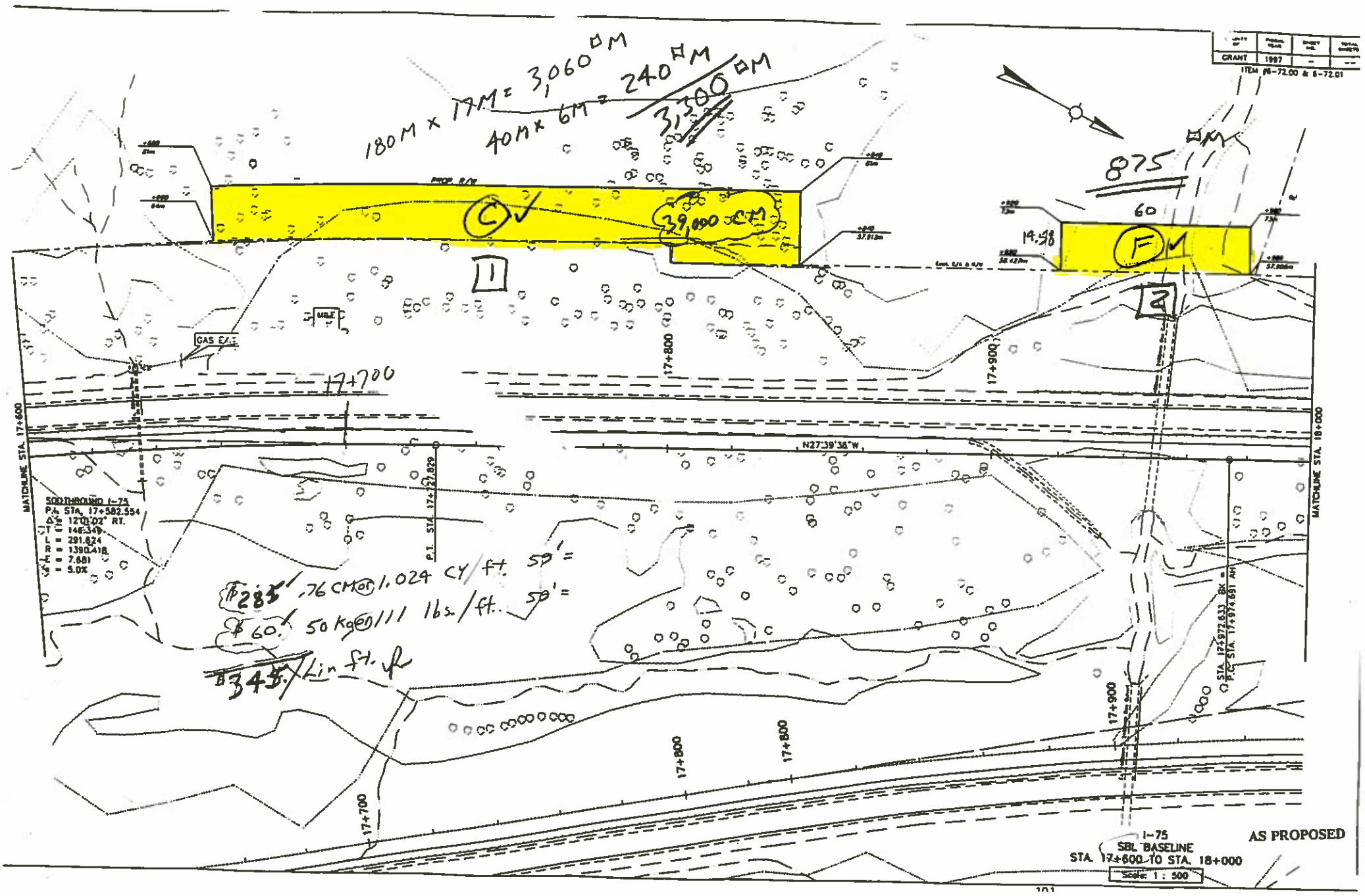
AS PROPOSED

I-75

SBL BASELINE

STA. 18+000 TO STA. 18+400

Scale: 1" = 500'

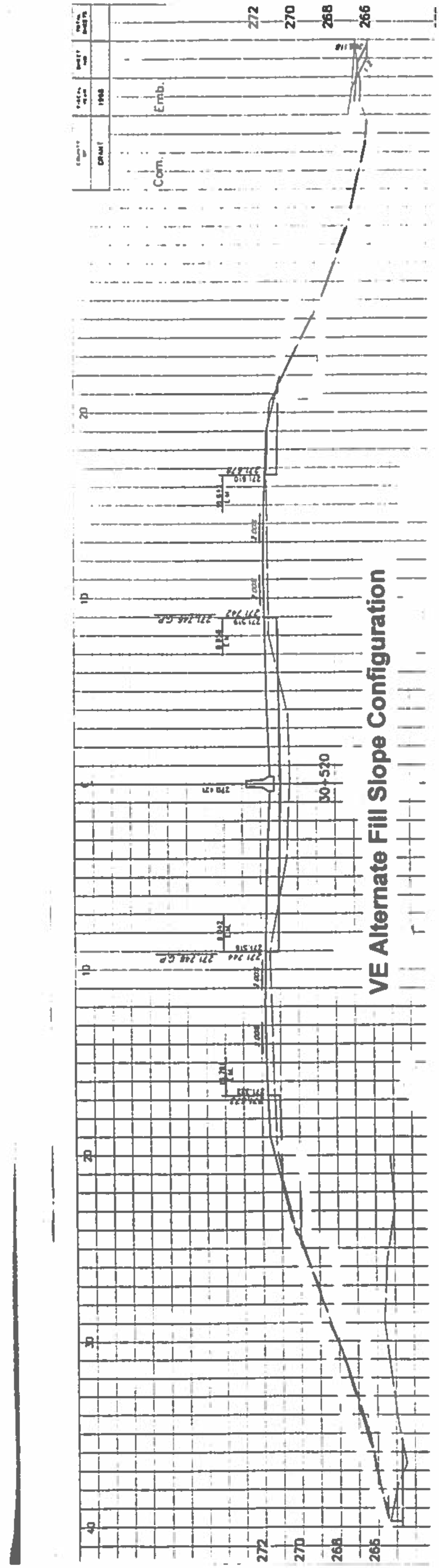

180M x 17M = 3,060 □M
40M x 6M = 240 □M
3,300 □M
875 □M
60
19.98
39,000 CM
C
F
1
2
GAS EVAC
MILE
17+700
17+800
17+900
N27°39'36"W
MATCHLINE STA. 17+600
MATCHLINE STA. 18+000
SOUTHBOUND I-75
P.I. STA 17+582.554
Δ = 12°01'02" RT.
T = 146.349
L = 291.624
R = 1390.418
E = 7.881
e = 5.0%
P.I. STA 17+729.829
P.C. STA 17+877.633 BK =
STA 17+874.891 AH
$285', 76 CM or 1,024 CY/ft. 50' =
$60. 50 Kg or 111 lbs./ft. 50' =
$345./Lin ft. ℔
I-75
SBL BASELINE
STA. 17+600 TO STA. 18+000
Scale: 1 : 500
AS PROPOSED

VII.(d)(2) V.E. ALTERNATIVE

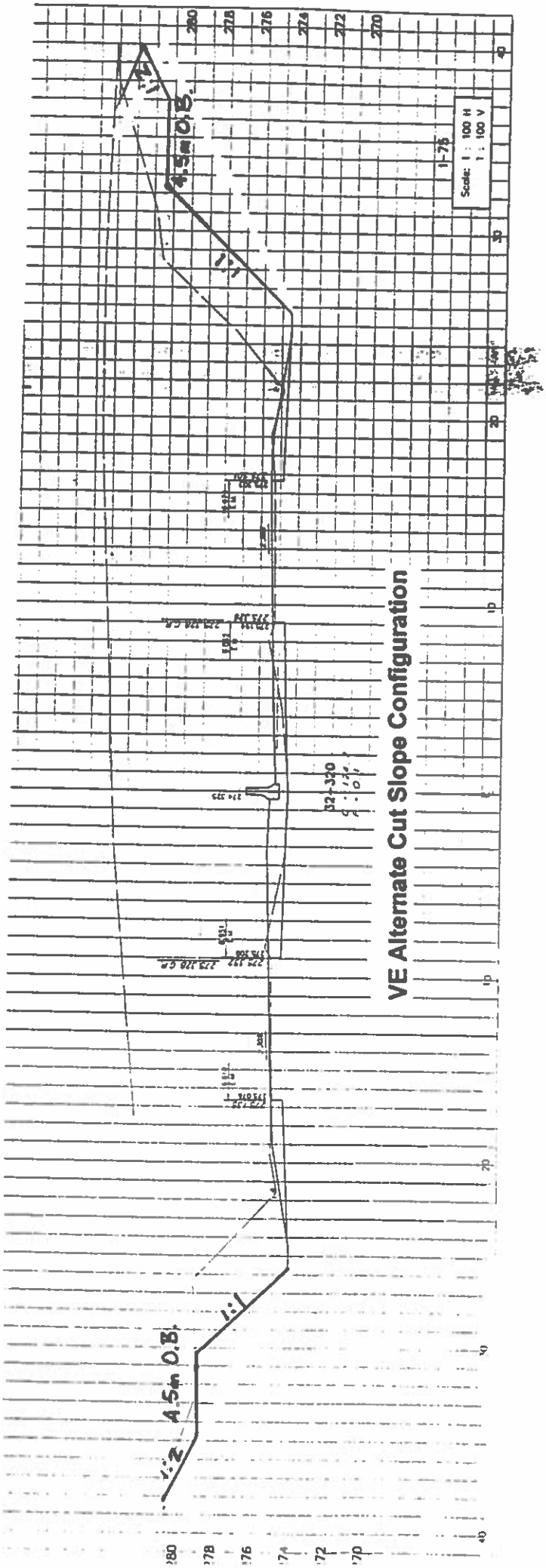
Value Engineering Alternative

The Value Engineering Alternative would, whenever possible, flatten slopes, but not to the extent that R/W would be required. It is the teams opinion that retaining the guardrail where necessary is a better option than buying R/W. When one considers the fact that this project has an accelerated production schedule, the additional time normally required for the R/W administration and environmental permitting normally associated with acquiring and filling new R/W areas could delay project letting. This could jeopardize the cabinets ability to capture Federal discretionary funds or other funding that might become available for production ready projects. Retaining the guardrail will not violate Federal requirements or standards.

In addition, several of the fill slopes spill over the top of the existing frontage road.



VALUE ENGINEERING ALTERNATIVE



VALUE ENGINEERING ALTERNATIVE

SLOPE EXCAVATION REQUIRING RIGHT OF WAY
COST COMPARISON

DESCRIPTION	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
RIGHT OF WAY	$5,000/ACRE	10.92	$ 54,600	3.93	$ 19,650
RDWY. EXC.	$6.50/CM	165,781	$1,077.577	138,454	$899,951
(6'X7') 1800MM X 2100MM BOX	$7.94/M	45M	$ 35,730	0	0
(8'X8') 2400MM X 2400MM BOX	$1,132/M	18M	$ 20,376	0	0
600MM RCP	$135/M	43M	$ 2,700	0	0
1350MM RCP	$300/M	43M	$ 12,000	0	0
TOTAL			$1,202,983		$919,601

Possible Savings $ 283,382

Areas Where Flattened Slopes Required R/W (Worksheet)

Cut Elev

Total Excavation

	Location			Side	Cor F	□M
~~1-SBL~~	~~17+220~~	~~to~~	~~17+280~~	~~Rt.~~	~~F~~	~~1,240~~
1-SBL	17+660	to	17+840	Lt. No	C (39,000 CM)	3,309
2-SBL	17+920	to	17+980	Lt.	F (.40 Ht)	875
3-SBL	18+340	to	18+400	Lt. No	C (7,150 CM)	480
4-SBL	19+760	to	19+967	Rt. No	C (48,271 CM)	2,691
19-	19+967	to	20+060	Lt.		837
	20+906	to	21+202	Lt. 6,602	(14,975 CM)	3,345
6-	21+288	to	21+344	Rt.	F	767
7-	21+304	to	21+431	Lt.	F	3,785
8-	21+965	to	22+032	Lt. 5,530	C (11,496 CM)	499
9-	24+061	to	24+1406	Rt.	F	884
10-	24+420	to	24+520	Rt. No	C (3,989 CM)	3,989
11-	25+252	to	25+390	Rt.	F	2,922
12-	25+810	to	26+060	Lt.	F	7,050
13-	27+300	to	27+420	Rt. 8,507	C (21,795 CM)	1,692
14-	28+050	to	28+140	Rt. No	C (12,831 CM)	540
15-	28+300	to	28+362	Rt.	F	427
16-	28+499	to	28+630	Rt.	F	1,782
17-	29+413	to	29+480	Lt. 612	C (612 CM)	1,018
18-	29+779	to	29+900	Lt.	F	2,183
19-	30+846	to	31+006	Rt.	F	925
20-	33+010	to	33+208	Rt.	F	1,980
21-	33+560	to	33+604	Rt. No	C (5662 CM)	671

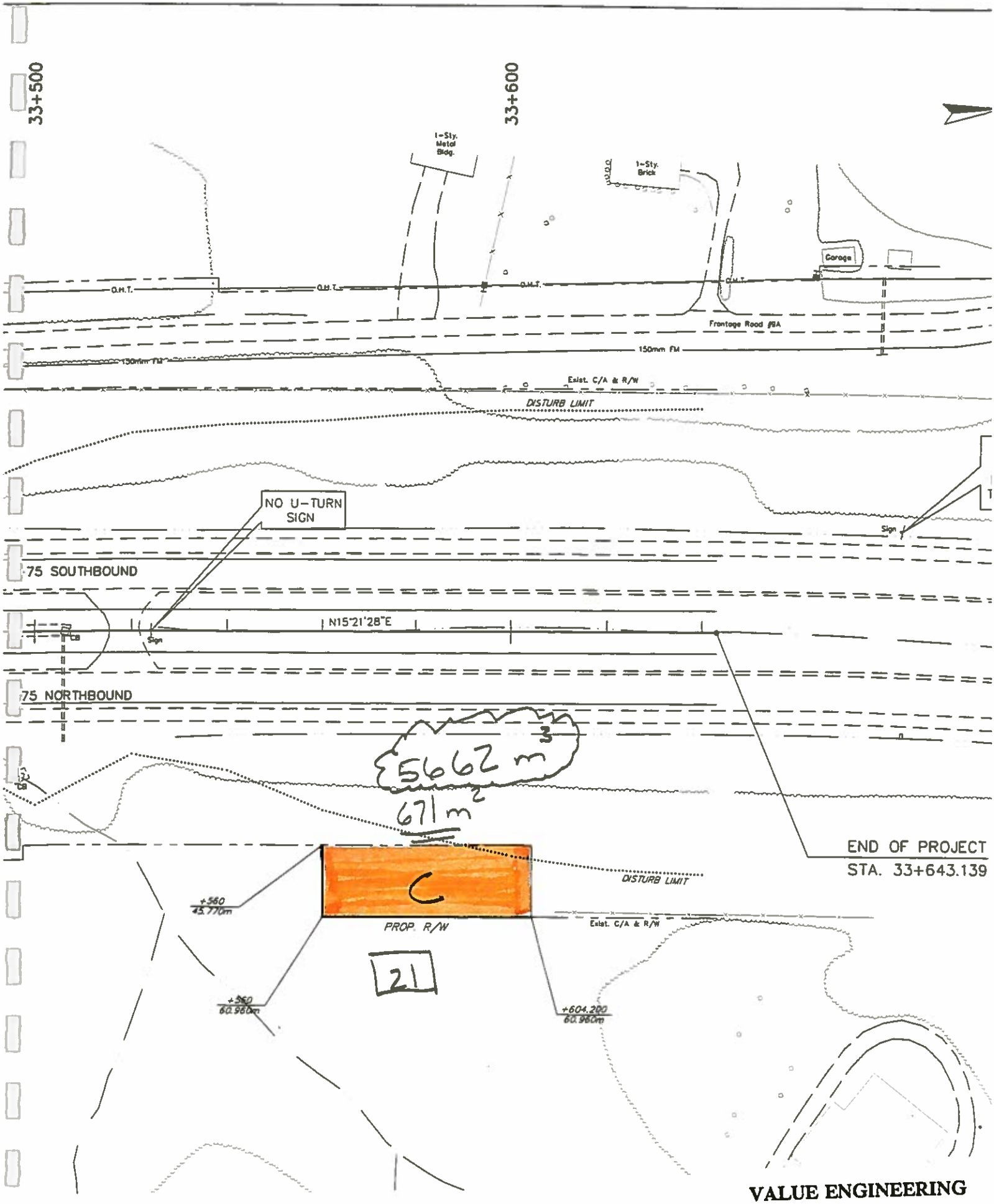
(165,781 CM)

25,851 □M
4,755 □M
-15,904 = 17,702

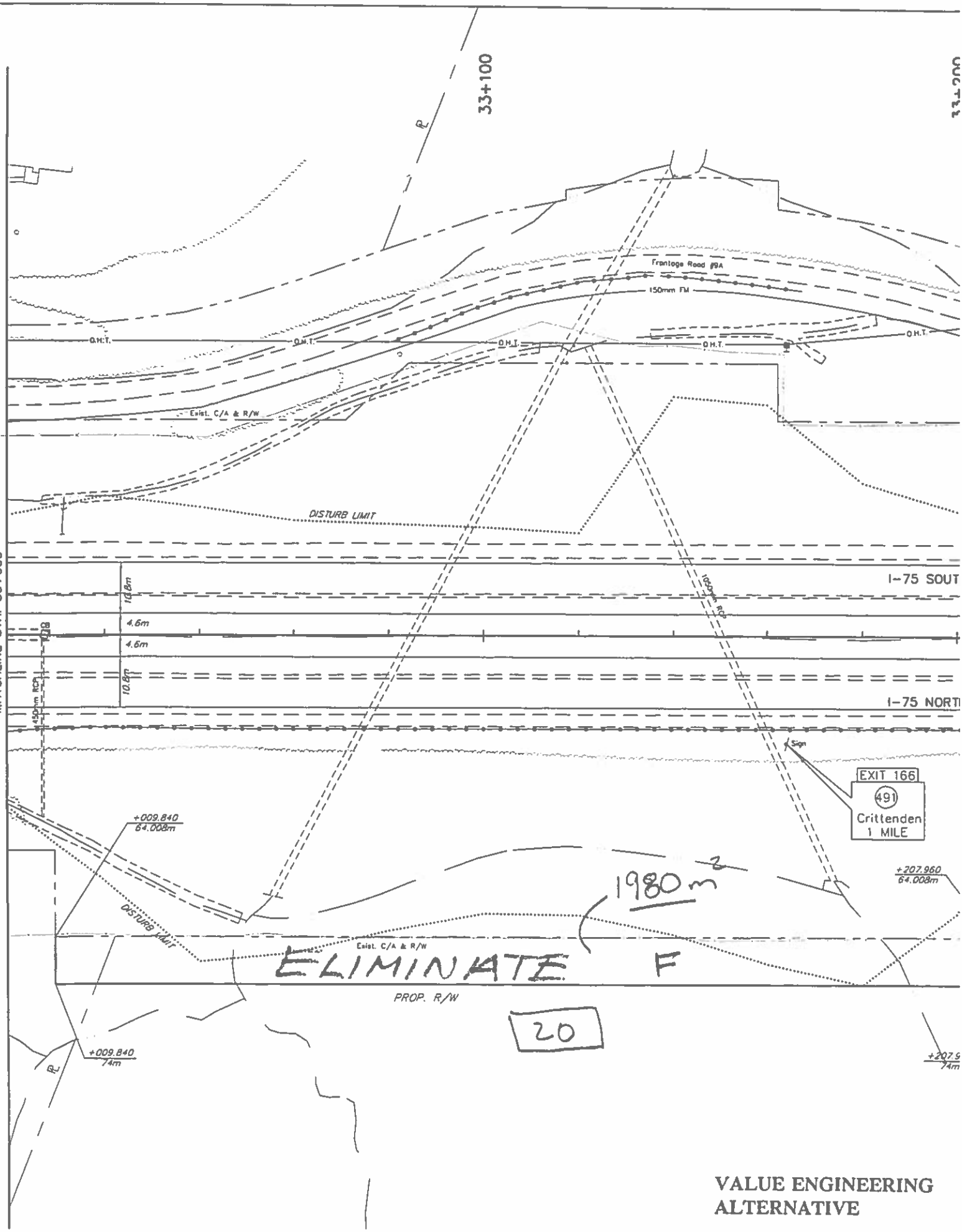
= 50,000 C.Y.
= ~~448,205~~ C.Y.
= 6.38
≈ ~~10.3~~ Acres.

10.3 Acres CEF

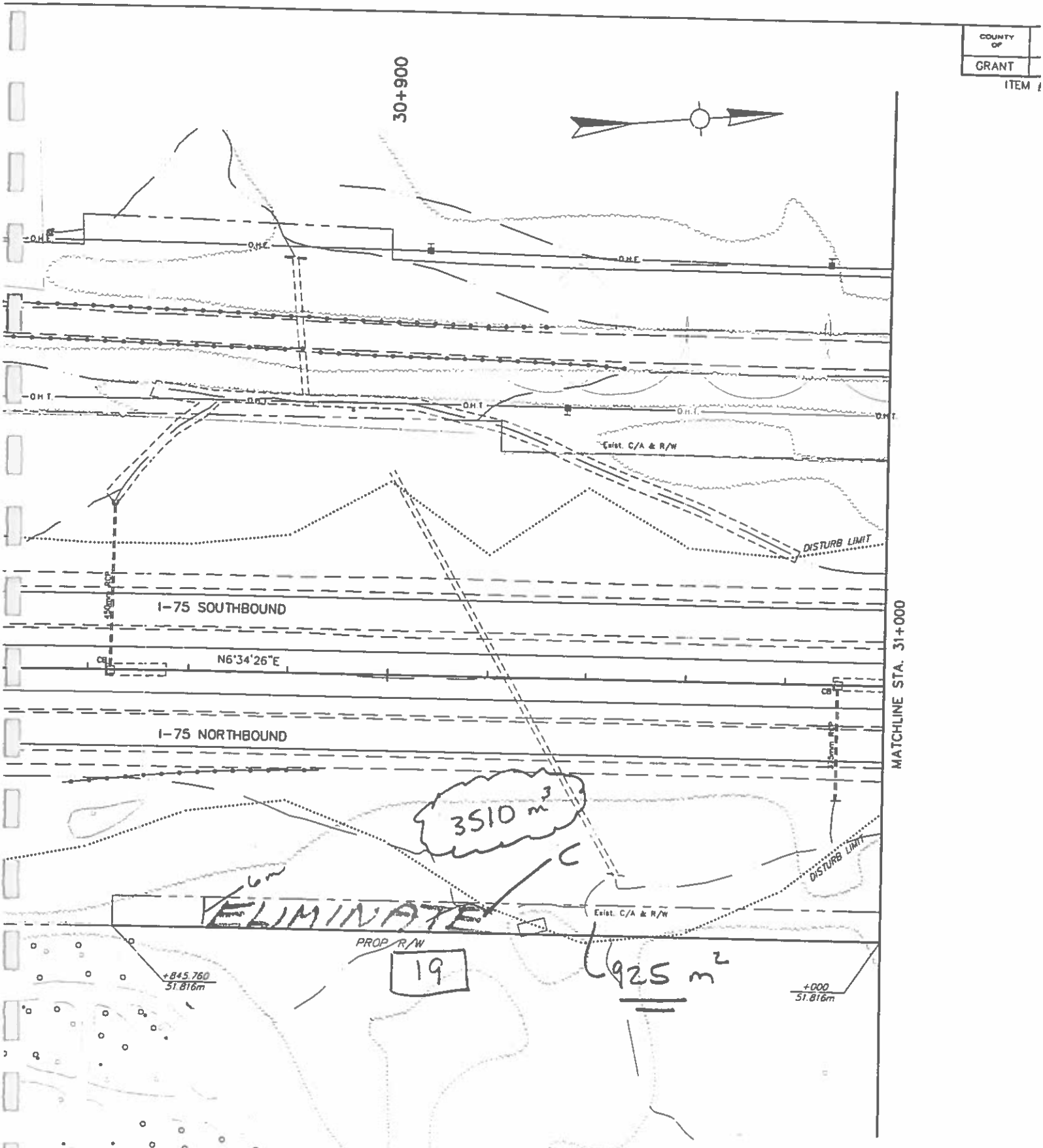
5.8 Acres (Fill only)



VALUE ENGINEERING ALTERNATIVE



VALUE ENGINEERING ALTERNATIVE



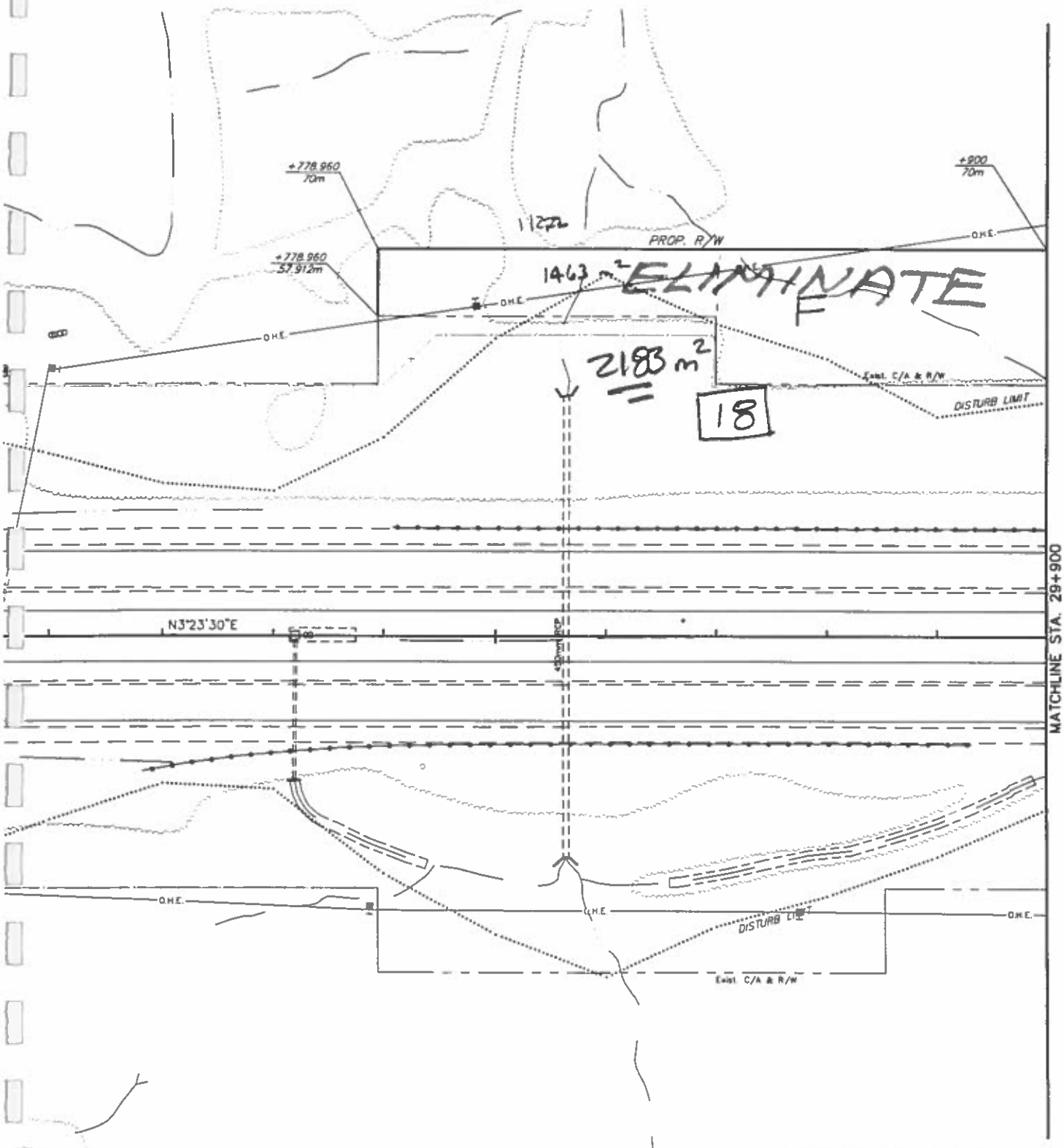
VALUE ENGINEERING ALTERNATIVE

I-75
STA. 30+700 TO STA. 31+000

Scale: 1 : 500

COUNTY OF	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
GRANT	1997	-	--

ITEM #6-72.00 & 6-72.01

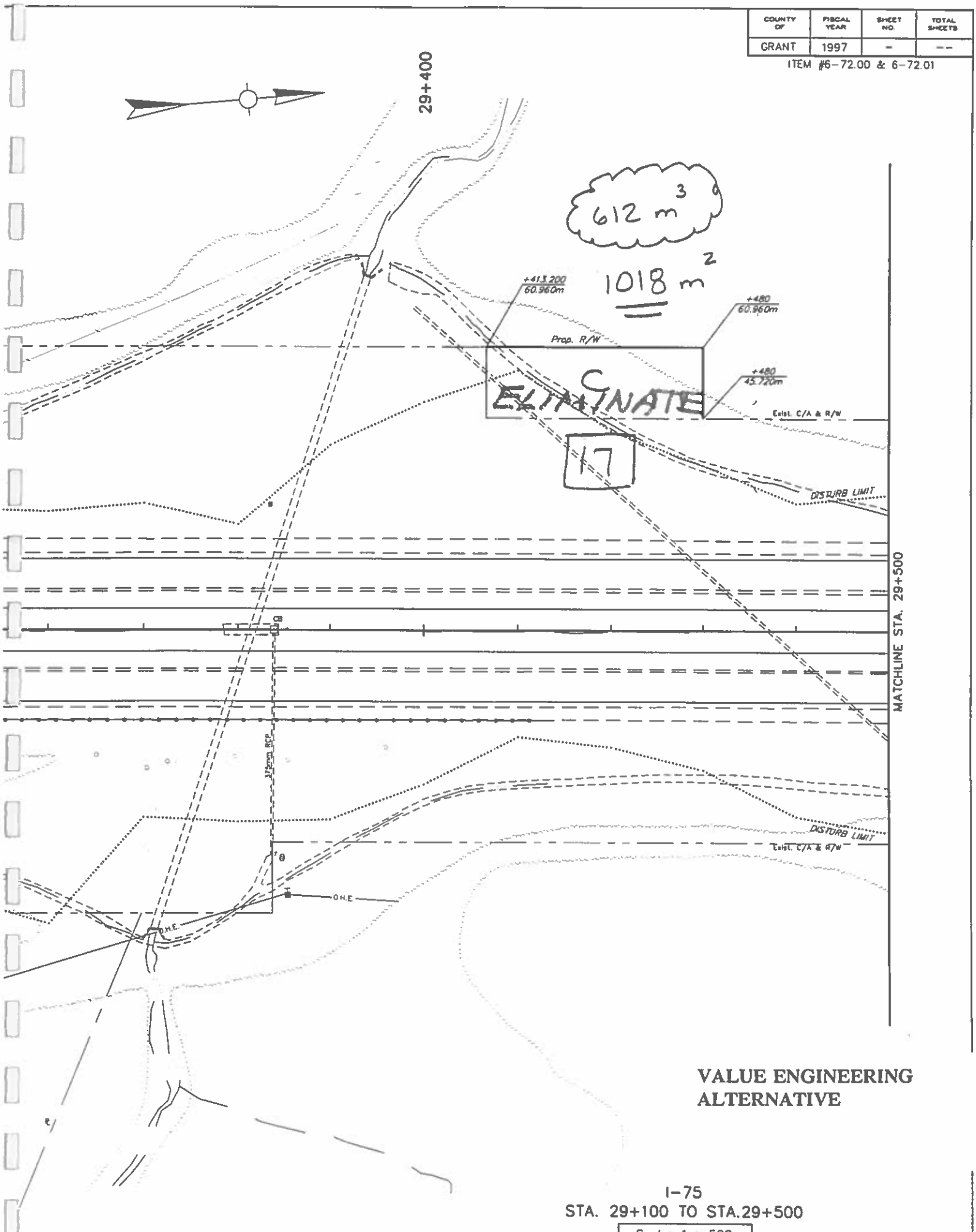


VALUE ENGINEERING ALTERNATIVE

I-75
STA. 29+500 TO STA. 29+900
Scale: 1 : 500

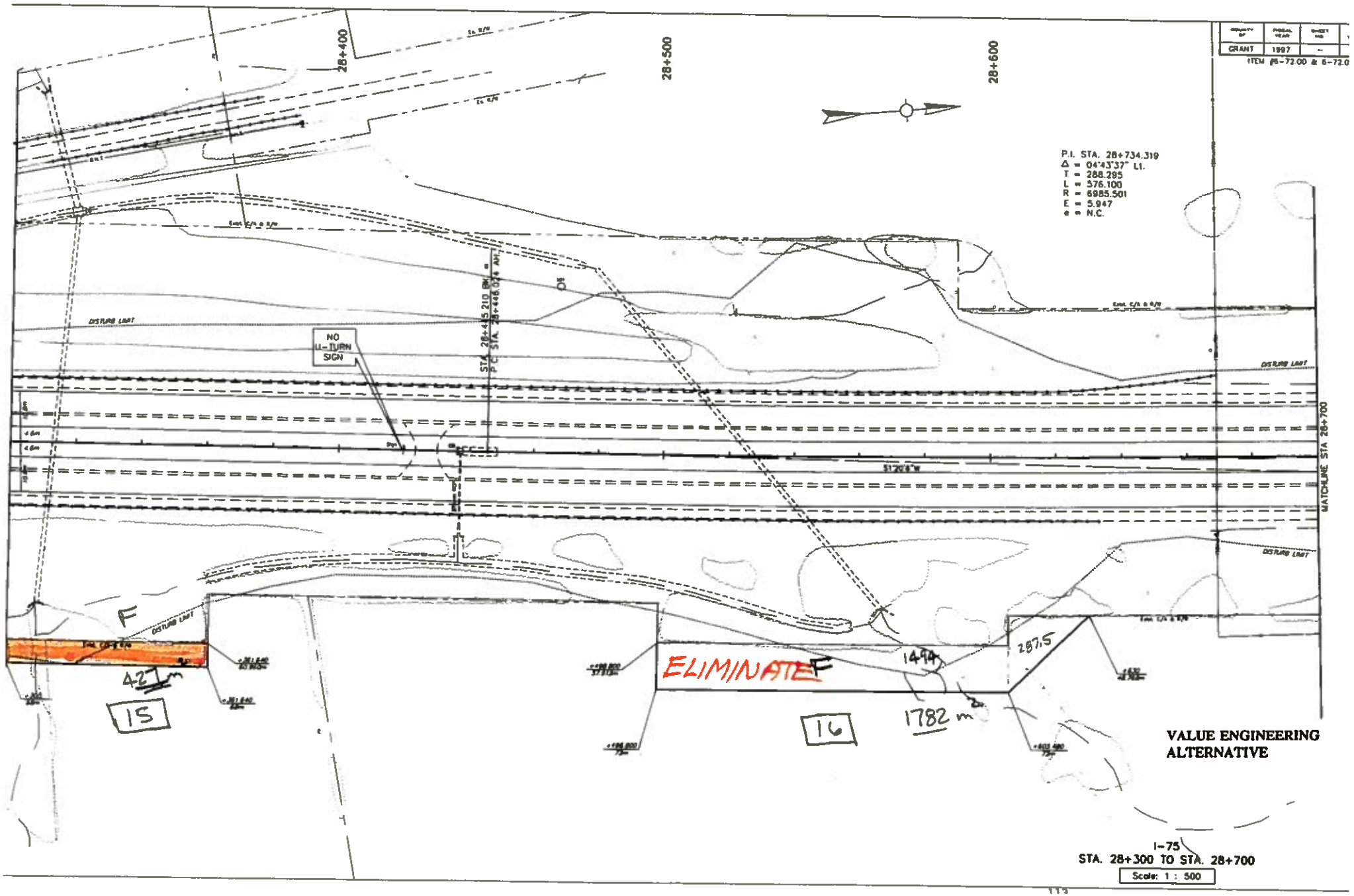
COUNTY OF	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
GRANT	1997	-	--

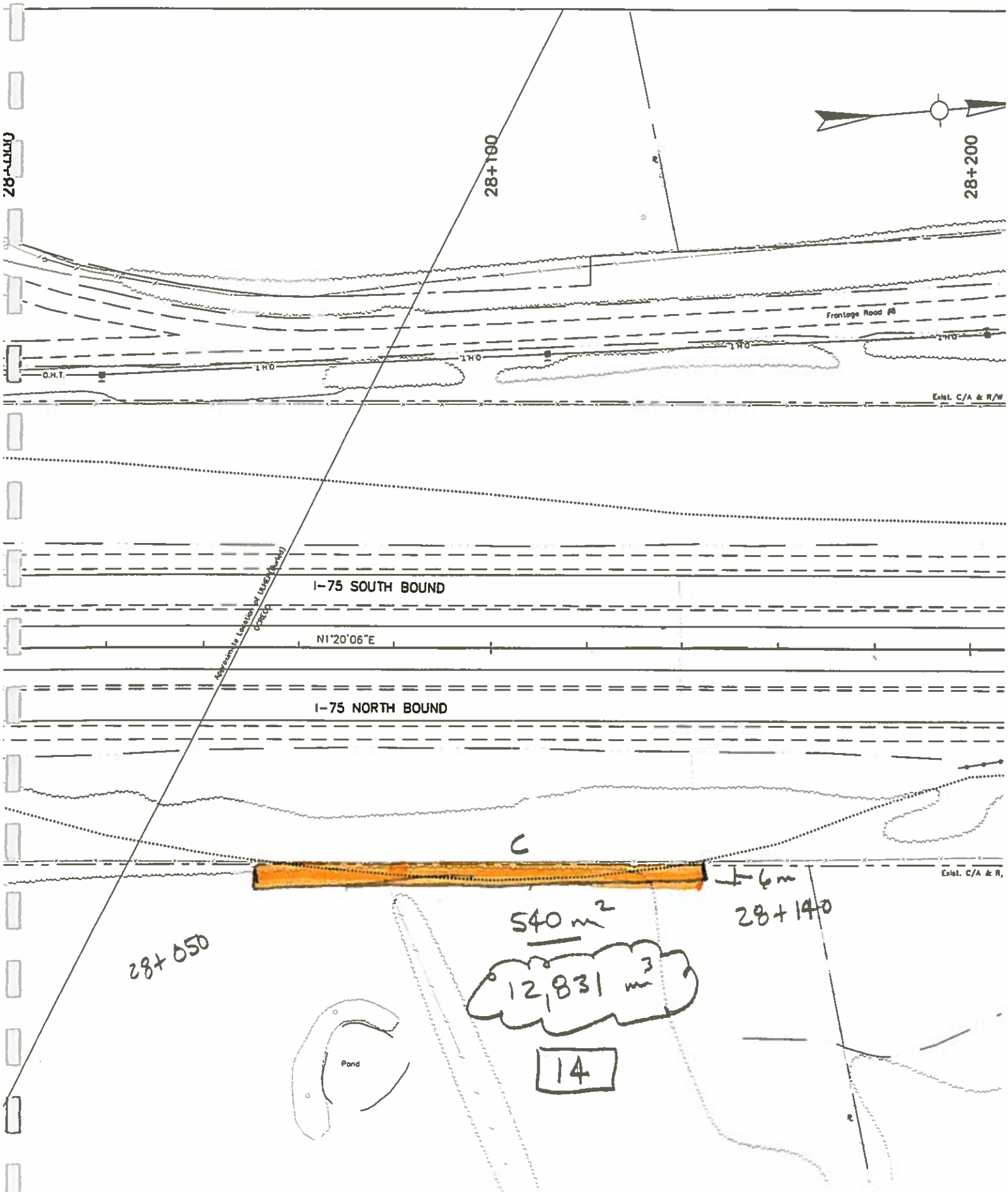
ITEM #6-72.00 & 6-72.01



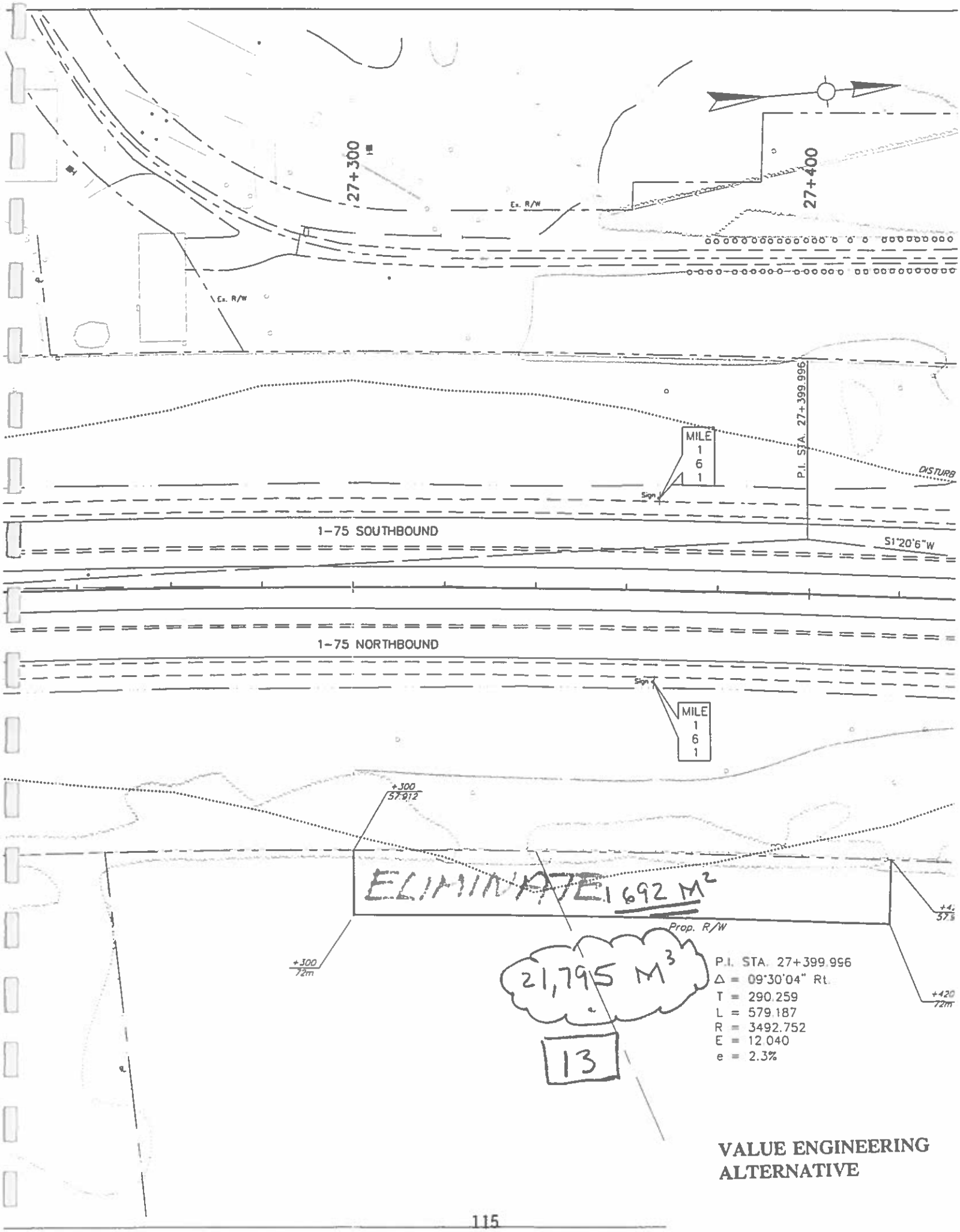
VALUE ENGINEERING ALTERNATIVE

I-75
STA. 29+100 TO STA.29+500
Scale: 1 : 500


28+400
28+500
28+600
P.I. STA. 28+734.319
Δ = 04°43'37" Lt.
T = 288.295
L = 576.100
R = 6985.501
E = 5.947
e = N.C.
NO U-TURN SIGN
DISTURB LIMIT
MATCHLINE STA 28+700
F
42 m
15
ELIMINATE
1494
287.5
1782 m
16
VALUE ENGINEERING ALTERNATIVE
I-75
STA. 28+300 TO STA. 28+700
Scale: 1 : 500



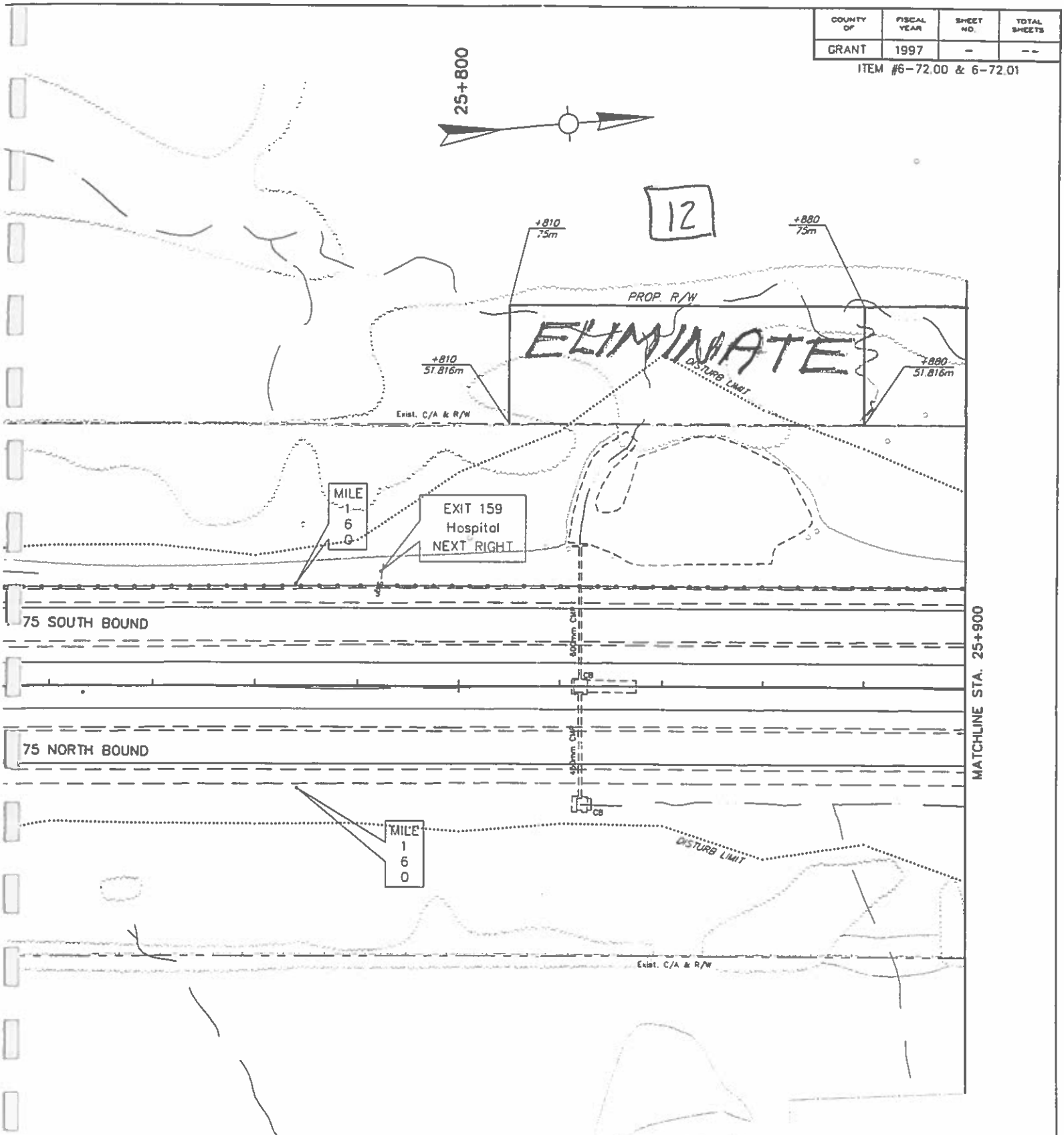
VALUE ENGINEERING ALTERNATIVE



VALUE ENGINEERING ALTERNATIVE

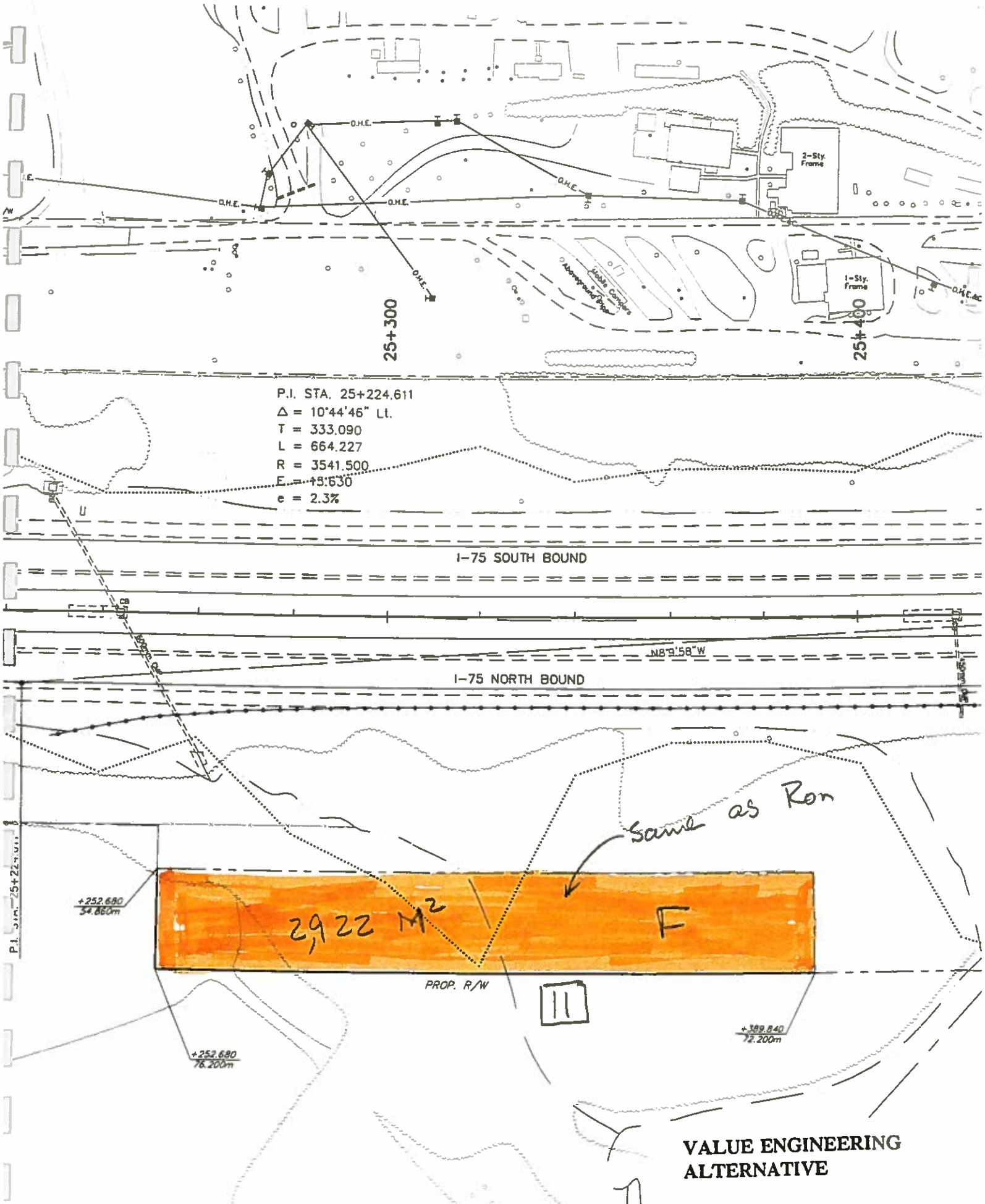
COUNTY OF	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
GRANT	1997	-	- -

ITEM #6-72.00 & 6-72.01

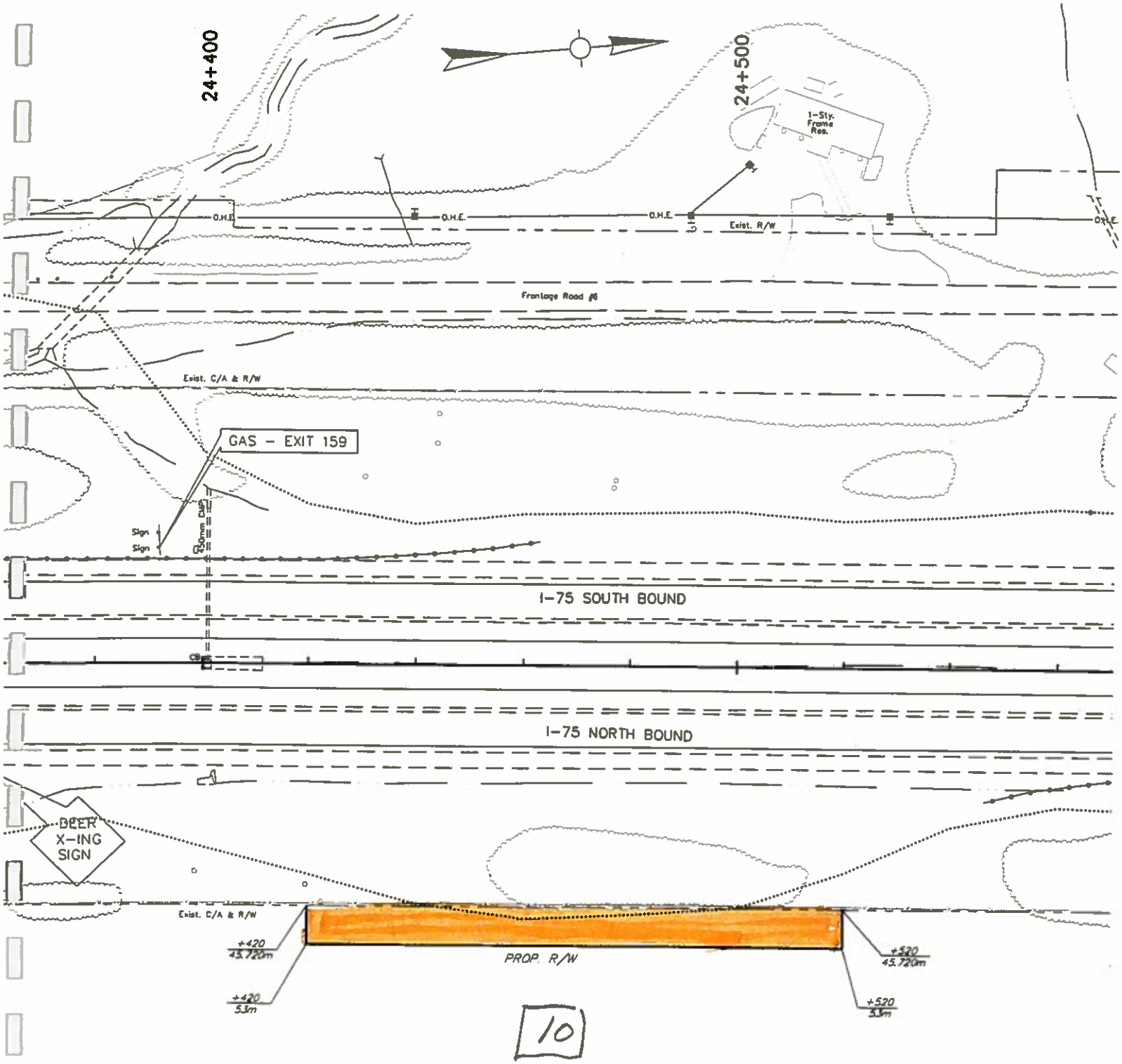


VALUE ENGINEERING ALTERNATIVE

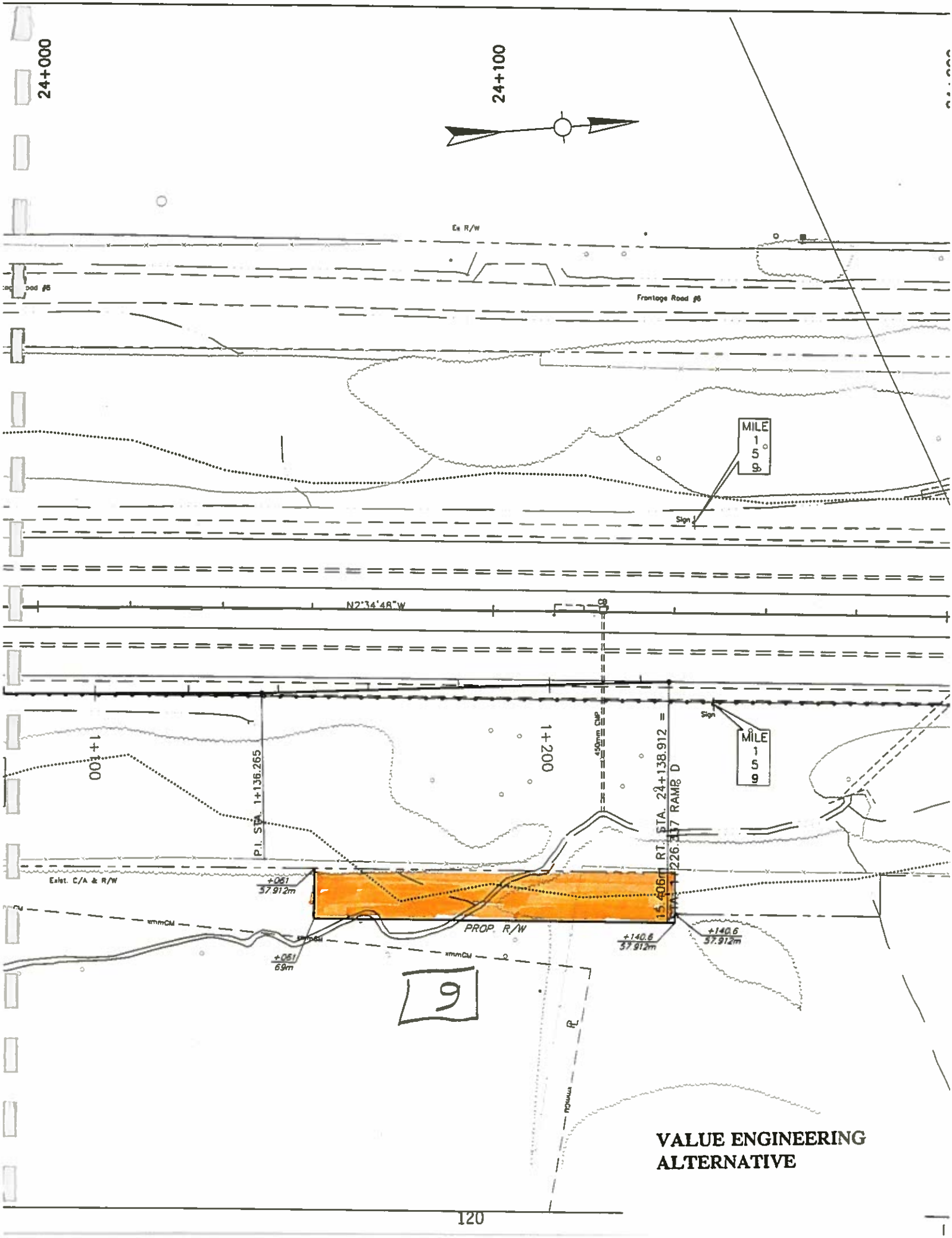
I-75
STA. 25+500 TO STA. 25+900
Scale: 1 : 500



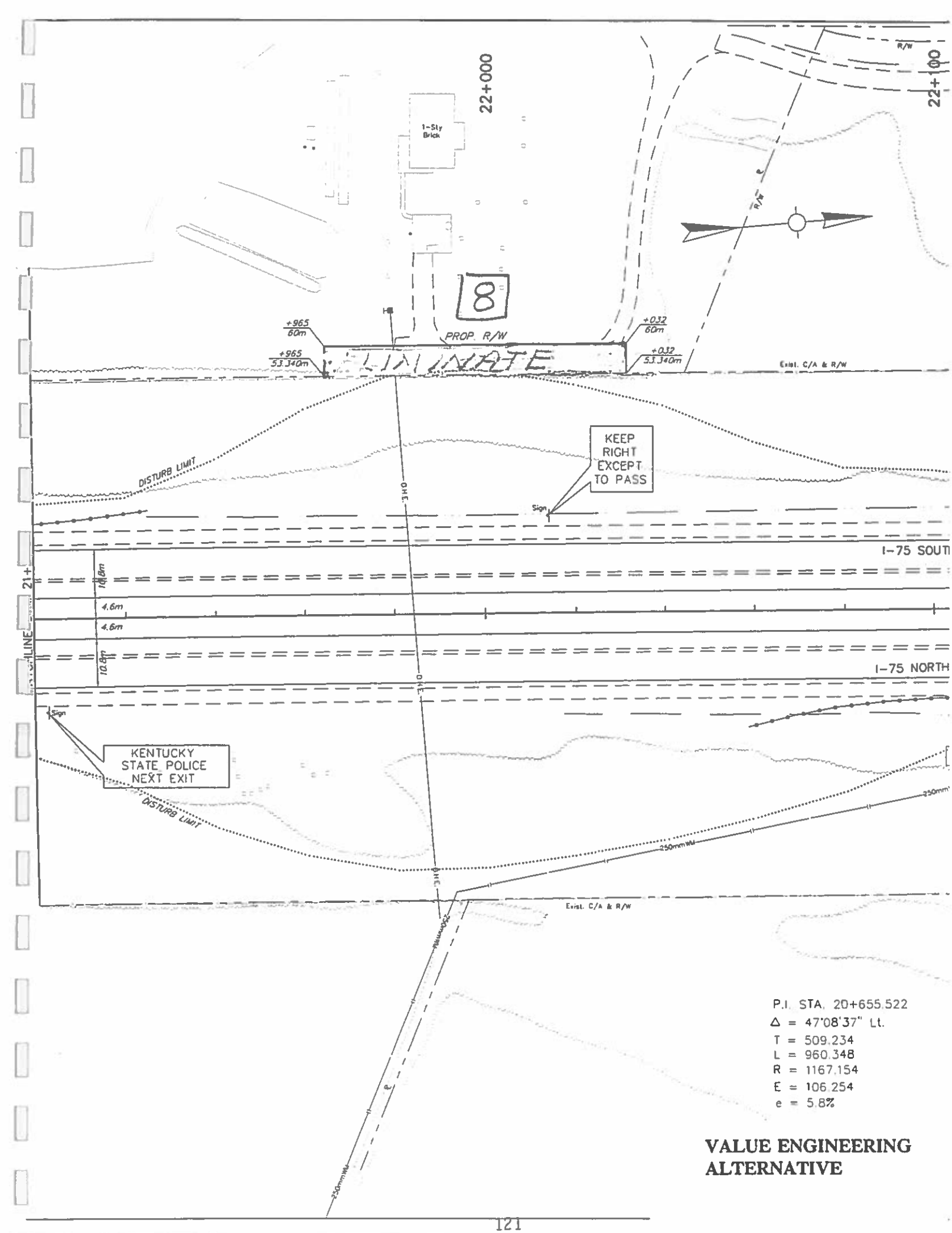
VALUE ENGINEERING ALTERNATIVE

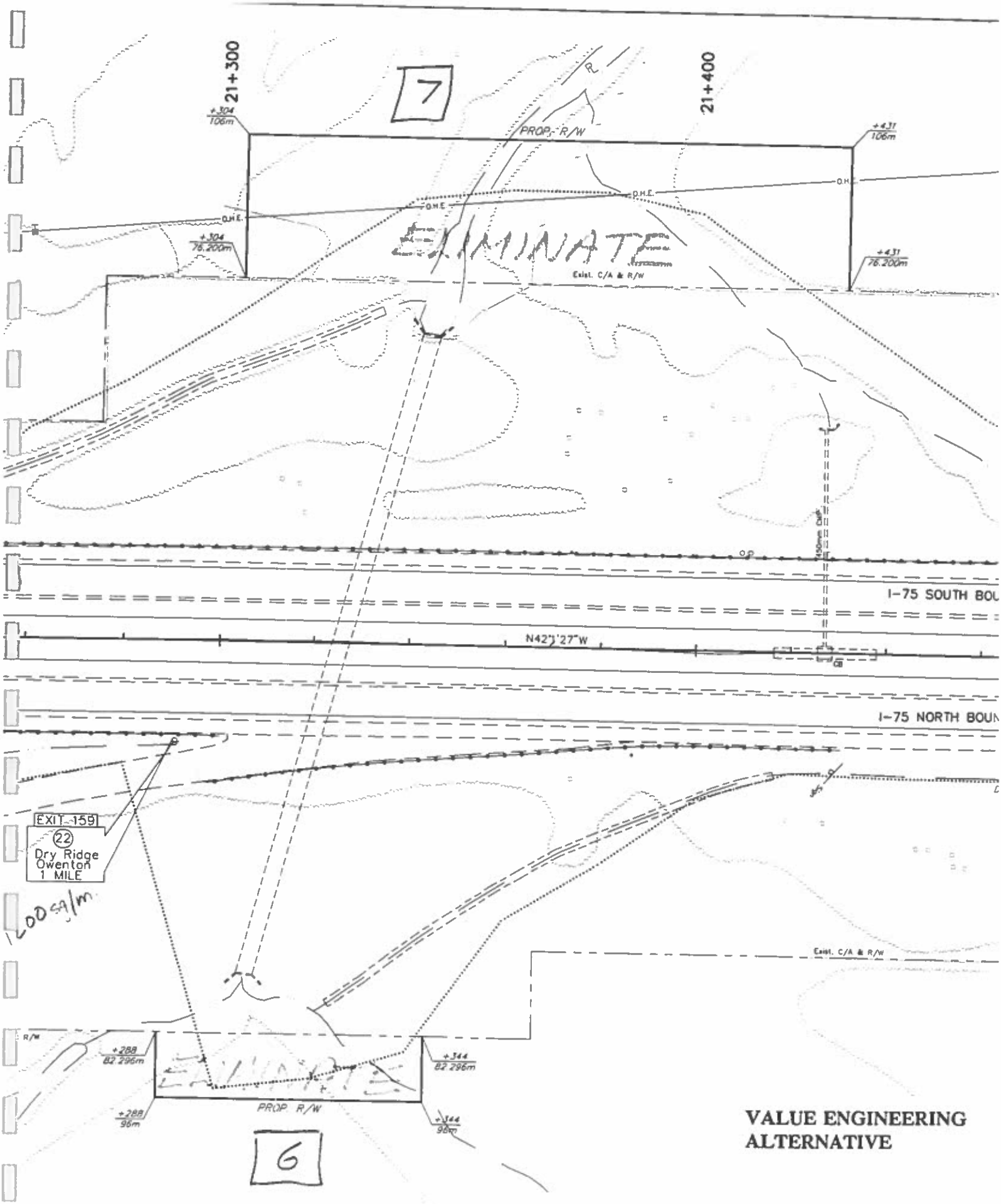


VALUE ENGINEERING ALTERNATIVE



VALUE ENGINEERING ALTERNATIVE

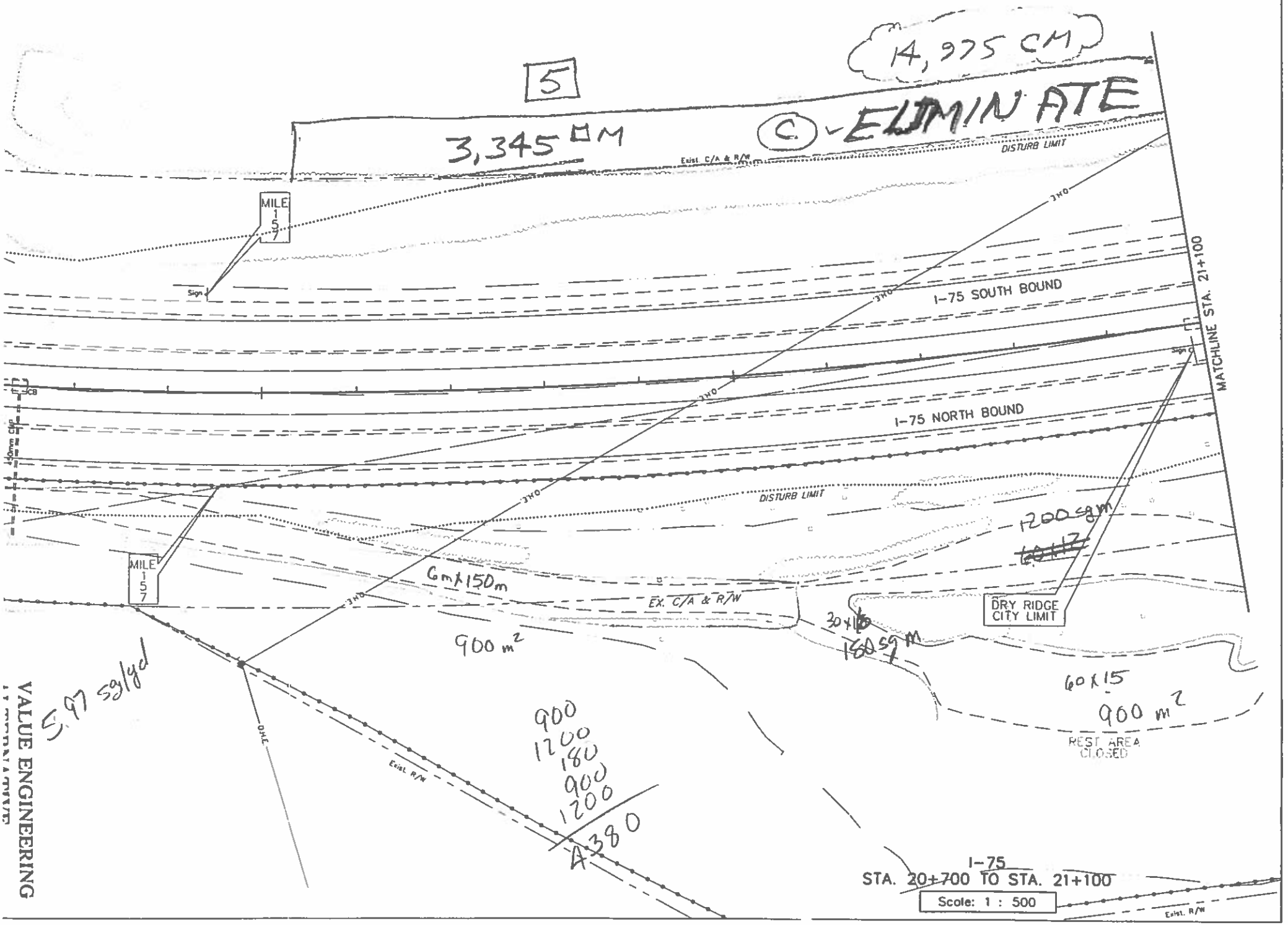

22+000
22+100
1-Sty Brick
8
+965 60m
+965 53.340m
PROP. R/W
+032 60m
+032 53.340m
ELIMINATE
Exist. C/A & R/W
R/W
DISTURB LIMIT
KEEP RIGHT EXCEPT TO PASS
Sign
I-75 SOUTH
I-75 NORTH
10.8m
4.6m
4.6m
10.8m
21+
LINE
3HO
Sign
KENTUCKY STATE POLICE NEXT EXIT
DISTURB LIMIT
250mmW
250mmW
250mmW
Exist. C/A & R/W
P.I. STA. 20+655.522
Δ = 47°08'37" Lt.
T = 509.234
L = 960.348
R = 1167.154
E = 106.254
e = 5.8%
VALUE ENGINEERING ALTERNATIVE

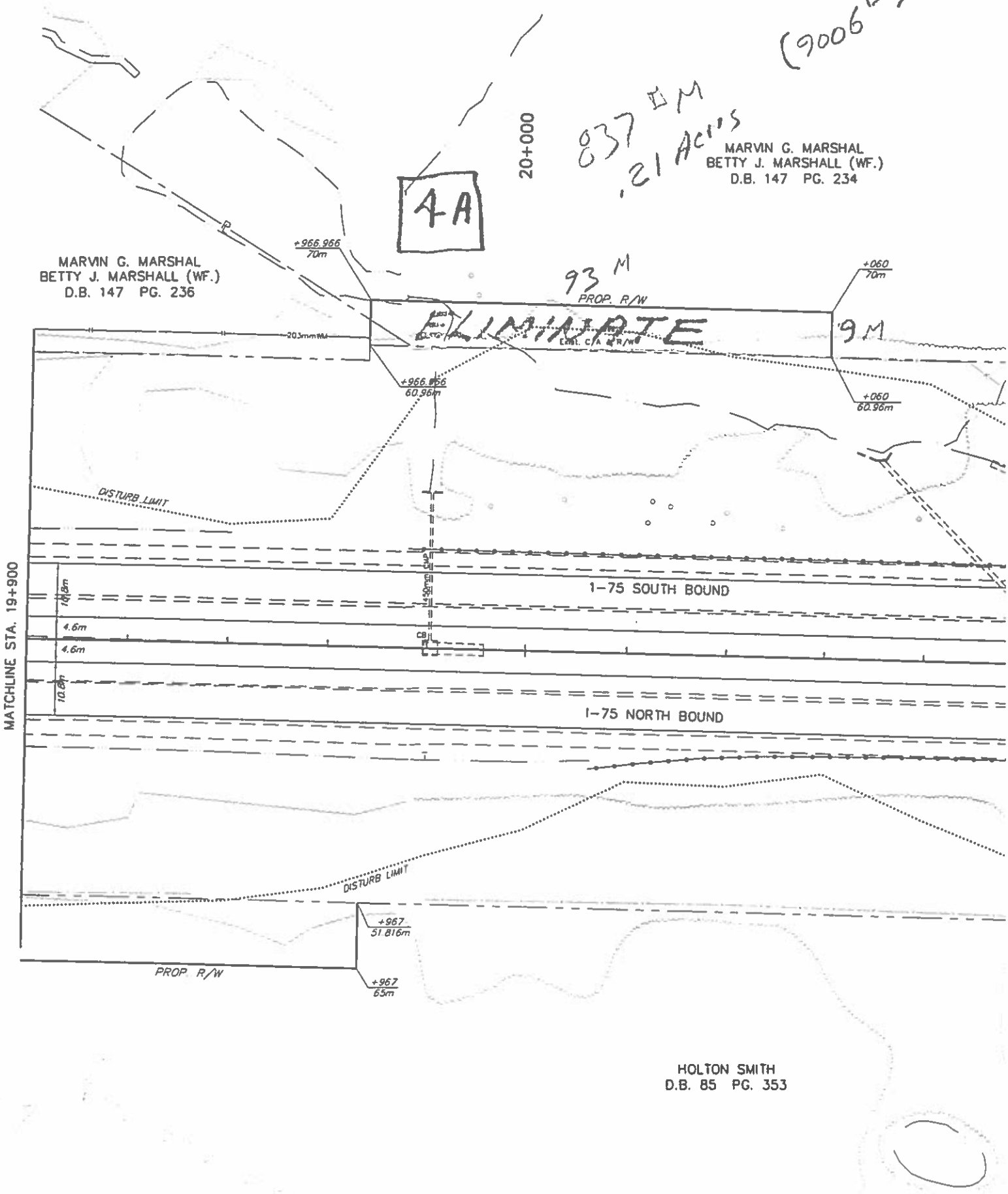


VALUE ENGINEERING ALTERNATIVE

I-75
STA. 21+100 TO

Scale: 1 :

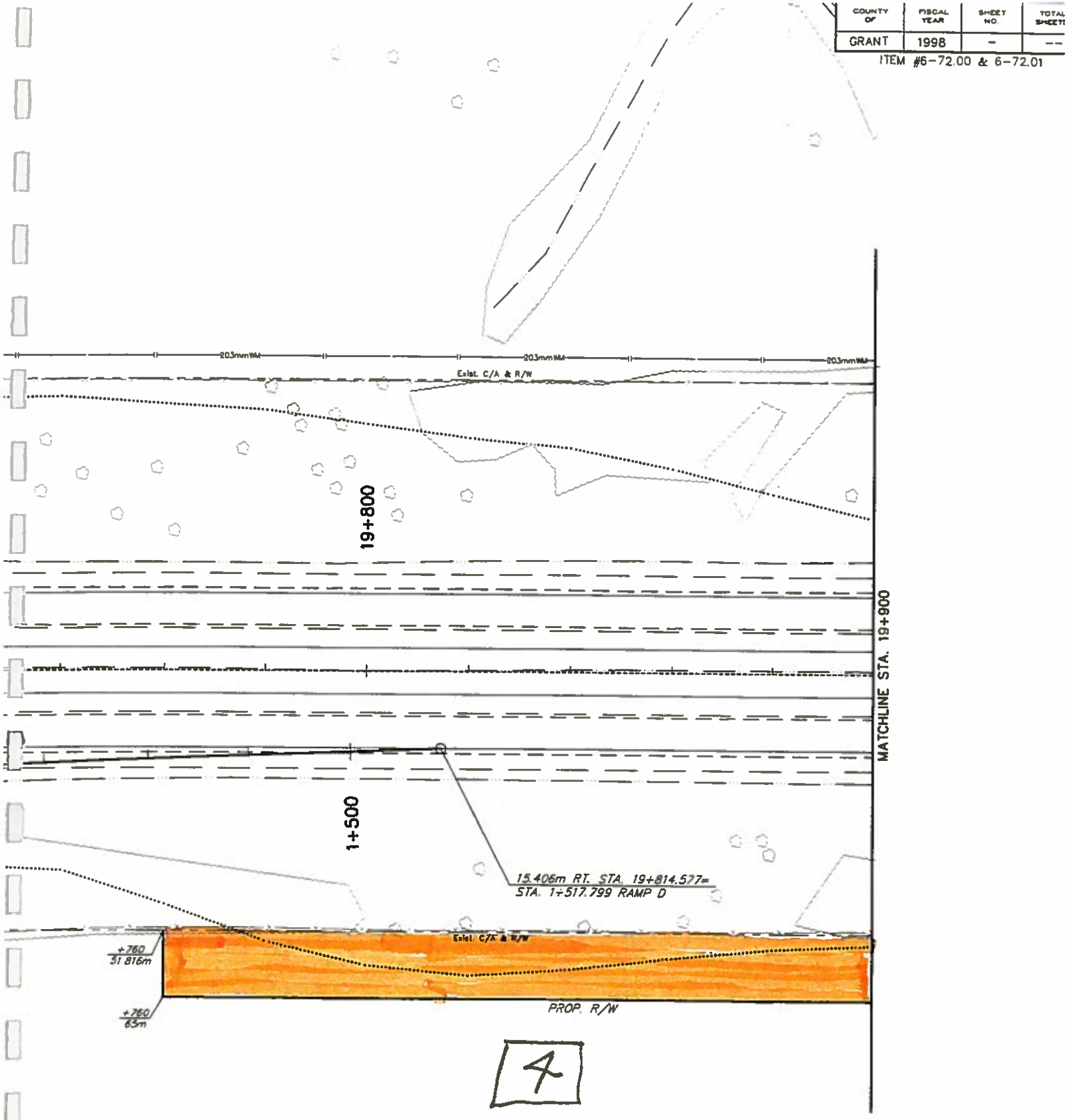

5
14,975 CM
3,345 □M
C. - ELIMINATE
Exist. C/A & R/W
DISTURB LIMIT
MILE 157
Sign
I-75 SOUTH BOUND
I-75 NORTH BOUND
MATCHLINE STA. 21+100
DISTURB LIMIT
1200 sqm
60 X 15
6m x 150m
EX. C/A & R/W
900 m²
30 x 15
150 sq m
DRY RIDGE CITY LIMIT
60 X 15
900 m²
REST AREA CLOSED
5.97 sq/yd
900
1200
180
900
1200
A380
Exist. R/W
I-75
STA. 20+700 TO STA. 21+100
Scale: 1 : 500
VALUE ENGINEERING



VALUE ENGINEERING ALTERNATIVE

COUNTY OF	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
GRANT	1998	-	--

ITEM #6-72.00 & 6-72.01



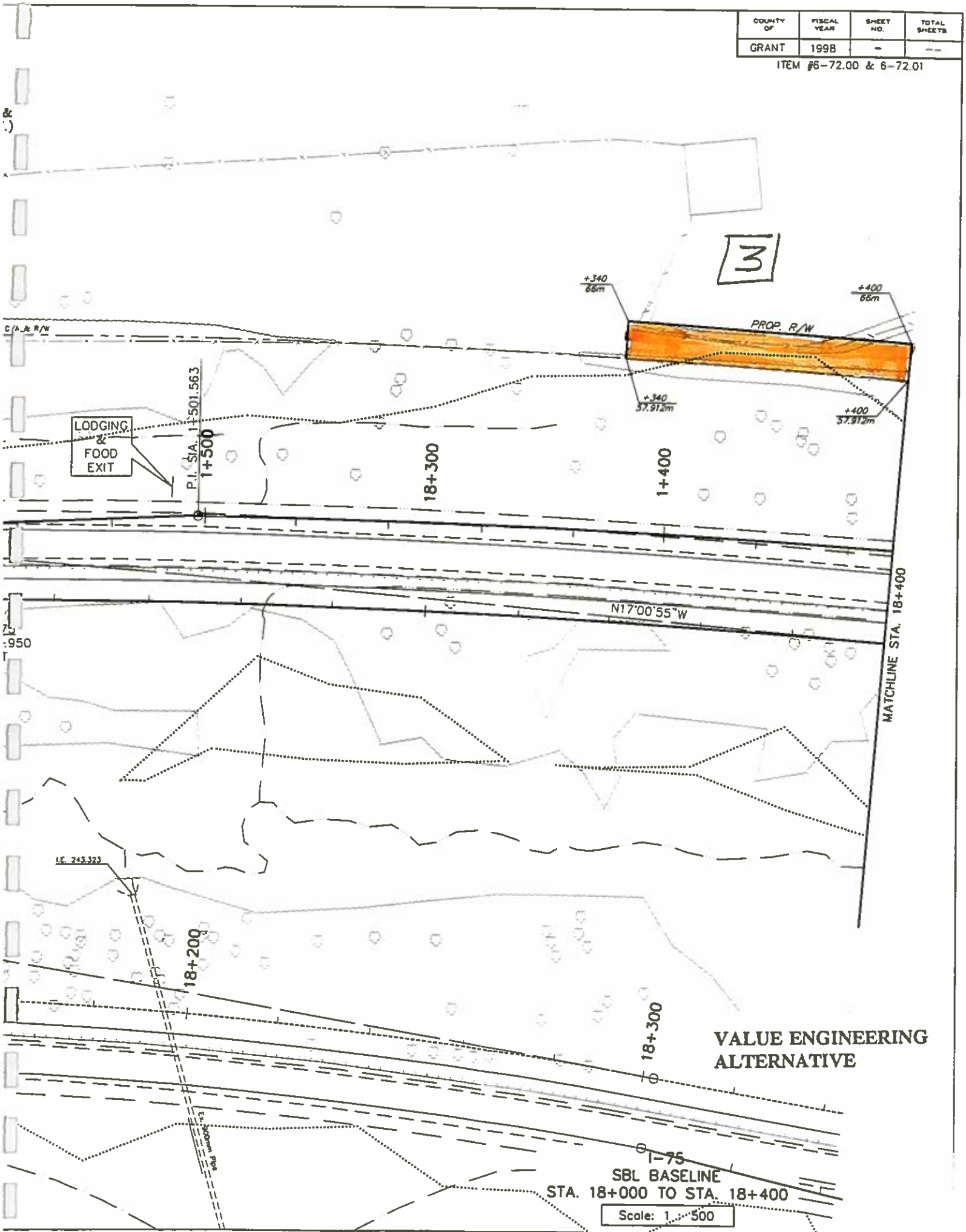
VALUE ENGINEERING ALTERNATIVE

I-75
SBL BASELINE
STA. 19+600 TO STA. 19+799.619

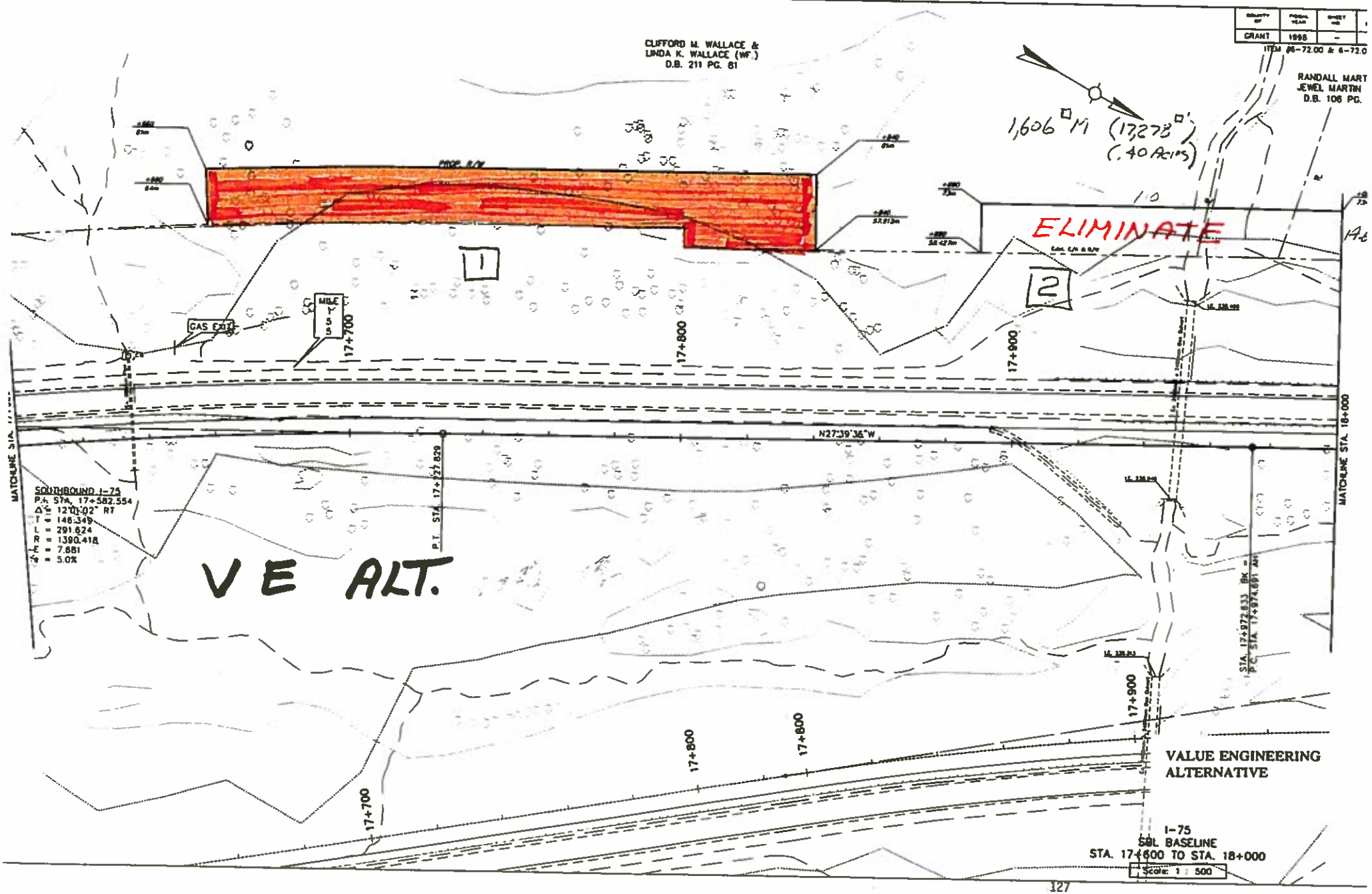
Scale: 1 : 500

COUNTY OF	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
GRANT	1998	-	--

ITEM #6-72.00 & 6-72.01



VALUE ENGINEERING ALTERNATIVE


CLIFFORD M. WALLACE &
LINDA K. WALLACE (WF.)
D.B. 211 PG. 81
RANDALL MART
JEWEL MARTIN
D.B. 106 PG.
1,606 M (17,278 ft²)
(.40 Acres)
ELIMINATE
1
2
GAS EXIT
MILE
17+700
17+800
17+900
N27°39'36"W
SOUTHBOUND I-75
P.I. STA. 17+582.554
Δ = 12°01'02" RT
T = 146.349
L = 291.624
R = 1390.418
e = 7.881
s = 5.0%
P.T. STA. 17+727.829
MATCHLINE STA. 16+000
VE ALT.
VALUE ENGINEERING
ALTERNATIVE
I-75
SBL BASELINE
STA. 17+600 TO STA. 18+000
Scale: 1 : 500

VII.(e) V. BARNES PIKE INTERCHANGE

VII.(e)(1) AS PROPOSED

"As Proposed"

The design consultant's "As Proposed" design is a diamond interchange with two new bridges. The new bridges will be on a new alignment approximately 25m north of the existing Barnes Pike alignment. This new alignment requires approximately 900m of roadway realignment including excavation. The existing bridges will be used for M.O.T.

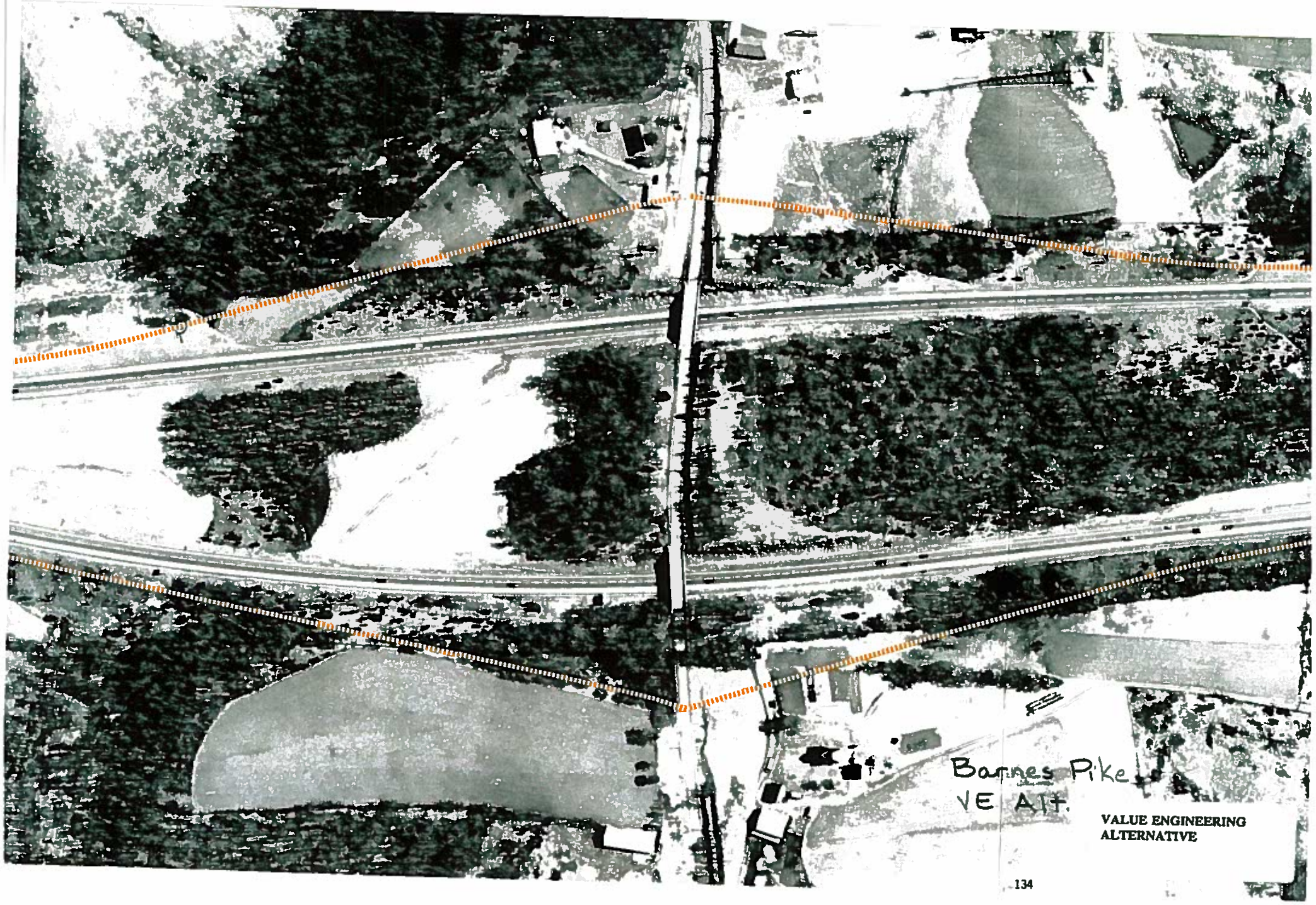
Barnes Pike
As Proposed

AS PROPOSED

VII.(e)(2) V.E. ALTERNATIVE

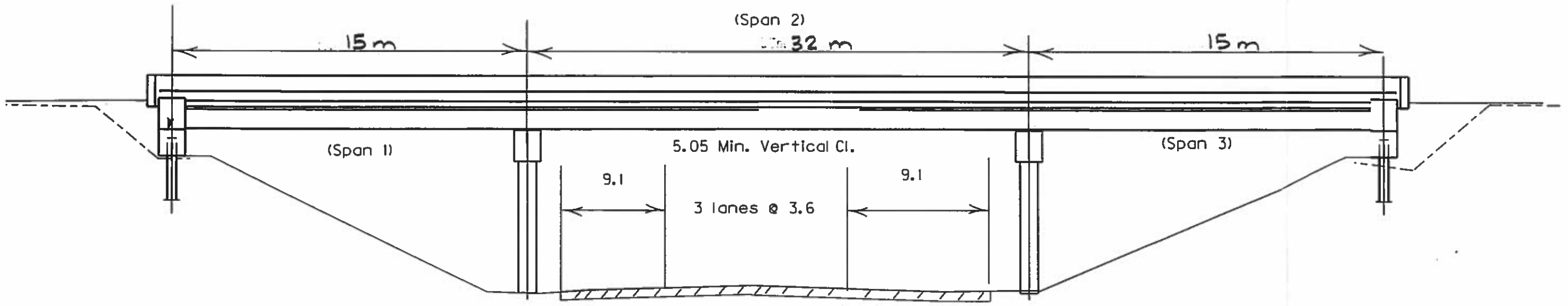
Value Engineering Alternative

The Value Engineering Alternative utilizes the "As Proposed" diamond interchange with two new bridges. The new bridges will be built at the location of the existing bridges. Acrow temporary bridges owned by the Transportation Cabinet can be used for MOT. The interchange ramps will be built before the bridges. This allows the ramps to be used for MOT during critical stages of existing bridge demolition and new bridge construction. Also, this alternative does not require realignment of Barnes Pike.



VALUE ENGINEERING
ALTERNATIVE

VE ALT

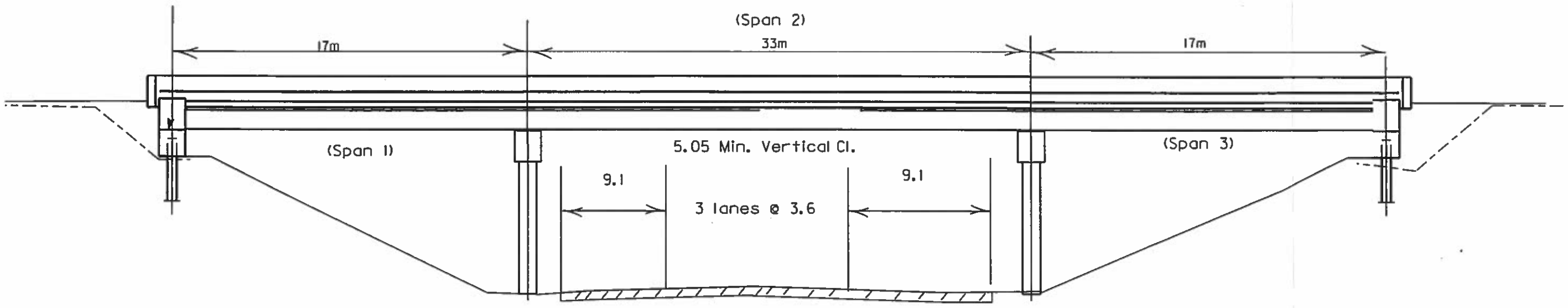


ELEVATION

Barnes Pike / I-75 NB

VALUE ENGINEERING ALTERNATIVE

VE ALT



ELEVATION

Barnes Pike/I-75 SB

VALUE ENGINEERING ALTERNATIVE

BARNES PIKE INTERCHANGE
COST COMPARISON

DESCRIPTION	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
BARNES PIKE BRIDGE NB I-75	$810,000	1	$ 810,000	1	$ 810,000
BARNES PIKE BRIDGE SB I-75	$730,000	1	$ 730,999	1	$ 730,000
RDWY EXCAVATION	$6.50	67,000	$ 435,500	0	0
DGA (4")	$16.00/MTON	643	$ 26,288	278	$ 4,448
BASE (6")	$31.00/MTON	2358	$ 73,098	399	$ 12,369
SURFACING (1 1/2")	$35.00/M TON	547	$ 19,145	0	0
TEMPORARY BRIDGES				1	$ 90,000
TOTAL			$2,094,031		$1,646,817
MOT 6.2%			$ 129,800		$ 102,100
TOTAL			$2,223,831		$1,748,917

Possible Savings $ 474,914

5. As proposed Barnes Pike Alignment 'B'

Bridges	$ 810,000
	+ 730,000

900 meters of new rdwy required

Rdwy Excavation =	61,000 m^3 x $6.50/$m^3$	= 396,500
DGA	1643 m-ton x $16/m-ton	= 26,288
Base	2358 m-ton x $31/m-ton	= 73,098
Surface	547 m-ton x $35/m-ton	= 19,145
		+ 2,055,031

MOT 6.2 %	127,410
	+ 2,182,441

Proposed Bridges are concrete box beams

5. As proposed Barnes Pike Alignment 'B' - 900 m

DGA (4")

$$\frac{24' \times 2953' \times \frac{4}{12} \times 153.4\ \#/Ft^3}{2000} \times .907 = 1643\ \text{m-ton}$$

Base (6")

$$\frac{24 \times 2953 \times \frac{6}{12} \times 146.7}{2000} \times .907 = 2358\ \text{m-ton}$$

Surf. (1 1/2")

$$\frac{24 \times 2953 \times \frac{1.5}{12} \times 136.1}{2000} \times .907 = 547\ \text{m-ton}$$

5. Barnes Pike -VE Alt

Bridges on original alignments 810,000
730,000

Temporary bridges
$250/LF × 180' × 2 = $90,000

DGA 278 × $16 = $4448
Base 399 m-tons × $31 = $12,369

$ 1,646,817

Proposed Bridges

are concrete box beams with 8" composite deck continuous over intermediate supports

D1

3/

5. Assume Transition 250' either side of bridge ∴ use 500'

Assume 4" DGA & 6" Base

DGA (4")

$$\frac{24' \times 500' \times \frac{4}{12} \times 153.4}{2000} \times .907 = 278 \text{ m-tons}$$

Base (6")

$$\frac{24' \times 500' \times \frac{6}{12} \times 146.7}{2000} \times .907 = 399 \text{ m-tons}$$

Excavation for Realigned Barnes Pike – Align. B

Sta.	Area	Vol.
110	3.5	
120	3.5	35
140	4	75
160	2.5	65
180	3	55
200	14	170
220	32	460
240	70	1020
260	126	1960
280	176	3020
300	184	3600
320	144	3280
340	80	2240
360	0	800
		16780
480	0	
500	150	1500
520	125	2750
540	33	1600
560	57	920
580	0	570
		7340
640	0	
660	210	2100
680	304	5140
700	352	6560
720	360	7120
740	259	6190
760	120	3790
780	240	3600
800	0	2400
		36900

61020 C Meters

Barnes PK

ML

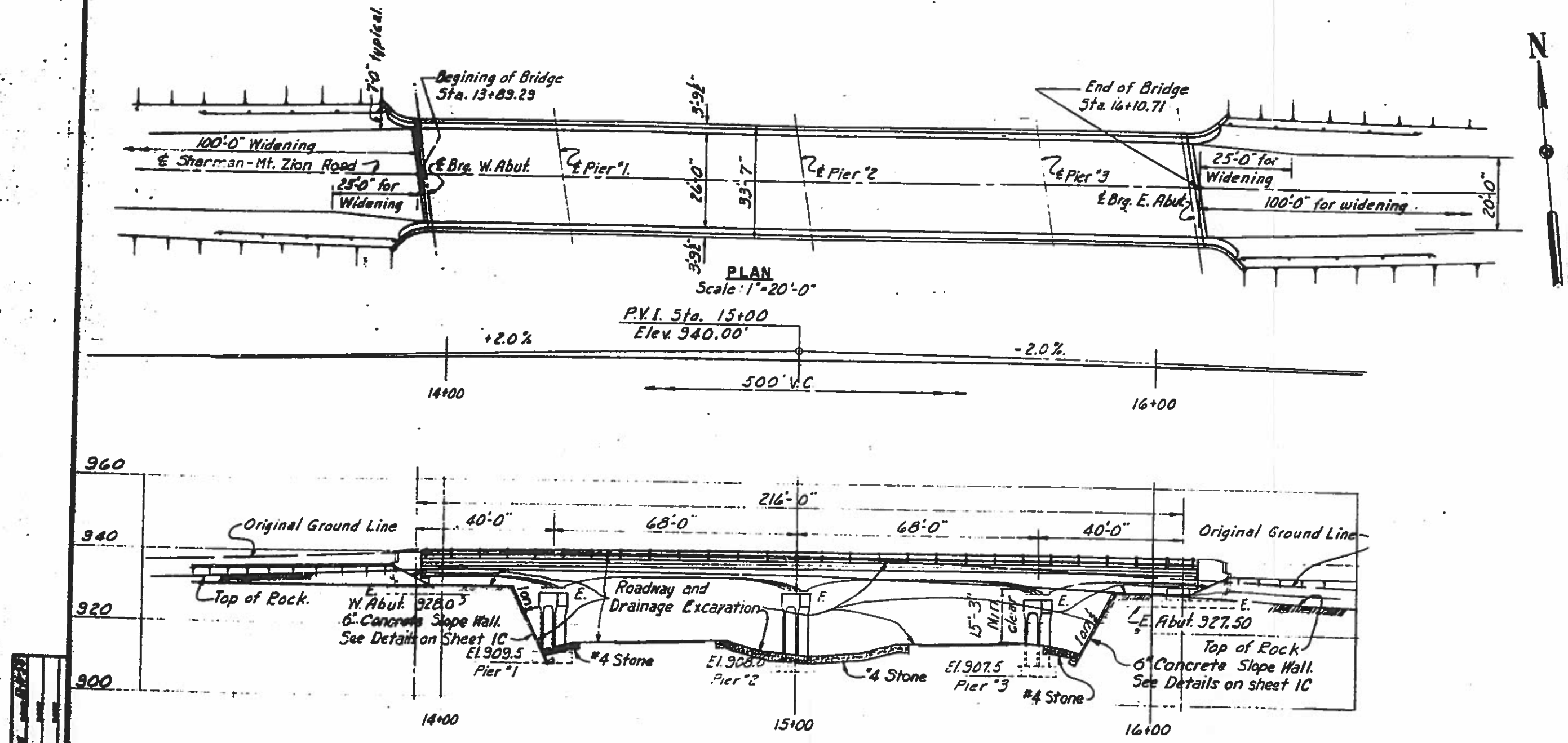
Exc Quantities

VII.(f) VI. SHERMAN/MT. ZION GRADE SEPARATION

VII.(f)(1) AS PROPOSED

"As Proposed"

The "As Proposed" recommendation is to jack the existing bridge to provide the required 16'6" vertical clearance. A site visit and the inspection report indicate the deck is delaminating and needs repair. Therefore, the "As Proposed" will include the cost of a deck overlay.



ELEVATION
Scale: 1"=20'-0"

Note:
No. 4 Stone shall be deposited in a uniform depth of four (4) inches. Any excavation or work incidental to applying this stone shall be paid by being included in the unit price bid per ton for the stone in place.

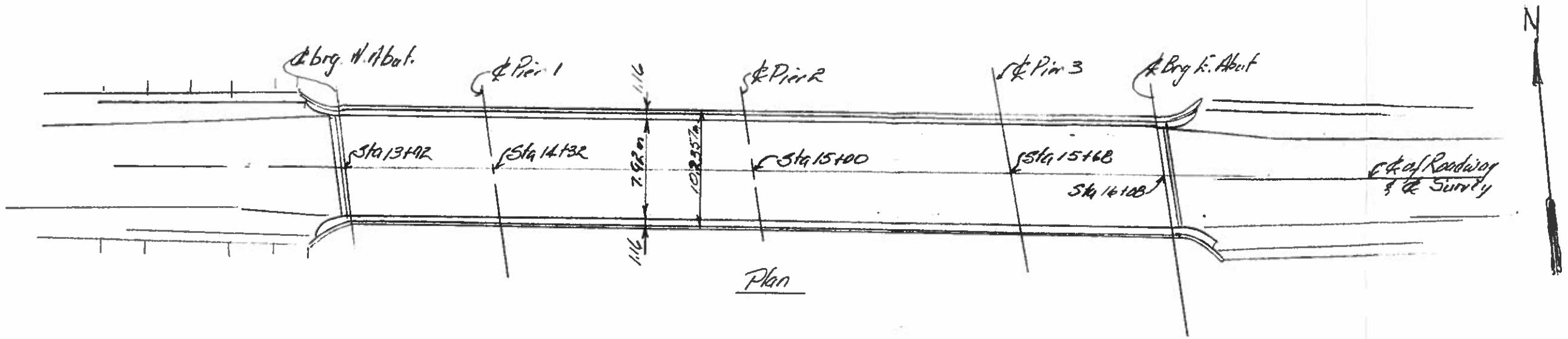
Sherman - Mt. Zion / I-75
'As - Proposed'

AS PROPOSED

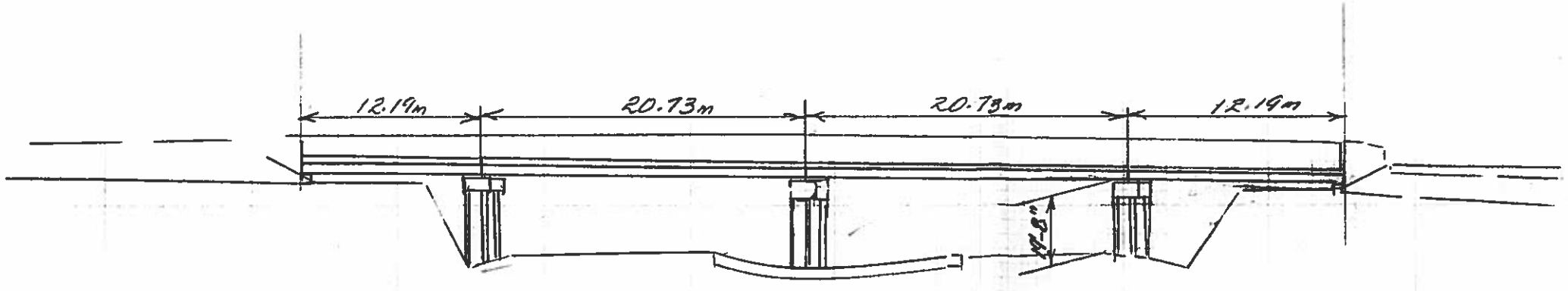
VII.(f)(2) V.E. ALTERNATIVES

Value Engineering Alternative No. 1

Value Engineering Alternative No. 1 is to remove the existing superstructure, rebuild the existing substructure to accept a new box beam bridge with current geometric requirements. This alternative reduces the amount of Sherman-Mt. Zion reconstruction required for this project. Also, the new superstructure would have a longer service life than the jacked-up existing superstructure. The Value Engineering alternative would save approximately $28,000.

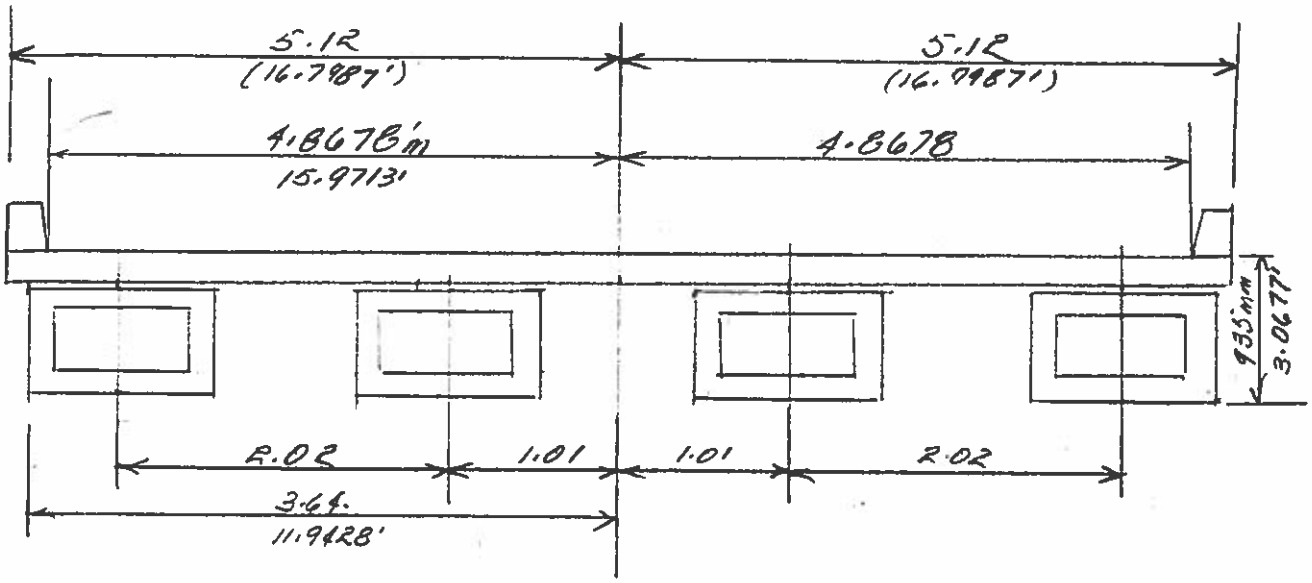


Plan

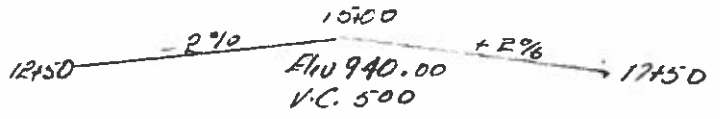


Elevation

Sherman - Mt. Zion / I-75
VE Alt.



Point of Vertical Clearance Taken @ Pier 3, right Side or Beam 4



$y = \frac{1}{2}\left(\frac{g_2 - g_1}{L}\right)x^2$

$= .004\left(\frac{x}{100}\right)^2$

Stg 15+68 + Tan 9.6667(11.9428) : Stn 15+70.0343

940 - .02(70.0343) - .004(1.7997)² = 938.5864

Slope —— 2% Slope = -.2389

Slab + Pad + Beam = -3.0677

935.2298

Sherman - Mt. Zion / I-75
VE Alt.

VALUE ENGINEERING ALTERNATIVE

SHERMAN/MT. ZION GRADE SEPARATION
COST COMPARISON

DESCRIPTION	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
JACK BRIDGE	$150,000	1	$150,000		
RECONSTRUCT SUBSTR.	$ 30,000	1	$ 30,000		
APPR. PAVEMENT	$ 50,000	1	$ 50,000		
APPR. GUARDRAIL	$ 5,000	1	$ 5,000	1	$ 5,000
MOT	$ 20,000	1	$ 20,000	1	$ 20,000
DECK OVERLAY	$15.00/SF	5616	$ 84,200		
REMOVE EXISTING SUPER.	$ 30,000			1	$ 30,000
RECONSTRUCT SUBSTR.	$ 25,000			1	$ 25,000
CLASS AA CONC.	$340/CY			228	$ 77,520
REINF.	$.75/LB			50,000	$ 37,500
BOX BMS	$100/FT			864	$ 86,400
APPR. PAVEMENT	$ 30,000			1	$ 30,000
TOTAL			$339,200		$311,420

Possible Savings $27,780

1/

6. Sherman - Mt. Zion/I-75
As-Proposed
Jack existing bridge & repair deck

Jack Bridge	150,000
Reconstruct Substruct.	30,000
Appr. Pavement	50,000
Appr. Guardrail	5,000
M.O.T.	20,000

Overlay ($15/SF)
26' x 216' x $15/SF = $84,200

339,200

6. Sherman - Mt. Zion / I-75
VE-1

Use existing substructure
& build new superstructure

Remove existing superstr.			30,000
Reconstruct substr.			25,000
Class AA Conc.	228 C.Y.	@ $340	77,520
Reinf.	50,000 lbs.	@ .75	37,500
Box Bms.	864'	@ $100/ft	86,400
Appr. Guardrail			5,000
Appr. Pavement			30,000
			$ 291,420

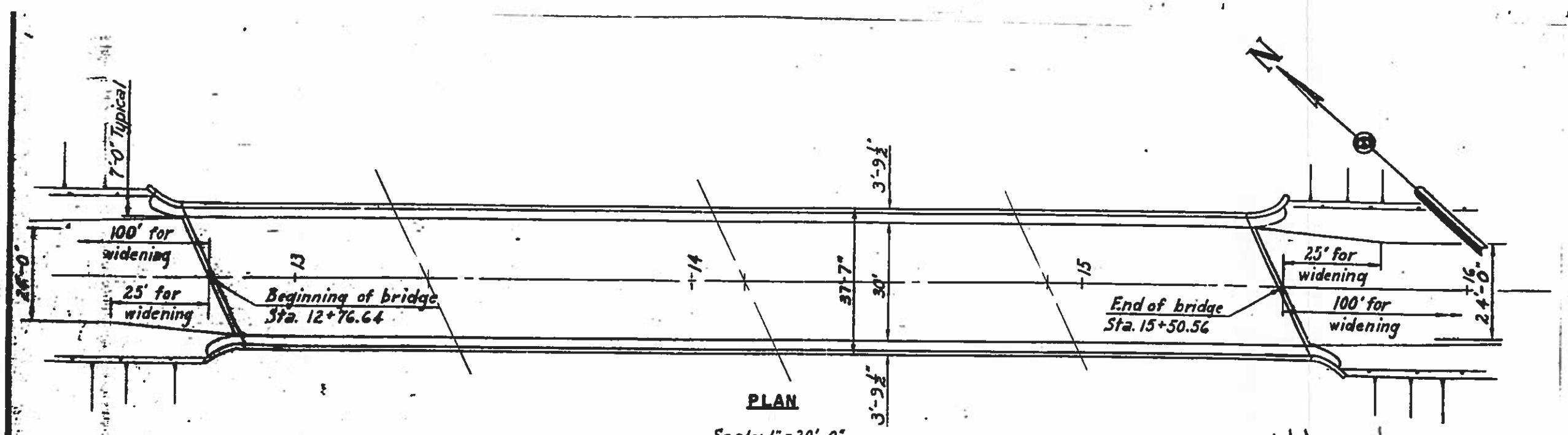
VII.(g) VII. CRITTENDEN/MT. ZION GRADE SEPARATION

VII.(g)(1) AS PROPOSED

"As Proposed"

The "As Proposed" recommended proposal is to build a new bridge at the existing bridge location. A school is nearby and school buses use this crossing. Therefore, the existing bridge demolition and new bridge construction must be completed in the 3 month summer period when the school is closed. This scheme will require closing Crittenden-Mt. Zion Road and MOT on I-75 during demolition and construction.

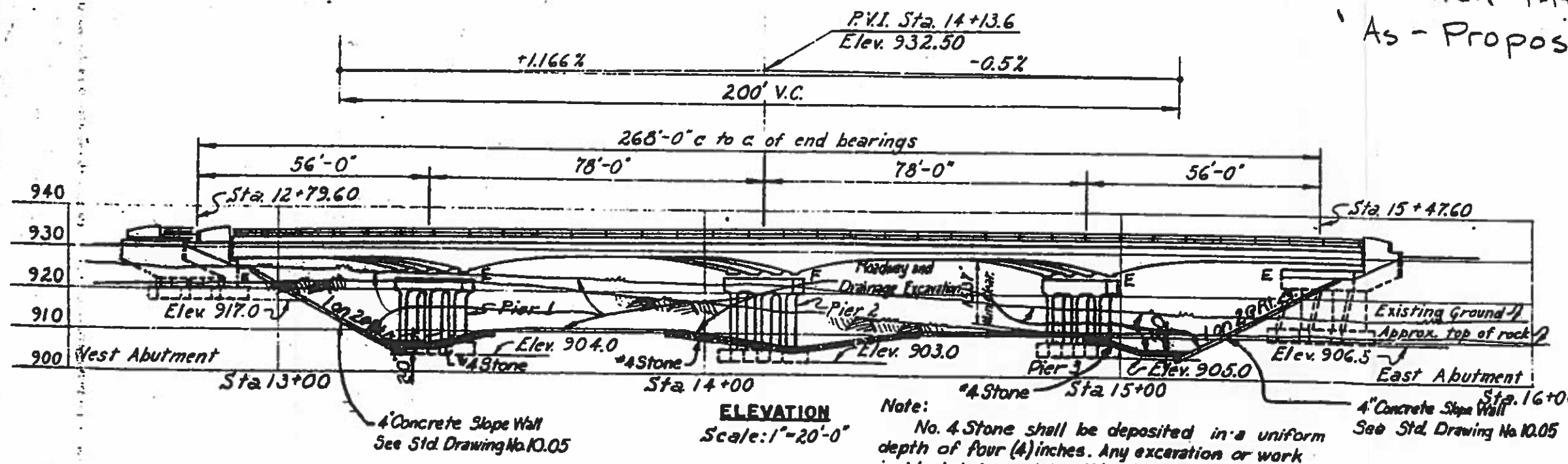
As Prop.



PLAN

Scale: 1" = 20'-0"

Crittenden - Mt. Zion / I-75
'As - Proposed'



ELEVATION

Scale: 1" = 20'-0"

Note:

No. 4 Stone shall be deposited in a uniform depth of four (4) inches. Any excavation or work incidental to applying this stone shall be paid for by being included in the unit price bid per ton for the stone in place.

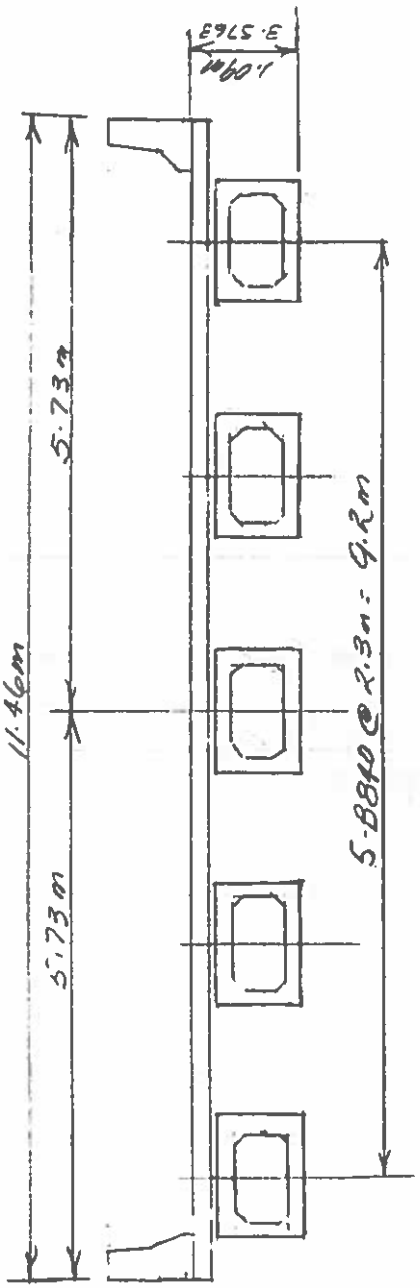
AS PROPOSED

VII.(g)(2) V.E. ALTERNATIVES

CRITTENDEN/MT. ZION GRADE SEPARATION

Value Engineering Alternative No. 1

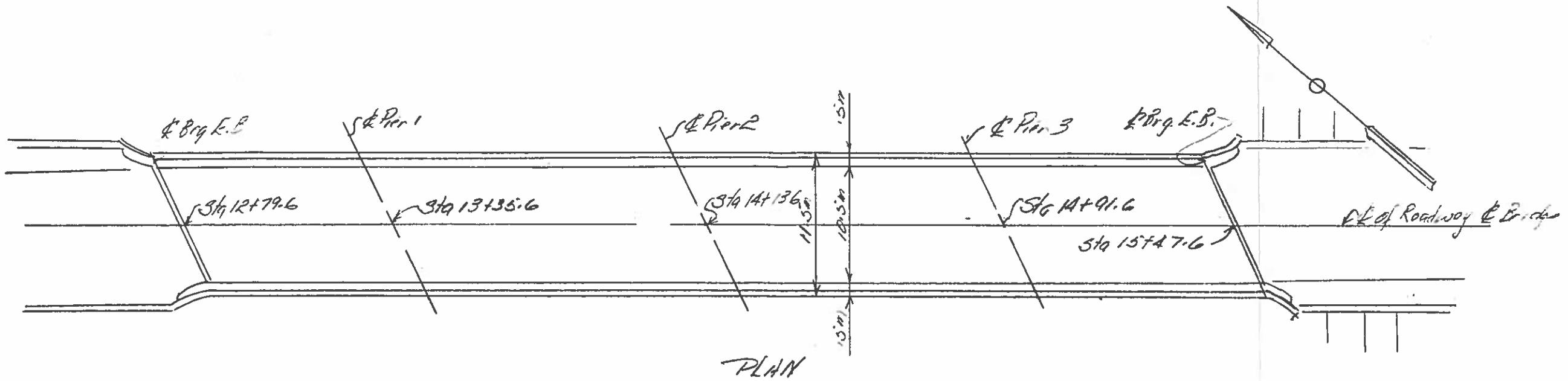
The Value Engineering Alternative No. 1 utilizes the existing substructure and a new superstructure. The new superstructure will utilize box beams and the width of the new superstructure will meet current standards. The substructure will be rebuilt to accept the new superstructure and to provide 16'-6" of vertical clearance. This alternative will provide longer service life than the "As Proposed" and save approximately $670,000.



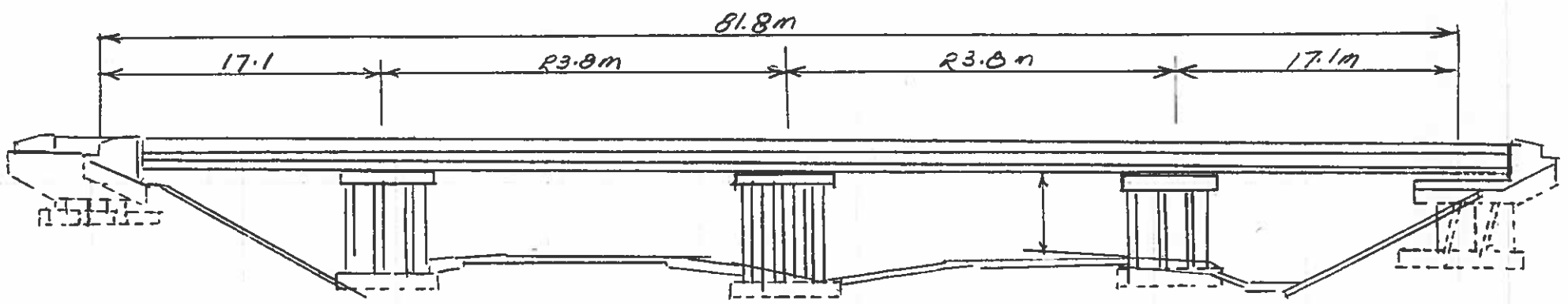
Crittenden - Mt. Zion / I-75
VE - 1

VALUE ENGINEERING ALTERNATIVE

VE 1



PLAN



ELEVATION

Crittenden - Mt. Zion / I-75
VE-1

CRITTENDEN/MT. ZION GRADE SEPARATION
VALUE ENGINEERING ALTERNATIVE NO. 1
COST COMPARISON

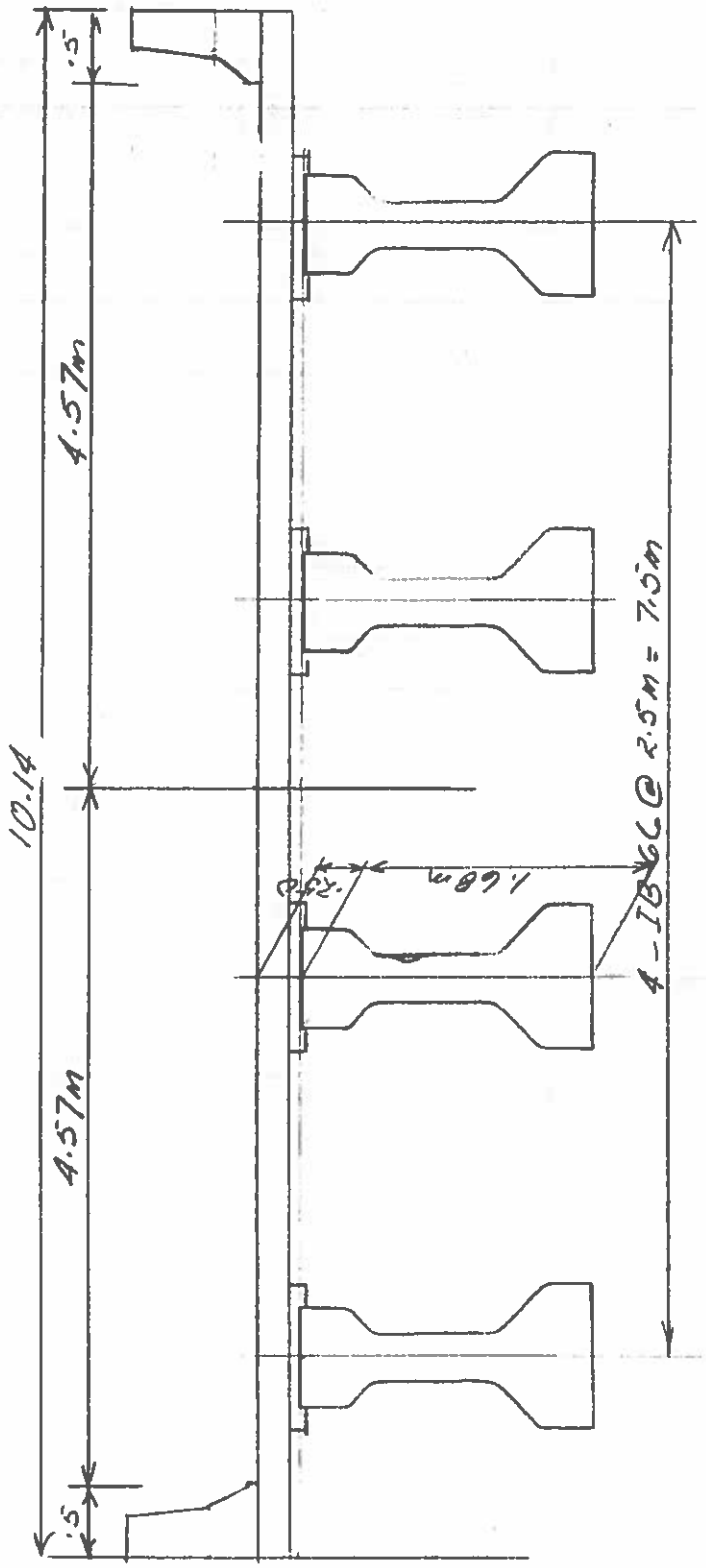
DESCRIPTION	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
NEW BRIDGE @ EXIST. LOC.		1	$767,000		
REMOVAL EXIST. BRIDGE	$ 50,000	1	$ 50,000		
APPR. PAVEMENT	$ 60,000	1	$ 60,000		
APPR. GUARDRAIL	$ 6,000	1	$ 6,000		
DETOUR	$ 25,000	1	$ 25,000	1	$ 25,000
APPR. PAVEMENT	$ 30,000			1	$ 30,000
PARTIAL BRIDGE REMOVAL				1	$ 30,000
RECONSTRUCT SUBSTR.				1	$ 25,000
CLASS AA CONCRETE	$340/YD^3			271	$ 92,140
REBARS	$0.75/LB			60,000	$ 45,000
BOX BMS	$100/LF			1,072	$107,200
TOTAL			$908,000		$354,340
MOT 6.2%			$ 56,300		$ 21,970
TOTAL			$964,300		$376,310

Possible Savings $ 587,990

CRITTENDEN/MT. ZION GRADE SEPARATION

Value Engineering Alternative No. 2

The Value Engineering Alternative No. 2 utilizes a two span bridge that spans I-75 on a 90 degree crossing. Crittenden/Mt. Zion Rd. will be realigned south of the existing crossing. The new bridge utilizes AASHTO Type V prestressed concrete beams with spans of 36 meters. This alternative utilizes the existing bridge for MOT. Therefore, construction schedule will not be affected by the schools schedule. The bridge length is minimized. The roadway realignment requires minimal right of way. The alignment improves the entrance to the high traffic generator mobile home park. The estimate includes the cost of upgrading Roark Road. This alternative saves approximately $305,000.

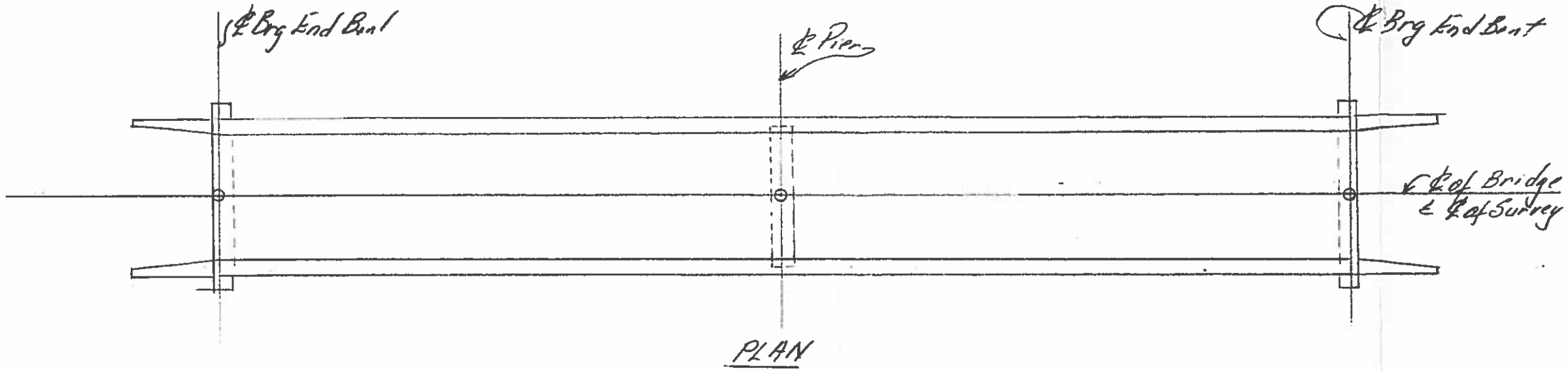


Crittenden - Mt. Zion / I-75
VE - 2

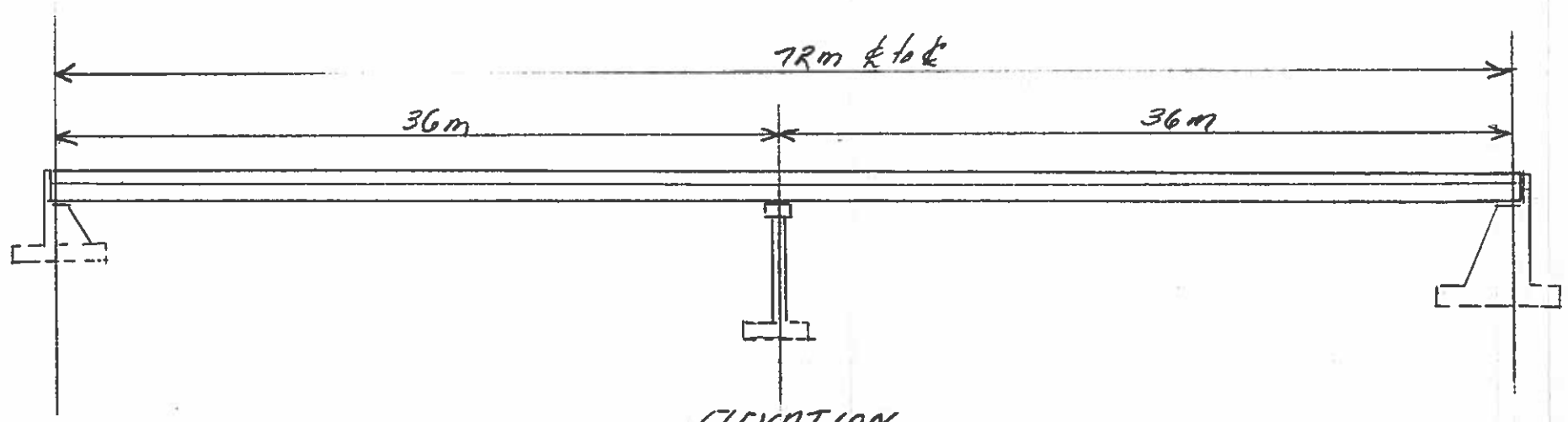
VALUE ENGINEERING ALTERNATIVE

VE 2

VE-2



PLAN



ELEVATION

Crittenden-Mt. Zion / I-75
VE-2

VALUE ENGINEERING
ALTERNATIVE

Crittenden-Mt. Zion
Grade Separation Structure
Over I-75

VE Alternate 2

VALUE ENGINEERING ALTERNATIVE

CRITTENDEN/MT. ZION GRADE SEPARATION
ALTERNATIVE NO. 2
COST COMPARISON

DESCRIPTION	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
NEW BRIDGE @ EXIST. LOC.		1	$767,000	1	$509,544
REMOVAL EXIST. BRIDGE	$50,000	1	$ 50,000	1	$ 50,000
APPR. PAVEMENT	$60,000	1	$ 60,000		
APPR. GUARDRAIL	$ 6,000	1	$ 6,000	1	$ 6,000
DETOUR	$ 25,000	1	$ 25,000	1	$ 25,000
DGA	$16/M TON			385	$ 6,160
BASE	$31/M TON			552	$ 17,112
SURFACING	$35/M TON			128	$ 4,480
R/W				1	$ 2,500
TOTAL			$908,000		$620,796
MOT 6.2%			$ 56,300		$ 38,500
TOTAL			$964,300		$659,296

Possible Savings $ 305,004

7. Crittenden - Mt. Zion / I-75
As Proposed

New Bridge @ existing location

Bridge	767,000
Remove existing bridge	50,000
Approach Pavement	60,000
Approach Guardrail	6,000
Detour	25,000
	908,000
MOT 6.2%	56,296
	964,296

7. Crittenden-Mt. Zion / I-75
VE-1
Reconstruct Superstructure
& Use existing substructure
Raise Grade ?

Use prestressed concrete box beams

Remove existing super.		30,000
Reconstruct substruct.		25,000
Class AA	271 CY. @ $340/yd^3	92,140
Rebars	60,000 lbs @ $.75/lb	45,000
Box Bms.	1072 Ft. @ $100/Ft.	107,200
Appr. Pave.		30,000
Detour		25,000
		$354,340

MOT 6.2	21,970
	$376,310

7. Crittenden - Mt. Zion / I-75
VE-2
Realign Crittenden-Mt. Zion Rd to provide 90° crossing & use existing bridge for MOT

Remove exist. Bridge 50,000
New bridge length =
(3 @ 12') + 30' + 15.11' + 36 = 117.11'
2 × 117.11' = 234.22' = 71.39 meters Say 72 meters
Bridge Cost ($65/SF)
72m × 10.11 m × $700 = $509,544

DGA (4")	385 m-tn	× $16 =	6,160
Base (6")	552 m-tn	× $31 =	17,112
Surfacing (1½")	128 m-tn	× $35 =	4,480
R/W		=	2,500
Detour			25,000
Appr. Guardrail			6,000
			645,796
MOT 6.2%			$ 40,040
			685,836

Crittenden
DGA (4")

$$\frac{24' \times 692' \times 4/12 \times 153.4}{2000} \times .907 = 385 \text{ m-tn.}$$

Base (6")

$$\frac{24' \times 692' \times 6/12 \times 146.7}{2000} \times .907 = 552 \text{ m-tn}$$

Surfacing (1½")

$$\frac{24 \times 692' \times 1.5/12 \times 136.1}{2000} \times .907 = 128 \text{ m-tn}$$

VII.(h) VIII. REST AREA REMOVAL

VII.(h)(1) AS PROPOSED

"As Proposed"

"As Proposed" pavement removal 5745m² @ $4.00/m² - $22,980
"As Proposed" guardrail removal & hauling 1670m @ $4.00/m - $6,680
"As Proposed" seed & protect Method I 5745m² @ .74/m² - $4,251

A possible savings of $33,911.

Rest Area Removal

VII.(h)(2) V.E. ALTERNATIVE

Value Engineering Alternative

The Value Engineering Alternative is to leave rest area as is. Do not remove pavement, utilize rest area for construction staging.

REST AREA REMOVAL
COST COMPARISON

DESCRIPTION	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
PAVEMENT REMOVAL	$4.00/M^2	5745 M^2	$22,980	0	0
REMOVING GUARDRAIL	$4.00/M^2	1670 M	$ 6,680	0	0
SEED & PROTECT METHOD I	$.71/M^2	5745 M^2	$ 4,251	0	0
TOTAL			$33,911		0

Possible Savings $33,911

VII.(i) IX. NORTHBOUND EXIT TO THE KY 36 INTERCHANGE

VII.(i)(1) AS PROPOSED

"As Proposed"

The existing NB exit at KY36 leaves the mainline on an alignment that is almost tangent to the mainline curve. This has caused some drivers to think they are still on the mainline with no idea that they are approaching the stop condition at KY36. This condition is aggravated by the fact that there is a mainline vertical curve crest just south of where the ramp exits the mainline.

The "As Proposed" solution to this problem is to add a parallel exit lane preceded by a 25:1 exit taper. It is the teams opinion that this could make the problem worse by making it easier for a through vehicle to get into the exit lane by mistake.

COUNTY OF	FISCAL YEAR	SHEET NO.	TO SHEET
GRANT	1997	-	--

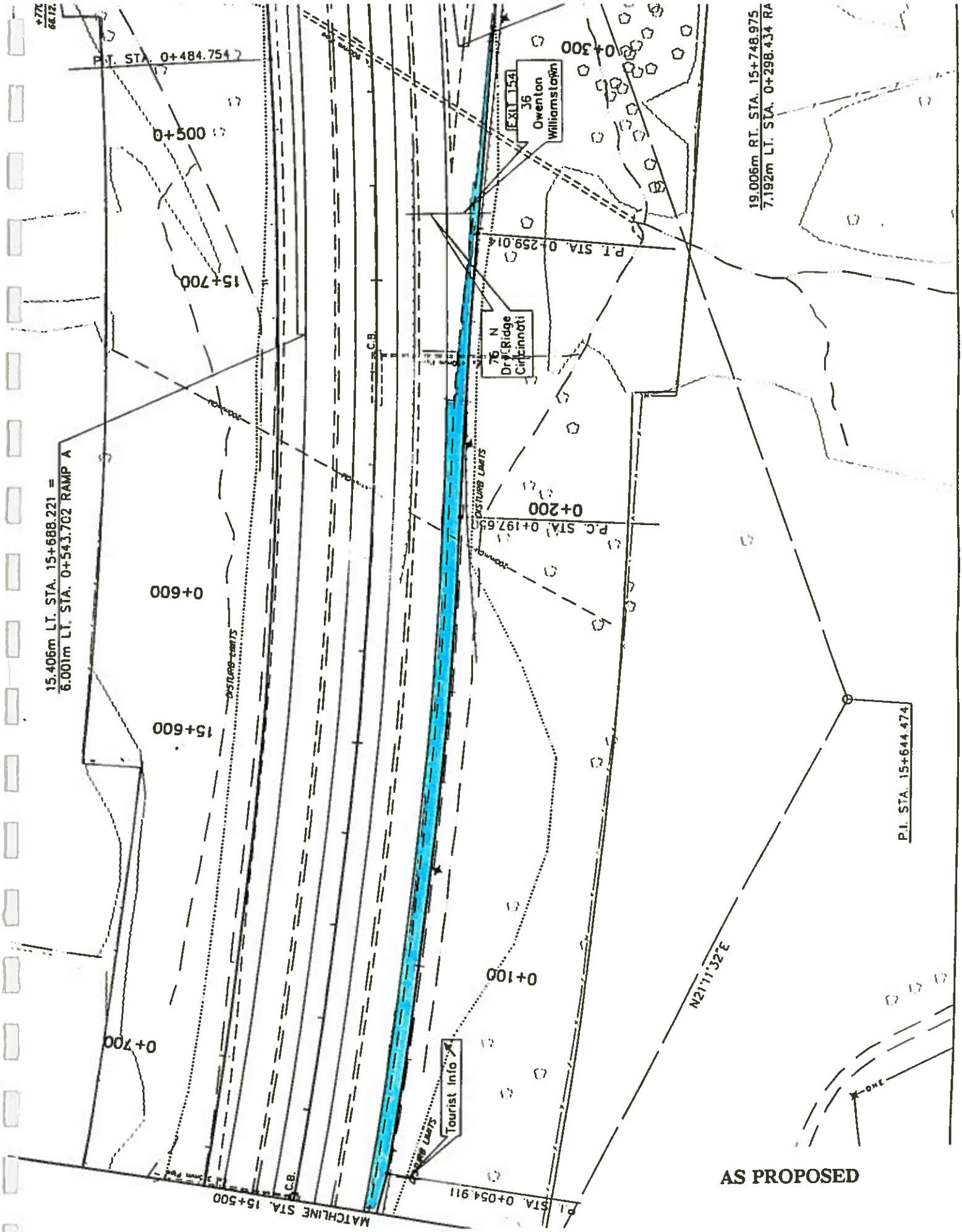
ITEM #6-72.00 & 6-72.01

I-75
P.I. STA. 15+644.474
Δ = 46°42'08" LT.
T = 502.917
L = 949.518
R = 1164.900
E = 103.925
e = 5.8%

AS PROPOSED

I-75
STA. 15+100 TO STA. 15+500

Scale: 1 : 500


P.T. STA. 0+484.754
0+500
15+700
0+600
15+600
0+700
0+300
EXIT 154
36
Owenton
Williamstown
P.T. STA. 0+259.014
76
N
Dry Ridge
Cincinnati
0+200
P.C. STA. 0+197.63
0+100
Tourist Info
P.I. STA. 15+644.474
N21°11'32"E
P.I. STA. 0+054.911
MATCHLINE STA. 15+500
15.406m LT. STA. 15+688.221 =
6.001m LT. STA. 0+543.702 RAMP A
19.006m RT. STA. 15+748.975
7.192m LT. STA. 0+298.434 RA
DISTURB LIMITS
C.B.
AS PROPOSED

GRANT	1997	-	--

ITEM #6-72.00 & 6-72.01

75
P.I. STA. 15+644.474
Δ = 46°42'08" LT.
D = 502.917
R = 949.518
T = 1164.900
L = 103.925
e = 5.8%

P.C. STA. 0+294.420

0+200

0+300

E/A & R/W

$500 FINE FOR LITTERING

AS PROPOSED
(3 of 3)

0+000

16+000

P.T. STA. 16+091.075

16+100

P.I. STA. 16+164.027
NO CURVE

16+200

MATCHLINE STA. 15+900

MATCHLINE STA. 16+300

N25°30'36"W

N25°37'16"W

36

ONE

Gas Stations Sign

OWENTON
WILLIMSTOWN

HOSPITAL

0+500

0+600

0+100

0+200

P.C. STA.

AS PROPOSED

I-75
STA. 15+900 TO STA. 16+300

Scale: 1 : 500

VII.(i)(2) V.E. ALTERNATIVE

Value Engineering Alternative

The Value Engineering Alternative would leave the existing ramp geometry as it is. The problem would be addressed by making the following improvements.

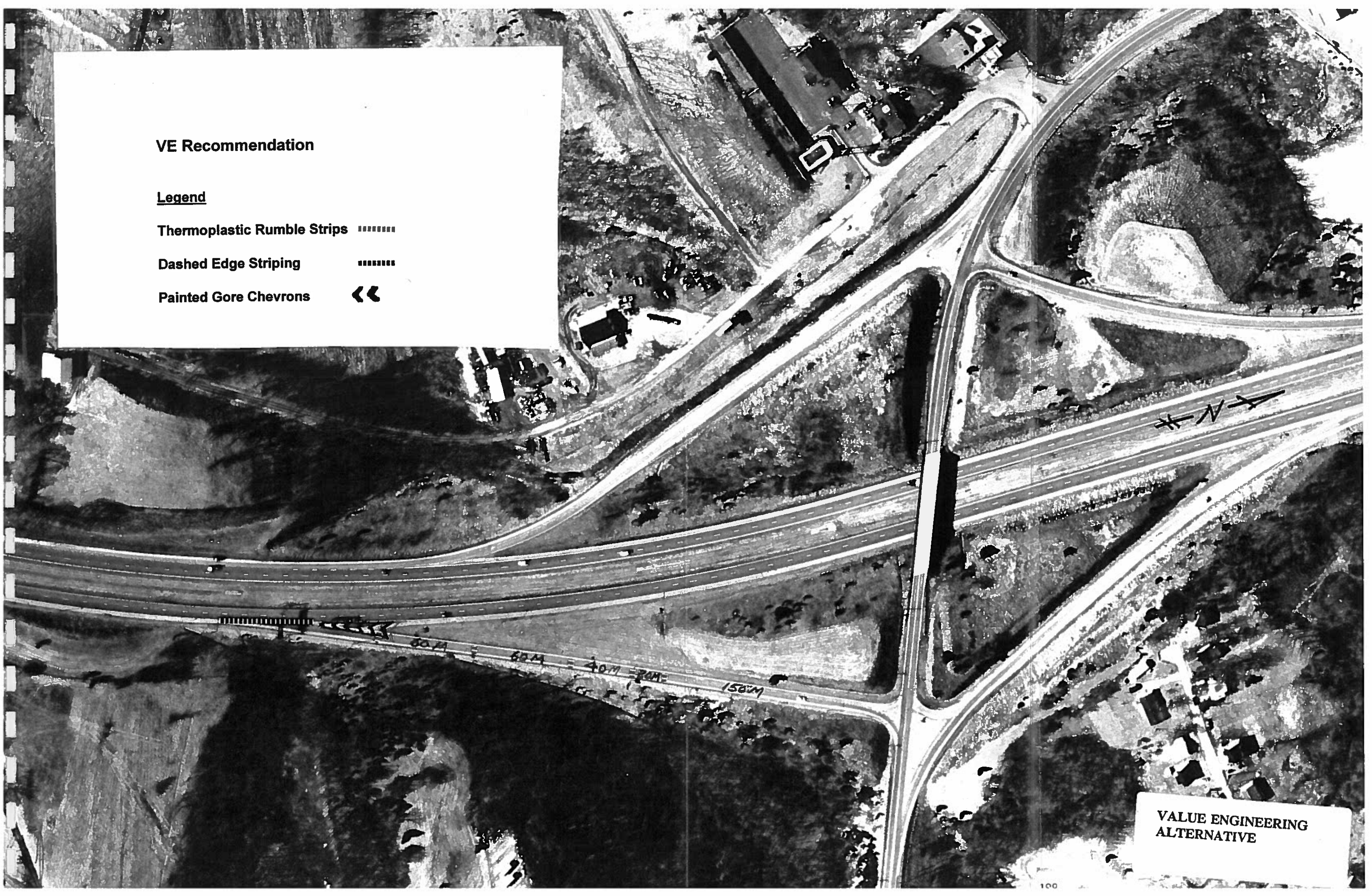
- **Place thermoplastic rumble strips (standard spacing) on the exit ramp**
- **Paint the ramp gore Chevrons**
- **Paint the outside edge of the outside mainline lane with a dashed edge stripe through the ramp exit area**
- **Add a flashing beacon to the "stop ahead" warning sign**

185 feet of parallel deceleration lane would not have to be built.

NORTHBOUND EXIT TO KY36 INTERCHANGE
COST COMPARISON

DESCRIPTION	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
DRAINAGE BLANKET	$ 29	216.7 M TON	$ 6,284	0	0
DGA	$ 16	249.1 M TON	$ 3,986	0	0
BIT. CONC. BASE	$ 31	614.7 M TON	$19,055	0	0
BIT. CONC. SURFACE	$ 35	55.3 M TON	$ 1,936	0	0
RUMBLE STRIPS	$ 70	0	0	5 SETS	$ 350
DASHED EDGE STRIPE	$ 2	0	0	50M	$ 100
PAINTED GORE CHEVRON	$ 80	0	0	1	$ 80
FLASHING BEACON	$2,100	0	0	1	$2,100
TOTAL			$31,261		$2,630

Possible Savings $28,631


VE Recommendation
Legend
Thermoplastic Rumble Strips
Dashed Edge Striping
Painted Gore Chevrons
N
80M
60M
40M
20M
150M
VALUE ENGINEERING
ALTERNATIVE

605 Suwannee Street
Tallahassee, Florida 32399-0450
FAX Number: (850) 922-9293
Suncom FAX: Number: 292-9293

FAX TRANSMITTAL MEMORANDUM

To: William Ventry **Date:** 2/5/98

Company/Department: Ventry Engineering

FAX Number: (502) 564-3324 **Phone Number:** _____

Number of Pages in this transmittal (including this memo): 4

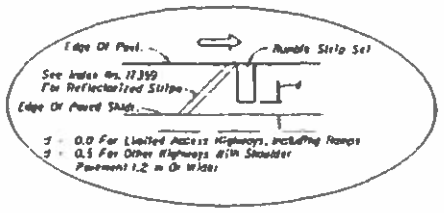
From: John Grant **Suncom:** 994-4334

Office: Roadway Design **Phone Number:** (850) 414-4334

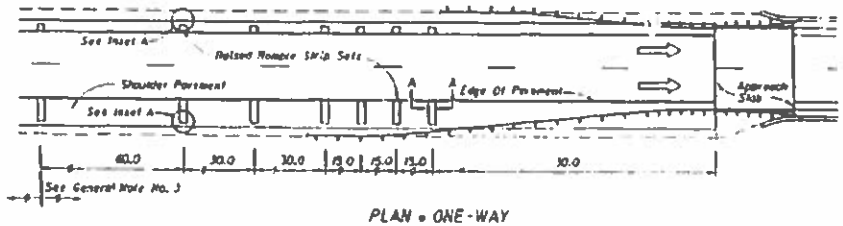
Message: Index No. 518 per request only general notes 1 and 4 were modified for 1998 issue.

☐ If this box is checked, please acknowledge receipt of this FAX
If contents are illegible, please call (850) _____ or SunCom _____

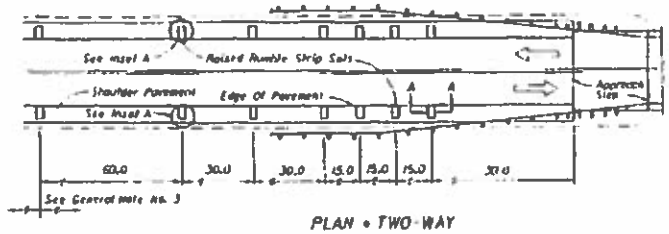
VALUE ENGINEERING ALTERNATIVE



INSET A

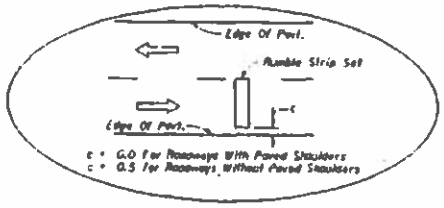


PLAN • ONE-WAY

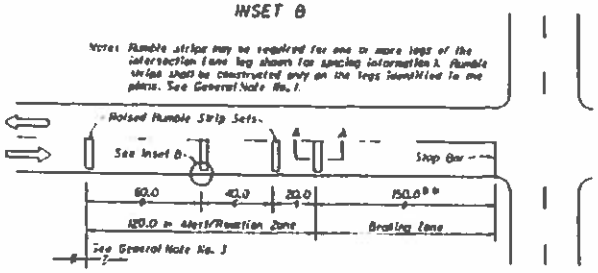


PLAN • TWO-WAY

STRUCTURES WITH LESS THAN FULL WIDTH SHOULDERS



INSET B

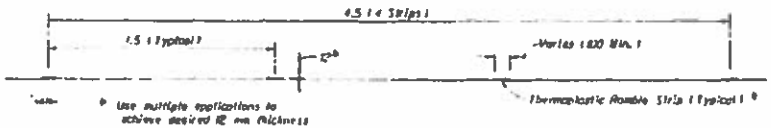


Notes: Rumble strips may be required for one or more legs of the intersection (see leg shown for spacing information). Rumble strips shall be constructed only on the legs identified in the plans. See General Note No. 1.

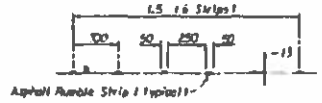
** May be decreased in urban areas with low operating speeds.

PLAN

INTERSECTIONS



THERMOPLASTIC SET



ASPHALT SET

SECTION AA • FOR THERMOPLASTIC AND ASPHALT RUMBLE STRIP SETS

GENERAL NOTES FOR RAISED RUMBLE STRIPS

1. Raised rumble strips shall be constructed on all paved shoulders approaching structures with less than full roadway width, including paved shoulders. Raised rumble strips at intersections shall be constructed only when specified in the plans.
2. Raised rumble strips are to be constructed in accordance with Section 546 of the Specifications.
3. Where any portion of a curve falls within the limit of rumble strips shown in these details, additional rumble strip sets spaced at 60.0 m centers shall be constructed throughout the remainder of the approaching curve.
4. Raised rumble strips shall be paid for under the contract unit price for Rumble Stripe, PS. Such price and payment shall be full compensation for all work and materials required.

   Raised rumble strips shall be paid for per set without any adjustment due to width of pavement receiving the strips or length of strips.

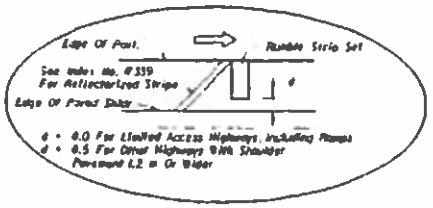
STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
ROAD DESIGN

RUMBLE STRIPS

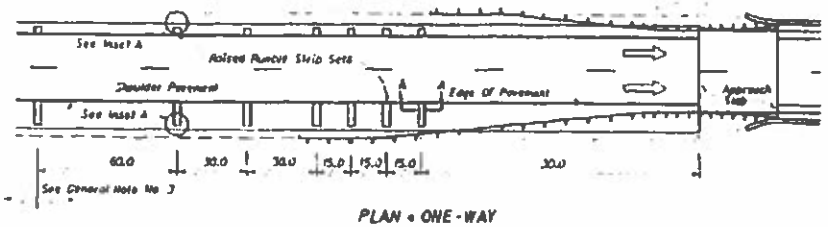
Designed by		Checked by	
Detailed by		Quantities by	
Reviewed by		Submitted by	
F.H.W.A. Approved		Standard No. 34	Sheet No. 1 of 2

518

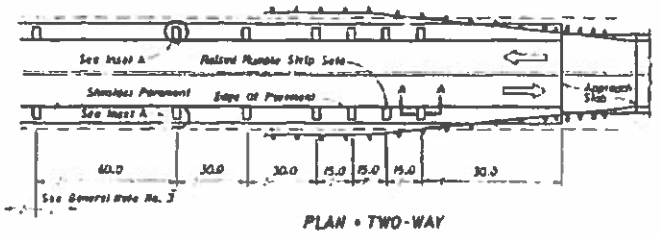
1994 & 1996



INSET A

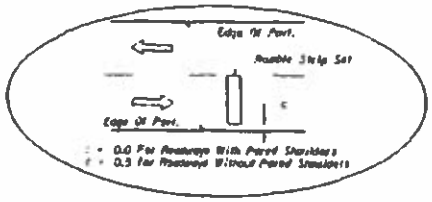


PLAN - ONE-WAY



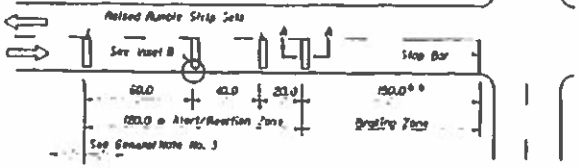
PLAN - TWO-WAY

STRUCTURES WITH LESS THAN FULL WIDTH SHOULDERS



INSET B

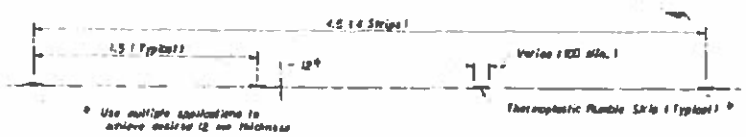
Note: Rumble strips may be required for two or more legs of the intersection (one leg shown for spacing information). Rumble strips shall be constructed only on the legs identified in the plans. See General Note No. 1.



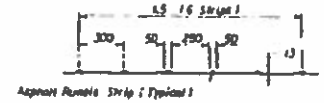
** May be decreased in urban areas with low operating speeds.

PLAN

INTERSECTIONS



THERMOPLASTIC SET



ASPHALT SET

SECTION AA - FOR THERMOPLASTIC AND ASPHALT RUMBLE STRIP SETS

GENERAL NOTES FOR RAISED RUMBLE STRIPS

1. Raised rumble strips shall be constructed on all paved shoulders approaching structures, where the structure shoulder width is less than the usable shoulder width of the approach roadway. Raised rumble strips at intersections shall be constructed only where specified in the plans.
2. Raised rumble strips are to be constructed in accordance with Section 546 of the Specifications.
3. When any portion of a curve falls within the limit of rumble strips shown in these details, additional rumble strip sets spaced at 60.0 m centers shall be constructed throughout the remainder of the approaching curve.
4. Raised rumble strips shall be paid for under the contract unit price for Rumble Strips Sets, EA. Such price and payment shall be full compensation for all work and materials required.

   Raised rumble strips shall be paid for per set without any adjustment due to width of pavement receiving the strips or length of strips.

RAISED RUMBLE STRIPS

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
ROAD DESIGN

RUMBLE STRIPS

Designed By		Date	Approved By
Detailed By		Date	
Checked By		Date	
F.H.W.A. Approval			Index No. 10 · Sheet No. 1 of 2 · Date No. 518

DB

$$\frac{607' \times 11.8' \times \frac{6}{12}\,(.5) \times 133.4 \times .907}{2{,}000.}$$

= 216.7 Metric Tons @ $29. = $6,284.3

DGA

$$\frac{607' \times 11.8' \times \frac{6}{12}\,(.5) \times 153.4 \times .907}{2{,}000.}$$

= 249.1 Metric Tons @ $16. = 3,985.60

BCB

$$\frac{607' \times 11.8' \times \frac{15.5}{12}\,(1.29) \times 146.7 \times .907}{2{,}000}$$

= 614.7 Metric Tons @ $31. = 19,055.70

BCS

$$\frac{607' \times 11.8' \times \frac{1.5}{12}\,(.125) \times 136.1 \times .907}{2{,}000}$$

= 55.3 Metric Tons @ $35. = 1,935.5

VII.(j) X. MAINLINE AND SHOULDER TYPICAL SECTION

VII.(j)(1) AS PROPOSED

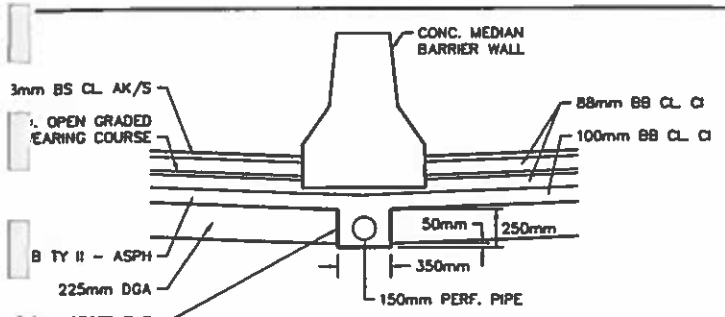
"As Proposed"

The proposed typical section calls for a median shoulder width of 4.2m (14ft) in the portion of the project, (15,442m) that has an existing constant width median of 60 ft. (18.29m). In those areas where guardrail is required on the outside edge of the roadway, the proposed plans include widening the roadway section 0.6m (2 ft.) on the outside to provide adequate width for the installation of the guardrail.

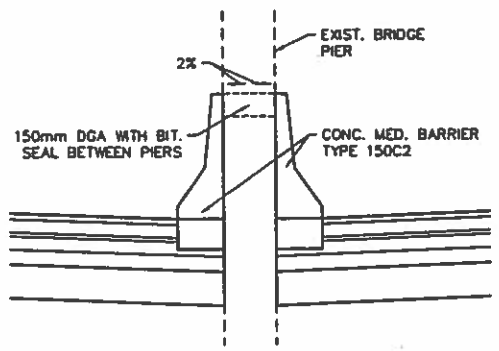
In the portion of the project that has a variable width median (3,060m), the proposed paved median shoulder width is 3.0m (10 ft.).

COUNTY OF	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
GRANT	1998	2	–

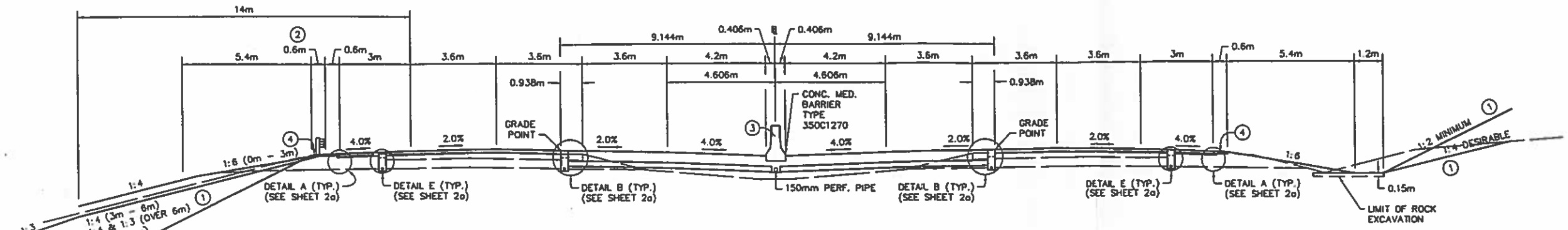
TYPICAL SECTIONS



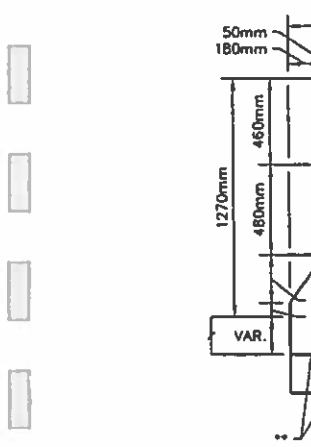
PERFORATED PIPE DETAIL



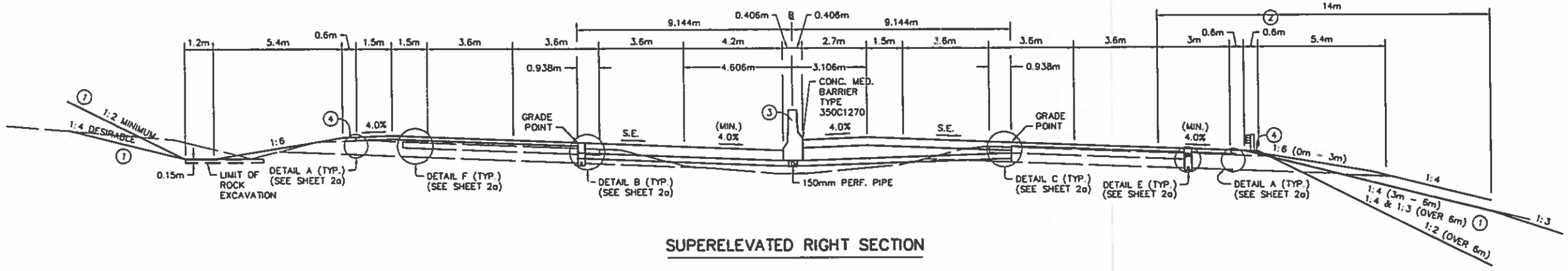
BARRIER DETAIL AT BRIDGE PIERS



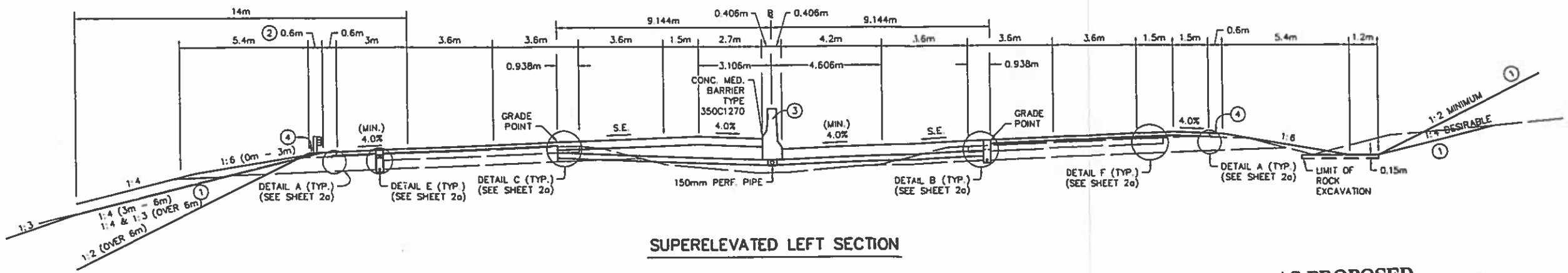
NORMAL SECTION



CONCRETE MEDIAN BARRIER TYPE 350C1270



SUPERELEVATED RIGHT SECTION



SUPERELEVATED LEFT SECTION

** CONSTRUCTION JOINT PERMITTED WHEN FIXED FORMS OR SLIP FORMS USED. WHEN CONSTRUCTION JOINT USED, NO. 8 DOWEL BARS SPACED 1220mm O.C. AND STAGGERED 610mm WILL BE REQUIRED.

(1) SEE CROSS-SECTIONS FOR SLOPES OUTSIDE THE LIMITS OF THE SHOULDER.

(2) SHOULDER SHALL BE WIDENED 0.6m WHERE GUARDRAIL IS TO BE INSTALLED.

(3) CONCRETE MEDIAN BARRIER WALL UTILIZED IN THE PERMANENT INSTALLATION INCLUDES TYPE 350C50, TYPE 350C1, & TYPE 350C. SEE PLANS FOR ACTUAL LIMITS. SEE DETAIL FOR BARRIER WALL AT MEDIAN BRIDGE PIERS.

(4) BITUMINOUS SEAL REQUIRED FROM OUTSIDE EDGE OF PAVED SHOULDER TO A POINT 0.6m DOWN THE DITCH OR FILL SLOPE. TWO APPLICATIONS OF THE FOLLOWING:

EMULSIFIED ASPHALT RS-2
BITUMINOUS SEAL AGGREGATE

NOTE: SEE SHEET 2A FOR PAVEMENT SCHEDULE

AS PROPOSED

VII.(j)(2) V.E. ALTERNATIVE

Value Engineering Alternative

In reviewing the proposed median shoulder widths, the Value Engineering team agreed that the 3.0m (10 ft.) paved median shoulder in the variable width median section of the project is the appropriate design. In this section of the project it is assumed that the independent horizontal alignments of the two roadways will be adjusted as necessary to provide adequate width on the outside edge of the roadway sections for the installation of guardrail. This will permit all grading for the pavement widening to be accomplished in the median area and the retention of the existing outside cut and fill slopes, with the exception of those areas where outside slope improvements may be warranted.

In the portion of the project where there is an existing constant width median of 60 feet (18.29m), the Value Engineering team concluded that a significant cost savings can be realized by utilizing a 3.6m (12 ft.) median shoulder. The primary reasons for recommending the 3.6m (12 ft.) shoulder are as follows.

- The existing graded roadway section will accommodate the proposed widened roadway if the median shoulder width is limited to 3.6m.
- A 3.6m paved shoulder exceeds the minimum required paved shoulder width of 3.0m.
- Significant cost savings can be realized as a result of reducing the width of the full depth pavement by 0.6m.

The existing graded roadway section for each directional roadway is 20.12m (66 ft.) consisting of 30 feet from the median centerline to the inside edge of pavement, two 12 ft. travel lanes and 12 ft. from the outside edge of pavement to the hinge point with the proposed 4.2m paved median shoulder width, the required overall roadway width from the centerline to the hinge point is 19.606m in those areas where guardrail is required. This roadway width includes the following.

3 travel lanes at 3.6m		10.8m
Median paved shoulder		4.2m
Barrier width (l/2)		0.406m
Outside paved shoulder		3.0m
Graded width outside of shoulder		0.6m
Area for guardrail		0.6m
	Total	19.606m

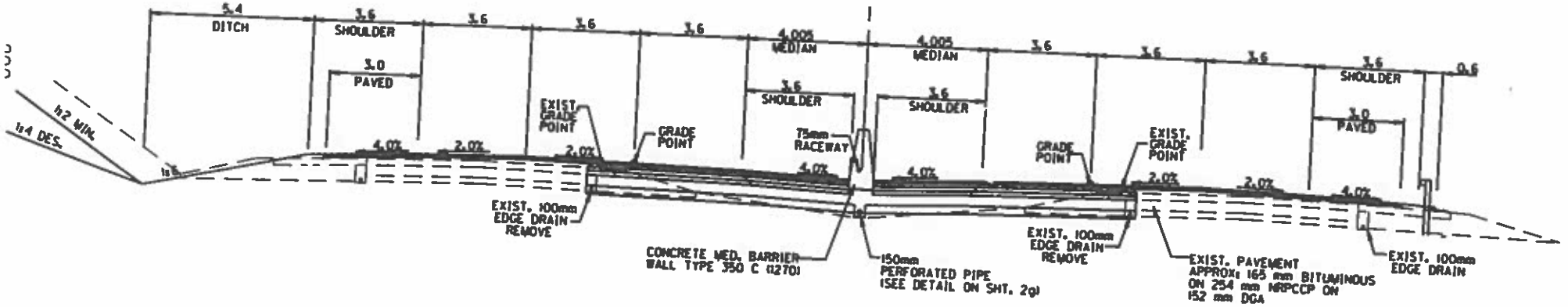
In addition to the preceding width requirement, an allowance must also be made for the proposed pavement overlay thickness of 165mm (6.5in.) which, with a 1:2 proposed slope at guardrail locations will require an additional width of approximately 0.33m for an overall existing graded directional roadway width of 19.936m in order for the new roadway to be constructed without disturbing the existing outside cut and fill slopes. Since the existing graded roadway section is 20.12m the reconstructed roadway section can be constructed within the limits of the existing graded roadway.

By reducing the median shoulder width to 3.6m (12ft.) as shown in the typical section, the overall directional roadway width from the centerline to the hinge point is reduced to 19.006m at guardrail locations and to 18.406m at other locations. With the existing graded roadway width of 20.12m as shown on the plans, there is an excess of approximately 0.5m to 1.0m of graded area which reduces the degree to which the existing established outside fill and cut slopes need to be disturbed to provide minor slope flattening between the hinge point and the ditch line.

The estimated construction cost savings associated with reducing the median paved shoulder width from 4.2m to 3.6m as tabulated in the cost estimate is ~~$916,026.~~ $486,438

VE ALTERNATE

WITH REDUCED MEDIAN WIDTH



VALUE ENGINEERING ALTERNATIVE

MAINLINE AND SHOULDER TYPICAL SECTION
COST COMPARISON

DESCRIPTION	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
DENSE GRADED AGG.	$16/MTON	48,568	$ 777,088	48,568	$ 777,088
DRAINAGE BLANKET TYPE II ASPHALT	$29/MTON	42,244	$1,225,076	42,244	$1,225,076
BIT. CONC. BASE CLASS I	$31/MTON	127,717	$3,959,537	113,904	$3,531,024
BIT. CONC. SURFACE CLASS AK/A	$35/MTON	11,582	$ 405,370	9,927	$ 347,445
TOTAL			$6,367,071		$5,880,633

Possible Savings $486,438

The quantity estimates are as follows.

Dense Graded Aggregate DGA
"As Proposed"

$$\frac{(4.2m)(15.442m)(0.1524m)(35.315)(153.4\#/ft^3)}{2205\#/MTON} = 24,284/MTONS/Rdy$$

48,568/MTONS/both Rdys

Value Engineering Alternative = 48,568 = 41,630/MTONS both Rdys

Drainage Blanket Type II
"As Proposed"

$$\frac{(4.2m)(15.442)(0.1524m)(35.315)(133.4\#/ft^3)}{2205\#/MTON} = 21,122/MTONS/Rdy$$

42,244/MTONS both Rdys

Value Engineering Alternative = 42,244/MTONS

Bit. Concrete Base
"As Proposed"

$$\frac{(2)(4.2m)(15.442)(0.4191m)(35.315)(146.7)}{2205} = 127,727/MTONS$$

Value Engineering Alternative

$$\frac{(2)(0.6)(15.442)(0.3175)(35.315)(146.7)}{2205} = 127,727 - 13,823 = 113,904/MTONS$$

Bit. Concrete Surface
"As Proposed"

$$\frac{(2)(4.2)(15.442)(0.038m)(35.315)(146.7)}{2205} = 11,582/MTONS$$

Value Engineering Alternative

$$\frac{(7.2)(11,582)}{(8.4)} = 9,927/MTONS$$

VIII. SUMMARY OF RECOMMENDATIONS

SUMMARY OF RECOMMENDATIONS

It is the recommendation of the Value Engineering team that the following Value Engineering Alternatives be carried into the Project Development process for further development.

Recommendation Number 1-Pavement

A. Open Graded Wearing Course

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative eliminates the wearing course by changing the staging of construction and maintenance of traffic plan.

If this recommendation can be implemented, there is a possible savings of $1,609,148.

B. New Mainline Pavement and Shoulder, Base and Surface

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative changes the layer thicknesses and material types.

If this recommendation can be implemented, there is a possible savings of $4,571,494.

C. Drainage Blanket

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative changes to untreated stone blanket.

If this recommendation can be implemented, there is a possible savings of $2,071,978.

Recommendation Number 2-High Mast Lighting

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative meets the department standards for high mast lighting at interchanges only.

If this recommendation can be implemented, there is a possible savings of $400,000.

Recommendation Number 3-Mainline Roadway Earthwork

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative steepens the cut slopes and flattens the fill slopes only where material and right of way will allow.

If this recommendation can be implemented, there is a possible savings of $872,839.

Recommendation Number 4-Slope Excavation requiring Right of Way

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative steepens or maintains the existing slopes to eliminate right of way takes.

If this recommendation can be implemented, there is a possible savings of $283,382.

Recommendation Number 5-Barnes Pike Interchange

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative constructs the proposed ramps to the existing Barnes Pike, uses the ramps for temporary maintenance of traffic, constructs the new bridges at the existing bridge locations and does not realign Barnes Pike.

If this recommendation can be implemented, there is a possible savings of $474,914.

Recommendation Number 6-Sherman/Mt. Zion Grade Separation

The Value Engineering Team recommends that Value Engineering Alternative No. 1 be implemented. This alternative replaces the superstructure and uses the existing sub-structure.

If this recommendation can be implemented, there is a possible savings of $27,780.

Recommendation Number 7-Crittenden/Mt. Zion Grade Separation

The Value Engineering Team recommends that Value Engineering Alternative No. 2 be implemented. This alternative realigns Crittenden/Mt. Zion Rd. to a 90 degree crossing and uses the existing structure for maintenance of traffic.

If this recommendation can be implemented, there is a possible savings of $305,000.

If the Value Engineering Alternative No. 2 cannot be implemented then the Value Engineering Team recommends that Value Engineering Alternative No. 1 be implemented. This alternative reconstructs the superstructure and salvages the sub-structure.

If this recommendation can be implemented, there is a possible savings of $587,990.

Recommendation Number 8-Rest Area

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative does not remove the rest area.

If this recommendation can be implemented, there is a possible savings of $33,911.

Recommendation Number 9-Northbound Exit to the KY 36 Interchange

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative leaves the ramp as is and makes needed traffic operations improvements.

If this recommendation can be implemented, there is a possible savings of $28,631.

Recommendation Number 10-Mainline and Shoulder Typical Section

The Value Engineering Team recommends that Value Engineering Alternative be implemented. This alternative decreases the inside shoulder widths to 3.6 meters.

If this recommendation can be implemented, there is a possible savings of $486,438.