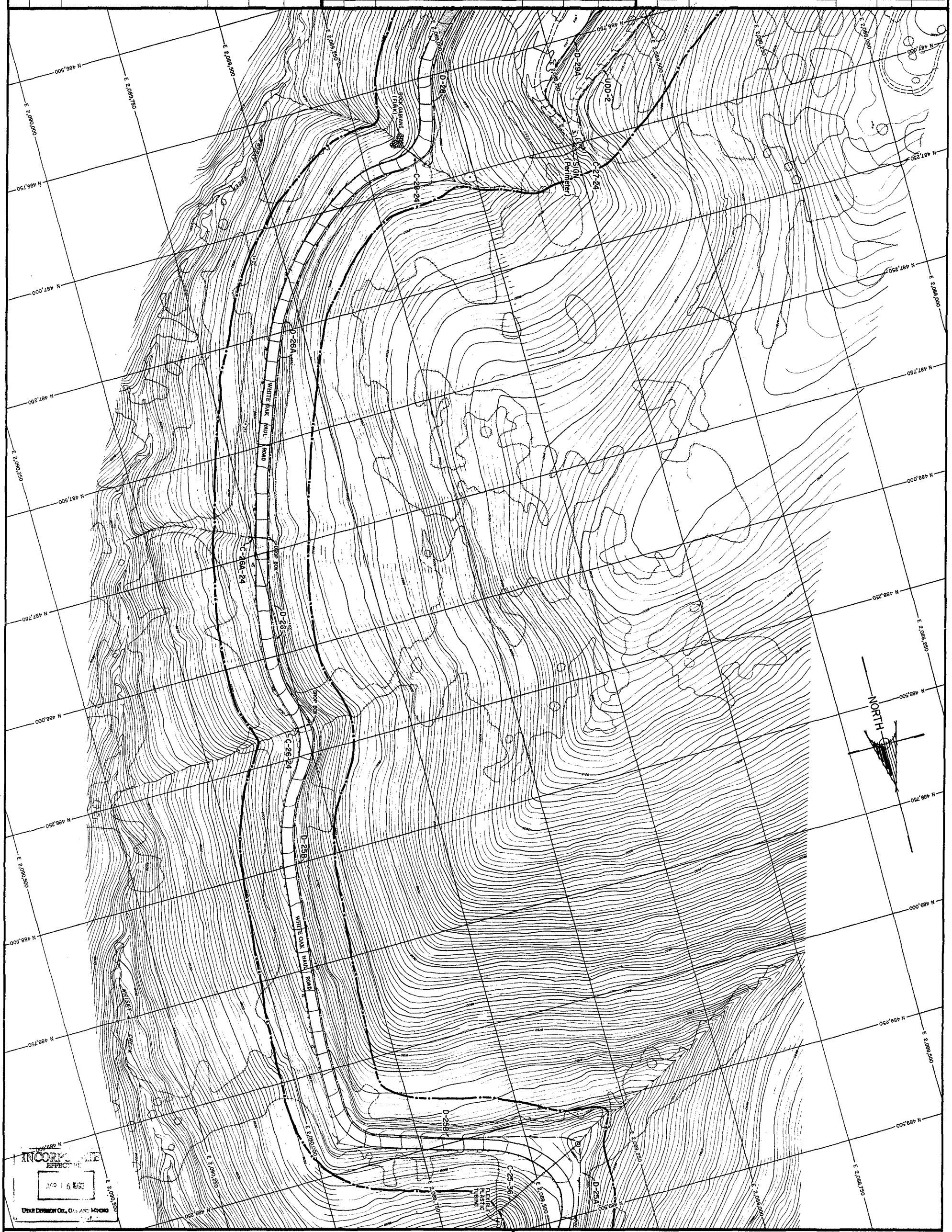
WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP			

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



INCORPORATE EFFECTIVE
AUG 1 6 1993
UTAH DIVISION OIL, GAS AND MINING

LEGEND:

Note: See Sheet 1

REGISTERED PROFESSIONAL ENGINEER
No. 5323
EDWIN BROOKSHIRE FOUST
Mar 93
STATE OF UTAH

WHITE OAK MINING & CONSTRUCTION CO., INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE INC.

TITLE:
R645-301-231.300
SUITABILITY OF TOPSOIL SUBSTITUTES - VSM

Drawn by: Ed Sanderson	Date: 3/93
Approval:	Date:
Drawing No. R645-301-231.300	Rev. 1 3/93

SAND DESIGN & GRAPHICS

SCALE: 1" = 100'

SHEET 3 of 4

ETS-5-89

STRUCTURE INDEX

NO.	DESCRIPTION
S-24	Oil Storage Shed
S-25	Wastewater Treatment Plant
S-26	White Oak Wellhouse
S-27	White Oak Mines Bathhouse – Office Complex
S-28	White Oak Shop
S-29	Garage (portable)
S-30	Pumphouse
S-31	Washbay
S-32	Reclaim Belt & Truck Bin
S-33	White Oak Truck Loadout
S-34	White Oak Loadout Sub-Station
S-35	White Oak No.1 Conveyor Gallery
S-36	Stacking Tube
S-37	Reclaim Tunnel
S-38	High Angle Conveyor
S-39	White Oak No.2 Conveyor
S-40	Transfer Building
S-41	White Oak No.1 Mine Fan
S-42	White Oak No.2 Mine Fan
S-43	Filter Pond 005A
S-44	White Oak Mines Sub-Station

NO.	DATE	WHITE OAK ACTIVITY REVISION DESCRIPTION	INCORPORATED INTO MRP BY DOCKET REF. NO.	DATE	INITIALS
	9/94	CHANGE IN OWNERSHIP			

LEGEND:

NOTE: See Sheet 1

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

TITLE: R645-301-231.300 SUITABILITY OF TOPSOIL SUBSTITUTES - VSM

PREPARED BY HANSEN ALLEN & LUCE

Drawn by: Ed Sanderson Date: 3/93
Approval: Date:

Drawing No. R645-301-231.300 Rev.1 3/93

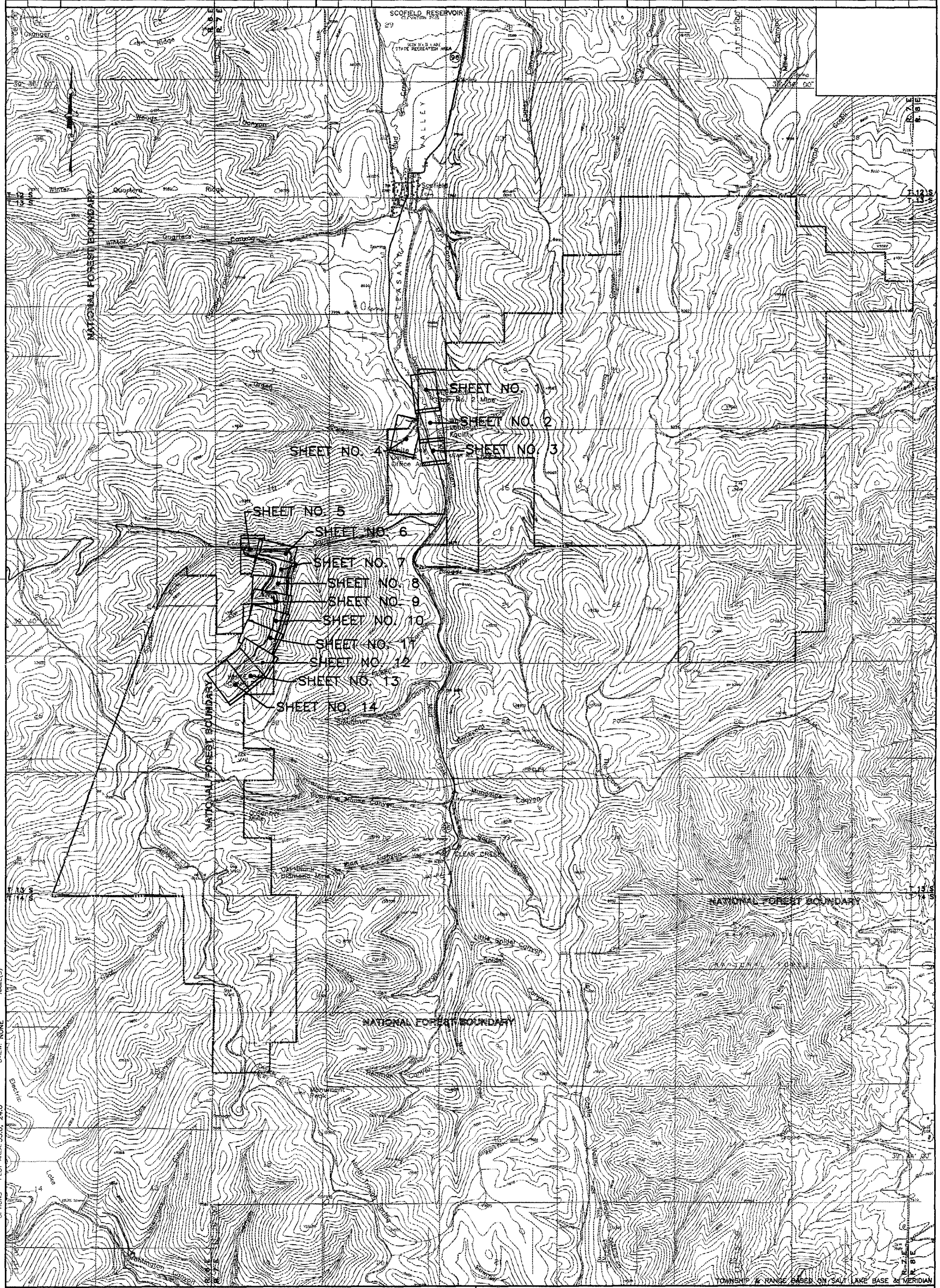
SCALE: 1" = 100' SHEET 4 of 4

SAND DESIGN & GRAPHICS

REGISTERED PROFESSIONAL ENGINEER No. 5323 EDWIN BROOKSHIRE AUGUST STATE OF UTAH

ETS-5-K9

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM			WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM			WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS	NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS	NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	8/94	OWNERSHIP CHANGED TO WHITE OAK MINING & CONSTRUCTION CO., INC.															



LEGEND:

SHEETS 1 THROUGH 14 INDICATED ABOVE ARE SHOWN AS MAPS R645-301-527, SHEETS 1 THROUGH 14.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID R. HANSEN STATE OF UTAH

CERTIFICATION STATEMENT

I Certify that the information provided hereon is to the best of my knowledge true and correct as reflected by previous mapping and available data provided from either the coal operator or public files at the time of its preparation.

WHITE OAK MINING & CONSTRUCTION CO., INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALTEN & LUCE

VERIFY SCALE 0" 1"

BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

TITLE: R645-301-500 MAP INDEX

DRAWN BY: Ed Sanderson

DATE: 12/16/89

APPROVAL:

DATE:

DRAWING NO.

SCALE: 1" = 2000'

SHEET: 1 of 1

FILE NAME: Z:\CAD\125\07-100\TOPO\301-500.DWG

FILE DATE: SEPT. 07, 1994

PLOT OPTIONS: PLOT IN = DWG UNITS:1 = 1 PLOT AREA: 35.0, 24.0

ORIGIN: 0.0,0 DVIEW: NONE

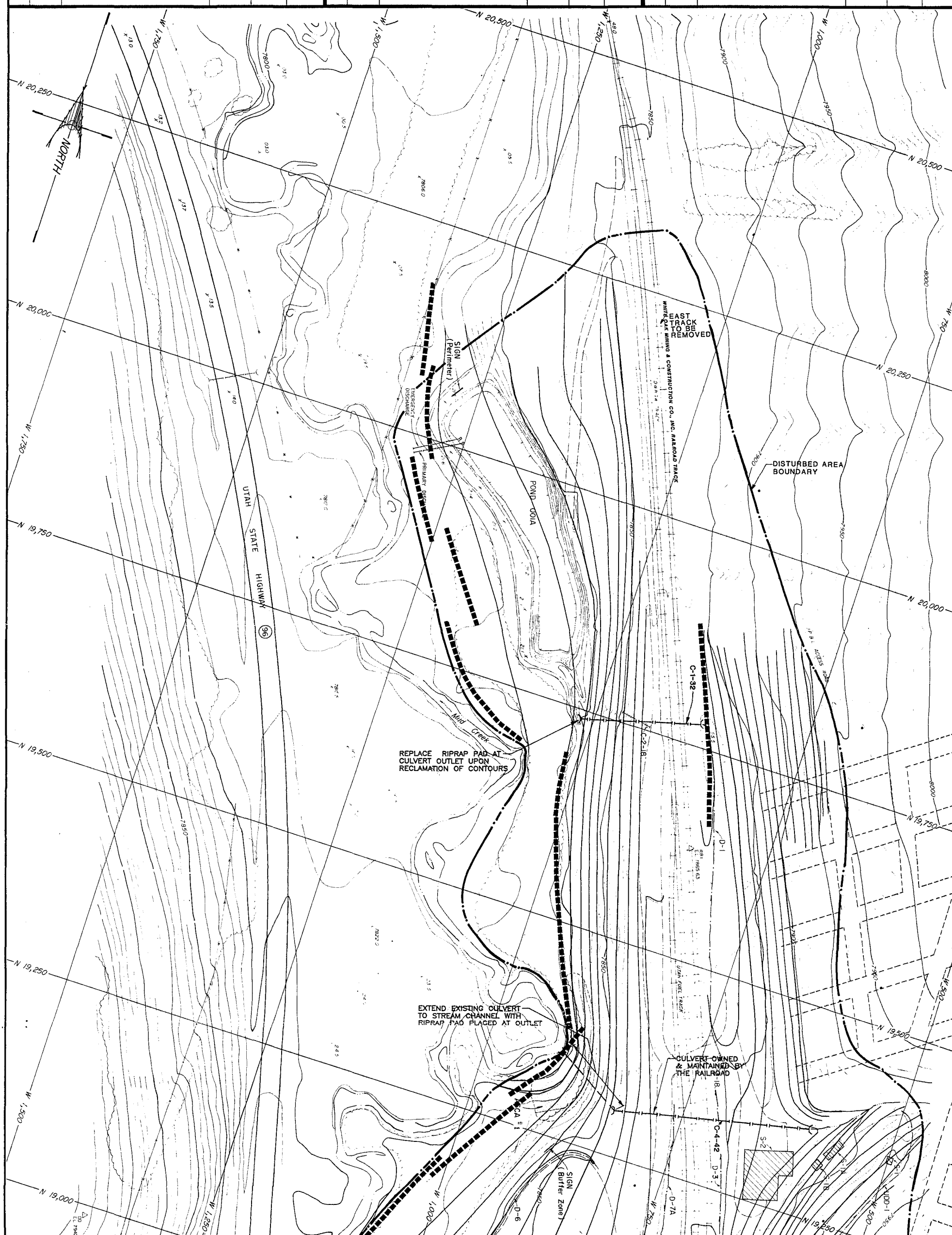
XREF FILE NAME(S): Z:\CAD\125\07-100\TOPO\WO-TITLE.DWG

7/94

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP			

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



LEGEND

APPROXIMATE STRAW BALE BARRIER LOCATIONS

NOTES:

1. CHANNEL WIDTHS NOT TO SCALE.
2. STRAW BALE BARRIERS TO OVERLAP SUCH THAT MATERIAL PASSING UPPER BARRIER IS CAUGHT BY DOWNGRADIENT BARRIER.
3. FACILITIES TO REMAIN UPON RECLAMATION ARE SHOWN BOLDED.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID HANSEN STATE OF UTAH 8/1/93

CERTIFICATION

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE INFORMATION CONTAINED ON THIS FIGURE IS A TRUE AND ACCURATE REPRESENTATION OF PROPOSED RECLAMATION PLANS AS DIRECTED BY WHITE OAK MINING & CONSTRUCTION CO., INC.

REGISTERED PROFESSIONAL ENGINEER No. 5323 EDWIN BROOKSHIRE FOUST Mar 93 STATE OF UTAH

WHITE OAK MINING & CONSTRUCTION CO., INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE INC.

TITLE:

R645-301-527

WHITE OAK LOADOUT FACILITY RECLAMATION

Drawn by: JEFF JENSEN	Date: 8/1/93
Approval:	Date:
Drawing No. R645-301-527	Rev. 7

SAND DESIGN & GRAPHICS

SCALE: 1"=50'

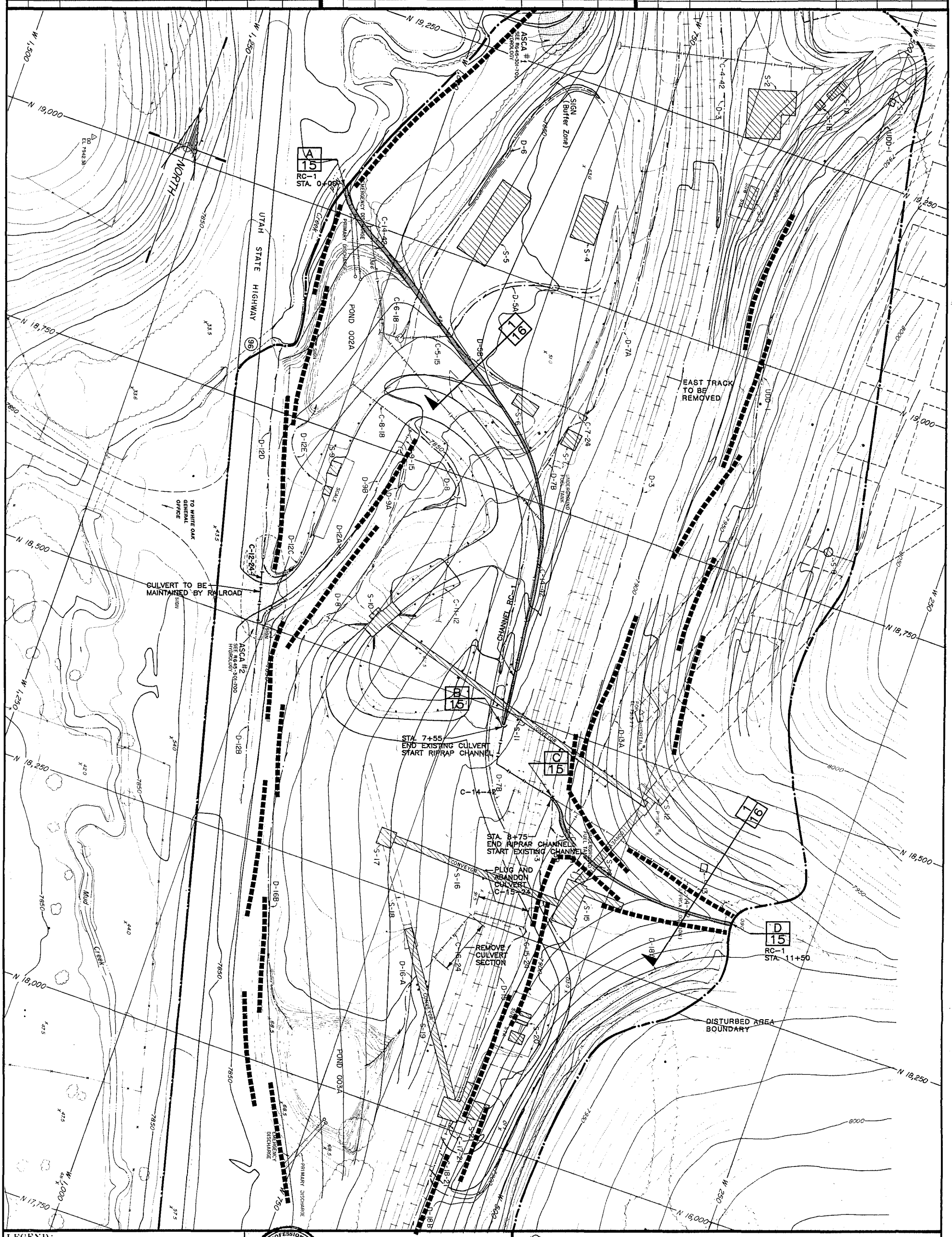
SHEET 1

ETS-5-89

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP			

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



LEGEND:

APPROXIMATE STRAW BALE BARRIER LOCATIONS

NOTES:

1. CHANNEL WIDTHS NOT TO SCALE.
2. STRAW BALE BARRIERS TO OVERLAP SUCH THAT MATERIAL PASSING UPPER BARRIER IS CAUGHT BY DOWNGRADIENT BARRIER.
3. FACILITIES TO REMAIN UPON RECLAMATION ARE SHOWN BOLDED.
4. RECLAIMED CHANNEL ELEVATIONS AT STATIONS 0+00, 7+55, 8+75, AND 11+50 TO MATCH EXISTING CONDITIONS AND GRADES.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID HANSEN 8/1/93 STATE OF UTAH

CERTIFICATION

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE INFORMATION CONTAINED ON THIS FIGURE IS A TRUE AND ACCURATE REPRESENTATION OF PROPOSED RECLAMATION PLANS AS DIRECTED BY WHITE OAK MINING & CONSTRUCTION CO., INC.

REGISTERED PROFESSIONAL ENGINEER No. 5323 EDWIN BROOKSHIRE FOUST Mar 93 STATE OF UTAH

WHITE OAK MINING & CONSTRUCTION CO., INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE INC.

TITLE:
R645-301-527
WHITE OAK LOADOUT FACILITY
RECLAMATION

Drawn by: JEFF JENSEN — Date: 8/1/93
Approval: — Date:
Drawing No. R645-301-527 — Rev. 1

SAND DESIGN & GRAPHICS

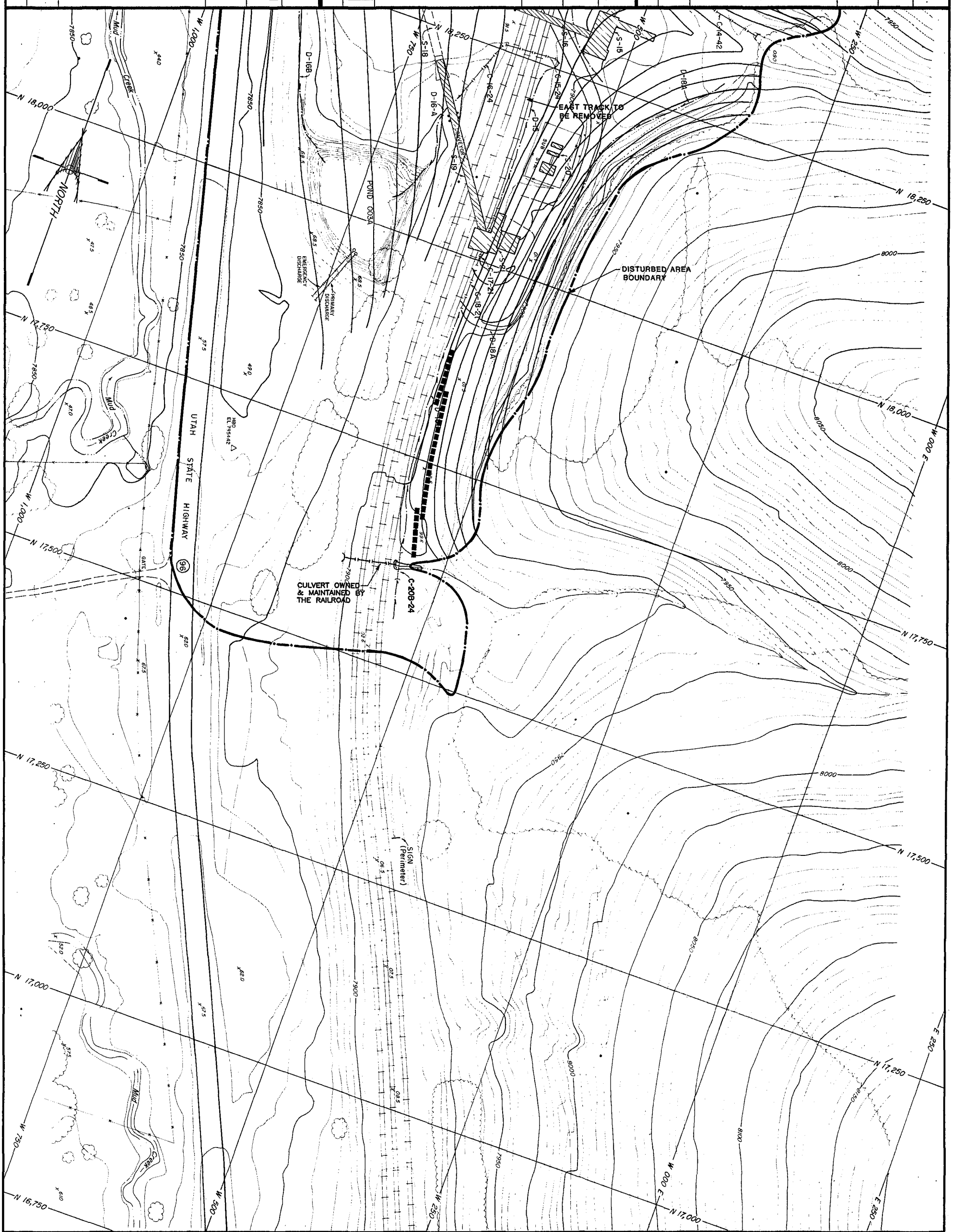
SCALE: 1"=50' — SHEET 2

ETS-5-89

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP			

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



LEGEND:

APPROXIMATE STRAW BALE BARRIER LOCATIONS

NOTES:

1. CHANNEL WIDTHS NOT TO SCALE.
2. STRAW BALE BARRIERS TO OVERLAP SUCH THAT MATERIAL PASSING UPPER BARRIER IS CAUGHT BY DOWNGRADIENT BARRIER.
3. FACILITIES TO REMAIN UPON RECLAMATION ARE SHOWN BOLDED.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID HANSEN STATE OF UTAH 8/1/93

CERTIFICATION

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE INFORMATION CONTAINED ON THIS FIGURE IS A TRUE AND ACCURATE REPRESENTATION OF PROPOSED RECLAMATION PLANS AS DIRECTED BY WHITE OAK MINING & CONSTRUCTION CO., INC.

REGISTERED PROFESSIONAL ENGINEER No. 5323 EDWIN BROOKSHIRE FOUST STATE OF UTAH

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE

TITLE:
R645-301-527
WHITE OAK LOADOUT FACILITY RECLAMATION

Drawn by: DAVE BRUSE — Date: 8/1/93
Approval: — Date:
Drawing No. R645-301-527 — Rev. 1

SAND DESIGN & GRAPHICS — SCALE: 1"=50' — SHEET 3

ETS-5-89

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP			

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

LEGEND:

NOTE: ALL SURFACE FACILITIES REMAIN UPON RECLAMATION

CERTIFICATION

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE INFORMATION CONTAINED ON THIS FIGURE IS A TRUE AND ACCURATE REPRESENTATION OF PROPOSED RECLAMATION PLANS AS DIRECTED BY WHITE OAK MINING & CONSTRUCTION CO., INC.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID W. HANSEN 8/1/93 STATE OF UTAH

REGISTERED PROFESSIONAL ENGINEER No. 5323 EDWIN BROOKSHIRE FOUST Mar 93 STATE OF UTAH

WHITE OAK MINING & CONSTRUCTION CO., INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE

TITLE:

R645-301-527

GENERAL OFFICE AREA RECLAMATION

Drawn by: JEFF JENSEN — Date: 8/1/93

Approval: — Date:

Drawing No. R645-301-527 — Rev. 1

SAND DESIGN & GRAPHICS

SCALE: 1"=50'

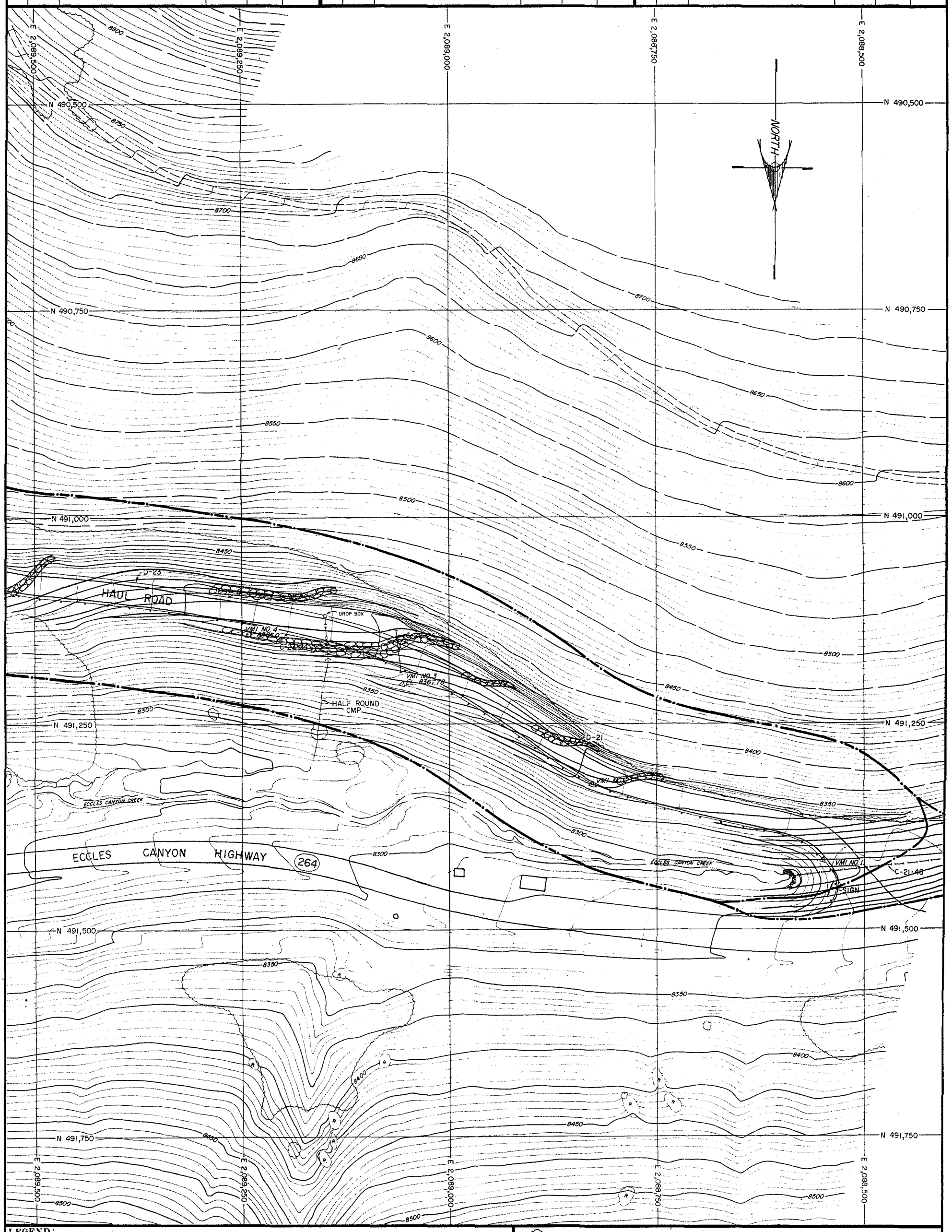
SHEET 4

ETS-5-89

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP			

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



LEGEND:

NOTE: RIPRAP LOCATIONS APPROXIMATE AND MAY VARY UPON CONSTRUCTION

CERTIFICATION

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE INFORMATION CONTAINED ON THIS FIGURE IS A TRUE AND ACCURATE REPRESENTATION OF PROPOSED RECLAMATION PLANS AS DIRECTED BY WHITE OAK MINING & CONSTRUCTION CO., INC.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID R. HANSEN STATE OF UTAH 8/1/93

REGISTERED PROFESSIONAL ENGINEER No. 5323 EDWIN BROOKSHIRE FOUST Mar 93 STATE OF UTAH

WHITE OAK MINING & CONSTRUCTION CO., INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE INC.

TITLE:

R645-301-527
WHITE OAK HAUL ROAD
RECLAMATION

Drawn by: JEFF JENSEN	Date: 8/1/93
Approval:	Date:
Drawing No. R645-301-527	Rev. 1

SAND DESIGN & GRAPHICS

SCALE: 1"=50'

SHEET 5

ETS-5-89

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP			

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

LEGEND:

NOTE: RIPRAP LOCATIONS APPROXIMATE AND MAY VARY UPON CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID B. HANSEN STATE OF UTAH 8/1/93

REGISTERED PROFESSIONAL ENGINEER No. 8323 EDWIN BROOKSHIRE POUST Mar 93 STATE OF UTAH

CERTIFICATION

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE INFORMATION CONTAINED ON THIS FIGURE IS A TRUE AND ACCURATE REPRESENTATION OF PROPOSED RECLAMATION PLANS AS DIRECTED BY WHITE OAK MINING & CONSTRUCTION CO., INC.

UTAH DIVISION

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE

TITLE:
R645-301-527
WHITE OAK HAUL ROAD
RECLAMATION

Drawn by: DAVE BRUSE — Date: 6/1/93
Approval: — Date:
Drawing No. R645-301-527 — Rev. 1

SAND DESIGN & GRAPHICS

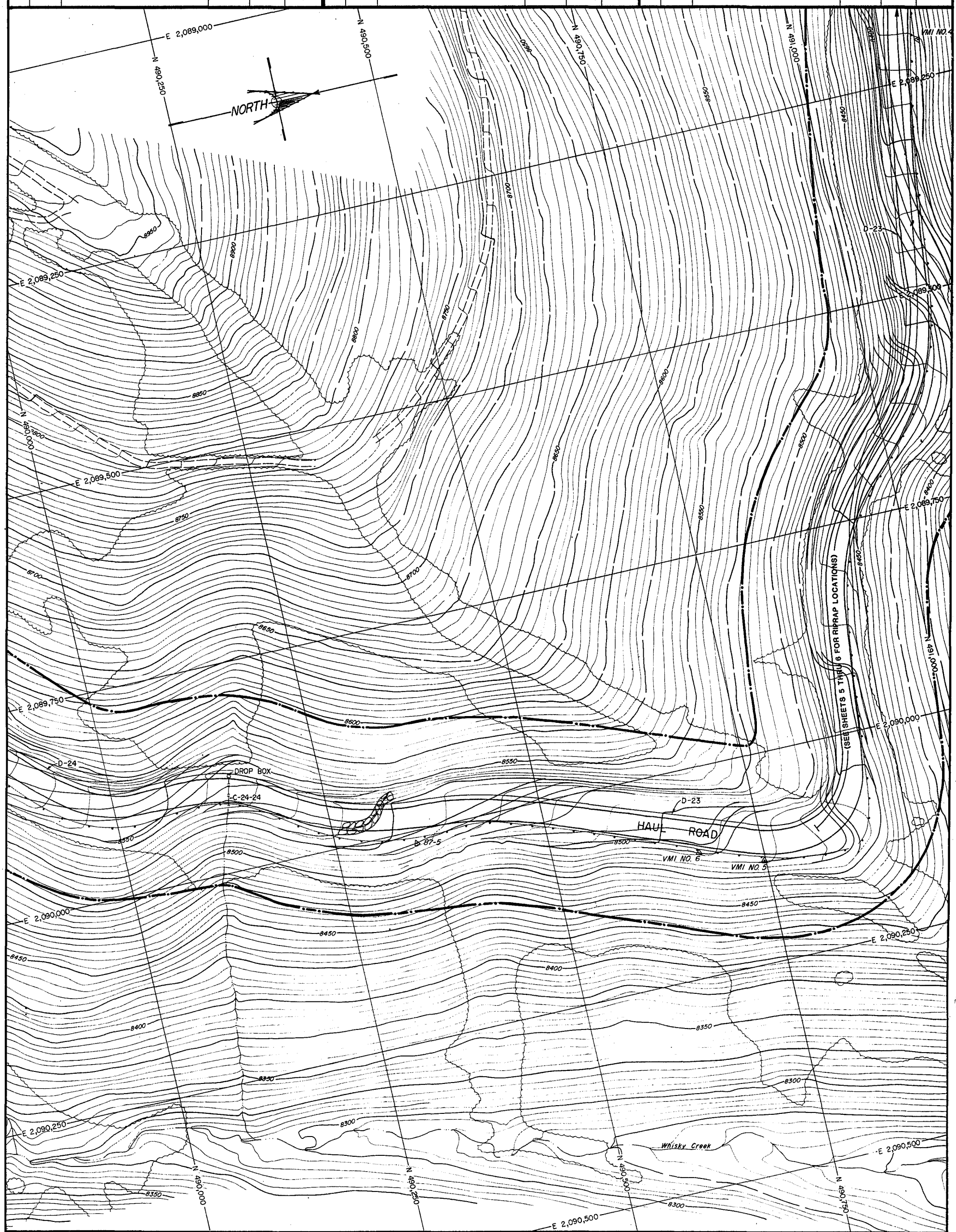
SCALE: 1"=50' — SHEET 6

ETS-5-89

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP			

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



LEGEND:

NOTE: RIPRAP LOCATIONS APPROXIMATE AND MAY VARY UPON CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID HANSEN STATE OF UTAH 8/1/93

REGISTERED PROFESSIONAL ENGINEER No. 6869 EDWIN BROOKSHIRE FOUST Mar 93 STATE OF UTAH

CERTIFICATION

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE INFORMATION CONTAINED ON THIS FIGURE IS A TRUE AND ACCURATE REPRESENTATION OF PROPOSED RECLAMATION PLANS AS DIRECTED BY WHITE OAK MINING & CONSTRUCTION CO., INC.

WHITE OAK MINING & CONSTRUCTION CO., INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY: HANSEN ALLEN & LUCE INC.

TITLE:

R645-301-527
WHITE OAK HAUL ROAD
RECLAMATION

Drawn by: DAVE BRUSE	Date: 8/1/93
Approval:	Date:
Drawing No. R645-301-527	Rev. 1

SAND DESIGN & GRAPHICS

SCALE: 1"=50'

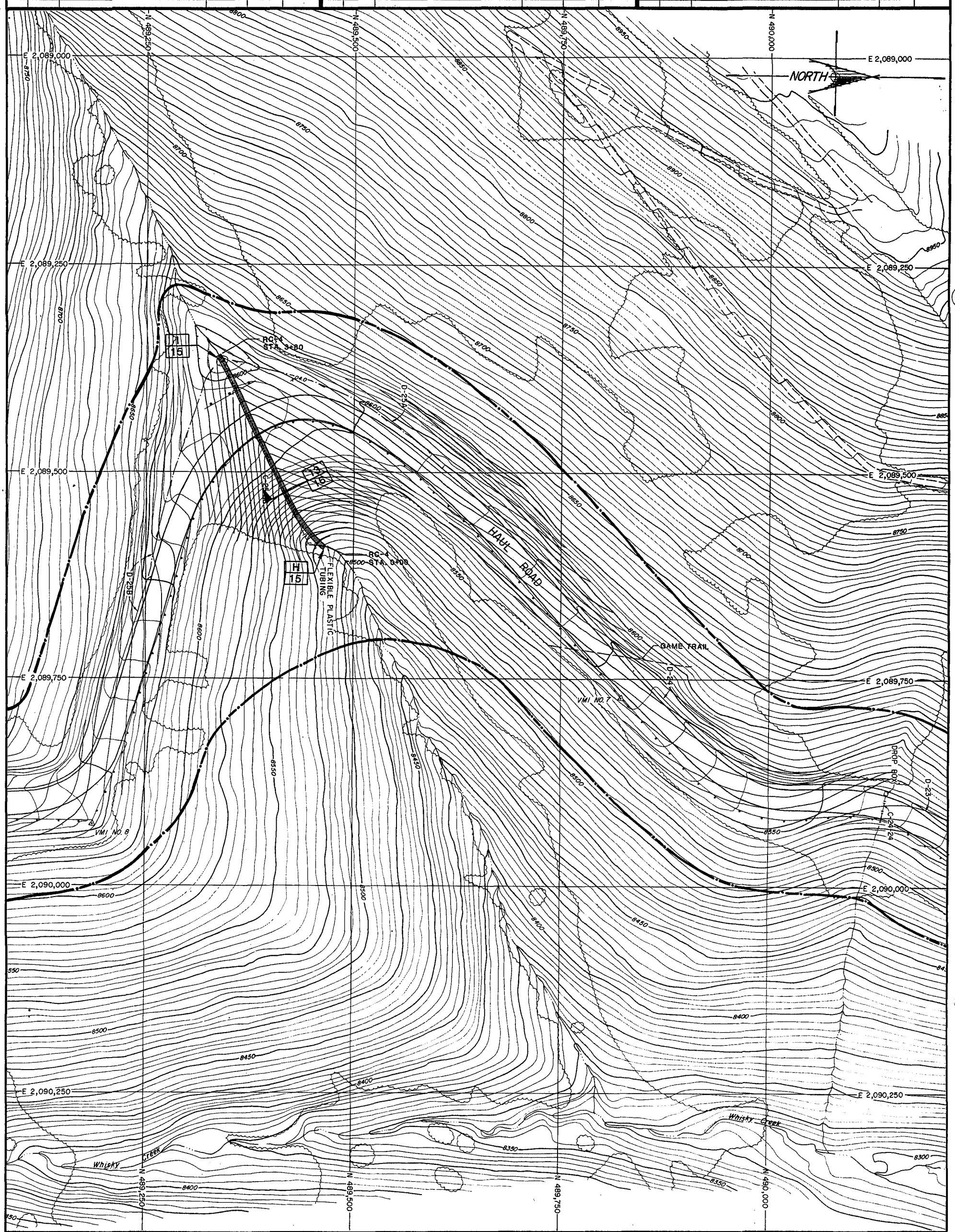
SHEET 7

ETS-5-89

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP			

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



LEGEND:

CERTIFICATION

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE INFORMATION CONTAINED ON THIS FIGURE IS A TRUE AND ACCURATE REPRESENTATION OF PROPOSED RECLAMATION PLANS AS DIRECTED BY WHITE OAK MINING & CONSTRUCTION CO., INC.

REGISTERED PROFESSIONAL ENGINEER #7848 DAVID W. HANSEN 8/1/93 STATE OF UTAH

REGISTERED PROFESSIONAL ENGINEER No 9329 EDWIN BROOKSHIRE FOUST Mar 93 STATE OF UTAH

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE

TITLE:
R645-301-527
WHITE OAK HAUL ROAD
RECLAMATION

Drawn by: DAVE BRUSE	Date: 8/1/93
Approval:	Date:
Drawing No. R645-301-527	Rev.

SAND DESIGN & GRAPHICS

SCALE: 1"=50'

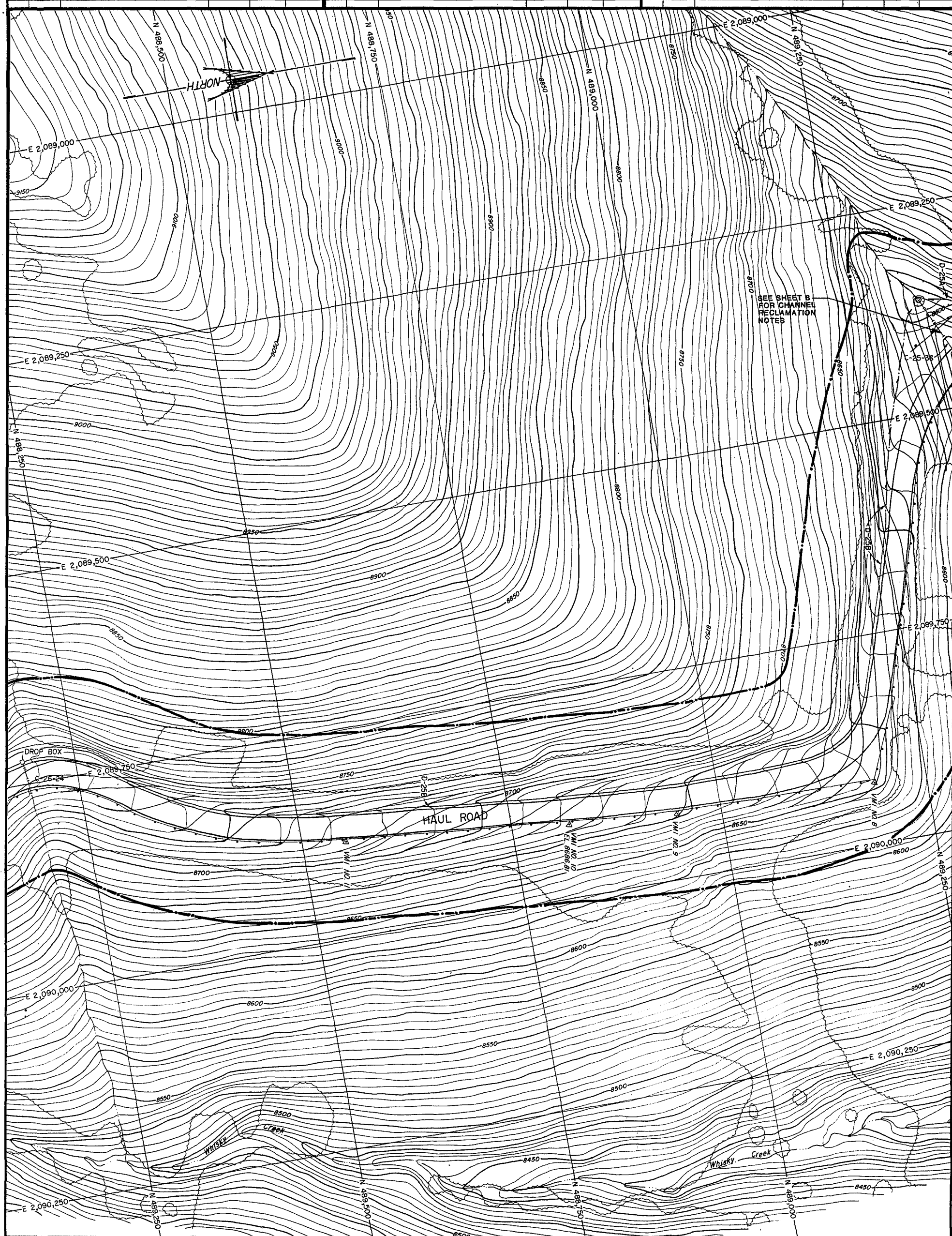
SHEET 8

ETS-5-89

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP			

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



LEGEND:

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID L. HANSEN 8/1/93 STATE OF UTAH

REGISTERED PROFESSIONAL ENGINEER No 5329 EDWIN BROOKSHIRE FOUST Mar 93 STATE OF UTAH

CERTIFICATION

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE INFORMATION CONTAINED ON THIS FIGURE IS A TRUE AND ACCURATE REPRESENTATION OF PROPOSED RECLAMATION PLANS AS DIRECTED BY WHITE OAK MINING & CONSTRUCTION CO., INC.

WHITE OAK MINING & CONSTRUCTION CO., INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE

TITLE:

R645-301-527
WHITE OAK HAUL ROAD RECLAMATION

Drawn by: JEFF JENSEN — Date: 8/1/93

Approval: — Date:

Drawing No. R645-301-527 — Rev.

SAND DESIGN & GRAPHICS

SCALE: 1"=50'

SHEET 9

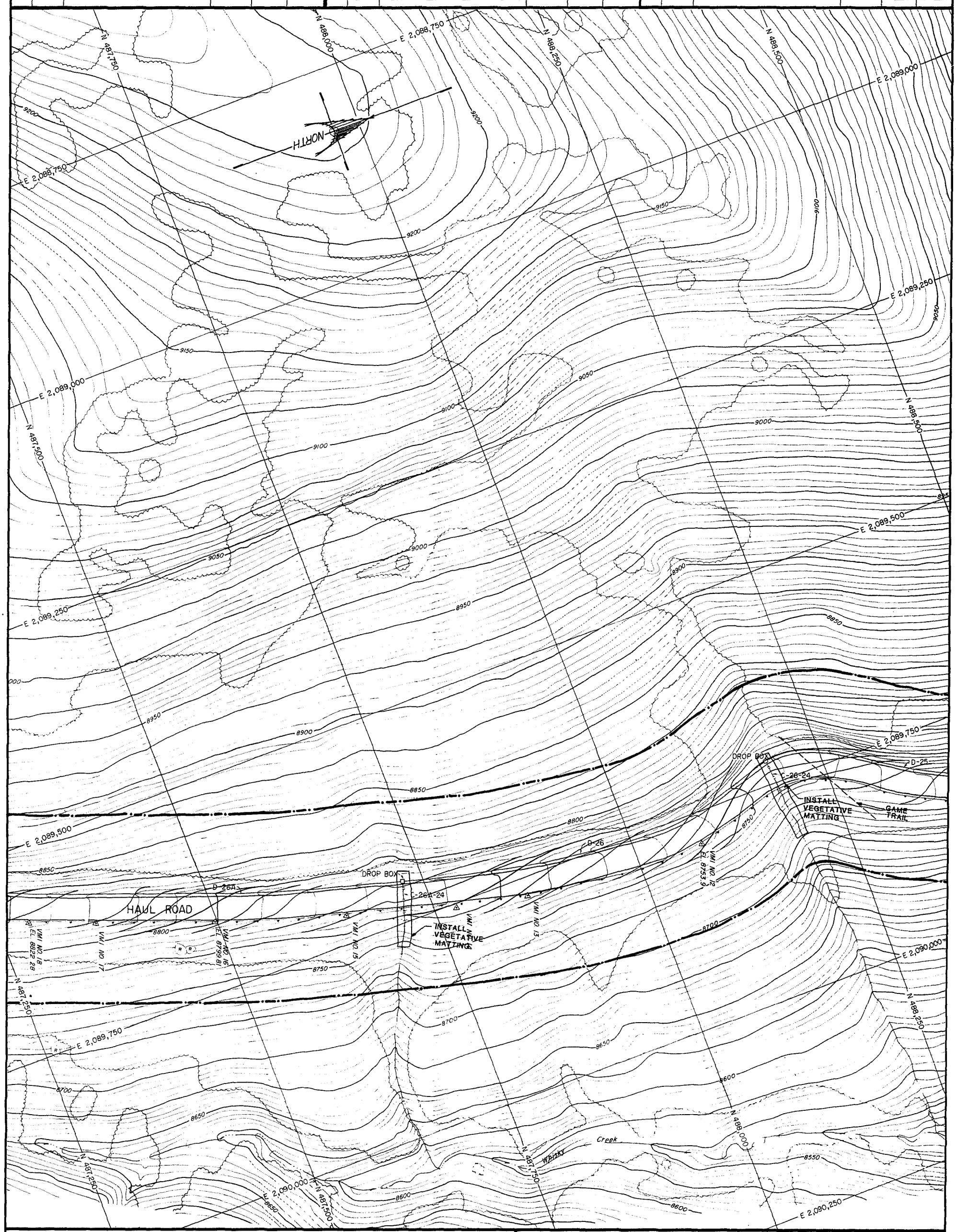
ETS-5-89

Sheet 9 R645-301-540

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP			

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



LEGEND:

CERTIFICATION

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE INFORMATION CONTAINED ON THIS FIGURE IS A TRUE AND ACCURATE REPRESENTATION OF PROPOSED RECLAMATION PLANS AS DIRECTED BY WHITE OAK MINING & CONSTRUCTION CO., INC.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID HANSEN STATE OF UTAH 8/1/93

REGISTERED PROFESSIONAL ENGINEER No 8329 EDWIN BROOKSHIRE FOUST Ma r93 STATE OF UTAH

WHITE OAK MINING & CONSTRUCTION CO., INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE

TITLE:

R645-301-527
WHITE OAK HAUL ROAD
RECLAMATION

Drawn by: JEFF JENSEN	Date: 8/1/93
Approval:	Date:
Drawing No. R645-301-527	Rev.:

SAND DESIGN & GRAPHICS

SCALE: 1"=50'

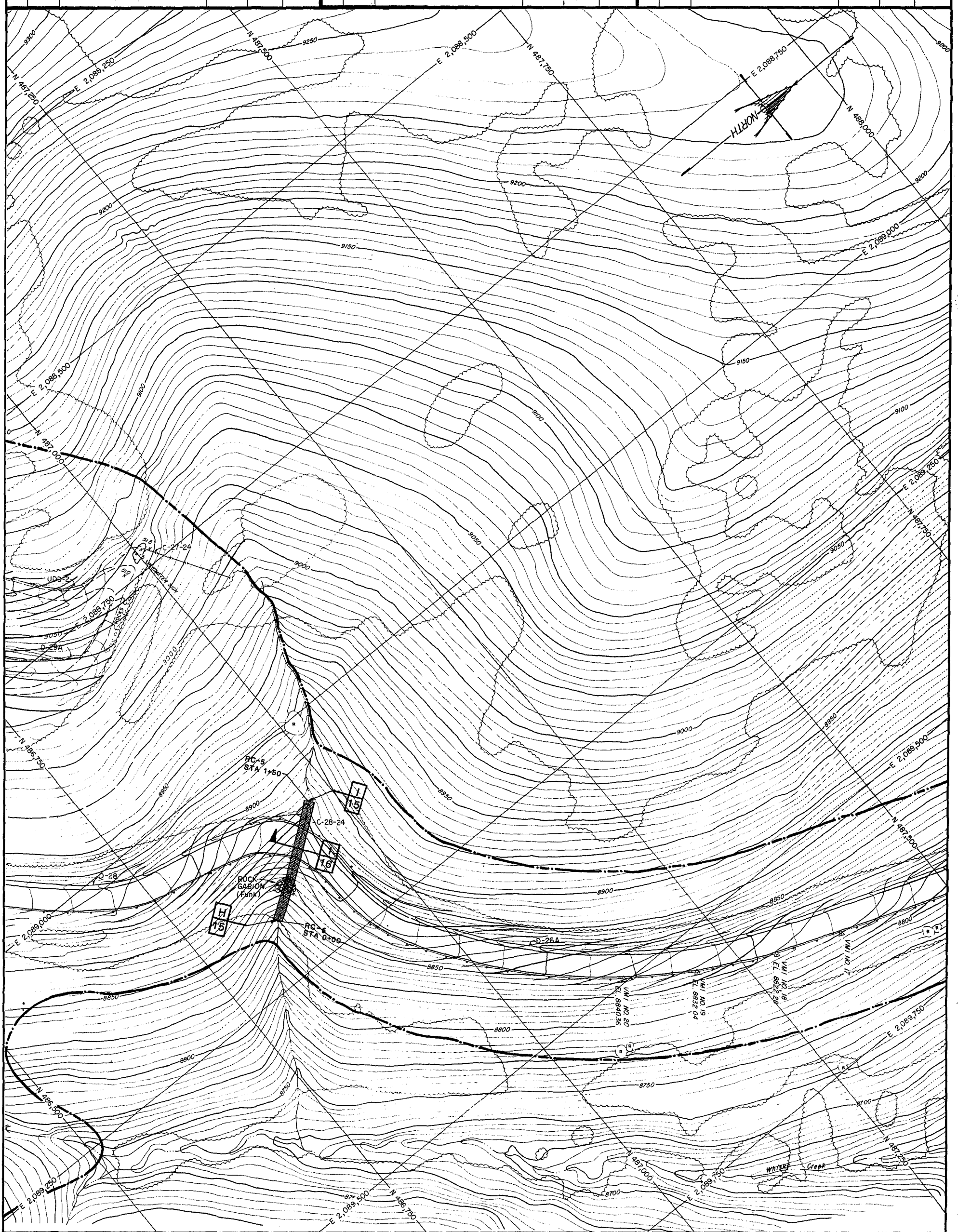
SHEET 10

ETS-5-89

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP			

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



LEGEND:

CERTIFICATION

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE INFORMATION CONTAINED ON THIS FIGURE IS A TRUE AND ACCURATE REPRESENTATION OF PROPOSED RECLAMATION PLANS AS DIRECTED BY WHITE OAK MINING & CONSTRUCTION CO., INC.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID L. HANSEN 8/1/93 STATE OF UTAH

REGISTERED PROFESSIONAL ENGINEER No 8323 EDWIN BROOKSHIRE FOUST Mar 93 STATE OF UTAH

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE

TITLE:
R645-301-527
WHITE OAK HAUL ROAD
RECLAMATION

Drawn by: JEFF JENSEN — Date: 8/1/93
Approval: — Date:
Drawing No. R645-301-527 — Rev. 1 3/93

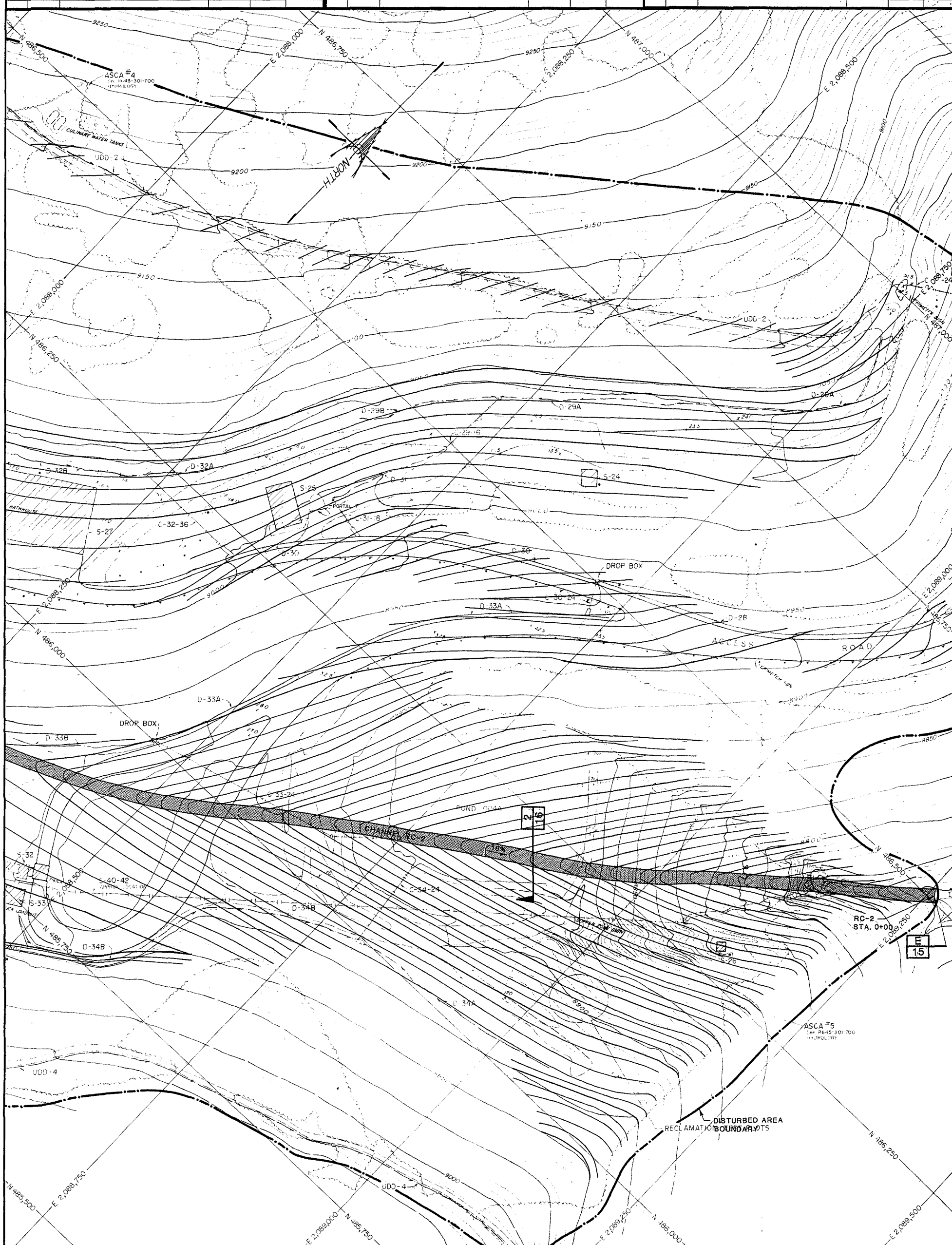
SAND DESIGN & GRAPHICS — SCALE: 1"=50' — SHEET 11

ETS-5-89

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP			

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



LEGEND:

CERTIFICATION

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE INFORMATION CONTAINED ON THIS FIGURE IS A TRUE AND ACCURATE REPRESENTATION OF PROPOSED RECLAMATION PLANS AS DIRECTED BY WHITE OAK MINING & CONSTRUCTION CO., INC.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID L. HANSEN STATE OF UTAH 8/1/93

REGISTERED PROFESSIONAL ENGINEER No 5323 EDWIN BROOKSHIRE FOUST Mar 93 STATE OF UTAH

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE INC.

TITLE:
R645-301-527
WHITE OAK MINE SITE RECLAMATION

Drawn by: DAVE BRUSE — Date: 8/1/93
Approval: — Date:
Drawing No. R645-301-527 — Rev.1

SAND DESIGN & GRAPHICS

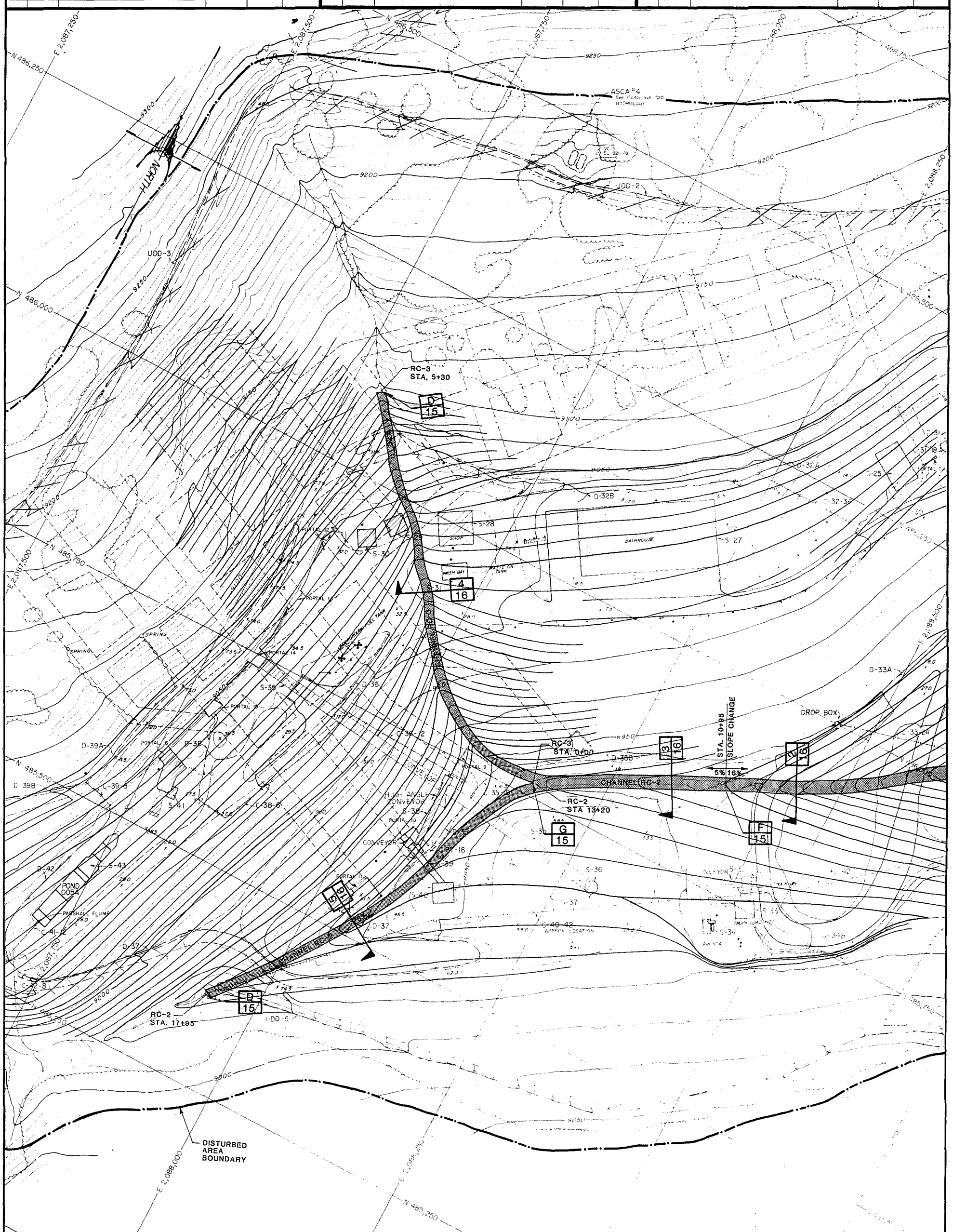
SCALE: 1"=50' — SHEET 12

ETS-5-89

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP			

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



LEGEND:

CERTIFICATION

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE INFORMATION CONTAINED ON THIS FIGURE IS A TRUE AND ACCURATE REPRESENTATION OF PROPOSED RECLAMATION PLANS AS DIRECTED BY WHITE OAK MINING & CONSTRUCTION CO., INC.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID HANSEN STATE OF UTAH 8/1/93

REGISTERED PROFESSIONAL LAND SURVEYOR No. 5091 BRENT R. FOUST STATE OF UTAH Mar 93

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE INC.

TITLE:
R645-301-527
WHITE OAK MINE SITE
RECLAMATION

Drawn by: JEFF JENSEN	Date: 8/1/93
Approval:	Date:
Drawing No. R645-301-527	Rev. 1

SAND DESIGN & GRAPHICS

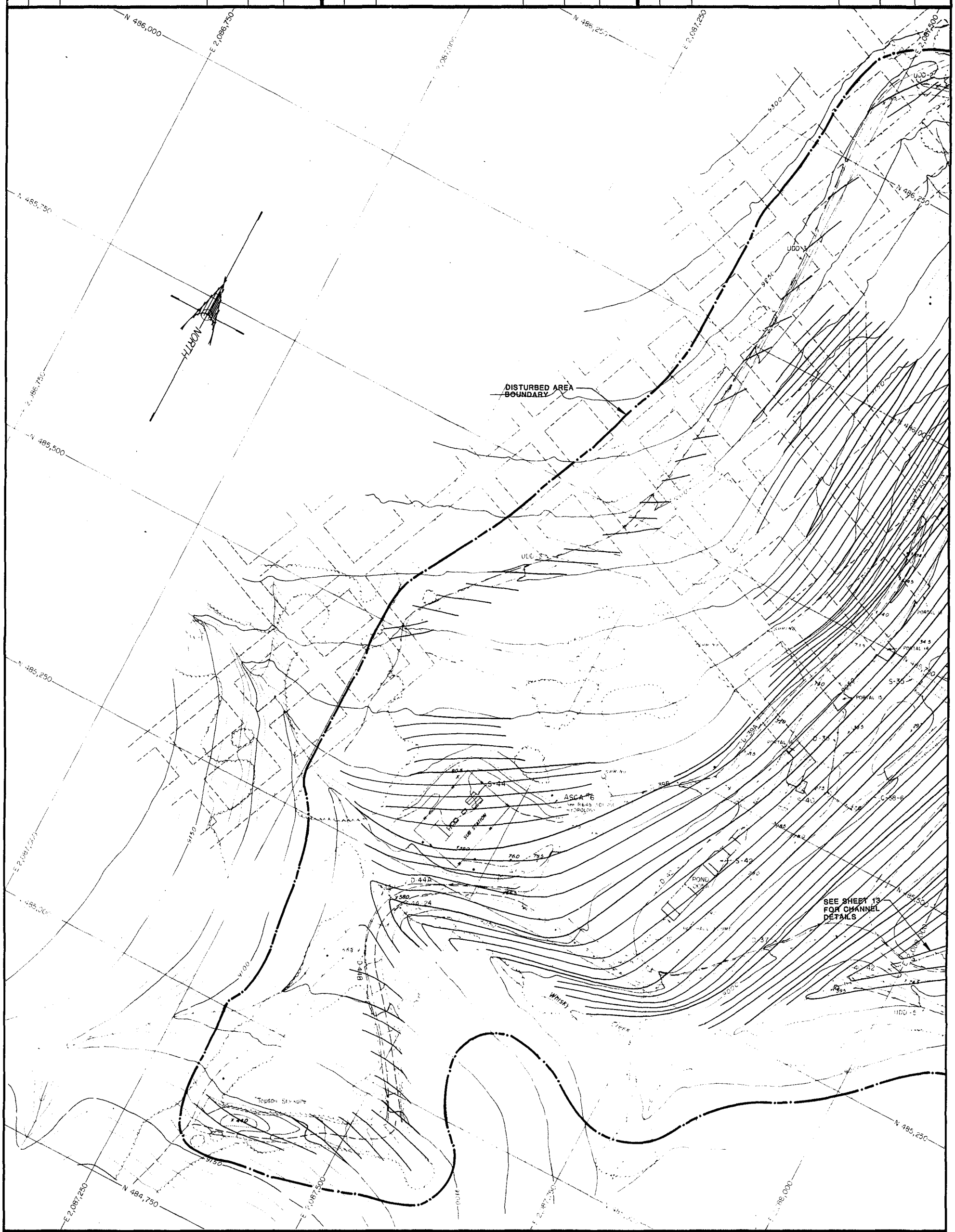
SCALE: 1"=50'

SHEET 13

ETS-5-89

R645-301-527
SHT # 14

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM			WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM			WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS	NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS	NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP															



LEGEND:

CERTIFICATION

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE INFORMATION CONTAINED ON THIS FIGURE IS A TRUE AND ACCURATE REPRESENTATION OF PROPOSED RECLAMATION PLANS AS DIRECTED BY WHITE OAK MINING & CONSTRUCTION CO., INC.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID BRUCE HANSEN 8/1/93 STATE OF UTAH

REGISTERED PROFESSIONAL ENGINEER No. 5727 EDWIN BRUCE BRUSE Mar 93 STATE OF UTAH

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

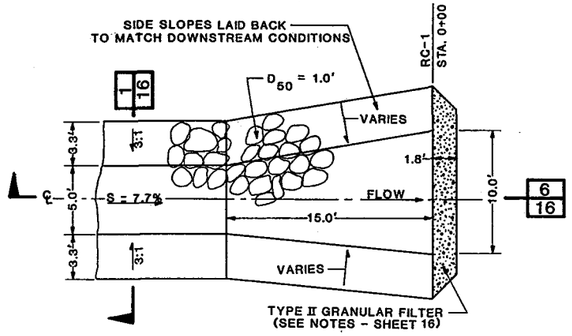
PREPARED BY HANSEN ALLEN & LUCE INC.

TITLE:
R645-301-527
WHITE OAK MINE SITE
RECLAMATION

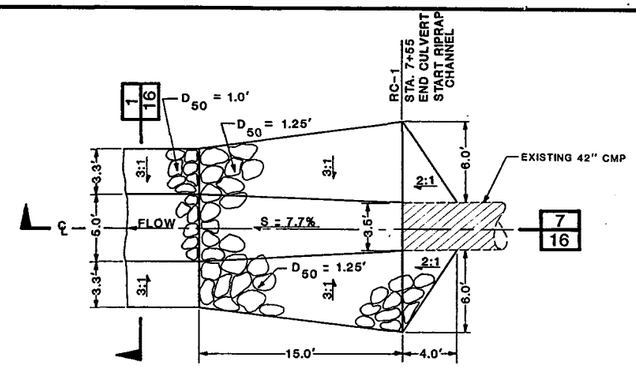
Drawn by: DAVE BRUSE	Date: 8/1/93
Approval:	Date:
Drawing No. R645-301-527	Rev.

SAND DESIGN & GRAPHICS | SCALE: 1"=50' | SHEET 14

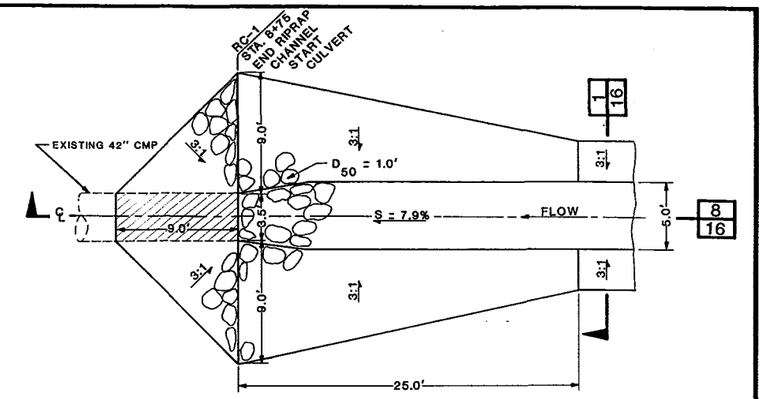
ETS-5-89



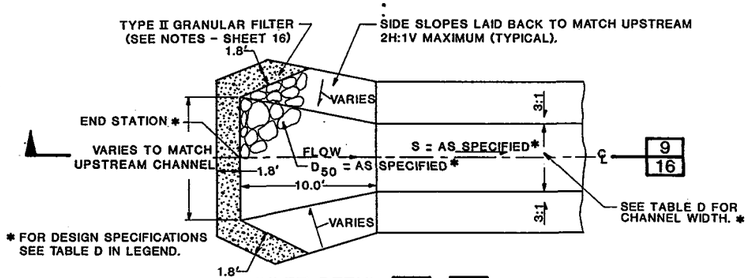
OUTLET DETAIL A/2
N.T.S.



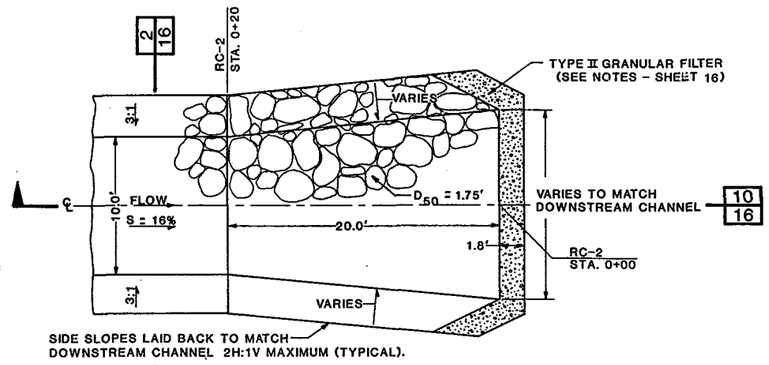
CULVERT OUTLET DETAIL B/2
N.T.S.



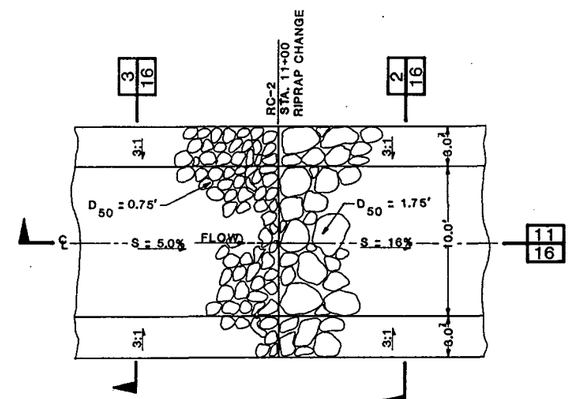
CULVERT INLET DETAIL C/2
N.T.S.



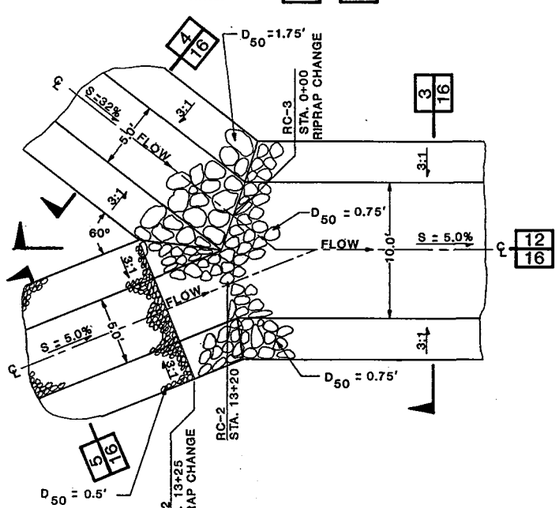
INLET DETAIL D/2 — D/13
N.T.S.



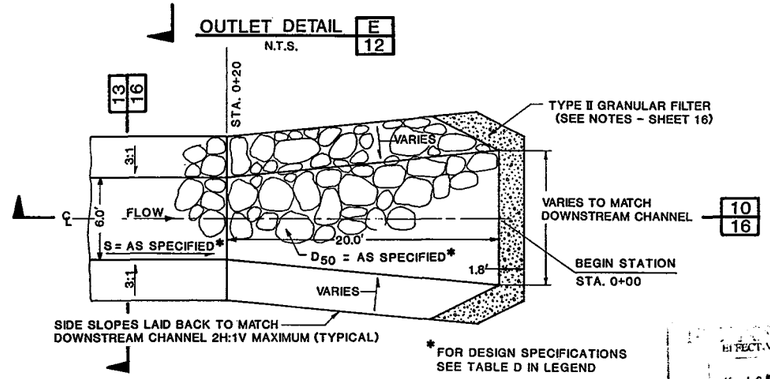
OUTLET DETAIL E/12
N.T.S.



SLOPE CHANGE DETAIL F/13

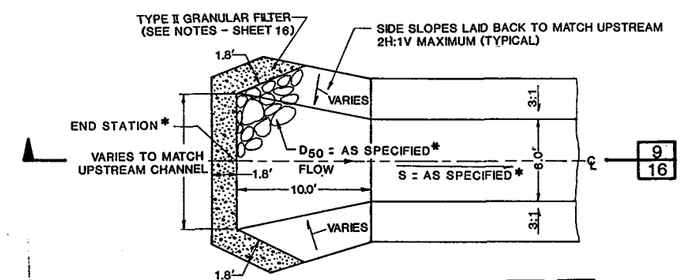


JUNCTION DETAIL G/13
N.T.S.



* FOR DESIGN SPECIFICATIONS SEE TABLE D IN LEGEND

OUTLET DETAIL H/8 — H/11
N.T.S.



* FOR DESIGN SPECIFICATIONS SEE TABLE D IN LEGEND.

INLET DETAIL I/8 — I/11
N.T.S.

LEGEND

TABLE D
DETAIL SPECIFICATIONS

CHANNEL	END STATION	SLOPE %	WIDTH (FT)	D_{50} (FT)	RIPRAP THICKNESS (FT)
RC-1	11+50	7.7	5	1.0	1.75
RC-2					
Above Sta 0+00	10+95	16.0	10	1.75	3.0
Above Sta 10+95	13+20	5.0	10	0.75	1.25
Above Sta 13+20	17.95	5.0	5	0.5	1.0
RC-3	5+30	32.0	5	1.75	3.0
RC-4	3+80	31.6	6	1.5	2.0
RC-5	1+50	26.7	5	1.0	1.75

CERTIFICATION

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE INFORMATION CONTAINED ON THIS FIGURE IS A TRUE AND ACCURATE REPRESENTATION OF PROPOSED RECLAMATION PLANS AS DIRECTED BY WHITE OAK MINING & CONSTRUCTION CO., INC.

REGISTERED PROFESSIONAL ENGINEER #7918 DAVID HANSEN 3/11/93 STATE OF UTAH

EFFECTIVE MAR 16 1993 UTAH DIVISION OIL, GAS AND MINING

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE INC. Salt Lake City Utah

TITLE: MAP R645-301-527 RECLAMATION CHANNEL DETAILS

Drawn by: DRB — Date: 8/93
Approval: DEH — Date: 8/93
Drawing No. — Rev.

SCALE: N.T.S.

SHEET 15 OF 16

007.012.100.015

NO.	DATE	DESCRIPTION
1	9/94	CHANGE IN OWNERSHIP

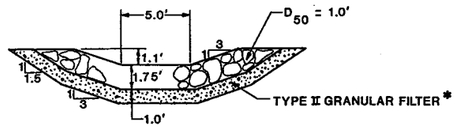
WHITE OAK ACT/007/001 REVISION — INCORPORATED INTO MRP BY DOGM

NO.	DATE	DESCRIPTION	INCORPORATED INTO MRP BY DOGM REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP			

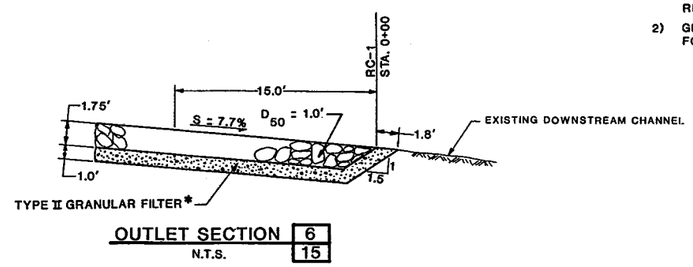
WHITE OAK ACT/007/001 REVISION

*NOTES:

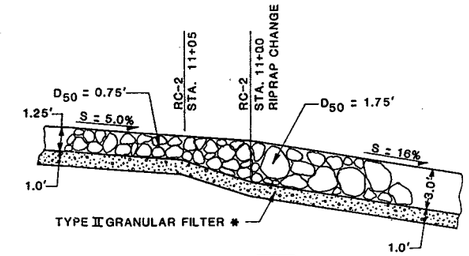
1) SEE TABLE D IN LEGEND, SHEET 15 FOR D_{50}, SLOPE, RIPRAP THICKNESS AND END STATIONING SPECIFICATIONS.
2) GEOTEXTILE FILTER FABRIC MAY BE SUBSTITUTED FOR TYPE II GRANULAR FILTER.



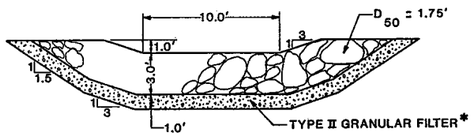
TYPICAL SECTION 1/2 — 1/11 — 1/15
N.T.S.



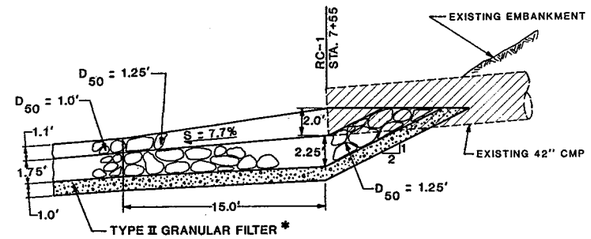
OUTLET SECTION 6/15
N.T.S.



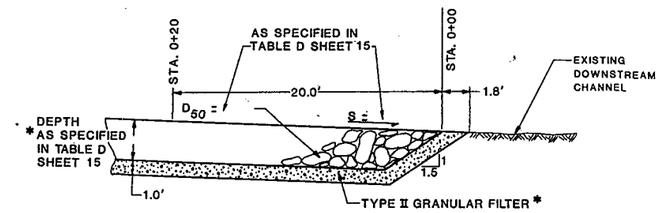
SECTION 11/15
N.T.S.



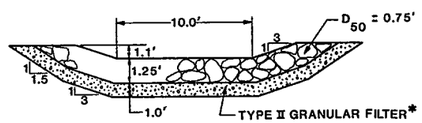
TYPICAL SECTION 2/13 — 2/15
N.T.S.



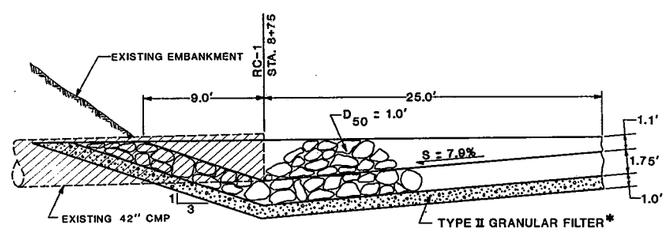
CULVERT OUTLET SECTION 7/15
N.T.S.



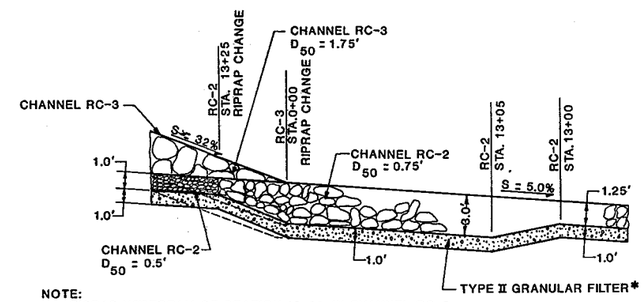
OUTLET SECTION 10/15
N.T.S.



TYPICAL SECTION 3/13 — 3/15
N.T.S.

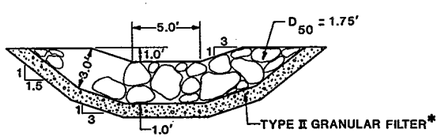


CULVERT INLET SECTION 8/15
N.T.S.

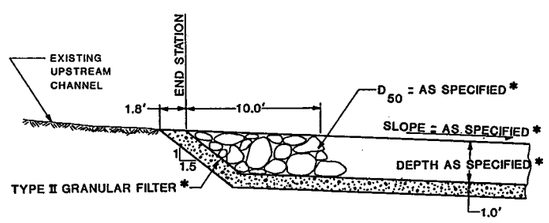


NOTE:
RIPRAP UPSTREAM OF STATION 13+20 IN CHANNEL RC-2 HAS D_{50} = 0.75', RIPRAP D_{50} = 0.5' USED DOWNSTREAM.

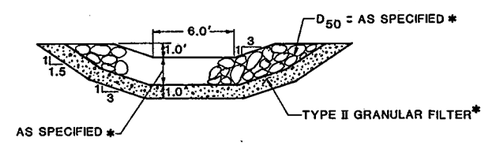
SECTION 12/15
N.T.S.



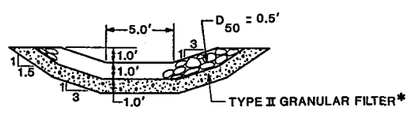
TYPICAL SECTION 4/13 — 4/15
N.T.S.



INLET SECTION 9/15
N.T.S.



SECTION 13/13 — 8/15
N.T.S.



TYPICAL SECTION 5/13 — 5/15
N.T.S.

INCORPORATED
EFFECTIVE:
APR 1 1996
UTAH DIVISION OIL, GAS AND MINING

NOTES:

RIPRAP GRADATIONS (in)							TYPE II GRANULAR FILTER GRADATION	
% PASSING BY WEIGHT	RIPRAP D_{50} (in)						% PASSING BY WEIGHT	U.S. STD. SIEVE SIZE
	6	9	12	15	18	21		
70-100	12	15	21	22	24	36	90-100	3"
50-70	9	12	18	19	20	27	20-90	3/4"
35-50	6	9	12	15	18	21	0-20	#4
2-10	2	3	4	5	5	9	0-3	#200

CHANNEL SLOPE OF FIRST 20 FEET OF CHANNEL INLETS MAY BE LESS THAN SHOWN IF FIELD ADJUSTMENTS ARE REQUIRED TO MATCH DESIGN AND FIELD CONDITIONS.

CERTIFICATION

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THE INFORMATION CONTAINED ON THIS FIGURE IS A TRUE AND ACCURATE REPRESENTATION OF PROPOSED RECLAMATION PLANS AS DIRECTED BY WHITE OAK MINING & CONSTRUCTION CO., INC.

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID H. HANSEN 9/1/93 STATE OF UTAH

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE

TITLE:
MAP R645-301-527
RECLAMATION CHANNEL DETAILS

Drawn by: DRB	Date: 8/93	
Approval: DEH	Date: 8/93	
Drawing No.	Rev.	

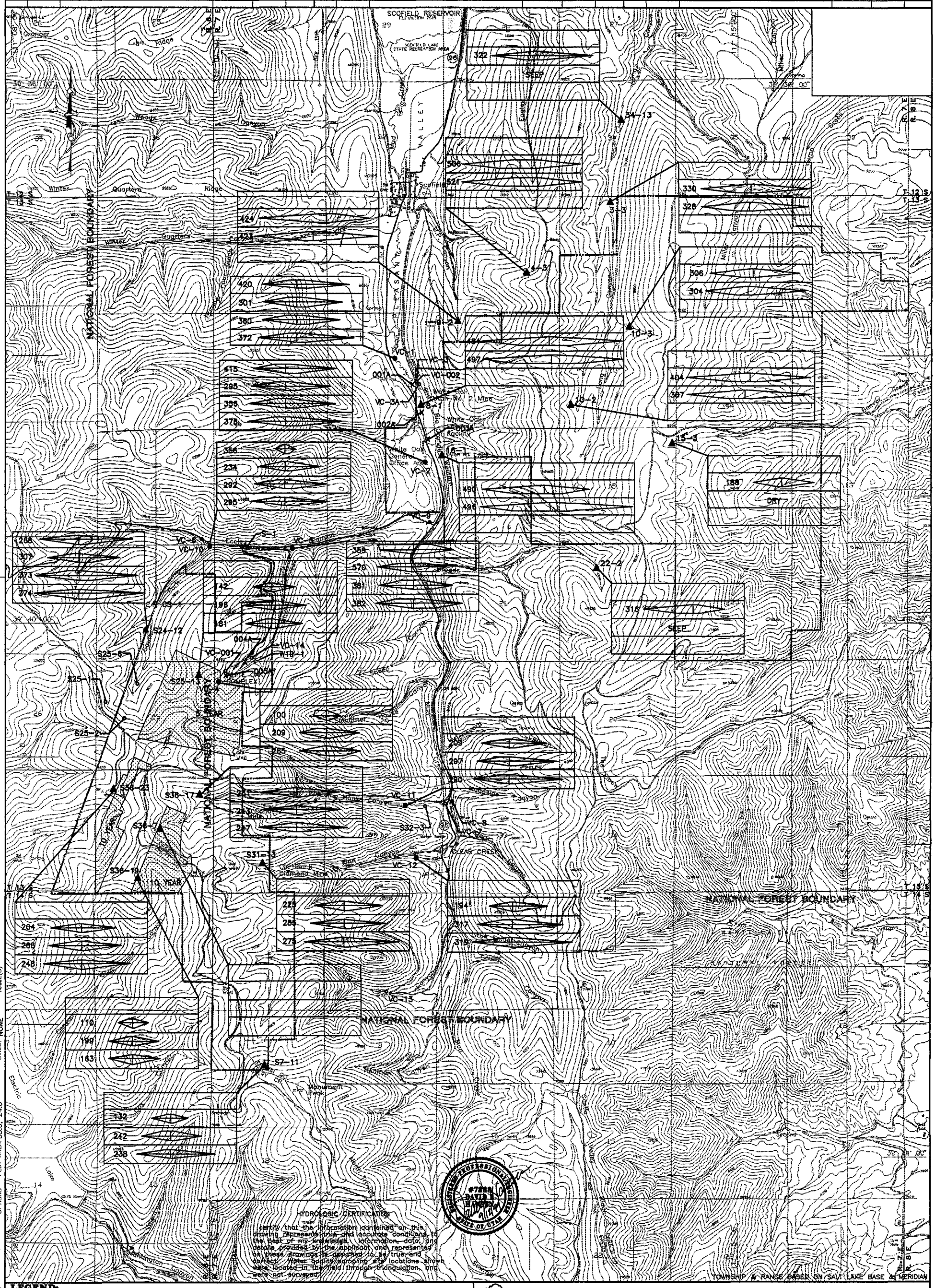
HANSEN ALLEN & LUCE Salt Lake City Utah

SCALE: N.T.S.

SHEET 16 OF 16

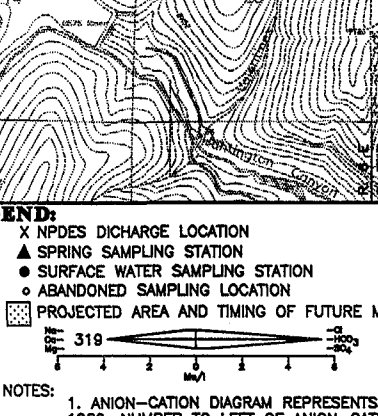
007.012.100.016

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM			WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM			WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS	NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS	NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	8/94	OWNERSHIP CHANGED TO WHITE OAK MINING & CONSTRUCTION CO., INC.															
2	9/94	NEW STATIONS ADDED EAST OF MUD CREEK															



LEGEND:

- X NPDES DICHARGE LOCATION
- ▲ SPRING SAMPLING STATION
- ● SURFACE WATER SAMPLING STATION
- ○ ABANDONED SAMPLING LOCATION
- PROJECTED AREA AND TIMING OF FUTURE MINING



NOTES:

1. ANION–CATION DIAGRAM REPRESENTS DATA THROUGH MAY, 1989. NUMBER TO LEFT OF ANION–CATION DIAGRAM IS QUARTERLY TDS AS UPDATED THROUGH APRIL, 1990.
2. SPRING 36–7 SAMPLING STARTED 9/92 AT THE REQUEST OF DOGM.

BOX SHOWN IDENTIFIES SEASONAL WATER QUALITY AS SHOWN BELOW

1st	QUARTER WATER QUALITY
2nd	QUARTER WATER QUALITY
3rd	QUARTER WATER QUALITY
4th	QUARTER WATER QUALITY

WHITE OAK MINING & CONSTRUCTION CO., INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE

VERIFY SCALE 0" 1"
BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

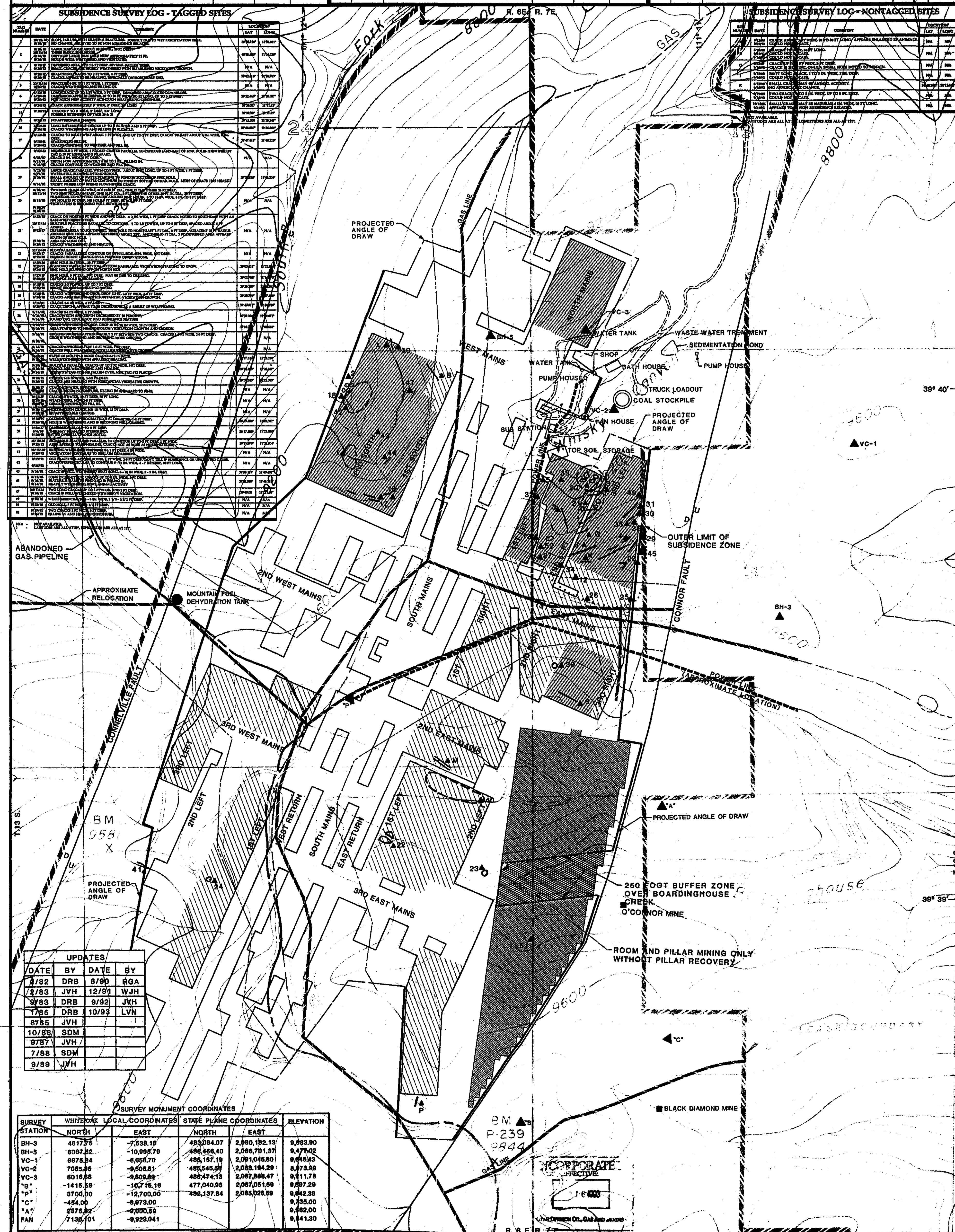
TITLE: MAP R645–301–722.100a GROUND AND SURFACE WATER SAMPLING LOCATIONS WITH SEASONAL WATER QUALITY

DRAWN BY:	DRB	DATE:	7/89
APPROVAL:	DEH	DATE:	9/90
DRAWING NO.			
SCALE: 1" = 2000'		SHEET:	1 of 1

FILE NAME Z:\CAD\125\07-100\TOPO\722-100A.DWG FILE DATE SEPT. 07, 1994 PLOT OPTIONS PLOT -IN = DWG UNITS:1 = 1 PLOT AREA: 35.0, 24.0 ORIGIN: 0,0,0 DVIEW: NONE XREF FILE NAME(S) Z:\CAD\125\07-100\WO-TITLE.DWG

7/94

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	10/15/93	REFINED LOCATION OF STA. 47, ADDED			
-	-	STATIONS 12 & 45, RENAMED STA. 33 TO 13			
1	9/94	CHANGE IN OWNERSHIP			



SUBSIDENCE SURVEY LOG - TAGGED SITES

TAG NUMBER	DATE	COMMENT	LOCATION LAT	LOCATION LONG
1	10/13/86, 9/26/92	SLOPE FAILURE WITH MULTIPLE FRACTURES. POSSIBLY DUE TO WET PRECIPITATION YEAR. NO CHANGE, BELIEVED TO BE NON SUBSIDENCE RELATED.	[illegible]	[illegible]
2	[illegible]	LARGE SINK HOLE ABOUT 40 [illegible], 30 FT DEEP. THREE SMALL SINK HOLES. DEPTH OF LARGE SINK HOLE NOW APPROXIMATELY 12 FT. HOLE IS WELL WEATHERED AND VEGETATED.	[illegible]	[illegible]
3	[illegible]	DEPRESSED AREA 1 TO 1.5 FT DEEP. SEVERAL FALLEN TREES. SMALL CRACKS ARE HIGHLY WEATHERED WITH ESTABLISHED VEGETATIVE GROWTH.	N/A	N/A
4	[illegible]	BRANCHING CRACKS TO 2 FT WIDE, 4 FT DEEP. CRACKS APPEAR TO BE HEALING, ESPECIALLY ON NORTHEAST END.	[illegible]	[illegible]
5	[illegible]	FRACTURES 6 IN. TO 1 FT WIDE, 1 FT DEEP. CRACKS WEATHERING AND FILLING IN.	N/A	N/A
6	[illegible]	LONG CRACK UP TO 2 FT WIDE, 3 FT DEEP. DEPRESSED AREA NOTED DOWNSLOPE. DEPRESSION APPEARS DEEPER, 40 TO 50 FT WIDE, 300 FT LONG, UP TO 3 FT DEEP. NOT MUCH NEW ACTIVITY ALTHOUGH WEATHERING CONTINUES.	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

N/A - NOT AVAILABLE

SUBSIDENCE SURVEY LOG - NONTAGGED SITES

TAG NUMBER	DATE	COMMENT	LOCATION LAT	LOCATION LONG
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

UPDATES			
DATE	BY	DATE	BY
2/82	DRB	8/90	RGA
2/83	JVH	12/91	WJH
9/83	DRB	9/92	JVH
1/85	DRB	10/93	LVH
8/85	JVH		
10/86	SDM		
9/87	JVH		
7/88	SDM		
9/89	JVH		

SURVEY MONUMENT COORDINATES

SURVEY STATION	WHITE OAK LOCAL COORDINATES NORTH	WHITE OAK LOCAL COORDINATES EAST	STATE PLANE COORDINATES NORTH	STATE PLANE COORDINATES EAST	ELEVATION
BH-3	4617.75	-7,538.16	483,094.07	2,090,182.13	9,633.90
BH-5	8007.82	-10,995.79	486,466.40	2,086,701.37	9,477.02
VC-1	6675.84	-6,658.70	485,157.19	2,091,045.80	9,645.43
VC-2	7085.35	-9,506.81	485,545.56	2,088,194.29	8,973.99
VC-3	8016.68	-9,809.69	486,474.13	2,087,888.47	9,211.78
"B"	-1415.58	-10,716.16	477,040.93	2,087,051.59	9,897.29
"P"	3700.00	-12,700.00	482,137.84	2,085,025.59	9,942.39
"C"	-454.00	-8,973.00			9,735.00
"A"	2378.82	-9,000.59			9,662.00
FAN	7138.101	-9,923.041			9,641.30

INCORPORATED EFFECTIVE: 1-6 1993 UTAH DIVISION OIL, GAS AND MINING

LEGEND

- LEASE BOUNDARY
- GAS LINE
- BH-5 — SURVEY MONUMENT
- 24 — TAGGED SUBSIDENCE FEATURES
- P — NONTAGGED SUBSIDENCE FEATURES
- SURFACE CRACK
- SINKHOLE
- APPROXIMATE AREA OF SUBSIDENCE FEATURE
- BOARDINGHOUSE CREEK BUFFER ZONE
- PIPE COVER LINES (@ 35° DRAW ANGLE)
- WHITE OAK NO. 2
- WHITE OAK NO. 1 UPPER O'CONNOR MINE WORKINGS
- PILLARED AREA
- FULL SEAM EXTRACTION
- PROJECTED COAL ANGLE OF DRAW
- FAULT INFLUENCED ANGLE OF DRAW

CERTIFICATION

I certify that to the best of my knowledge the subsidence information contained on this map is true and accurate of field conditions noted at the time the data was collected.

WHITE OAK MINING & CONSTRUCTION CO., INC.
SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE INC.

TITLE: MAP R645-301-728.100a SUBSIDENCE BASE MAP

Drawn by: RGA	Date: 9/90	Approval: DEH	Date: 9/90
Drawing No.		Rev. 1 3/93	

HANSEN ALLEN & LUCE INC. Salt Lake City Utah

SCALE: 1" = 500'

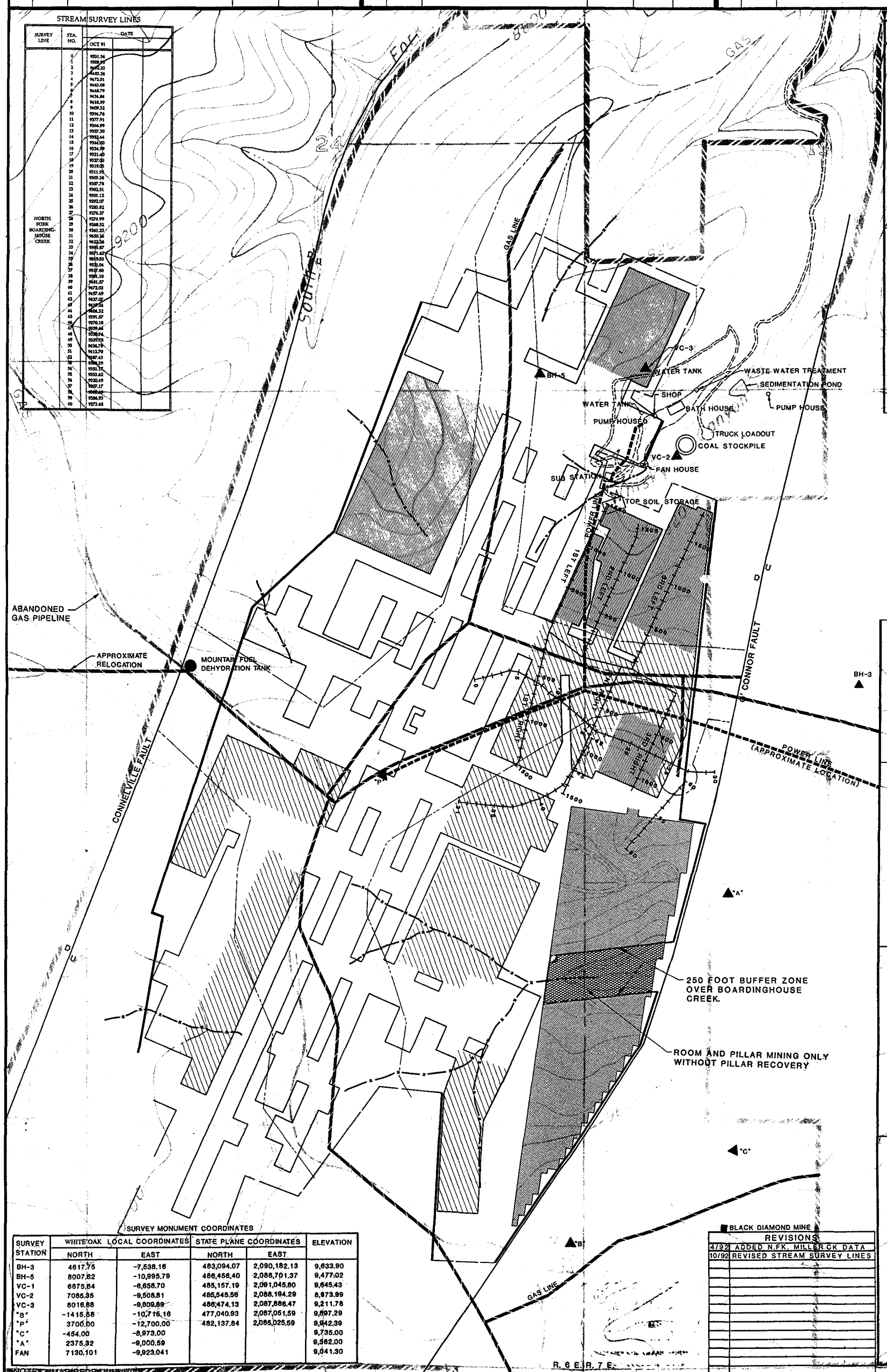
SHEET 1 OF 1

007.11.100.014

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS
1	9/94	CHANGE IN OWNERSHIP			

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS

WHITE OAK ACT/007/001 REVISION			INCORPORATED INTO MRP BY DOGM		
NO.	DATE	DESCRIPTION	REF. NO.	DATE	INITIALS



STREAM SURVEY LINES

SURVEY LINE	STA. NO.	DATE OCT 91
NORTH FORK BOARDING-HOUSE CREEK	0	9531.56
	1	9508.94
	2	9495.22
	3	9483.26
	4	9472.01
	5	9463.08
	6	9448.29
	7	9434.84
	8	9418.39
	9	9409.32
	10	9394.74
	11	9377.91
	12	9366.99
	13	9357.30
	14	9352.44
	15	9344.00
	16	9334.99
	17	9331.40
	18	9327.00
	19	9319.05
	20	9311.93
	21	9309.38
	22	9307.78
	23	9302.51
	24	9301.12
	25	9292.07
	26	9283.82
	27	9276.37
	28	9274.99
	29	9268.52
	30	9261.23
	31	9650.24
	32	9422.24
	33	9595.87
	34	9571.63
	35	9549.50
	36	9533.04
	37	9517.80
	38	9501.10
	39	9481.57
	40	9473.03
	41	9457.49
	42	9437.02
	43	9419.24
	44	9406.32
	45	9391.57
	46	9370.10
	47	9359.46
	48	9338.74
	49	9329.78
	50	9436.73
	51	9412.70
	52	9387.43
	53	9368.39
	54	9351.37
	55	9333.62
	56	9320.49
	57	9307.17
	58	9295.42
	59	9286.93
	60	9273.48

STREAM SURVEY LINES

SURVEY LINE	STA. NO.	DATE OCT 93	DATE AUG 93	DATE OCT 92
1st RIGHT	0	9504.26	*	*
	50	9503.97	9505.98	9506.16
	100	9497.37	9497.37	9498.53
	150	9487.79	9487.77	9487.93
	200	9475.01	9474.98	9475.16
	250	9464.87	9464.83	9465.01
	300	9455.88	*	9456.45
	350	9442.54	9442.38	9442.51
	400	9430.02	9429.84	9430.03
	450	9419.44	9417.27	9417.47
	500	9403.66	9403.33	9403.71
	550	9389.72	9389.56	9389.75
	600	9390.33	*	9391.12
	650	9404.49	9404.29	9404.48
	700	9418.87	9418.72	9418.90
	750	9429.54	9429.57	9429.73
	800	9440.87	9440.72	9440.93
	850	9449.78	9449.74	9449.88
	900	9457.89	9457.43	9457.59
	950	9465.77	9465.72	9465.88
	1000	9467.42	9467.39	9467.66
	1050	9470.53	9470.32	9470.48
	1100	9475.18	9475.10	9475.26
	1150	9483.64	9483.50	9483.52
	1200	9497.18	9497.19	9497.35
	1250	9515.53	9515.49	9515.65
	1300	9531.11	9531.14	9531.30
	1350	9540.05	9539.79	9539.95
	1400	9537.96	9537.90	9534.57
	1450	9536.69	*	*
	1500	9538.25	9538.22	9538.37
2nd RIGHT	0	9485.82	9485.78	9485.96
	50	9480.72	*	*
	100	9469.39	9469.15	9469.12
	150	9457.46	9457.31	9457.28
	200	9451.26	9451.17	9451.16
	250	9438.06	9438.08	9438.05
	300	9425.95	9425.79	9425.98
	350	9412.73	*	*
	400	9397.91	9392.93	9397.84
	450	9384.43	*	*
	500	9370.93	9370.87	9370.91
	550	9356.46	9356.25	9356.30
	600	9341.36	9341.49	9341.69
	650	9333.86	9333.55	9335.60
	700	9330.53	9329.98	9330.51
	750	9329.39	9328.51	9328.54
	800	9333.11	9332.20	9332.20
	850	9333.82	9333.04	9333.04
	900	9339.19	9338.37	9338.37
	950	9342.41	9341.87	9341.86
	1000	9350.98	9350.44	9350.44
	1050	9360.16	9359.70	9359.70
	1100	9368.71	9368.38	9368.38
	1150	9377.02	9376.82	9376.83
	1200	9387.10	9386.95	9387.08
	1250	9393.44	9393.47	9393.53
	1300	9399.16	9399.23	9399.29
	1350	9405.18	9405.28	9405.35
	1400	9411.48	9411.50	9411.58
	1450	9419.98	*	*
	1500	9427.23	9427.34	9427.43
3rd RIGHT	0	9471.16	9471.15	9471.35
	50	9454.88	9454.96	9454.88
	100	9440.31	9440.33	9440.40
	150	9426.60	9426.68	9426.69
	200	9412.56	9412.56	9412.64
	250	9398.42	9398.41	9398.52
	300	9382.30	*	*
	350	9367.98	9367.67	9368.04
	400	9353.58	9353.30	9353.67
	450	9339.76	9339.67	9339.86
	500	9325.39	9324.88	9325.11
	550	9310.97	9310.82	9311.04
	600	9297.55	9296.81	9297.06
	650	9294.24	*	*
	700	9296.55	9296.21	9296.38
	750	9306.99	9306.41	9306.60
	800	9320.12	9319.12	9319.27
	850	9333.01	9331.79	9331.82
	900	9348.44	9347.32	9347.36
	950	9363.52	9362.11	9362.57
	1000	9377.07	9376.22	9376.25
	1050	9390.16	9389.70	9389.74
	1100	9405.42	9404.86	9404.92
	1150	9417.48	9417.26	9417.30
1st LEFT	0	9504.26	*	*
	50	9491.41	9494.41	9491.34
	100	9476.35	9476.47	9476.43
	150	9463.46	9462.41	9462.58
	200	9449.63	9449.67	9449.71
	250	9438.28	9438.28	9438.32
	300	9427.84	9427.85	9427.86
	350	9414.35	9414.36	9414.11
	400	9395.70	9395.50	9395.34
	450	9381.33	9380.98	9380.89
	500	9367.60	9367.29	9367.15
	550	9355.97	9355.58	9355.47
	600	9343.81	9343.51	9343.39
	650	9328.63	9328.51	9327.88
	700	9312.26	9312.05	9311.66
	750	9299.04	9298.87	9298.46
	800	9286.10	9285.86	9285.81
	850	9273.21	9273.02	9272.75
	900	9259.96	9259.79	9259.55
	950	9249.53	9249.34	9242.99
	1000	9229.20	9228.82	9228.65
	1050	9215.44	9215.68	9215.39
	1100	9203.79	9203.66	9203.41
	1150	9193.37	9193.22	9193.02
	1200	9177.83	9177.61	9177.46
	1250	9163.42	9163.27	9162.01
	1300	9147.31	9147.08	9146.88
	1350	9132.48	9132.24	*
	1400	9122.01	*	*
	1450	9107.34	9107.06	9106.85
	1500	9095.12	9094.80	9094.74
2nd LEFT	0	9478.56	*	9478.49
	50	9479.13	*	9479.22
	100	9474.80	9474.92	9474.81
	150	9464.16	9464.16	9464.00
	200	9449.53	9448.44	9449.21
	250	9434.07	9433.77	9433.45
	300	9417.48	9417.16	9416.40
	350	9403.81	9403.37	9401.84
	400	9380.96	9380.65	9376.96
	450	9366.93	9366.68	9360.39
	500	9354.54	9354.04	9344.62
	550	9339.19	9338.72	9330.92
	600	9318.25	*	*
	650	9294.43	9294.09	9286.87
	700	9276.64	9276.34	9268.17
	750	9261.29	9261.09	9253.12
	800	9248.26	9248.10	9240.70
	850	9237.17	9237.04	9226.45
	900	9223.56	9223.44	*
	950	9211.61	9210.96	9206.02
	1000	9200.60	9200.82	9195.44
	1050	9190.56	9190.49	9184.08
	1100	9178.95	9178.87	9175.26
	1150	9164.98	9163.89	9161.20
	1200	9154.18	9153.89	9152.82
	1250	9144.82	9144.51	9144.29
	1300	9133.75	9133.46	9133.46
	1350	9118.02	9117.68	9117.74
	1400	9103.24	9102.90	9102.87
	1450	9102.16	9101.89	9101.87
	1500	9094.06	9093.71	9093.79
	1550	9083.10	9082.60	9082.69
3rd LEFT	0	9490.54	9490.50	9490.49
	50	9491.92	9491.69	9491.84
	100	9484.12	9485.86	9485.75
	150	9476.74	9476.66	9473.57
	200	9463.89	9462.70	9459.88
	250	9450.88	9449.25	9445.91
	300	9438.05	9435.90	9432.14
	350	9423.72	9420.03	9413.79
	400	9406.46	9402.84	9398.14
	450	9388.61	9384.58	9379.31
	500	9372.32	*	*
	550	9361.33	9356.40	9350.95
	600	9353.93	9347.93	9342.28
	650	9345.10	9340.50	9334.47
	700	9334.55	9331.50	9325.64
	750	9324.63	9319.81	9314.15
	800	9316.19	9311.26	9306.21
	850	9306.72	9304.02	9299.23
	900	9301.27	9296.96	9292.23
	950	9293.99	9291.46	9284.86
	1000	9280.33	9279.12	9274.84
	1050	9267.33	9266.70	9262.24
	1100	9257.33	9256.98	9252.64
	1150	9248.86	9249.69	9245.45
	1200	9242.83	9242.73	9239.00
	1250	9236.45	9236.38	9232.68
	1300	9230.87	9230.80	9227.11
	1350	9225.27	9225.19	9221.48
	1400	9219.16	9219.01	9215.20
	1450	9214.09	9214.03	9210.41
	1500	9209.09	9208.91	9205.18
	1550	9204.18	9204.10	9201.35
	1600	9200.57	9200.49	9198.91
	1650	9196.01	9195.94	9195.10
	1700	9192.07	9191.92	9191.47
	1750	9187.05	9186.81	9186.66
	1800	9181.61	9181.46	9181.28
	1850	9177.36	9177.24	9177.45

* MONUMENT NOT FOUND

SURVEY MONUMENT COORDINATES

SURVEY STATION	WHITE OAK LOCAL COORDINATES NORTH	WHITE OAK LOCAL COORDINATES EAST	STATE PLANE COORDINATES NORTH	STATE PLANE COORDINATES EAST	ELEVATION
BH-3	4617.75	-7,538.16	483,094.07	2,090,182.13	9,633.90
BH-5	8007.82	-10,995.79	486,456.40	2,086,701.37	9,477.02
VC-1	6675.84	-6,656.70	485,157.19	2,091,045.80	9,645.43
VC-2	7085.35	-9,508.81	485,545.56	2,088,194.29	8,973.99
VC-3	8016.88	-9,809.89	486,474.13	2,087,886.47	9,211.78
"B"	-1415.58	-10,715.16	477,040.93	2,087,051.59	9,897.29
"P"	3700.00	-12,700.00	482,137.84	2,085,025.59	9,942.39
"C"	-454.00	-8,973.00			9,735.00
"A"	2375.32	-9,000.59			9,562.00
FAN	7130.101	-9,923.041			9,041.30

NOTES: AS MARKED/DRAWN 8/90

REVISIONS	
4/92	ADDED N.FK. MILLER CK DATA
10/92	REVISED STREAM SURVEY LINES

LEGEND

- LEASE BOUNDARY
- GAS LINE
- BH-5 — SURVEY MONUMENT
- EXISTING SURVEY LINE WITH STATION
- FUTURE POTENTIAL STREAM SURVEY LINE
- BOARDINGHOUSE CREEK BUFFER ZONE
- PIPE COVER LINES (@ 35° DRAW ANGLE)
- WHITE OAK NO. 2
- WHITE OAK NO. 1 UPPER O'CONNOR MINE WORKINGS
- PILLARED AREA
- FULL SEAM EXTRACTION
- PROJECTED COAL ANGLE OF DRAW
- FAULT INFLUENCED ANGLE OF DRAW

REGISTERED PROFESSIONAL ENGINEER #7888 DAVID E. HANSEN STATE OF UTAH

CERTIFICATION

I certify that to the best of my knowledge the subsidence information contained on this map is true and accurate of field conditions noted at the time the data was collected.

WHITE OAK MINING & CONSTRUCTION CO., INC.

SCOFIELD ROUTE, HELPER, UTAH 84526

PREPARED BY HANSEN ALLEN & LUCE INC

TITLE:

MAP R645-301-728.100b
SUBSIDENCE SURVEY LOCATION MAP

Drawn by: JVH	Date: 1/91	Approval: DEH	Date: 1/91
Drawing No.	Rev. 1 3/93		

HANSEN ALLEN & LUCE INC Salt Lake City Utah

SCALE: 1" = 500'

SHEET 1 OF 1

007.011.100.014A

APPENDIX R1

Reclamation Design

White Oak Loadout Area

RECLAIMED CHANNER RC-1

ADD ADDITIONAL AREA TO C-14-42 DATA

C-14-42 CHARACTERISTICS

A = 242.0 AC
S = 37.9%
CN = 67.5
P = 2.25 (USE 2.3")
D = 6HR
H_L = 5000'
Qp = 21.9cfs

ADDITIONAL AREA: CALIBRATE = $\frac{1.43ac}{407}$ = 0.00353

AREA ABOVE C-14-42 = 1.33ac
AREA BELOW C-14-42 = 1.83ac } 3.16ac
AREA USED FOR C-14-42 = 242.0ac
245.2ac

SLOPE:

CONTOUR LENGTH (ADDL. AREA) = 6070'
CONTOUR INTERVAL = 5'

$$S = \frac{6070 * 5 * 100}{3.16 * 43560} = 22.0\%$$

$$\text{AVG SLOPE} = \frac{22 * 3.16 + 37.9 * 242}{245.2} = 37.7\%$$

CURVE NUMBER:

		AREA	Qi
RECLAIMED	CN = 80	3.16	0.75
OAK / ASPEN	= 40	123	0.03
SAGE/GRASS	= 75	119	0.54
			$\bar{Q}$ = 0.29

CN = 67.4

H_L = 5000 + 1180 = 6180'

Qpeak = 23.0cfs

Channel Slopes Lower = 7.7% } USE Smax = 8%
Upper = 7.9% } Smin = 7.5%

D50 = 1.0' Dmax = 1.75' USE TYPE II GRANULAR FILTER

PROJECT : Valley Camp of Utah, Inc. Reclaimed Channel RC-1; 100 Yr 6 Hr

AREA= 245.2 ACRES
AVERAGE BASIN SLOPE= 37.7 PERCENT
CURVE NUMBER= 67.4
DESIGN STORM= 2.30 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 6180. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .3531 HOURS QPCFS= 525.10 CFS QPIN= 2.1237 INCHES
C3= 10.4679 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.19	.8515	.0000	.0000	.0	.00
2.26	.9717	.0000	.0000	26.3	.00
2.33	1.0919	.0031	.0031	163.1	.08
2.40	1.2121	.0118	.0087	348.6	.74
2.47	1.3323	.0256	.0138	482.0	2.87
2.54	1.3996	.0355	.0099	525.1	7.04
2.61	1.4321	.0407	.0053	491.9	12.38
2.68	1.4646	.0463	.0056	415.2	17.19
2.75	1.4971	.0523	.0059	324.7	20.48
2.83	1.5296	.0585	.0063	239.6	22.22
2.90	1.5620	.0651	.0066	168.9	22.89
2.97	1.5945	.0720	.0069	114.7	23.02
3.04	1.6236	.0784	.0064	75.5	23.00
3.11	1.6496	.0843	.0059	48.5	22.94
3.18	1.6756	.0905	.0061	30.4	22.81
3.25	1.7016	.0968	.0063	18.8	22.62
3.32	1.7276	.1033	.0065	11.4	22.42
3.39	1.7536	.1099	.0067	6.8	22.29
3.46	1.7796	.1168	.0068	4.0	22.27
3.53	1.8019	.1228	.0060	2.3	22.37
3.60	1.8198	.1277	.0049	1.3	22.43
3.67	1.8377	.1327	.0050	.8	22.23
3.74	1.8555	.1378	.0051	.4	21.72
3.81	1.8734	.1430	.0052	.2	21.03
3.88	1.8913	.1482	.0052	.1	20.30
3.96	1.9092	.1535	.0053	.0	19.68

HYDROGRAPH PEAK= 23.02 cfs
TIME TO PEAK= 2.97 Hours
RUNOFF VOLUME= 5.80 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:25 AM
Channel Section: Reclaimed Channel RC-1 Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	23.00	cfs
	Bottom Width:	5.0	feet
	Side Slope1:	3.0	1/m1
	Side Slope2:	3.0	1/m2
	Friction Factor:		
	Assumed D50:	1.00	feet
	Calc n Value:	0.040	
	Used:	0.040	
	Min. Bottom Slope:	0.075	ft/ft
	Max. Bottom Slope:	0.080	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.58	feet
	Qn/1.49(S)1/2=	2.261	
	A(R)2/3=	2.263	
	Required Depth:	1.08	feet
	Area:	3.87	ft2
	Perimeter:	8.64	feet
	Hydraulic Radius:	0.45	feet
	Velocity:	5.95	ft/sec
	Riprap Ck (V<5?):	Required	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.57	feet
	Qn/1.49(S)1/2=	2.189	
	A(R)2/3=	2.192	
	Required Depth:	1.07	feet
	Area:	3.78	ft2
	Perimeter:	8.57	feet
	Hydraulic Radius:	0.44	feet
	Velocity:	6.08	ft/sec
	Riprap Ck (V<5?):	Required	

DESIGN CRITERIA:	Bottom Width:	5.0	feet
	Side Slope 1:	3.0	1/m1
	Side Slope 2:	3.0	1/m2
	Min. Bottom Slope:	7.5	%
	Max. Bottom Slope:	8.0	%
	Min Channel Depth:	1.08	feet
	Riprap (Min S):	Required	
	Riprap (Max S):	Required	

RIPRAP DESIGN - Using the RED BOOK (Applied Hydrology and for Disturbed Areas)

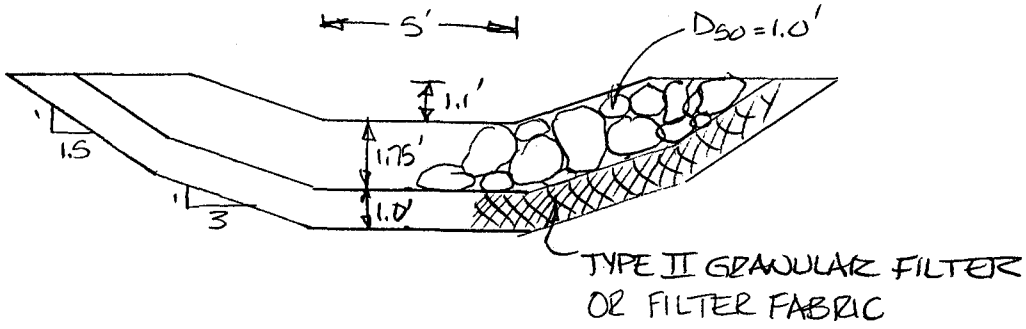
Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:25 AM
Channel Section: Reclaimed Channel RC-1 Computed:DEH

			UNITS
DESIGN CRITERIA:	Design Flow:	23.00	cfs
	Bottom Width:	5.00	feet
	Side Slope1:	3.00	1/m1
	Side Slope2:	3.00	1/m2
	Friction Factor:	0.04	
	Min. Bottom Slope:	0.08	ft/ft
	Max. Bottom Slope:	0.08	ft/ft
	Freeboard:	0.50	feet
	Depth (Min. S):	0.58	feet
	Depth (Max. S):	0.57	feet
	Angle Repose (Ar):	42	degrees

Nb = 21T/(G(SG-1)D)
SFb = (Cos a tan b)/(sin a + Nb tan b)
Tmax= 0.76GdS
Ns = 21Tmax/(G(SG-1)D)
A = Atan(1/m)
B = Atan(Cos(Ar)/(2Sin(A)/NsTan)Ar))+Sin(Ar))
n = Ns(1+Sin(Ar+B)/2)
SFs = Cos(A)Tan(Ar)/(nTan(Ar)+Sin(A)Cos(B))

	Smin	Smax	
D50	1.00	1.00	feet
T	2.69	2.82	lb/ft2
Nb	0.55	0.58	
Tmax	2.05	2.14	lb/ft2
Ns	0.42	0.44	
m Critical	3.00	3.00	
A (m crit)	18.44	18.44	degrees
B	29.55	30.58	degrees
Nsp	0.32	0.34	
SFb	1.58	1.50	
SFs	1.51	1.47	

RC-1 X-SECTION



INLET SECTION

USE SAME AS BELINA EXCEPT

D_{50} = 1.0' ; S = 7.9%

OUTLET SECTION

USE SAME AS BELINA EXCEPT

D_{50} = 1.0' ; S = 7.7% ; MAX OUTLET BOTTOM WIDTH = 10'
FLATTEN SIDE SLOPES TO ZERO AT CHANNEL END

PIPE INLET

DESIGN INLET + OUTLET TO CARRY 100YR-6HR EVENT

INLET D_{50} CAN USE SAME AS CHANNEL

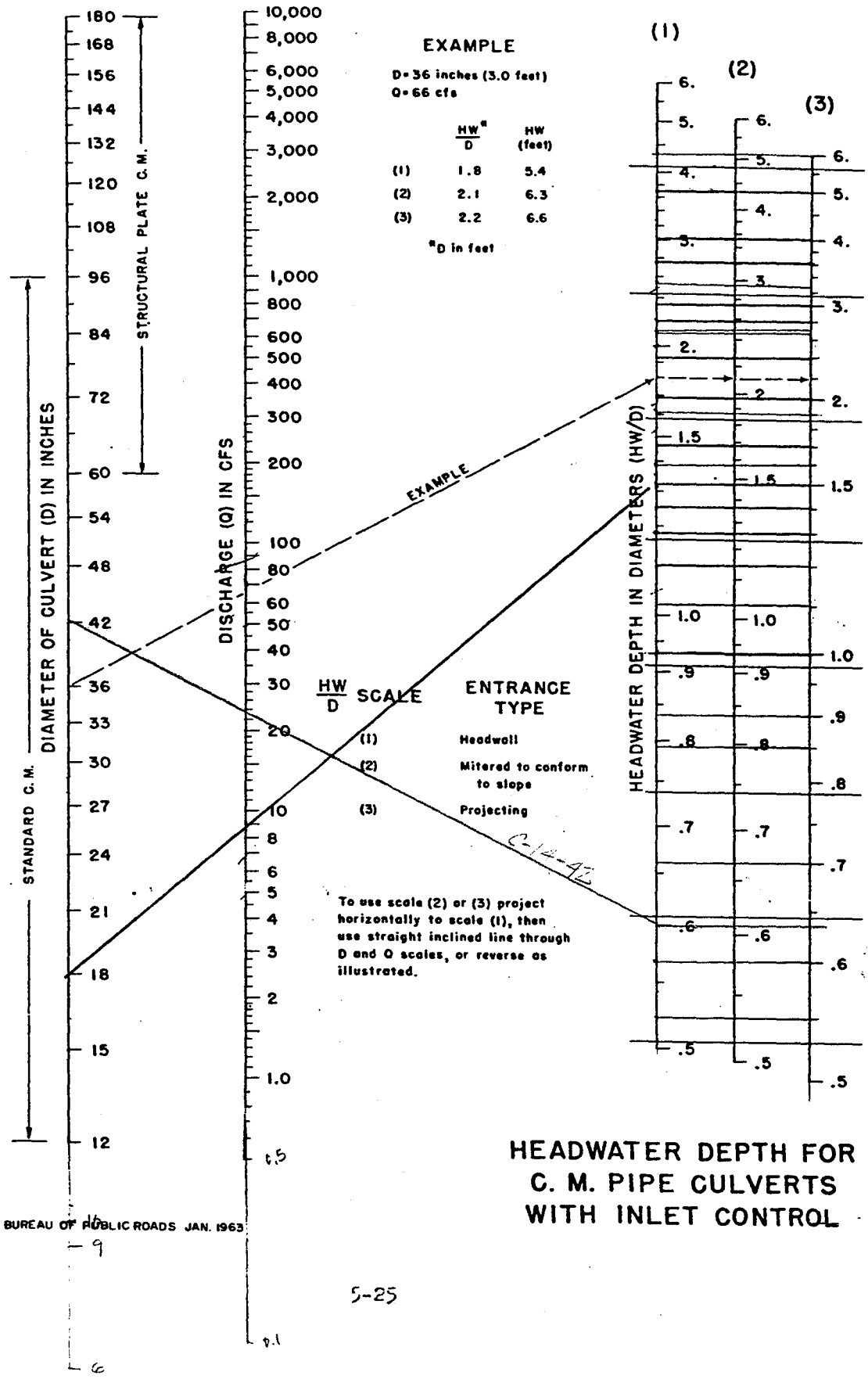
OUTLET D_{50} BASED UPON CULVERT VELOCITY CHARACTERISTICS.

INLET FLOW (CHART 5) SHOWS $^{HW}/_{d}$ = 0.65

42 * 0.65 = 27.3" = 2.3' RAISE RIPRAP TO D = 3.0'

6/12

CHART 5



HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

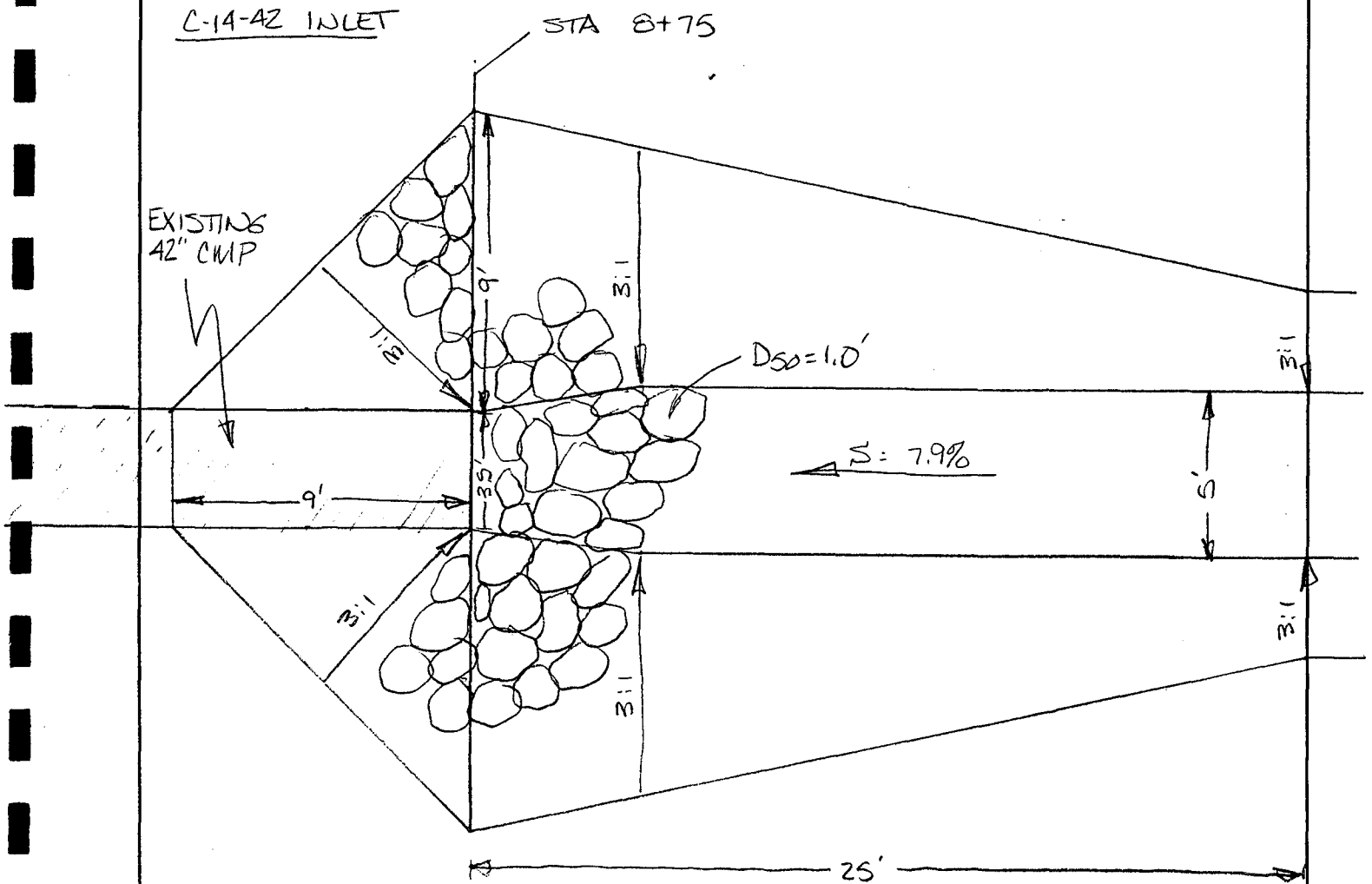
BUREAU OF PUBLIC ROADS JAN. 1963

HANSEN ALLEN & LUCE INC

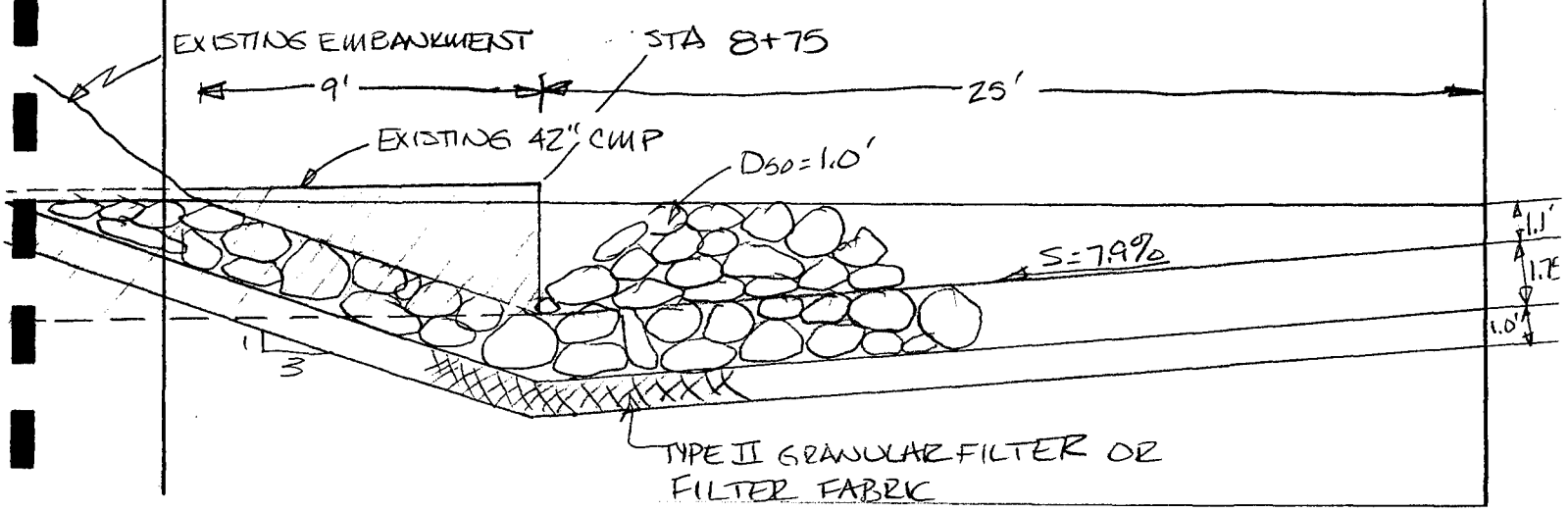
CLIENT: VALLEY CAMP
PROJECT: RECLAMATION
FEATURE:
PROJECT NO.: 007.12.100

SHEET 7 OF 12
COMPUTED: DEH
CHECKED:
DATE: 25 JAN 90

C-14-42 INLET



C-14-42 INLET



C-14-42 OUTLET

DESIGN USING TRAPEZOIDAL CHANNEL DESIGN WITH b = 3.5'

From design, $D_{50} = 1.25'$; Carry 15' downstream as channel width increases, then return D_{50} to 1.0'. Also take channel depth from normal depth + 1.0' @ OUTLET to design depth.

Calc. y_n: $Q = \frac{1.49}{n} AR^{2/3} S^{1/2}$ Assume $S = \frac{10}{120} * 100 = 8.3\%$

$\frac{Qn}{1.49 S^{1/2}} = 1.283$

y	$AR^{2/3}$	
1.0	1.568	A = 1.96
0.9	1.275	→ V = 11.75
0.91	1.303	

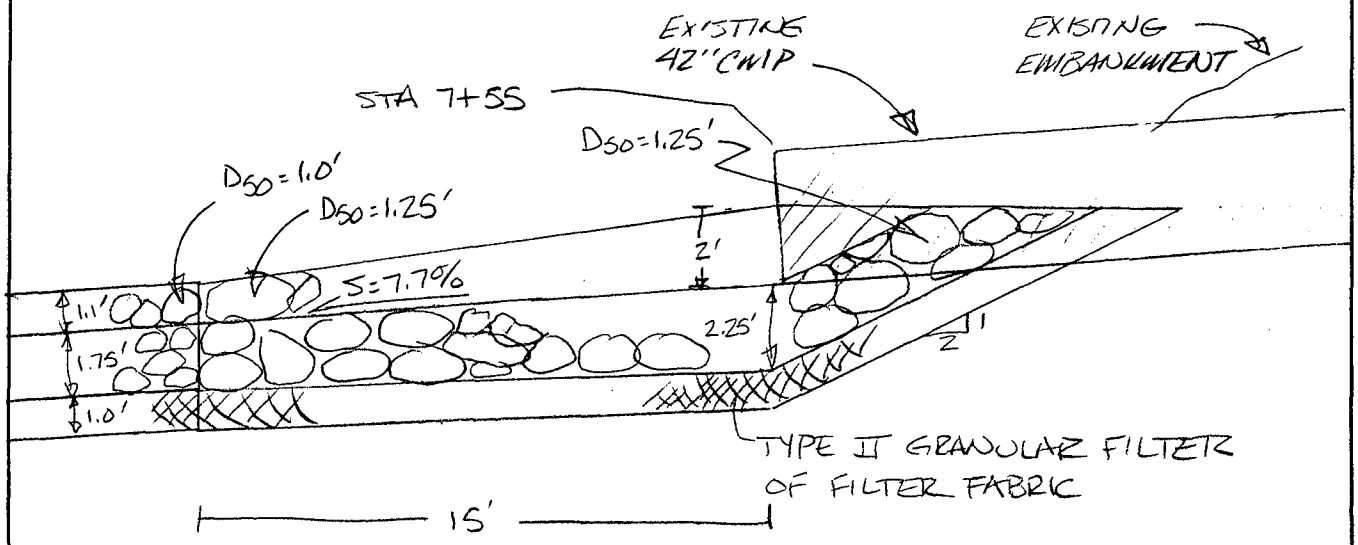
If S = 5% $\frac{Qn}{1.49 S^{1/2}} = 1.657$

y	$AR^{2/3}$
1.1	1.885
1.05	1.724
1.01	1.596
1.02	1.629

Depth didn't change much, Start w/ Riprap depth = 2.0'

$D_{50} = 1.25'$, $D_{max} = 2.25'$
$D_{50} = 1.0'$, $D_{max} = 1.75'$

C-14-42 OUTLET



Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:27 AM
Channel Section: Channel RC-1; C-14-42 Outlet Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	23.00	cfs
	Bottom Width:	3.5	feet
	Side Slope1:	3.0	1/m1
	Side Slope2:	3.0	1/m2
	Friction Factor:		
	Assumed D50:	1.25	feet
	Calc n Value:	0.041	
	Used:	0.041	
	Min. Bottom Slope:	0.077	ft/ft
	Max. Bottom Slope:	0.077	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.68	feet
	Qn/1.49(S)1/2=	2.287	
	A(R)2/3=	2.286	
	Required Depth:	1.18	feet
	Area:	3.73	ft2
	Perimeter:	7.77	feet
	Hydraulic Radius:	0.48	feet
	Velocity:	6.17	ft/sec
	Riprap Ck (V<5?):	Required	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.68	feet
	Qn/1.49(S)1/2=	2.287	
	A(R)2/3=	2.286	
	Required Depth:	1.18	feet
	Area:	3.73	ft2
	Perimeter:	7.77	feet
	Hydraulic Radius:	0.48	feet
	Velocity:	6.17	ft/sec
	Riprap Ck (V<5?):	Required	

DESIGN CRITERIA:	Bottom Width:	3.5	feet
	Side Slope 1:	3.0	1/m1
	Side Slope 2:	3.0	1/m2
	Min. Bottom Slope:	7.7	%
	Max. Bottom Slope:	7.7	%
	Min Channel Depth:	1.18	feet
	Riprap (Min S):	Required	
	Riprap (Max S):	Required	

RIPRAP DESIGN - Using the RED BOOK (Applied Hydrology and for Disturbed Areas)

Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:27 AM
Channel Section: Channel RC-1; C-14-42 Outlet Computed:DEH

			UNITS
DESIGN CRITERIA:	Design Flow:	23.00	cfs
	Bottom Width:	3.50	feet
	Side Slope1:	3.00	1/m1
	Side Slope2:	3.00	1/m2
	Friction Factor:	0.04	
	Min. Bottom Slope:	0.08	ft/ft
	Max. Bottom Slope:	0.08	ft/ft
	Freeboard:	0.50	feet
	Depth (Min. S):	0.68	feet
	Depth (Max. S):	0.68	feet
	Angle Repose (Ar):	42	degrees

Nb = 21T/(G(SG-1)D)
SFb = (Cos a tan b)/(sin a + Nb tan b)
Tmax= 0.76GdS
Ns = 21Tmax/(G(SG-1)D)
A = Atan(1/m)
B = Atan(Cos(Ar)/(2Sin(A)/NsTan)Ar))+Sin(Ar))
n = Ns(1+Sin(Ar+B)/2)
SFs = Cos(A)Tan(Ar)/(nTan(Ar)+Sin(A)Cos(B))

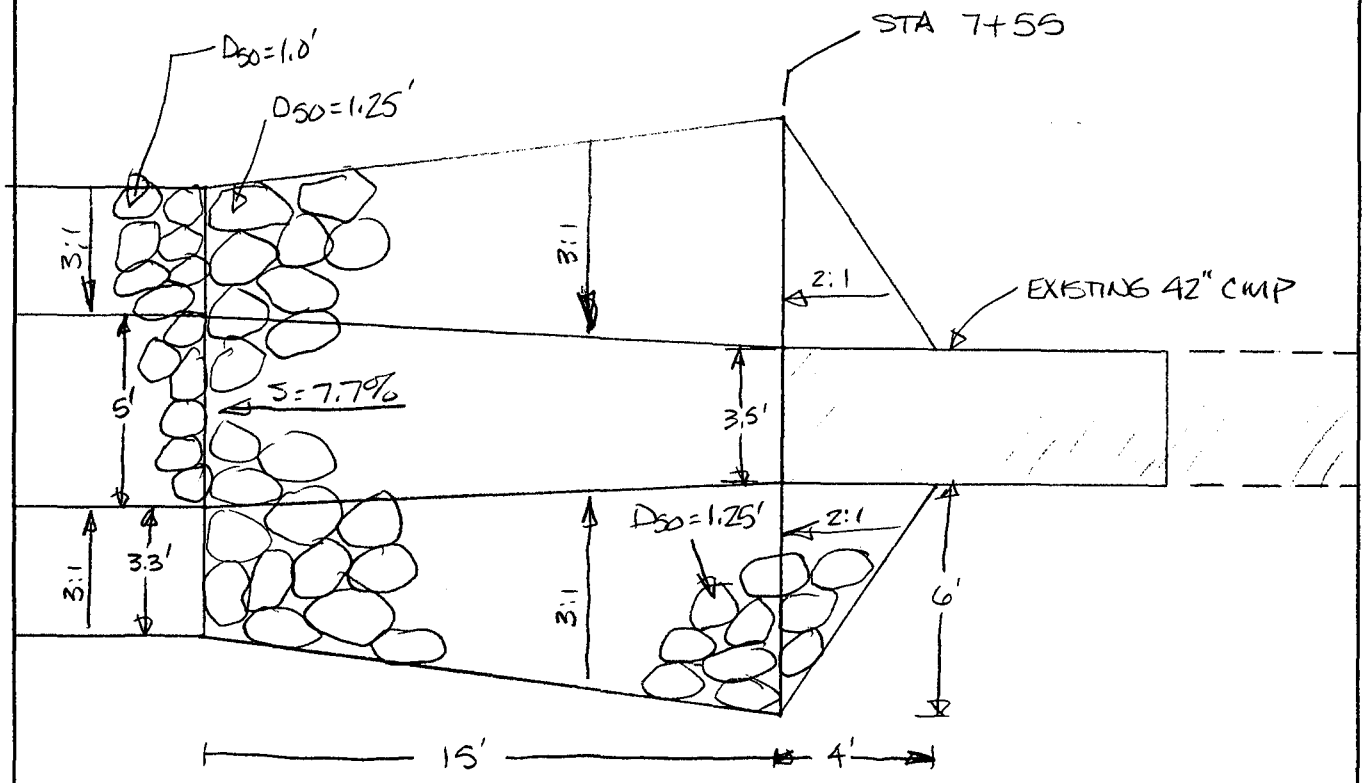
	Smin	Smax	
D50	1.25	1.25	feet
T	3.24	3.24	lb/ft2
Nb	0.53	0.53	
Tmax	2.46	2.46	lb/ft2
Ns	0.40	0.40	
m Critical	3.00	3.00	
A (m crit)	18.44	18.44	degrees
B	28.67	28.67	degrees
Nsp	0.31	0.31	
SFb	1.62	1.62	
SFs	1.53	1.53	

HANSEN ALLEN & LUCE inc

CLIENT VALLEY CAMP
PROJECT RECLAMATION
FEATURE
PROJECT NO. 007.12.100

SHEET 11 OF 12
COMPUTED DEH
CHECKED
DATE 25 JAN 90

C-14-A2 OUTLET

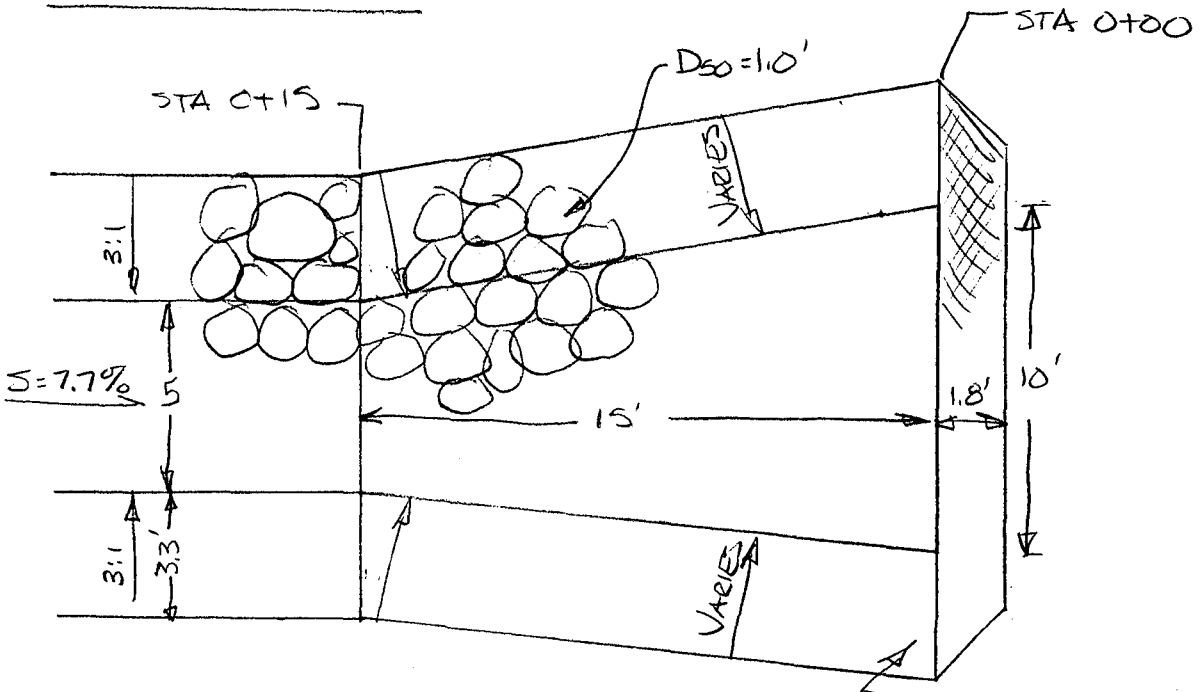


HANSEN ALLEN & LUCE INC

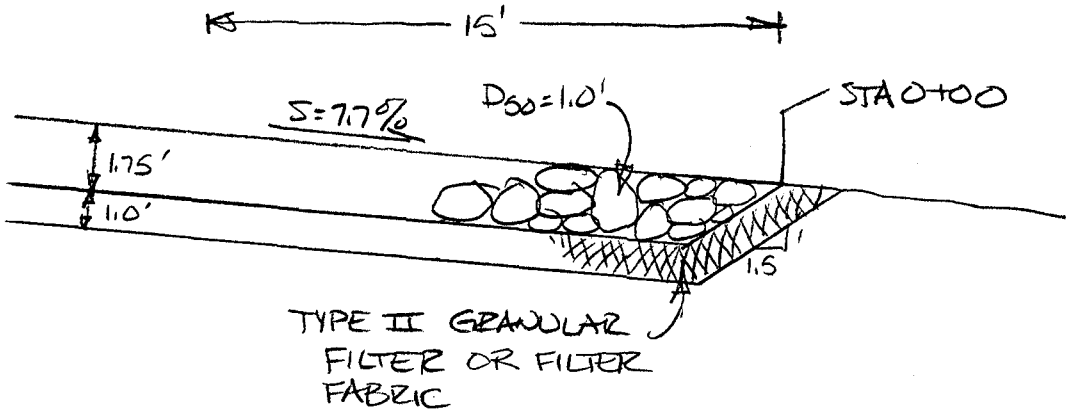
CLIENT VALLEY CAMP
PROJECT RECLAMATION
FEATURE
PROJECT NO. 007.12.100

SHEET 12 OF 12
COMPUTED DEH
CHECKED
DATE 25 JAN 90

VALCAN RC-1 OUTLET



SIDE SLOPES LAID BACK TO MATCH LOCAL CONDITIONS - SIDE SLOPE VARIES BETWEEN STA 0+00 AND STA 0+15



TYPE II GRANULAR FILTER OR FILTER FABRIC

C-19-48, C-20-48

Re-evaluate 100-yr runoff design for reclamation using full culvert capacity combined with overtopping flow under non eroding conditions.

From Calculations presented in "Hydrologic Calculations" Appendix

Area = 1485 ac
CN = 72.6
H_L = 16,600 ft
S = 39.3%

Precipitation = 2.25 in (100 yr, 6 hr)

from "Hydro": Q = 210 cfs

Culvert Inlet Capacities

Culvert No.	HW depth	Dia. (in)	HW/D	Q Capacity	Overflow Q Needed
C-19-48	8.5'	48	2.13	130 cfs	80 cfs
C-20-48	9.0	48	2.25	140 cfs	70 cfs

Check Pipe Flow Capacities

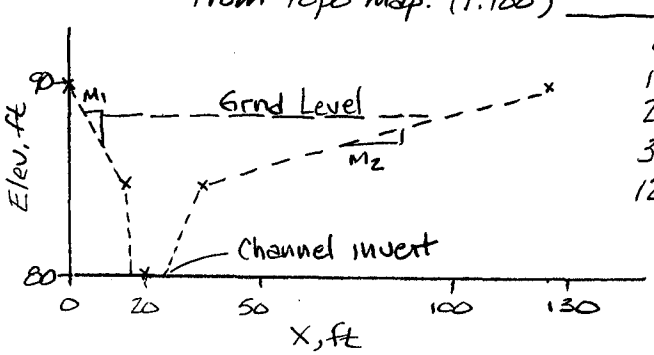
Culvert No.	Pipe Length	η	Dia (in)	Slope Max Hyd.	Q Capacity	Q Required	
C-19-48	60	0.024	48	0.11	258 cfs	210	✓
C-20-48	20	0.024	48	0.24	381 cfs	210	✓

Approximate overflow Conditions at each Culvert

C-19-48

From Topo Map: (1:100)

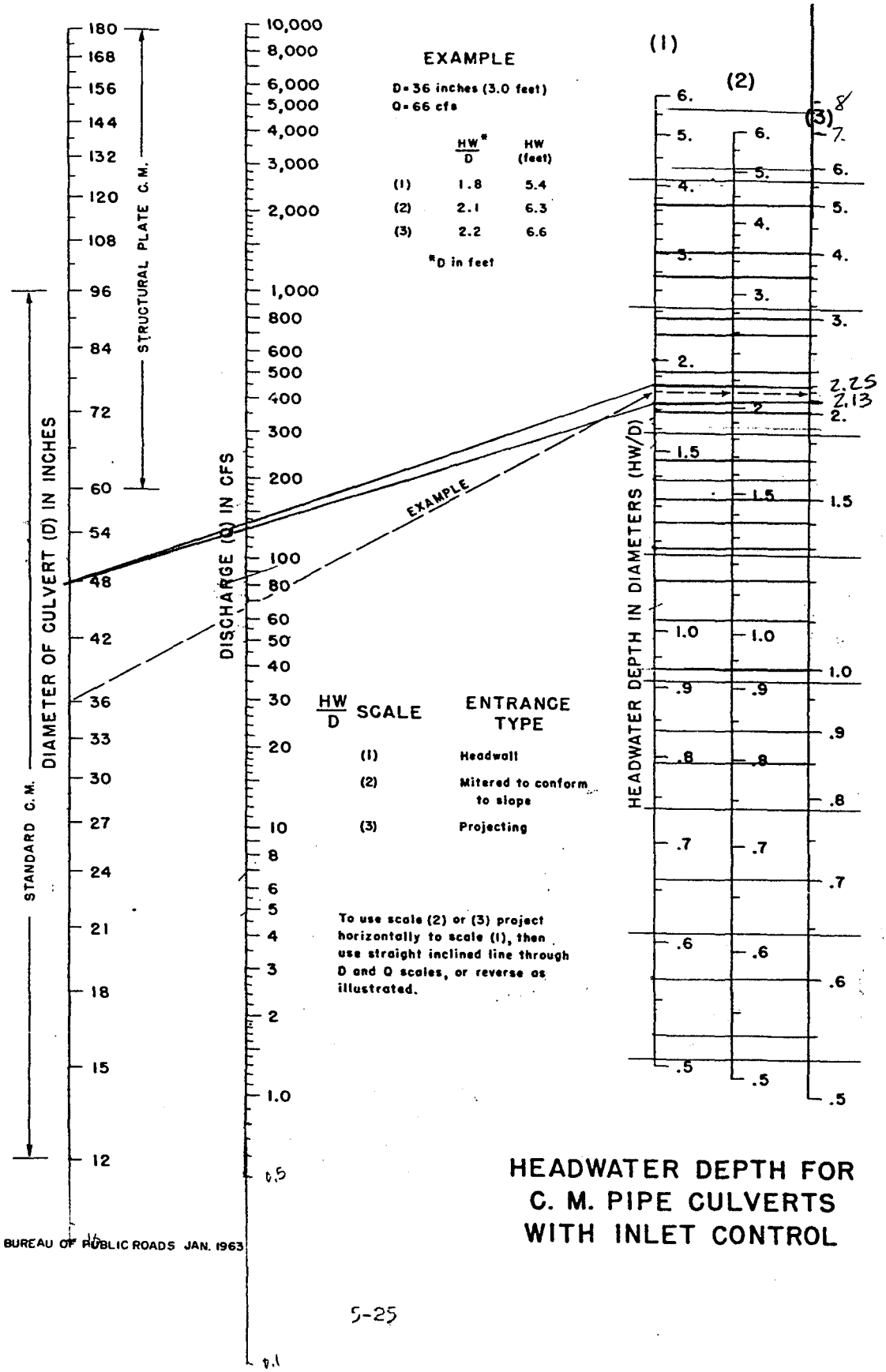
X	Elev
0	90
15	85
20	80
35	85
125	90



$M_1 = 0.5$
$M_2 = 2.5$

Overflow Configuration: b = 90', M_1 = 0.5; M_2 = 2.5, Q = 80 cfs, η = 0.075
η value from "Open Channel Flow" by Henderson, 1966 S = 0.05

CHART 5



HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

TRAPEZOIDAL Channel Flow Calculations using Mannings Equation

Client : Valley Camp of Utah Inc.
Project No. : 007.14.100
Channel Section: C-19-48 Overflow

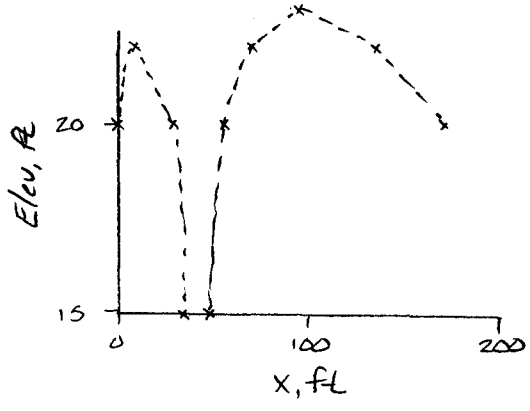
Date : 31-Mar-93
Time : 11:54 AM
Computed: DEH

				UNITS
GENERAL CRITERIA:	Design Flow	:	80.00	cfs
	Bottom Width	:	90.0	feet
	Side Slope1	:	0.5	1/m1
	Side Slope2	:	2.5	1/m2
	Friction Factor	:		
	Assumed D50	:	1.00	feet
	Calc n Value	:	0.040	
	Used	:	0.075	
	Min. Bottom Slope	:	0.050	ft/ft
	Max. Bottom Slope	:	0.050	ft/ft
	Freeboard	:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):		0.38	feet
	Q-1.49AR(2/3)S(1/2)/n =		0.000	Accuracy
	Required Depth	:	0.88	feet
	Area	:	34.50	ft2
	Perimeter	:	91.45	feet
	Hydraulic Radius	:	0.38	feet
	Velocity	:	2.32	ft/sec
	Riprap Ck (V(5?)	:	Not Needed	

According to hydraulic calculations, velocity of overflow water is 2.3 fps which is well within limits for non erosion under soil and vegetation conditions. Roadway is Asphalted.

∴ ALLOW CULVERT TO OVERTOP FOR 100 YR DESIGN FLOW.

C-20-48 from 1:100 Topo Map at tail end of culvert



X	ELEV
0	20
10	22
30	20
35	15
50	15
55	20
70	22
95	23
135	22
170	20

Conservatively, if flow were confined to area between x=10' and x=95', velocity would be a maximum

for Broad Crested Weir $q = \frac{2}{3} H \sqrt{\frac{2}{3} g H}$

$\Delta X = 95 - 10 = 85'$ $\quad q = 70\,cfs / 85\,ft = 0.82\,ft^2/s$

$$0.82 \frac{ft^2}{s}\left(\frac{3}{2}\right) = \sqrt{\frac{2}{3} g H^3} \qquad 0.27 = \sqrt{H^3}$$

$$0.07 = H^3$$

$$H = (0.07)^{1/3} = 0.41\,ft$$

Avg. Velocity $= V = \frac{Q}{A} = \frac{70\,cfs}{0.41(85)} = 1.99\,fps$ which is well below acceptable velocities to control erosion with vegetation and soils characteristic of the site.

In reality, velocities will be less as water spreads out from 85' assumed minimum width.

SUMMARY

Design for passage of 100 Year Event includes overtopping of both culverts. Velocities are low enough to not require additional erosion protection.

Eccles Canyon Area

HANSEN ALLEN & LUCE inc

CLIENT VALLEY CAMP
PROJECT RECLAMATION
FEATURE CULVERT C-21-48
PROJECT NO. 007.12.100

SHEET 1 OF 2
COMPUTED DEH
CHECKED
DATE 26 SEPT 90

PRELIMINARY CHANNEL DESIGN FOR CHANNEL AT C-21-48

IF CULVERT IS TO BE REMOVED (AT UDOT'S REQUEST) FULL DESIGN SHOULD BE COMPLETED. THESE CALCULATIONS SHOW FEASIBILITY.

APPROXIMATE DATA: Channel Slope: 5/120 = 0.042 (4.2%)
Channel Width: 10'
Channel Side Slope: m = 2

from Culvert design Sheets, $Q_{100yr,6Hr} = 330$ cfs. (100yr, 6Hr)

Assume: D_{50} Req'd = 1.0', then $n = 0.0395\, D^{1/6} \sim 0.04$

$\frac{Qn}{1.49 S^{1/2}} = 43.34$

y	$AR^{2/3}$	
1.0	10.59	
2.0	36.33	
3.0	77.46	A = 31.68
2.2	43.28 ⇒	V = 10.42 fps

from Chart 27, "Flexible Linings $D_{50} \sim 1.25 - 1.50'$

Recalculate using corrected "n" value

$n = 0.0395\,(1.5)^{1/6} = 0.042$

$\frac{Qn}{1.49 S^{1/2}} = 45.51$

y	$AR^{2/3}$	
2.3	46.99	
2.2	43.28	A = 32.63
2.25	45.16 ⇒	V = 10.12 fps

DOESN'T CHANGE: $\underline{D_{50} = 1.50'}$ $D_{max} = \frac{5 D_{50}}{\gamma' S_0} = 2.9 \Rightarrow \underline{3.0'}$

FILTER BLANKET $\frac{D_{15}\,filter}{D_{85}\,base} < 5 < \frac{D_{15}\,filter}{D_{15}\,base} < 40$

filter Criteria, OR COULD USE 1.0' TYPE II GRANULAR FILTER AS PER OSM STDS, SEE OTHER RECLAMATION CALC'S FOR DETAILS ON TYPE II SPECS.

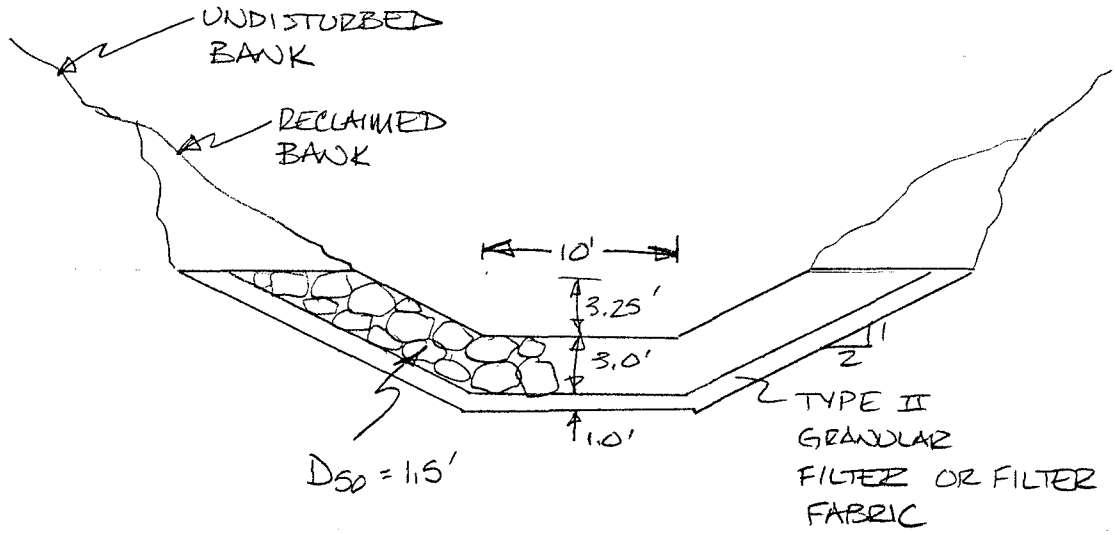
GENERAL: Riprap Thickness = 3.0'; Filter Thickness = 1.0'
Side Slope: 2:1; Channel depth = 2.25 + 1.0 = 3.25'

HANSEN ALLEN & LUCE inc

CLIENT VALLEY CAMP
PROJECT RECLAMATION
FEATURE
PROJECT NO. 007.12.100

SHEET 2 OF 2
COMPUTED DEH
CHECKED
DATE 26 SEPT 90

TYPICAL SECTION



NOTES:
- SIDES TO MATCH EXISTING EMBANKMENTS
- MEANDER CHANNEL TO MATCH NATURAL STREAM
- SHORT BENDS WILL REQUIRE CHECK OF DEPTH TO ACCOUNT FOR WAVE RUNUP.

Coal Haul Road Area

HANSEN ALLEN & LUCE inc

CLIENT VALLEY CAMP
PROJECT RECLAMATION
FEATURE CULVERT C-21-48
PROJECT NO. 007.12.100

SHEET 1 OF 2
COMPUTED DEH
CHECKED
DATE 26 SEPT 90

PRELIMINARY CHANNEL DESIGN FOR CHANNEL AT C-21-48

IF CULVERT IS TO BE REMOVED (AT UDOT'S REQUEST) FULL DESIGN SHOULD BE COMPLETED. THESE CALCULATIONS SHOW FEASIBILITY.

APPROXIMATE DATA: Channel Slope: 5/120 = 0.042 (4.2%)
Channel Width: 10'
Channel Side Slope: m = 2

from Culvert design Sheets, $Q_{100yr,6Hr} = 330$ cfs. (100yr, 6Hr)

Assume: D_{50} Req'd = 1.0', then $n = 0.0395\, D^{1/6} \sim 0.04$

$\frac{Qn}{1.49 S^{1/2}} = 43.34$

y	$AR^{2/3}$	
1.0	10.59	
2.0	36.33	
3.0	77.46	A = 31.68
2.2	43.28 ⇒	V = 10.42 fps

from Chart 27, "Flexible Linings $D_{50} \sim 1.25 - 1.50'$

Recalculate using corrected "n" value

$n = 0.0395\,(1.5)^{1/6} = 0.042$

$\frac{Qn}{1.49 S^{1/2}} = 45.51$

y	$AR^{2/3}$	
2.3	46.99	
2.2	43.28	A = 32.63
2.25	45.16 ⇒	V = 10.12 fps

DOESN'T CHANGE: $\underline{D_{50} = 1.50'}$ $D_{max} = \frac{S D_{50}}{\gamma S_0} = 2.9 \Rightarrow \underline{3.0'}$

FILTER BLANKET $\frac{D_{15}\,filter}{D_{85}\,base} < 5 < \frac{D_{15}\,filter}{D_{15}\,base} < 40$

filter Criteria, OR COULD USE 1.0' TYPE II GRANULAR FILTER AS PER OSM STDS, SEE OTHER RECLAMATION CALC'S FOR DETAILS ON TYPE II SPECS.

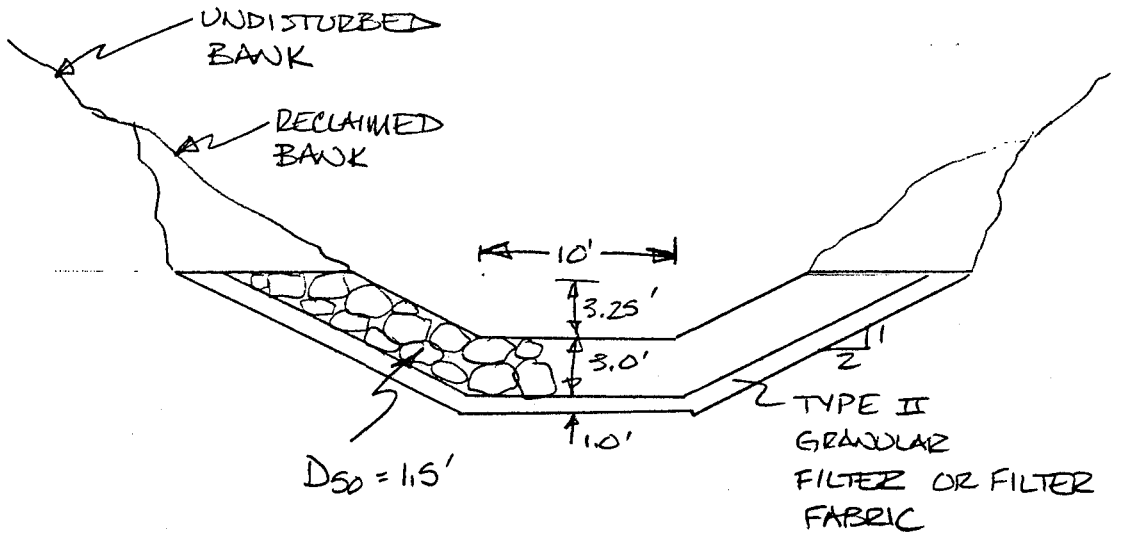
GENERAL: Riprap Thickness = 3.0'; Filter Thickness = 1.0'
Side Slope: 2:1; Channel depth = 2.25 + 1.0 = 3.25'

HANSEN ALLEN & LUCE inc

CLIENT VALLEY CAMP
PROJECT RECLAMATION
FEATURE
PROJECT NO. 007.12.100

SHEET 2 OF 2
COMPUTED DEH
CHECKED
DATE 26 SEPT 90

TYPICAL SECTION



NOTES:
- SIDES TO MATCH EXISTING EMBANKMENTS
- MEANDER CHANNEL TO MATCH NATURAL STREAM
- SHORT BENDS WILL REQUIRE CHECK OF DEPTH TO ACCOUNT FOR WAVE RUNUP.

HANSEN ALLEN & LUCE inc

CLIENT: VALLEY CAMP
PROJECT: RECLAMATION
FEATURE:
PROJECT NO.: 007.12.100

SHEET 1 OF 8
COMPUTED: DEH
CHECKED:
DATE: 6 FEB 90

CHECK FOR CHANNEL DESIGN ON HAUL ROAD @ BOWL (C-25-36) RC-4

Find Slope: $\Delta H = 8595 - 8475 = 120'$
$\Delta X = 380'$

$$\frac{120}{380} * 100 = 31.6\%$$

USE DATA FROM CULVERT C-25-36 TO CALC. 100 YR-6HR EVENT

$A = 151\,ac - 11\,ac = 140\,ac$
$S = 39.5\%$
$CN = 72.7$
$P = 2.3\,in$
$D = 6\,HR$
$H_L = 5000'$

11 acres now travels along road, when reclaimed it will not enter drainage
$Q_{100\,YR-6HR} = 34.1\,cfs$

Check Trapezoidal Channel design Possibilities

Calculations show that a $b = 10'$, $D_{50} = 1.75'$ gives $SF_b = 0.84$ which is unacceptable

In conversations with Rick Summers at DOGM, it was agreed that the solution did not appear reasonable - (Using Redbook) (See Sheets 4 + 5)
We decided to change methodology, and use the OSM Steep Channel Riprap Design Criteria. Because of the unproven nature of this design, Hansen, Allen & Luce and any successors will not warrant the stability of this design. It is recommended that a review and check of alternate designs be completed prior to reclamation at which time new technologies might be available.

From Figure 5.4 (Sheet 6)

$D_{50} = 1.3'$ USE 1.5'

$d = 0.1'$ USE CHANNEL DEPTH OF 1.0'

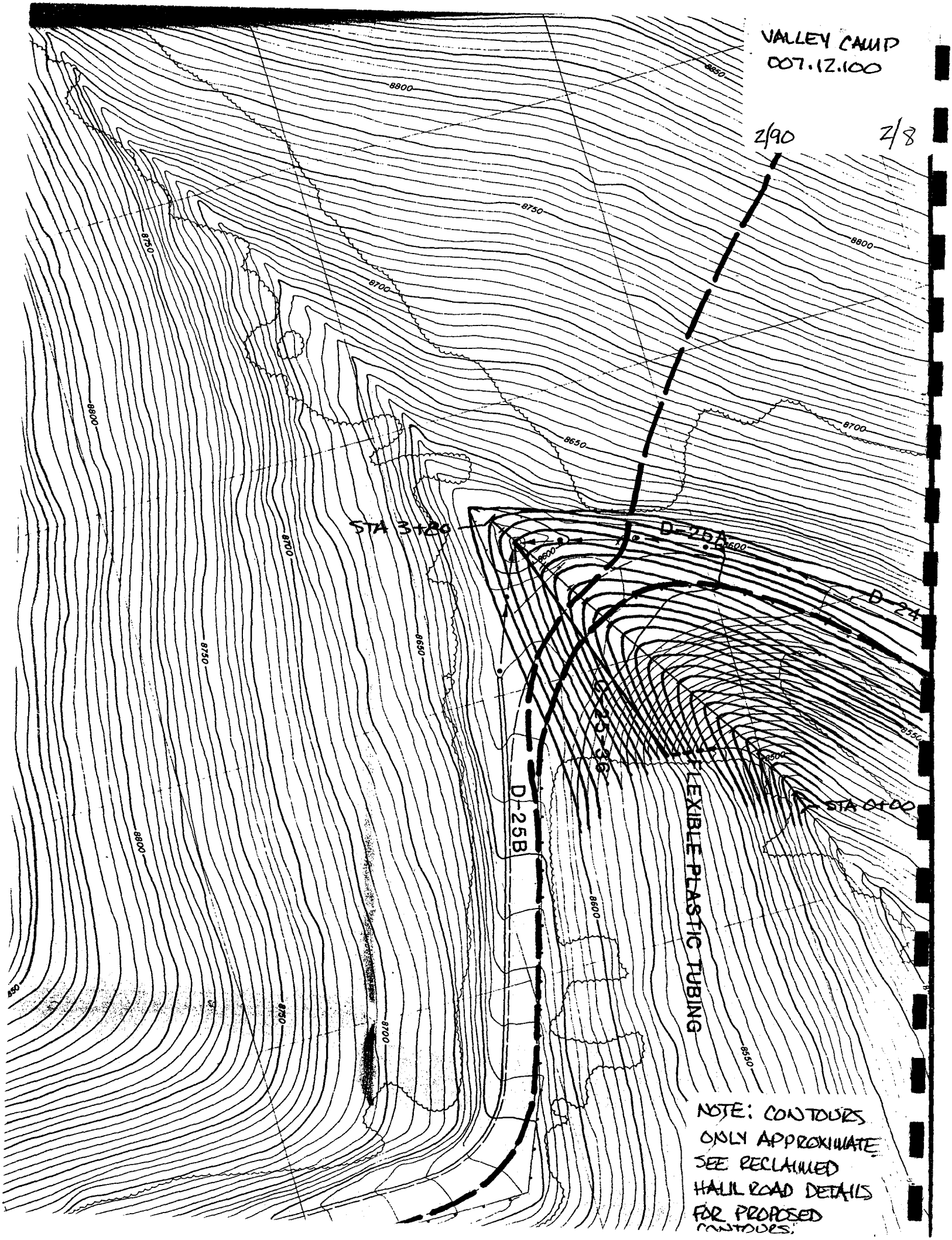
RIPRAP FILTER "TYPE II - 1.0' THICK" or Filter Fabric

$D_{max} = 1.25 D_{50} = 1.88'$ USE 2.0'

$$\frac{D_{50}}{D_{10-20}} = 2\text{-}3 \qquad D_{10-20} = \frac{D_{50}}{2\text{-}3} \qquad D_{10-20} = 0.75 - 0.50'$$

VALLEY CAMP
007.12.100

2/90 2/8



NOTE: CONTOURS ONLY APPROXIMATE SEE RECLAIMED HAUL ROAD DETAILS FOR PROPOSED CONTOURS.

RIPRAP DESIGN - Using the RED BOOK (Applied Hydrology and for Disturbed Areas)

Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:22 AM
Channel Section: Reclaimed Culvert C-25-36 Computed:DEH

			UNITS
DESIGN CRITERIA:	Design Flow:	34.10	cfs
	Bottom Width:	10.00	feet
	Side Slope1:	3.00	1/m1
	Side Slope2:	3.00	1/m2
	Friction Factor:	0.04	
	Min. Bottom Slope:	0.32	ft/ft
	Max. Bottom Slope:	0.32	ft/ft
	Freeboard:	0.50	feet
	Depth (Min. S):	0.35	feet
	Depth (Max. S):	0.35	feet
	Angle Repose (Ar):	42	degrees

Nb = 21T/(G(SG-1)D)
SFb = (Cos a tan b)/(sin a + Nb tan b)
Tmax= 0.76GdS
Ns = 21Tmax/(G(SG-1)D)
A = Atan(1/m)
B = Atan(Cos(Ar)/(2Sin(A)/NsTan)Ar))+Sin(Ar))
n = Ns(1+Sin(Ar+B)/2)
SFs = Cos(A)Tan(Ar)/(nTan(Ar)+Sin(A)Cos(B))

	Smin	Smax	
D50	1.75	5.00	feet
T	6.80	6.80	lb/ft2
Nb	0.79	0.28	
Tmax	5.17	5.17	lb/ft2
Ns	0.60	0.21	
m Critical	3.00	3.00	
A (m crit)	18.44	18.44	degrees
B	33.02	14.71	degrees
Nsp	0.53	0.16	
SFb	0.84	1.53	
SFs	1.15	1.89	

UNREASONABLE SIZE

TOO LOW!

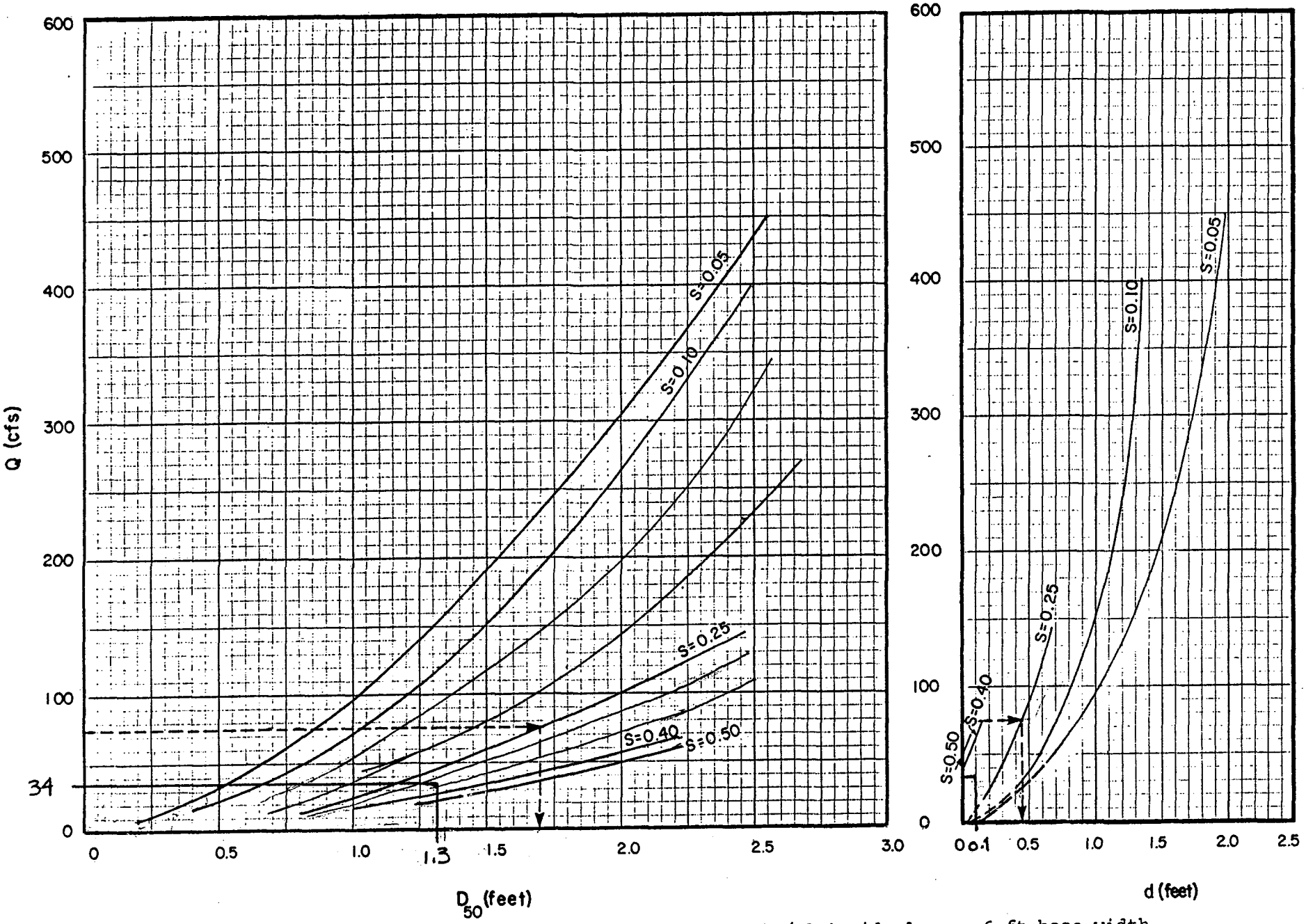


Figure 5.4. Steep slope riprap design, trapezoidal channels, 2:1 sideslopes, 6 ft base width.

PROJECT : Valley Camp of Utah, Inc. Reclaimed Channel Replacing C-25-36

AREA= 140.0 ACRES
AVERAGE BASIN SLOPE= 39.5 PERCENT
CURVE NUMBER= 72.7
DESIGN STORM= 2.30 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 5000. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .2523 HOURS QPCFS= 419.66 CFS QPIN= 2.9727 INCHES
C3= 14.6524 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.12	.7319	.0000	.0000	.0	.00
2.17	.8178	.0012	.0012	21.1	.02
2.22	.9037	.0060	.0048	130.4	.28
2.27	.9895	.0142	.0083	278.6	1.12
2.32	1.0754	.0258	.0116	385.2	3.11
2.37	1.1613	.0404	.0146	419.7	6.46
2.42	1.2472	.0579	.0175	393.1	11.15
2.47	1.3331	.0781	.0202	331.8	16.98
2.52	1.3905	.0931	.0150	259.5	23.45
2.57	1.4137	.0994	.0064	191.5	29.34
2.62	1.4369	.1059	.0065	135.0	33.06
2.67	1.4602	.1126	.0067	91.7	34.06
2.72	1.4834	.1195	.0069	60.4	32.94
2.78	1.5066	.1266	.0070	38.7	30.67
2.83	1.5298	.1338	.0072	24.3	28.10
2.88	1.5530	.1411	.0074	15.0	25.79
2.93	1.5762	.1487	.0075	9.1	23.98
2.98	1.5994	.1563	.0077	5.4	22.71
3.03	1.6201	.1633	.0070	3.2	21.91
3.08	1.6387	.1697	.0064	1.9	21.38
3.13	1.6572	.1762	.0065	1.1	20.92
3.18	1.6758	.1827	.0066	.6	20.44
3.23	1.6944	.1894	.0067	.3	19.97
3.28	1.7129	.1962	.0068	.2	19.56
3.33	1.7315	.2030	.0068	.1	19.26
3.38	1.7501	.2099	.0069	.0	19.07

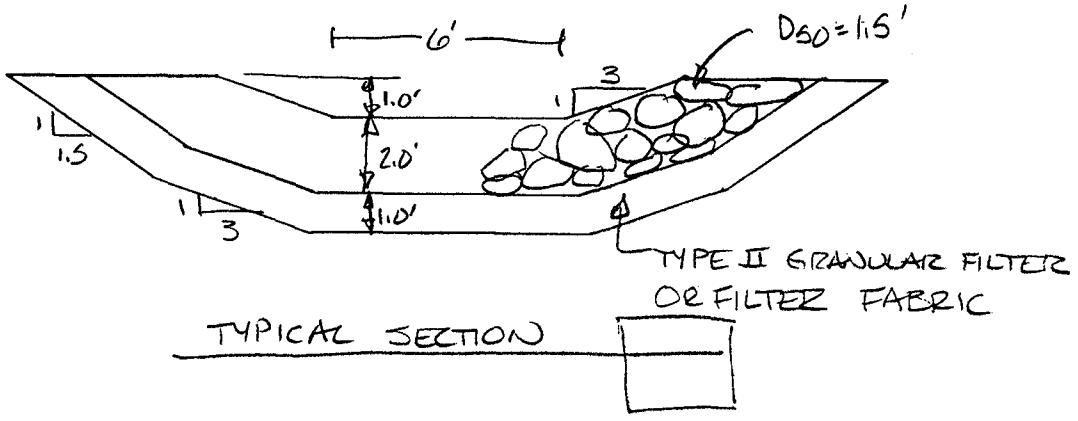
HYDROGRAPH PEAK= 34.06 cfs
TIME TO PEAK= 2.67 Hours
RUNOFF VOLUME= 5.23 Acre-Feet

Trapezoidal Channel Flow Calculations using Mannings Equation

Client: Valley Camp of Utah, Inc. Date: 26-Feb-90
Project No.: 007.12.100 Time: 09:22 AM
Channel Section: Reclaimed Culvert C-25-36 Computed: DEH

			UNITS
GENERAL CRITERIA:	Design Flow:	34.10	cfs
	Bottom Width:	10.0	feet
	Side Slope1:	3.0	1/m1
	Side Slope2:	3.0	1/m2
	Friction Factor:		
	Assumed D50:	1.75	feet
	Calc n Value:	0.043	
	Used:	0.043	
	Min. Bottom Slope:	0.316	ft/ft
	Max. Bottom Slope:	0.316	ft/ft
	Freeboard:	0.50	feet
CALCULATION: (Channel Depth)	Depth (Min. S):	0.35	feet
	Qn/1.49(S)1/2=	1.755	
	A(R)2/3=	1.753	
	Required Depth:	0.85	feet
	Area:	3.81	ft2
	Perimeter:	12.18	feet
	Hydraulic Radius:	0.31	feet
	Velocity:	8.96	ft/sec
	Riprap Ck (V<5?):	Required	
CALCULATION: (Velocity Check)	Depth (Max. S):	0.35	feet
	Qn/1.49(S)1/2=	1.755	
	A(R)2/3=	1.753	
	Required Depth:	0.85	feet
	Area:	3.81	ft2
	Perimeter:	12.18	feet
	Hydraulic Radius:	0.31	feet
	Velocity:	8.96	ft/sec
	Riprap Ck (V<5?):	Required	

DESIGN CRITERIA:	Bottom Width:	10.0	feet
	Side Slope 1:	3.0	1/m1
	Side Slope 2:	3.0	1/m2
	Min. Bottom Slope:	31.6	%
	Max. Bottom Slope:	31.6	%
	Min Channel Depth:	0.85	feet
	Riprap (Min S):	Required	
	Riprap (Max S):	Required	



TYPICAL SECTION

RIPRAP GRADATION (FROM FIGURES 1 - EXTRAPOLATED) PG 8

% PASSING BY WEIGHT	D_{50} (in)
70-100	24
50-70	20
35-50	18
2-10	5

USE INLET AND OUTLET DETAILS ALREADY DEVELOPED FOR OTHER CHANNELS.

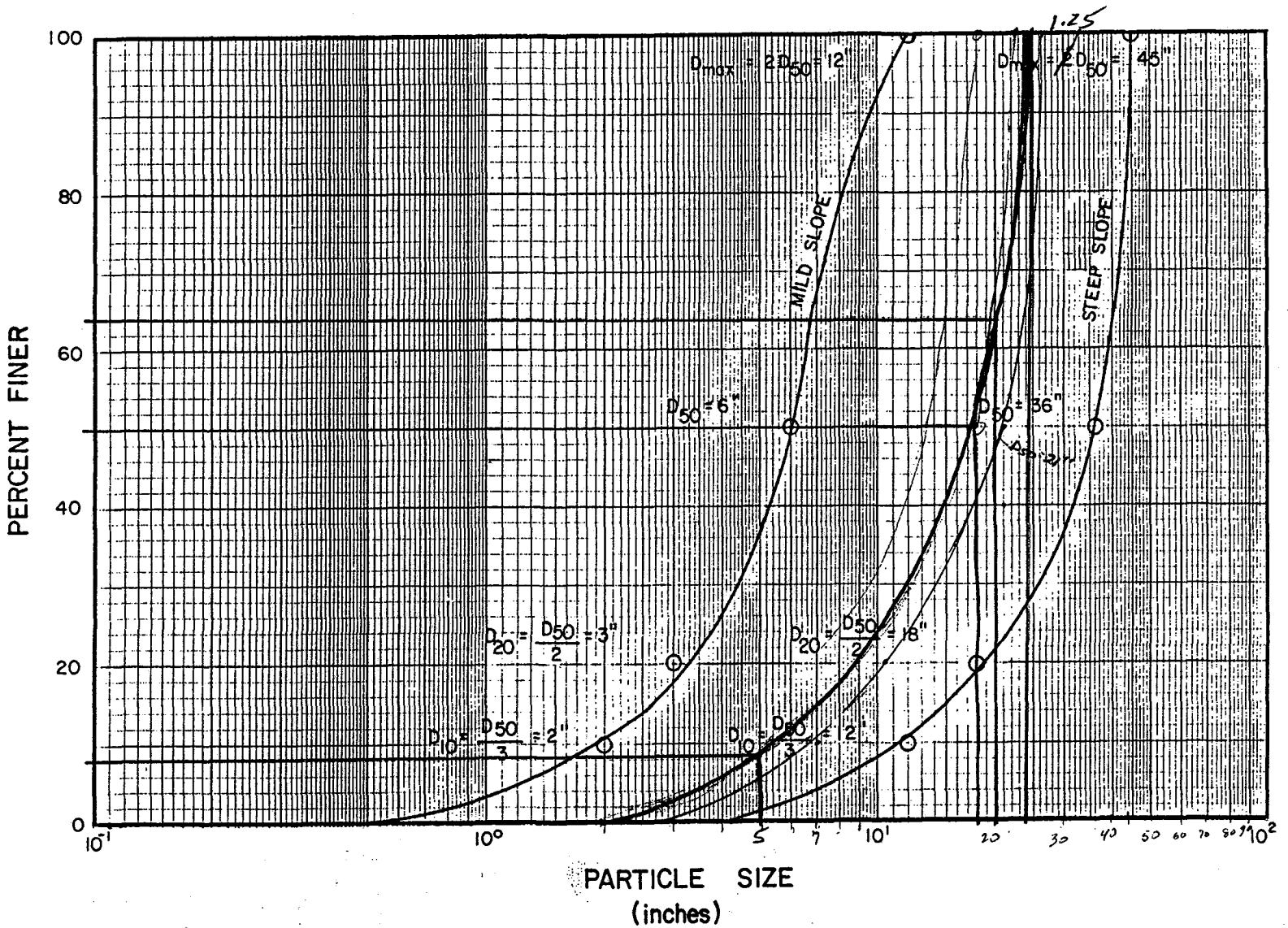


Figure 5.1. Definition sketch illustrating steep and mild slope riprap gradation based on recommended guidelines.

8/8

REVIEW OF RECLAMATION POTENTIALS AT CULVERTS ALONG HAUL ROAD.

Culverts Reviewed herein include: C-22-24
C-23-24
C-24-24
C-26-24
C-26A-24
C-28-24

(C-25-36 designed independently)

C-22-24

Culvert utilized to remove collected road drainage. Upon reclamation, all flow will be overland in the area. No surface channelization will be planned as part of the reclamation, therefore no additional design is required.

C-23-24

Same conditions apply at this culvert as were found at C-22-24.

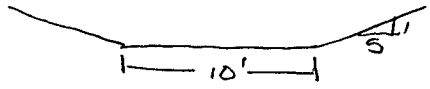
C-24-24

Upon reclamation the majority of area will experience overland flow. At this site however, some concentration of flow may exist.

Check 100yr-6hr flow potential

$Q_{100yr,6hr} = 1.2 cfs$

Simulate potential for erosion by using a 10' wide trapezoidal channel with 5:1 sideslopes.

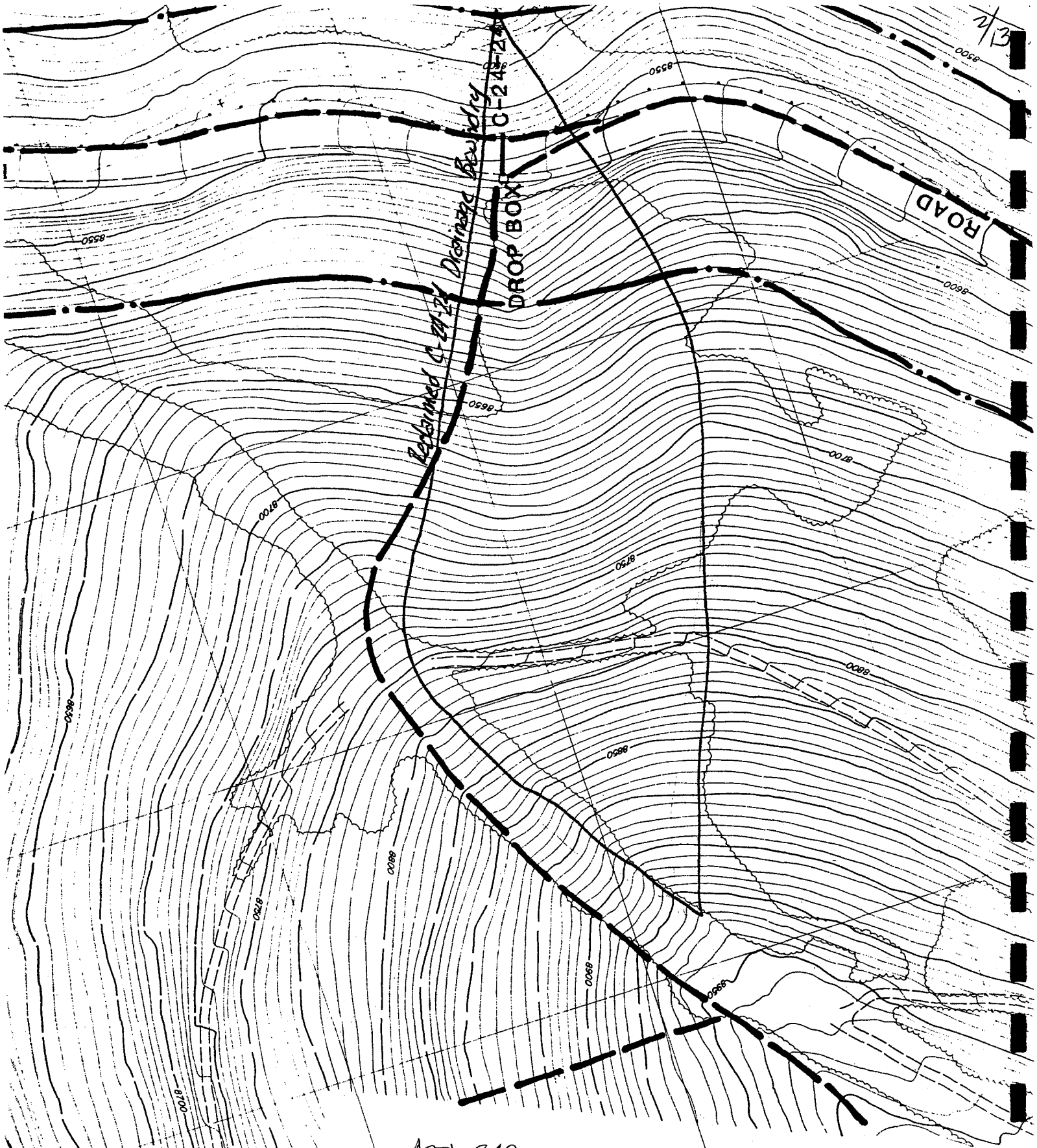


$n = 0.03$
$S = 0.54$

$$\frac{Qn}{1.49 S^{1/2}} = 0.033 \;,\; y \approx 0.03 \;,\; V = 3.9 fps < 5.0$$

For long term conditions, erosion will occur as a natural occurance. The design of specific erosion protection measures on this steep slope is impractical, nor do acceptable design methodologies exist.

Concrete is unacceptable due to 1) its relatively short life period and aesthetics, and 2) it would require



AREA = 2.48ac

SLOPE: CONT LENGTH = 2980'; CONT INT = 25'

$$\frac{2980' * 25' * 100}{2.48ac * 43560 ft^2/ac} = 69.0\%$$

HYD. LENGTH = 750'

CN = 75

PROJECT : Valley Camp Coal - Reclaimed C-24-24 - 100 Yr, 6 Hr Runoff

AREA= 2.5 ACRES
AVERAGE BASIN SLOPE= 69.0 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 750. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0392 HOURS QPCFS= 47.83 CFS QPIN=19.1268 INCHES
C3= 94.2759 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.08	.6476	.0000	.0000	.0	.00
2.09	.6693	.0000	.0000	9.7	.00
2.10	.6911	.0002	.0002	36.6	.00
2.12	.7129	.0006	.0005	47.8	.01
2.13	.7346	.0014	.0007	40.4	.03
2.14	.7564	.0024	.0010	26.9	.07
2.16	.7782	.0036	.0013	15.4	.11
2.17	.7999	.0051	.0015	7.9	.15
2.18	.8217	.0069	.0018	3.8	.20
2.20	.8434	.0089	.0020	1.7	.25
2.21	.8652	.0112	.0023	.7	.30
2.22	.8870	.0137	.0025	.3	.35
2.23	.9087	.0164	.0027	.1	.39
2.25	.9305	.0193	.0030	.0	.44
2.42	1.2134	.0770	.0056	.0	.97
2.43	1.2352	.0828	.0058	.0	1.01
2.44	1.2569	.0888	.0060	.0	1.05
2.46	1.2787	.0949	.0061	.0	1.08
2.47	1.3004	.1012	.0063	.0	1.11
2.48	1.3222	.1077	.0065	.0	1.15
2.50	1.3440	.1144	.0066	.0	1.18
2.51	1.3542	.1176	.0032	.0	1.18
2.52	1.3601	.1194	.0018	.0	1.06
2.54	1.3660	.1213	.0019	.0	.87
2.55	1.3719	.1231	.0019	.0	.67
2.56	1.3778	.1250	.0019	.0	.53
2.57	1.3837	.1269	.0019	.0	.45

HYDROGRAPH PEAK= 1.18 cfs
TIME TO PEAK= 2.50 Hours
RUNOFF VOLUME= .11 Acre-Feet

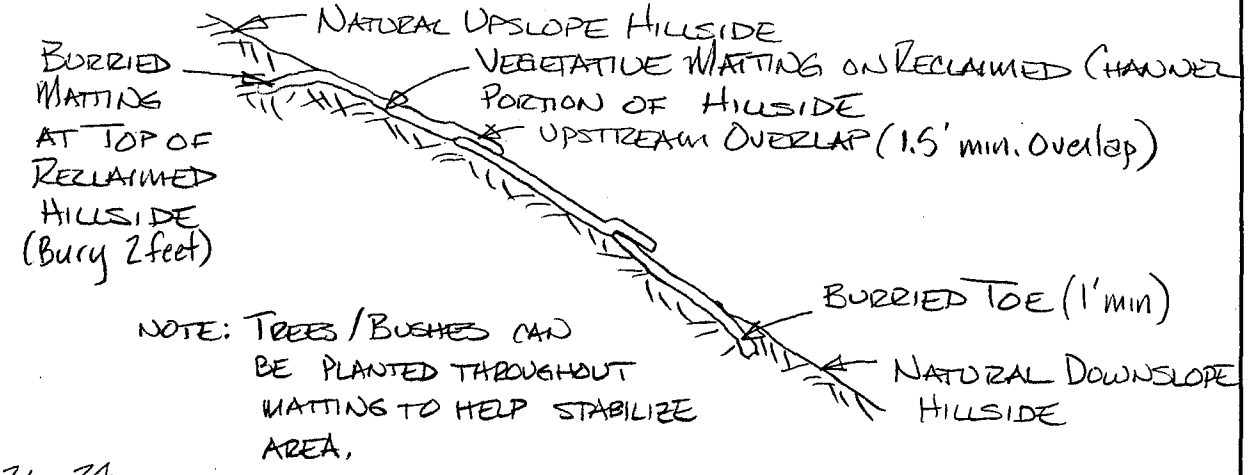
C-24-24 - Continued

that the concrete be extended to the bottom of Whisky Creek so that the energy could be dissipated.

Rock riprap is unstable on slopes found along the haul road. Designs of riprap are not meant to be applied to these conditions, and riprap used will likely not remain as a permanent structure.

The only feasible solution to protect against erosion may be to reclaim the area and install a vegetative matting along the intended flow path. New vegetative matting would help stabilize the soil along the flow path during the period of vegetation regrowth. The surrounding area is under a state of natural erosion. this method of reclamation may be the most reasonable option based upon 1) Current design methodologies, 2) current construction products, and 3) constructability. It is doubtful that any equipment could install properly a riprap channel on the local steep slopes because of the extended reach required both up and down slope from the reclaimed road.

A typical cross-section of a vegetative mat channel is shown below.



NOTE: TREES / BUSHES CAN BE PLANTED THROUGHOUT MATTING TO HELP STABILIZE AREA.

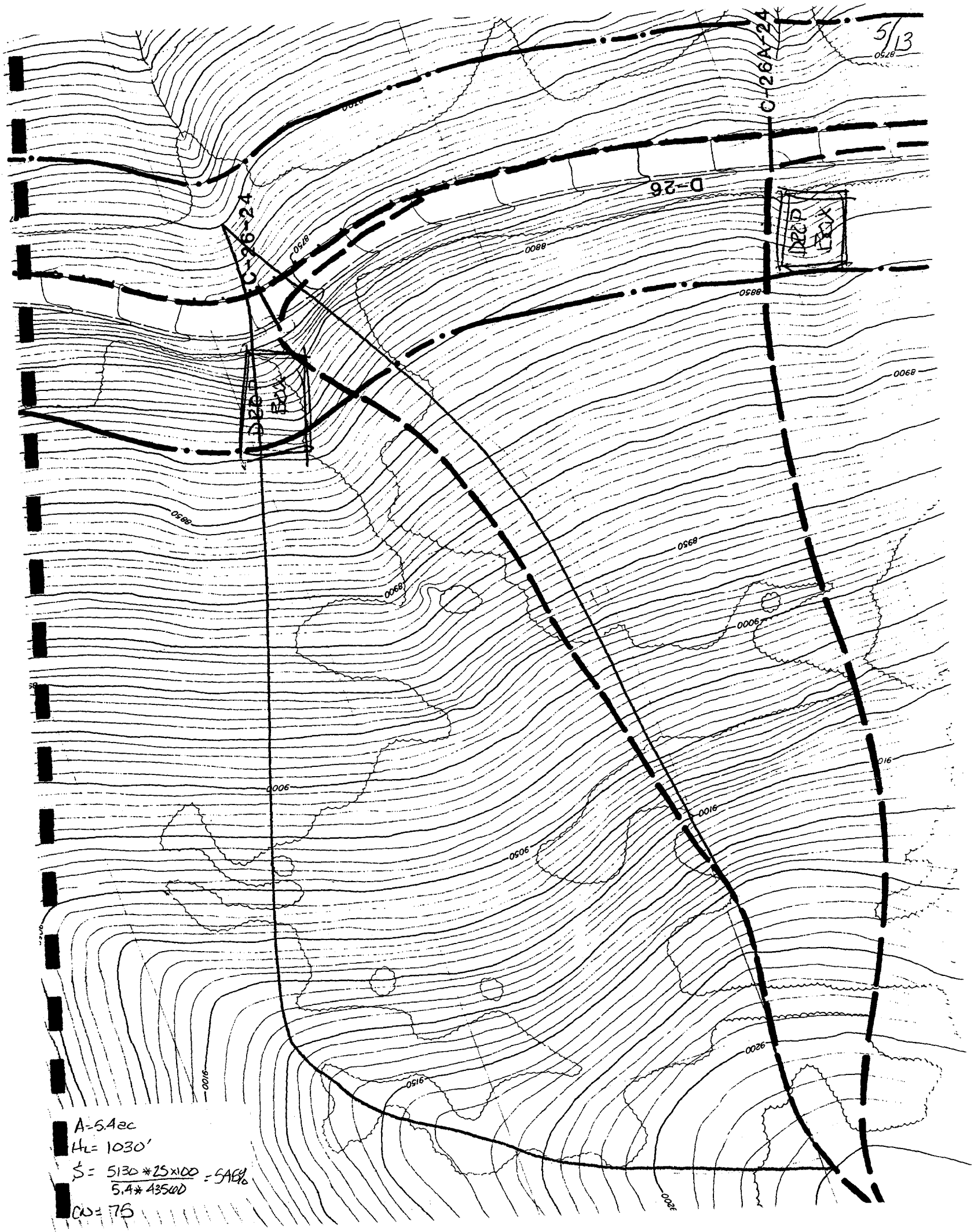
C-26-24

Same concerns as with C-24-24 apply here.

$Q_{100yr,6hr} = 2.5$ cfs Using $b = 10'$, $m = 5$ Trapezoidal Channel
$n = 0.03$, $S = 57\%$

$\frac{Qn}{1.49S^{1/2}} = 0.066$, $y = 0.05'$, $V = 4.9$ fps

Use Matting solution used at C-24-24.



A=5.4ac

H_L= 1030'

$S = \frac{5130 * 25 \times 100}{5.4 * 43560} = 54\%$

CN = 75

PROJECT : Valley Camp Coal - Reclaimed C-26-24 - 100 Yr, 6 Hr Runoff

AREA= 5.4 ACRES
AVERAGE BASIN SLOPE= 54.5 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1030. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0569 HOURS QPCFS= 71.81 CFS QPIN=13.1885 INCHES
C3= 65.0060 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.08	.6442	.0000	.0000	.0	.00
2.09	.6679	.0000	.0000	6.8	.00
2.10	.6916	.0002	.0002	35.2	.00
2.12	.7153	.0007	.0005	62.5	.01
2.13	.7389	.0015	.0008	71.8	.04
2.15	.7626	.0027	.0012	65.0	.08
2.16	.7863	.0041	.0015	50.6	.15
2.18	.8100	.0059	.0018	35.5	.24
2.19	.8337	.0080	.0021	23.1	.34
2.20	.8573	.0103	.0023	14.2	.44
2.22	.8810	.0129	.0026	8.3	.55
2.23	.9047	.0159	.0029	4.7	.66
2.25	.9284	.0190	.0032	2.6	.78
2.26	.9520	.0225	.0035	1.4	.89
2.28	.9757	.0262	.0037	.7	.99
2.29	.9994	.0302	.0040	.4	1.10
2.30	1.0231	.0344	.0042	.2	1.21
2.32	1.0467	.0389	.0045	.0	1.31
2.43	1.2361	.0831	.0063	.0	2.07
2.45	1.2598	.0896	.0065	.0	2.15
2.46	1.2835	.0963	.0067	.0	2.24
2.47	1.3072	.1032	.0069	.0	2.32
2.49	1.3309	.1104	.0071	.0	2.40
2.50	1.3512	.1166	.0063	.0	2.48
2.52	1.3576	.1186	.0020	.0	2.49
2.53	1.3640	.1207	.0020	.0	2.34
2.55	1.3704	.1227	.0020	.0	2.06
2.56	1.3768	.1247	.0020	.0	1.73
2.57	1.3832	.1268	.0021	.0	1.43
2.59	1.3896	.1289	.0021	.0	1.20
2.60	1.3960	.1309	.0021	.0	1.04

HYDROGRAPH PEAK= 2.49 cfs
TIME TO PEAK= 2.52 Hours
RUNOFF VOLUME= .23 Acre-Feet

C-26A-24 Slight Channelization occurs immediately above culvert - Check flow Characteristics.

$Q_{100yr, 6hr} = 1.24$ cfs

Simulate using 10' Trapezoidal Channel.

$n = 0.03,\ b = 10,\ m = 5,\ S = 0.48$

$\frac{Qn}{1.49 S^{1/2}} = 0.04,\ y = 0.35',\ V = 3.5$ fps

Apply same concept as at C-24-24

Use Matting Solution as at C-24-24 and C-26-24.

C-27-24

Hillslope to be reclaimed without channel. Channel design not required. Regrade + Revegetate upon Phase II reclamation.

C-28-24 (Reclaimed Channel RC-4)

$Q_{100yr, 6hr} = 7.84$ cfs

Channel Slope ~ 0.27'/ft $\quad n = 0.0395\, D_{50}^{1/6}$

Check design according to OSM procedure - Use $b = 6'$, $m = 2$

Assume $D_{50} = 0.75'$ $\quad n = .0395(.75)^{1/6} = 0.04$

$\frac{Qn}{1.49 S^{1/2}} = 0.41,\ y = 0.2',\ V = 6.1$ fps

According to OSM procedure, Figure 5.4

DESIGN PARAMETERS

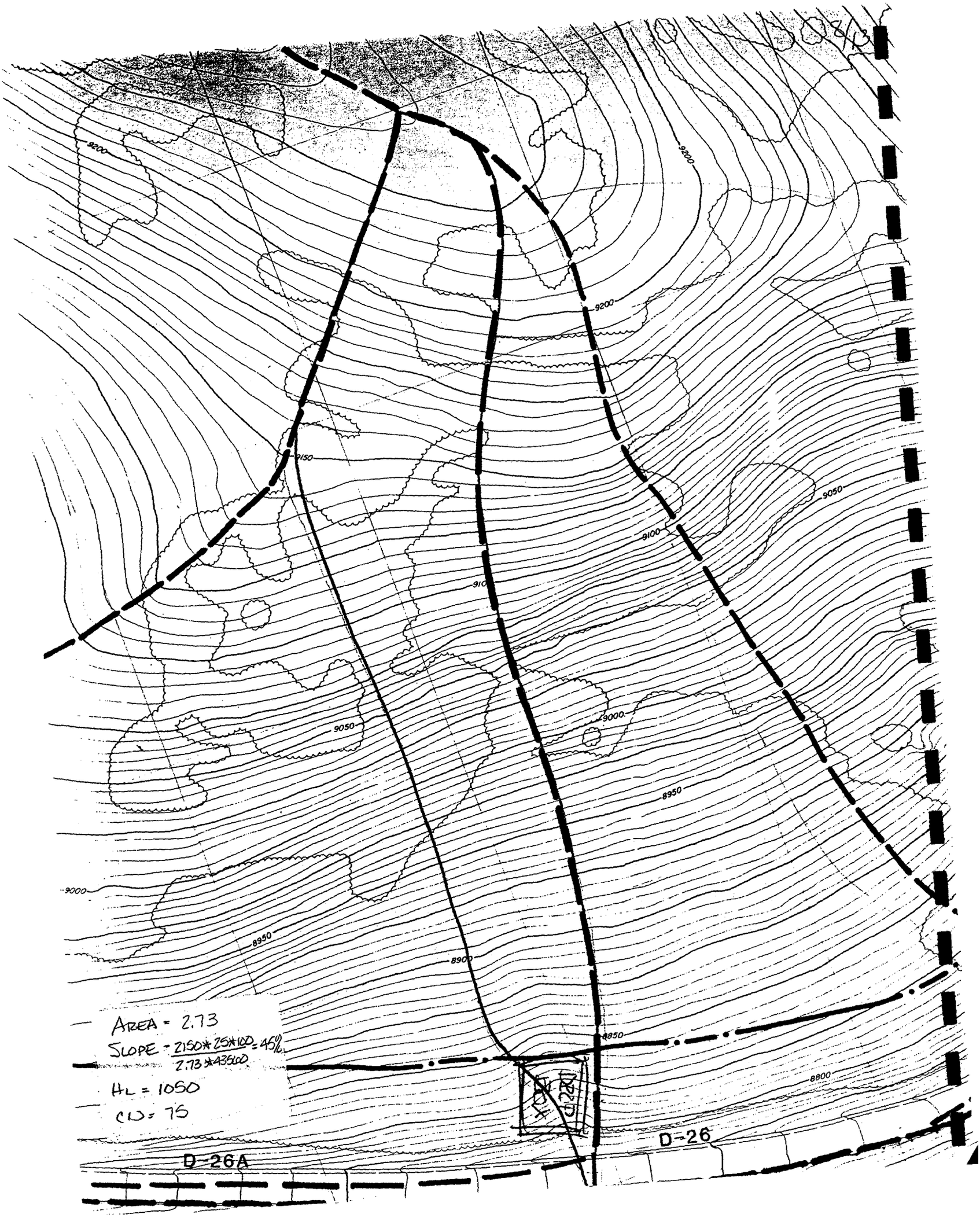
$D_{50} = 0.75'$

$D_{max} = 1.25 D_{50} = 0.94'$ USE 1.0' = Riprap Thickness

$D_{10-20} = D_{50}/(2 \text{ or } 3) = 0.25 - 0.38$ USE 0.25'

Use = 0.5' freeboard. Total depth = 0.5 + 0.18 ⇒ 1.00' depth

Use 1.0' Type II granular Filter. Channel starts at Sta 0+00 at elev 8850 and extends to Sta 1+50 at elev 8890.


9200
9200
9200
9150
9050
9100
9050
9000
9000
8950
8950
8900
8850
8800
AREA = 2.73
SLOPE = 2150*25*100 / 2.73*43560 = 45%
HL = 1050
CN = 75
D-26A
D-26

PROJECT : Valley Camp Coal - Reclaimed C-26A-24 - 100 Yr, 6 Hr Runoff

AREA= 2.7 ACRES
AVERAGE BASIN SLOPE= 45.0 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1050. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0636 HOURS QPCFS= 32.49 CFS QPIN=11.8011 INCHES
C3= 58.1674 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.08	.6533	.0000	.0000	.0	.00
2.10	.6798	.0000	.0000	3.1	.00
2.11	.7063	.0005	.0004	15.9	.00
2.13	.7327	.0013	.0008	28.3	.01
2.15	.7592	.0025	.0012	32.5	.03
2.16	.7856	.0041	.0016	29.4	.06
2.18	.8121	.0061	.0020	22.9	.11
2.19	.8385	.0084	.0023	16.1	.16
2.21	.8650	.0111	.0027	10.4	.22
2.22	.8915	.0142	.0031	6.4	.28
2.24	.9179	.0176	.0034	3.8	.34
2.26	.9444	.0214	.0037	2.1	.40
2.27	.9708	.0254	.0041	1.2	.46
2.29	.9973	.0298	.0044	.6	.52
2.30	1.0237	.0345	.0047	.3	.58
2.32	1.0502	.0396	.0050	.2	.64
2.34	1.0767	.0449	.0053	.0	.70
2.35	1.1031	.0505	.0056	.0	.75
2.37	1.1296	.0564	.0059	.0	.81
2.38	1.1560	.0626	.0062	.0	.86
2.40	1.1825	.0691	.0065	.0	.92
2.42	1.2089	.0759	.0068	.0	.97
2.43	1.2354	.0829	.0070	.0	1.02
2.45	1.2618	.0902	.0073	.0	1.07
2.46	1.2883	.0977	.0075	.0	1.12
2.48	1.3148	.1055	.0078	.0	1.16
2.49	1.3412	.1135	.0080	.0	1.21
2.51	1.3548	.1177	.0042	.0	1.24
2.53	1.3619	.1200	.0022	.0	1.22
2.54	1.3691	.1223	.0023	.0	1.11
2.56	1.3762	.1245	.0023	.0	.95
2.57	1.3834	.1268	.0023	.0	.79
2.59	1.3905	.1291	.0023	.0	.66
2.61	1.3977	.1315	.0023	.0	.56

HYDROGRAPH PEAK= 1.24 cfs
TIME TO PEAK= 2.51 Hours
RUNOFF VOLUME= .12 Acre-Feet

GEND:

HYDROLOGIC CERTIFICATION

VALLEY CAM

10/13/01

PROJECT : Valley Camp Coal - Reclaimed C-28-24 - 100 Yr. 6 Hr Runoff

AREA= 17.8 ACRES
AVERAGE BASIN SLOPE= 39.0 PERCENT
CURVE NUMBER= 75.0
DESIGN STORM= 2.25 INCHES
STORM DURATION= 6.0 HOURS
HYDRAULIC LENGTH= 1250. FEET
MINIMUM INFILTRATION RATE= .00 IN/HR

TP= .0785 HOURS QPCFS= 171.52 CFS QPIN= 9.5559 INCHES
C3= 47.1009 ITERATIONS= 8 SCS 6-hour

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS
2.09	.6634	.0000	.0000	.0	.00
2.10	.6896	.0002	.0002	8.6	.00
2.12	.7157	.0007	.0006	53.3	.01
2.13	.7418	.0017	.0009	113.9	.06
2.15	.7680	.0030	.0013	157.5	.15
2.17	.7941	.0047	.0017	171.5	.31
2.18	.8202	.0068	.0021	160.7	.53
2.20	.8464	.0092	.0024	135.6	.81
2.21	.8725	.0120	.0028	106.1	1.13
2.23	.8986	.0151	.0031	78.3	1.48
2.24	.9248	.0185	.0035	55.2	1.86
2.26	.9509	.0223	.0038	37.5	2.24
2.28	.9770	.0264	.0041	24.7	2.63
2.29	1.0032	.0309	.0044	15.8	3.02
2.31	1.0293	.0356	.0047	9.9	3.41
2.32	1.0554	.0406	.0050	6.1	3.79
2.34	1.0816	.0459	.0053	3.7	4.16
2.35	1.1077	.0515	.0056	2.2	4.53
2.37	1.1338	.0574	.0059	1.3	4.89
2.39	1.1600	.0636	.0062	.8	5.25
2.40	1.1861	.0700	.0064	.4	5.60
2.42	1.2123	.0767	.0067	.3	5.94
2.43	1.2384	.0837	.0070	.1	6.27
2.45	1.2645	.0909	.0072	.0	6.59
2.46	1.2907	.0984	.0075	.0	6.91
2.48	1.3168	.1061	.0077	.0	7.23
2.50	1.3429	.1141	.0080	.0	7.53
2.51	1.3552	.1179	.0038	.0	7.80
2.53	1.3622	.1201	.0022	.0	7.84
2.54	1.3693	.1223	.0022	.0	7.53
2.56	1.3763	.1246	.0023	.0	6.90
2.57	1.3834	.1268	.0023	.0	6.11
2.59	1.3905	.1291	.0023	.0	5.29
2.61	1.3975	.1314	.0023	.0	4.57
2.62	1.4046	.1338	.0023	.0	3.99

PROJECT : Valley Camp Coal - Reclaimed C-28-24 - 100 Yr, 6 Hr Runoff
(Continued)

TIME HOURS	ACCUMULATED RAINFALL INCHES	RUNOFF INCHES	RAINFALL EXCESS INCHES	UNIT HYDROGRAPH CFS	OUTFLOW HYDROGRAPH CFS

HYDROGRAPH PEAK= 7.84 cfs
TIME TO PEAK= 2.53 Hours
RUNOFF VOLUME= .76 Acre-Feet

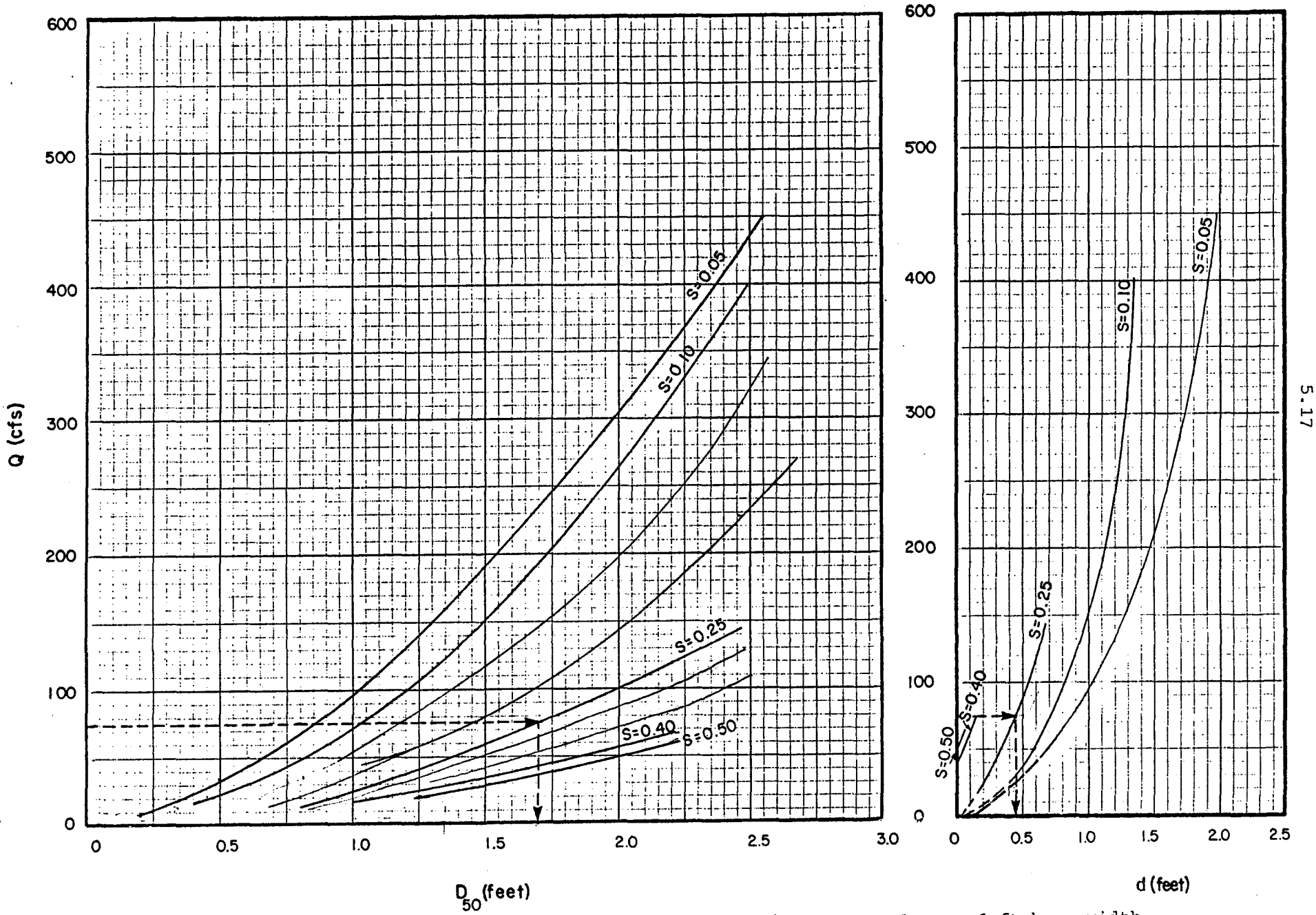


Figure 5.4. Steep slope riprap design, trapezoidal channels, 2:1 sideslopes, 6 ft base width.