CONTRACT: C201963

ID: A-0011BB

NOTE: SEE SHEET 1A FOR PLAN SHEET LAYOUT AT TIME OF INVESTIGATION

CONTENTS

LINE	STATION	SHEET NUMBERS PLAN	PROFILE	XSECT
-L-	75+00 to 266+00	4 - 18	NA	19 - 60

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

ROADWAY SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 32574.1.4 F.A. PROJ. _____

COUNTY CLAY

PROJECT DESCRIPTION US 64 FROM EAST OF THE HIWASSEE RIVER TO WEST OF NC 175

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	A-0011BB	1	64

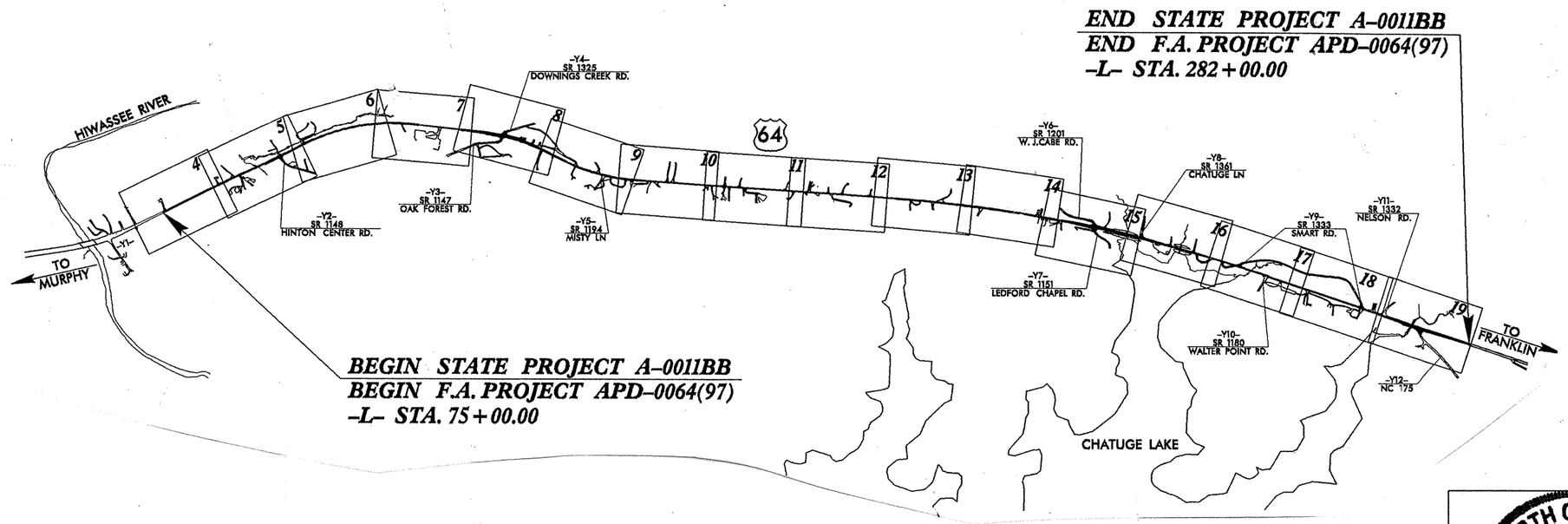
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
32574.1.4	APD-16-1(20)	P. E.
32574.1.4	APD-16-1(20)	R/W & UTILITIES
32574.3.7	APD-0064(97)	CONST.

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.



PERSONNEL

JC KUHNE

MM HAGER

R CHILDERS

G ROSE

INVESTIGATED BY J KUHNE

CHECKED BY _____

SUBMITTED BY J KUHNE

DATE _____

NORTH CAROLINA LICENSED SEAL 1878 GEOLOGIST JODY KUHNE

3/2/06

DRAWN BY: J KUHNE

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

09/08/99

TIP PROJECT: A-0011BB

CONTRACT: C2#####

See Sheet 1-A For Index of Sheets
See Sheet 1-B For Conventional Symbols

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

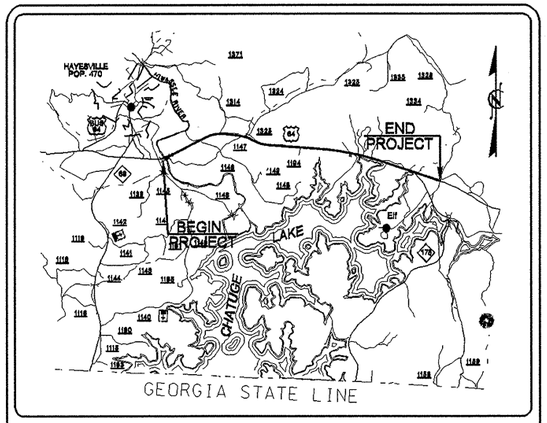
CLAY COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	A-0011BB	1A	64

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
32574.1.1	APD-16-1(20)	P.E.

LOCATION: US 64 FROM EAST OF THE HIWASSEE RIVER TO WEST OF NC 175

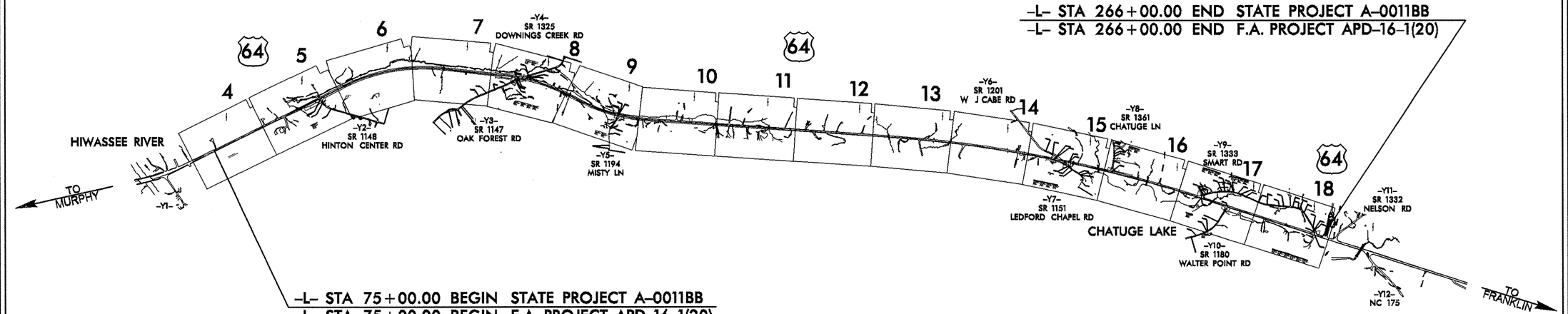
TYPE OF WORK: GRADING, PAVING, DRAINAGE AND STRUCTURES



PROJECT VICINITY MAP

NAD 83

-L- STA 266+00.00 END STATE PROJECT A-0011BB
-L- STA 266+00.00 END F.A. PROJECT APD-16-1(20)



-L- STA 75+00.00 BEGIN STATE PROJECT A-0011BB
-L- STA 75+00.00 BEGIN F.A. PROJECT APD-16-1(20)

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

DESIGN DATA

ADT 2003 = 4,200-8,400
ADT 2030 = 9,400-18,400
DHV = 12 %
D = 60 %
T = 8 % *
V = 60 MPH

* TTST 2 DUAL 6

PROJECT LENGTH

LENGTH ROADWAY F.A. PROJECT APD-16-1(20) = 3.618 MILES
LENGTH ROADWAY F.A. PROJECT APD-16-1(20) = 0.000 MILES
TOTAL LENGTH STATE PROJECT 8.3064123 = 3.618 MILES

Prepared In the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh NC, 27610

2002 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: October 2006

LETTING DATE: August 2008

JIMMY GOODNIGHT, P.E.
PROJECT ENGINEER

S.D. KENDALL
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER
SIGNATURE: P.E.

ROADWAY DESIGN ENGINEER
SIGNATURE: P.E.

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA
P.E.
STATE DESIGN ENGINEER

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED
DIVISION ADMINISTRATOR DATE

04-JAN-2006 14:43
d:\caddprojects\roadways\a0011bb_geo_rdwy_modifier\cadd_original\proj\a0011bb_rdy_tsh.dgn
jkuhne AT GEA226156

PROJECT REFERENCE NO.		SHEET NO.
32574.1.4	A-0011B	2/64

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)							SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS		
GROUP CLASS.	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6			
SYMBOL														
% PASSING #10	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN			
LIQUID LIMIT	6 MX		NP	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	40 MX	41 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
PLASTIC INDEX				10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<0.25 0.25 TO 0.50 0.5 TO 1.0 1 TO 2 2 TO 4 >4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE MM: 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005
GRAIN SIZE IN.: 12 | 3

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NONPLASTIC	0-5	VERY LOW
LOW PLASTICITY	6-15	SLIGHT
MED. PLASTICITY	16-25	MEDIUM
HIGH PLASTICITY	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED)
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 31
MODERATELY COMPRESSIBLE	LIQUID LIMIT EQUAL TO 31-50
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	>10%	>20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER 24 HOURS
- PW. PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES
- SOUNDING ROD
- SPT CPT DPT DMT VST PMT TEST BORING
- AUGER BORING
- CORE BORING
- MW MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF SPT REFUSAL

SAMPLE DESIGNATIONS
S - BULK SAMPLE
SS - SPLIT SPOON SAMPLE
ST - SHELBY TUBE SAMPLE
RM - RESILIENT MODULUS SAMPLE
RS - ROCK SAMPLE
RT - RECOMPACTED TRIAXIAL SAMPLE
CBR - CALIFORNIA BEARING RATIO SAMPLE

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HI. - HIGHLY
MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] MOBILE B-___
- [ ] BK-51
- [X] CME-45C
- [X] CME-550
- [ ] PORTABLE HOIST
- [ ] OTHER _____
- [ ] OTHER _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [X] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE ____" STEEL TEETH
- [ ] TRICONE ____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] OTHER _____

HAMMER TYPE:
- [X] AUTOMATIC
- [ ] MANUAL

CORE SIZE:
- [ ] -B_____
- [ ] -N_____
- [ ] -H_____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] OTHER _____

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FEET
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK:

ELEVATION: FT.

NOTES:

xt

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

Michael F. Easley
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

Lyndo Tippett
SECRETARY

18 January, 2006

STATE PROJECT: 32574.1.4, A-11BB

COUNTY: Clay

DESCRIPTION: US 64 from East of the Hiwassee River to West of NC 175

SUBJECT: Geotechnical Report – Inventory

PROJECT DESCRIPTION

The project consists of 3.6 miles of 2 lane improved widening along the existing alignment. Structures to be added or lengthened are eight 1-barrel culverts.
A geotechnical investigation was performed from October through November of 2005 utilizing a CME 550 ATV mounted drill and CME 45C track mounted drill. Standard Penetration Tests were performed at selected locations along the alignment for embankments, cut slopes and culverts. Representative soil samples were obtained for visual classification in the field and laboratory analysis by the Material and Tests Unit. Rock samples were obtained for Net Neutralization Potential (NNP) of potential acid producing rock

The following survey line was investigated:

Line	Stations
- L -	75+00 – 266+00

AREAS OF SPECIAL GEOTECHNICAL INTEREST

STRUCTURES

No bridge structures are included and it is assumed that existing culverts will be lengthened. Borings with SPT's were done at these existing culvert locations:

137+82 26' rt 144+13 40' rt

GROUNDWATER

Groundwater is expected within 2'-3' of grade within all alluvial areas with low fills. Water will be within the expected foundations of culvert extensions. Water was not encountered within cut area sections.

POTENTIALLY UNSUITABLE SUBSURFACE CONDITIONS

Soft soils requiring shallow undercut were discovered from Stations 93+00 – 124+00, 5'-25' RT. Small areas that may require treatment were encountered in other shallow fill areas and are reflected in contingency items for shallow undercut, fabric and select backfill in the Recommendations.

PHYSIOGRAPHY AND GEOLOGY

The project beginning ties into existing US 64 at the Hiwassee River bridge south of Hayesville. It generally follows the floodplain and valley of Downing Creek to Station 135+00 and then continues as a straight section over moderately rolling terrain. The final section, stations 222 – 266+00, crosses flooded limbs of Chatuge Lake with small culverts providing cross flow.

There is much development because the existing alignment serves as the major commercial corridor. Commercial development is frequent as are residential driveway inlets. Lane turn-outs should be considered in the planning of any improvements.

The project is contained within three geologic units which are identified as Zhha, Zwe and Zybn on the State geologic map. These are contained within the Ocoee Supergroup and are typically metasedimentary rocks with typical schists and slates. Only the Zhha formation is exposed along the project, with the other units being weathered to soil classification materials.

SOIL PROPERTIES

Soils in cut areas are predominately micaceous silts and clayey silts. One cut area, Stations 100 – 112+00, will have a significant amount of rock. All other cuts will be in weak to moderately strong residual and saprolitic soils. There are not significant amounts of weathered rock.

Soils under fill areas are predominately very weak alluvial deposits of silt, and silty clays with typical classifications of A-5 and A-7.

ROCK PROPERTIES

Rock is exposed along one section of the project from Stations 100+00 – 112+00. This is within the Zhha (Hot House Unit) and is characterized by schistose to well foliated fabric of sufficient strength to steepen the slope. The rock units on the project are noted in some areas as being acid runoff producing. The rock in this cut area tested well within values to be considered non to very mildly acid producing. In the sample results the Net Neutralization Potential (NNP) reflects acid potential (Hotness) when values are <0. Values between 0 and –10 are not treated or mitigated and values less than –10 begin requiring special provisions for treatment. Rock on this project may be used in any construction application or wasted without concern. The other rock units have weathered to soil and will not be a concern for NNP values.

GROUNDWATER

Soils on the project are generally well drained with very little water likely above grade in all cut areas. The extensive alluvial areas on which most of the low fills will be built are likely to have water at the base flow elevation of the streams to within 2.0' of the surface. Rainfall amounts were average at the time of the investigation, however, no swampy areas or standing water was noted along the alignment. A quantity of fabric for soil stabilization and granular backfill is in the recommendations for fill areas over alluvium to deal with saturated areas combined with weak soils.

GEOTECHNICAL DESCRIPTIVE ANALYSIS

Stations 75+00 – 100+00

This section consists of low fills with a right side cut of 20' from 83+00 – 87+50 in loose to medium dense residual soils and saprolite.

Stations 100+00 – 113+00

This section is characterized by a 30' high cut section on the right. This will contain the majority of rock excavation on the project.

Stations 113+00 – 128+00

Section of low fills with an area of shallow undercut as described under "Potentially Unsuitable Subsurface Conditions". May contain smaller areas of very weak soils under potential shallow fill areas.

Stations 128+00 – 137+00

Characterized by a 25' cut on the right with ditchline grading improvements on the left. Cut consists of mostly med. dense to dense soil and saprolite.

Stations 137+00 – 153+50
Section of low fills, cuts and ditchline improvements. No Geotechnical concerns were noted through this section.

Stations 153+50 – 179+00

The section consists of long cut areas of 10 – 15' height in dense/med. dense soils and saprolite on the right and ditchline improvements on the left.

Stations 179+00 – 198+00

This alignment section contains relatively larger cuts in med. dense/dense saprolite and weathered rock. There is through cut for much of the length with cut heights approaching 30'. Cut section from 194+50 – 198+00, left, will be in loose to medium dense soil and saprolite.

Stations 198+00 – 266+00

This long section switches variably between low cuts and fills on both sides with medium dense soils and saprolite in the cuts and loose to med. dense foundation bearing materials for the fills and culvert extensions.

Respectfully submitted,

Jody C. Kuhne

EARTHWORK BALANCE SHEET

Volumes in Cubic Yards

PROJECT TIP # A-0011 BB

Calc. by: L. Charova Sept. 12, 2008
Checked by: S. Kendall Sept 11, 2008

COUNTY Clay

DATE 4/15/2008

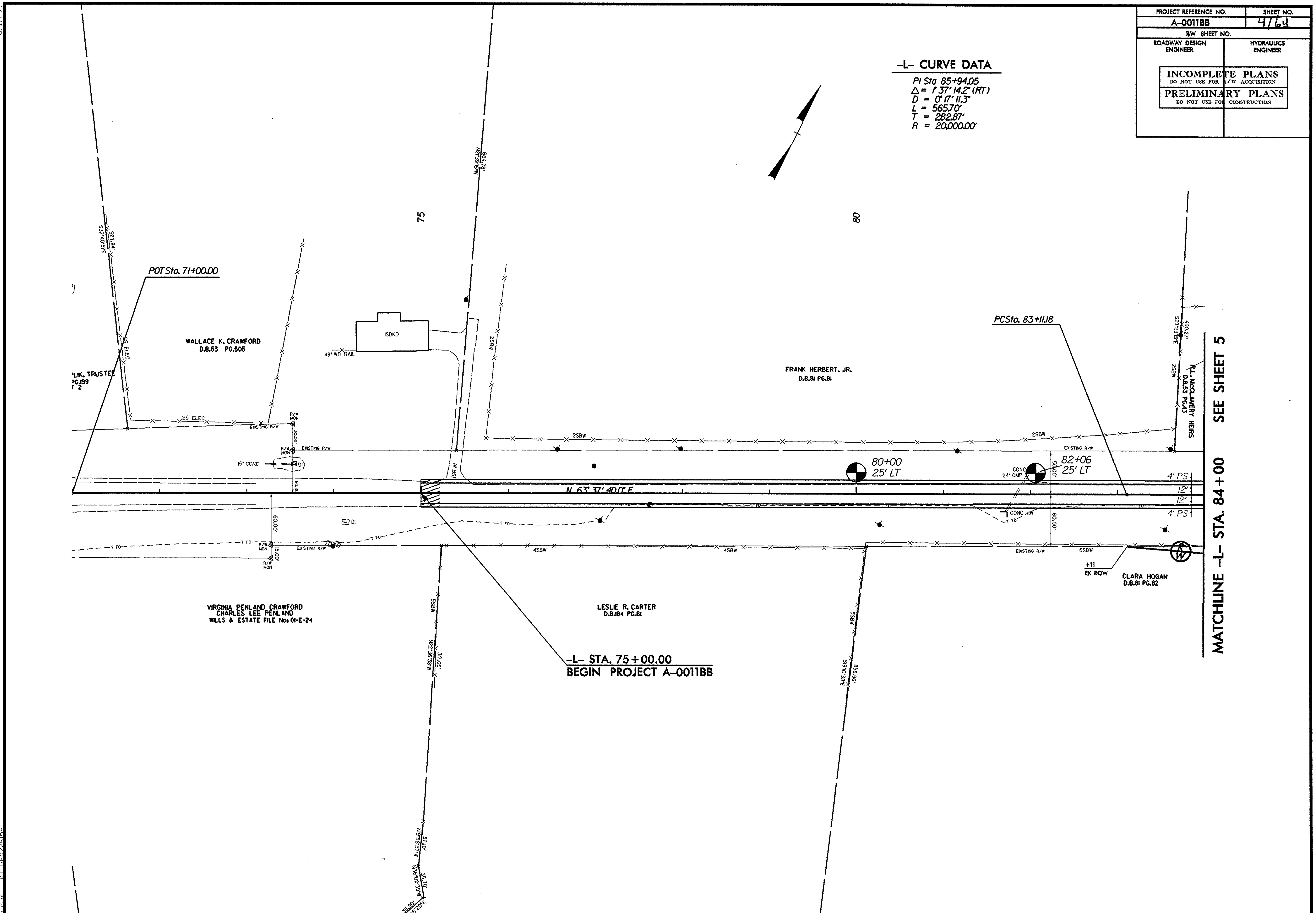
SHEET__ OF __ SHEETS

LINE	STATION	STATION	TOTAL EXCAV. (UNCL.)	ROCK EXCAV.	UNDERCUT EXCAV.	UNSUIT. EXCAV.	SUITABLE EXCAV.	TOTAL EMB.	ROCK EMB.	UNDERCUT EMB.	EARTH EMB.	EMBANK. 15%	BORROW	ROCK WASTE	SUITABLE WASTE	TOTAL WASTE
	SUMMARY	No. 1 LT														
L LT	75+00	105+00	4,646	0	0	0	4,646	479	0	0	479	551	0	0	4,095	4,095
TOTAL	SUMMARY	No.1 LT	**4,646**	**0**	**0**	**0**	**4,646**	**479**	**0**	**0**	**479**	**551**	**0**	**0**	**4,095**	**4,095**
	SUMMARY	No.2 LT														
L LT	105+00	135+00	5,628	0	0	0	5,628	103	0	0	103	118	0	0	5,510	5,510
TOTAL	SUMMARY	No. 2 LT	**5,628**	**0**	**0**	**0**	**5,628**	**103**	**0**	**0**	**103**	**118**	**0**	**0**	**5,510**	**5,510**
	SUMMARY	No. 3 LT														
L LT	135+00	165+00	1,521	0	0	0	1,521	4	0	0	4	5	0	0	1,516	1,516
DR1LT	10+00	11+50	51	0	0	0	51	7	0	0	7	8	0	0	43	43
TOTAL	SUMMARY	No. 3 LT	**1,572**	**0**	**0**	**0**	**1,572**	**11**	**0**	**0**	**11**	**13**	**0**	**0**	**1,559**	**1,559**
	SUMMARY	No. 4 LT														
L LT	165+00	195+00	9,532	0	0	0	9,532	2,062	0	0	2,062	2,371	0	0	7,161	7,161
TOTAL	SUMMARY	No.4 LT	**9,532**	**0**	**0**	**0**	**9,532**	**2,062**	**0**	**0**	**2,062**	**2,371**	**0**	**0**	**7,161**	**7,161**
	SUMMARY	No. 5 LT														
L LT	195+00	225+00	18,868	0	0	0	18,868	2,823	0	0	2,823	3,246	0	0	15,622	15,622
Y6	12+00	16+76.12	811	0	0	0	811	3,892	0	0	3,892	4,476	3,665	0	0	0
TOTAL	SUMMARY	No. 5 LT	**19,679**	**0**	**0**	**0**	**19,679**	**6,715**	**0**	**0**	**6,715**	**7,722**	**3,665**	**0**	**15,622**	**15,622**
	SUMMARY	No. 6 LT														
L LT	225+00	255+00	11,362	0	0	0	11,362	1,465	0	0	1,465	1,685	0	0	9,677	9,677
TOTAL	SUMMARY	No. 6 LT	**11,362**	**0**	**0**	**0**	**11,362**	**1,465**	**0**	**0**	**1,465**	**1,685**	**0**	**0**	**9,677**	**9,677**
	SUMMARY	No. 7 LT														
L LT	255+00	282+00	14,034	0	0	0	14,034	42	0	0	42	48	0	0	13,986	13,986
TOTAL	SUMMARY	No. 7 LT	**14,034**	**0**	**0**	**0**	**14,034**	**42**	**0**	**0**	**42**	**48**	**0**	**0**	**13,986**	**13,986**
	SUMMARY	No. 8 RT														
L RT	75+00	105+00	30,324	9,458	0	0	20,866	3,170	2,642	0	0	2,672	0	6,816	20,866	27,682
TOTAL	SUMMARY	No. 8 RT	**30,324**	**9,458**	**0**	**0**	**20,866**	**3,170**	**2,642**	**0**	**0**	**2,642**	**0**	**6,816**	**20,866**	**27,682**
	SUMMARY	No. 9 RT														
L RT	105+00	135+00	55,892	11,037	0	0	44,855	2,870	2,392	0	0	2,392	0	8,645	44,855	53,500
Y3	10+50	15+50	17,542	0	0	0	17,542	500	0	0	500	575	0	0	16,967	16,967
TOTAL	SUMMARY	No. 9 RT	**73,434**	**11,037**	**0**	**0**	**62,397**	**3,370**	**2,392**	**0**	**500**	**2,967**	**0**	**8,645**	**61,822**	**70,467**
	SUMMARY	No. 10 RT														
L RT	135+00	165+00	20,864	0	0	0	20,864	4,707	0	0	4,707	5,413	0	0	15,451	15,451
DR1RT	10+12.03	11+84.01	22	0	0	0	22	585	0	0	585	673	651	0	0	0
Y5	10+26.20	11+70	9	0	0	0	9	224	0	0	224	258	249	0	0	0
TOTAL	SUMMARY	No. 10 RT	**20,895**	**0**	**0**	**0**	**20,895**	**5,516**	**0**	**0**	**5,516**	**6,344**	**900**	**0**	**15,451**	**15,451**
	SUMMARY	No. 11 RT														
L RT	165+00	195+00	10,083	0	0	0	10,083	2,476	0	0	2,476	2,847	0	0	7,236	7,236
DR2 RT	10+12.50	12+80	1,854	0	0	0	1,854	0	0	0	0	0	0	0	1,854	1,854
TOTAL	SUMMARY	No. 11 RT	**11,937**	**0**	**0**	**0**	**11,937**	**2,476**	**0**	**0**	**2,476**	**2,847**	**0**	**0**	**9,090**	**9,090**
	SUMMARY	No. 12 RT														
L RT	195+00	225+00	5,593	0	0	0	5,593	2,823	0	0	2,823	3,246	0	0	2,347	2,347
TOTAL	SUMMARY	No. 12 RT	**5,593**	**0**	**0**	**0**	**5,593**	**2,823**	**0**	**0**	**2,823**	**3,246**	**0**	**0**	**2,347**	**2,347**
	SUMMARY	No.. 13 RT														
L RT	225+00	255+00	1,157	0	0	0	1,157	931	0	0	931	1,071	0	0	86	86
TOTAL	SUMMARY	No. 13 RT	**1,157**	**0**	**0**	**0**	**1,157**	**931**	**0**	**0**	**931**	**1,071**	**0**	**0**	**86**	**86**
	SUMMARY	No. 14 RT														
L RT	255+00	282+00	1,439	0	0	0	1,439	5,204	0	0	5,204	5,985	4,546	0	0	0
TOTAL	SUMMARY	No. 14 RT	**1,439**	**0**	**0**	**0**	**1,439**	**5,204**	**0**	**0**	**5,204**	**5,985**	**4,546**	**0**	**0**	**0**
PROJECT TOTAL			**211,232**	**20,495**	**0**	**0**	**190,737**	**34,367**	**5,034**	**0**	**28,327**	**37,609**	**9,111**	**15,461**	**167,272**	**182,733**
Loss Due to Clear. & Grub.			-3,600				-3,600								-3,600	-3,600
Rock Waste to Replace Borrow									6,602		-6,602		-6,602	-6,602	0	-6,602
Adjustment for Rock Swell											-1,320	-1,320	-1,320	0	0	0
Adjustment for Uncompacted Rock Waste												-1,189	-1,189	0	0	0
Earth Waste to Replace Borrow													0	0	0	0
PROJECT GRAND TOTAL			**207,632**	**20,495**	**0**	**0**	**187,137**	**34,367**	**11,636**	**0**	**20,405**	**35,100**	**0**	**8,859**	**163,672**	**172,531**
SAY			**208,000**													
PAVEMENT STRUCTURE VOLUME			**16,550**													
DRAINAGE DITCH EXCAVATION			**3,920**	**CY**												
SHOULDER BORROW			**14,000**	**CY**												

*** EARTHWORK QUANTITIES ARE CALCULATED BY THE ROADWAY DESIGN UNIT. THESE EARTHWORK QUANTITIES ARE BASED IN PART ON SUBSURFACE DATA PROVIDED BY THE GEOTECHNICAL ENGINEERING UNIT.**

8/17/99

REVISIONS



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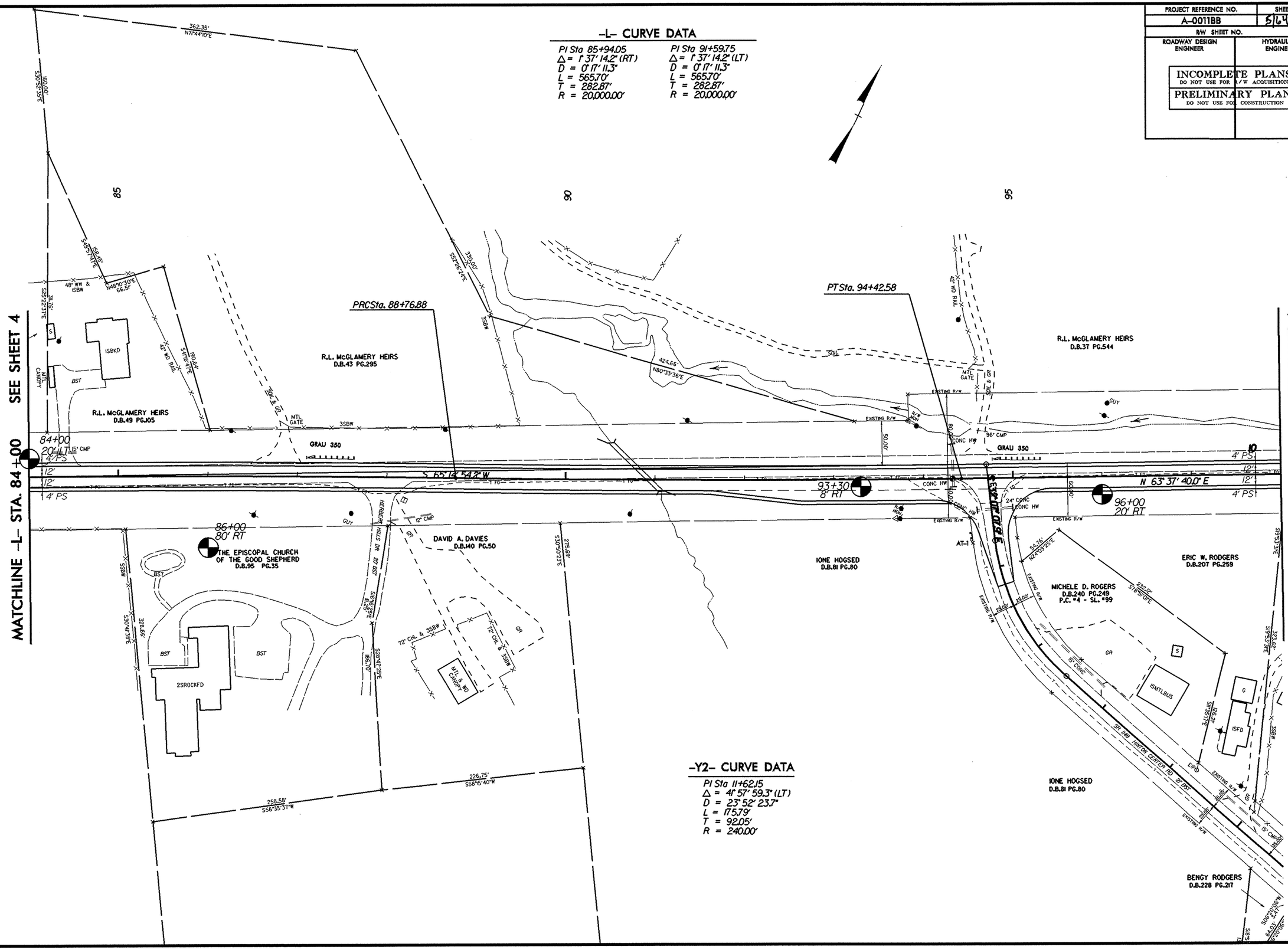
PROJECT REFERENCE NO.	SHEET NO.
A-0011BB	5/64
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

-L- CURVE DATA

PI Sta 85+94.05	PI Sta 91+59.75
Δ = 1° 37' 14.2" (RT)	Δ = 1° 37' 14.2" (LT)
D = 0° 17' 11.3"	D = 0° 17' 11.3"
L = 565.70'	L = 565.70'
T = 282.87'	T = 282.87'
R = 20,000.00'	R = 20,000.00'



-Y2- CURVE DATA

PI Sta 11+62.15
Δ = 41° 57' 59.3" (LT)
D = 23° 52' 23.7"
L = 175.79'
T = 92.05'
R = 240.00'

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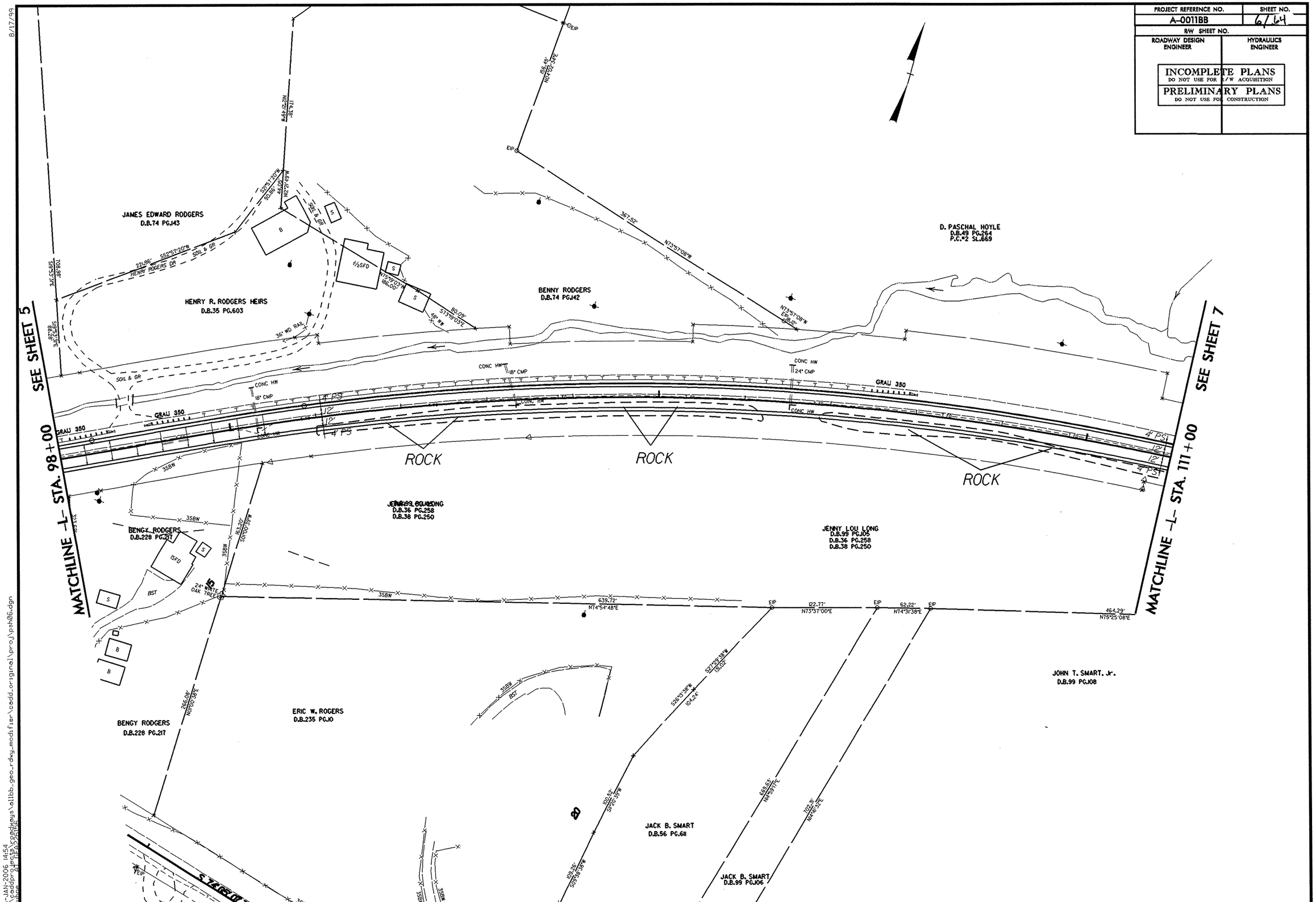
8/17/99

PROJECT REFERENCE NO.	SHEET NO.
A-0011BB	6/64
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



REVISIONS

8/17/99

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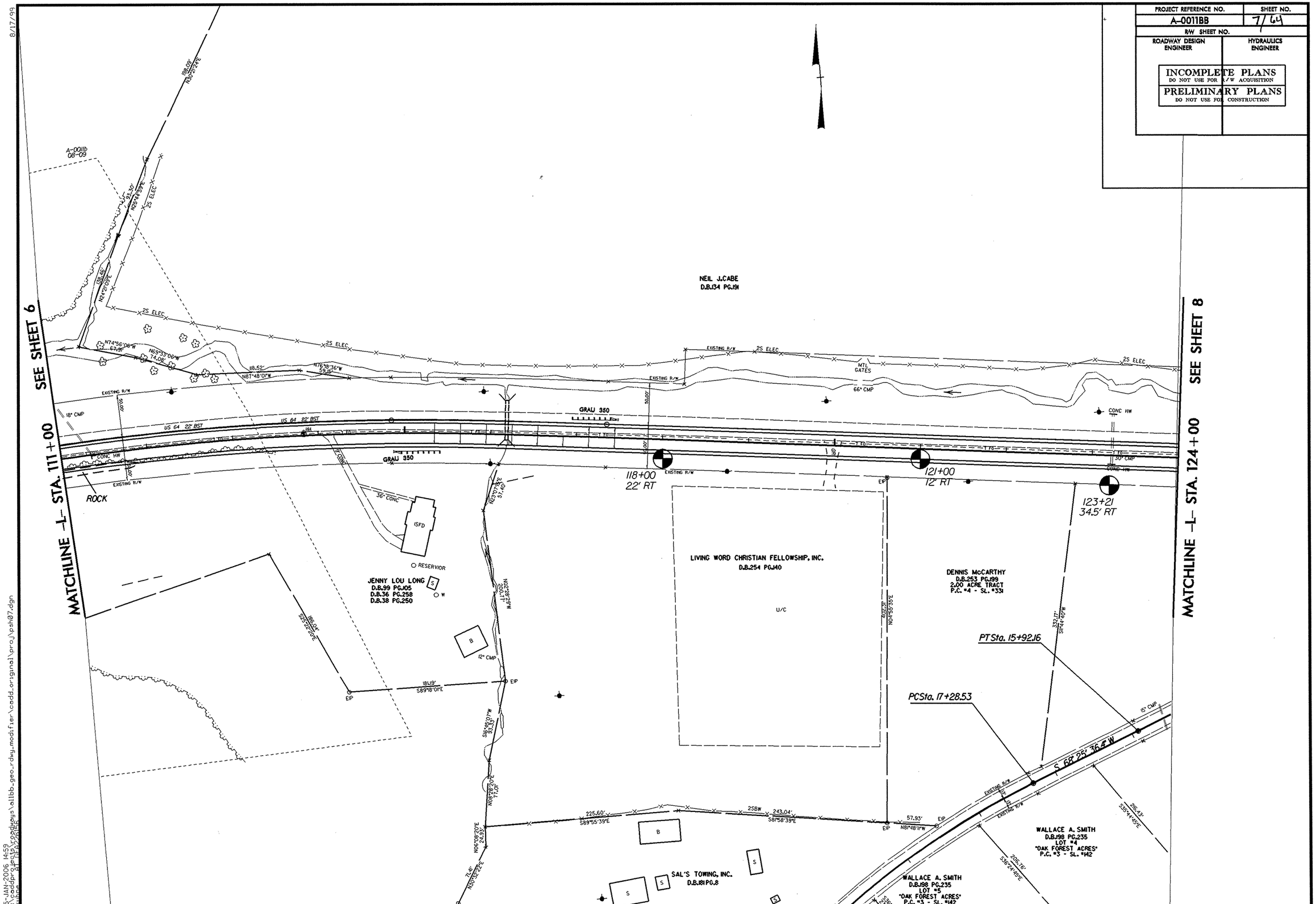
PROJECT REFERENCE NO.	SHEET NO.
A-0011BB	7/64
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



REVISIONS

8/17/99

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PROJECT REFERENCE NO.	SHEET NO.
A-0011BB	8/64
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

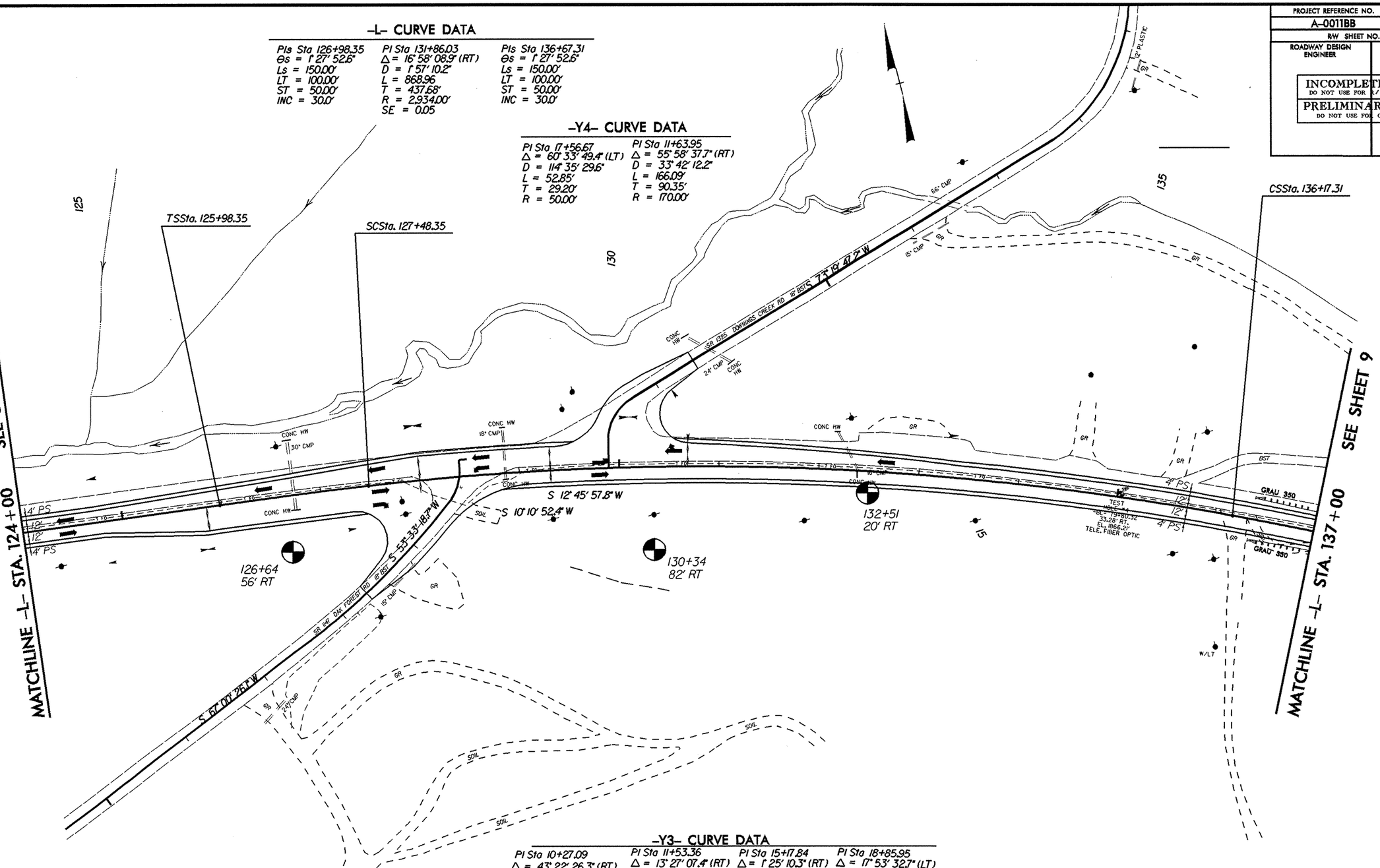
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

-L- CURVE DATA

Pls Sta 126+98.35	Pl Sta 131+86.03	Pls Sta 136+67.31
θs = 1° 27' 52.6"	Δ = 16° 58' 08.9" (RT)	θs = 1° 27' 52.6"
Ls = 150.00'	D = 1° 57' 10.2"	Ls = 150.00'
LT = 100.00'	L = 868.96	LT = 100.00'
ST = 50.00'	T = 437.68'	ST = 50.00'
INC = 30.0'	R = 2,934.00'	INC = 30.0'
	SE = 0.05	

-Y4- CURVE DATA

Pl Sta 17+56.67	Pl Sta 11+63.95
Δ = 60° 33' 49.4" (LT)	Δ = 55° 58' 37.7" (RT)
D = 114° 35' 29.6"	D = 33° 42' 12.2"
L = 52.85'	L = 166.09'
T = 29.20'	T = 90.35'
R = 50.00'	R = 170.00'



-Y3- CURVE DATA

Pl Sta 10+27.09	Pl Sta 11+53.36	Pl Sta 15+17.84	Pl Sta 18+85.95
Δ = 43° 22' 26.3" (RT)	Δ = 13° 27' 07.4" (RT)	Δ = 1° 25' 10.3" (RT)	Δ = 17° 53' 32.7" (LT)
D = 114° 35' 29.6"	D = 7° 38' 22.0"	D = 0° 57' 17.7"	D = 5° 43' 46.5"
L = 37.85'	L = 176.09'	L = 148.65'	L = 312.28'
T = 19.88'	T = 88.45'	T = 74.33'	T = 157.42'
R = 50.00'	R = 750.00'	R = 6,000.00'	R = 1,000.00'

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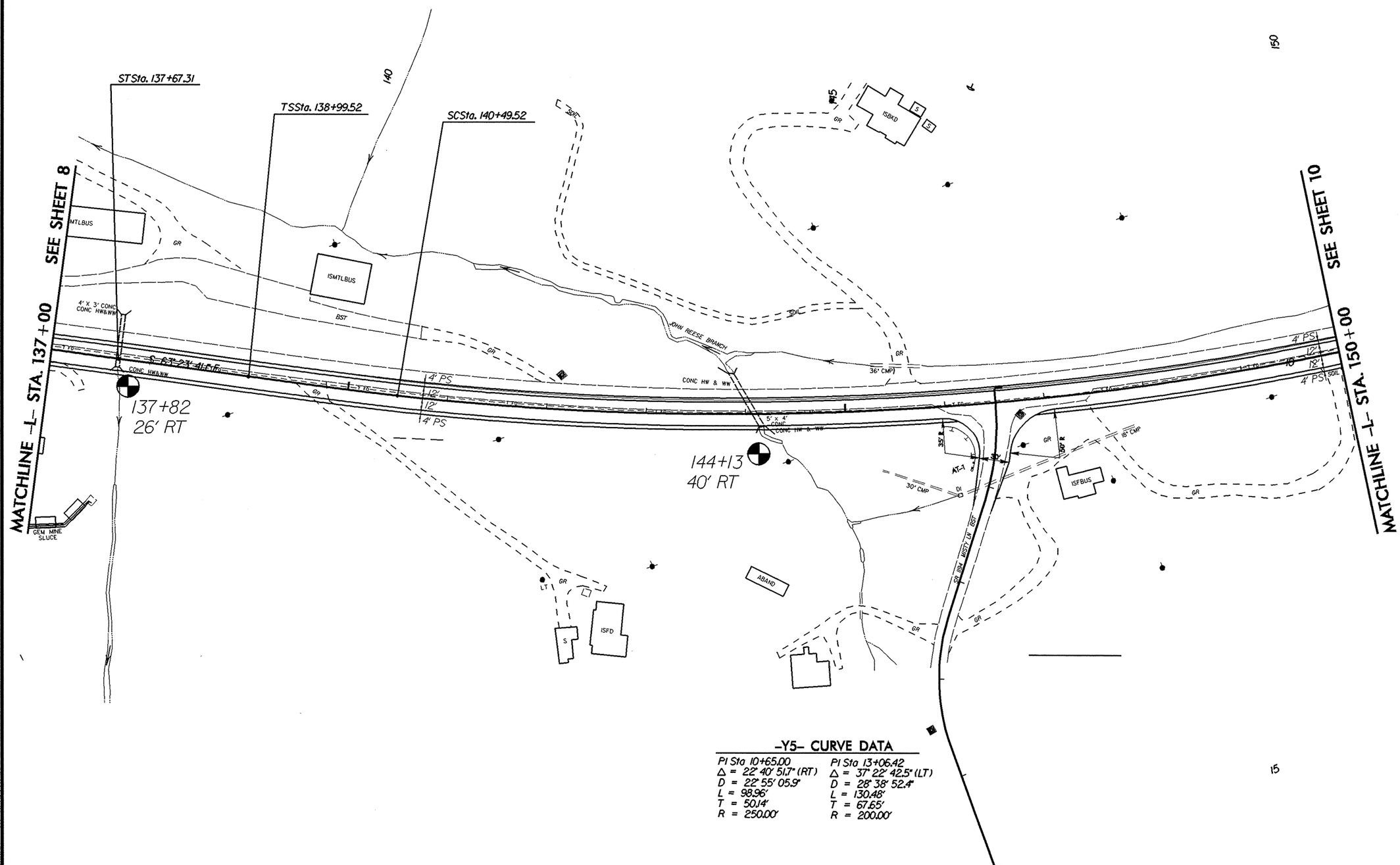
PROJECT REFERENCE NO.	SHEET NO.
A-0011BB	9/64
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

-L- CURVE DATA

PIs Sta 136+67.31	PIs Sta 139+99.52	PI Sta 145+73.11
θs = 1° 27' 52.6"	θs = 1° 25' 56.6"	Δ = 19° 48' 00.5" (LT)
Ls = 150.00'	Ls = 150.00'	D = 1° 54' 35.5"
LT = 100.00'	LT = 100.00'	L = 1,036.73
ST = 50.00'	ST = 50.00'	T = 523.59'
INC = 30.0'	INC = 30.0'	R = 3,000.00'
		SE = 0.05



-Y5- CURVE DATA

PI Sta 10+65.00	PI Sta 13+06.42
Δ = 22° 40' 51.7" (RT)	Δ = 37° 22' 42.5" (LT)
D = 22° 55' 05.9"	D = 28° 38' 52.4"
L = 98.96'	L = 130.48'
T = 50.14'	T = 67.65'
R = 250.00'	R = 200.00'

REVISIONS

8/17/99

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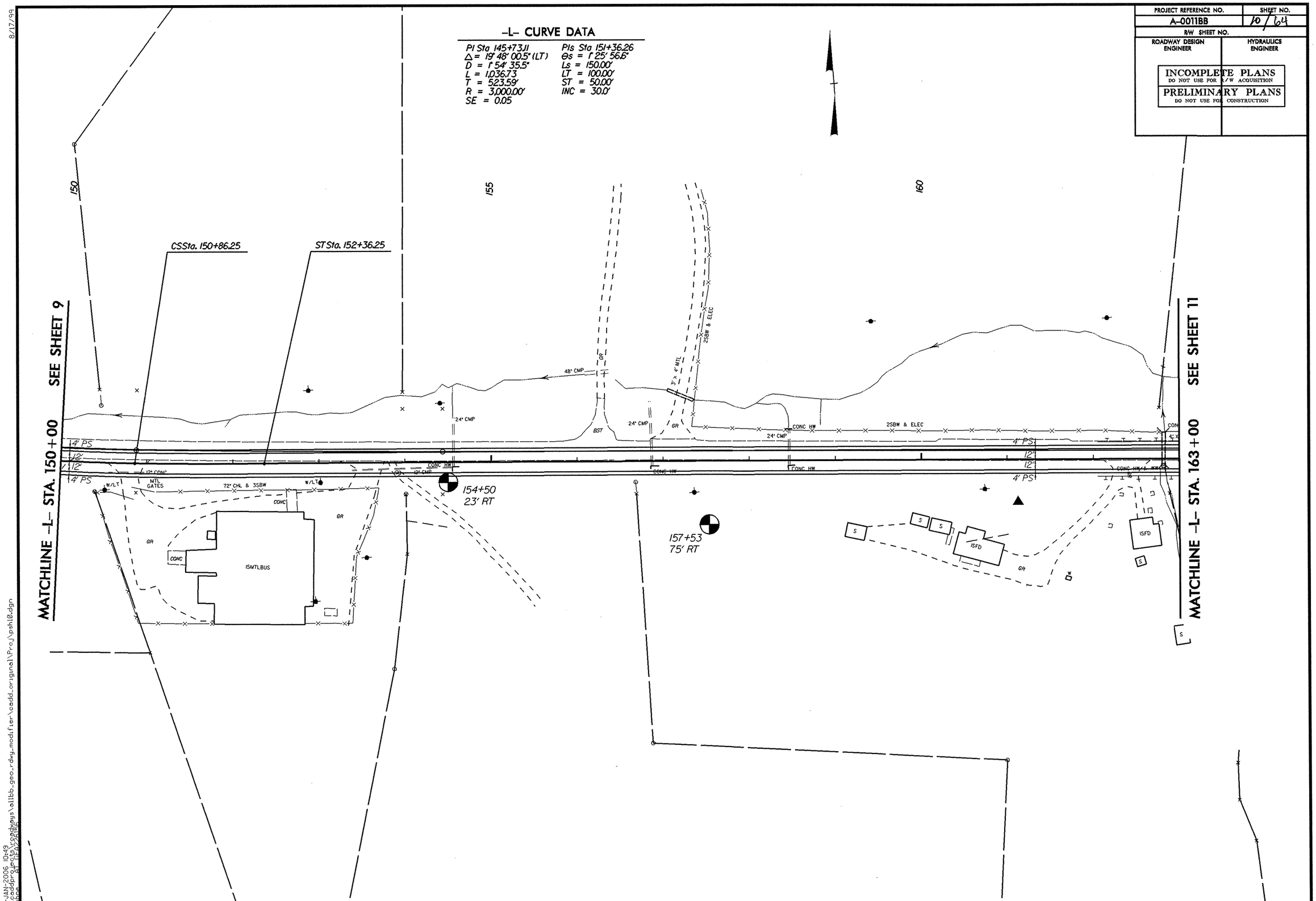
PROJECT REFERENCE NO.	SHEET NO.
A-0011BB	10/64
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

-L- CURVE DATA

PI Sta 145+73.11	PIs Sta 151+36.26
Δ = 19° 48' 00.5" (LT)	θs = 1° 25' 56.6"
D = 1° 54' 35.5"	Ls = 150.00'
L = 1,036.73	LT = 100.00'
T = 523.59'	ST = 50.00'
R = 3,000.00'	INC = 30.0'
SE = 0.05	



REVISIONS

8/17/99

04-JAN-2006 10:49
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ikinge
BT INFA22A16

PROJECT REFERENCE NO.	SHEET NO.
A-0011BB	11/64
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

8/17/99

04-JAN-2006 10:50
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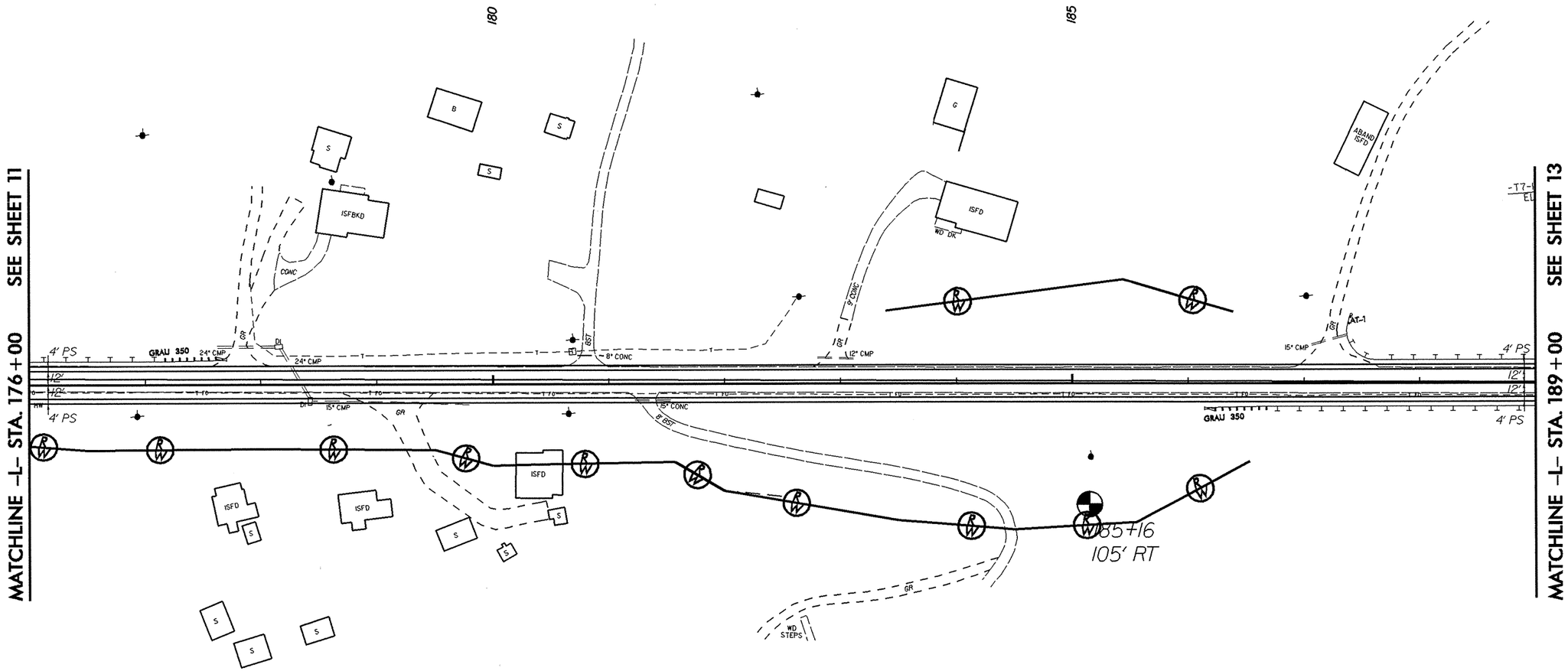
jkunne
AT TREADPLATE

PROJECT REFERENCE NO.	SHEET NO.
A-0011BB	12/64
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



8/17/99

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A1 11x22ENG

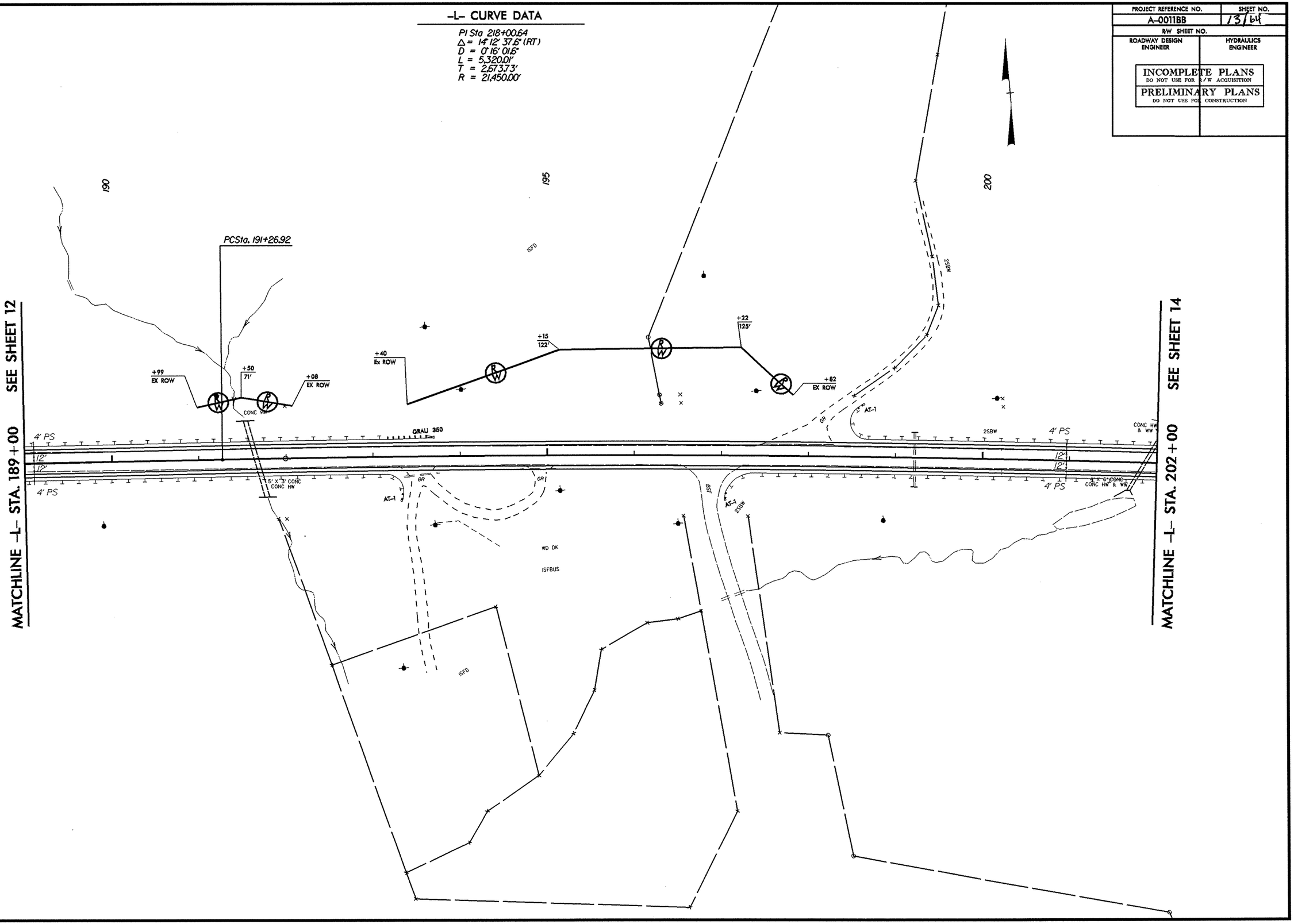
PROJECT REFERENCE NO.	SHEET NO.
A-0011BB	13/64
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

-L- CURVE DATA

PI Sta 218+00.64
Δ = 14° 12' 37.6" (RT)
D = 0° 16' 01.6"
L = 5,320.01'
T = 2,673.73'
R = 21,450.00'



8/17/99

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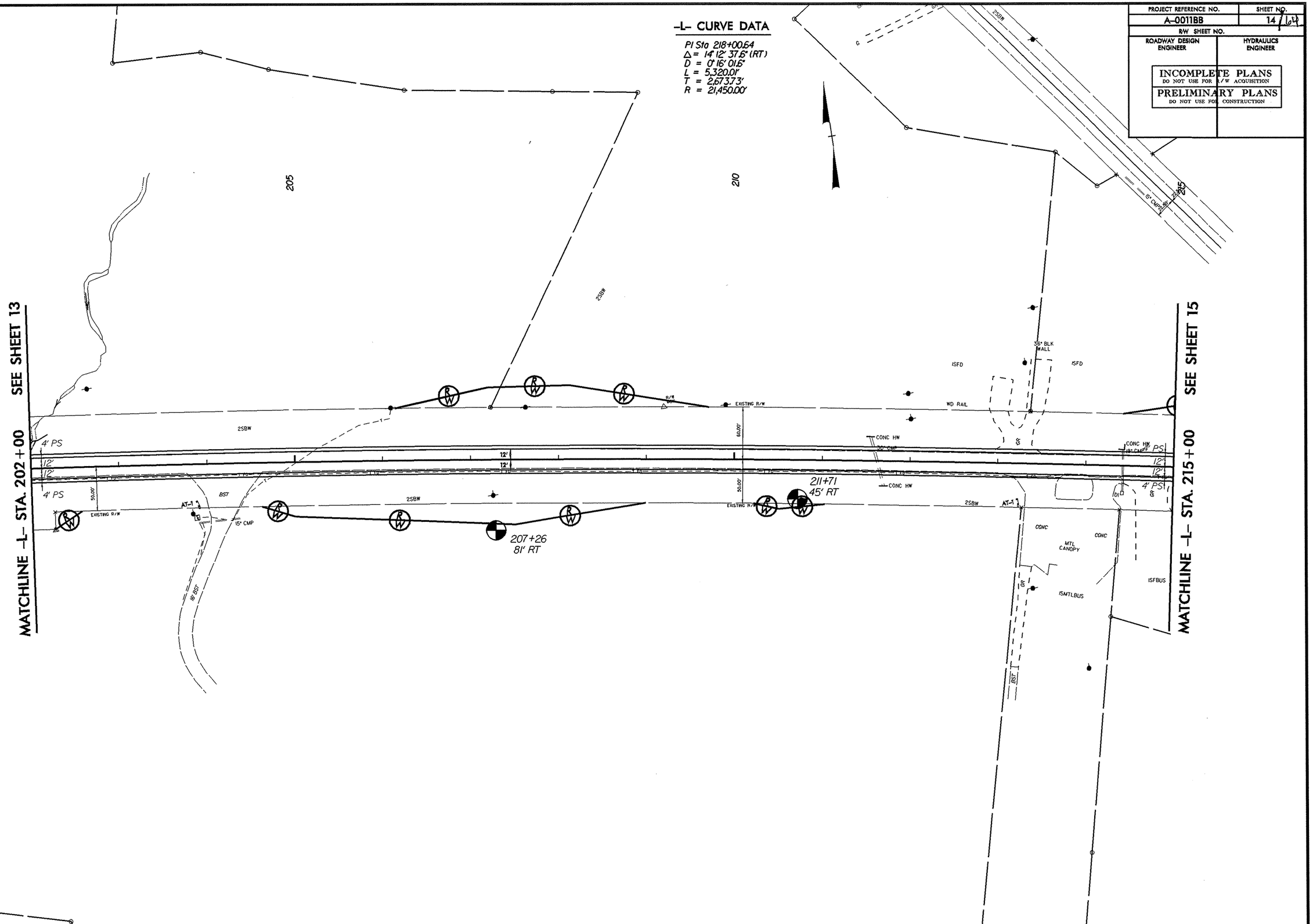
User: gt1

8/17/99

PROJECT REFERENCE NO.	SHEET NO.
A-0011BB	14/64
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



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kubne
A1 11x17 PLOTTER

PROJECT REFERENCE NO.	SHEET NO.
A-0011BB	15/64
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

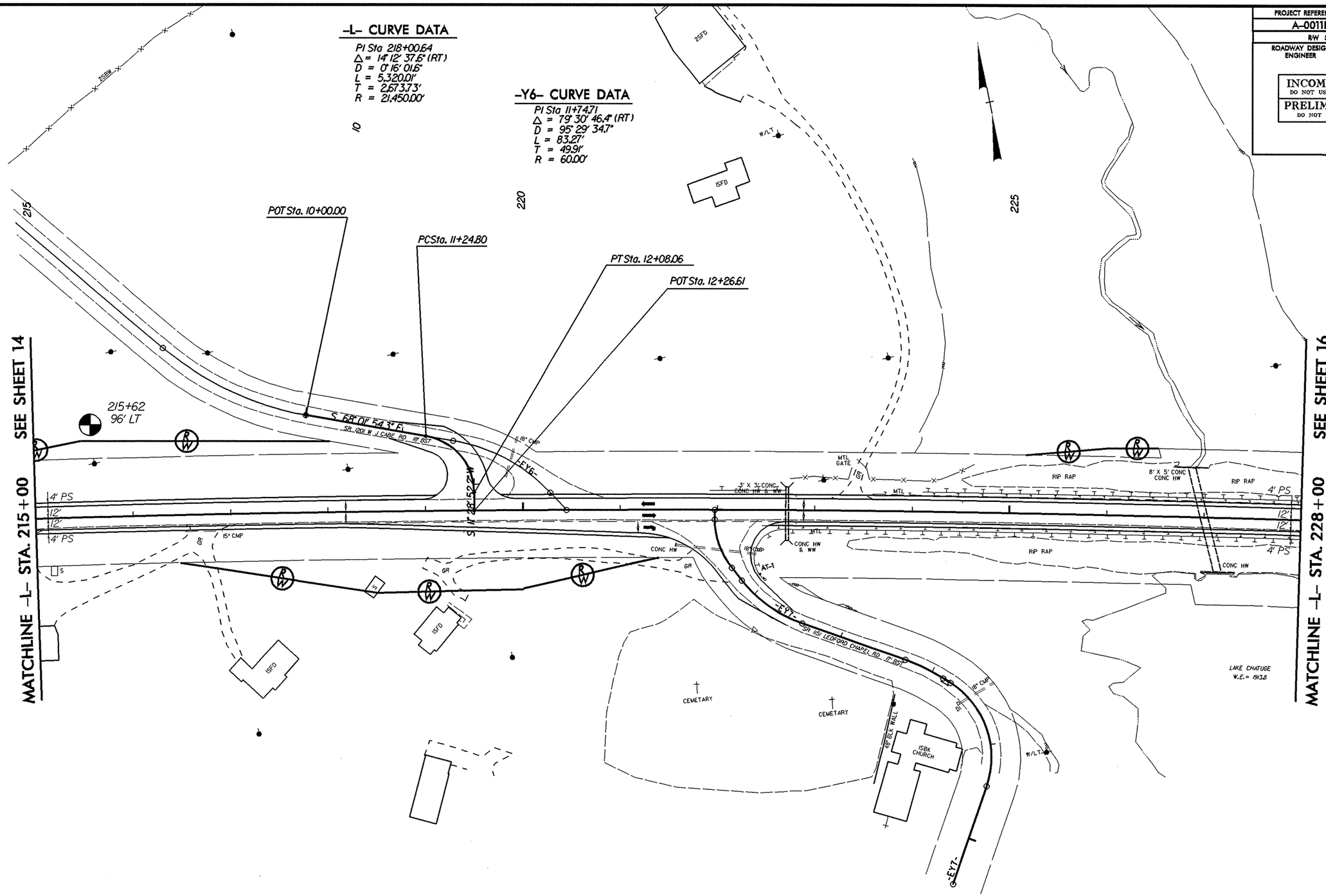
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

-L- CURVE DATA

PI Sta 218+00.64
Δ = 14° 12' 37.6" (RT)
D = 0° 16' 01.6"
L = 5,320.01'
T = 2,673.73'
R = 21,450.00'

-Y6- CURVE DATA

PI Sta 11+74.71
Δ = 79° 30' 46.4" (RT)
D = 95° 29' 34.7"
L = 83.27'
T = 49.91'
R = 60.00'



-Y7- CURVE DATA

PI Sta 10+38.33	PI Sta 11+20.43	PI Sta 12+91.65	PI Sta 13+93.76
Δ = 38° 58' 06.5" (LT)	Δ = 31° 31' 59.7" (LT)	Δ = 12° 23' 05.2" (RT)	Δ = 77° 11' 59.8" (RT)
D = 71° 37' 11.0"	D = 40° 55' 32.0"	D = 28° 38' 52.4"	D = 63° 39' 43.5"
L = 54.41'	L = 77.05'	L = 43.23'	L = 121.27'
T = 28.30'	T = 39.53'	T = 21.70'	T = 71.85'
R = 80.00'	R = 140.00'	R = 200.00'	R = 90.00'

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04-JAN-2006 10:54
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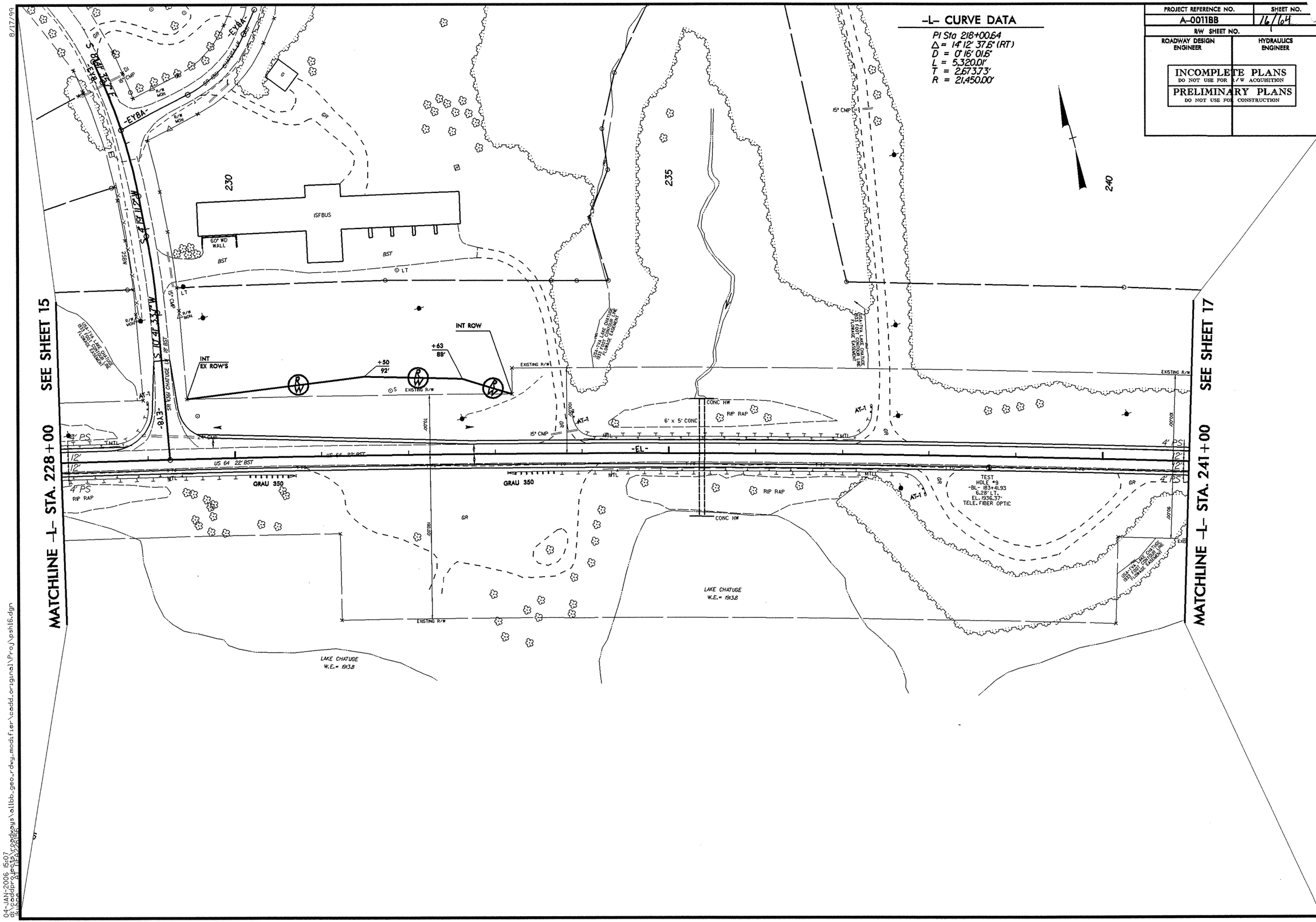
dlinnen

PROJECT REFERENCE NO.	SHEET NO.
A-0011BB	16/64
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



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04-JAN-2006 15:07
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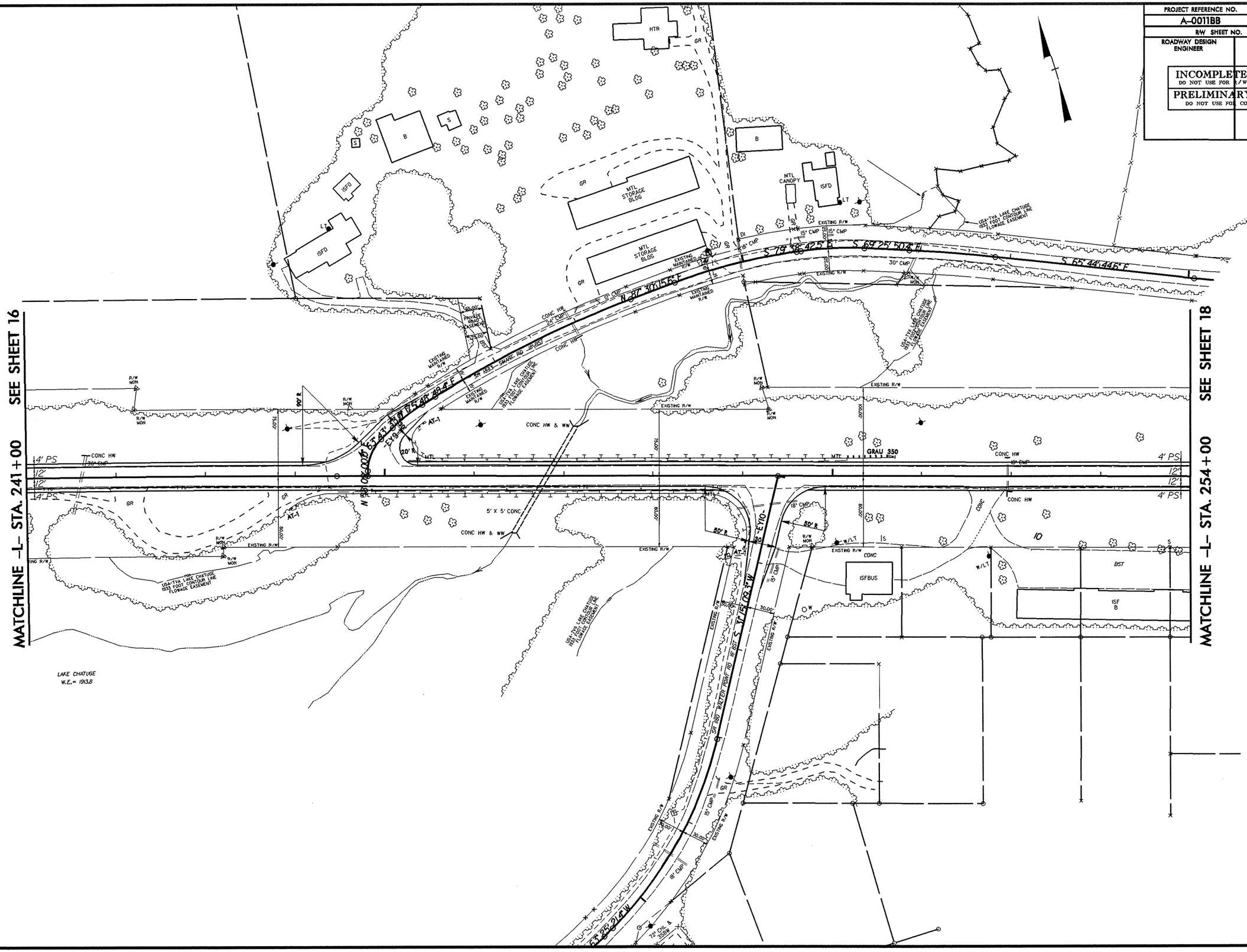
8/17/99

PROJECT REFERENCE NO.	SHEET NO.
A-0011BB	17/69
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



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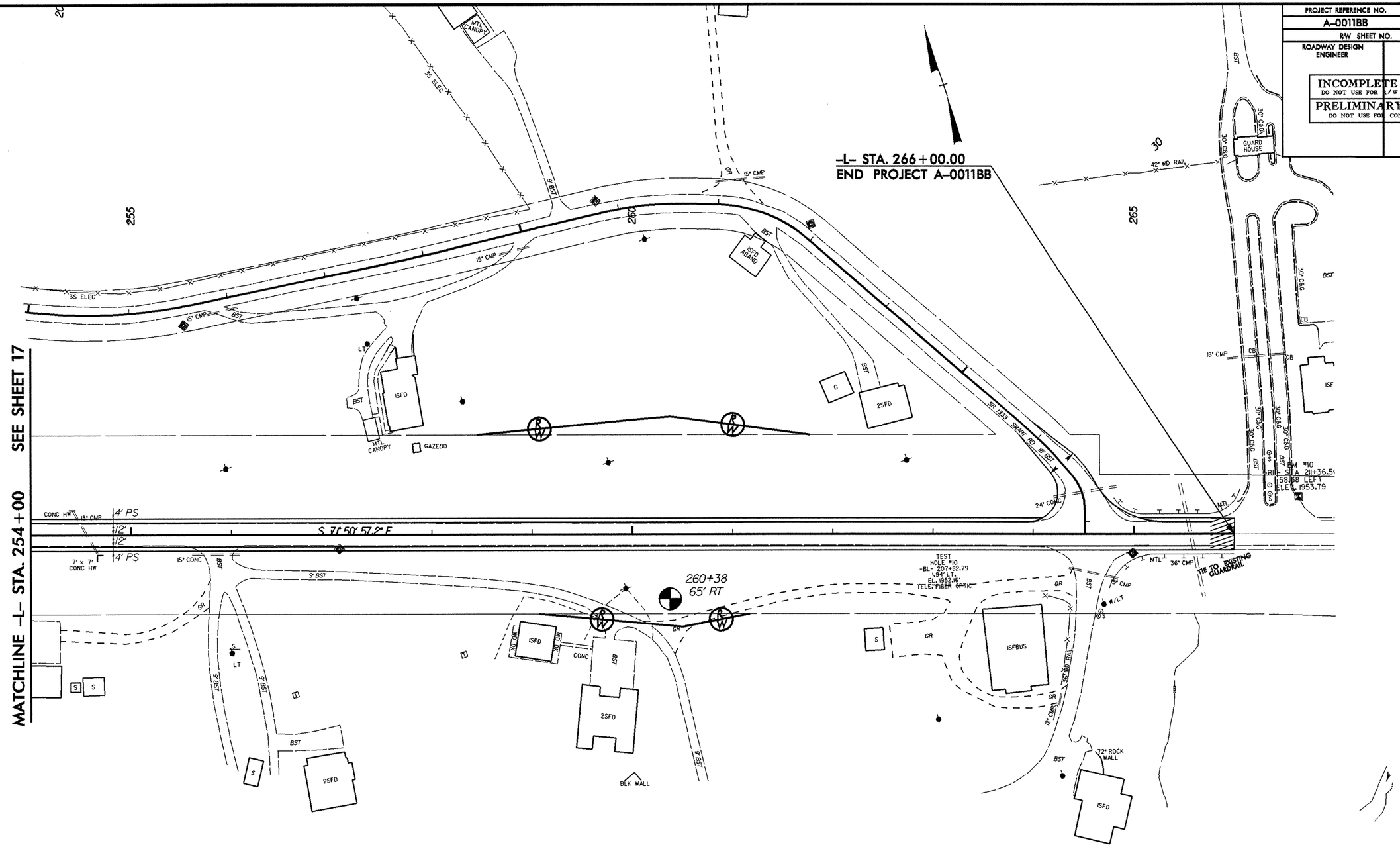
PROJECT REFERENCE NO.	SHEET NO.
A-0011BB	18/64
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION



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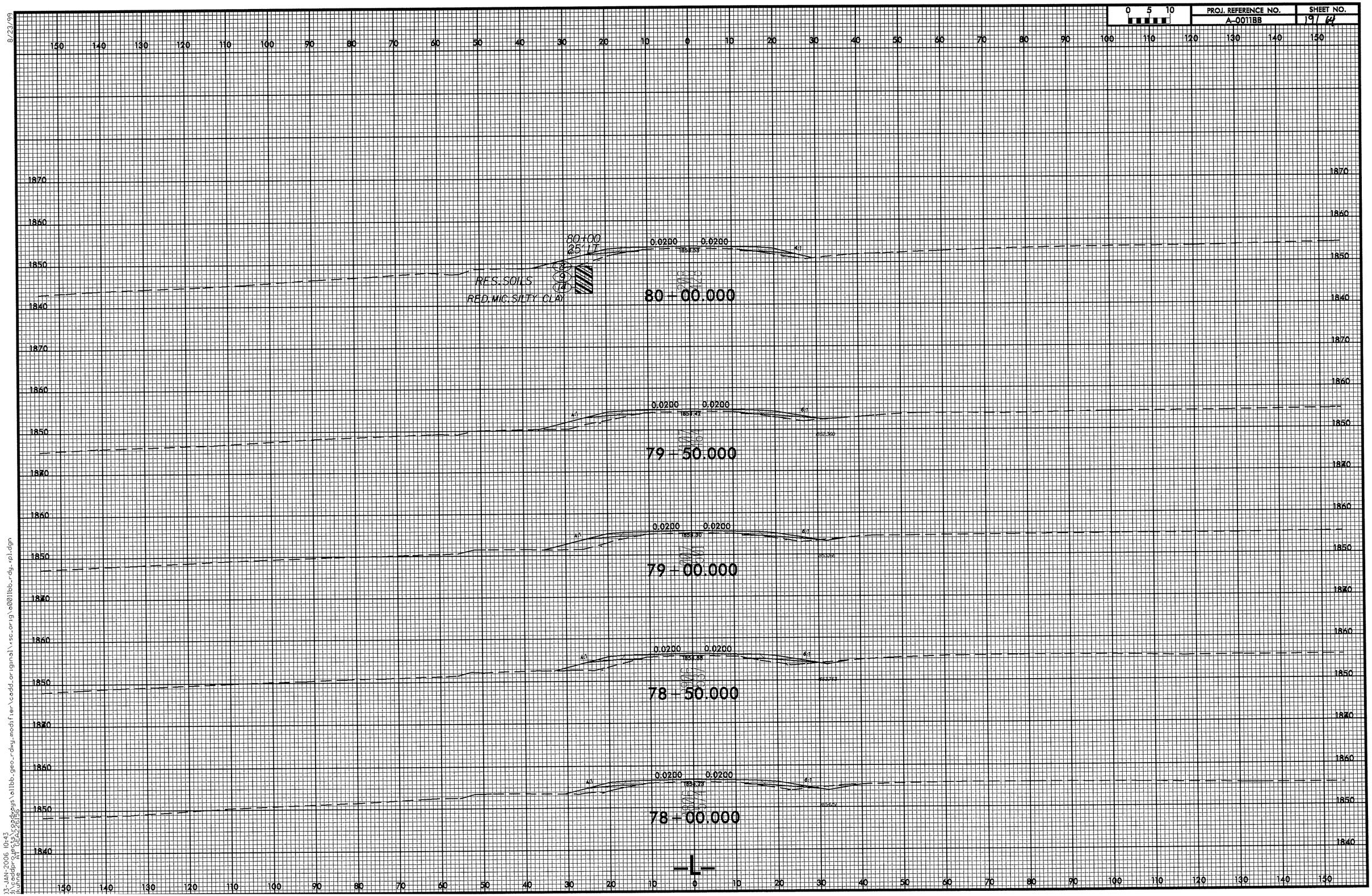

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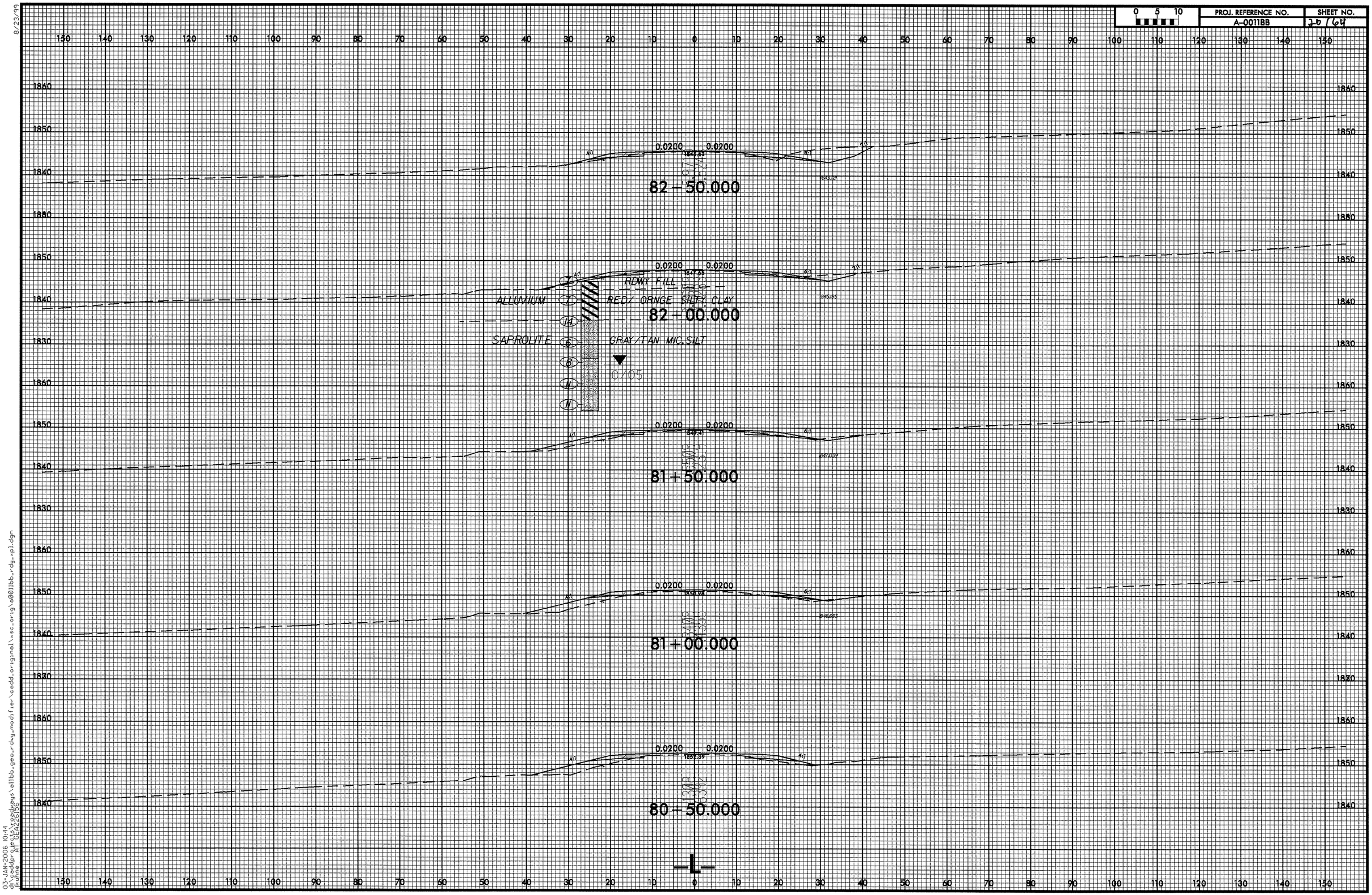
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A-0011BB
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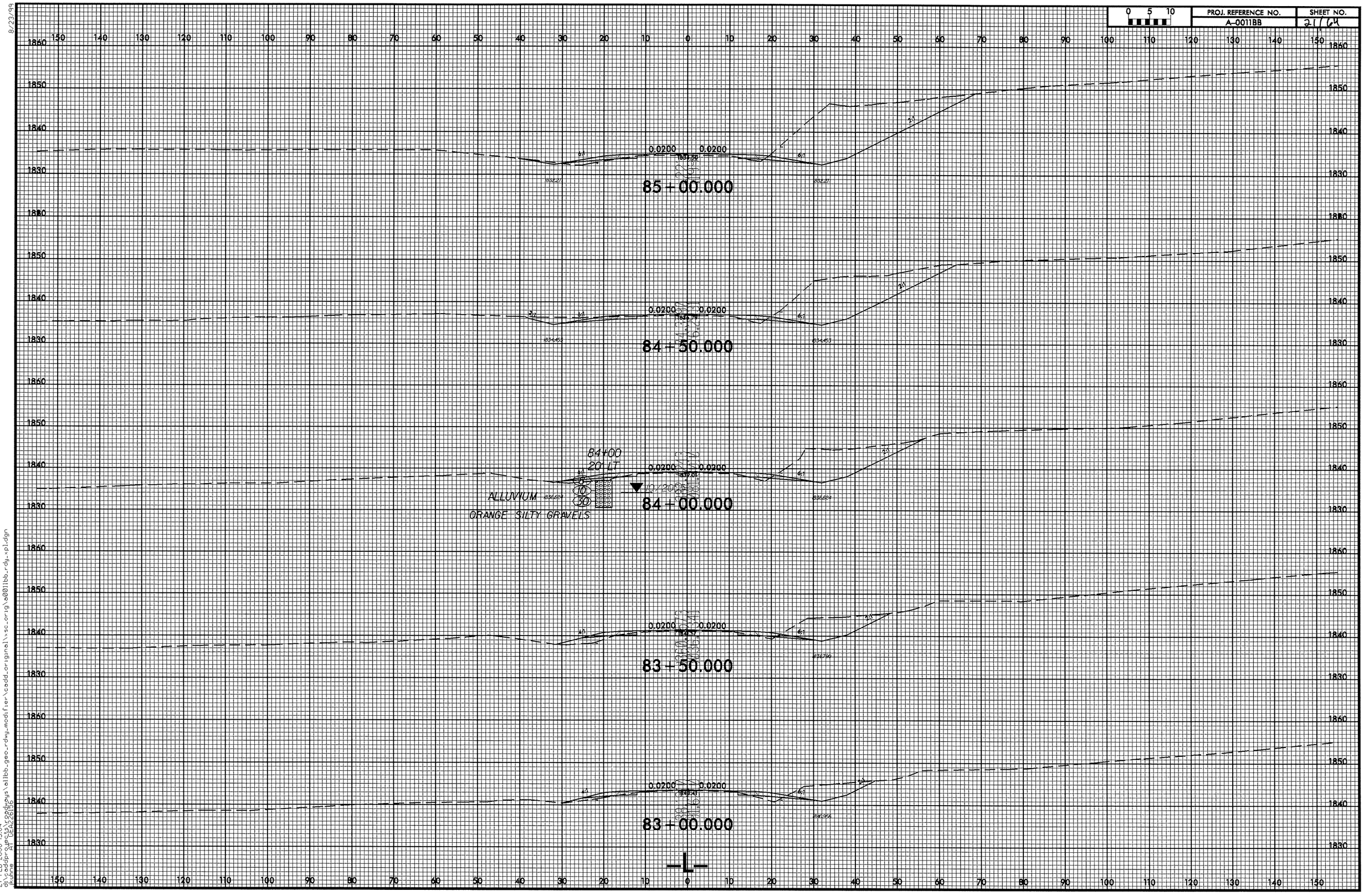
jkuhne



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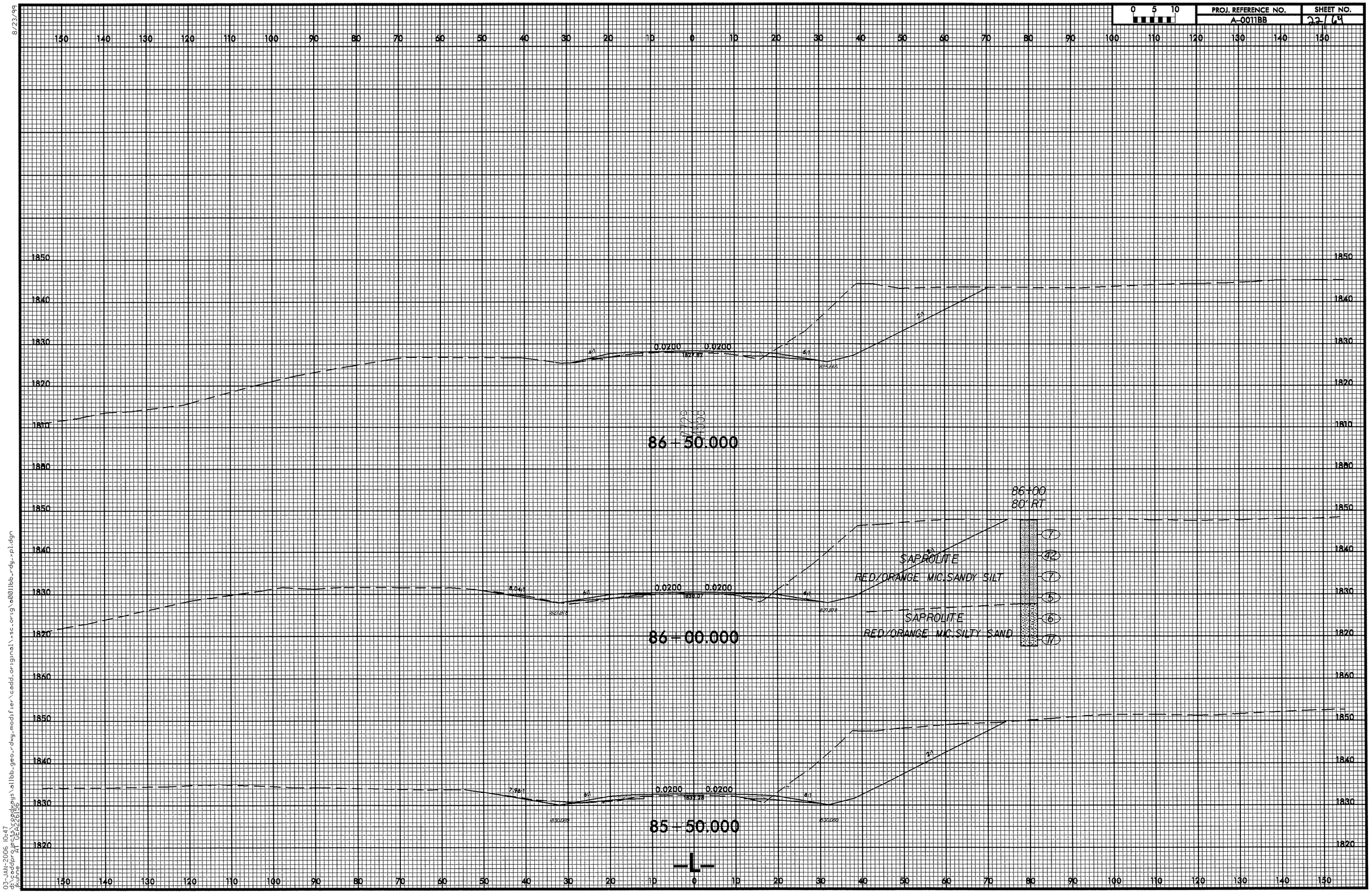
PLANE 2 DEC 2005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jkuhne

8/23/99

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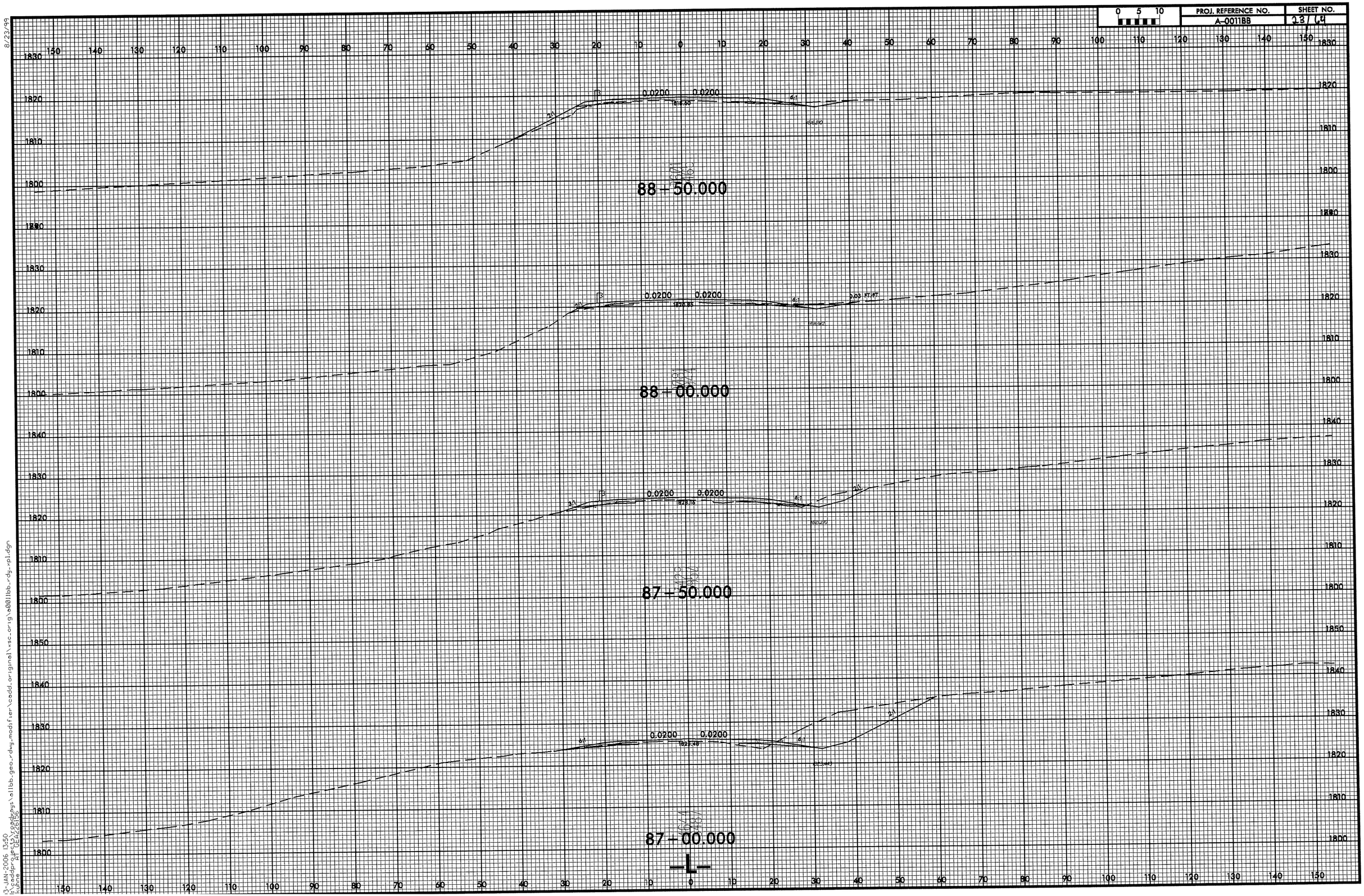

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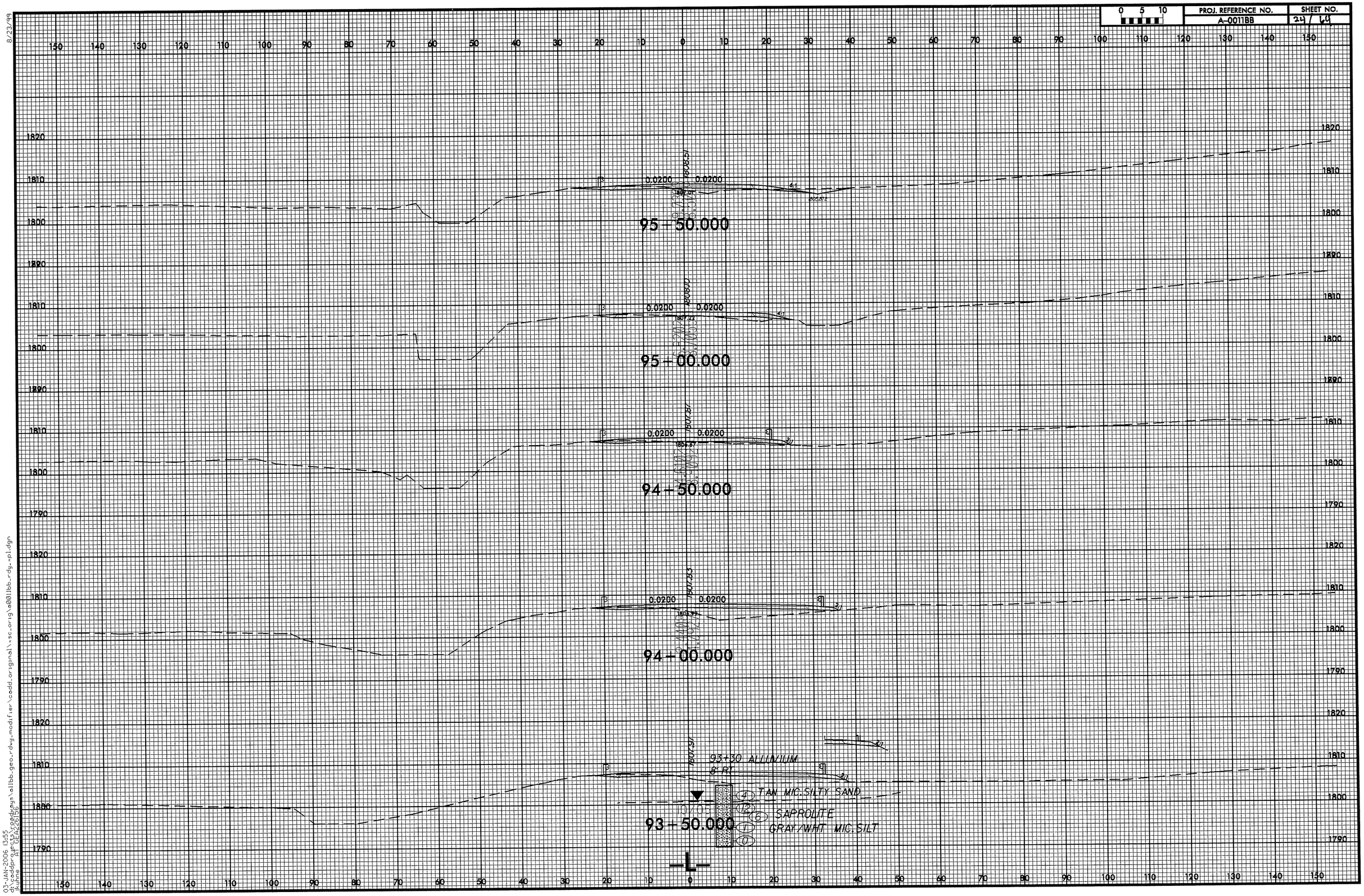
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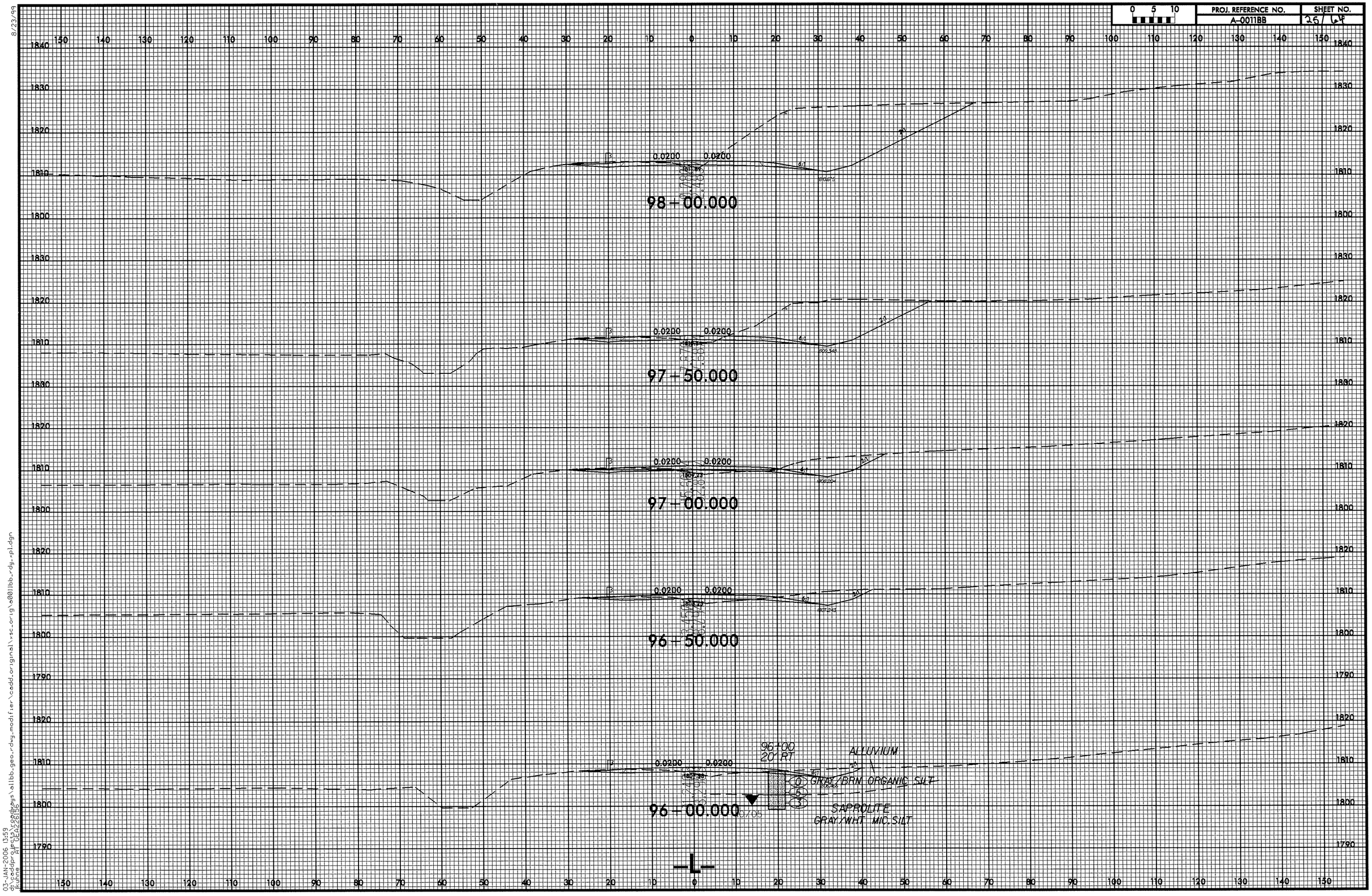

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8/23/99

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
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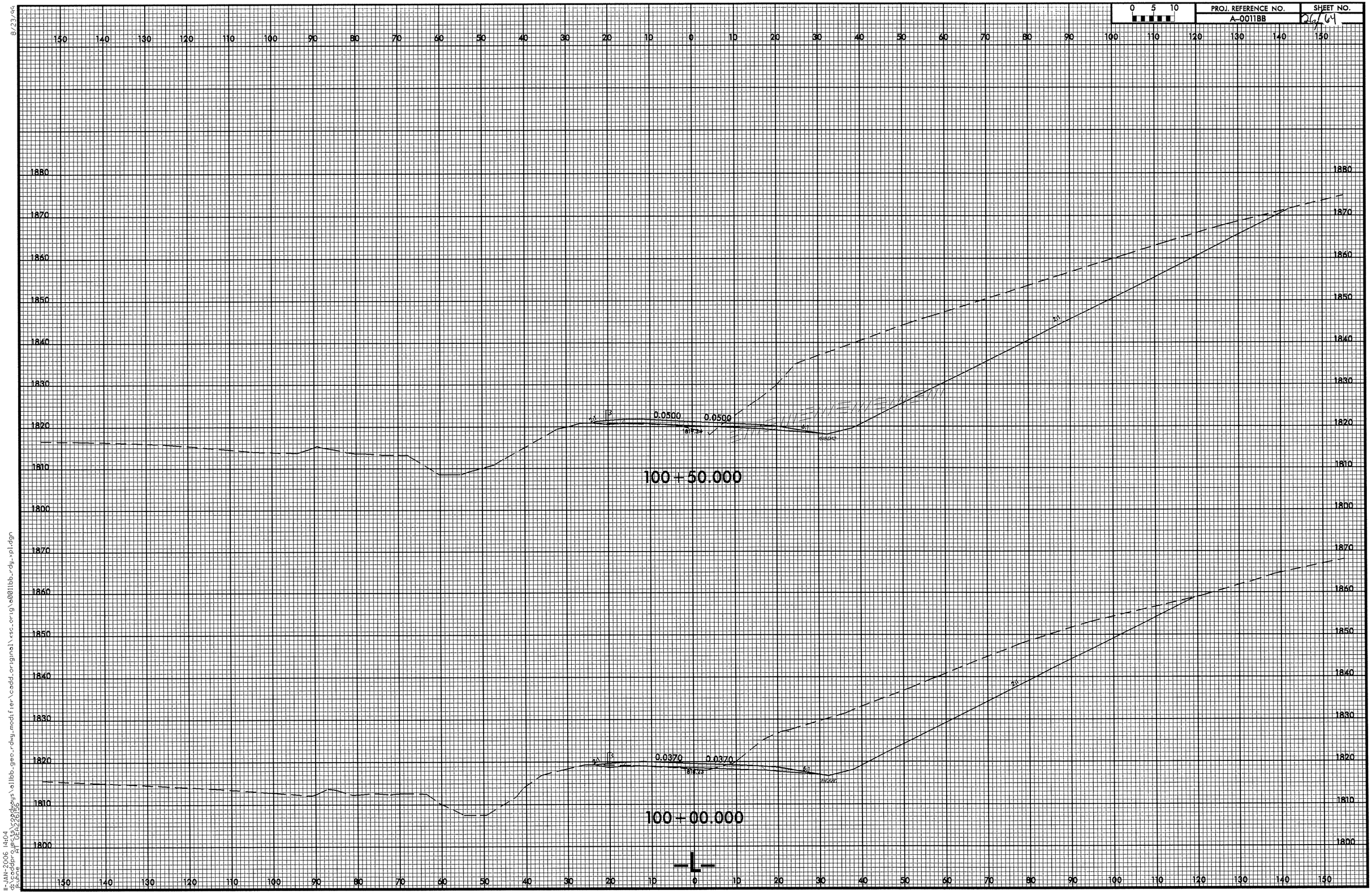

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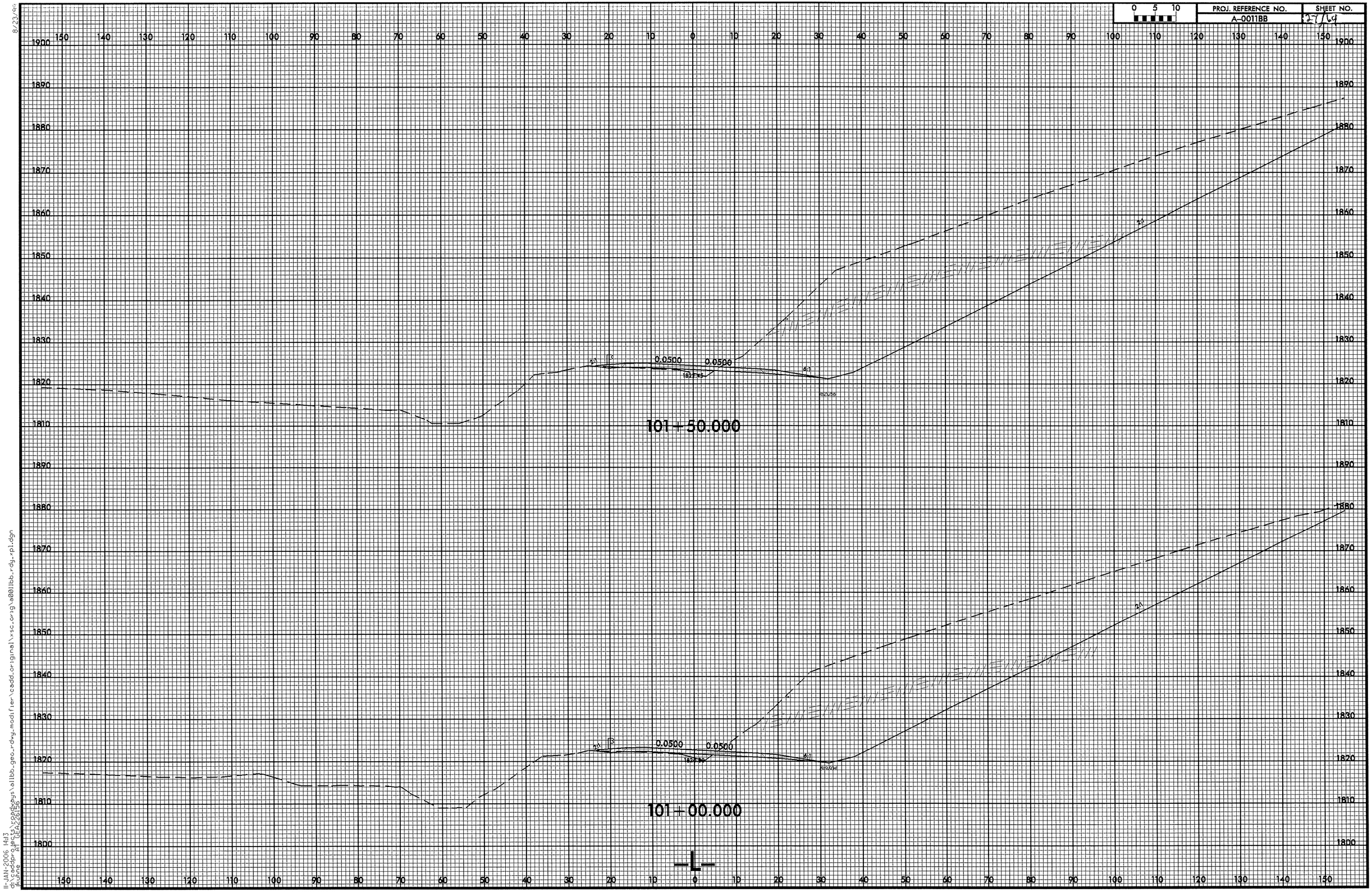

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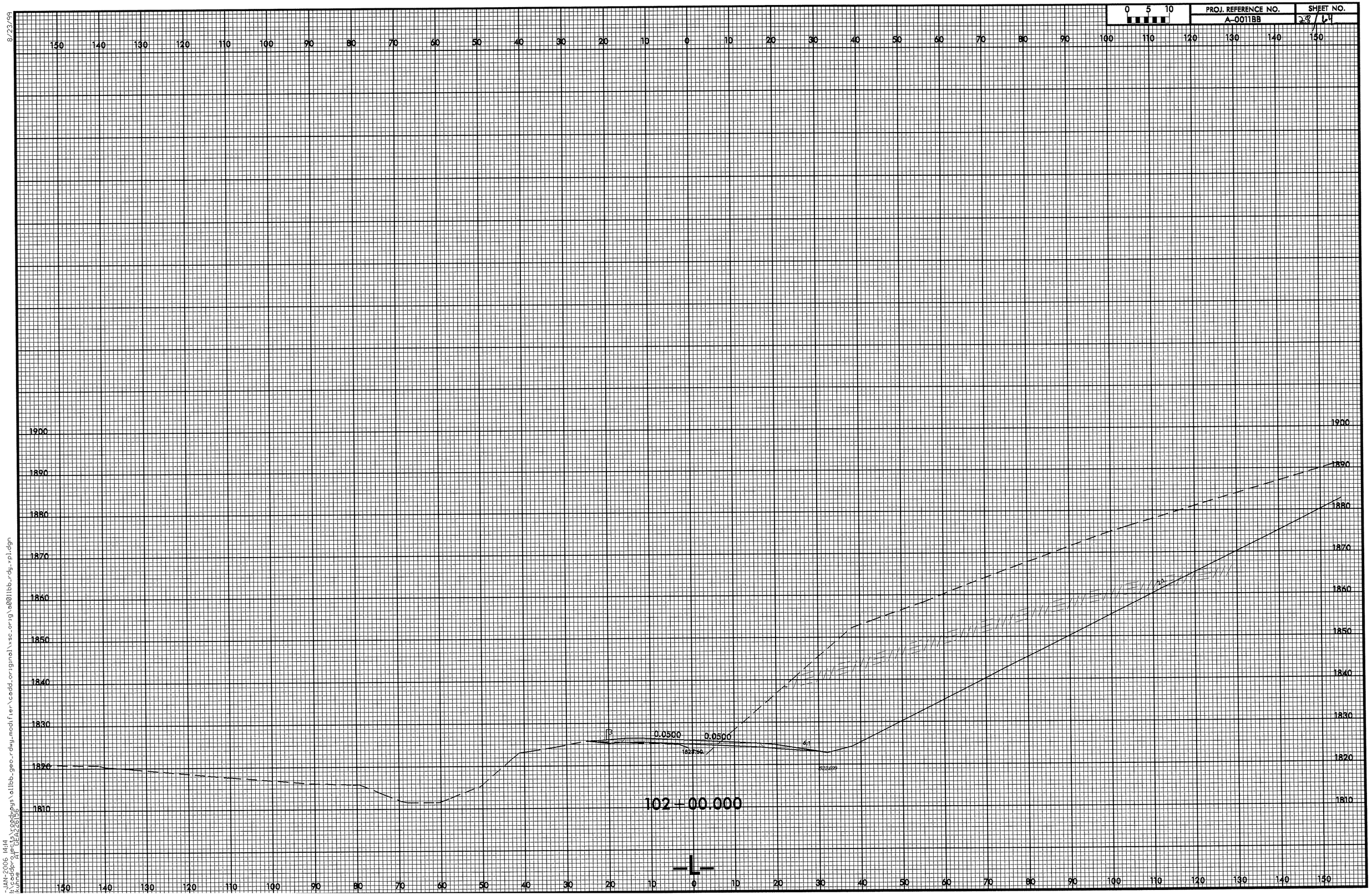

8/23/99

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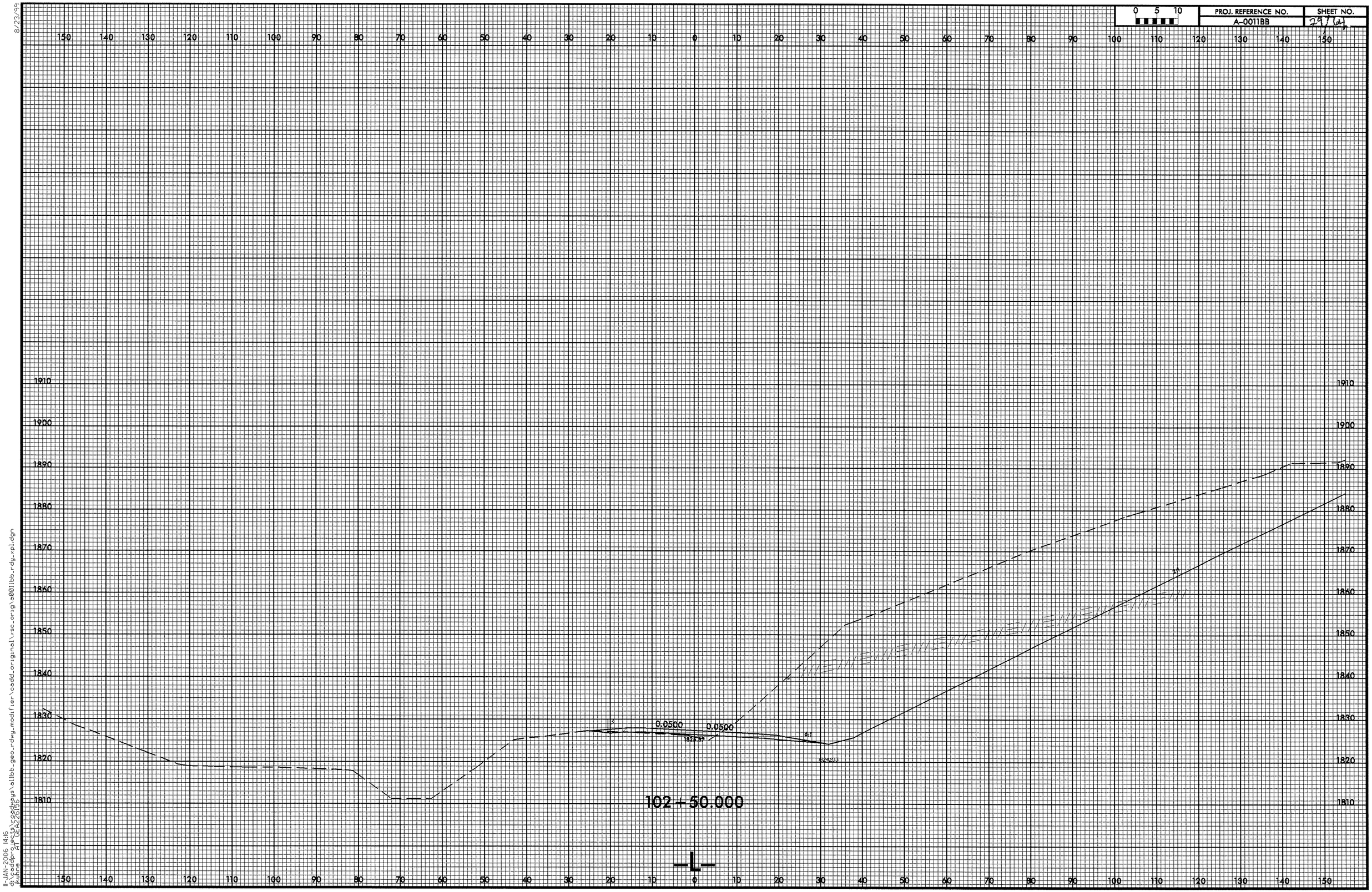

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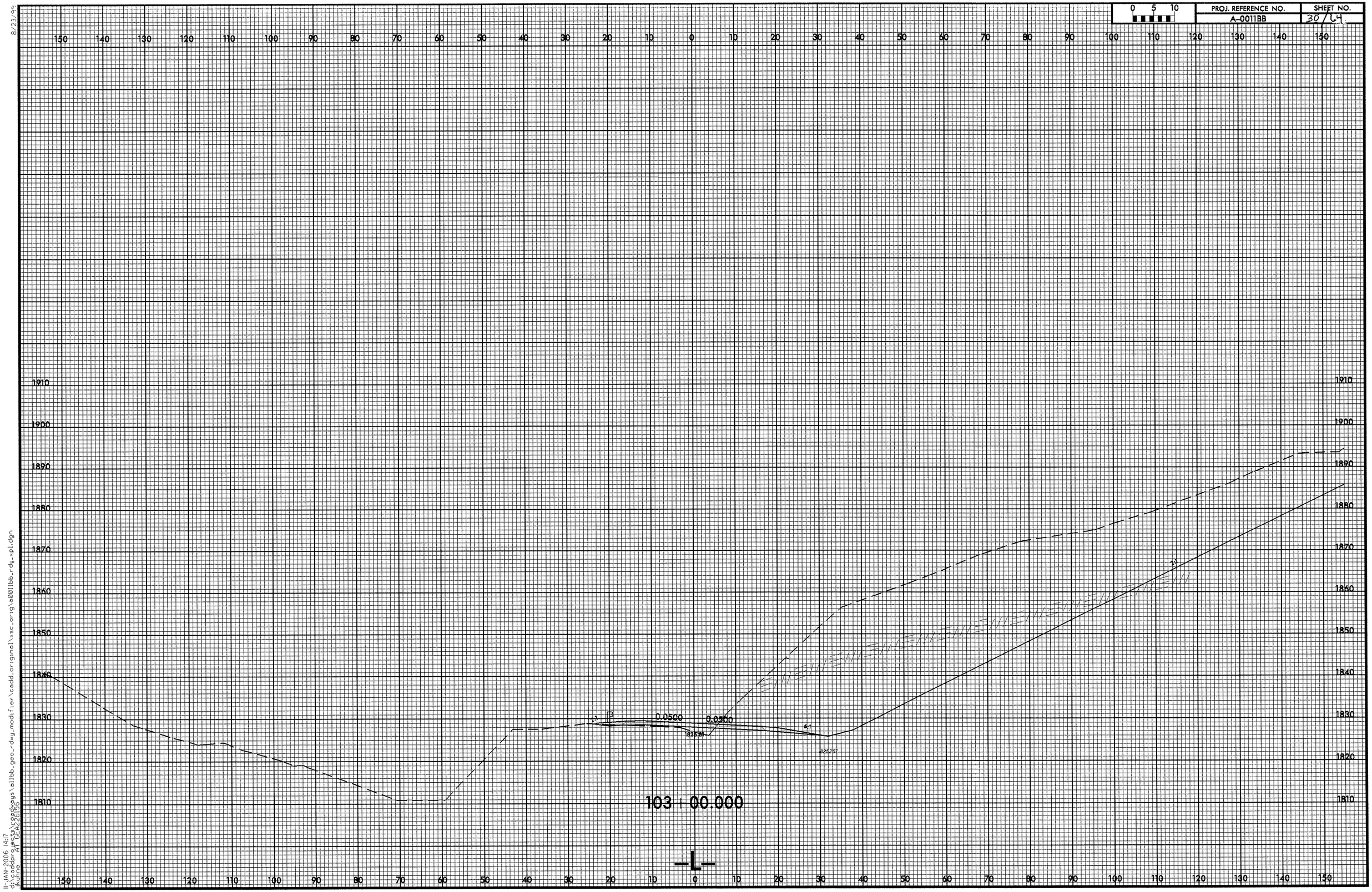

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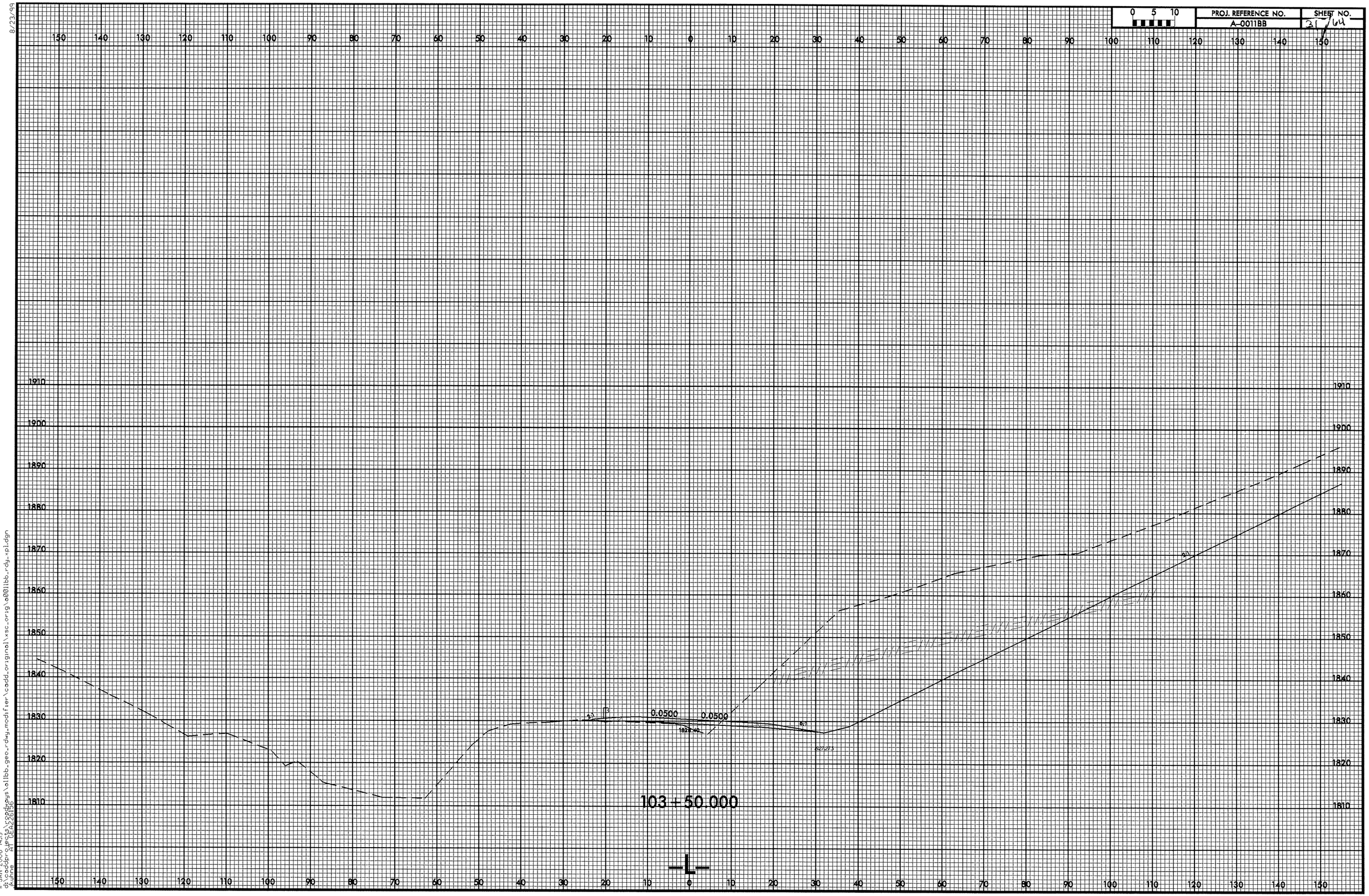
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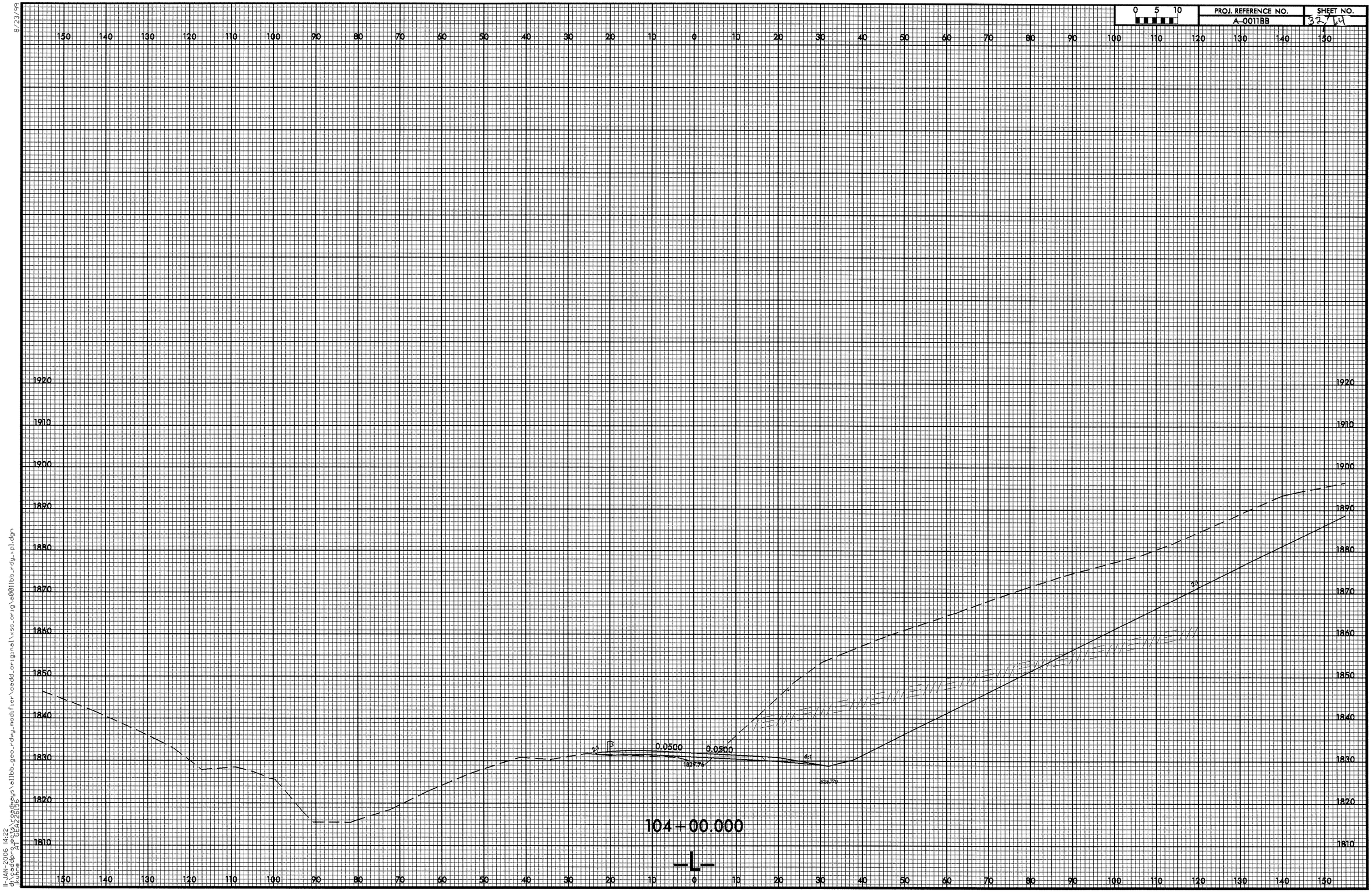

8/23/99

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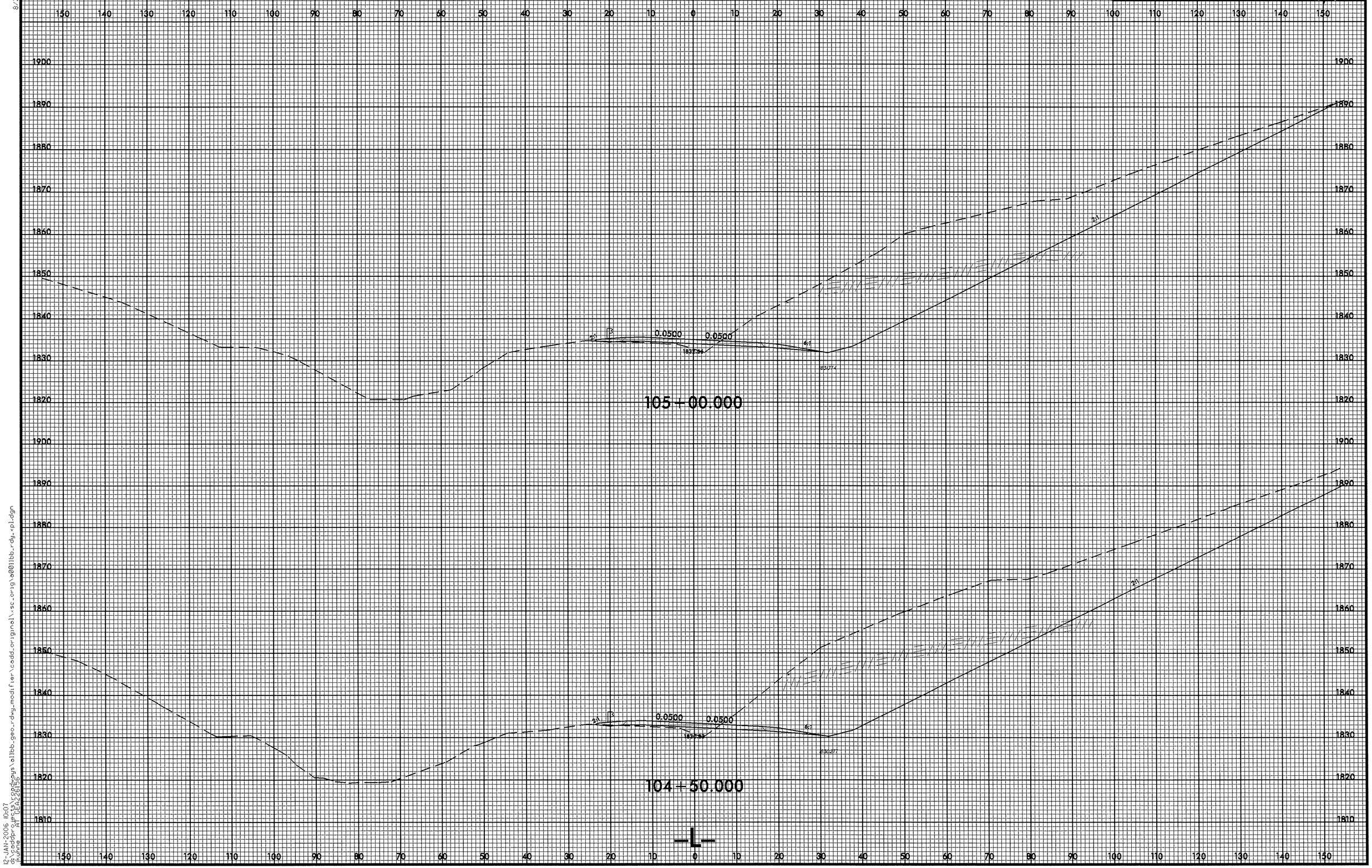

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12-JAN-2006 10:07
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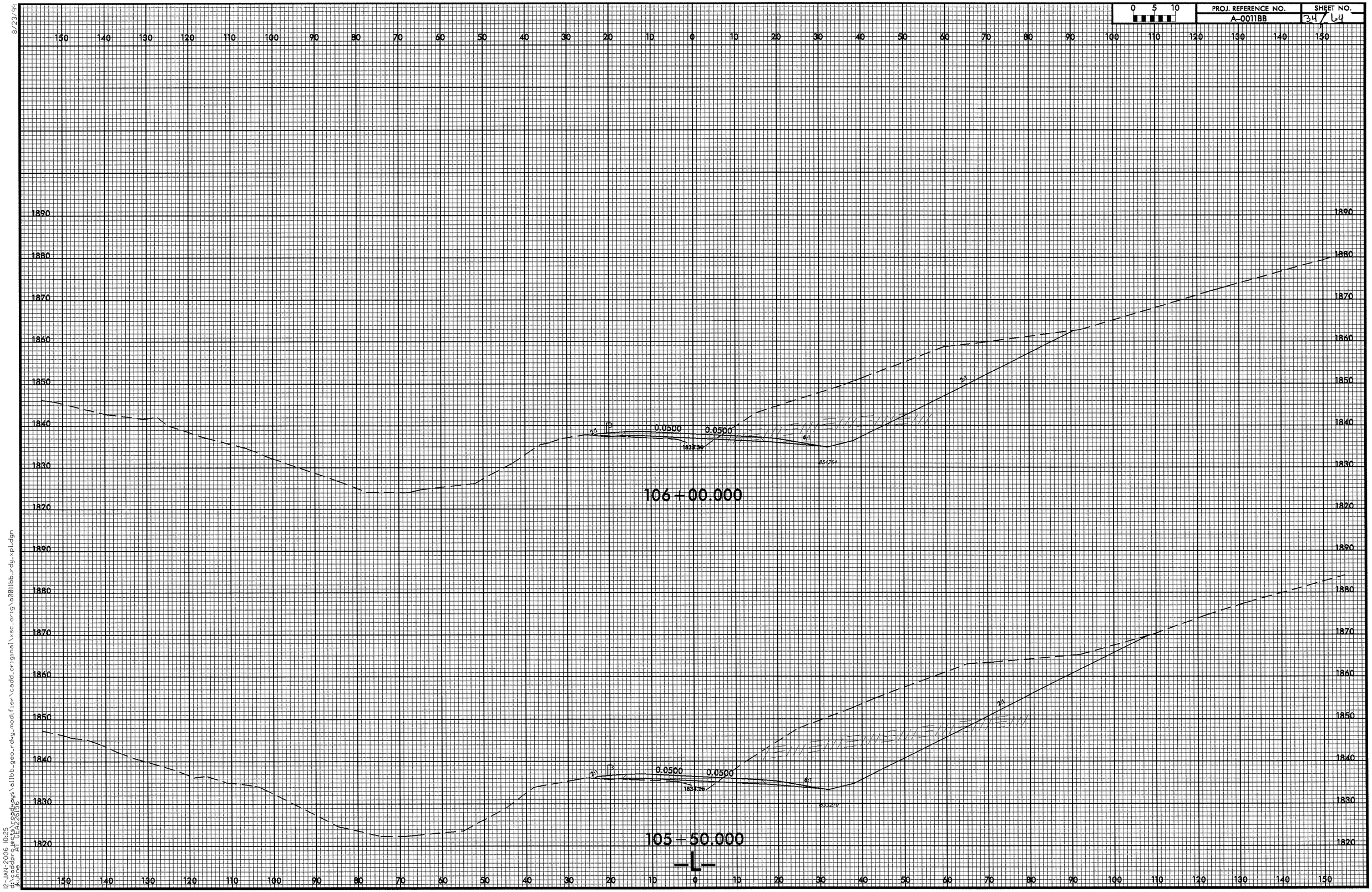

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12-JAN-2006 10:25
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8/23/99

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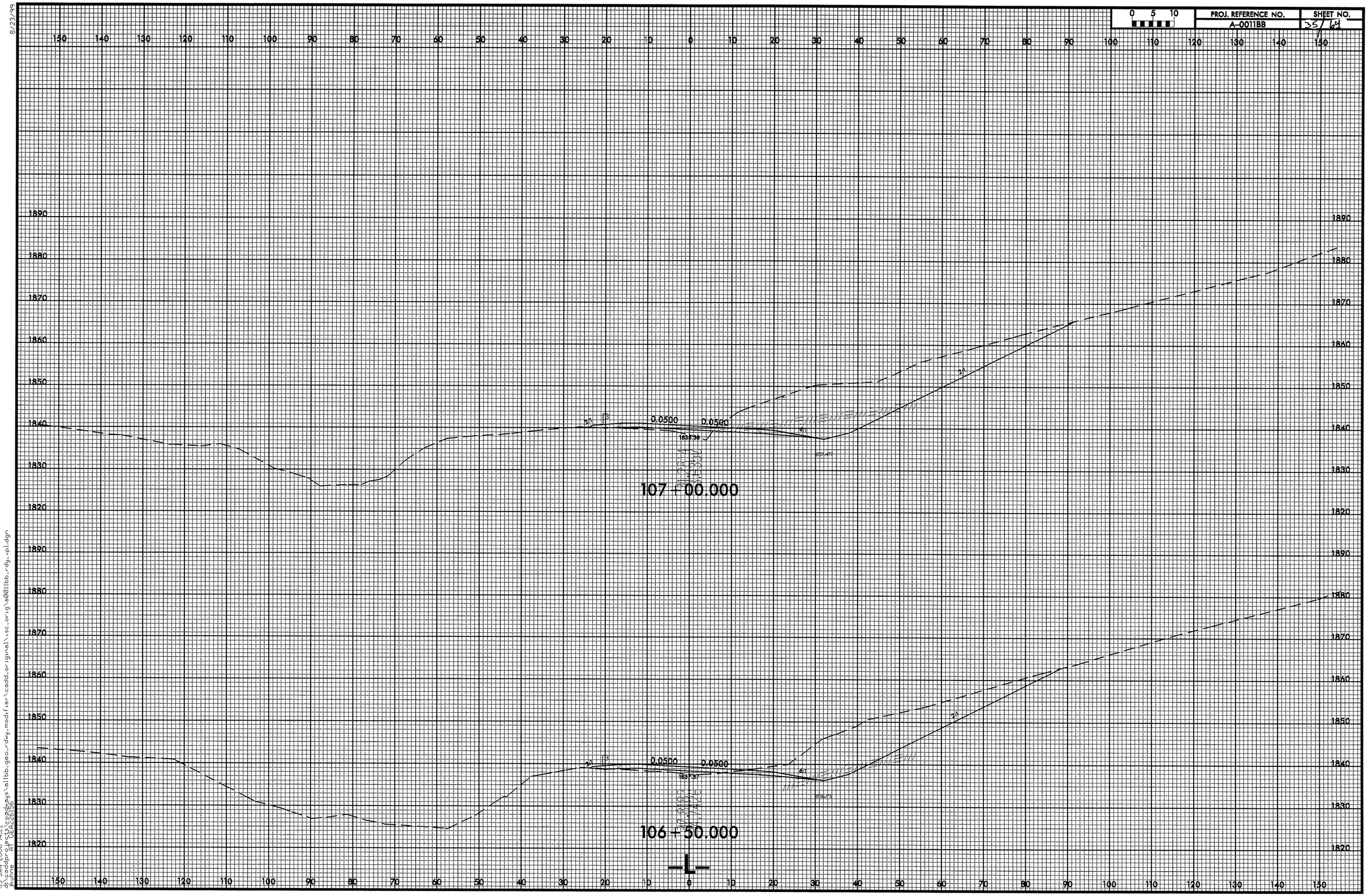

03-JAN-2006 14:22
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8/23/99

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
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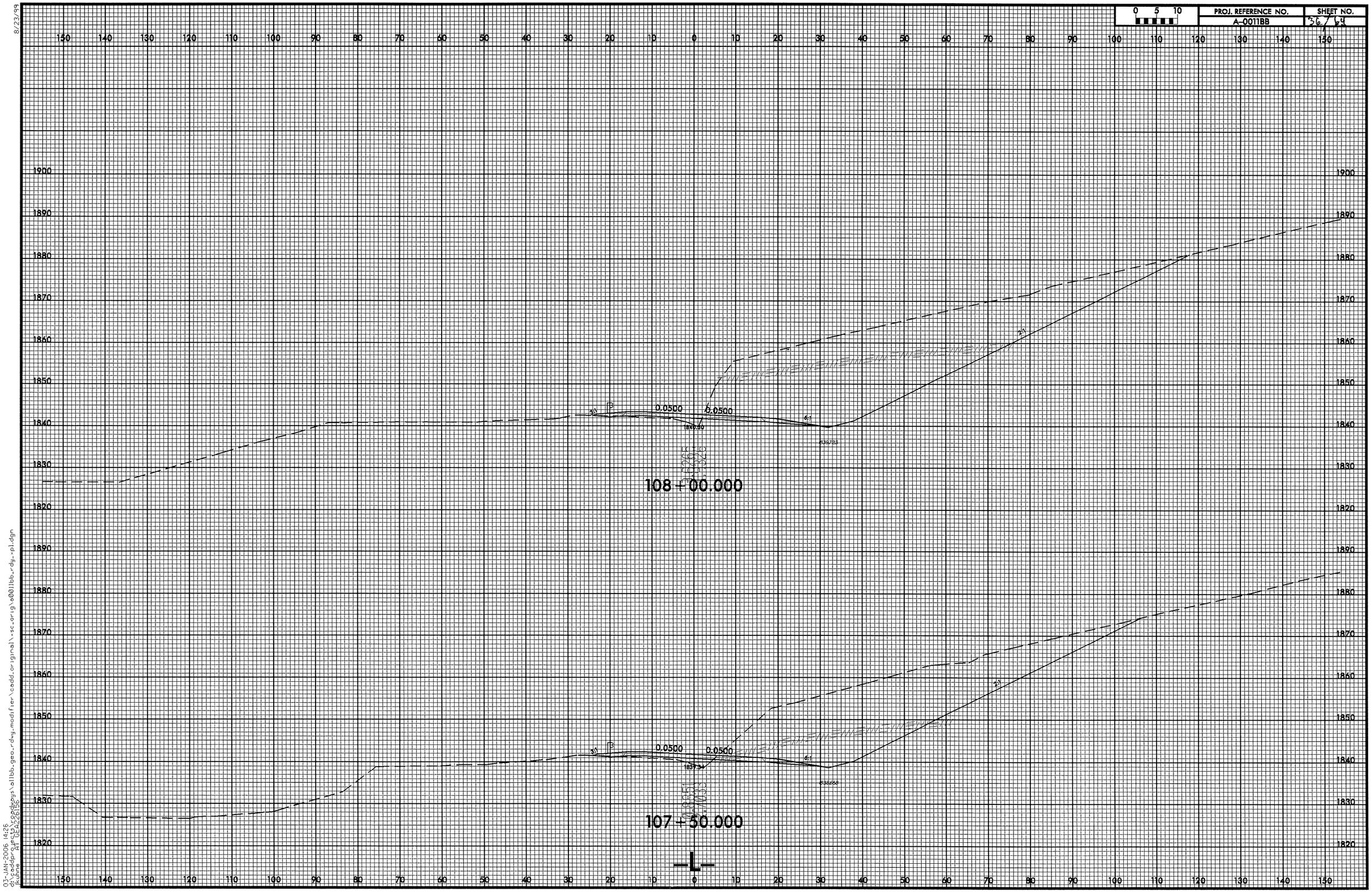

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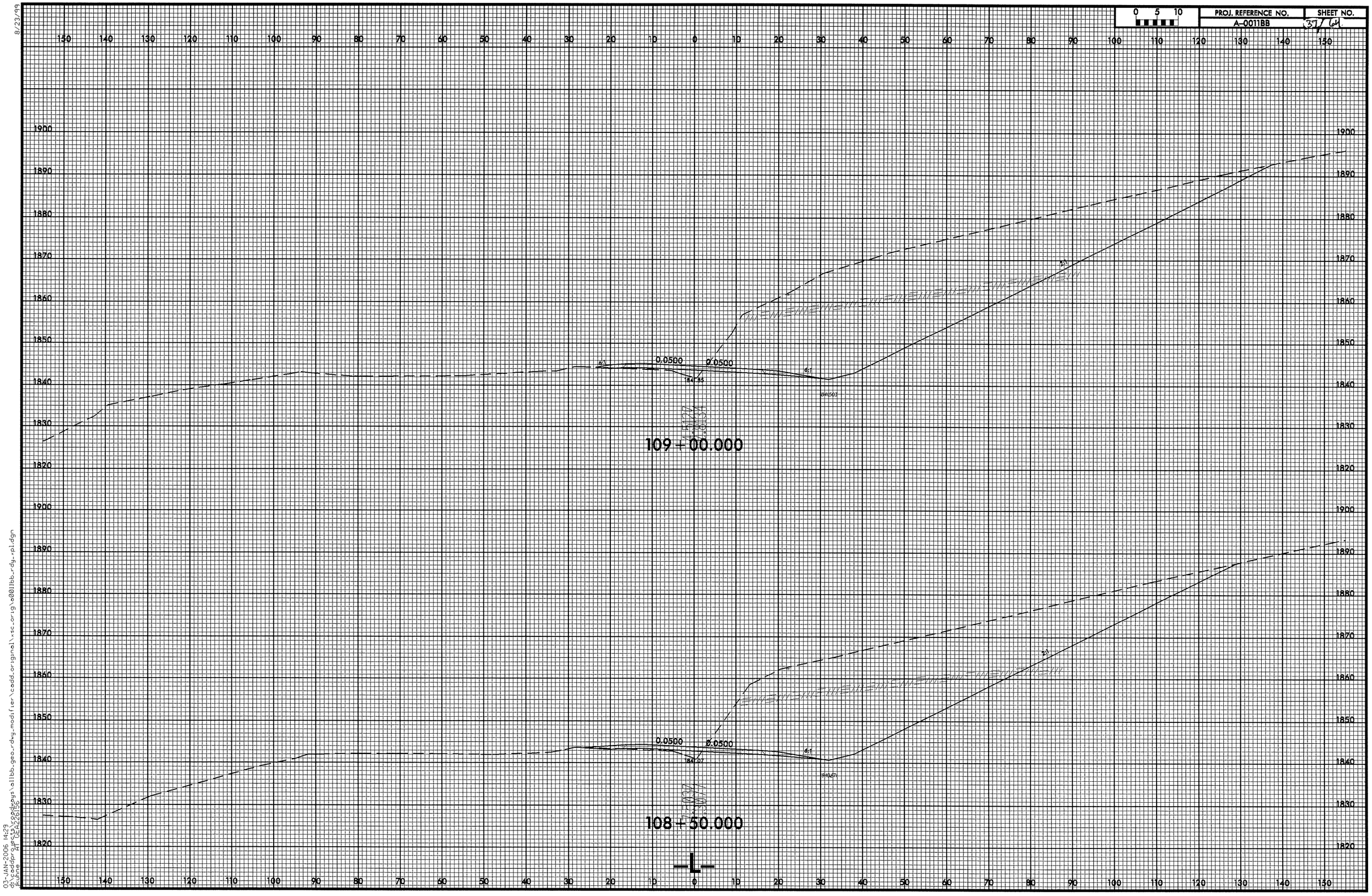
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A-0011BB
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35/64
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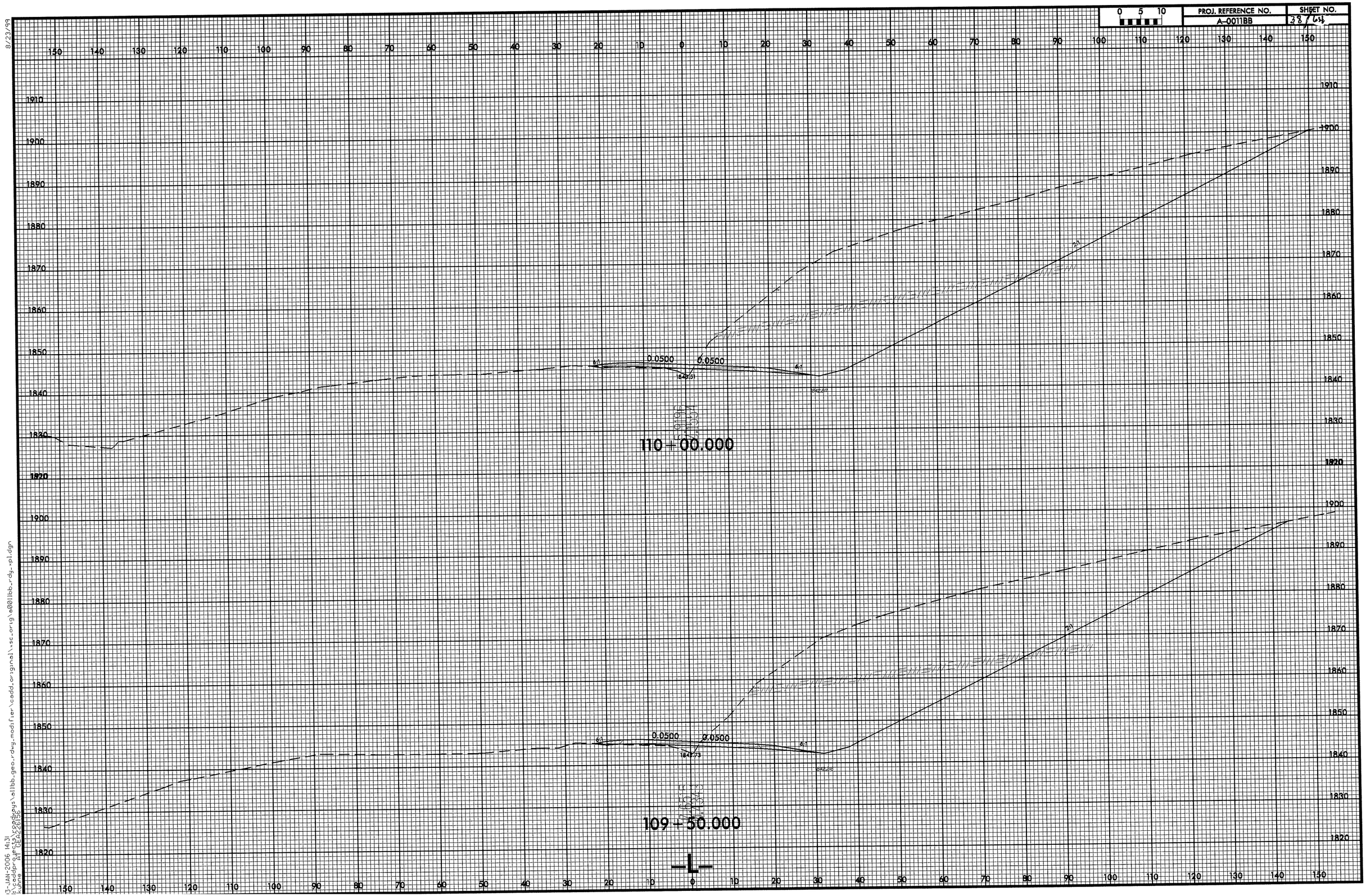
03-JAN-2006 14:29
jkuhne
A-0011bb_rdy_pl.dgn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38 / 65
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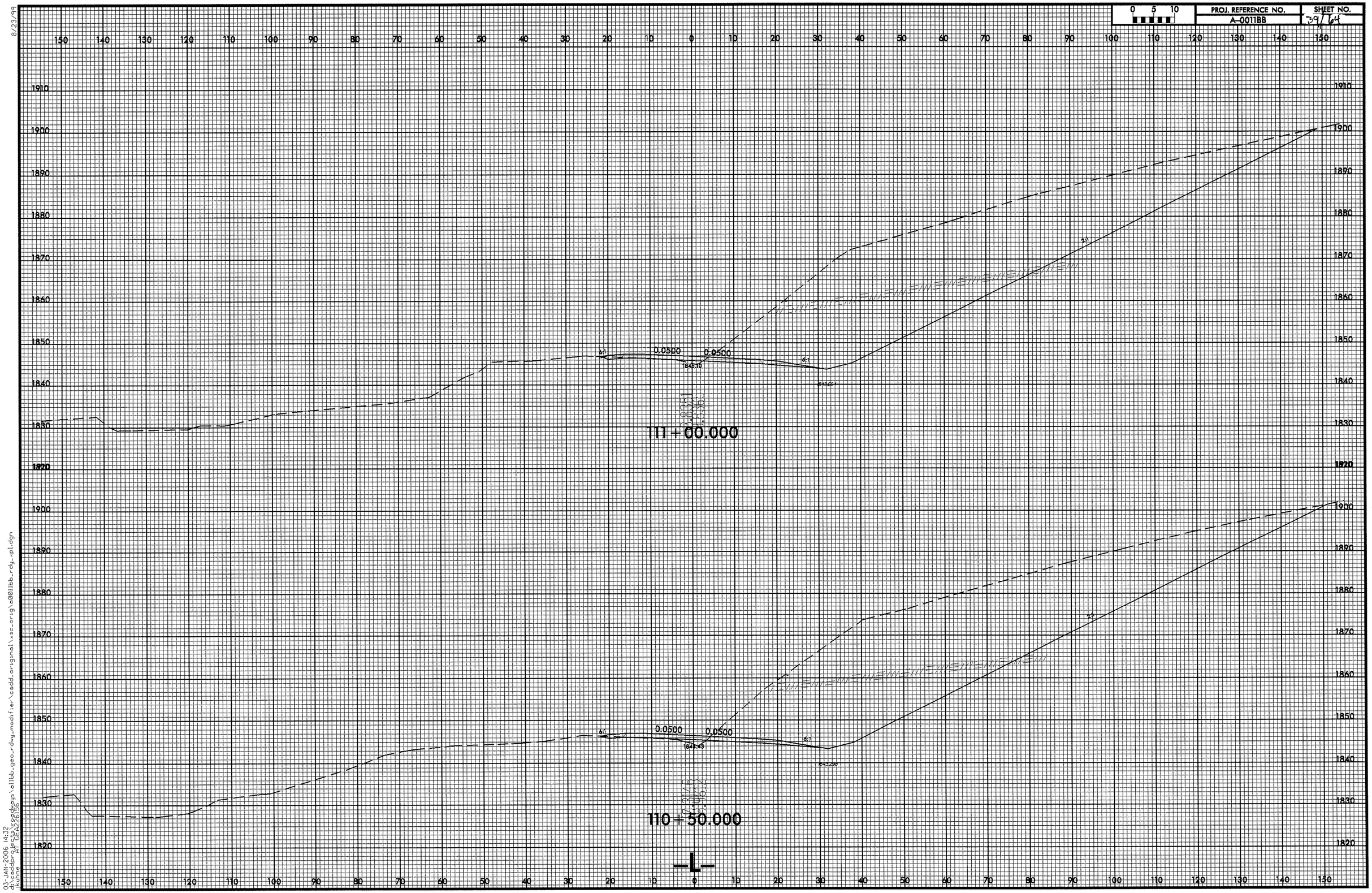
13-JAN-2006 14:31
kuhne



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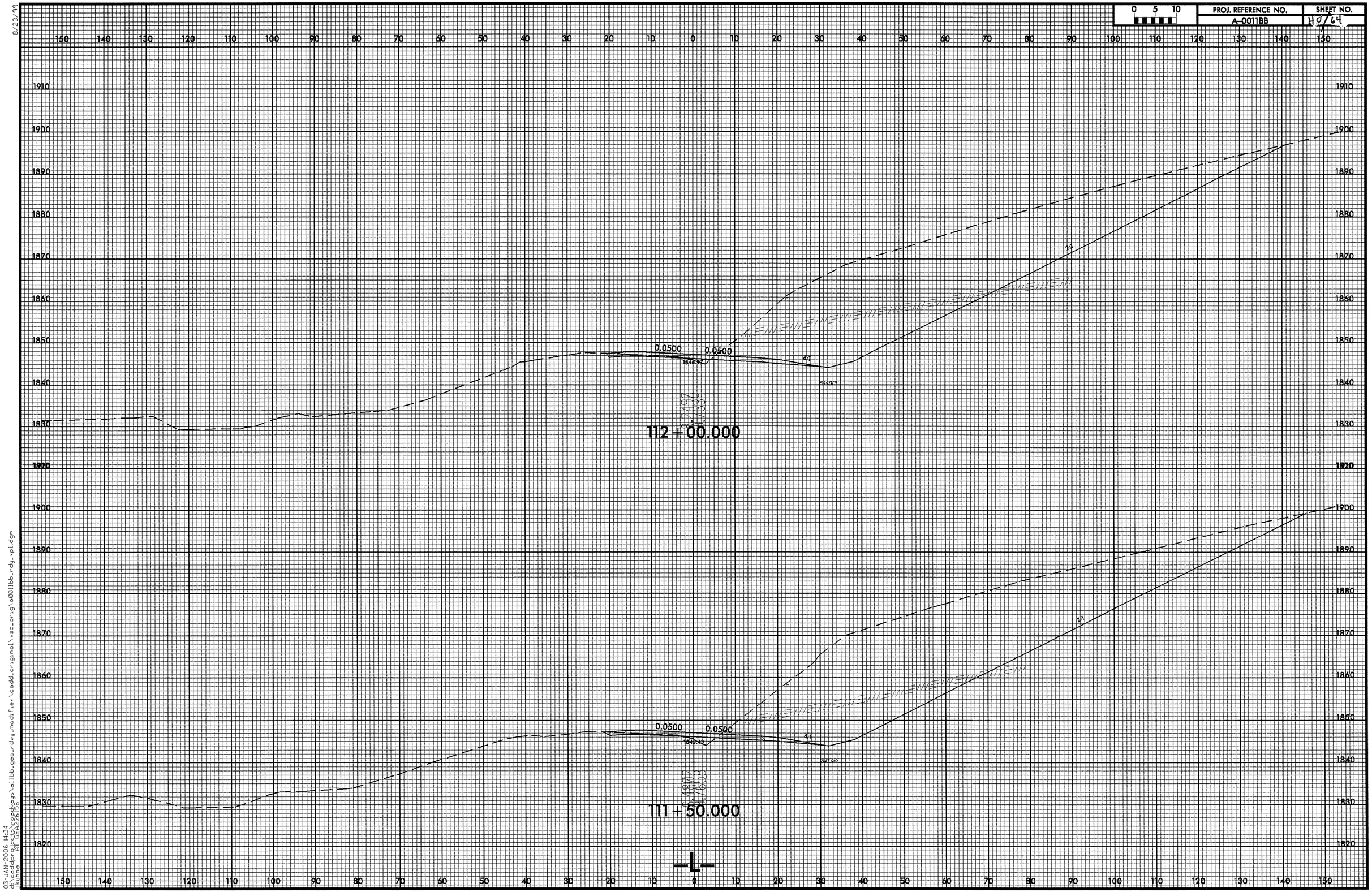

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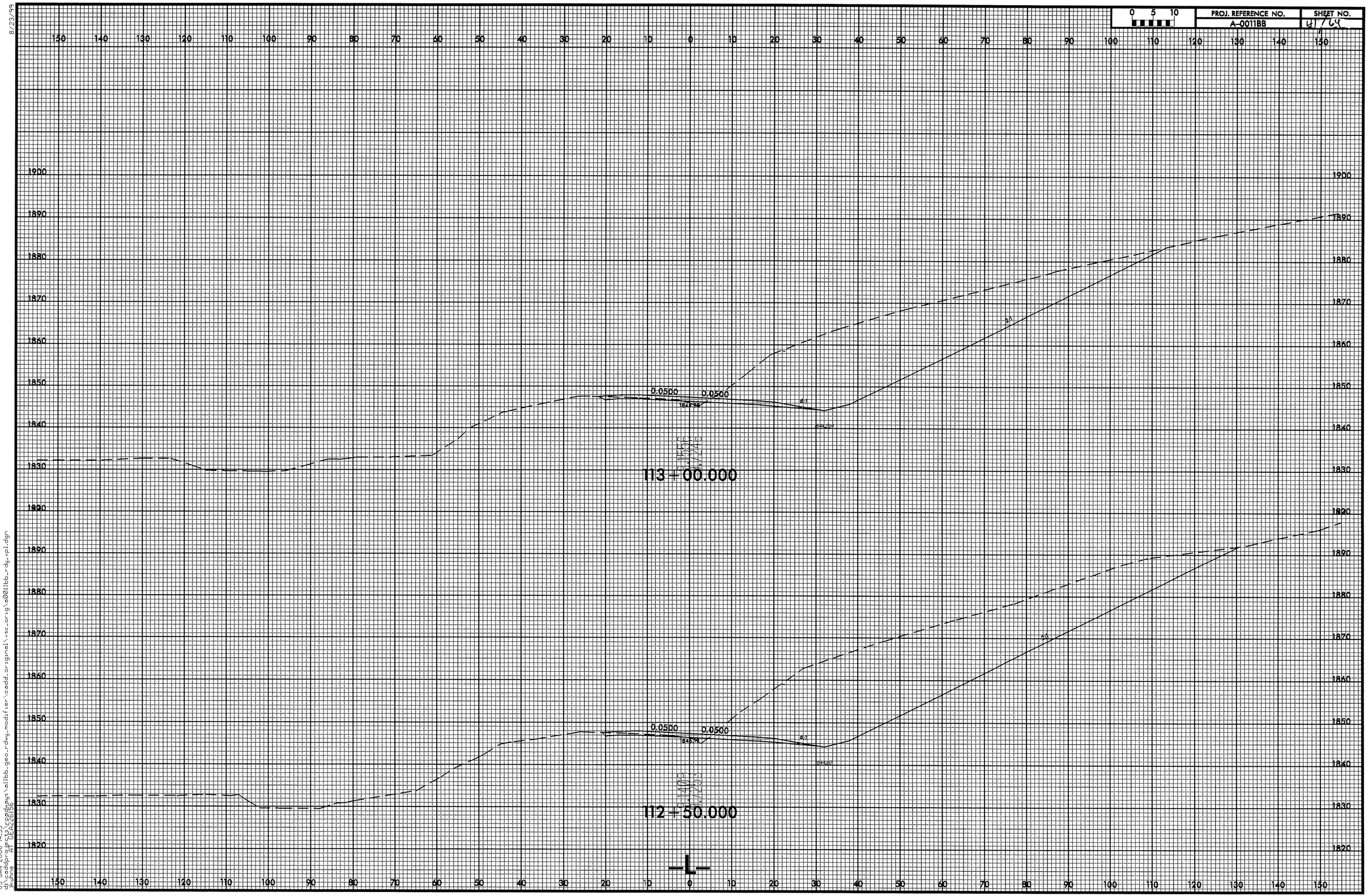

8/23/99

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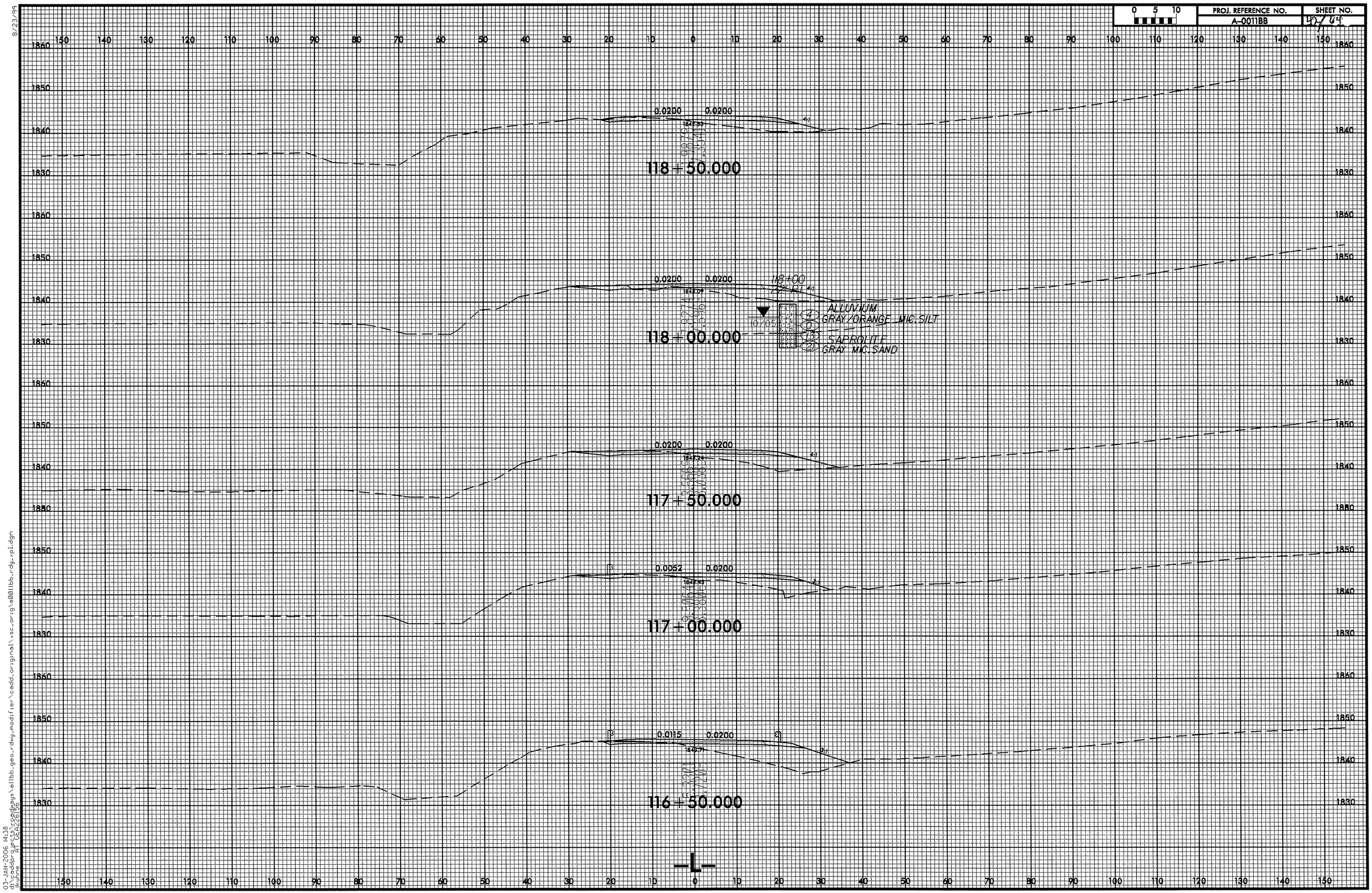

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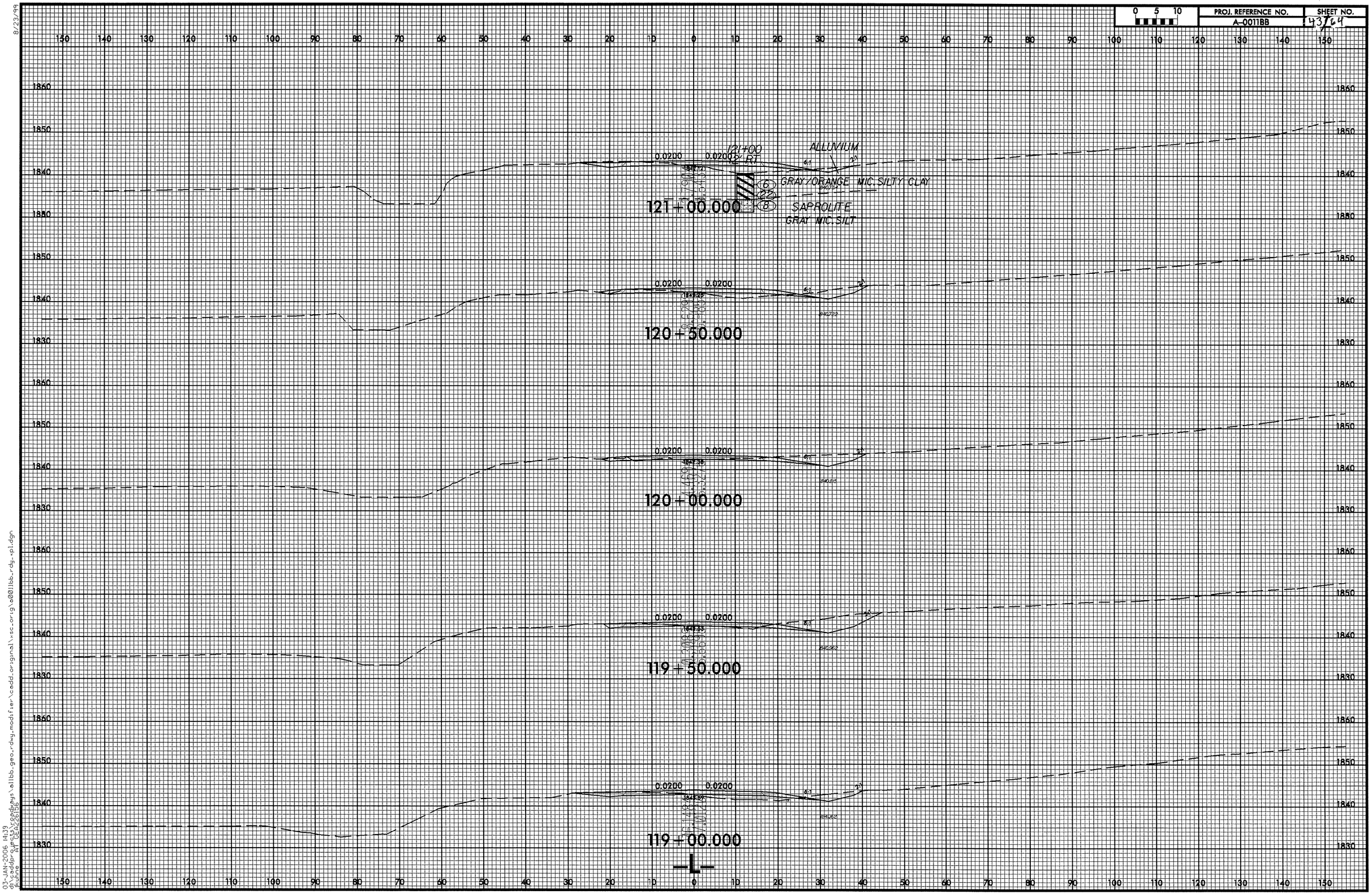

8/23/99

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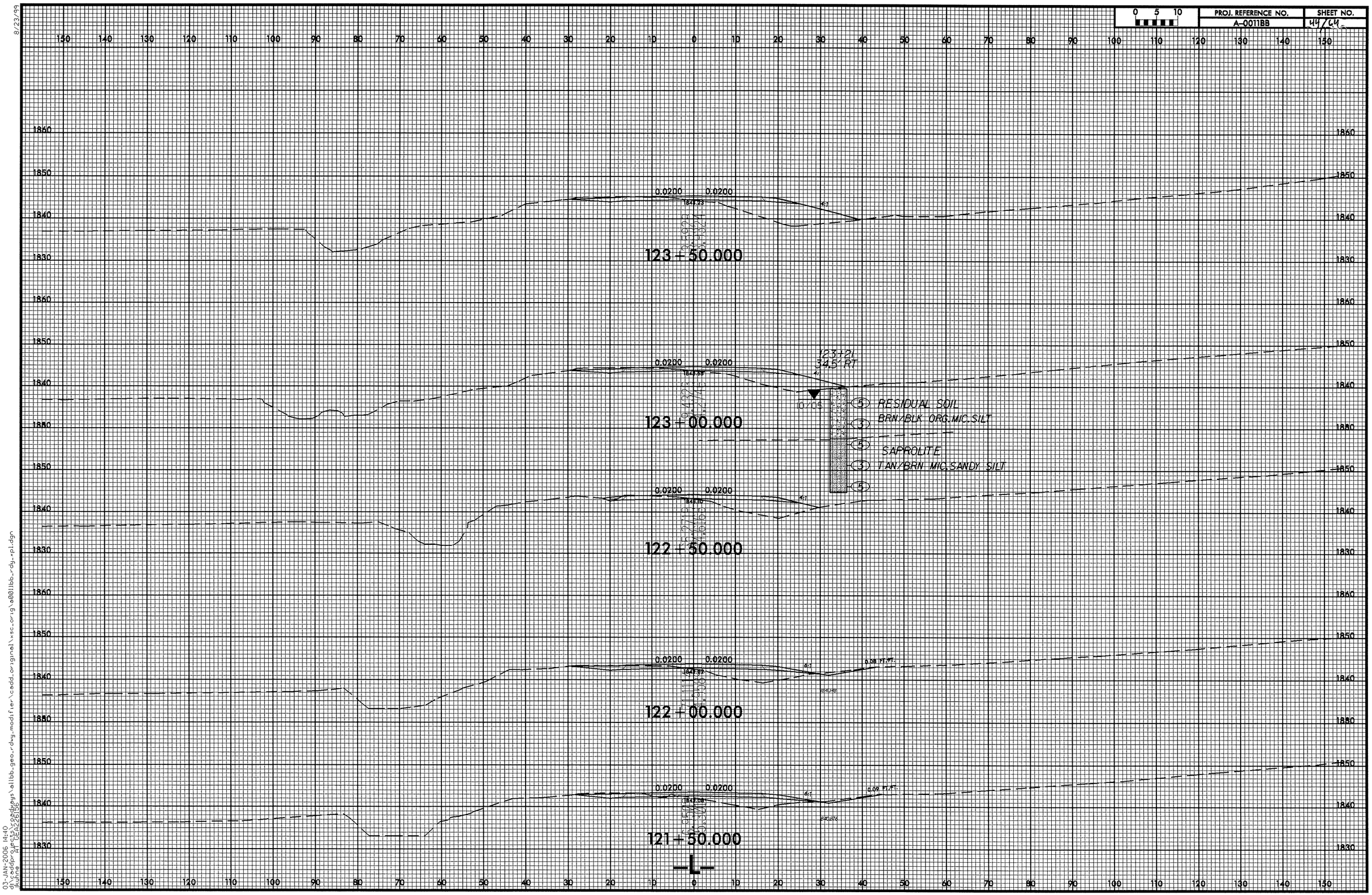
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A-0011BB
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44/64
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RESIDUAL SOIL
BRN/BLK ORG.MIC.SILT
SAPROLITE
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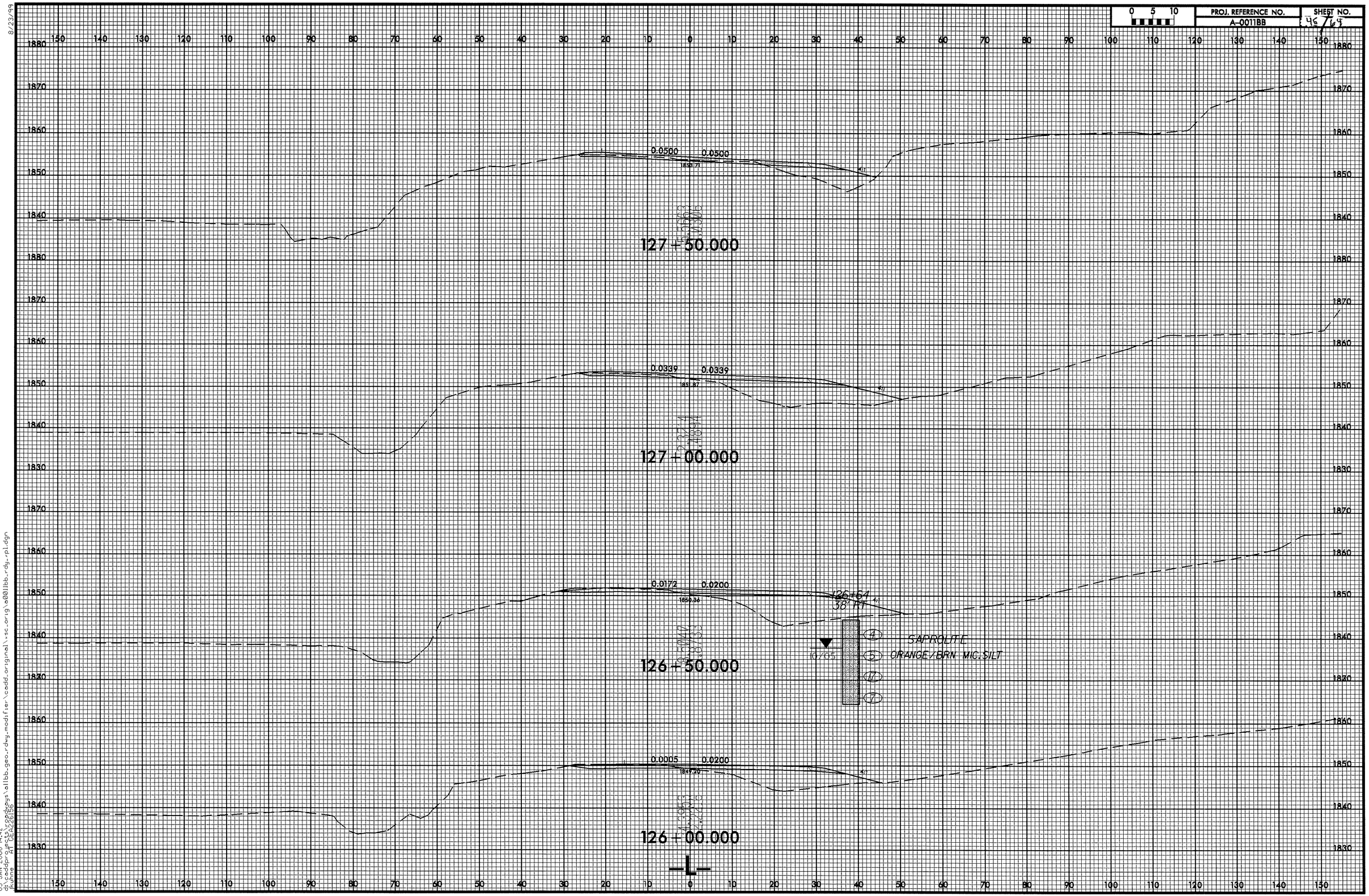

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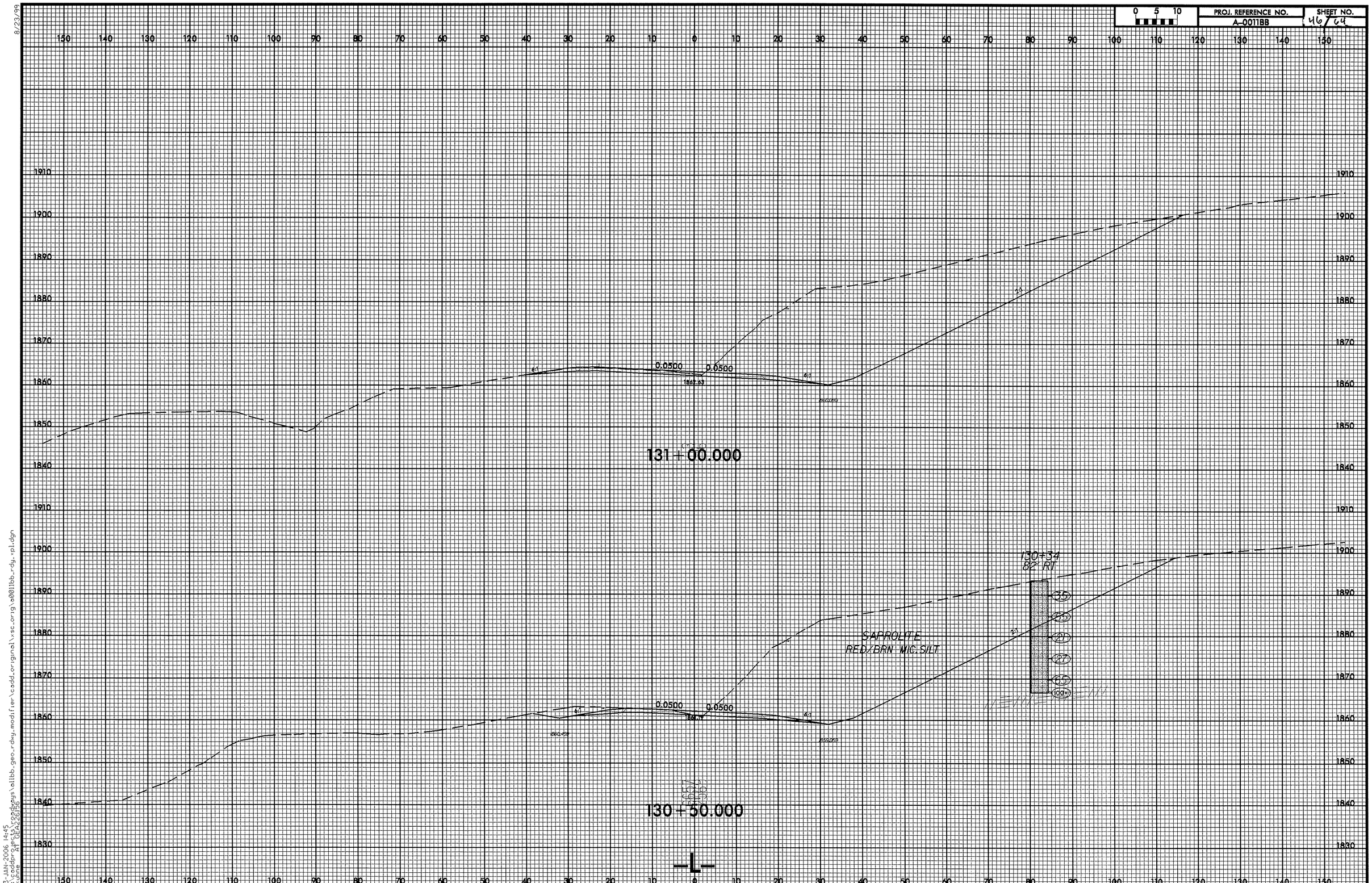

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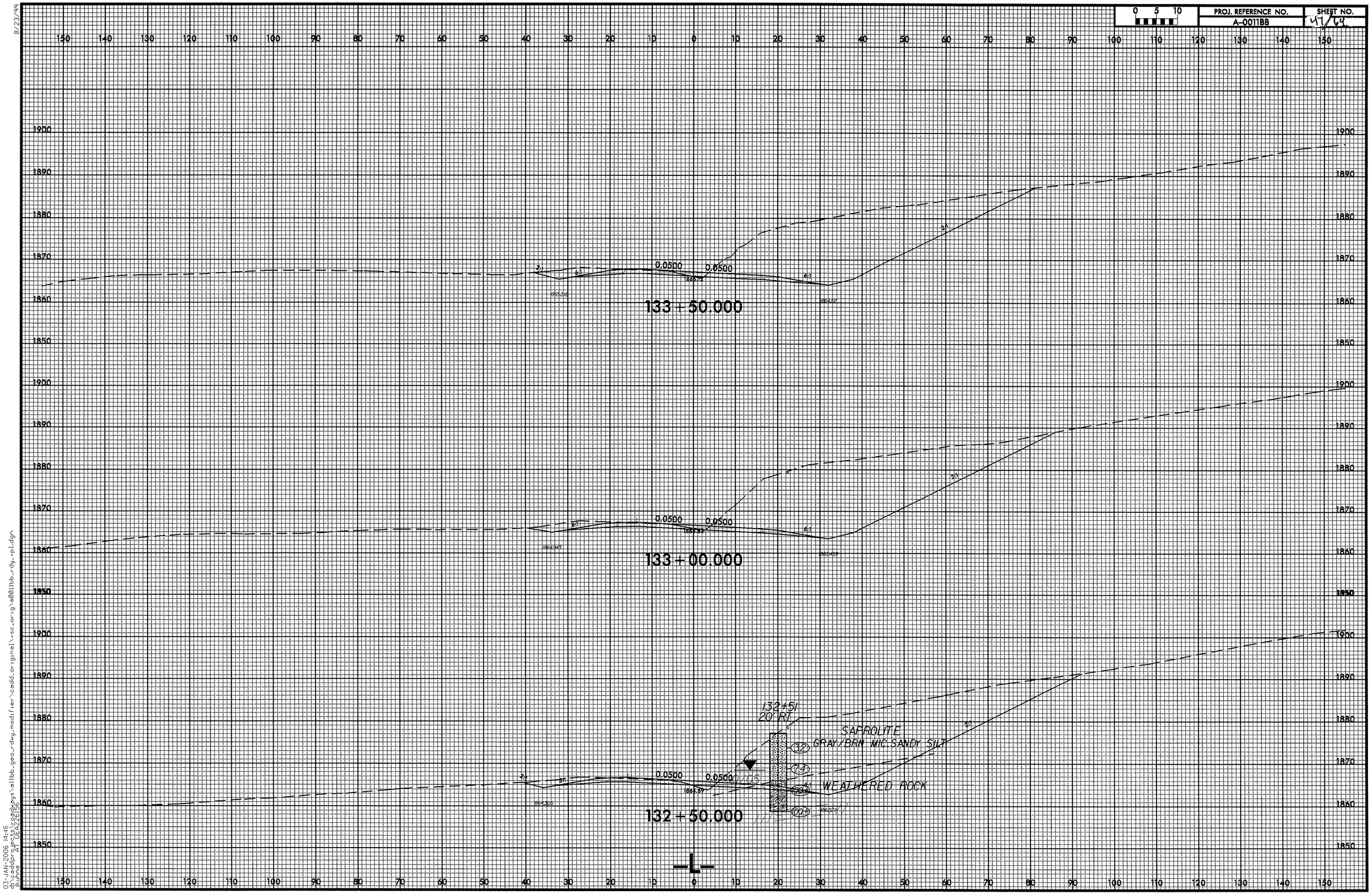

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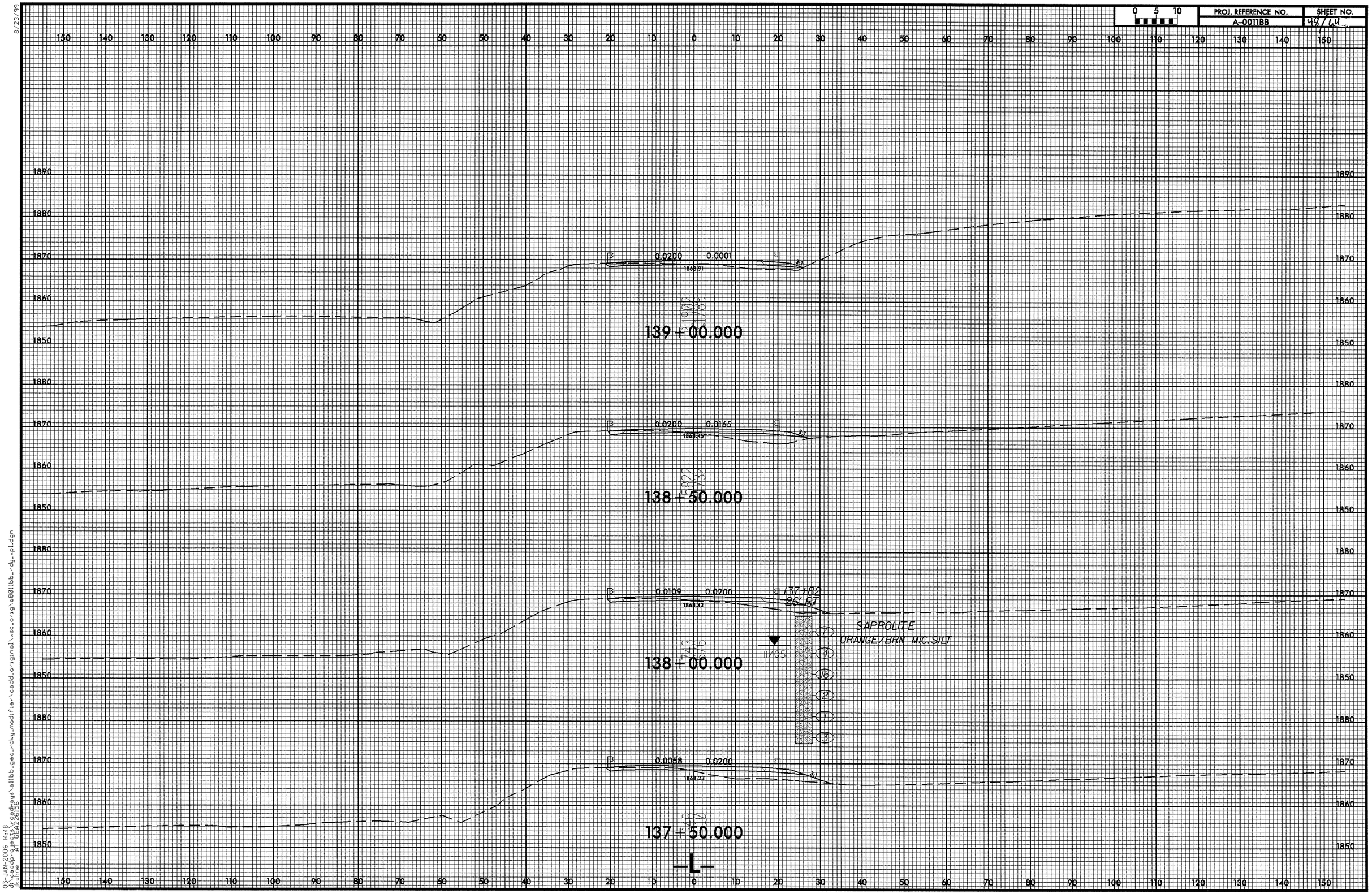
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A-0011BB
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138+00.000
0.0109
0.0200
137+82
26 RT
SAPROLITE
ORANGE/BRN MIC. SILT
137+50.000
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8/23/99
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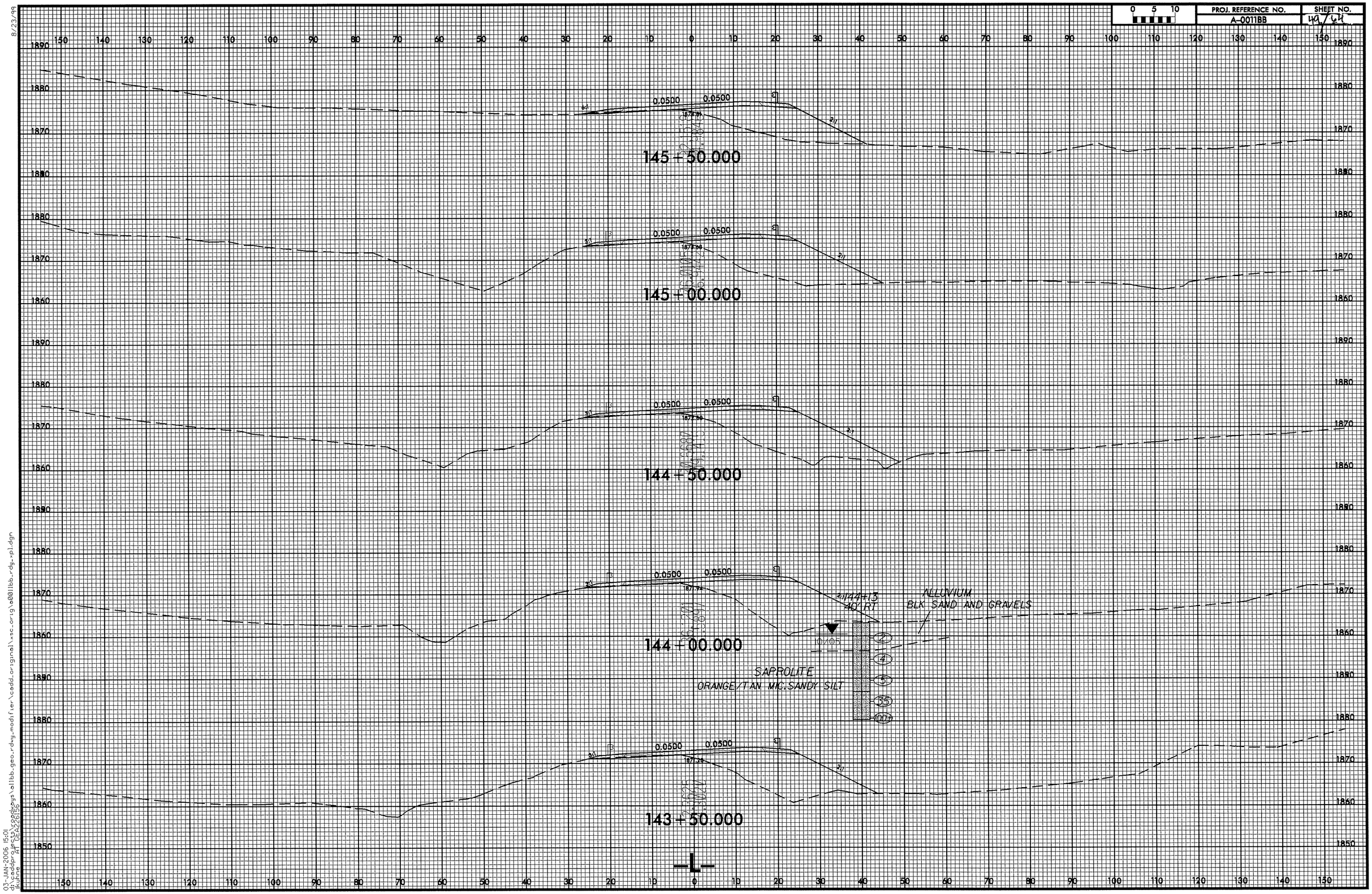

8/23/99

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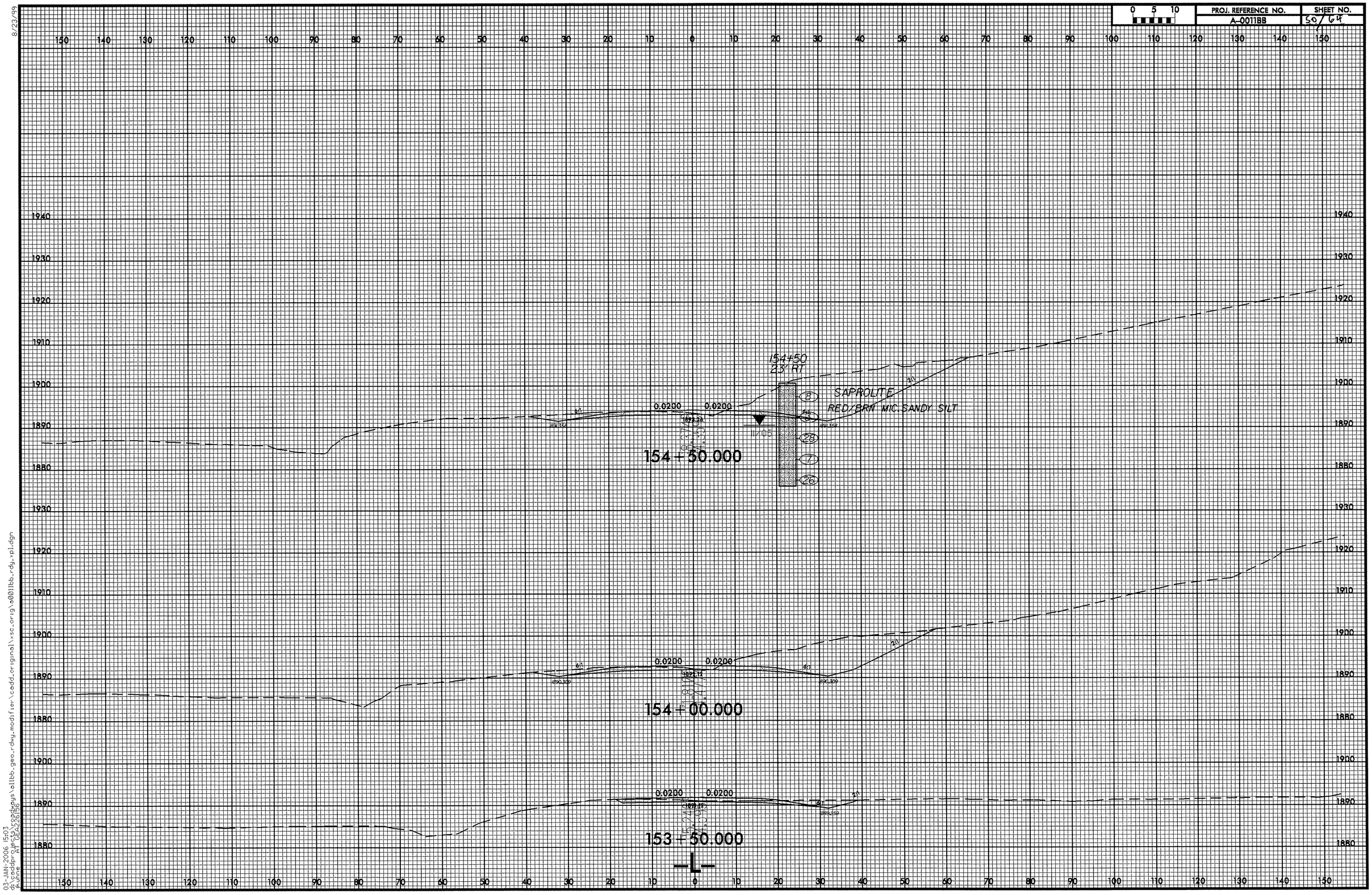
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50/64
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23' RT
SAPROLITE
RED/BRN MIC. SANDY SILT
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154+00.000
153+50.000
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8/23/99
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8/23/99

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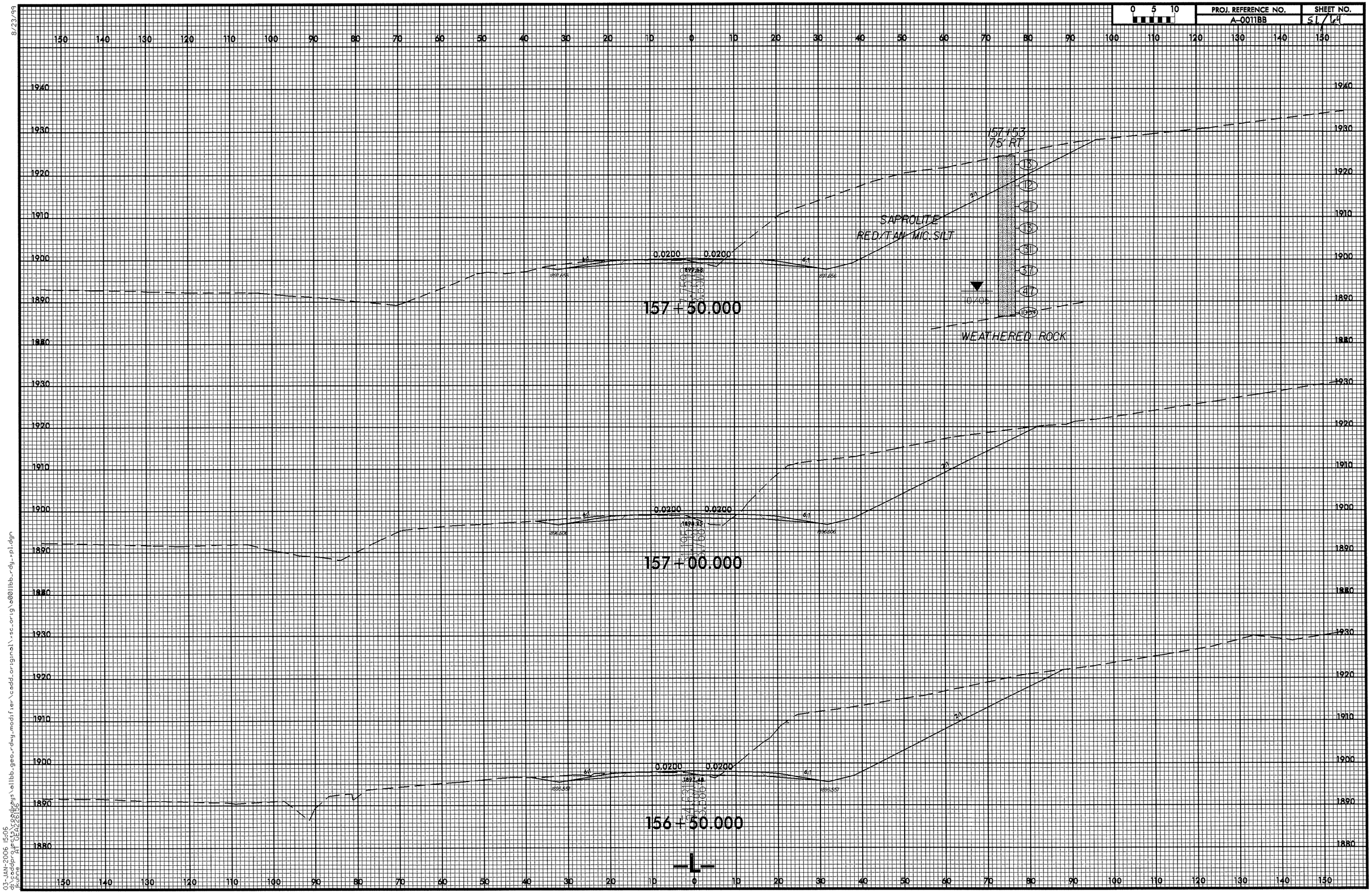
	A-0011BB	S1/16



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AT DEPARTMENT

0 5 10	PROJ. REFERENCE NO.	SHEET NO.
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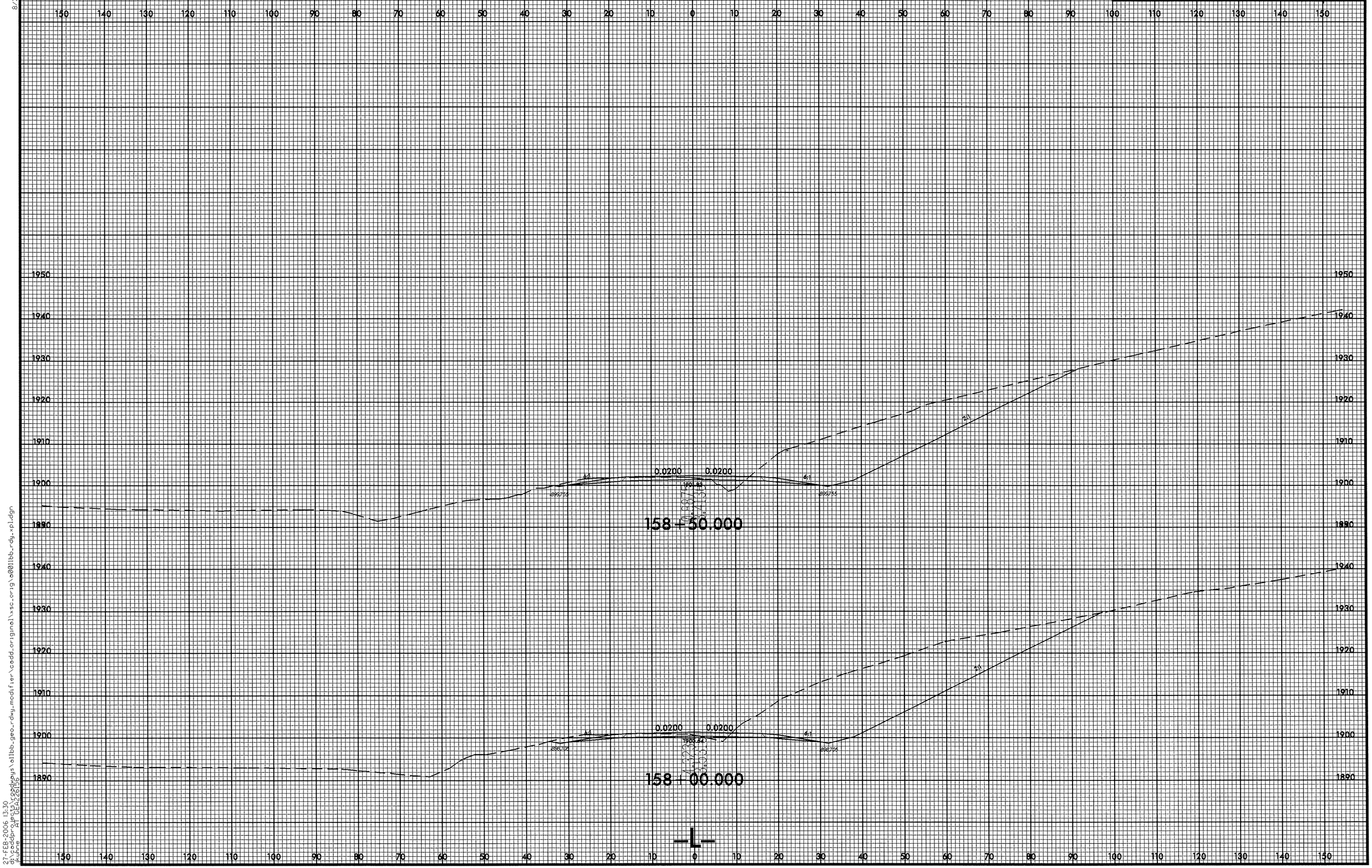

8/23/99

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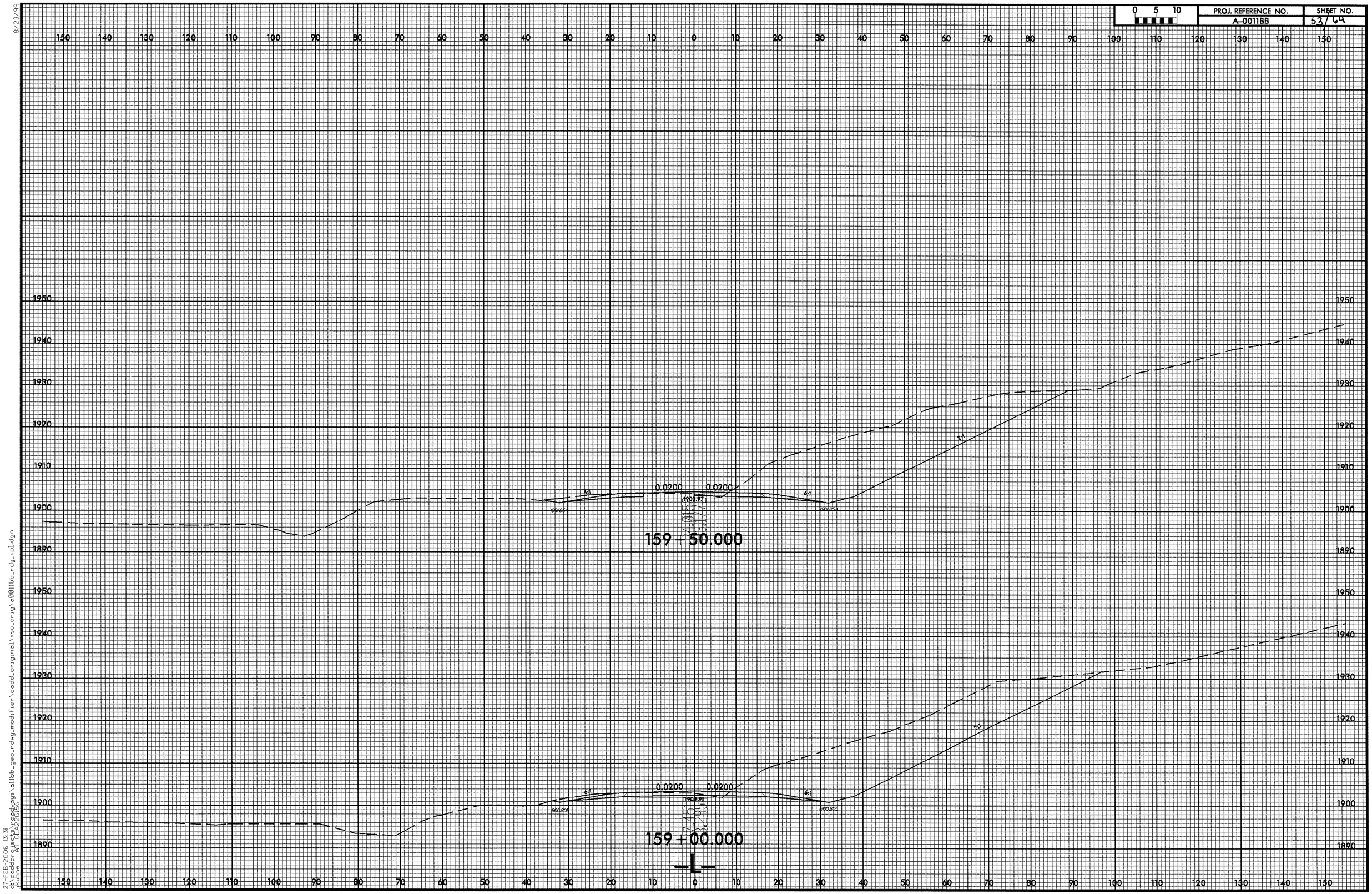

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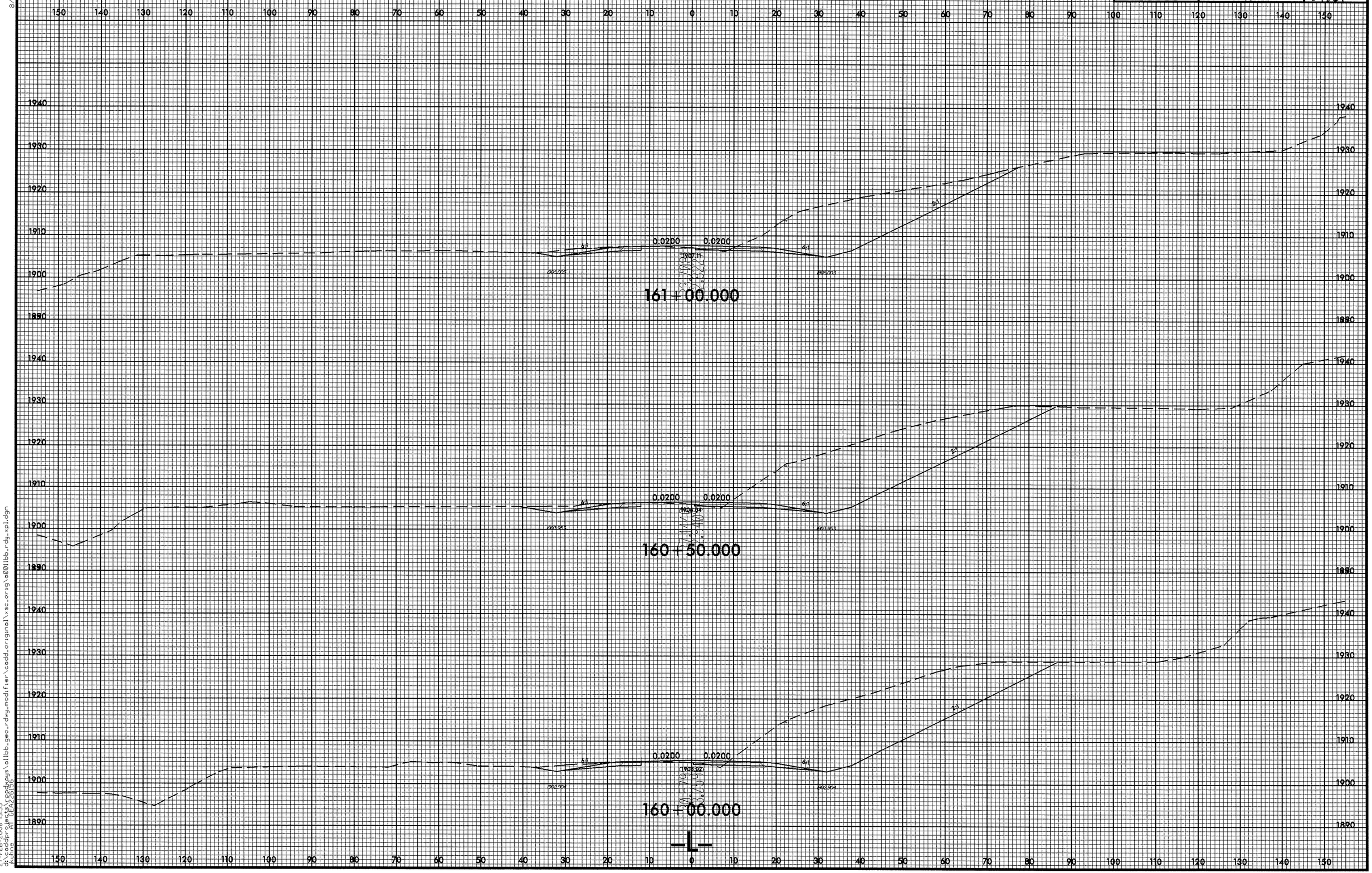
A-0011BB	54/64



8/22/99

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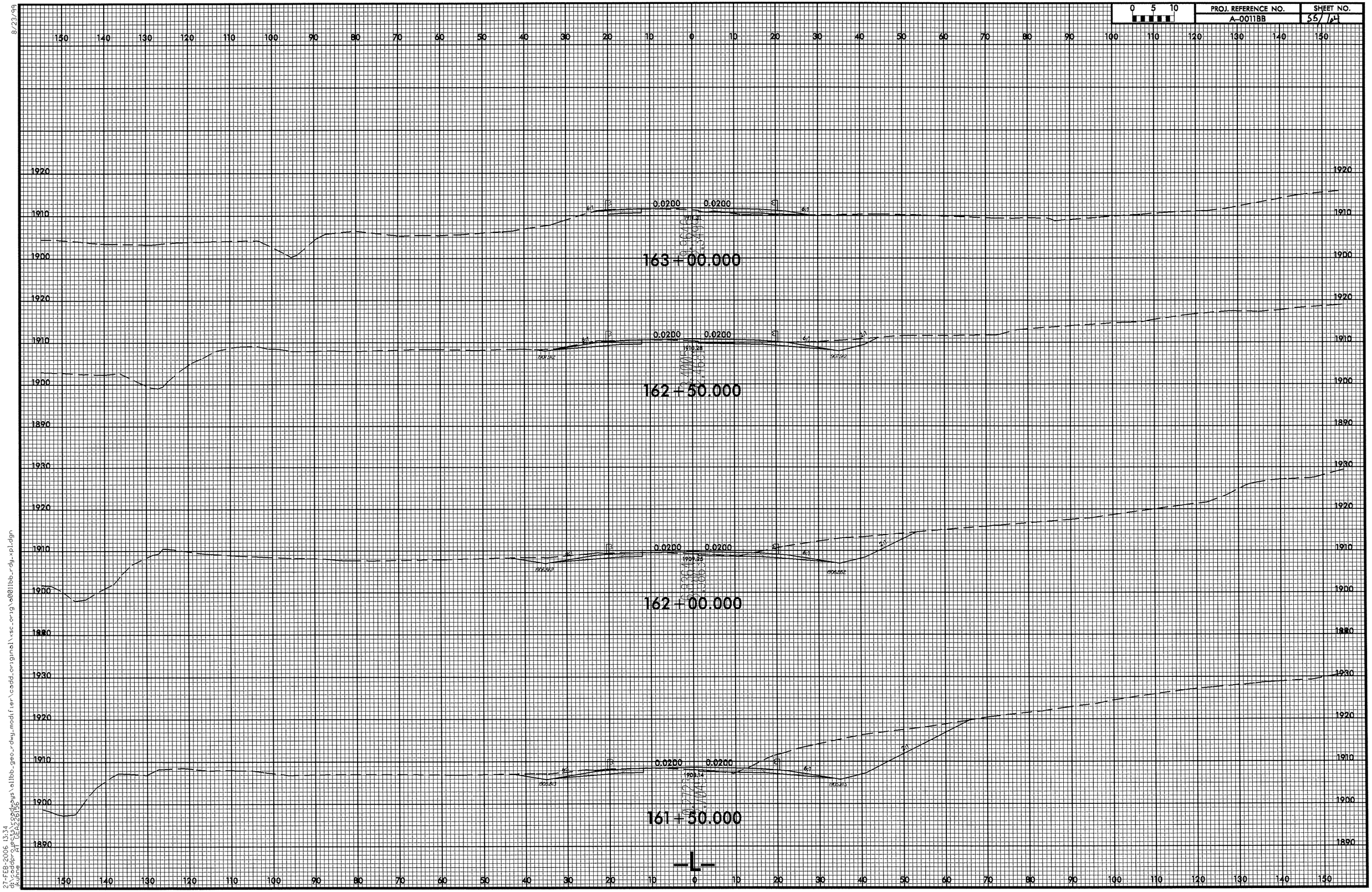

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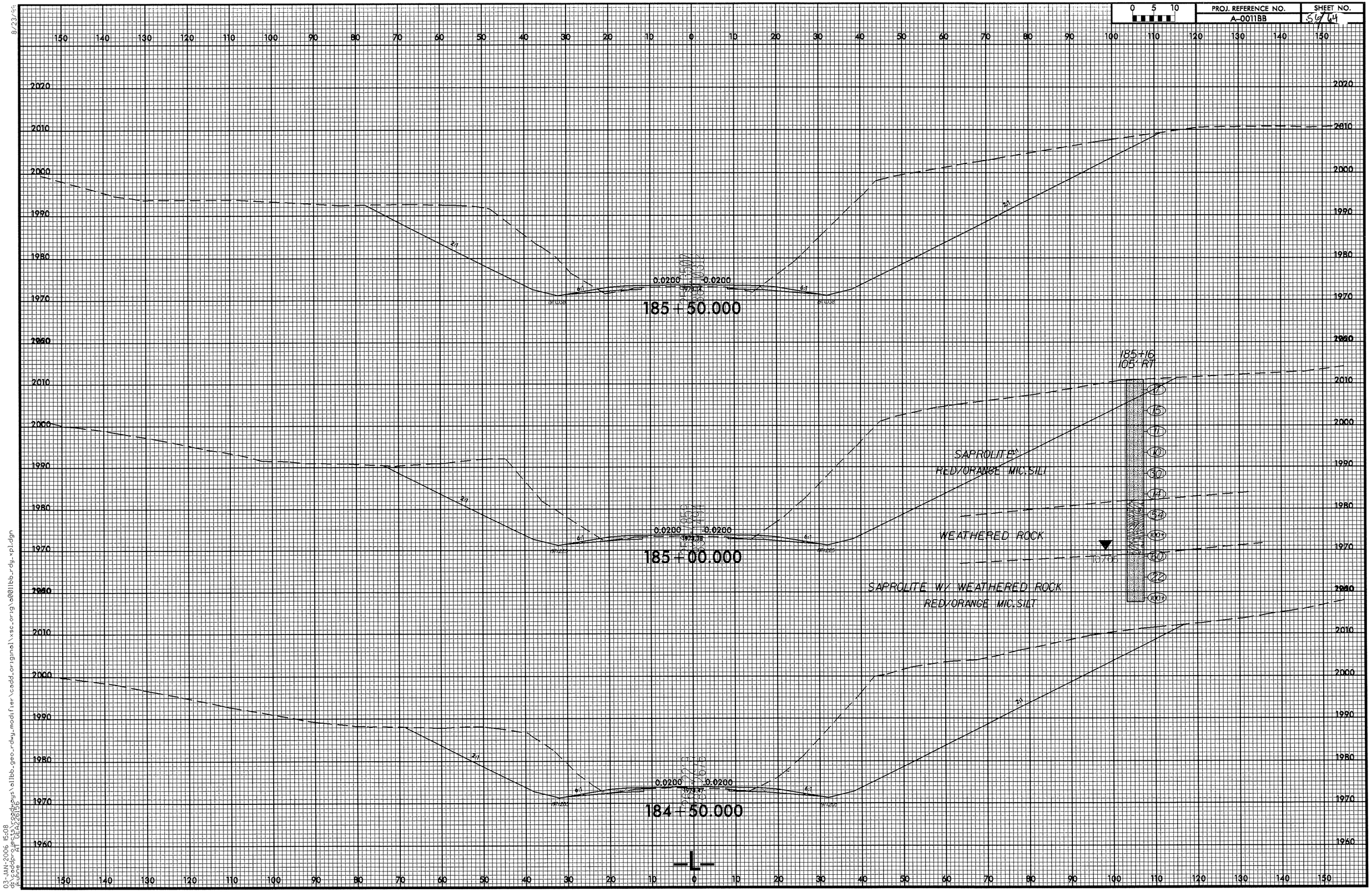

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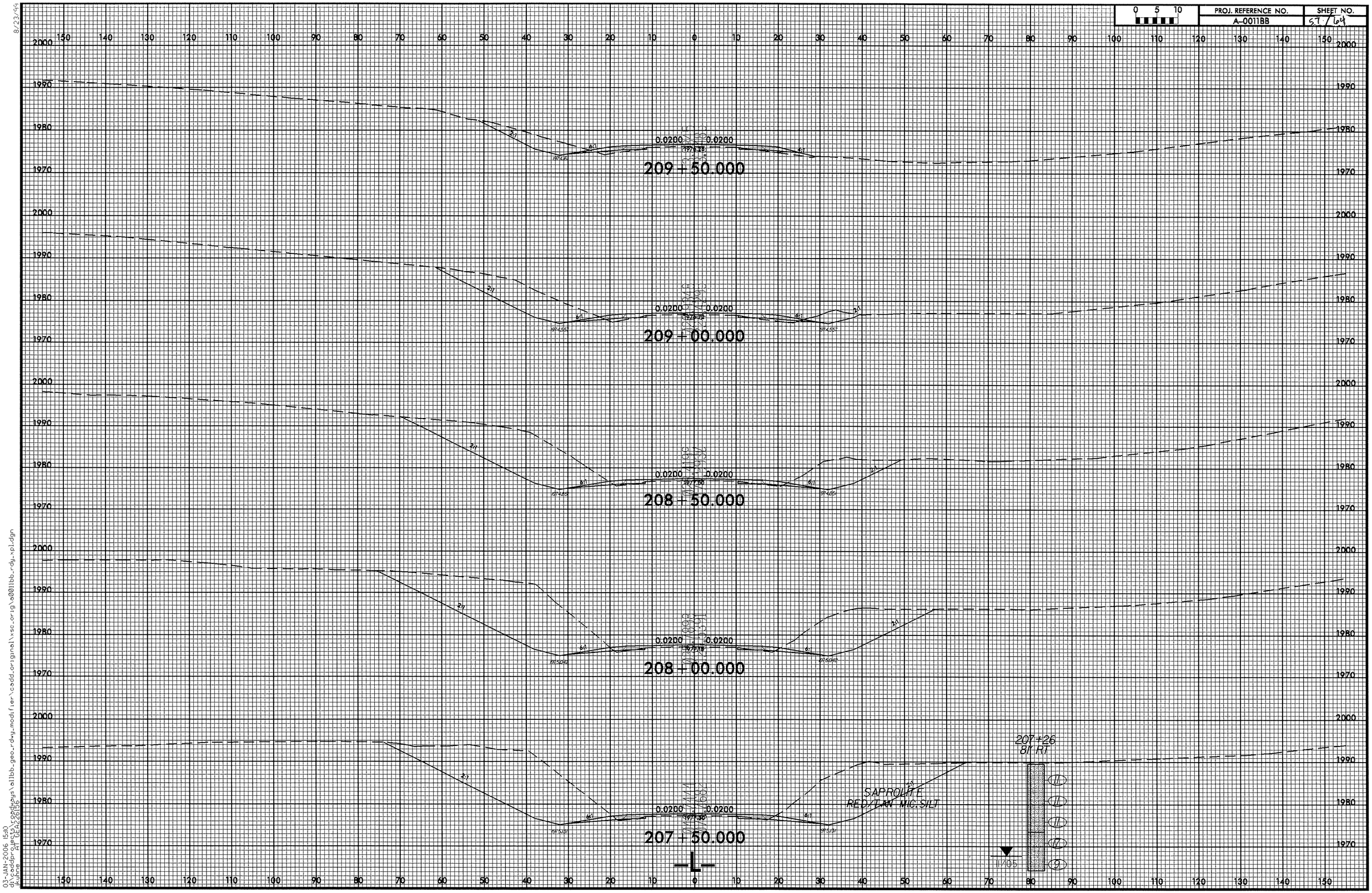

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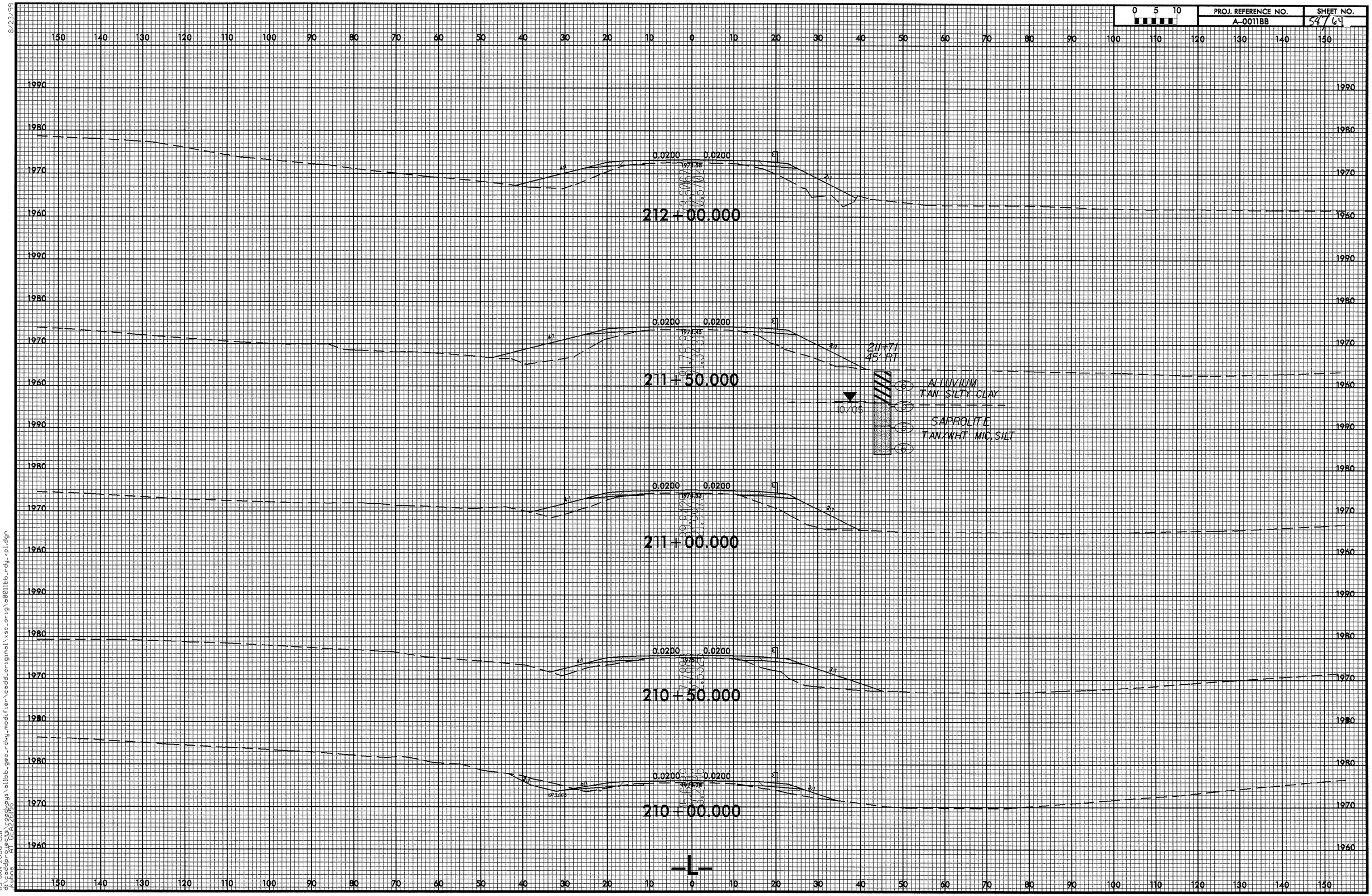

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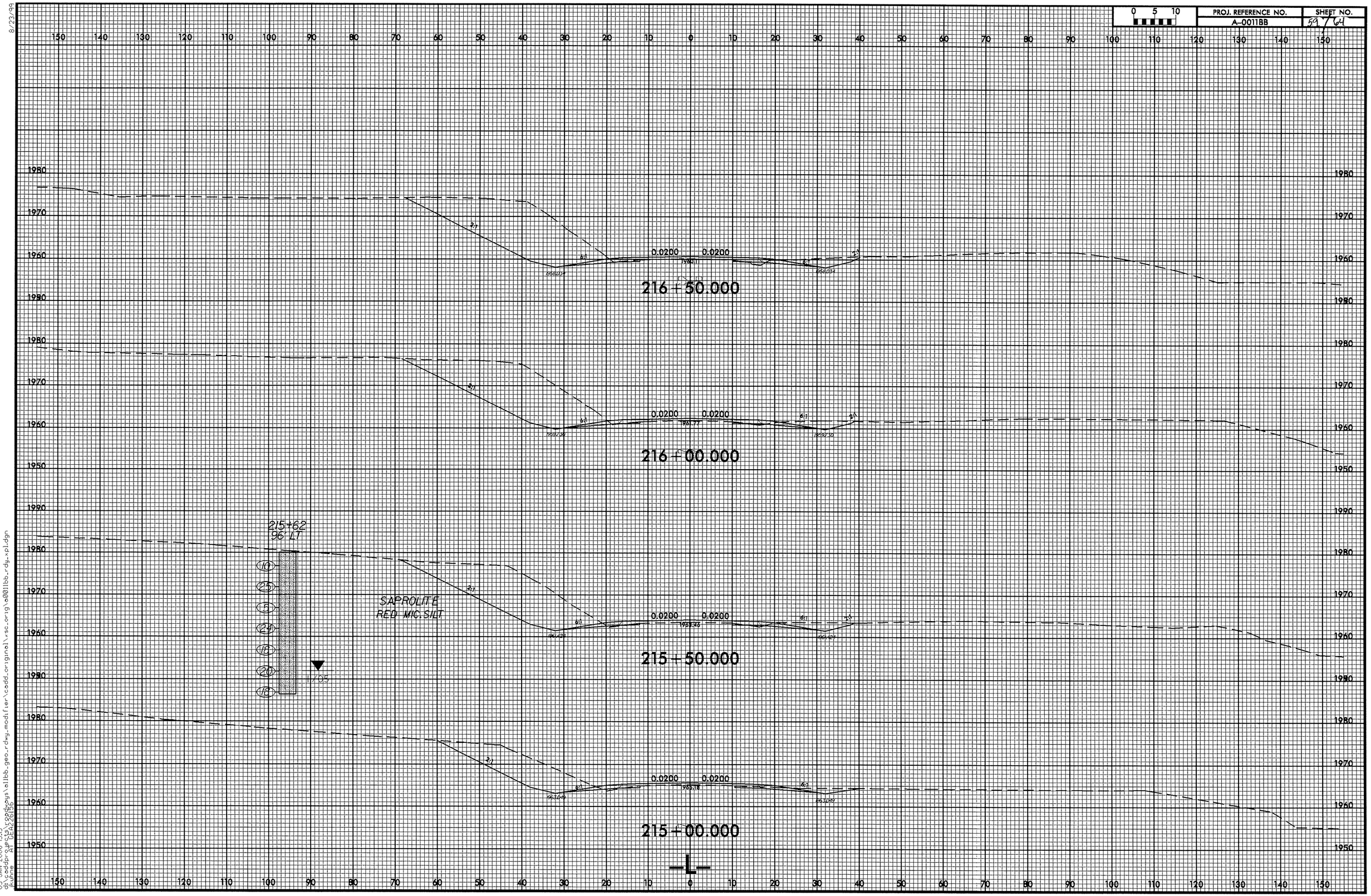

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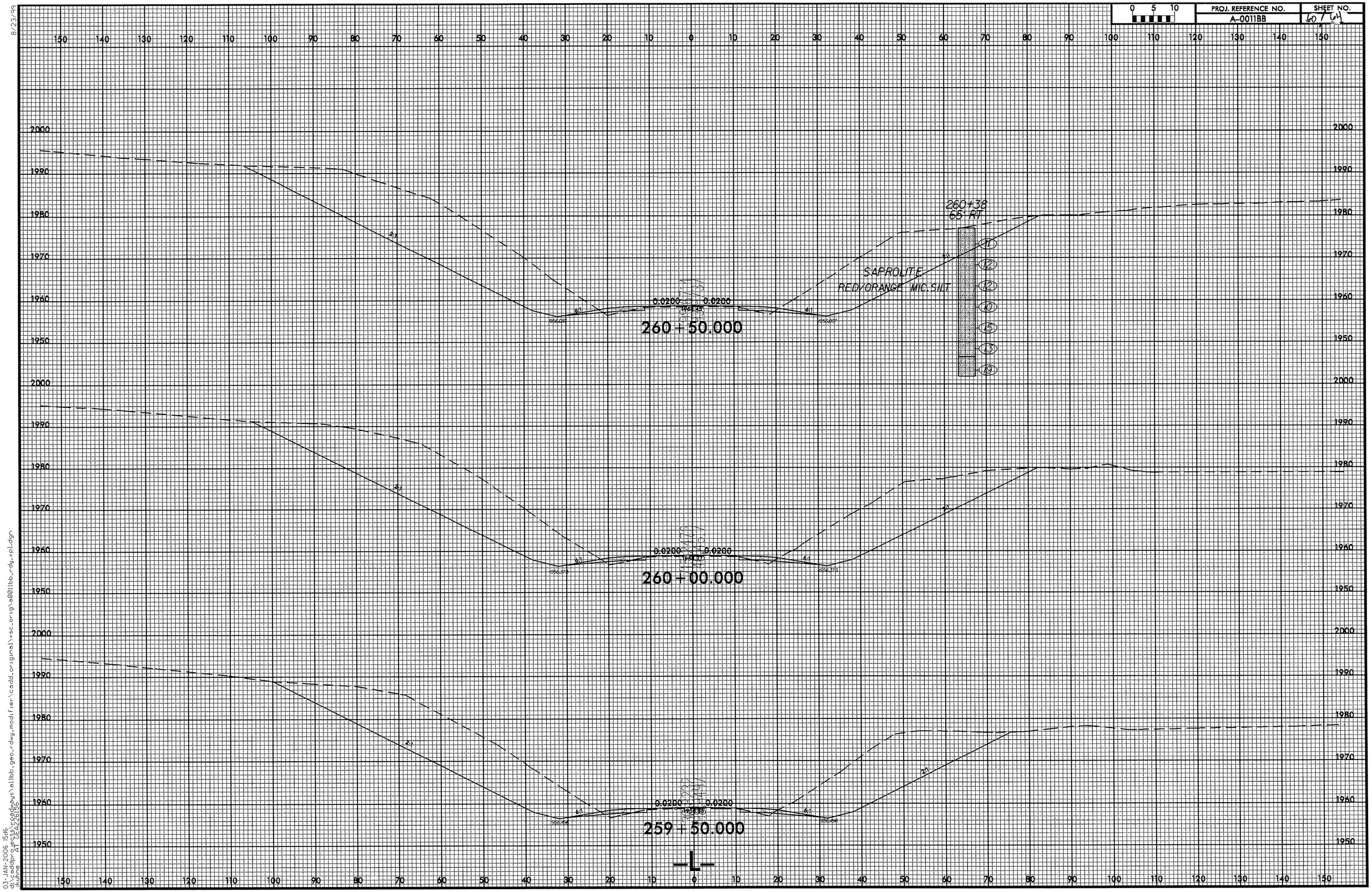

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kdunne
AT DEN26596

JCS

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
SOILS TEST REPORT-SOILS LABORATORY

T.I.P. ID #:	A-0011BB

REPORT ON SAMPLES OF:	Soils for Classification

PROJECT:	32574.1.1	COUNTY:	Clay	Owner:	--		
DATE SAMPLED:	10.05	DATE RECEIVED:	12.8.05	DATE REPORTED:	12.21.05		
SAMPLED FROM:	Roadway	SAMPLED BY:	J. C. Khune				
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION				
LABORATORY:	Asheville						

TEST RESULTS

Project Sample No.	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8
Lab Sample No. A	151267	151268	151269	151270	151271	151272	151273	151274
HiCAMS Sample #	--	--	--	--	--	--	--	--
Retained #4 Sieve %	--	--	--	--	--	--	--	--
Passing #10 Sieve %	99	100	100	100	100	91	100	100
Passing #40 Sieve %	96	99	99	100	99	82	97	97
Passing #200 Sieve %	65	76	44	74	44	53	53	49

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	15	5	6	2	11	19	9	13
Fine Sand - Ret. #270	21	25	57	36	58	27	50	49
Silt 0.05-0.005 mm %	17	21	17	54	29	14	25	28
Clay < 0.005 mm %	47	49	20	8	2	40	16	10
Passing # 40 Sieve %	--	--	--	--	--	--	--	--
Passing # 200 Sieve %	--	--	--	--	--	--	--	--

Liquid Limit	35	57	36	39	35	47	37	35
Plastic Index	9	15	NP	NP	NP	9	NP	NP
AASHTO Classification	A-4 (6)	A-7-5 (13)	A-4 (2)	A-4 (8)	A-4 (2)	A-5 (5)	A-4 (4)	A-4 (3)
Quantity								
Texture								
Station	80+00	82+06	82+06	82+06	82+06	86+00	86+00	86+00
Hole No.								
Depth (ft) From:	3.5	9.3	14.3	19.3	29.3	3.5	13.5	18.5
To:	4.1	10.8	15.8	20.8	30.8	5.0	15.0	20.0

Remarks:

A-151267 - 151274

CC:

J. C. Khune	
File	

SOILS ENGINEER:	

JCS

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
SOILS TEST REPORT-SOILS LABORATORY

T.I.P. ID #:	A-0011BB

REPORT ON SAMPLES OF:	Soils for Classification

PROJECT:	32574.1.1	COUNTY:	Clay	Owner:	--		
DATE SAMPLED:	10.05	DATE RECEIVED:	12.8.05	DATE REPORTED:	12.21.05		
SAMPLED FROM:	Roadway	SAMPLED BY:	J. C. Khune				
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION				
LABORATORY:	Asheville						

TEST RESULTS

Project Sample No.	SS-9	SS-10	SS-11	SS-12	SS-13	SS-15	SS-17	SS-18
Lab Sample No. A	151275	151277	151278	151279	151280	151281	151283	151284
HiCAMS Sample #	--	--	--	--	--	--	--	--
Retained #4 Sieve %	--	--	--	--	--	--	--	--
Passing #10 Sieve %	98	98	88	77	78	87	93	91
Passing #40 Sieve %	94	66	85	55	52	86	89	80
Passing #200 Sieve %	36	44	61	30	35	60	65	40

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	18	20	9	39	41	3	5	20
Fine Sand - Ret. #270	50	45	28	27	19	38	30	51
Silt 0.05-0.005 mm %	22	29	23	24	30	37	37	25
Clay < 0.005 mm %	10	6	40	10	10	22	28	4
Passing # 40 Sieve %	--	--	--	--	--	--	--	--
Passing # 200 Sieve %	--	--	--	--	--	--	--	--

Liquid Limit	31	42	40	44	40	40	38	53
Plastic Index	NP	NP	7	NP	NP	NP	7	NP
AASHTO Classification	A-4 (0)	A-5 (2)	A-5 (5)	A-2-5 (0)	A-2-4 (0)	A-4 (5)	A-4 (6)	A-5 (1)
Quantity								
Texture								
Station	96+00	96+00	93+30	93+30	93+30	118+00	126+64	126+64
Hole No.								
Depth (ft) From:	2.5	7.5	2.5	7.5	10.0	5.0	3.5	N/A
To:	4.0	9.0	4.0	9.0	11.5	6.5	5.0	N/A

Remarks:

A-151275 - 151284

CC:

J. C. Khune	
File	

SOILS ENGINEER:	

JCS

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
SOILS TEST REPORT-SOILS LABORATORY

T.I.P. ID #:	A-0011BB

REPORT ON SAMPLES OF:	Soils for Classification

PROJECT:	32574.1.1	COUNTY:	Clay	Owner:	--		
DATE SAMPLED:	10.05	DATE RECEIVED:	12.8.05	DATE REPORTED:	12.21.05		
SAMPLED FROM:	Roadway	SAMPLED BY:	J. C. Khune				
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION				
LABORATORY:	Asheville						

TEST RESULTS

Project Sample No.	SS-19	SS-20	SS-21	SS-22	SS-23	SS-24	SS-25	SS-26
Lab Sample No. A	151285	151286	151287	151288	151289	151290	151291	151292
HiCAMS Sample #	--	--	--	--	--	--	--	--
Retained #4 Sieve %	--	--	--	--	--	--	--	--
Passing #10 Sieve %	83	97	96	93	94	80	98	100
Passing #40 Sieve %	56	88	91	81	73	60	94	98
Passing #200 Sieve %	22	32	35	55	42	33	68	32

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	49	26	17	18	31	36	10	13
Fine Sand - Ret. #270	28	50	62	28	38	31	25	64
Silt 0.05-0.005 mm %	13	16	13	24	29	7	14	17
Clay < 0.005 mm %	10	8	8	30	2	26	51	6
Passing # 40 Sieve %	--	--	--	--	--	--	--	--
Passing # 200 Sieve %	--	--	--	--	--	--	--	--

Liquid Limit	38	32	67	49	46	47	44	30
Plastic Index	NP	NP	NP	18	NP	NP	17	NP
AASHTO Classification	A-2-4 (0)	A-2-4 (0)	A-2-5 (0)	A-5 (8)	A-5 (1)	A-2-5 (0)	A-7-6 (11)	A-2-4 (0)
Quantity								
Texture								
Station	130+34	130+34	144+13	157+53	157+53	157+53	185+16	185+16
Hole No.								
Depth (ft) From:	3.5	13.5	8.6	2.0	12.0	27.0	2.4	12.4
To:	5.0	15.0	10.1	3.5	13.5	28.5	3.9	13.9

Remarks:

A-151285 - 151292

CC:

J. C. Khune	
File	

SOILS ENGINEER:	

JCS

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
SOILS TEST REPORT-SOILS LABORATORY

T.I.P. ID #:	A-0011BB

REPORT ON SAMPLES OF:	Soils for Classification

PROJECT:	32574.1.1	COUNTY:	Clay	Owner:	--		
DATE SAMPLED:	10.05	DATE RECEIVED:	12.8.05	DATE REPORTED:	12.21.05		
SAMPLED FROM:	Roadway	SAMPLED BY:	J. C. Khune				
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION				
LABORATORY:	Asheville						

TEST RESULTS

Project Sample No.	SS-27	SS-28	SS-29	SS-30	SS-31	SS-32	SS-33	SS-39
Lab Sample No. A	151293	151294	151295	151296	151298	151299	151300	151301
HiCAMS Sample #	--	--	--	--	--	--	--	--
Retained #4 Sieve %	--	--	--	--	--	--	--	--
Passing #10 Sieve %	71	97	95	96	92	99	91	80
Passing #40 Sieve %	56	82	88	91	71	91	76	76
Passing #200 Sieve %	28	31	49	51	31	40	23	54

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	34	29	16	14	38	20	36	12
Fine Sand - Ret. #270	35	47	38	45	36	51	46	25
Silt 0.05-0.005 mm %	23	18	42	19	14	21	10	27
Clay < 0.005 mm %	8	6	4	22	12	8	8	36
Passing # 40 Sieve %	--	--	--	--	--	--	--	--
Passing # 200 Sieve %	--	--	--	--	--	--	--	--

Liquid Limit	39	35	27	48	53	70	33	48
Plastic Index	NP	NP	8	NP	NP	NP	NP	22
AASHTO Classification	A-2-4 (0)	A-2-4 (0)	A-4 (3)	A-5 (4)	A-2-5 (0)	A-5 (1)	A-2-4 (0)	A-7-5 (10)
Quantity								
Texture								
Station	185+16	185+16	137+82	137+82	137+82	154+50	154+50	206+26
Hole No.								
Depth (ft) From:	27.4	47.4	3.7	8.7	18.7	8.3	N/A	3.6
To:	28.9	48.9	5.2	10.2	20.2	9.2	N/A	5.1

Remarks:

A-151293 - 151301

CC:

J. C. Khune	
File	

SOILS ENGINEER:	

63/64

JCS

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-MATERIALS AND TESTS UNIT
SOILS TEST REPORT-SOILS LABORATORY

T.I.P. ID #:	A-0011BB

REPORT ON SAMPLES OF:	Soils for Classification

PROJECT:	32574.1.1	COUNTY:	Clay	Owner:	--		
DATE SAMPLED:	10.05	DATE RECEIVED:	12.8.05	DATE REPORTED:	12.21.05		
SAMPLED FROM:	Roadway	SAMPLED BY:	J. C. Khune				
SUBMITTED BY:	W. D. Frye	2002	STANDARD SPECIFICATION				
LABORATORY:	Asheville						

TEST RESULTS

Project Sample No.	SS-40	S-9						
Lab Sample No. A	151302	151306						
HiCAMS Sample #	--	--						
Retained #4 Sieve %	--	--						
Passing #10 Sieve %	100	96						
Passing #40 Sieve %	99	91						
Passing #200 Sieve %	71	36						

MINUS #10 FRACTION

Soil Mortar - 100%								
Coarse Sand -Ret. #60	4	19						
Fine Sand - Ret. #270	35	50						
Silt 0.05-0.005 mm %	37	21						
Clay < 0.005 mm %	24	10						
Passing # 40 Sieve %	--	--						
Passing # 200 Sieve %	--	--						

Liquid Limit	51	38						
Plastic Index	12	NP						
AASHTO Classification	A-7-5 (10)	A-4 (0)						
Quantity								
Texture								
Station	206+26	96+00						
Hole No.								
Depth (ft) From:	8.6	2.5						
To:	10.1	4.0						

Remarks:

A-151302 – 151306

CC:

J. C. Khune	
File	

SOILS ENGINEER:	

Sheet1

	LAB #	Samp. #	N HCl	QNTY HCl mL	QNTY NaOH mL	QNTY HCl BLANK	QNTY NaOH BLANK	C	ACID CONSMD mL	Nt. Pot. NP Tn.CaCO3	S %	Acid Pot. Tn.CaCO3 Equiv.	Net NP NP-AP T.C.E.'s
A-	151423	HS-7	0.1	40	37.4	40	41.21	0.971	3.698	9.245	0.05	1.563	7.683
A-	151424	HS-8	0.1	40	35.9	40	41.21	0.971	5.154	12.885	0.046	1.438	11.448
A-	151425	HS-9	0.1	40	41.25	40	41.21	0.971	-0.039	-0.097	0.02	0.625	-0.722
A-	151426	HS-10	0.1	40	42.2	40	41.21	0.971	-0.961	-2.402	0.004	0.125	-2.527

Sheet1

	LAB #	Samp. #	N HCl	QNTY HCl mL	QNTY NaOH mL	QNTY HCl BLANK	QNTY NaOH BLANK	C	ACID CONSMD mL	Nt. Pot. NP Tn.CaCO3	S %	Acid Pot. Tn.CaCO3 Equiv.	Net NP NP-AP T.C.E.'s
A-	151417	HS-1	0.1	40	33.9	40	41.21	0.971	7.095	17.738	0.005	0.156	17.582
A-	151418	HS-2	0.1	40	38.15	40	41.21	0.971	2.970	7.425	0.007	0.219	7.207
A-	151419	HS-3	0.1	40	40.5	40	41.21	0.971	0.689	1.723	0.005	0.156	1.567
A-	151420	HS-4	0.1	40	39.05	40	41.21	0.971	2.097	5.241	0.011	0.344	4.898
A-	151421	HS-5	0.1	40	39.55	40	41.21	0.971	1.611	4.028	0	0.000	4.028
A-	151422	HS-6	0.1	40	38.45	40	41.21	0.971	2.679	6.697	0.006	0.188	6.510