CALIFORNIA HIGH-SPEED TRAIN
TUNNELS

RECORD SET PEPD
DESIGN SUBMISSION

Bakersfield to Palmdale
Tunnels

October 2017
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AB</td>
<td>Aggregate base</td>
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<td>ABG</td>
<td>Aggregate bonded bituminous coated</td>
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<td>ABM</td>
<td>Air-blown mortar</td>
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<td>ABN</td>
<td>Abandon</td>
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<tr>
<td>ADJ</td>
<td>Adjustment</td>
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<td>AC</td>
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<td>ACP</td>
<td>Asbestos cement pipe</td>
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<td>AKL</td>
<td>Added dead load</td>
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<td>Adjust</td>
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<td>AFES</td>
<td>Alternative flared end section</td>
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<tr>
<td>AG</td>
<td>Ambled</td>
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<tr>
<td>AL</td>
<td>Alternate</td>
</tr>
<tr>
<td>AM</td>
<td>Time from midnight to noon</td>
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<tr>
<td>AN</td>
<td>Alternative pipe</td>
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<tr>
<td>AS</td>
<td>Assemble</td>
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<td>ATPB</td>
<td>Asphalt treated permeable base</td>
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<td>ATRN</td>
<td>Asphalt treated permeable material</td>
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<tr>
<td>AVG</td>
<td>Avenue</td>
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<tr>
<td>AW</td>
<td>At</td>
</tr>
<tr>
<td>BAGR</td>
<td>Bridge approach guard railing</td>
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<td>BB</td>
<td>Beginning of bridge</td>
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<tr>
<td>BC</td>
<td>Begin horizontal curve</td>
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<td>BCC</td>
<td>Balanced cantilever construction</td>
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<td>BCR</td>
<td>Begin curb return</td>
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<td>Begin</td>
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<td>Bakersfield F Street station alignment</td>
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<td>BIT CTO</td>
<td>Bit curve to</td>
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<td>BK</td>
<td>Back</td>
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<td>BMF</td>
<td>Bearing flail</td>
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<td>Building</td>
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<td>Burlington North &amp; Santa Fe</td>
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<td>Bearing</td>
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<td>Begin vertical curve</td>
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<td>CAPA</td>
<td>Corrugated aluminum pipe arch</td>
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<td>CAS</td>
<td>Construction area sign</td>
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<td>CB</td>
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<td>C-C</td>
<td>Center to center</td>
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<td>charismatic pipe</td>
<td>CHSR</td>
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<td>CHPRA</td>
<td>California high speed rail</td>
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<tr>
<td>CNO</td>
<td>Cured, concrete, cast-in-place</td>
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<tr>
<td>CNL</td>
<td>Channel</td>
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<td>Cast iron</td>
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<td>Cast-in-place, cement pipe</td>
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<td>CEM-H</td>
<td>Cast-in-place, cement pipe centers</td>
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<td>CM-1-P-C</td>
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<td>Cast-in-place concrete pipe centers</td>
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<td>Complete joint penetration</td>
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<td>Creek</td>
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<td>Continuous reinforced concrete pavement</td>
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<td>Corrugated steel pipe</td>
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<td>Curve, cast in place, concrete pipe</td>
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<td>D</td>
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<td>Downbrain, direct drilled</td>
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<td>Department of water and power</td>
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<td>Edge of traveled way</td>
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<td>EXC</td>
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<td>Exterior</td>
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<tr>
<td>F</td>
<td>Frame and cover</td>
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<tr>
<td>F &amp; G</td>
<td>Frame and grade</td>
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<td>FAK</td>
<td>Floor beam</td>
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<td>Facing, eastbound traffic</td>
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<td>Filter fabric</td>
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<td>Finished grade</td>
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<td>Figure</td>
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<td>Facing, westbound traffic</td>
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<td>Fair side, finished surface</td>
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<td>Feet</td>
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<td>Height</td>
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<td>Horizon, drain, gravel, gravel, gravel</td>
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<td>Head, gravel, gravel, gravel</td>
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<td>HEX</td>
<td>Hexagonal head</td>
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<td>HMA</td>
<td>Hot mixed asphalt</td>
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<td>Horizontal</td>
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<td>High point, horseshoe</td>
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<td>High performance steel</td>
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<td>High strength, gravel, gravel, gravel</td>
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<td>High strength, gravel, gravel, gravel</td>
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<td>HSV</td>
<td>High strength, gravel, gravel, gravel</td>
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<td>HW</td>
<td>High wall, gravel, gravel, gravel</td>
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<td>HM</td>
<td>High, gravel, gravel, gravel</td>
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<tr>
<td>HMY</td>
<td>High way, gravel, gravel, gravel</td>
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**General Abbreviations and Legend**

- **Calif. High-Speed Rail Project**
- **Bakersfield to Palmdale**

**Note:** The abbreviations and legends provide a comprehensive list of terms used in the document, including geographic locations, construction elements, and engineering specifications.
LEGEND:

PLAN

- SECTION NUMBER
- DRAWING NUMBER
  XX CURVE DATA (ALIGNMENTS, ROADWAYS)
  XX CURVE DATA (STRUCTURES)
  XX LINE DATA (ALIGNMENTS, ROADWAYS)
- NORTH ARROW

PROFILE

- ORIGINAL GROUND
- PROPOSED CHSR ELEVATION
- STRUCTURAL CLEARANCE ENVELOPE
- FACE EXCAVATION (CUT AND BENCH)

GENERAL NOTES

1. ROADWAY IMPROVEMENTS NOT PART OF THIS SET.
2. FOR PROPOSED RETAINING WALL SEE SHEET SERIES ST-G.

CALEIFORNIA HIGH-SPEED RAIL PROJECT
Bakersfield to Palmdale

GENERAL ABBREVIATIONS AND LEGEND
SHEET 4 OF 4
ALIGNMENT "ALTERNATIVES 1,2,3,5"

APPROXIMATE WHITE WOLF FAULT ZONE BOUNDARY

APPROXIMATE TEHACHAPI CREEK FAULT ZONE BOUNDARY

APPROXIMATE GARLOCK FAULT ZONE BOUNDARY

CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE

KEY MAP- ALT 1,2,3,5 ALIGNMENT TUNNELS
GENERAL NOTES:

1. FOR PROFILE INFORMATION, SEE SHEET TN-11301
2. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00

PLAN

CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
ALT 1,2,3,5 ALIGNMENT
TUNNEL 1 = NORTH AND SOUTH PORTAL
STATION 18015+00 TO 18075+00
GENERAL NOTES:
1. FOR PROFILE INFORMATION SEE SHEET TN-71503
2. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00

CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
ALT 1,2,3,5 ALIGNMENT
TUNNEL 2 - NORTH AND SOUTH PORTAL
STATION 18103+00 TO 18163+00

PLAN
CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
ALT 1,2,3,5 ALIGNMENT TUNNEL 3
NORTH AND SOUTH PORTAL
STATION 18171+00 TO 18231+00

GENERAL NOTES:
1. FAULT ZONE LOCATIONS ARE APPROXIMATE, TO BE CONFIRMED.
2. FOR PROFILE INFORMATION SEE SHEET TN-Y1002
3. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19581+00

PLAN
GENERAL NOTES:
1. FAULT ZONE LOCATIONS ARE APPROXIMATE, TO BE CONFIRMED.
2. FOR PROFILE INFORMATION SEE SHEETS TN-Y1002, TN-Y1003
3. TUNNEL 4 WILL BE CONSTRUCTED BY CUT AND COVER METHODS BETWEEN STATION 18362+50 TO 18368+00
4. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00
GENERAL NOTES:

1. FAULT ZONE LOCATIONS ARE APPROXIMATE, TO BE CONFIRMED.

2. FOR PROFILE INFORMATION SEE SHEET TN-Y1003

3. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00

CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
ALT 1,2,3,5 ALIGNMENT
TUNNEL 4 - SOUTH PORTAL
STATION 18398+00 TO 18458+00

PROPOSED 4" CHSR WATERLINE, SEE NOTE 3.

PLAN
GENERAL NOTES:
1. FAULT ZONE LOCATIONS ARE APPROXIMATE, TO BE CONFIRMED.
2. FOR PROFILE INFORMATION SEE SHEET TN-Y1003
3. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00

TUNNEL 5 - NORTH AND SOUTH PORTALS
STATION 18505+00 TO 18566+00

SOUTH PORTAL
CHSR TUNNEL #5
CONTROL ZONE
EVACUATION AND FIRE
1350' TRAIN SURFACE

EXCAVATION LIMITS
TUNNEL 5

TYPICAL SECTIONS.
ACCESS ROAD. SEE TRACK TIE INTO MAINTENANCE

DISTURBANCE
GROUND LIMITS OF
ZONE BOUNDARY
TEHACHAPI CREEK FAULT
PROP CHSR R/W

PROPOSED 4" CHSR WATERLINE, SEE NOTE 3.

PTEF
PPEF
ACCESS ROAD

ALT 1,2,3,5 • CHSR NB ALIGNMENT
ALT 1,2,3,5 • CHSR SB ALIGNMENT

DESIGNED BY
J. CARROLL
DRAWN BY
J. FOUCH
CHECKED BY
G. ERICKSON
IN CHARGE
J. MORRISON
DATE
10/31/2017

RECORD
PEPD
SUBMITTAL
NOT FOR
CONSTRUCTION

CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
CONTRACT NO.
HSR13-44
DRAWING NO.
TN-C4008
SCALE
AS SHOWN
SHEET NO.
PLAN

1"=200' HOR

CALIFORNIA HIGH-SPEED RAIL PROJECT
ALT 1,2,3,5 ALIGNMENT
TUNNEL 5 - NORTH AND SOUTH PORTALS
STATION 18505+00 TO 18566+00

10/31/2017
GENERAL NOTES:

1. FAULT ZONE LOCATIONS ARE APPROXIMATE, TO BE CONFIRMED.
2. FOR PROFILE INFORMATION SEE SHEET TN-Y1004
3. PROPOSED 4' WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00

DESIGNED BY
J. CARROLL
DRAWN BY
J. FOUCH
CHECKED BY
G. ERICKSON
IN CHARGE
J. MORRISON
DATE
10/31/2017

RECORD
PEPD
SUBMITTAL
NOT FOR CONSTRUCTION
GENERAL NOTES:
1. FAULT ZONE LOCATIONS ARE APPROXIMATE, TO BE CONFIRMED.
2. FOR PROFILE INFORMATION SEE SHEET TN-Y1004
3. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00

PROPOSED 4" CHSR WATERLINE, SEE NOTE 3.

TUNNEL 6 EXCAVATION LIMITS

EMERGENCY EXIT - TYPICAL

LIMITS OF GROUND DISTURBANCE

SOUTH PORTAL

CHSR TUNNEL #6

PROP CHSR R/W

PTEF

E. CHSR SB ALIGNMENT

PTEF

PROP CHSR R/W

EMERGENCY EXIT - TYPICAL

PTEF

TUNNEL 6 EXCAVATION LIMITS

PTEF

EMERGENCY EXIT - TYPICAL

TUNNEL 6 EXCAVATION LIMITS

PTEF

EMERGENCY EXIT - TYPICAL

CALIFORNIA HIGH-SPEED RAIL PROJECT
Bakersfield to Palmdale

ALT 1, 2, 3, 5 ALIGNMENT
TUNNEL 6 - SOUTH PORTAL
STATION 18630+00 TO 18690+00
GENERAL NOTES:

1. FOR PROFILE INFORMATION SEE SHEET TN-C1005
2. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00
GENERAL NOTES:
1. FAULT ZONE LOCATIONS ARE APPROXIMATE, TO BE CONFIRMED.
2. FOR PROFILE INFORMATION SEE SHEET TN-Y1005
3. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00

DESIGNED BY
J. CARROLL
DRAWN BY
J. FOUCH
CHECKED BY
G. ERICKSON
IN CH.
J. MORRISON
DATE
10/31/2017

RECORD
PEPD
SUBMITTAL
NOT FOR CONSTRUCTION

CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
CONTRACT NO.
HSR13-44
DRAWING NO.
TN-C4012
SCALE
AS SHOWN
SHEET NO.
TN
DATE
11/6/2017
11:34:14 AM
Projects\701206.00_CHSRBP\00 CADD\Sheet Files\TN\BP-TN-C4012.dgn
GENERAL NOTES:
1. FOR PROFILE INFORMATION SEE SHEET TN-T1000.
2. PROPOSED 4" CHSR WATERLINE PARALLEL ALIGNMENT FROM STATION 18034+00 TO 19591+00

PPEF
PROP CHSR R/W
CHSR TUNNEL #8
PROP CHSR R/W
PTEF
PTEF

LIMITS OF GROUND DISTURBANCE

12'2" TOWN SURFACE EXCAVATION AND FIRE CONTROL ZONE

PLAN

CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
ALT 1,2,5 ALIGNMENT
TUNNEL #8 - NORTH PORTAL
STATION 19275+00 TO 19335+00

DESIGNED BY
J. CARROLL
DRAWN BY
J. FOUCH
CHECKED BY
G. ERICKSON
IN CHARGE
J. MORRISON
DATE
10/31/2017
RECORD
PEPD
SUBMITTAL
NOT FOR CONSTRUCTION
GENERAL NOTES:
1. SEE PROFILE INFORMATION ON SHEETS TD-Y1006 AND TD-Y1007
2. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00

DRAWN BY: J. FOUCH
CHECKED BY: G. ERICKSON
IN CHARGE: J. MORRISON
DATE: 10/31/2017

RECORD PEPD SUBMITTAL
NOT FOR CONSTRUCTION

CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
ALT 1,2,5 ALIGNMENT TUNNEL 8
STATION 18335+00 TO 18395+00
GENERAL NOTES:

1. FAULT ZONE LOCATIONS ARE APPROXIMATE, TO BE CONFIRMED.
2. FOR PROFILE INFORMATION SEE SHEET TN-Y1007
3. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00

PLANNED WATERLINE, SEE NOTE
GENERAL NOTES:
1. FOR PROFILE INFORMATION SEE SHEETS TN-Y1007 AND TN-Y1008
2. PROPOSED 4" WATER LINE PARALLEL ALONGMENT FROM STATION 18034+00 TO 19591+00

PLAN
GENERAL NOTES:
1. FOR PROFILE INFORMATION SEE SHEET TN-C4008
2. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00
GENERAL NOTES:

1. FOR THIS BLK INFORMATION SEE SHEET TN-Y1101
2. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00
**GENERAL NOTES:**

1. FOR PROFILE INFORMATION SEE SHEETS TN-11101 AND TN-11102
2. PROPOSED 4" CHSR WATERLINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00

**CALIFORNIA HIGH-SPEED RAIL PROJECT**
**BAKERSFIELD TO PALMDALE**

**ALT 3 ALIGNMENT TUNNEL B**
**STATION 19333+00 TO 19395+00**

**DRAWING NO.**  TN-C4104
**DATE**  10/31/2017
**DESIGN**  TYPIN INTERNATIONAL

**DESIGN BY**  J. CARROLL
**DRAWN BY**  J. FOUCH
**CHECKED BY**  G. ERICKSON
**IN CHARGE**  J. MORRISON

**RECORD**  PEPD
**SUBMITTAL**  NOT FOR CONSTRUCTION
GENERAL NOTES:
1. TOP PROFILES INFORMATION SEE SHEET TN-1102
2. PROPOSED 4" WATERLINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00
GENERAL NOTES:
1. FOR PROFILE INFORMATION SEE SHEET TN-P1107
2. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18634+00 TO 19687+50

PLAN

CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
ALT 3 ALIGNMENT
TUNNEL 9 - NORTH PORTAL
STATION 19463+00 TO 19523+00
GENERAL NOTES:
1. FOR PROFILE INFORMATION SEE SHEET TN-C4104
2. THE TUNNEL WILL BE EXCAVATED BY CUT AND COVER METHODS
3. PROPOSED 4" CMSR WATERLINE SEE NOTE 3.

PPIF
PTEF

TUNNEL 9 EXCAVATION LIMITS (TYPICAL)
CROSS PASSAGE
EMERGENCY EGRESS-CUT AND COVER
TUNNEL CONSTRUCTION
BEGIN TBM TUNNEL CONSTRUCTION

CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
ALT 3 ALIGNMENT
TUNNEL 9
STATION 19583+00 TO 19633+00

DESIGNED BY
J. CARROLL
DRAWN BY
J. FOUCH
CHECKED BY
G. ERICKSON
IN CHARGE
J. MORRISON
DATE
10/31/2017

RECORD
PEPD
SUBMITTAL
NOT FOR CONSTRUCTION

CONTRACT NO.
HSR13-44
DRAWING NO.
TN-C4108
SCALE
AS SHOWN
SHEET NO.
11/6/2017
11:39:44 AM
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GENERAL NOTES:
1. FOR PROFILE INFORMATION SEE SHEET TN-4125
2. THE TUNNEL WILL BE EXCAVATED BY CUT AND COVER METHODS
   BETWEEN STA. 19634+00 TO 19635+00
3. PROPOSED 4" CRUSH WATERLINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19687+50
GENERAL NOTES:

1. FOR PROFILE INFORMATION SEE SHEET TN-M1114
2. THE TUNNEL WILL BE EXCAVATED BY CUT AND COVER METHODS
   BETWEEN STA 19694+00 TO 19687+00
3. PROPOSED 4" WATER LINE PARALELLS ALIGNMENT FROM STATION 18034+00 TO 19687+50

CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
ALT 3 ALIGNMENT
TUNNEL 9 - SOUTH PORTAL
STATION 19683+00 TO 19734+00
CALIFORNIA HIGH-SPEED RAIL PROJECT
Bakersfield to Palmdale

ALTERNATIVE 1,2,5
TUNNEL 9

TUNNEL PROFILES

CHSR TUNNEL #9

MATCH LINE (UPPER RIGHT)

MATCH LINE (LOWER LEFT)

CROSS PASSAGE (TYPICAL)

"ALT 1,2,5" TRACK PROFILE

BUILDING PORTAL VENTILATION (TYPICAL)

DATE: 10/31/2017

CHECKED BY: G. ERICKSON

IN CHARGE: J. MORRISON

DESIGNED BY: J. CARROLL

DRAWN BY: J. FOUCH

CONTRACT NO.: HSR13-44

DRAWING NO.: TN-Y1008

SCALE: AS SHOWN

SHEET NO.: 0
GENERAL NOTES:

1. SEQUENTIAL EXCAVATION METHODS ARE ADOPTED FOR THE 15% IN-PROGRESS DESIGN OF DOUBLE-TRACK, TUNNEL 1, 2 & 3, SITED IN FANGLOMERATE.

2. EXCAVATION, GROUND SUPPORT, LINING THICKNESS, WATERTIGHTNESS AND GAS-TIGHTNESS PROVISIONS WILL BE OPTIMIZED BASED ON SITE INVESTIGATION RESULTS AND TUNNEL-SPECIFIC DESIGN WORK.

3. TYPICAL CROSS-SECTION REQUIRES FURTHER STUDY TO EVALUATE DYNAMIC AIRFLOW/PRESSURE LEVELS UNDER HIGH SPEED OPERATING CONDITIONS, AND TO FURTHER REFINE SPACE ALLOCATED FOR STRUCTURES, EQUIPMENT, AND ESPERS.

4. CENTER DIVIDING WALL SHALL CONFORM TO NFPA 130 AND HAVE A 2 HOUR FIRE RATING.

5. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00 WATERLINE, SEE NOTE 5.
GENERAL NOTES:

1. SEQUENTIAL EXCAVATION METHODS IS IDENTIFIED FOR THE 15% IN-PROGRESS DESIGN OF DOUBLE-TRACK TUNNEL FOR
   TUNNEL 1, 2 & 3, SITED IN FANGLOMERATES.
2. EXCAVATION, GROUND SUPPORT, LINING THICKNESS, WATERTIGHTNESS PROVISIONS WILL BE OPTIMIZED
   BASED ON SITE INVESTIGATION RESULTS AND TUNNEL-SPECIFIC DESIGN WORK.
3. TYPICAL CROSS-SECTION REQUIRES FURTHER STUDY TO EVALUATE DYNAMIC AIRFLOW/PRESSURE LEVELS
   UNDER HIGH SPEED OPERATING CONDITIONS, AND TO FURTHER REFINE SPACE ALLOTTED FOR STRUCTURES,
   EQUIPMENT, AND EMERGENCY ESCAPE ROUTES.
4. SEM IN BLOCKY OR SEAMY GROUND WILL REQUIRE FACE SUPPORT INCLUDING SHOTCRETE AND FACE DOWELS. SUPPORT OF
   TEMPORARY SPLEES WILL BE SHOWN IN THE NEXT DESIGN STAGE.

*BLOCKY OR SEAMY GROUND MAY INCLUDE
- TOOLS BOX ITEMS
- PROBE DRILLING, FLASHCRETE, FACE DOWELS, FACE WEDGES, SPILLING-FOREPOLING, AND PRE-EXCAVATED
  GROUTING.

REINFORCED SHOTCRETE
EXCAVATION LIMIT
LATTICE GIRDER
TUNNEL AXIS

CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
TUNNEL SEQUENTIAL EXCAVATION METHOD
EXCAVATION SEQUENCE
INITIAL SUPPORT
**CALIFORNIA HIGH-SPEED RAIL PROJECT**  
**BAKERSFIELD TO PALMDALE**

**GENERAL NOTES**

1. **DRILL AND BLAST METHOD** IS IDENTIFIED FOR THE 15% IN-PROGRESS DESIGN OF DOUBLE TRACK TUNNEL FOR TUNNEL 4, 5, AND 6 IN HARD ROCK UNITS.

2. **EXCAVATION, GROUND SUPPORT, LINING THICKNESS, AND WATERTIGHTNESS PROVISIONS** WILL BE OPTIMIZED BASED ON SITE INVESTIGATION RESULTS AND TUNNEL-SPECIFIC DESIGN WORK.

3. **TYPICAL CROSS-SECTION REQUIREMENTS** REQUIRE FURTHER STUDY TO EVALUATE DYNAMIC AIRFLOW/PRESSURE LEVELS UNDER HIGH-SPEED OPERATING CONDITIONS, AND TO FURTHER REFINE SPACE ALLOTTED FOR STRUCTURES, EQUIPMENT, AND EGRESS.

4. **CENTER DIVIDING WALL** SHALL CONFORM TO NFPA 130 AND HAVE A 2-HOUR FIRE RATING.

5. **THE COMPOSITE VEHICLE STATIC AND DYNAMIC ENVELOPES SHOWN** FOLLOW TM1.110-A AND C.

6. **PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00**.

**NOTE 6.** PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00.
GENERAL NOTES:

1. A DRILL AND BLAST OPTION IS IDENTIFIED FOR THE 15% IN-PROGRESS DESIGN OF TWIN, SINGLE TRACK TUNNELS.
2. EXCAVATION, GROUND SUPPORT, LINING THICKNESS AND WATER-TIGHTNESS PROVISIONS WILL BE OPTIMIZED BASED ON SITE INVESTIGATIONS.
3. THE TYPICAL CROSS-SECTION REQUIRES FURTHER STUDY TO EVALUATE DYNAMIC AIRFLOW/PRESSURE LEVELS UNDER HIGH-SPEED OPERATING CONDITIONS, AND TO FURTHER DEFINE SPACE ALLOCATED FOR STRUCTURES, EQUIPMENT, AND EGRESS.
4. CLASS I AND II MAY BE EXCAVATED FULL FACE. CLASS III MAY REQUIRE HEADING AND BENCH EXCAVATION WITH FACE SUPPORT AS REQUIRED. CLASS IV MAY REQUIRE TOP HEADING AND BENCH EXCAVATION WITH ONE SLASH, SLASH, AND FACE SUPPORT AS NEEDED.
5. THE COMPOSITE TUNNEL DESIGN IS SUBJECT TO CHANGE AS MORE INFORMATION IS OBTAINED.
GENERAL NOTES:

1. A DRILL AND BLAST OPTION IS IDENTIFIED FOR THE 15% IN-PROGRESS DESIGN OF TWIN, SINGLE TRACK TUNNELS.
2. EXCAVATION, GROUND SUPPORT, PILLAR WIDTH, LINING THICKNESS AND WATER-PROOFNESS PROVISIONS WILL BE OPTIMIZED BASED ON SITE INVESTIGATION RESULTS AND TUNNEL-SPECIFIC DESIGN AND GUIDANCE IN TM 2.4.6.
3. TYPICAL CROSS-SECTION REQUIREMENTS FOR TUNNELS TO BE ONE TUNNEL DIAMETER OR MORE BASED ON GUIDANCE IN TM 2.4.6.
4. PILLAR WIDTH BETWEEN TUNNELS TO BE ONE TUNNEL DIAMETER OR MORE BASED ON GUIDANCE IN TM 2.4.6.
5. TYPICAL CROSS-SECTION REQUIREMENTS FOR TUNNELS TO BE ONE TUNNEL DIAMETER OR MORE BASED ON GUIDANCE IN TM 2.4.6.
6. THE COMPOSITE VEHICLE STATIC AND DYNAMIC ENVELOPES SHOWN FOLLOW TM 1.1.10-A AND C.
7. PROPOSED 4" WATER LINE PARALELLENS ALIGNED FROM STATION 18034+00 TO 19591+00.
CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
TUNNEL DRILL AND BLAST METHOD
SINGLE TUNNEL
INITIAL SUPPORT

GENERAL NOTES:
1. A DRILL AND BLAST OPTION IS IDENTIFIED FOR THE 15% IN-PROGRESS DESIGN OF TWIN, SINGLE TRACK TUNNELS FOR TUNNEL 7 THROUGH THE TEHACHAPI FAULT ZONE.
2. EXCAVATION, GROUND SUPPORT, PILLAR WIDTH, LINING THICKNESS AND WATERPROOFNESS PROVISIONS WILL BE OPTIMIZED BASED ON SITE INVESTIGATION RESULTS AND TUNNEL-SPECIFIC DESIGN WORK.
3. TYPICAL CROSS-SECTION REQUIREMENTS FOLLOW STANDARDS TO EVALUATE DYNAMIC AIRFLOW/PRESSURE LEVELS UNDER HIGH SPEED OPERATING CONDITIONS, AND TO FURTHER DEFINE SPACES ALLOCATED FOR STRUCTURES, EQUIPMENT, AND EGRESS.
4. PILLAR WIDTH BETWEEN TUNNELS TO BE ONE TUNNEL DIAMETER OR MORE BASED ON GUIDANCE IN TM 2.4.6.
5. THE COMPOSITE VEHICLE STATIC AND DYNAMIC ENVELOPES SHOWN FOLLOW TM 1.1.10-A AND C.
6. PROPOSED 4" WATER LINE PARALLEL TO ALLEVIATE FROM STATION 18034+00 TO 19591+00.

DATE CHK APP REV DESCRIPTION DESIGNED BY DRAWN BY CHECKED BY IN CHARGE
10/31/2017 11/6/2017 11:38:46 AM
J. CARROLL J. FOUCH G. ERICKSON J. MORRISON

CONTRACT NO. DRAWING NO. SCALE SHEET NO.
HSR13-44 TN-B-0006 AS SHOWN

NOT FOR CONSTRUCTION
1. DRILL AND BLAST OPTION IS IDENTIFIED FOR THE 15% IN-PROGRESS DESIGN OF TWIN, SINGLE TRACK TUNNELS.
2. EXCAVATION, GROUND SUPPORT, PILLAR WIDTH, LINING THICKNESS AND WATERPROOFNESS PROVISIONS WILL BE OPTIMIZED BASED ON SITE INVESTIGATION RESULTS AND TUNNEL SPECIFIC DESIGN WORK.
3. TYPICAL CROSS-SECTION REQUIREMENTS ARE TO IDENTIFY DYNAMIC AIRFLOW PRESSURE LEVELS UNDER HIGH SPEED OPERATING CONDITIONS, AND NO FURTHER PILLAR SPACE ALLOWED FOR SUPPORT.
4. PILLAR WIDTH BETWEEN TUNNELS TO BE ONE TUNNEL DIAMETER OR MORE BASED ON GUIDANCE IN TM 2.4.6.
5. CLASSES I AND II MAY BE EXCAVATED FULL FACE. CLASS III MAY REQUIRE HEADING AND BENCH WITH FACE SUPPORT AS REQUIRED. CLASS IV MAY REQUIRE TOP HEADING AND BENCH WITH ONE SLASH FACE AND SIDE SLASH FACE SUPPORT AS NEEDED. CLASS IV MAY REQUIRE A CHANGE IN EXCAVATION METHOD TO AN AEROMEMBRANE ALTERNATIVE.
GENERAL NOTES:

1. OPEN TBM METHODS ARE ADOPTED FOR THE 15% IN-PROGRESS DESIGN OF THE LONGER (GREATER THAN 1 MILE) TWIN, SINGLE TRACK 7, 8 & 9, SITED IN HARD ROCK UNITS.

2. EXCAVATION, GROUND SUPPORT, PILLAR WIDTH, LINING THICKNESS AND WATERPROOFNESS PROVISIONS WILL BE OPTIMIZED BASED ON SITE INVESTIGATION RESULT AND TUNNEL SPECIFIC DESIGN WORK.

3. TYPICAL CROSS-SECTION REQUIRES FURTHER STUDY TO EVALUATE DYNAMIC AIRFLOW/PRESSURE LEVELS UNDER HIGH-Speed OPERATING CONDITIONS, AND TO FURTHER DEFINE SPACE ALLOWED FOR STRUCTURES, EQUIPMENT, AND EGRESS.

4. PILLAR WIDTH BETWEEN TUNNELS TO BE ONE TUNNEL DIAMETER OR MORE BASED ON GUIDANCE IN TM 2.4.6.

5. A DUAL DRAINAGE SYSTEM WILL BE USED IN TUNNEL 8 AT INVERT GRADIENTS OF LESS THAN 0.25% AND GREATER THAN -0.25%.

6. THE COMPOSITE VEHICLE STATIC AND DYNAMIC ENVELOPES SHOWN FOLLOW TM 1.1.10-A AND C.

7. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00.

CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
TUNNEL TWN TBM BORED TUNNELS
CLEARANCE DIAGRAM
TANGENT TRACK

DRAWN BY:
J. FOUCH
CHECKED BY:
G. ERICKSON
IN CHARGE:
J. MORRISON

DESIGNED BY:
J. CARROLL
DRAWN BY:
J. FOUCH
CHECKED BY:
G. ERICKSON
IN CHARGE:
J. MORRISON

CONTRACT NO.:
HSR13-44
DRAWING NO.:
TN-B-0008
SCALE:
AS SHOWN
SHEET NO.:
CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
TUNNEL TWIN TBM BORED TUNNELS
CLEARANCE DIAGRAM
SUPER ELEVATED TRACK

GENERAL NOTES:

1. OPEN TBM METHODS ARE ADOPTED FOR THE 10% IN-PROGRESS DESIGN OF THE LONGER
   TUNNELS THAT ARE MORE THAN 7 MILES LONG. TUNNELS 7, 8, AND 9 ARE IN HARD ROCK.
   
2. EXCAVATION, GROUND SUPPORT, PILLAR WIDTH, LINING THICKNESS AND WEATHERPROOFNESS PROVISIONS
   WILL BE OPTIMIZED BASED ON SITE INVESTIGATION RESULTS AND TUNNEL SPECIFIC DESIGN WORK.
   
3. TYPICAL CROSS-SECTION REQUIRED FURTHER STUDY TO EVALUATE DYNAMIC AIRFLOW/LEVEL.
   
4. PILLAR WIDTH BETWEEN TUNNELS TO BE ONE TUNNEL DIAMETER OR MORE BASED ON GUIDANCE IN TM 2.4.6.
   
5. A DUAL DRAINAGE SYSTEM WILL BE USED IN TUNNEL 8 AT INVERT GRADIENTS OF LESS
   THAN 0.25% AND GREATER THAN -0.25%.
   
6. THE COMPOSITE VEHICLE STATIC AND DYNAMIC ENVELOPES SHOWN FOLLOW TO TM 1.1.10-A AND C
   
7. PROPOSED 4" WATERLINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00.
GENERAL NOTES:

1. OPEN TBM METHODS ARE ADOPTED FOR THE 50% IN-PROGRESS DESIGN OF THE LONGER TUNNELS.

2. EXCAVATION AND GROUND SUPPORT REQUIREMENTS WILL BE OPTIMIZED BASED ON SITE INVESTIGATION AND TUNNEL SPECIFIC DESIGN WORK.

3. A DUAL DRAINAGE SYSTEM WILL BE USED IN TUNNEL 8 AT INVERT GRADIENTS OF LESS THAN 0.25%.

4. DYNAMIC AIRFLOW/PRESSURE LEVELS UNDER HIGH SPEED OPERATING CONDITIONS, AND TO FURTHER REFINE SPACE ALLOTED FOR STRUCTURES, EQUIPMENT, AND EGRESS.

5. PILLAR WIDTH BETWEEN TUNNELS TO BE ONE TUNNEL DIAMETER OR MORE.

6. SHOTCRETE 2" MIN.
GENERAL NOTES:
1. TEMPORARY SLOPE AND BENCH GEOMETRIES SHOWN ARE BASED ON GUIDANCE PROVIDED IN TM 2.6.7.
2. SLOPE PROTECTION, DRAINAGE, STRUCTURAL DIMENSIONS, AND STABILIZATION PROVISIONS WILL BE DEVELOPED BASED ON SITE INVESTIGATION RESULTS AND SLOPE-SPECIFIC DESIGN WORK.
3. TYPICAL CROSS-SECTION DESIGNS REQUIRES FURTHER STUDY TO EVALUATE DYNAMIC AIRFLOW/PRESSURE LEVELS UNDER HIGH SPEED OPERATING CONDITIONS AND TO FURTHER DEFINE SPACE ALLOTTED FOR STRUCTURES, FIXED EQUIPMENT, ENVELOPE, AND EMERGENCY WALKWAY ENVELOPE (TYP.).
4. EXCAVATION, GROUND SUPPORT, LINING AND WATERPROOFNESS PROVISIONS WILL BE OPTIMIZED BASED ON SITE INVESTIGATION RESULTS AND CUT AND COVER-SPECIFIC DESIGN WORK.
5. CENTER DIVIDING WALL SHALL CONFORM TO NFPA 130 AND HAVE A 2 HOUR FIRE RATING.
6. PROPOSED 4" CHSR WATER LINE PARALLELS ALIGNMENT FROM STATION 19394+40 TO 19687+50.
7. PROPOSED 4" CHSR WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19687+50.

CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
TUNNEL CUT AND COVER BOX (HABITAT RESTORATION)
CLEARANCE DIAGRAM - TANGENT TRACK

DESIGNED BY: J. CARROLL
DRAWN BY: J. FOUCH
CHECKED BY: G. ERICKSON
IN CHARGE: J. MORRISON

DATE: 10/31/2017

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CONTRACT NO.: HSR13-44
DRAWING NO.: TN-B-0011
SCALE: AS SHOWN
SHEET NO.:
GENERAL NOTES:

1. TEMPORARY SLOPE AND BENCH GEOMETRIES SHOWN ARE BASED ON GUIDANCE PROVIDED IN TM 2.6.7
2. SLOPE PROTECTION, DRAINAGE, STRUCTURAL DIMENSIONS, AND STABILIZATION PROVISIONS WILL BE DEVELOPED BASED ON SITE INVESTIGATION RESULTS AND SLOPE-SPECIFIC DESIGN WORK.
3. TYPICAL CROSS-SECTION REQUIRED FURTHER STUDY TO EVALUATE DYNAMIC AIRFLOW/PRESSURE LEVELS UNDER HIGH-SPEED OPERATING CONDITIONS, AND TO FURTHER RefINE SPACE ALLOTTED FOR STRUCTURES, EQUIPMENT, AND EGRESS.
4. EXCAVATION, GROUND SUPPORT, LINING AND WATERPROOFING PROVISIONS WILL BE OPTIMIZED BASED ON SITE INVESTIGATION RESULTS AND CUT AND COVER-SPECIFIC DESIGN WORK.
5. CUT AND COVER BOX TYPICAL SECTION TO BE USED AT TUNNEL #4 AND #5, STATIONS 18362+50 TO 18368+00 AND 19594+00 TO 19610+00.
6. CENTER DIVIDING WALL SHALL CONFORM TO NFPA 101 AND HAVE A 2-HOUR FIRE RATING.
7. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00.
GENERAL NOTES:

1. TEMPORARY SLOPE AND BENCH GEOMETRIES SHOWN ARE BASED ON GUIDANCE PROVIDED IN TM 2.6.7.
2. SLOPE PROTECTION, DRAINAGE, STRUCTURAL DIMENSIONS, AND STABILIZATION PROVISIONS WILL BE DEVELOPED BASED ON SITE INVESTIGATION RESULTS AND SLOPE-SPECIFIC DESIGN WORK.
3. TYPICAL CROSS-SECTION REQUIRE FURTHER STUDY TO EVALUATE DYNAMIC AIRFLOW/PRESSURE LEVELS, STRUCTURAL PROVISIONS REQUIRE FURTHER STUDY TO EVALUATE DYNAMIC forces, AND TO FURTHER REFINE THE SPACE ALLOCATED FOR STRUCTURES, EQUIPMENT, AND EMERGENCY WALKWAYS.
4. EXCAVATION, GROUND SUPPORT, LINING AND WATERPROOFNESS PROVISIONS WILL BE OPTIMIZED BASED ON THE INVESTIGATION RESULTS AND CUT AND COVER-SPECIFIC DESIGN WORK.
5. CUT AND COVER BOX TYPICAL SECTION TO BE USED AT TUNNEL 4 AND 9, STATIONS 18362+50 TO 18368+00 AND 19594+00 TO 19610+00.
6. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00.

PROPOSED 4" WATERLINE, SEE NOTE 6.
GENERAL NOTES:

1. TEMPORARY SLOPE AND BENCH GEOMETRIES SHOWN ARE BASED ON GUIDANCE PROVIDED IN TM 246.7

2. SLOPE WIDENING, DRAINAGE, FIXED AND ROOF ENVELOPES, AND CONSOLIDATION PROVISIONS WILL BE DEVELOPED BASED ON SITE INVESTIGATION RESULTS AND SLOPE-SPECIFIC DESIGN AGA.

3. TYPICAL CROSS-SECTION DEPICTS FTM IDEA TO EVALUATE DYNAMIC AIRFLOW/PRESSURE LEVELS UNDER HIGH-SPEED OPERATING CONDITIONS, AND TO FURTHER REFINE SPACE ALLOCATED FOR STRUCTURES, EQUIPMENT, AND EGRESS.

4. TYPICAL CROSS-SECTION DEPICTS FTM IDEA TO EVALUATE DYNAMIC AIRFLOW/PRESSURE LEVELS UNDER HIGH-SPEED OPERATING CONDITIONS, AND TO FURTHER REFINE SPACE ALLOCATED FOR STRUCTURES, EQUIPMENT, AND EGRESS.

5. EXCAVATION, GROUND SUPPORT, LINING AND WATER-TIGHTNESS PROVISIONS WILL BE OPTIMIZED BASED ON SITE INVESTIGATION RESULTS AND CUT AND COVER-SPECIFIC DESIGN ADO.

6. PROPOSED 4" WATER LINE PARALLELS ALIGNMENT FROM STATION 18034+00 TO 19591+00
GENERAL NOTES:

1. Transformers are required to be located outside buildings, with no structures above.
   Transformer clear space includes electrical design work.
2. Permanent slope protection, drainage, and stabilization provisions will be developed based on
   on-site investigation results and slope-specific design work.
3. Low cover tunneling options to be evaluated at each portal.
4. Portal layouts were developed following TM 2.4.6 high speed train tunnel portal facilities.

SECTION X
TN-B-0018

California High-Speed Rail Project
Bakersfield to Palmdale
TYPICAL TRANSVERSE SECTION
PORTAL FACILITIES
FOR SINGLE TUNNEL CONFIGURATION

RECORD
PEPD
SUBMITTAL
NOT FOR CONSTRUCTION

CONTRACT NO.
HSR13-44
DRAWING NO.
TN-B-0016
SCALE
AS SHOWN
SHEET NO.

DESIGNED BY
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DRAWN BY
J. Fouch
CHECKED BY
G. Erickson
IN CHARGE
J. Morrison

DATE
10/31/2017
TYPICAL TRANSVERSE SECTION
PORTAL FACILITIES
FOR TWIN TUNNEL CONFIGURATION

SECTION X
TN-B-0019

GENERAL NOTES:
1. TRANSFORMERS, IF REQUIRED TO BE LOCATED
   OVER BUILDING, WITH NO STRUCTURES ABOVE
   TRANSFORMER, CLEAR SPACE INCLUDES ELECTRICAL
   CLEARANCE.
2. PERMANENT SLOPE PROTECTION, DRAINAGE AND
   STABILIZATION PROVISIONS WILL BE DEVELOPED BASED
   ON SITE INVESTIGATION RESULTS AND SLOPE-SPECIFIC
   DESIGN WORK.
3. LOW COVER TUNNELING OPTIONS TO BE EVALUATED AT
   EACH PORTAL.
4. PORTAL LAYOUTS WERE DEVELOPED FOLLOWING TM 2.4.6 HIGH
   SPEED TRAIN TUNNEL PORTAL FACILITIES

CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE

RECORD PEPD
SUBMITTAL
NOT FOR CONSTRUCTION

DRAWING NO.
TN-B-0017
SCALE
AS SHOWN
SHEET NO.

DRAWN BY
J. FOUCH
CHECKED BY
G. ERICKSON
IN CHARGE
J. MO
DATE
10/31/2017

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DRAWING NO.
TN-B-0017
SCALE
AS SHOWN
SHEET NO.

DRAWN BY
J. FOUCH
CHECKED BY
G. ERICKSON
IN CHARGE
J. MO
DATE
10/31/2017
TYPICAL TUNNEL PORTAL FACILITIES PLAN
AT GRADE TWIN TUNNEL CONFIGURATION

LONG SECTION

TRACTION POWER, VENTILATION AND MAINTENANCE FACILITIES CONTAINED WITHIN A SINGLE PORTAL BUILDING APPROXIMATELY 40,000 FT² ON 3 FLOORS (SEE NOTE 2)

UPPER FLOOR LEVEL
BUILDING Access

ROCKFALL AND DEBRIS CONTAINMENT AREA

150' TRUMPET HOOD FOR NOISE MITIGATION

TWO APPROX. 100 SQ. FT. APERTURES FOR PRESSURE RELIEF TO OPEN AIR OR TO OTHER TUNNEL

GENERAL NOTES:
1. FREE AREA CSA A = 150% OF FREE AREA CSA B
2. FLOOR AREA EXCLUDES TRACTION POWER TRANSFORMERS WHICH ARE LOCATED OUTSIDE THE BUILDING.

SECTION Y
TN-B-0019

TRAI N INTERNATIONAL

CALIFORNIA HIGH-SPEED RAIL PROJECT
BAKERSFIELD TO PALMDALE
TYPICAL TUNNEL PORTAL FACILITIES PLAN
AT GRADE TWIN TUNNEL CONFIGURATION
LONG SECTION

DATE CHK APP REV DESCRIPTION
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RECORD PE PD SUBMITTAL
NOT FOR CONSTRUCTION

CONTRACT NO. HSR13-44
DRAWING NO. TN-B-0020
SCALE AS SHOWN
SHEET NO.

DESIGNED BY J. CARROLL
DRAWN BY J. FOUCH
CHECKED BY G. ERICKSON
IN CHARGE J. MORRISON
TYPICAL TUNNEL PORTAL FACILITIES PLAN

AT GRADE SINGLE TUNNEL CONFIGURATION

LONG SECTION

PORTAL VENT

PORTAL BUILDING

TUNNEL HEADWALL

TRUMPET HOOD

SECTION Y

1. FREE AREA CSA B = 150% OF FREE AREA CSA B
2. FLOOR AREA EXCLUDES TRACTION POWER TRANSFORMERS WHICH ARE LOCATED OUTSIDE THE BUILDING.

GENERAL NOTES:

CALIFORNIA HIGH-SPEED RAIL PROJECT

BAKERSFIELD TO PALMDALE

TYPICAL TUNNEL PORTAL FACILITIES PLAN

AT GRADE SINGLE TUNNEL CONFIGURATION

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