

CIVIL ENGINEERING APPLICATIONS USING TDA

PRESENTED BY:

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On Behalf of CalRecycle

TO:

ASCE Redwood Empire Branch

3/12/20



Today's Presentation

- Introduction to TDA use in Civil Engineering Applications Video
- Civil Engineering Applications in California Project Summaries
- CalRecycle TDA Grant Outline

CalRecycle' s Objective is to promote the use of TDA in Civil Engineering Applications

- Educate Local Public Works, CALTRANS, Private Consulting Civil Engineers and State and Local Environmental Agencies on the benefits of TDA
- Research – Develop Sustainable, Environmental Beneficial and Cost Effective Civil Engineering Reuses for Waste Tires
- Coordinate and Assist Waste Tire Processors to assure there is adequate TDA to meet future demand.

Beneficial Properties of Tire Derived Aggregate (TDA) in Civil Engineering Applications

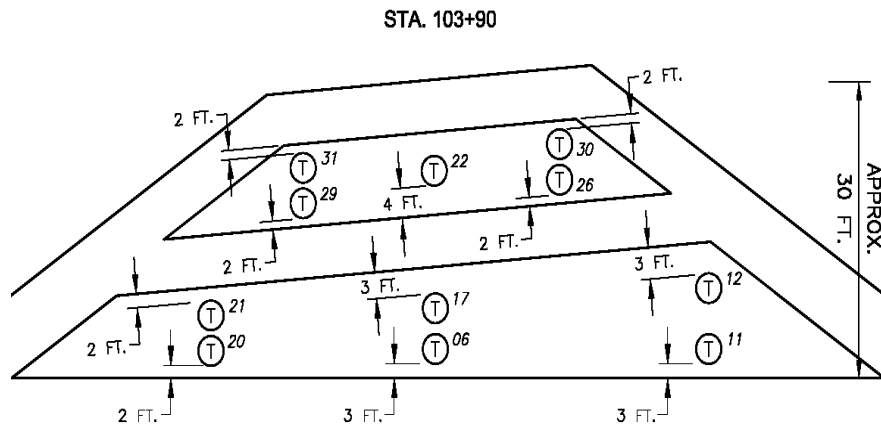
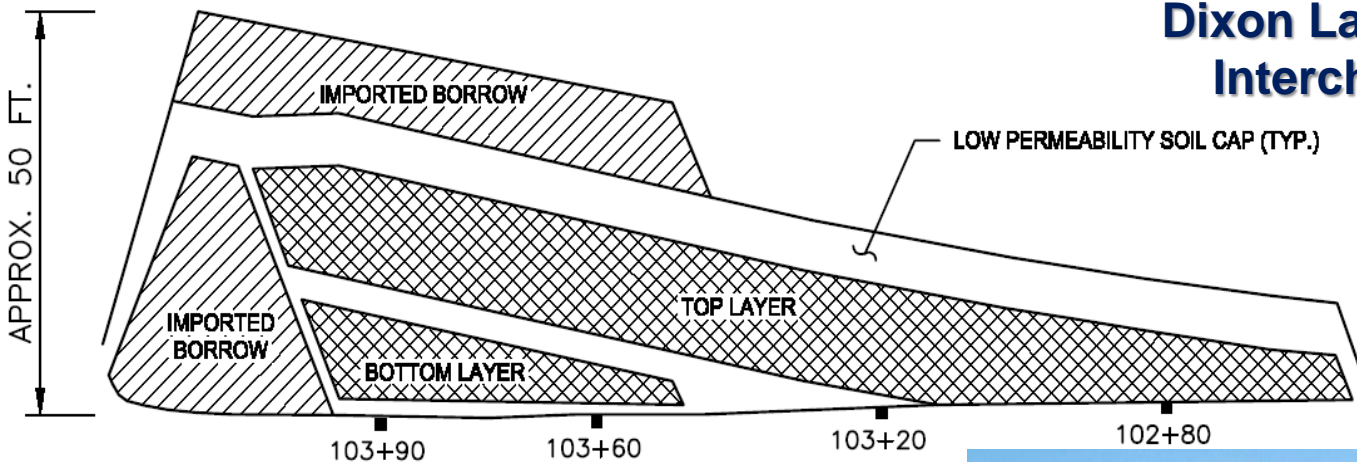
- Tire Derived Aggregate (TDA) has properties that civil engineers, public works directors & contractors need
 - Lightweight
 - Free Draining/High Permeability
 - Low earth pressure
 - Good thermal insulation
 - Durable
 - Compressible
 - May be cheapest solution
 - Helps the environment when used in sustainable infrastructure
 - Conserve natural aggregate resources

Uses for Tire Derived Aggregate

- Lightweight fill for Road Embankments
- Lightweight backfill for Retaining Walls
- Lightweight fill for Road Slide Repair
- TDA used in Vibration Mitigation Applications
- TDA in Storm-Water infiltration galleries
- TDA in Landfill Applications
- TDA in ??

Caltrans Embankment Projects with TDA

Dixon Landing/HWY 880 Interchange Project



660,000 Tires



DIXON LANDING



Dixon Landing Road

7/27/2001

Caltrans Embankment Projects with TDA

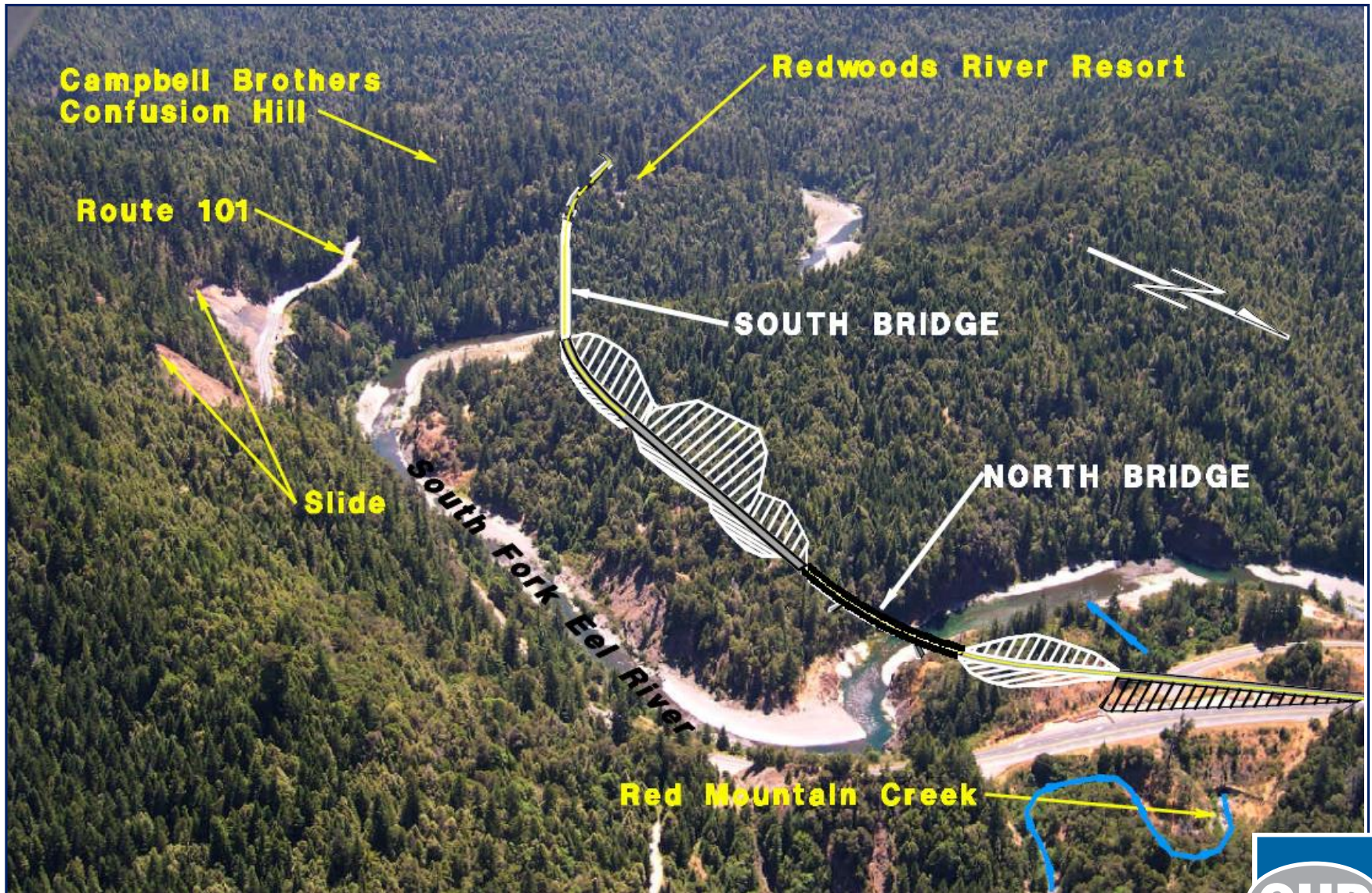


**Dixon Landing/HWY 880
Interchange Project**

Caltrans Embankment Projects with TDA



101 Re-alignment Project, Caltrans



LEGEND

- STAGE 1 TDA FILL
- STAGE 2 TDA FILL
- STAGE 3 TDA FILL

LOWER COURSE TDA ELEVATION WITH OVERBUILD

0.45 MIN FILTER FABRIC OVERLAP (TYP)

3.0 MAX

1:2.0

STAGE 1 TDA FILL

SUBGRADE ELEVATION

SELECT MATERIAL (TDA) (STOCKPILED ROADWAY EXCAVATION)

"W" LINE

2.4 3.6 3.6 2.4

1:2.5

TEMP RAILING (TYPE K)

1.5 TOTAL COVER

1.5 MAX TDA FILL THICKNESS

1.0 COVER

SEE TDA UNDERDRAIN DETAIL FIGURE 17

1:2.0

6.0

150 MM PERFORATED PLASTIC PIPE UNDERDRAIN

VAR 2.0-10.0

150 MM PERFORATED PLASTIC PIPE UNDERDRAIN

**CONFUSION HILL TDA EMBANKMENT
HIGHWAY 101 - TIRE DERIVED
AGGREGATE LIGHTWEIGHT FILL**

Confusion Hill - Lightweight TDA Embankment Project 2008



270,000 Tires

05/15/2008

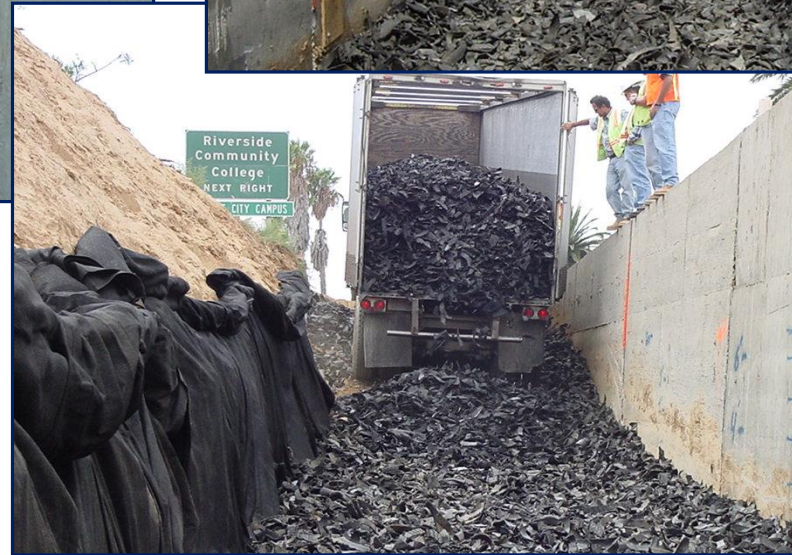
Confusion Hill - Lightweight TDA Embankment Project 2008



Highway 101 Confusion Hill project Final Condition



Caltrans Route 60/215/91 Interchange TDA Backfill Behind Retaining Walls



Riverside, CA

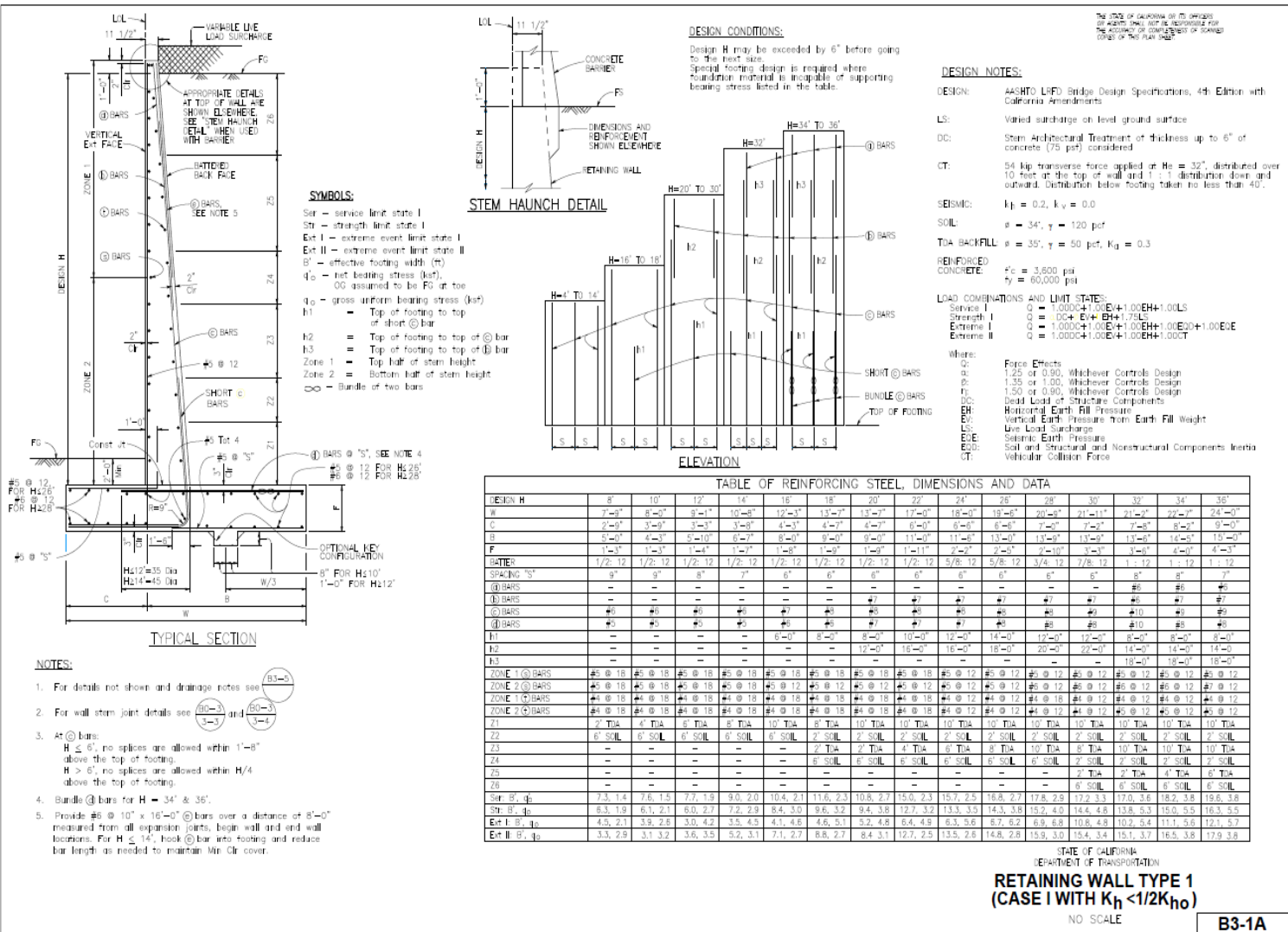


Type 1 T Retaining Walls



Estimated Savings on Future Walls - \$200/ lineal foot

Type 1 TDA Retaining Wall



B3-1A

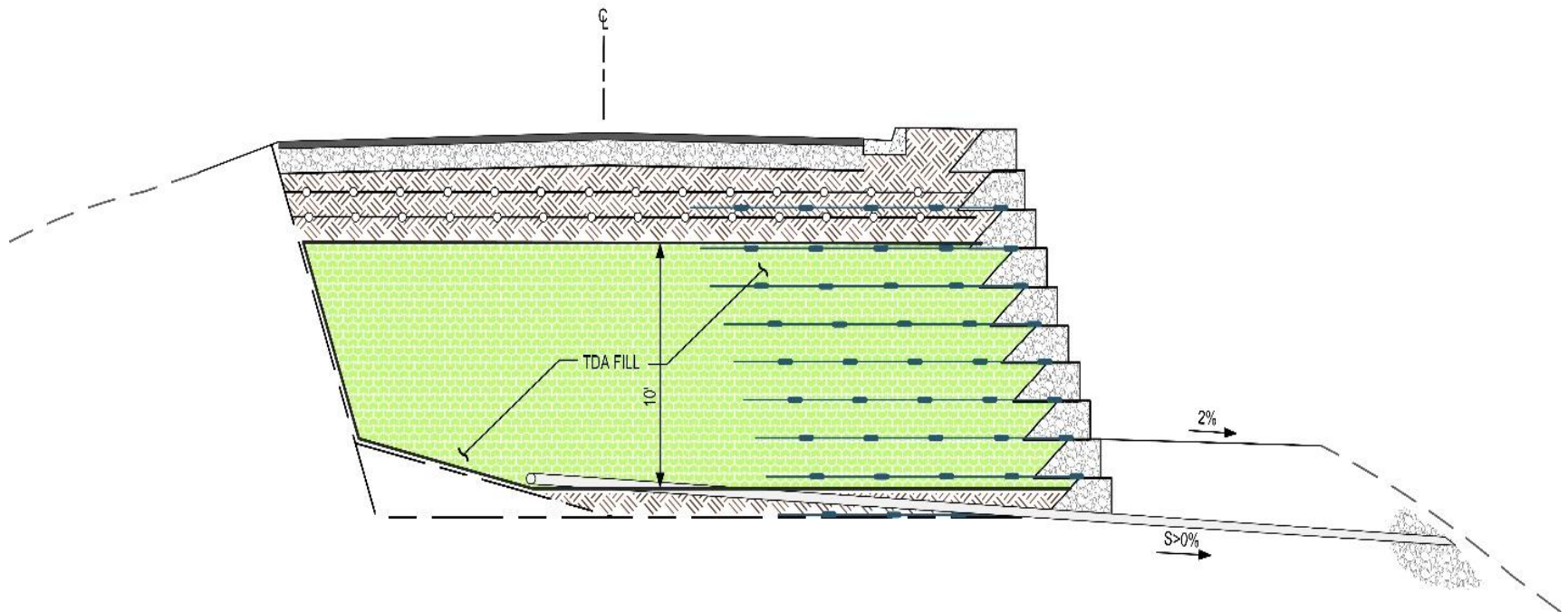
Substantially reduced steel quantities

CalRecycle TDA Project

presenting beneficial and cost effective uses of TDA

Ortega Ridge Road Repair

Mechanically Stabilized Tire Derived Aggregate (MSTDA)



CalRecycle TDA Project

Ortega Ridge Road Repair

Mechanically Stabilized Tire Derived Aggregate (MSTDA)



CalRecycle TDA Project

Ortega Ridge Road Repair

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CalRecycle TDA Project

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CalRecycle TDA Project

Ortega Ridge Road Repair

Mechanically Stabilized Tire Derived Aggregate (MSTDA)



CalRecycle TDA Project

Ortega Ridge Road Repair

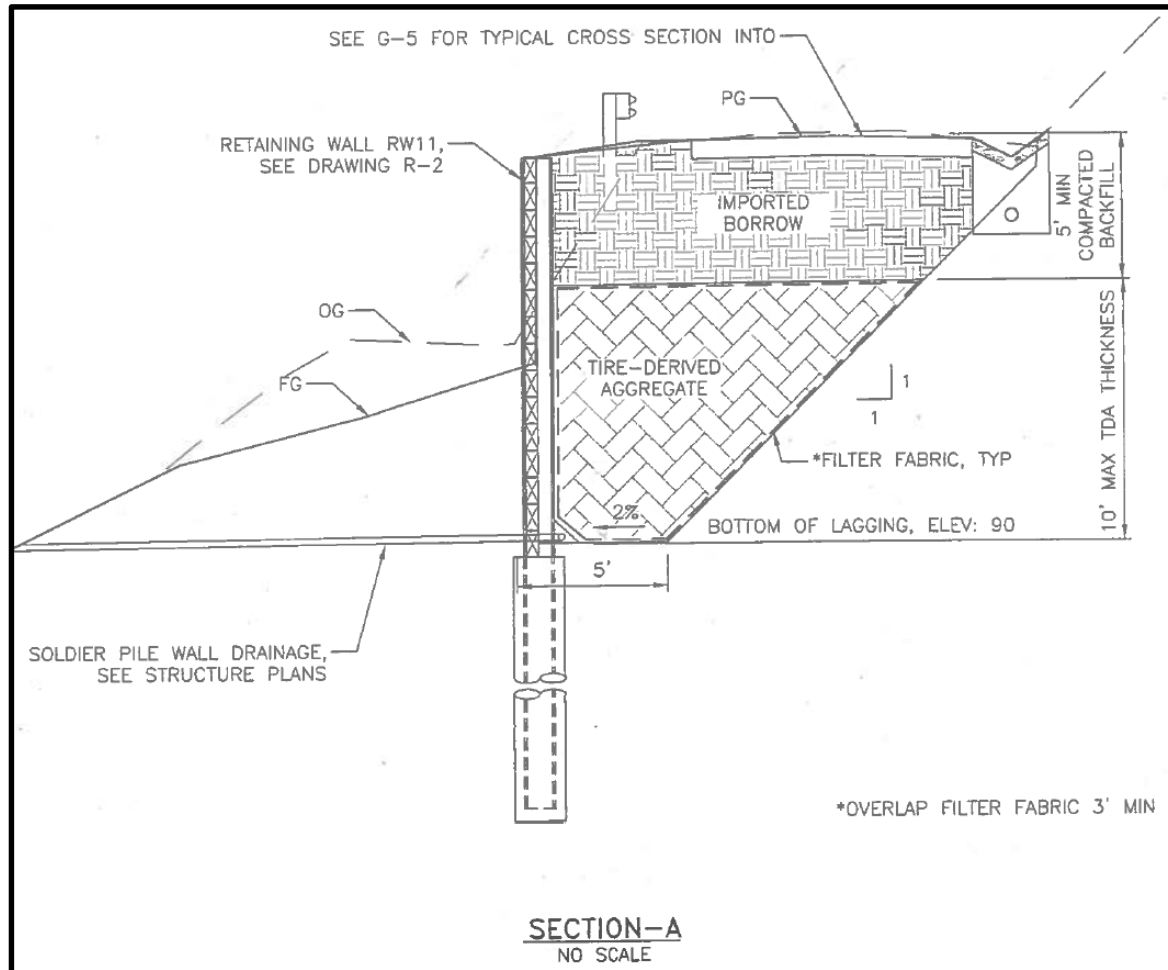
Mechanically Stabilized Tire Derived Aggregate (MSTDA)



CalRecycle TDA Project

Yuba County road failure repairs with TDA

TDA behind soldier pile walls



CalRecycle TDA Project

Yuba County road failure repairs with TDA

TDA behind soldier pile walls



CalRecycle TDA Project

Yuba County road failure repairs with TDA

TDA behind soldier pile walls



CalRecycle TDA Project

Yuba County road failure repairs with TDA

TDA behind soldier pile walls



CalRecycle TDA Leader Project

Yuba County road failure repairs with TDA

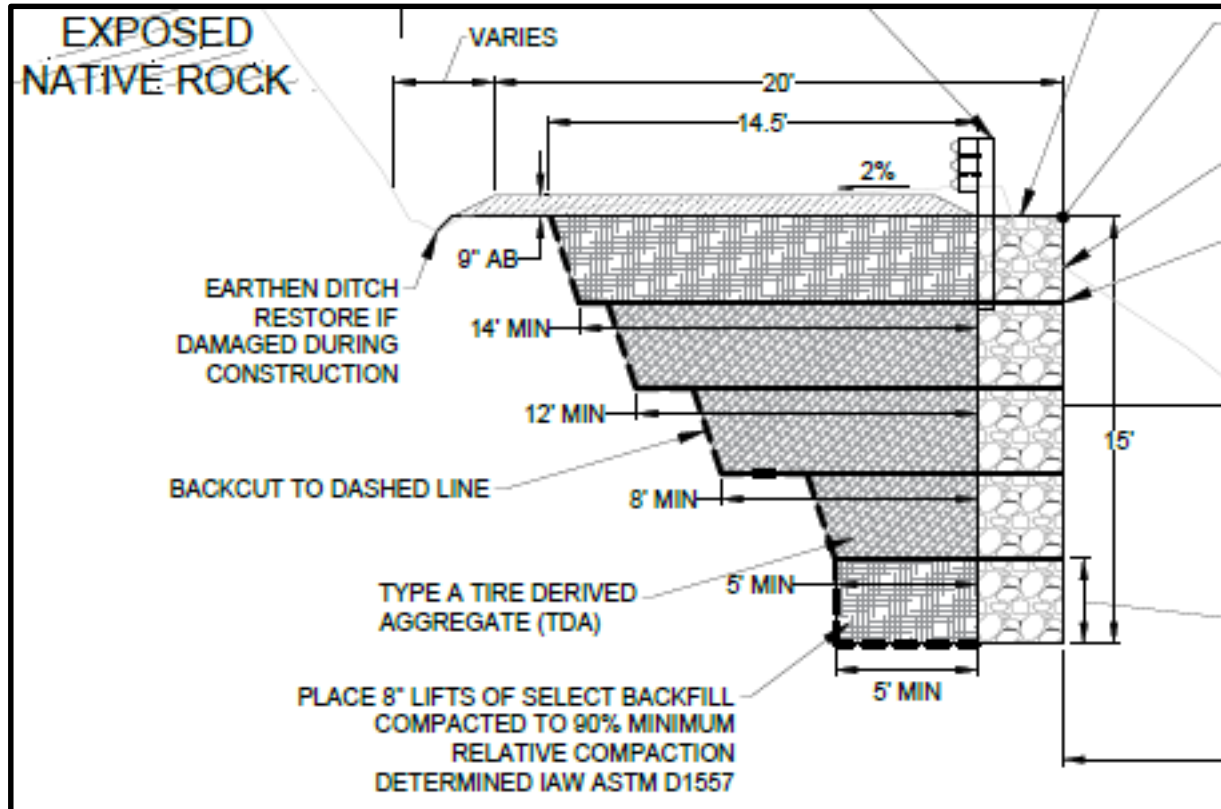
TDA behind soldier pile walls



CalRecycle TDA Project

Tuolumne County Road Failure Repairs

TDA Gabion Basket Walls



CalRecycle TDA Project

Tuolumne County Road Failure Repairs

TDA Gabion Basket Walls



CalRecycle TDA Project

Tuolumne County Road Failure Repairs

TDA Gabion Basket Walls



CalRecycle TDA Project

Tuolumne County Road Failure Repairs

TDA Gabion Basket Walls



CalRecycle TDA Project

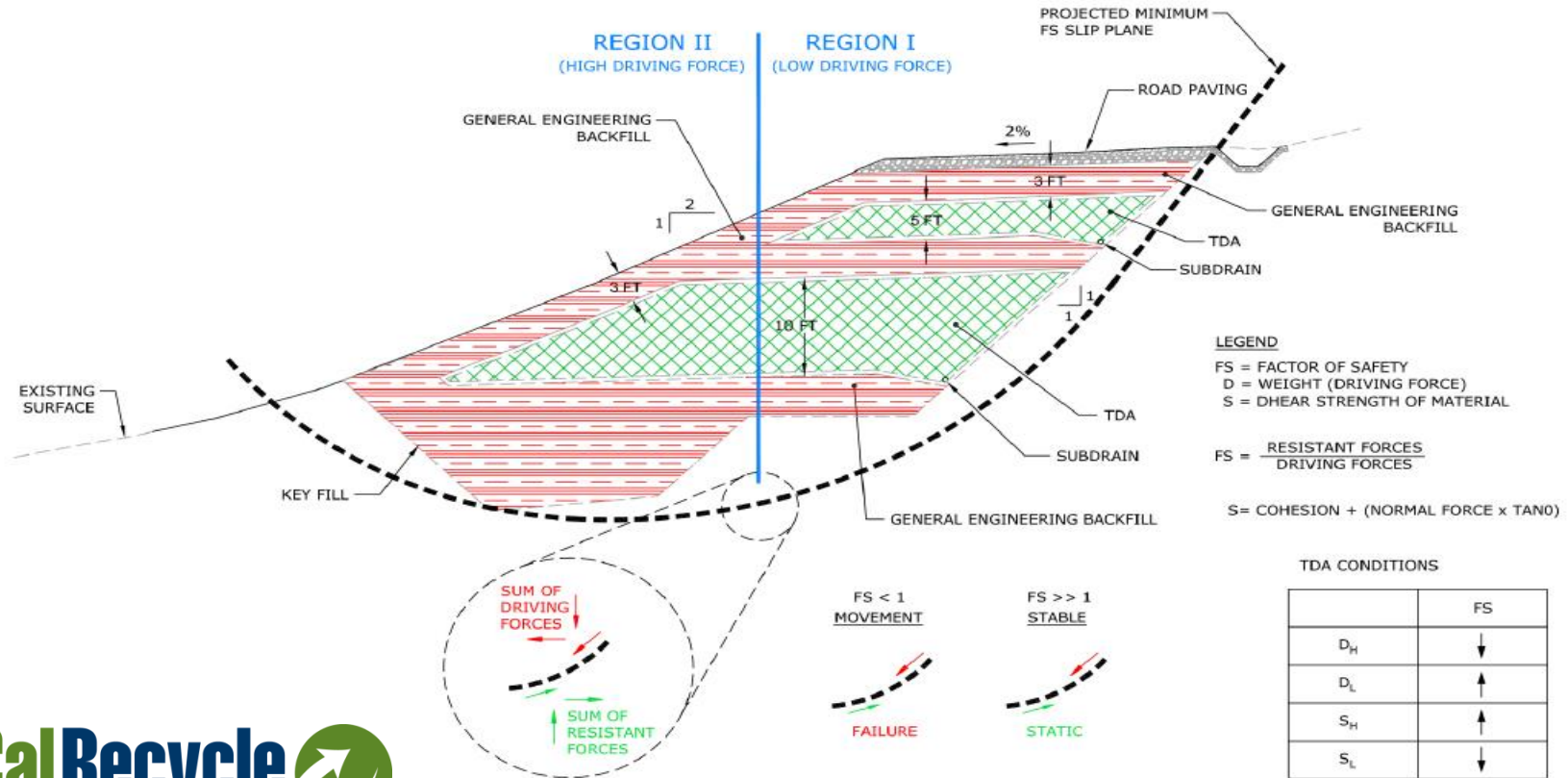
Tuolumne County Road Failure Repairs

Footing for Gabion Basket Walls backfilled with TDA, Italian Bar Road Site #5



Slide Repair Projects

- 2007 – Marina Drive, Mendocino Co. Landslide Repair
- 2008 - Sonoma Co. Geysers Rd. Landslide Repair Project
- 2009 - Sonoma Mtn. Road , Landslide Repair Project



Marina Drive Slide Repair



Mendocino County, Marina Dr.



133,000 Tires 04/2007

Marina Drive Slide Repair



Geyzers Road Slide



Geyzers Road Slide Repair



150,000 Tires

01/22/2008

Geyzers Road



Before



After
**TIRE DERIVED
AGGREGATE**



Savings to County
\$128,000



Sonoma Mtn. Road, Sonoma County



Sonoma Mountain Road

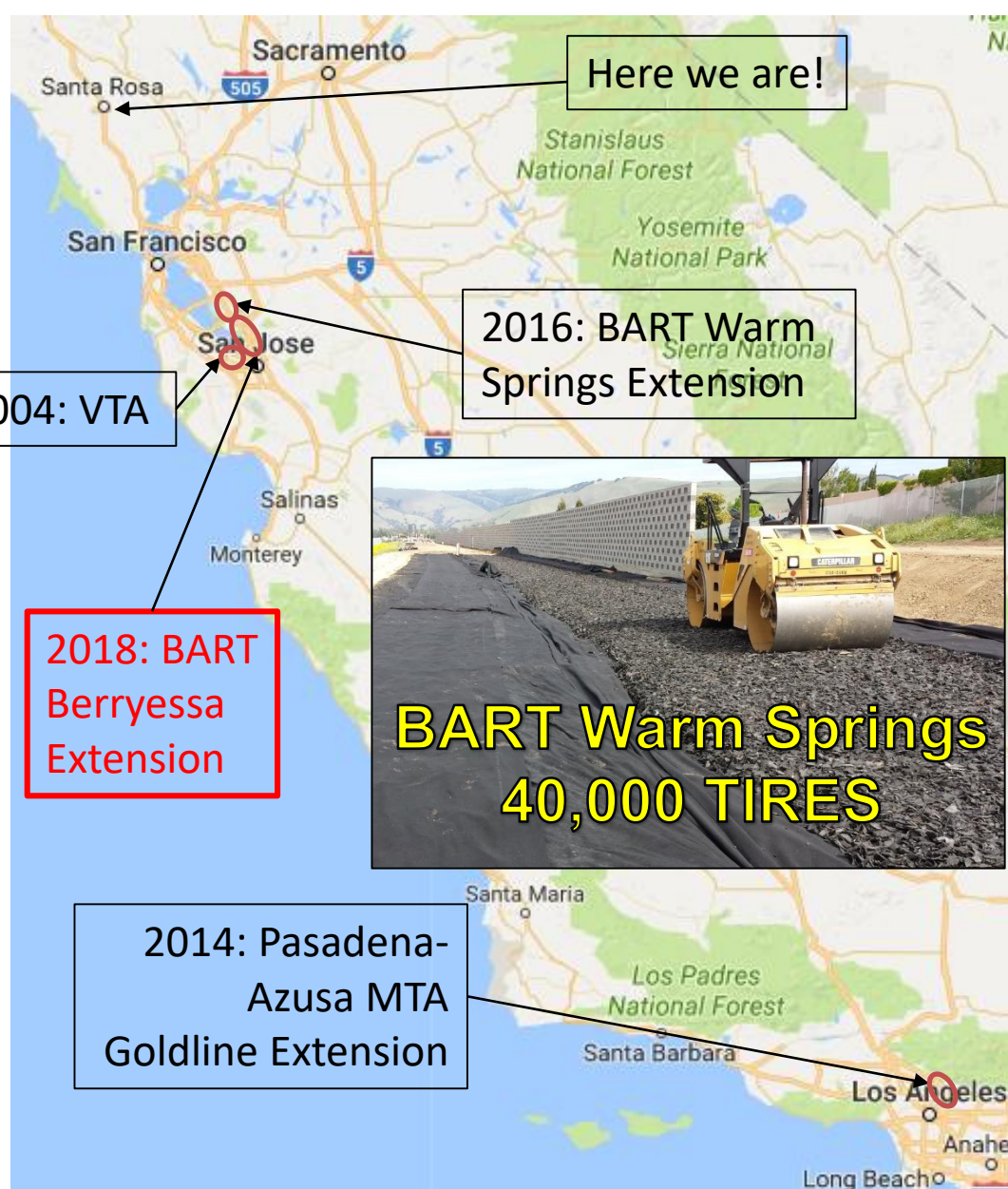
330,000 TIRES



Sonoma Mtn. Road, Sonoma County



TDA Vibration Attenuation in California



TDA for Vibration Attenuation

- Factors for TDA Usage
 - Geotechnical data
 - Proximity and height of nearby buildings
 - Targeted vibration frequency ranges
 - TDA underlayment provides significant reduction to rail frequencies above 16 Hz
- Alternative to traditional floating concrete slabs

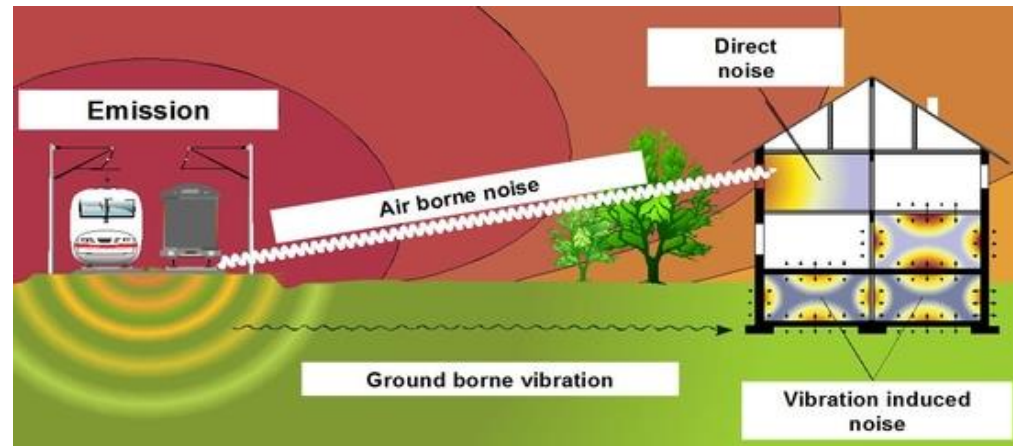


Image Source: RIVAS (<http://www.rivas-project.eu>)

Conventional Vibration Mitigation Technology \$800+/ft



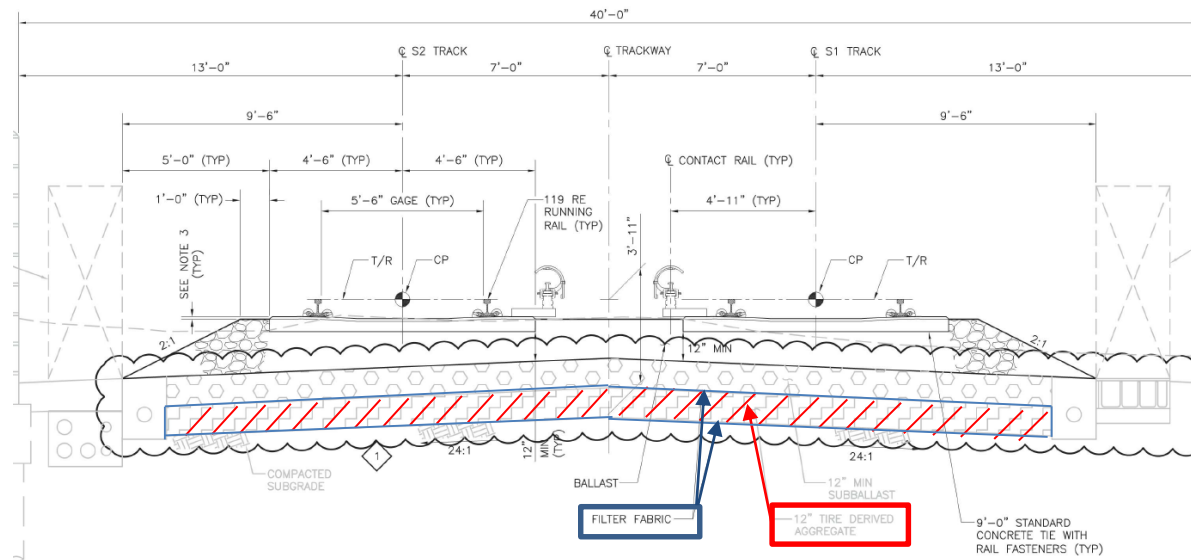
TDA Vibration Mitigation \$150/ft



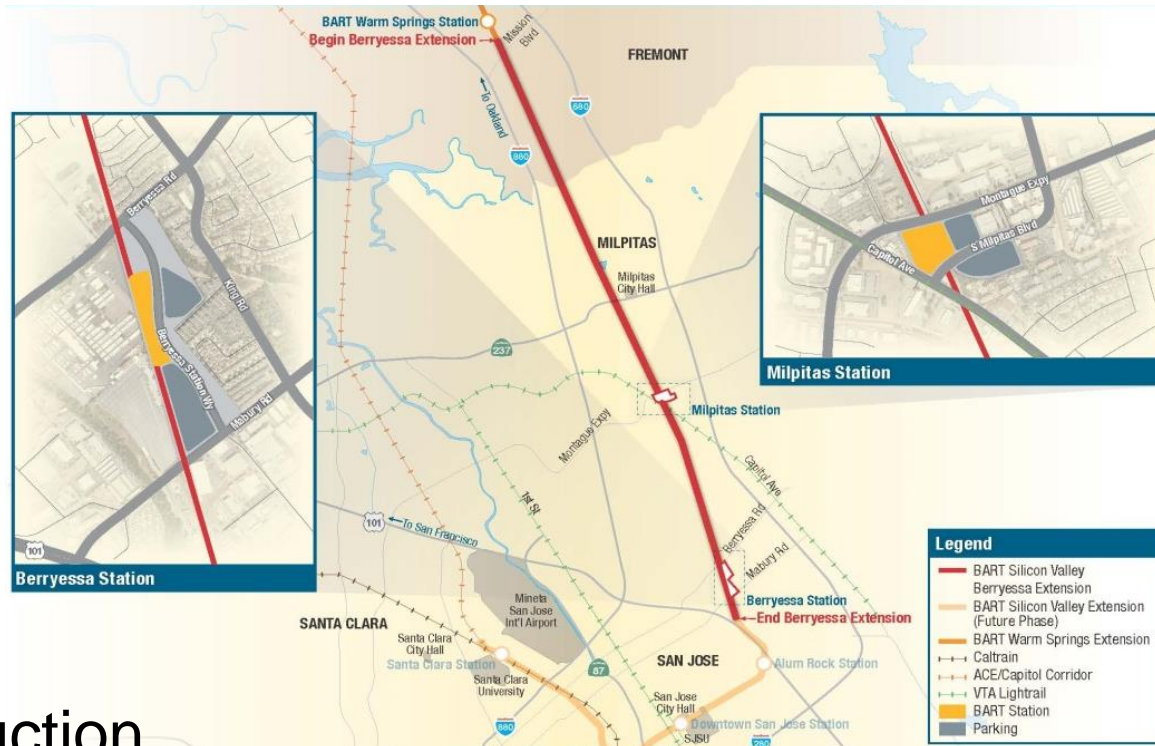
VTA BART Berryessa Extension

TDA Underlayment

- 1-foot thick TDA
- Non-woven filter fabric for drainage and separation, installed on top and bottom of TDA
- Compacted with 10-ton vibratory roller (6 passes)



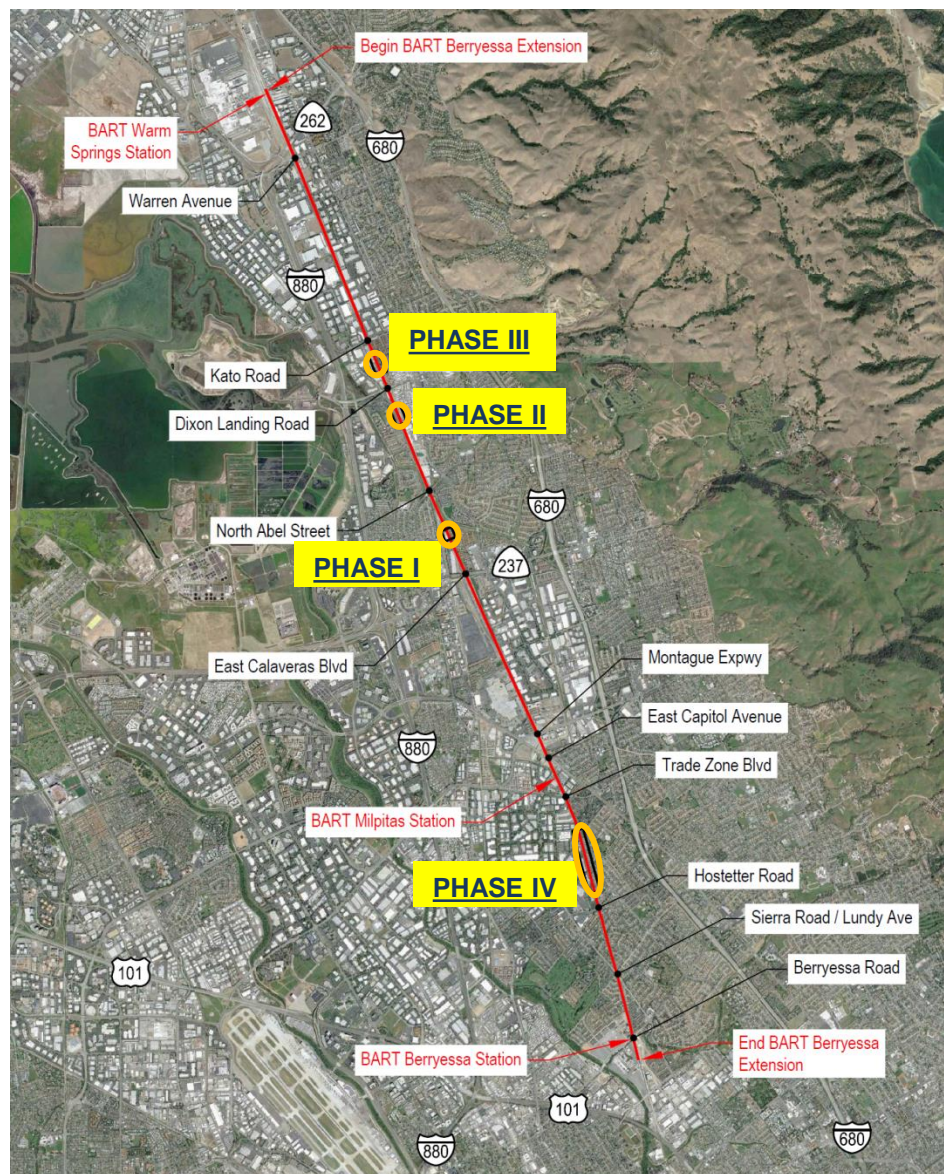
Valley Transportation Authority(VTA) BART Berryessa Extension



- Construction
 - Commenced in 2012
 - Passenger service anticipated for 2018
 - Contractor: Skanska Shimmick Herzog Joint Venture (SSHJV)

VTA BART Berryessa Extension

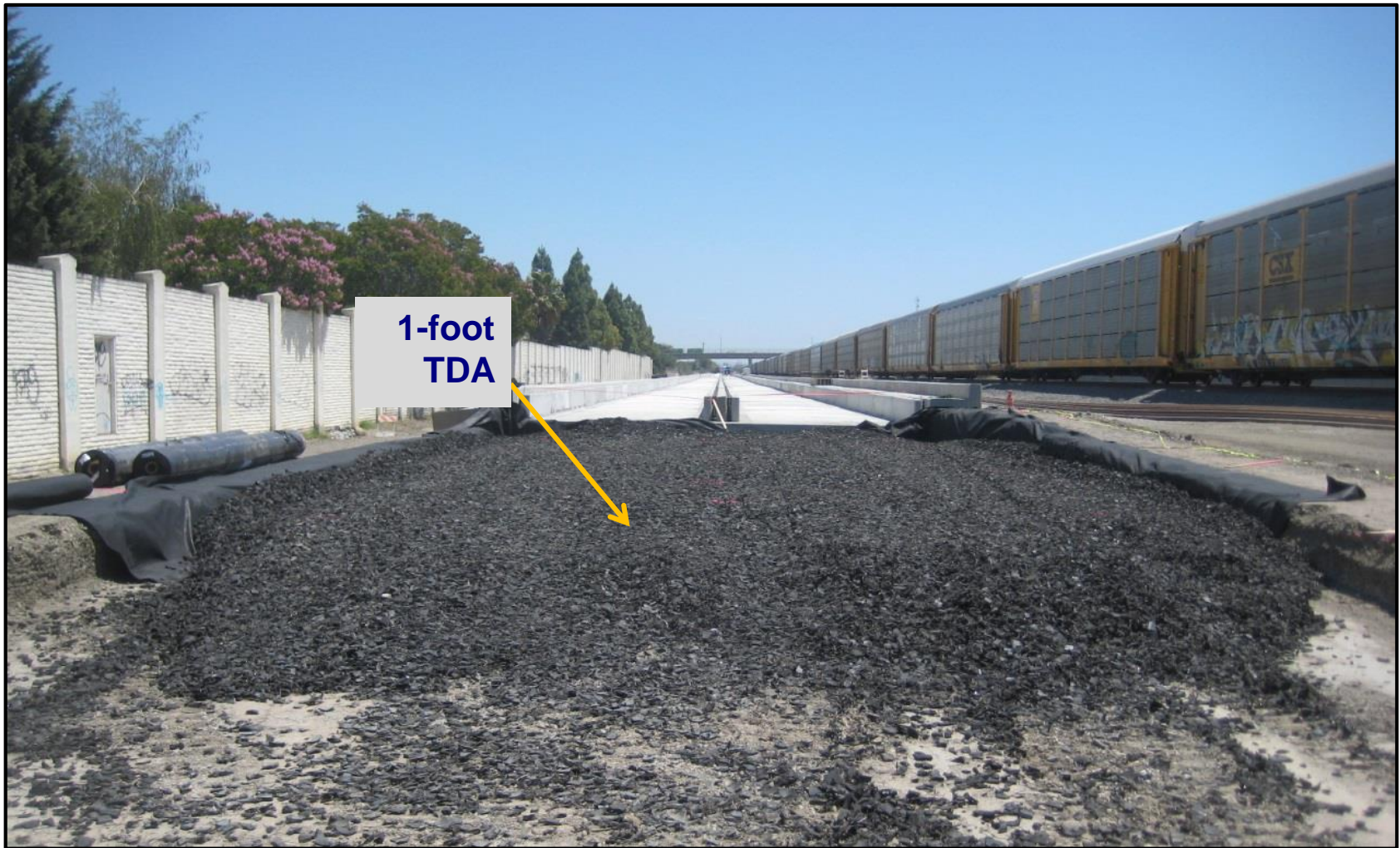
- TDA Sections
 - 4 separation phases
 - Length of TDA sections combined totaled over 1 mile (5,550 feet)



VTA BART Berryessa Extension



VTA BART Berryessa Extension



VTA BART Berryessa Extension

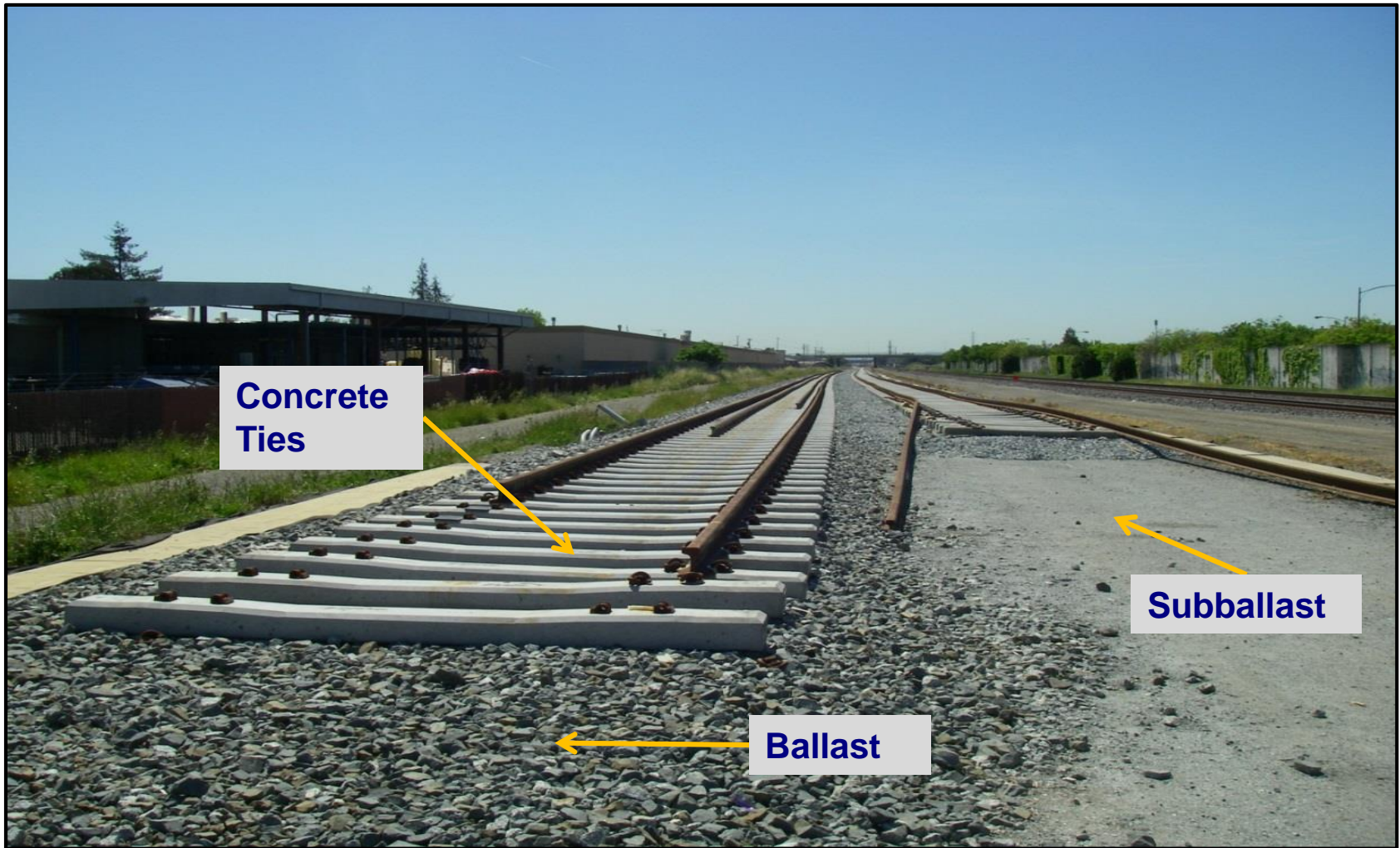


**Compact
with roller**

VTA BART Berryessa Extension



VTA BART Berryessa Extension



VTA BART Berryessa Extension

- Installed using standard construction methodologies
- Density: 46 lb/CF \pm 10% (41 to 50 lb/CF)



Construction Schedule and Cost

- Average TDA placement productivity:
 - 110 linear foot track per day
 - 130 cubic yards of TDA per day
- Cost Comparison

Cost Comparison	TDA Underlayment	Floating Concrete Slab
Total Cost for 5,500 LF track	\$ 350,000[†]	\$ 4,026,000*

• *Per the Federal Transit Administration, 2006, for cost per linear foot track; listed value accounts for inflation and market conditions for 2017*

[†] *Reported by SSHJV, includes labor, materials, and equipment*

VTA BART Berryessa Extension



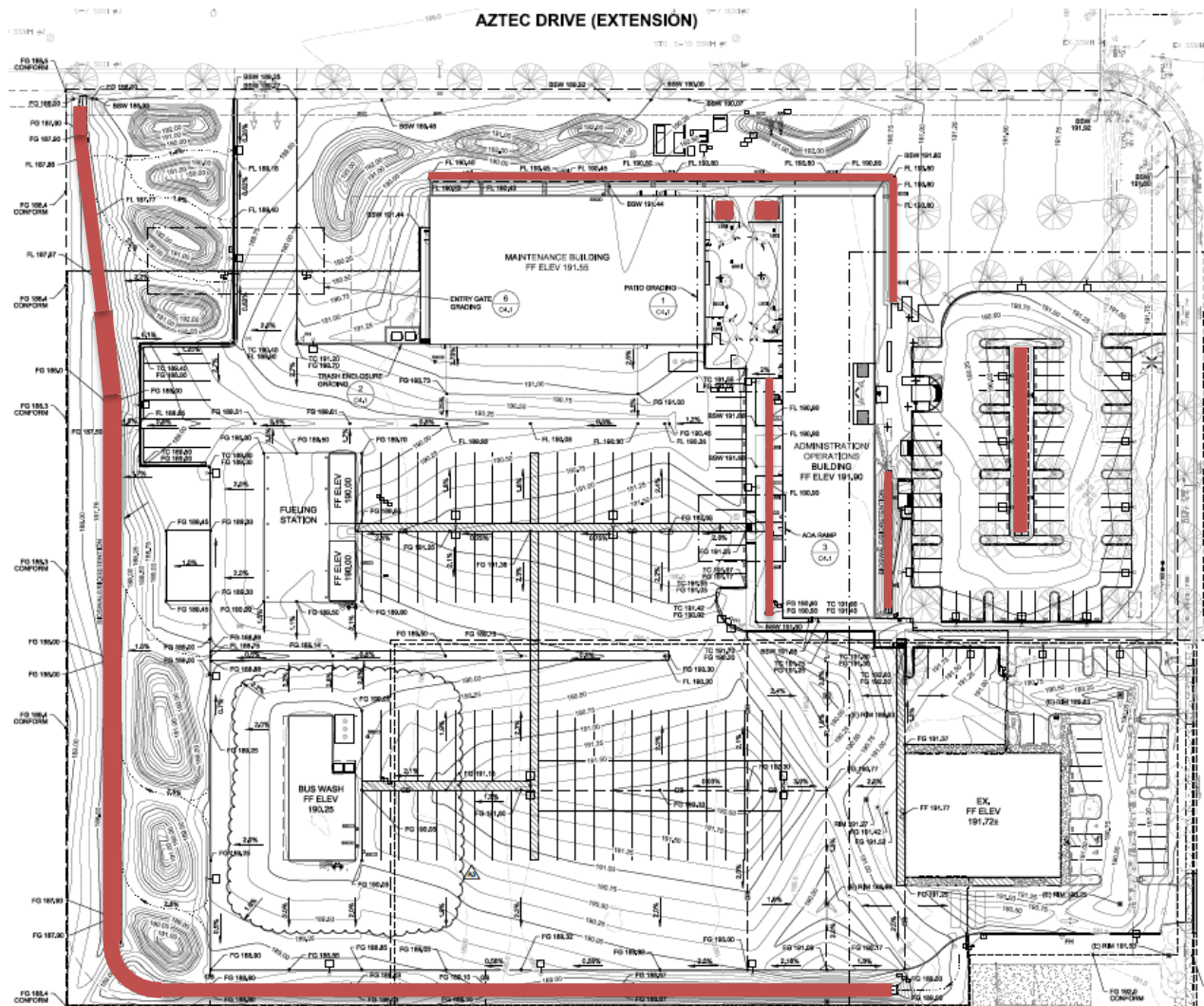
374,400 TIRES

Savings to VTA/ BART: \$3,676,000

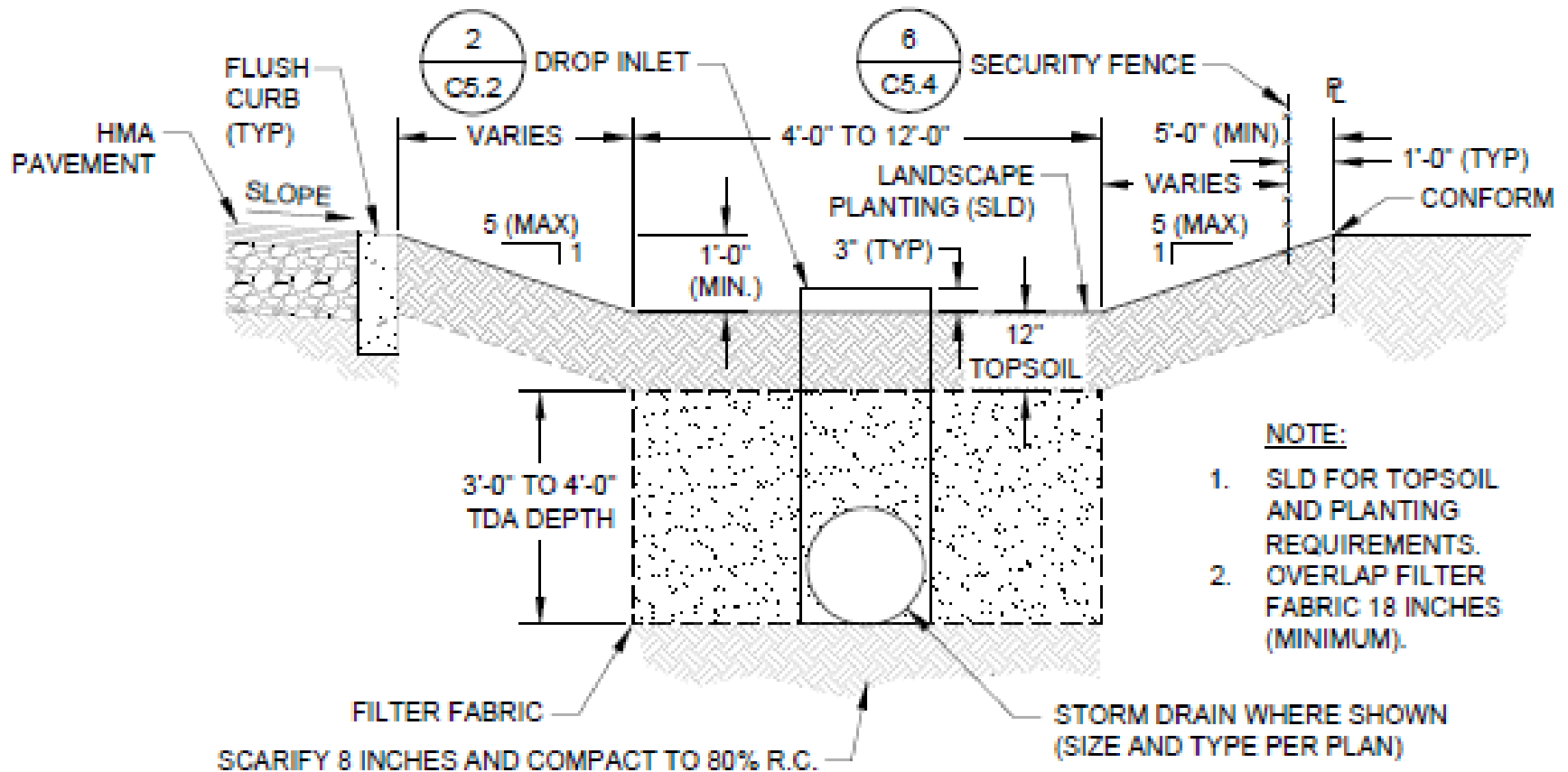
TDA LID Designs

- Butte Regional Transit Operations Center (BRTOC), Chico, CA
 - Butte County Association of Governments
 - Construction Complete in 2016
- Fleet and Materials Lab Building, Santa Rosa, CA
 - County of Sonoma
 - Construction Complete in 2016
- Transportation Improvements for Redwood Business Park, Ukiah, CA
 - City of Ukiah
 - In Construction now

BRTOC Project Site Plan



Bioretention Swale Typical Section



BRTOC Construction Photos



BRTOC Construction Photos



BRTOC Construction Photos



BRTOC Construction Photos



BRTOC Construction Photos



BRTOC Construction Photos



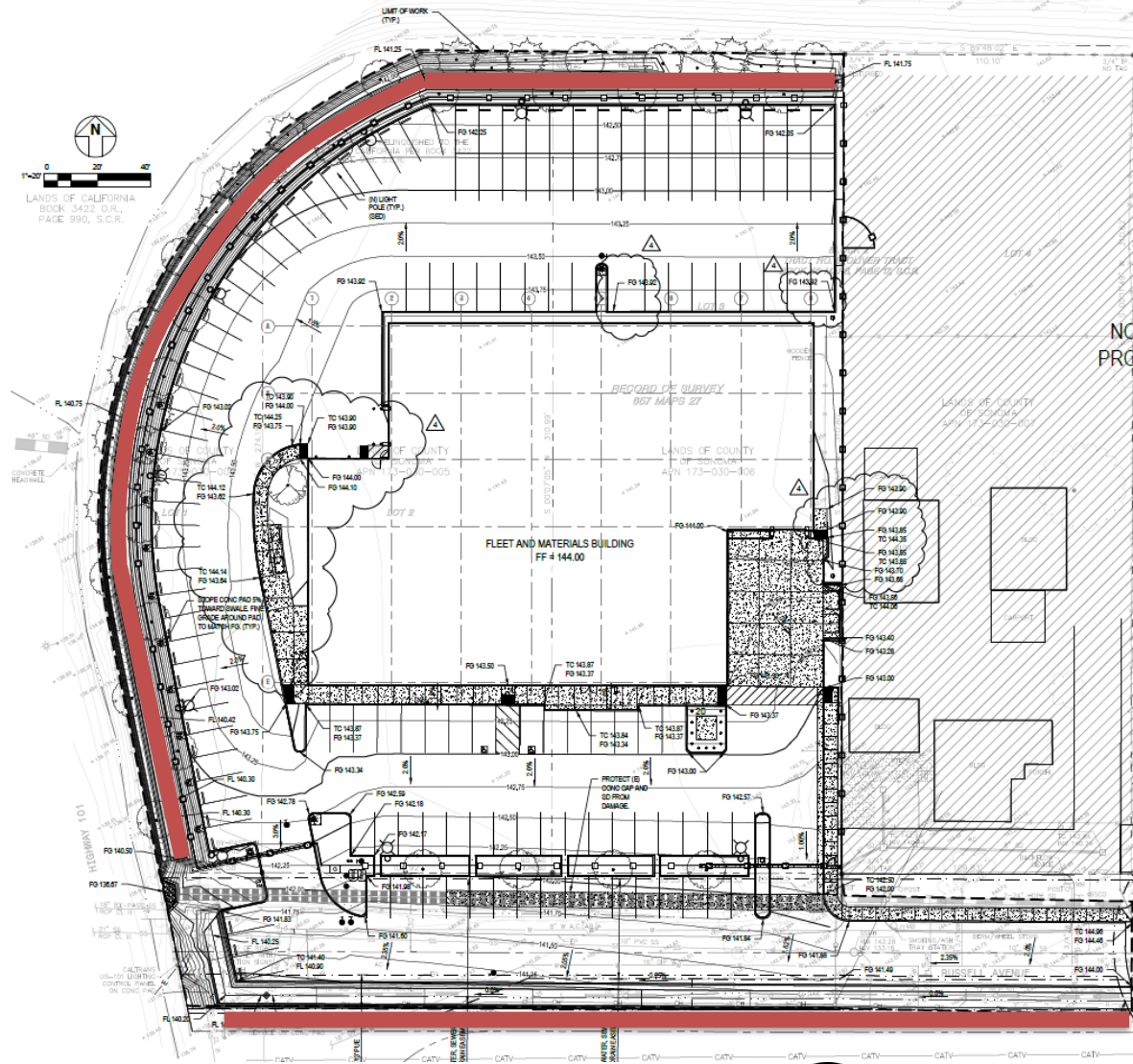
BRTOC Construction Photos



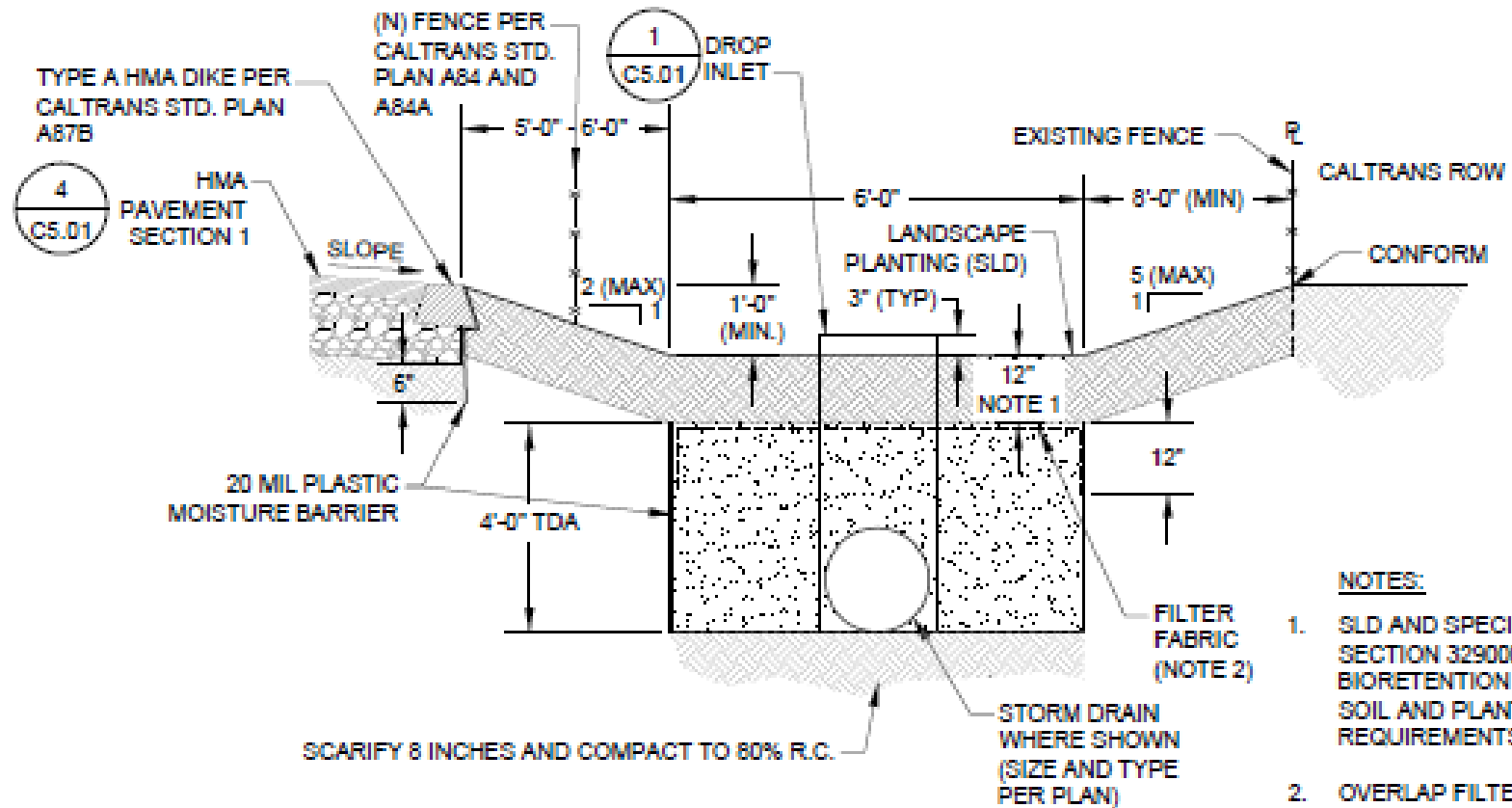
BRTOC Construction Photos



Sonoma County Fleet Facility Site Plan



Bioretention Swale Typical Section



Fleet Facility Site Construction Photos



Fleet Facility Site Construction Photos



Fleet Facility Site Construction Photos



Fleet Facility Site Construction Photos



Fleet Facility Site Construction Photos



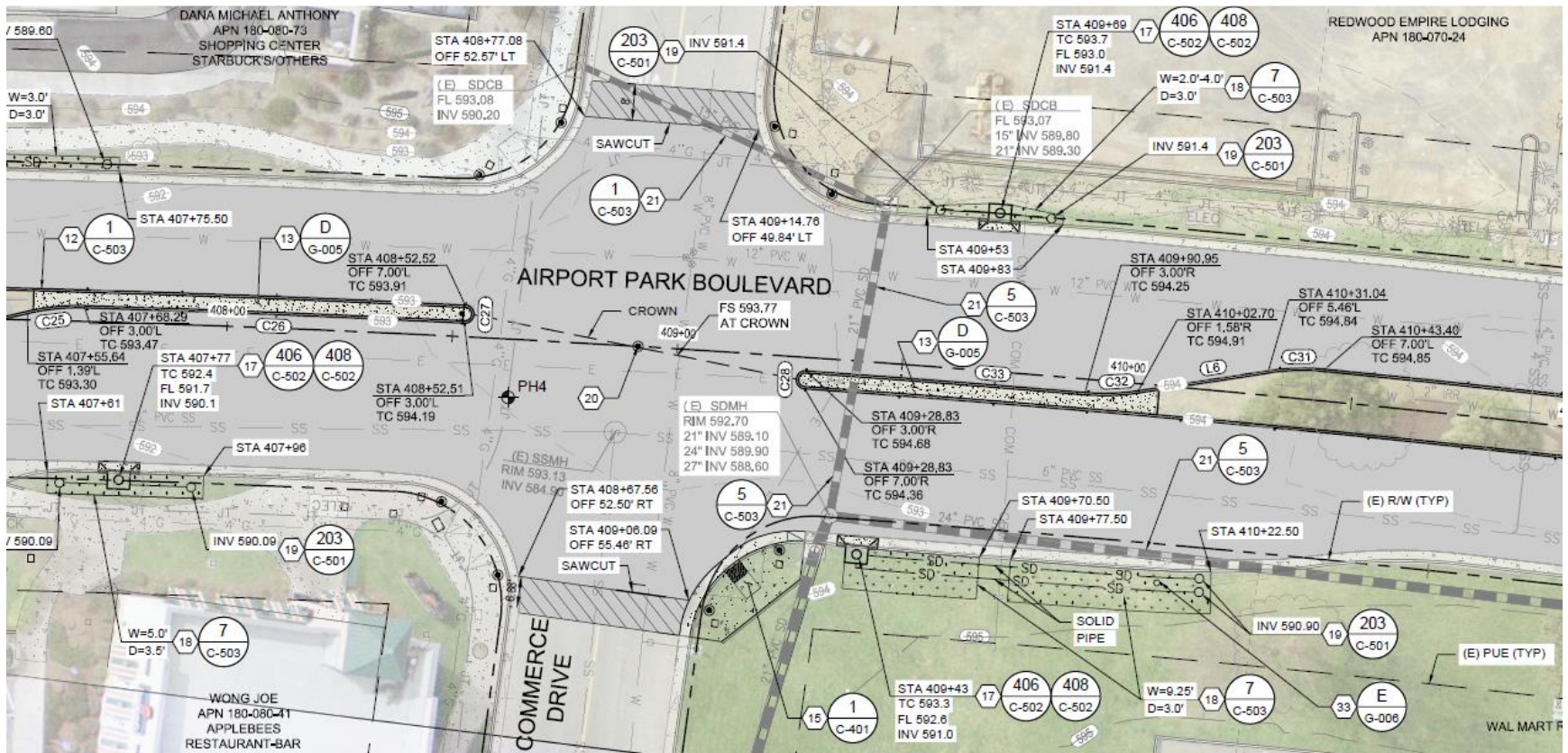
Fleet Facility Site Construction Photos



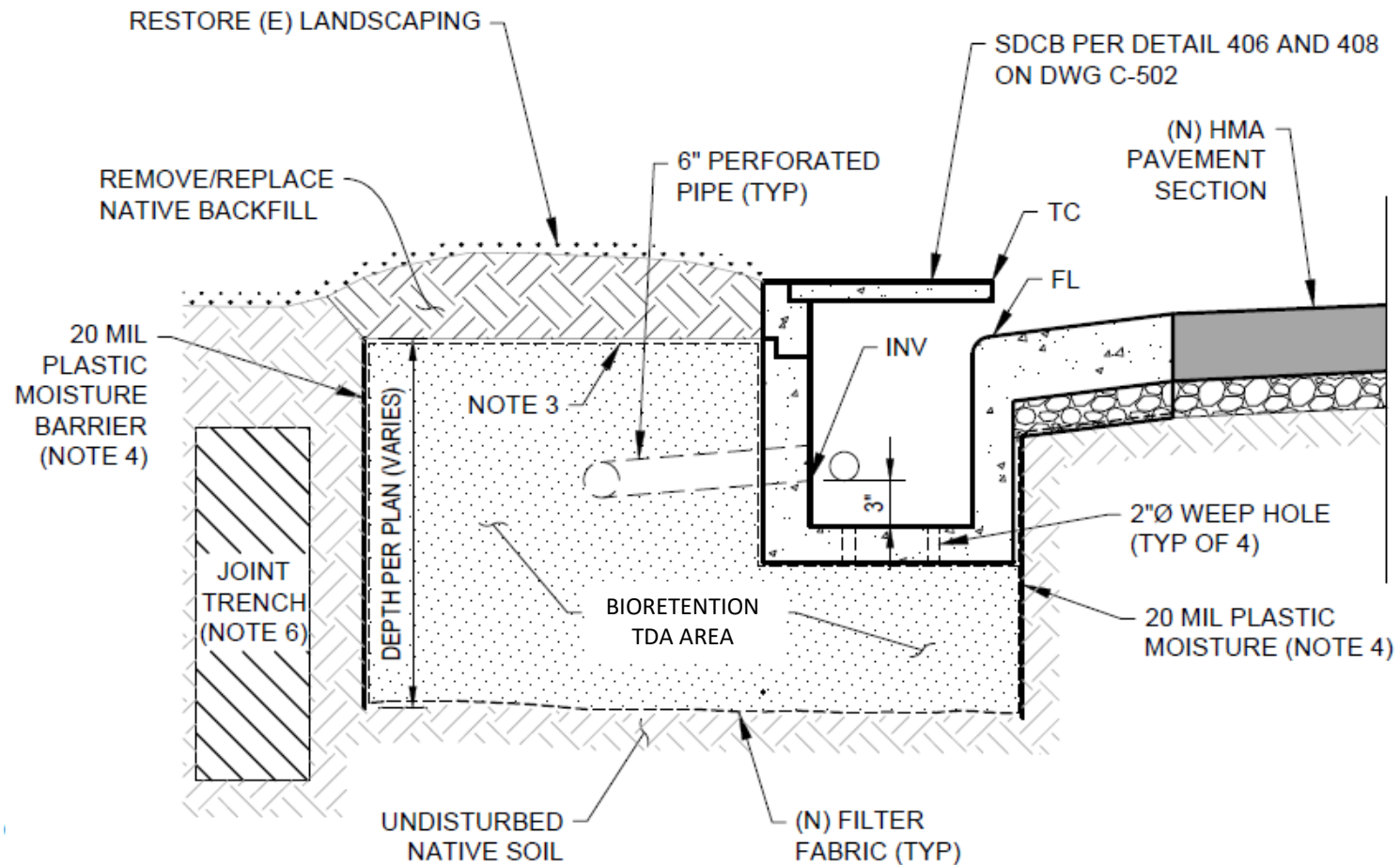
Fleet Facility Site Construction Photos



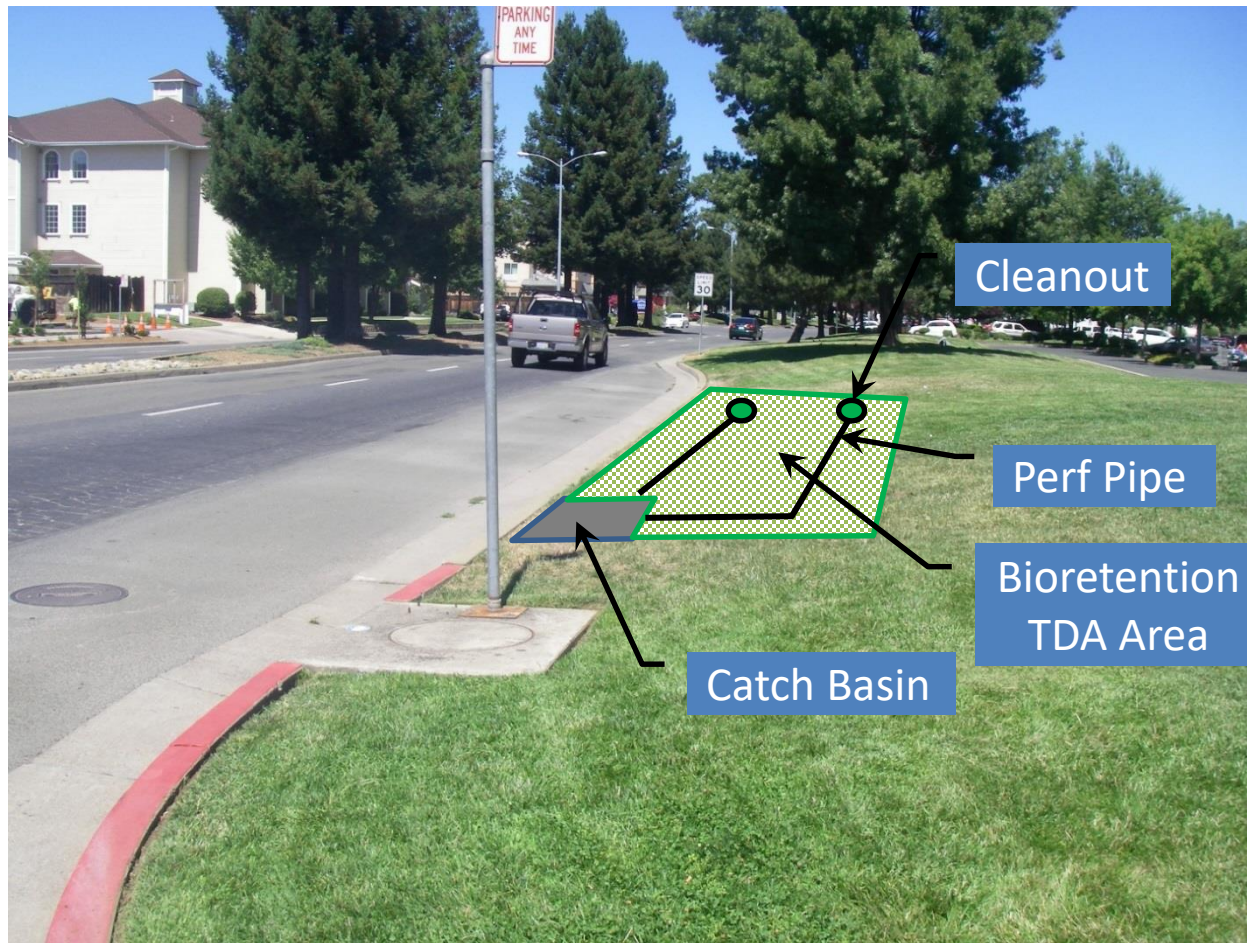
City of Ukiah Redwood Business Park Typical Road Reconstruction & LID Plan



TDA Infiltration gallery cross section view



Typical Infiltration Gallery (Pre-Construction)



Typical Infiltration Gallery (Storm Water)



Typical Infiltration Gallery (excavation & fill)



Typical Infiltration Gallery



Grant Program Overview

TDA Grants

Grant Program Overview TDA Grants

- Grant Amount: \$350,000 Maximum (\$750k for large TDA use projects)
- Eligible Applicants
 - Local Governments (cities and counties)
 - Special Districts
 - State Agencies
 - Qualifying Indian Tribes
 - Private, for-profit entities

Grant Program Overview TDA Grants

- Eligible Projects/Categories
 - Lightweight fill (slope stabilization, embankment fill, ...)
 - Vibration mitigation (under light rail lines)
 - Low impact development (LID) / Storm water management
 - Aggregate replacement projects in landfills

Grant Program Overview TDA Grants

- Project Requirements
 - 100% CA-generated waste tires
 - Minimum 500 tons of TDA materials (200 tons for LID projects)
 - Plans and specifications are subject to review by CalRecycle's engineering staff
 - Technical assistance/training will be provided by CalRecycle contractors and/or staff

Grant Program Overview TDA Grants

- Eligible Reimbursement Costs
 - TDA material
 - Transportation
 - Installation (\$7.5 per ton max)
 - Testing (5k max)
 - Engineering/Design Work (additional 13% - 50%, depending on project)

Grant Program Overview

- How to apply?

TDA Grant Webpage:

www.calrecycle.ca.gov/Tires/Grants/TDA

Date	Activity
April 2019	Application Release
August 2019 November 2019 February 2020	Application Due Dates
September 2019 December 2019 March 2020	Secondary Due Dates (for Resolutions, Environmentally Preferable)
October 2019 January 2020 April 2020	Grant Awards
April 1, 2022	Grant Term Ends

TDA Grant contact, Loreto Tamondong

(916) 341-6464, or e-mail: Loreto.Tamondong@CalRecycle.ca.gov

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