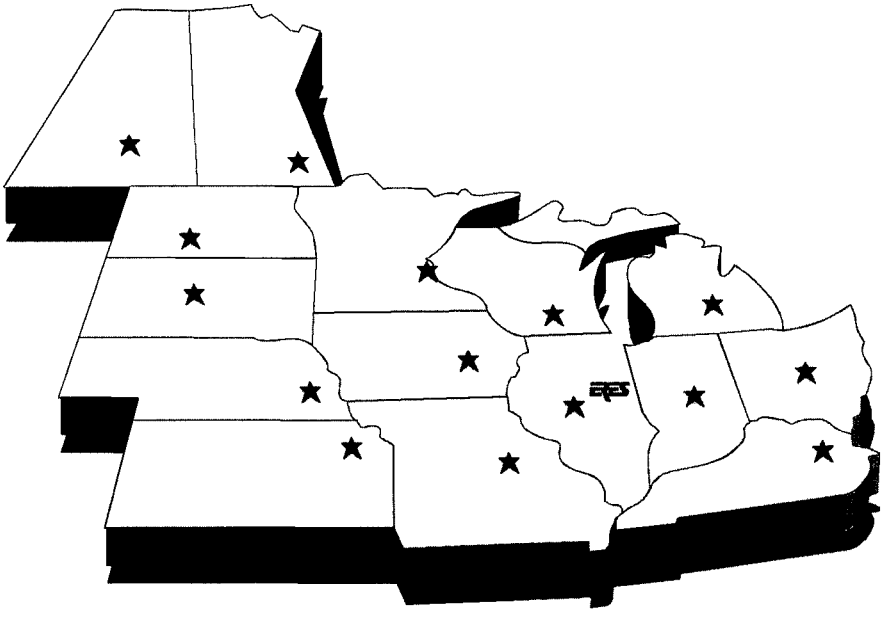
# Construction Report for Missouri SPS-9A

## DTFH61-96-C-00013

**September 28, 1998**



LTPP

Submitted by

ERES CONSULTANTS, INC.

File
SPS-Project File

# Long-Term Pavement Performance

**LTPP North Central Regional Office**
505 West University Avenue - Champaign, IL 61820-3915 - Tel 888 367-3737 - Fax 217 356-3088 - www ncrco com

September 28, 1998

Mr. Monte Symons, HNR-30
FHWA-LTPP
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101-2296

Re: SPS Construction reports

Dear Monte:

Please find enclosed one copy each of the following SPS Construction reports.

| | |
|---|---|
| Saskatchewan SPS-9A | Ohio SPS-1 |
| Missouri SPS-9A | Ohio SPS-2 |

These reports represent our first draft, and we would appreciate any comments or feedback you might have.

Please let me know if there any questions concerning these reports.

Sincerely,

Thomas P. Wilson, P.E.
Co-Principal Investigator
North Central Regional Coordination Office

enclosures

cc: A. Lopez, FHWA-LTPP (w/enclosures)

# SPS-9A Construction Report
# U.S. 65 Southbound
# Sedalia, Missouri

## Sections 290901 to 290903 and 290959 to 290964

**Federal Highway Administration**
**LTPP Division**
**North Central Region**

Report Prepared By:
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September 28, 1998

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Attachment A: Project Location map
Attachment B: Test Section Layout
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# 1

# Project Overview

One goal of the Strategic Highway Research Program (SHRP) asphalt research program is the further development and refinement of performance-based specifications for asphalt binder and asphalt-aggregate mixtures. In order to be successful, it is necessary to validate the binder and mixture properties as important determinants of in-place pavement performance. The evaluation of innovative asphalt pavement materials also requires in-service testing under actual traffic and climate conditions.

The objectives of the SPS-9A study are as follows:

- To compare the SHRP binder selected based on the average maximum and minimum temperatures and the annual precipitation.
- To compare to local agency mix designs.
- Comparisons to an alternate binder selected to evaluate cases of thermal cracking or rutting.
- The comparison should involve three test sections in the core experiment with same pavement cross section.
- The study of additional test sections (supplemental sections), such as stone-matrix asphalt (SMA).

## 1.1 Experimental Cell

Located in the wet-freeze experimental zone, this test site experiences greater than 25 inches (625 mm) of precipitation each year. The average monthly temperatures in Sedalia range from –9 to 32 °C. The extreme temperatures for the last sixty years has been from –34 to 46 °C. The pavement was designed for an average 7-day maximum temperature of 64 °C. The minimum pavement design temperature is –28 °C.

## 1.2 Summary of Supplemental Test Sections

In addition to the three cells meeting the basic SHRP requirements, six supplemental test sections were built. These test sections were built in order for the Missouri Highway Department to test variables of its own interest. See table 6 for a description of the properties of each supplemental test sections.

## 1.3 Project Location

The SPS-9A project is located on U.S. 65 in western Missouri, north of Sedalia. This is about 60 miles east of Kansas City. Figure A-1 in attachment A shows the general location of the SPS-9 site, as well as all the other GPS and SPS sites in Missouri.

## 1.4 Type of Roadway and Traffic Characteristics

At this location, U.S. 65 is a four-lane divided highway. The original 8-in reinforced portland cement concrete pavement was constructed in 1966 and opened in 1968. The SPS-9A project placed a 4-in asphalt concrete overlay. Table 1 shows gives the traffic data for this test site.

Table 1. Design Traffic on Missouri SPS-9A.

| | |
|---|---|
| Annual average daily traffic, two way | 9,129 (1995) |
| % heavy trucks and combinations (of AADT) | 15% (of which 57% is comb.) |
| 1995 estimated 18k ESAL rate in study lane | 785,000 rigid ESALS per year |
| Total 18k design ESAL applications in design lane | 5,772,103 rigid ESALS |
| Design period | 15 years |

Table 2. Geometry of Missouri SPS-9A Sections.

| Section # | Cut/fill (beginning) | Cut/fill (end) | Horizontal Alignment | Vertical alignment |
|---|---|---|---|---|
| 290959 | 2' fill | 14' fill | Tangent | -.84% |
| 290960 | 5' cut | 11' cut | Tangent | +.36% |
| 290961 | 10' fill | 17' fill | Tangent | -.52% |
| 290901 | 20' cut | 4' cut | Tangent | -2.32% |
| 290902 | 13' cut | 47' cut | Tangent | -2.32% |
| 290903 | 35' cut | 35' cut | P.I. = 486+72.9<br>Delta = 17°56' left<br>D = 2°56'<br>R = 2864.93<br>T = 482.1<br>L = 898.7<br>S.E. = .05'/ft | + 3.0% / -2.5%<br>P.I. = 487 + 50 |
| 290962 | 7' fill | 4' fill | Tangent | -.4% / +.2%<br>P.I. = 525+16.7 |
| 290963 | 13' fill | 16' fill | Tangent | +.2% / 0%<br>P.I. = 555 + 00 |
| 290964 | 14' cut | 10' cut | Tangent | 0% / +2.2%<br>P.I. = 571+68.2 |

**Field Sampling and Materials Testing:**

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Starr D. Kahn, P.E., Ph.D.
Soil and Materials Engineers, Inc.
43980 Plymouth Oaks Boulevard
Plymouth, Michigan 48170-2584
(313) 454-9900

Derek White
Missouri Highway and Transportation Department
Materials and Research Division Central Laboratory
P.O. Box 270
Jefferson City, Missouri 65102
(573) 526-4329

## 1.10 Summary of Key Construction Equipment

Table 3 summarizes the construction equipment that was used to place the asphalt concrete overlay.

Table 3. Construction Equipment Used at Missouri SPS-9A

| | |
|---|---|
| Pick-up machine | Gomaco 8500 B |
| Paver | Blaw Knox PF-200 |
| Breakdown roller | Cat CB-534C w/ or w/o vibration |
| Intermediate roller | Ingersoll-Rand DD-90 |
| Finish roller | Hyster C350C |
| Shoulder preparations | Hyster C340A |
| Additional roller | Tampo RS-166A dual steel drum |
| Substitute roller | Blaw Knox PF-172 |

A rubber-tired roller was used on State sections that did not use PG oils.

# 2

# Project Details

The Missouri SPS-9A test site consists of nine test sections. Attachment B shows the layout of the test sections. This attachment also contains plan and profile figures for each test sections. Table 5 gives the stationing of each test section.

Table 5. Station of Missouri SPS-9A Test Sections.

| Section # | Begin | End |
|---|---|---|
| 290959* | 291 + 94 | 296+94 |
| 290960* | 318 + 40 | 323 + 40 |
| 290961* | 347 + 91 | 352 + 91 |
| 290901 | 438 + 06 | 443 + 06 |
| 290902 | 460 + 13 | 465 + 13 |
| 290903 | 484 + 76 | 489 + 76 |
| 290962* | 524 + 46 | 529 + 46 |
| 290963* | 550 + 81 | 555 + 81 |
| 290964* | 568 + 00 | 573 + 00 |

*MoDOT test sections.

## 2.1 Construction Activities

This SPS-9A project involved the overlay of approximately 4 in of asphalt on the existing 8 in of portland cement concrete. Therefore, the only step in construction was to lay the different grades of pavement.

### Asphalt Concrete Plant

The asphalt concrete plant used was an Almix 8838 drum mix. It was located about 15 miles (16 minutes) from the test site.

### Asphalt Paving

Paving was performed by either a Blaw-Knox PF-200 or PF-172 with a single pass laydown width of approximately 12.5 ft. The longitudinal surface joint was located between lanes. The breakdown compaction was performed by a Cat CB-534C both with and without vibration. An Ingersoll-Rand DD-90 was used for intermediate compaction. Final compaction was achieved by a Hyster C350C. A tackcoat layer of type SS-1 was used. Table 6 gives a description of the various asphalt grades used.

Table 6. Asphalt Grades Used by Section on Missouri SPS-9A.

| Section | Asphalt Grade | Description |
|---|---|---|
| 290901 | AC 20 | Asphalt which Missouri specified for this location. 2 inch IC top layer and 2 inch IB second layer. (Normal mix) |
| 290902 | PG 64-28 | PG grade based on temperature conditions at this location. 2.5 inch surface course and 1.5 inch binder course. |
| 290903 | PG 58-28 | Back off one grade to study effect of a grade less conservative on rutting. |
| 290959 | AC 20 | SMA with fiber. |
| 290960 | PG 64-28 | SMA with fiber. |
| 290961 | AC 20 | Using SUPERPAVE design mix aggregate. |
| 290962 | PG 70-28 | One grade more conservative to observe effect on rutting. |
| 290963 | PG 64-16 | One grade less conservative on low temperature to study thermal cracking effect. |
| 290964 | PG 64-28 | Replicate of 290902 to study variation in performance. 2 inch surface course and 2 inch binder course. |

## 2.2 General Construction Remarks

Base layer paving of first four sections (0959, 0960, 0961 and 0901) had been completed on July 22 and 23. Approximately 9 in of rain fell the weekend prior to paving. Pumping was evident in these sections due to continued saturation from the weekend's rain. These areas of pumping were noted on distress surveys.

Pre-overlay distress surveys were made before the final five sections were paved. Photos and video of the existing pavement are available.

Several problems with compaction were reported. Section 0959 displayed isolated patches of excess asphalt near mid-lane after completion. Hot mix had also been tracked onto this section from loose piles on the shoulder. Section 0903 had stone cracking on surface. The compacted finish was not of high quality and the mix tended to move a considerable amount underneath the paver. Attempts were made to correct some surface defects, but without complete success.

Cores for material testing were taken after each test section was completed.

# Attachment A

# Project Location

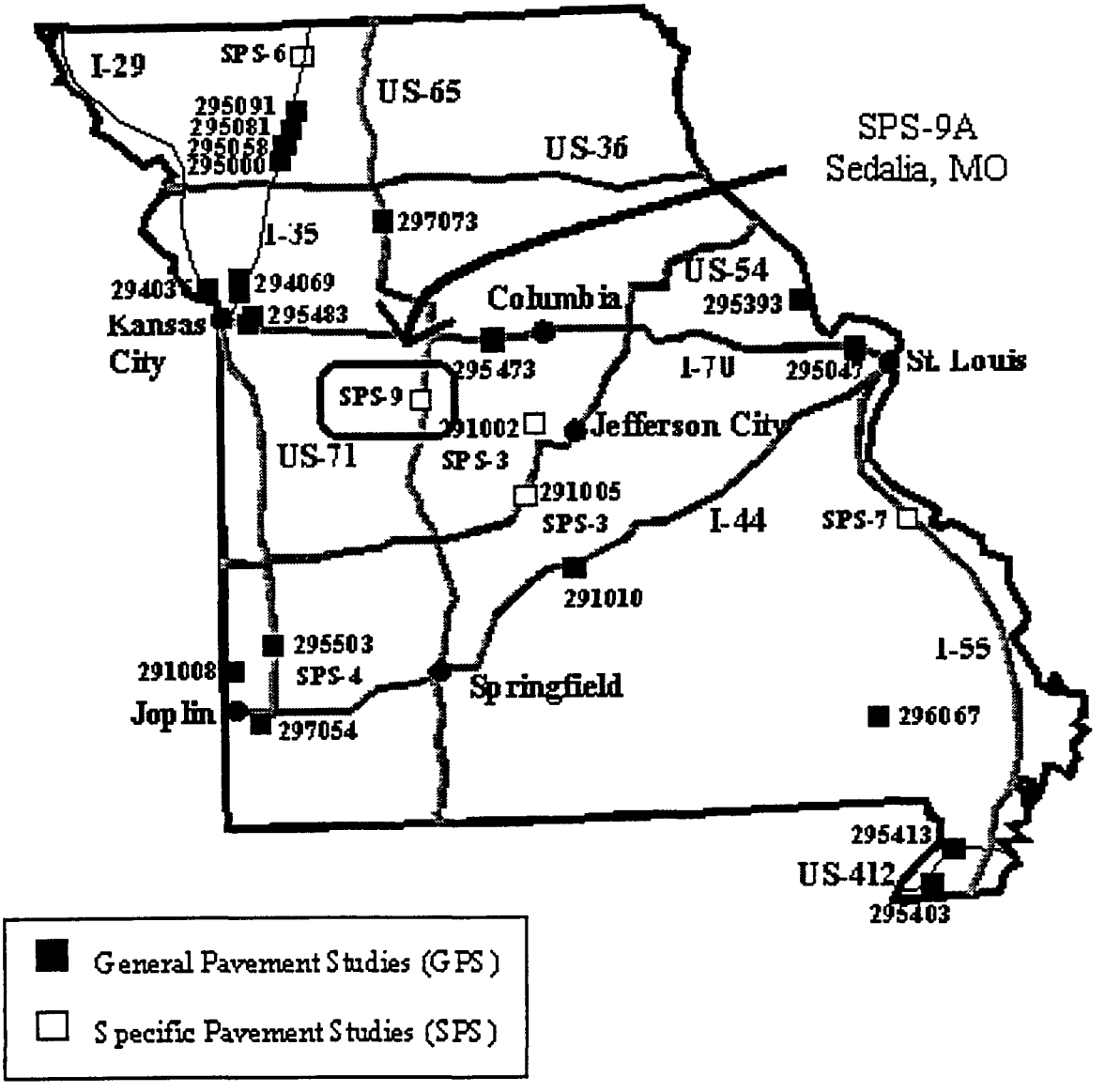



Figure A-1. General Missouri SPS-9A Site Location.

# Attachment B

# Test Section Layout

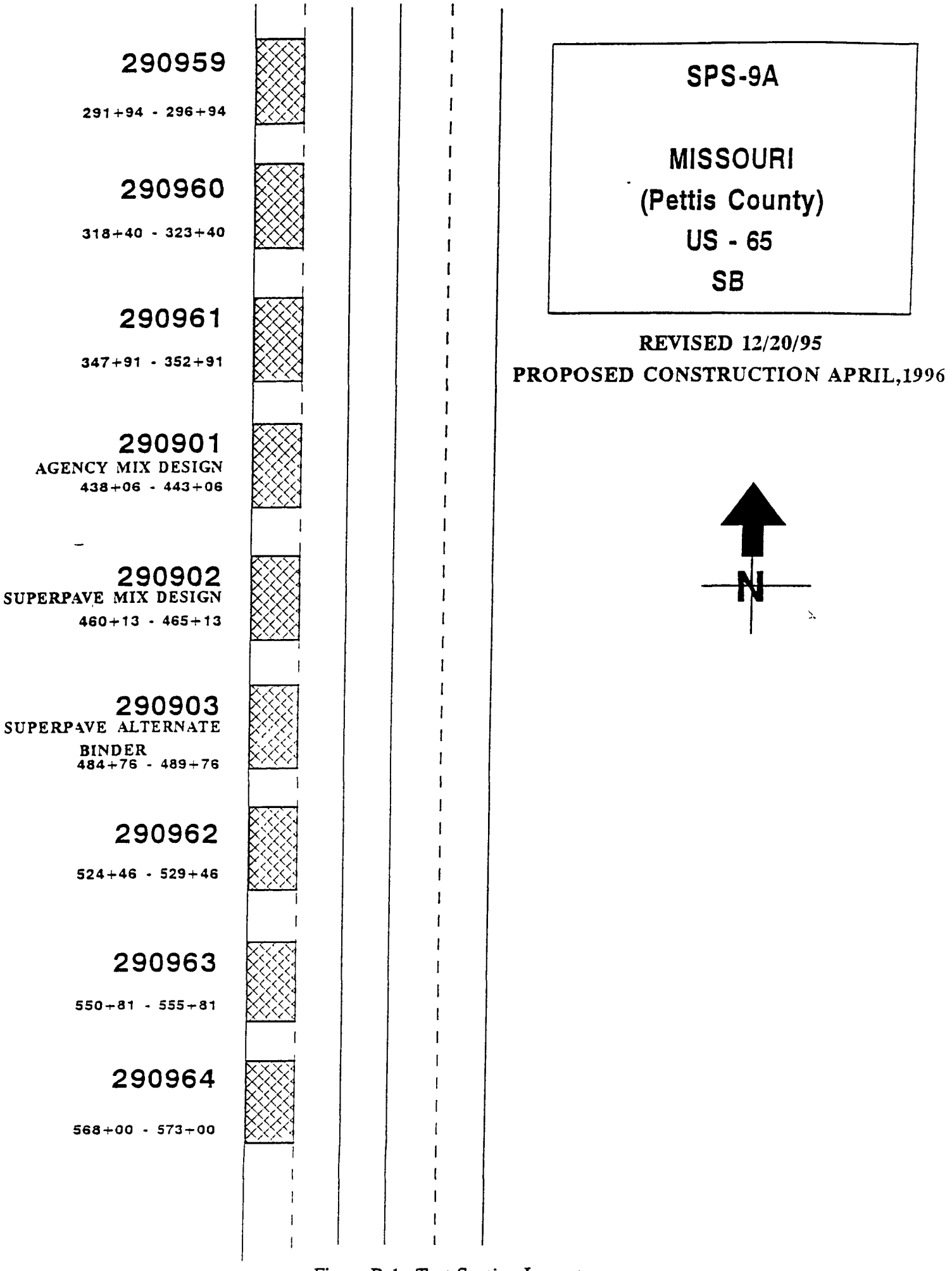
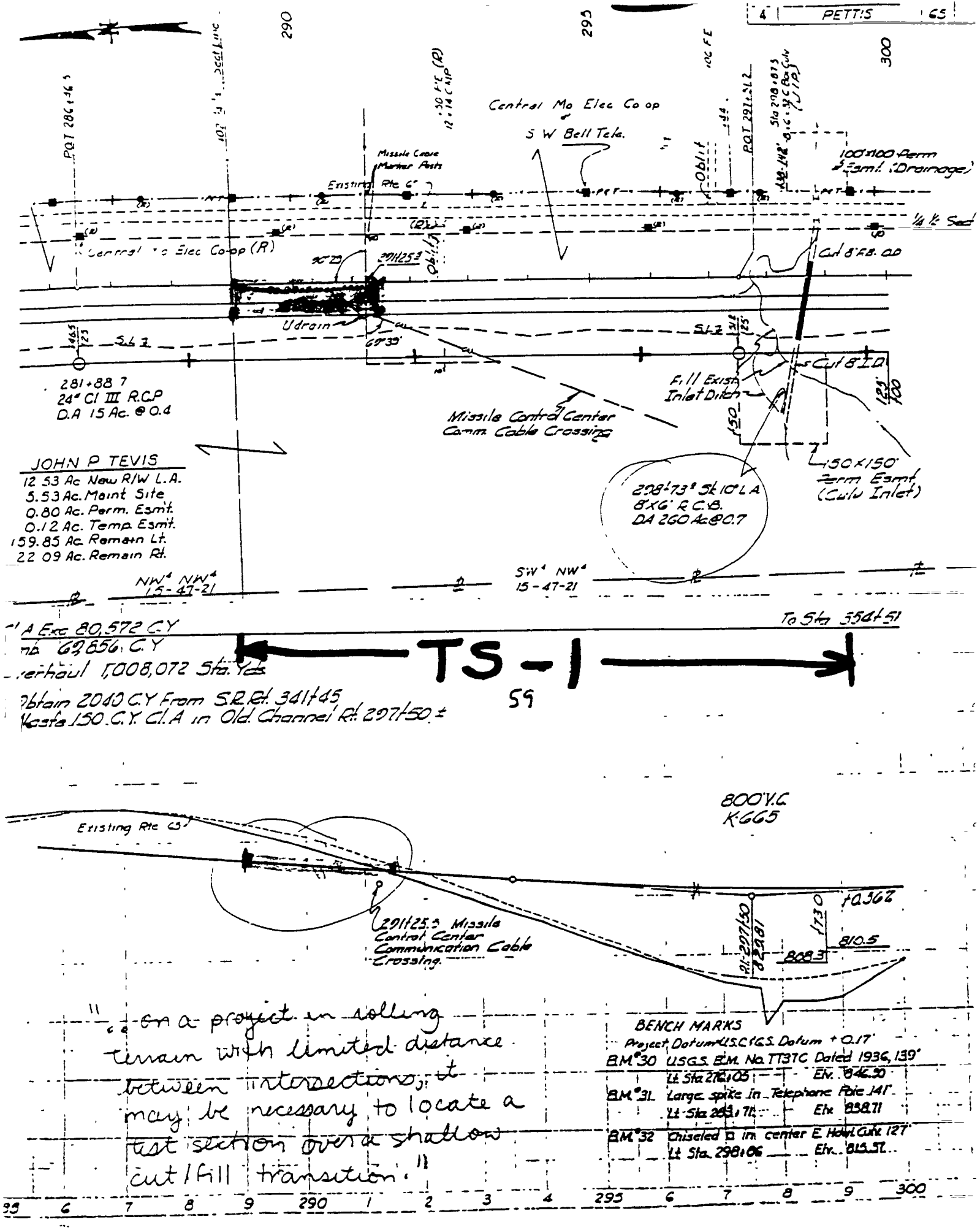



Figure B-1. Test Section Layout.




"On a project in rolling terrain with limited distance between intersections, it may be necessary to locate a test section over a shallow cut/fill transition."

Figure B-2. Plan and Profile for Section 290959.

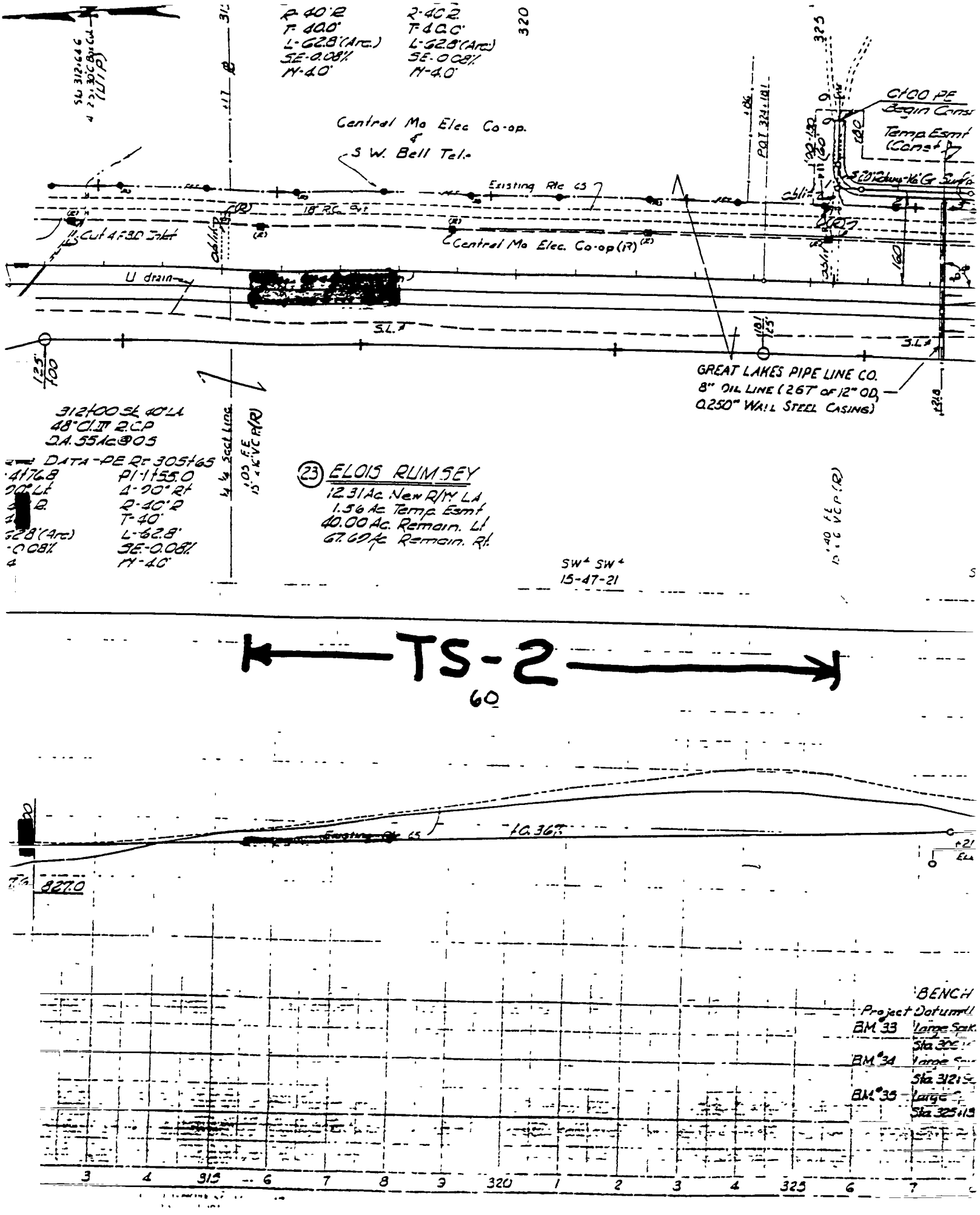



Figure B-3. Plan and Profile for Section 290960.

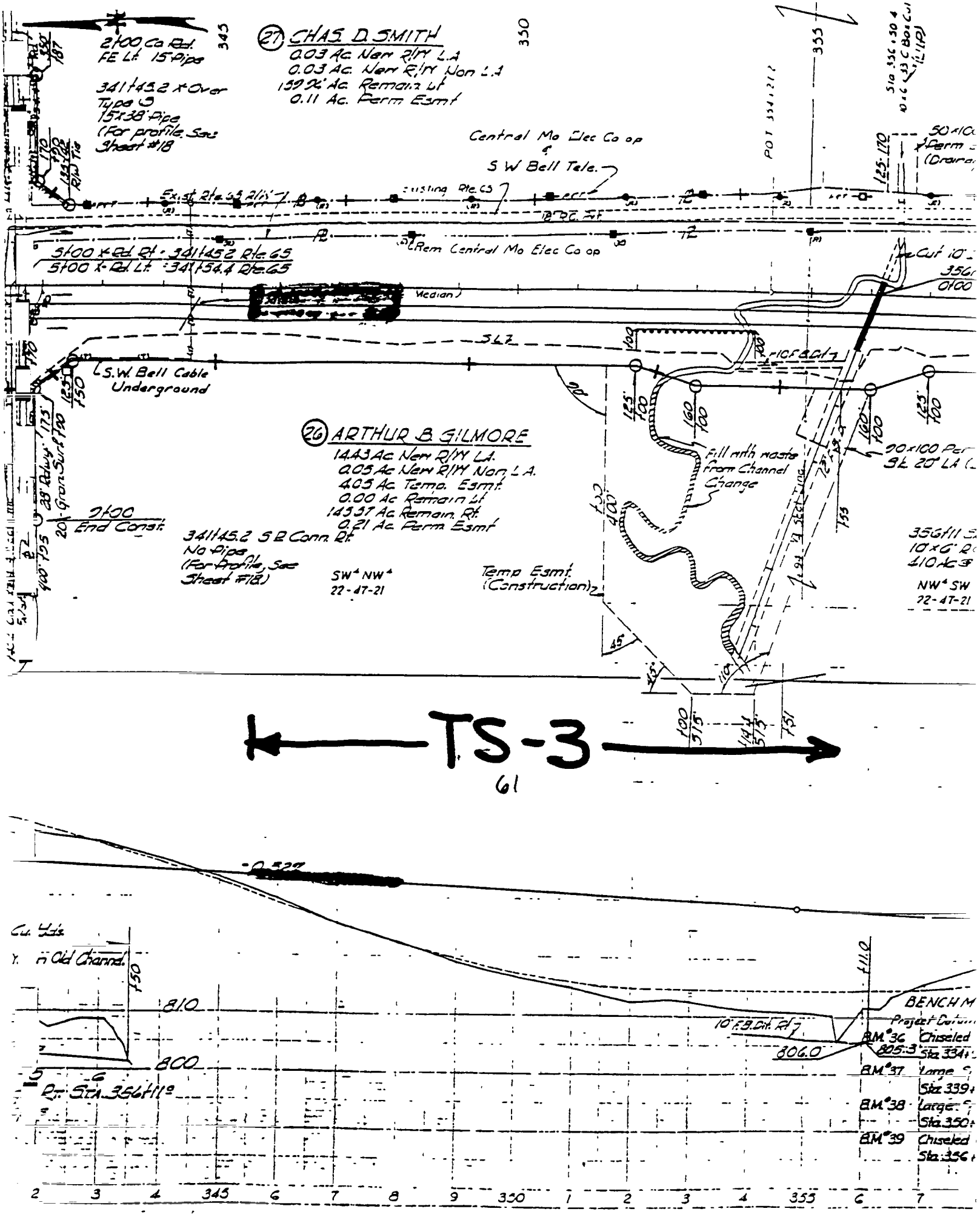



Figure B-4. Plan and Profile for Section 290961.

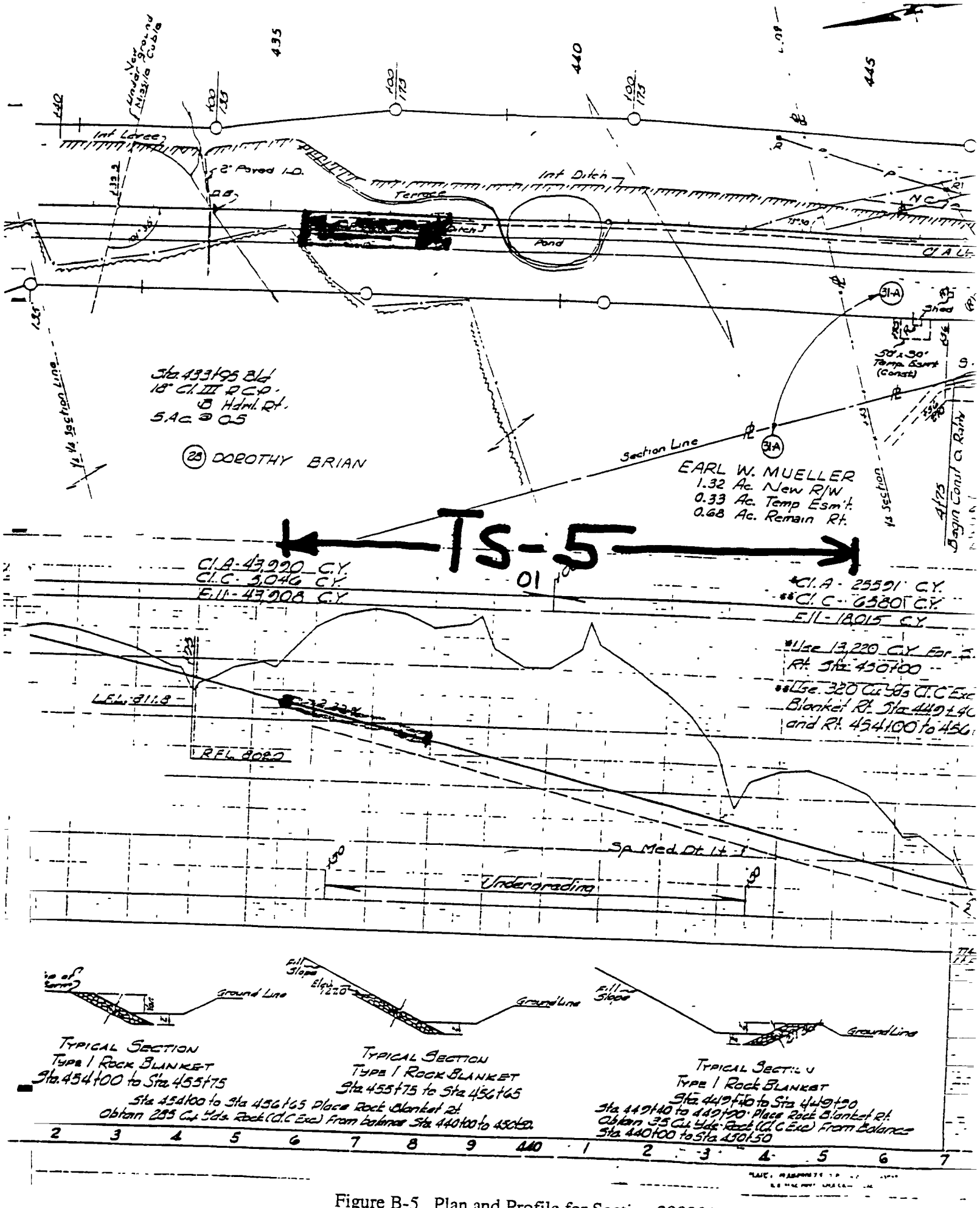



Figure B-5. Plan and Profile for Section 290901.

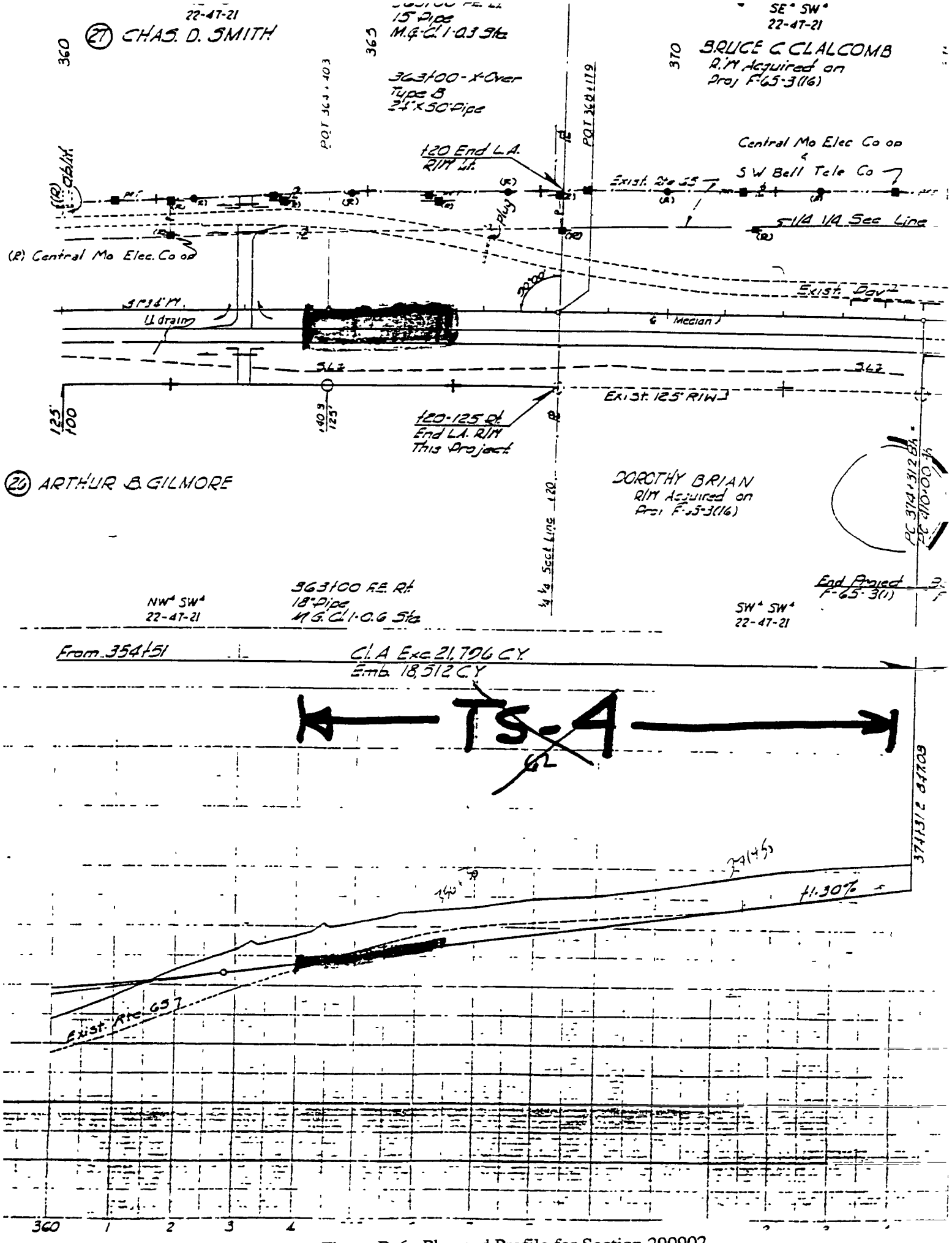



Figure B-6. Plan and Profile for Section 290902.

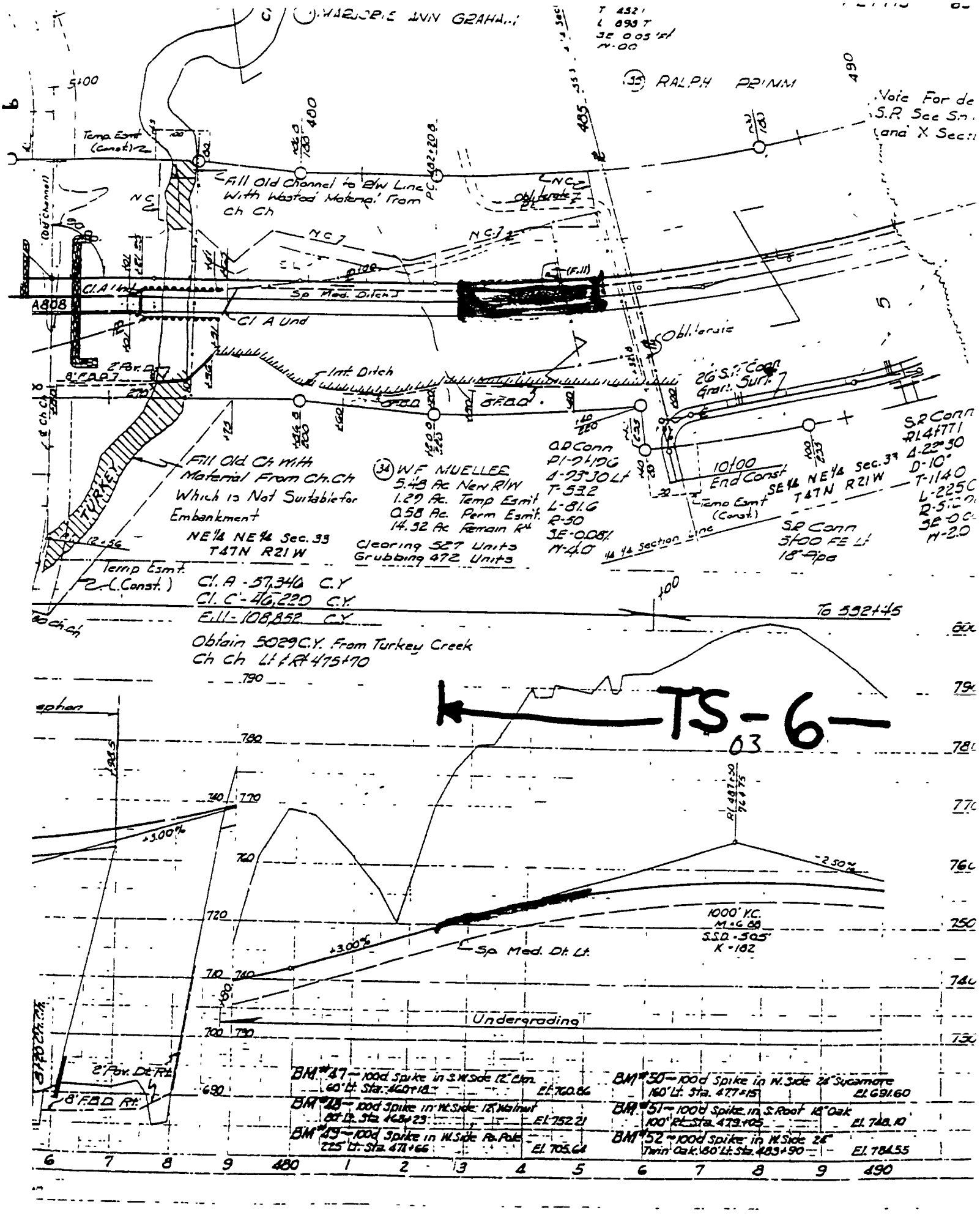



Figure B-7. Plan and Profile for Section 290903.

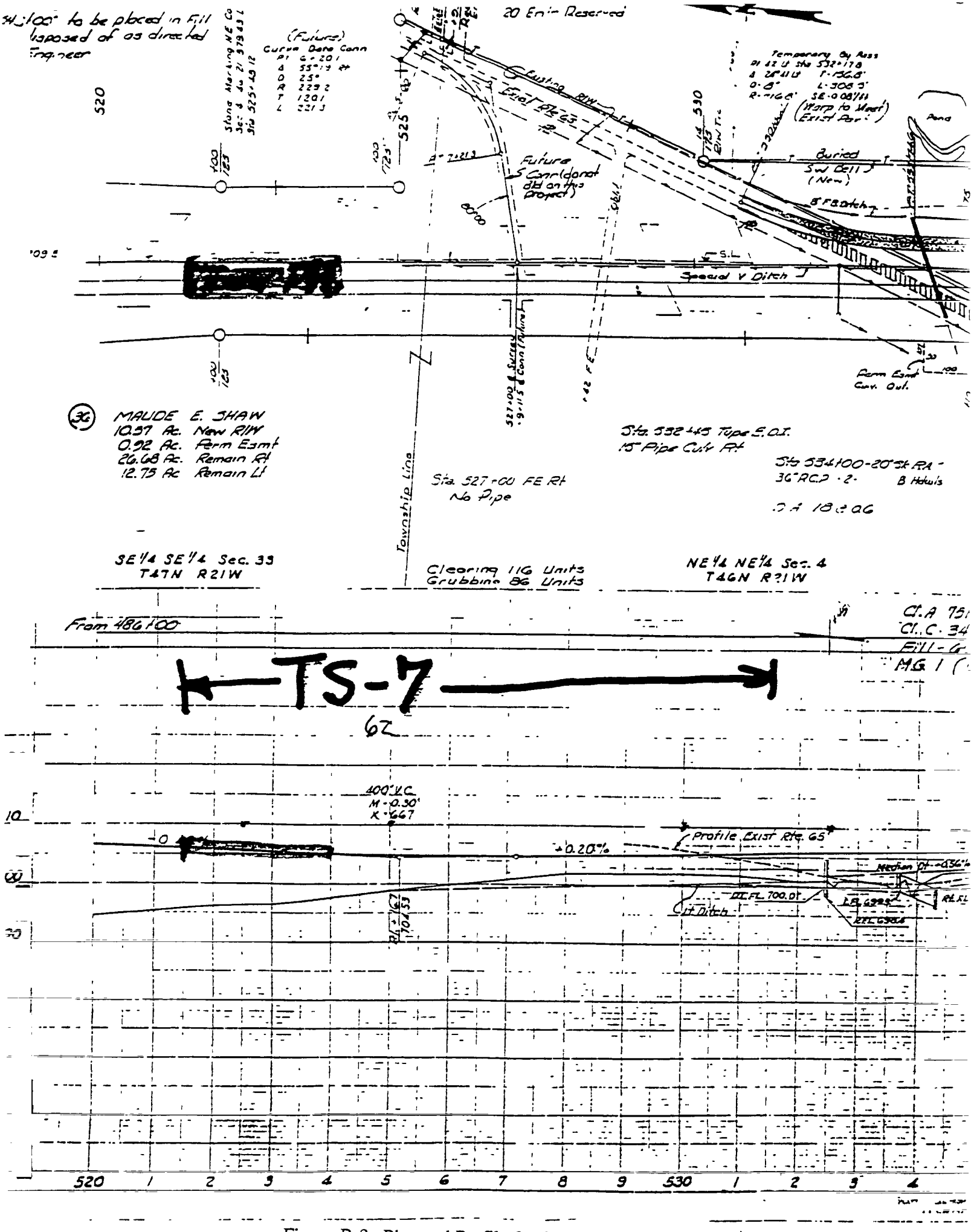



Figure B-8. Plan and Profile for Section 290962.

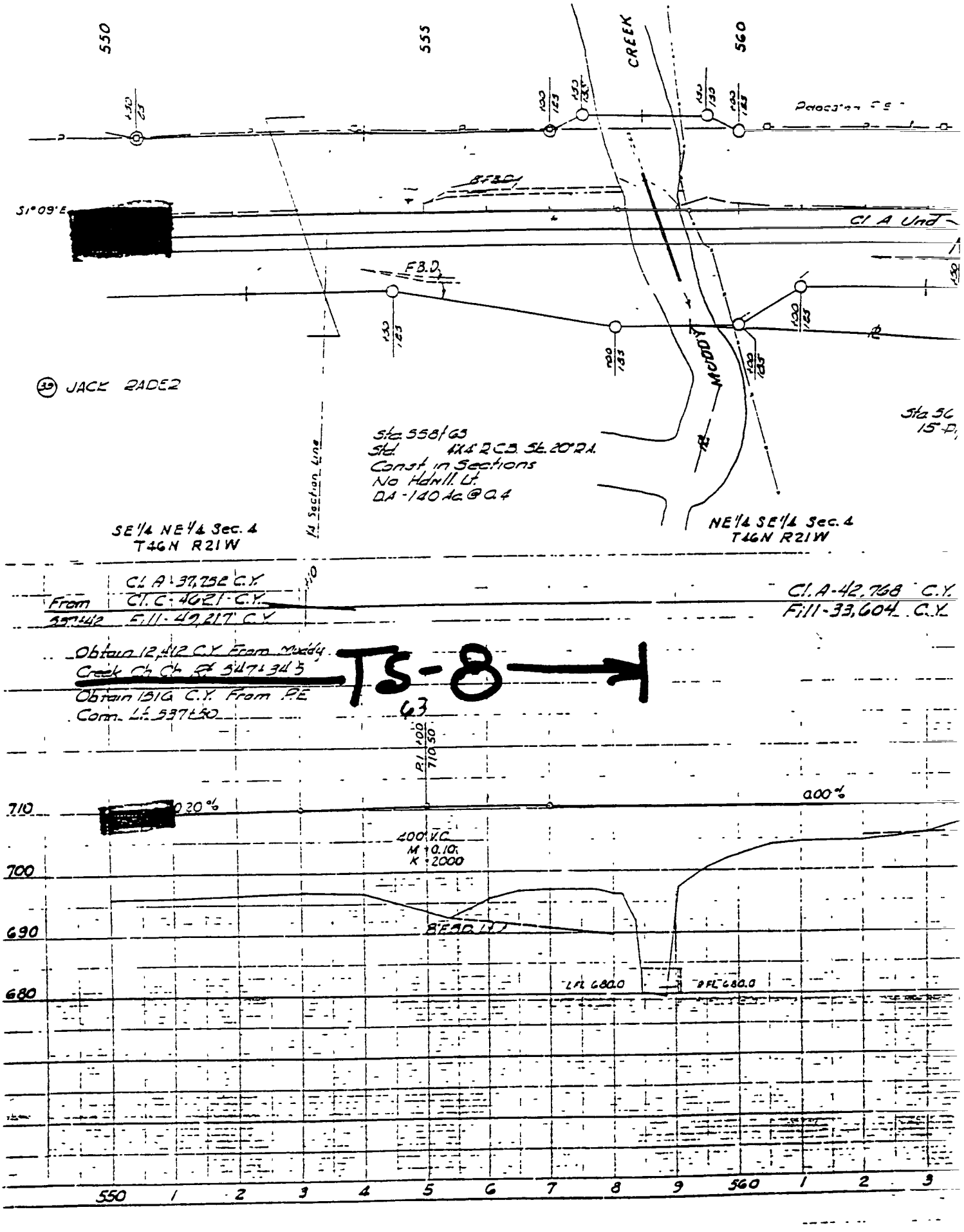



Figure B-9. Plan and Profile for Section 290963.

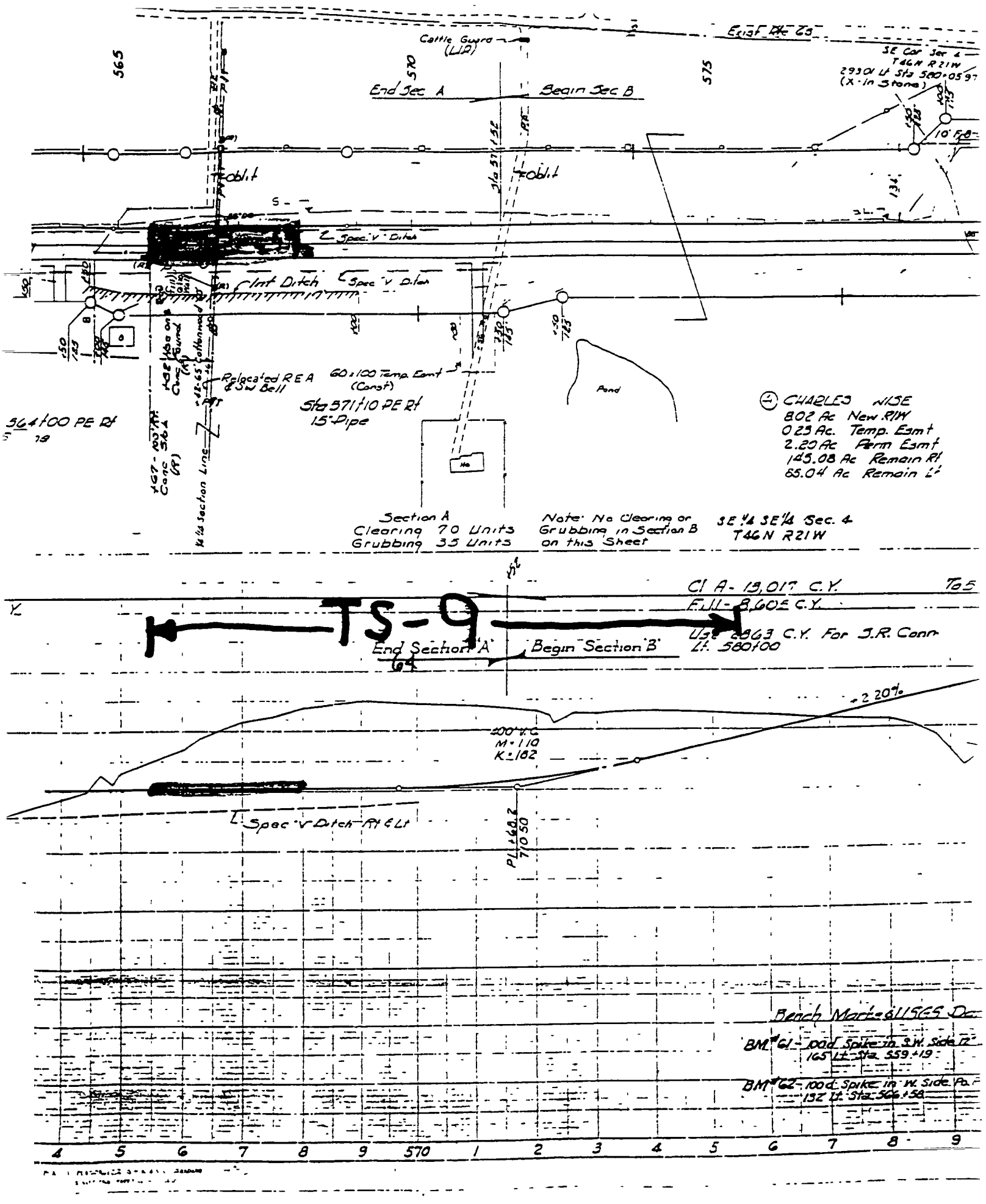



Figure B-10. Plan and Profile for Section 290964.

# Attachment C

# Project Deviation Reports

| **LTPP SPS Project Deviation Report**<br>**Project Summary Sheet** | State Code 2 9<br>Project Code 0 9 0 0 |
|---|---|

**Project Classification Information**

| | |
|---|---|
| SPS Experiment Number: SPS-9 | State or Province: Missouri |
| LTPP Region: | ☐ North Atlantic ☒ North Central ☐ Southern ☐ Western |
| Climate Zone: | ☐ Dry-Freeze ☐ Dry-No Freeze ☒ Wet-Freeze ☐ Wet-No Freeze |
| Subgrade Classification: | ☒ Fine Grain ☐ Coarse Grain ? ☐ Active (SPS-8 Only) |
| Project Experiment Classification Designation (SPS 1, 2, & 8): | |
| Construction Start Date: August 1996 | Construction End Date: September 1996 |
| FHWA Incentive Funds Provided to Agency for this Project: | ☐ Yes ☐ No |

**Deviation Summary**

| | |
|---|---|
| Site Location Deviations: | ☒ No Deviations ☐ Minor Deviations ☐ Significant Deviations |
| Construction Deviations: | ☐ No Deviations ☒ Minor Deviations ☐ Significant Deviations |

**Data Collection and Processing Status Summary**

| | |
|---|---|
| Inventory Data (SPS 5,6,7, & 9): | ☐ Complete Submission ☒ Incomplete ☐ Data Not Available |
| Materials Data: | ☒ All Scheduled Samples Obtained and Tested ☐ Incomplete |
| Construction Data: | ☐ All Required Data Obtained ☒ Incomplete / Missing Data Elements |
| Historical Traffic Data: | ☒ All Required Historical Estimates Submitted (SPS 5, 6, 7, & 9)<br>☐ Required Estimates Not Submitted |
| Traffic Monitoring Equipment: | ☒ WIM Installed On-Site ☐ AVC Installed On-Site<br>☐ ATR Installed On-Site ☐ No Equipment Installed |
| Traffic Monitoring: | ☐ Preferred ☒ Continuous ☐ Minimum ☐ Below Minimum ☐ Site Related |
| Traffic Monitoring Data: | ☒ Monitoring Data Submitted ☐ No Monitoring Data Submitted |
| FWD Measurements: | ☒ Pre-construction Tests Performed ☐ Construction Tests Performed<br>☒ Post-construction Tests Performed |
| Profile Measurements: | ☒ Pre-construction Tests Performed ☒ Post-construction Tests Performed |
| Distress Measurements | ☒ Pre-construction Tests Performed ☒ Post-construction Tests Performed |
| Maintenance and Rehab. Data: | ☒ Complete Submission ☐ Incomplete ☐ Data Not Available |
| Friction Data: | ☐ Complete Submission ☒ Incomplete ☐ Data Not Available |

**Report Status**

| | |
|---|---|
| Materials Sampling and Test Plan: | ☐ Document Prepared ☒ Final Submitted To FHWA |
| Construction Report: | ☒ Document Prepared ☐ Final Submitted To FHWA |
| AWS: (SPS 1, 2, & 8) NA | ☐ AWS Installed ☐ AWS Installation Report Submitted to FHWA |

Page 1 of 5 Preparer Mike Pozsgay Date 9-14-1998

| **LTPP SPS Project Deviation Report**<br>**Construction Guidelines Deviation** | State Code 2 9<br>Project Code 0 9 0 0 |
|---|---|

☐ Comments Pertain to All Test Sections on Project

☒ Comments Pertain Only to Section(s): (Specify) 290901, 290902, 290903, 290964

**Construction Guidelines Deviation Comments**

290901: Poor pavement finish.

290902: Poor pavement finish. VMA = 13.0%, want at least 13.4%

290903: Density only 91.1%. (Design density = 92%)

290964: High air voids content.

All sections: Some problems with AC content being .5 - .7% too low.

 Preparer Mike Pozsgay Date 9-14-1998

| **LTPP SPS Project Deviation Report**<br>**Other Deviations** | State Code 2 9<br>Project Code 0 9 0 0 |
|---|---|

☒ Comments Pertain to All Test Sections on Project

☐ Comments Pertain Only to Section(s): (Specify) _____

**Other Deviation Comments**

None known.

 Preparer Mike Pozsgay Date 9-14-1998

| **LTPP SPS Project Deviation Report**<br>**Site Location Guidelines Deviations** | State Code 2 9<br>Project Code 0 9 0 0 |
|---|---|

☒ Comments Pertain to All Test Sections on Project

☐ Comments Pertain Only to Section(s): (Specify) _____

**Site Location Guideline Deviation Comments**

None known.

 Preparer Mike Pozsgay Date 9-14-1998

| **LTPP SPS Project Deviation Report**<br>**Data Collection and Materials Sampling and Testing Deviations** | State Code 2 9<br>Project Code 0 9 0 0 |
|---|---|

☒ Comments Pertain to All Test Sections on Project

☐ Comments Pertain Only to Section(s): (Specify) _____

**Data Collection & Material Sampling and Testing Deviation Comments**

Torque amplitude data not readily available with current DSR software.

Sample numbers were split on testing data sheets as approved by Chuck Wienrank.

 Preparer Mike Pozsgay Date 9-14-1998

**Submitted by**

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