Attachment II

LPP Planset

US Army Corps
of Engineers
San Francisco District

SOUTH SAN FRANCISCO BAY SHORELINE FLOOD RISK MANAGEMENT FEASIBILITY STUDY SHORELINE LOCAL PREFERRED PLAN

Santa Clara County

California

US Army Corps
of Engineers
San Francisco District

Approved

Date

Revision

Revision Number

Date: 06/24/20.

Drawing Code: XXX

Designed by: I. - Z

Drawn by: US D

Checked by: XX

Submitted by: I. - Z

Reviewed by: XX

DEPARTMENT OF THE ARMY
DIVISION
SACRAMENTO DISTRICT

2379 GATEWAY OAKS
SUITE 200
SACRAMENTO, CA 95833-4210

HDR

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN

Sheet reference number:
G-01

UPDATE

GENERAL

G-01 COVER SHEET
G-02 INDEX SHEET
G-03 OVERALL SITE PLAN

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C-02 PLAN AND PROFILE STA 10+00 TO 20+00
C-03 PLAN AND PROFILE STA 20+00 TO 30+00
C-04 PLAN AND PROFILE STA 30+00 TO 40+00
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C-08 PLAN AND PROFILE STA 70+00 TO 80+00
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C-10 PLAN AND PROFILE STA 90+00 TO 100+00
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SHORELINE PROJECT DATUMS

HORIZONTAL
- CALIFORNIA COORDINATE SYSTEM NAD83 ZONE III

VERTICAL
- NAVD88

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. ROSSO
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
Spec No: XX
Design File no: XXX
Drawing Code:
File name: C-41
Plot date:
Dwg size:
Rev. XX

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

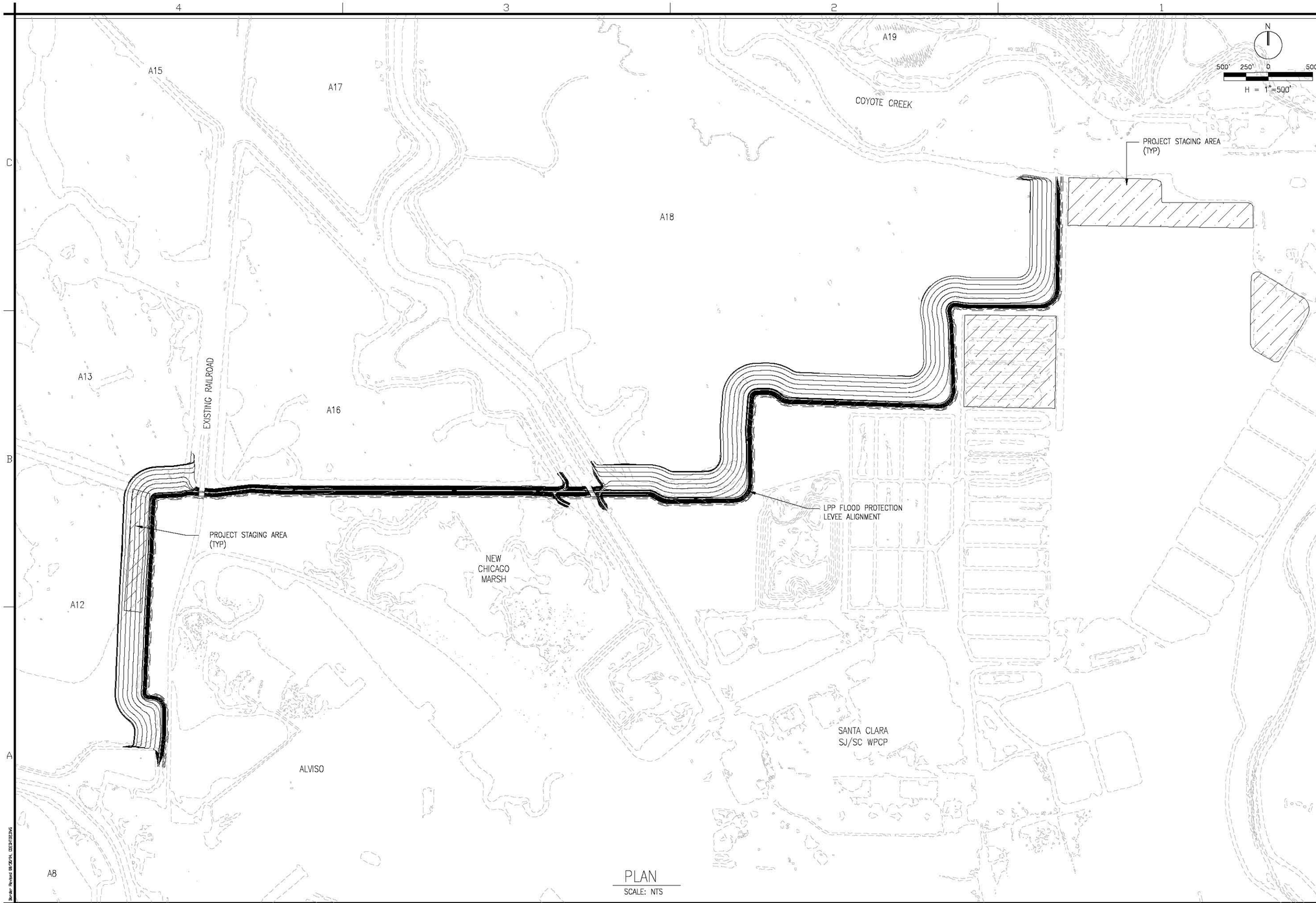
HDR
HDR Engineering, Inc. SACRAMENTO, CA 95899-4210
2379 GATEWAY OAKS
SUITE 200

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
INDEX SHEET

Sheet reference number:
G-02

UPDATE

Border: Revised 08/30/04, DESCRIPTION



PLAN
SCALE: NTS

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Rev. XX

Date: 06/24/2014
Design File no: XXX
Drawing Code:
File name: C-01
Plot date:
Dwg scale:

Designed by: S. JIMENEZ
Dwn by: V. VASSO
Spec No: XX
Reviewed by: XX
Submitted by: S. JIMENEZ

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

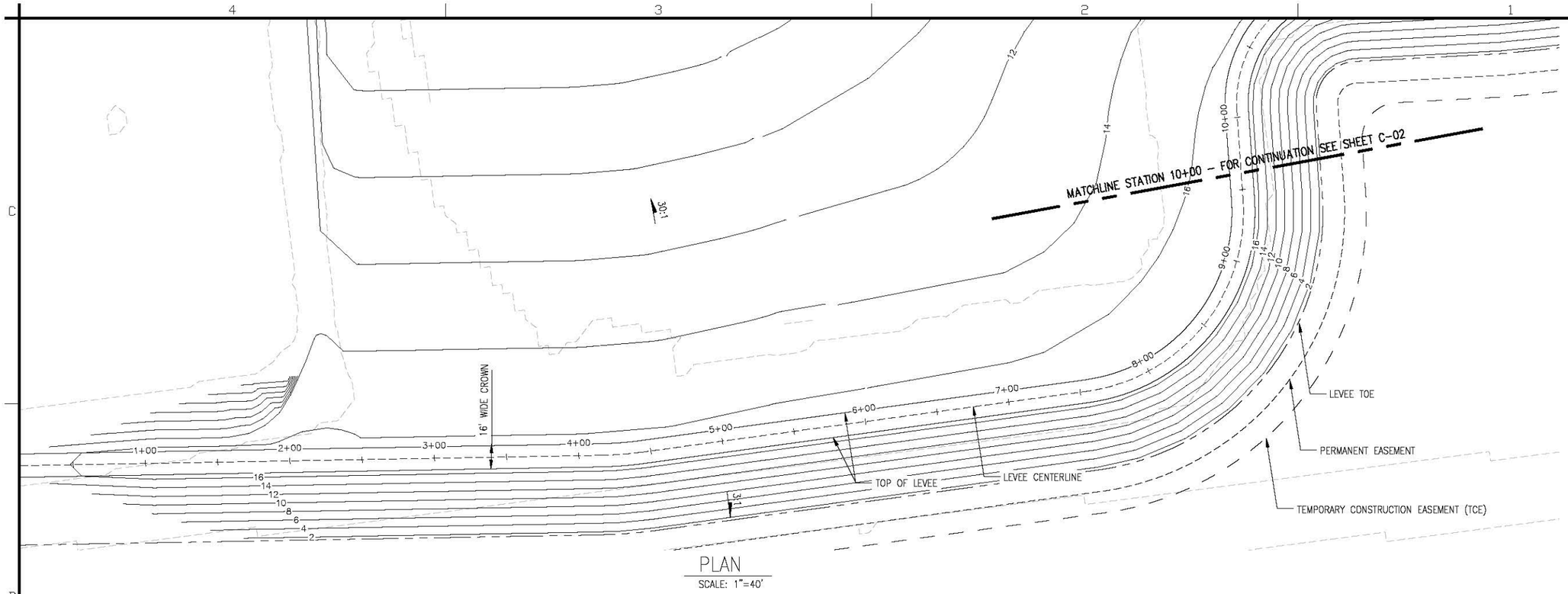
HDR
HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95833-4210

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
OVERALL SITE PLAN

Sheet reference number:
G-03

UPDATE

Template Revised 08/2014, DESIGNTEAM



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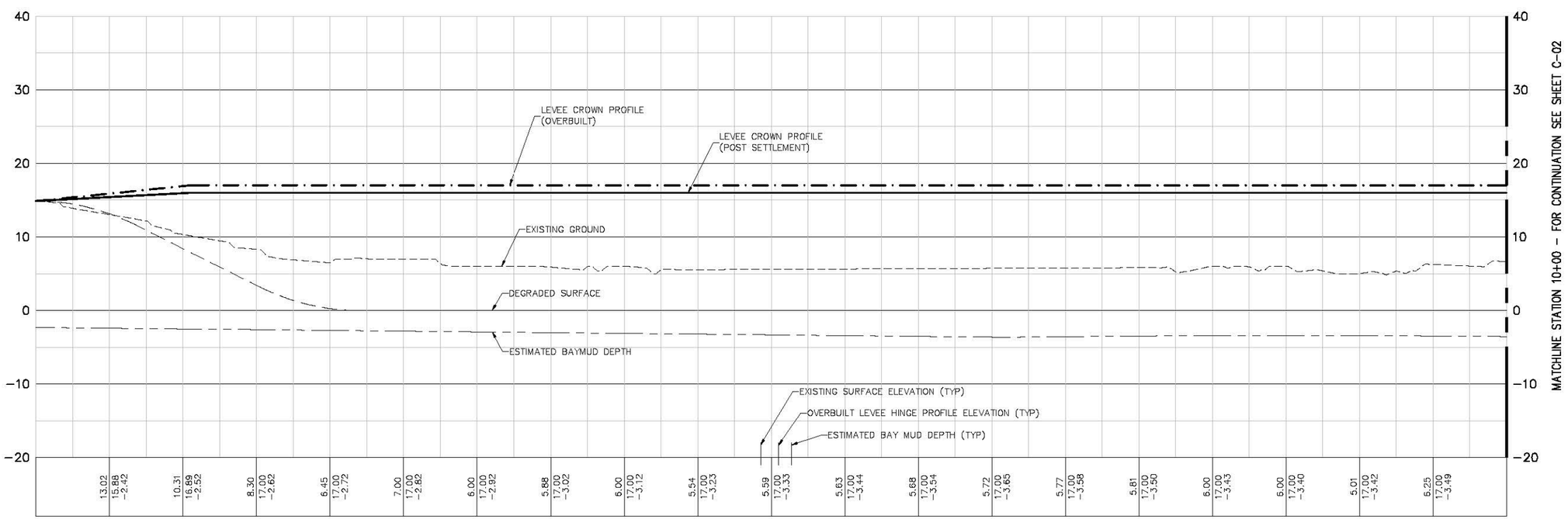

PROFILE

V: SCALE: 1"=5'

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. RUSSO
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
Spec No: XX
Design File no: XXX
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File name: C-01
Plot date:
Dwg scale:
Rev: XX

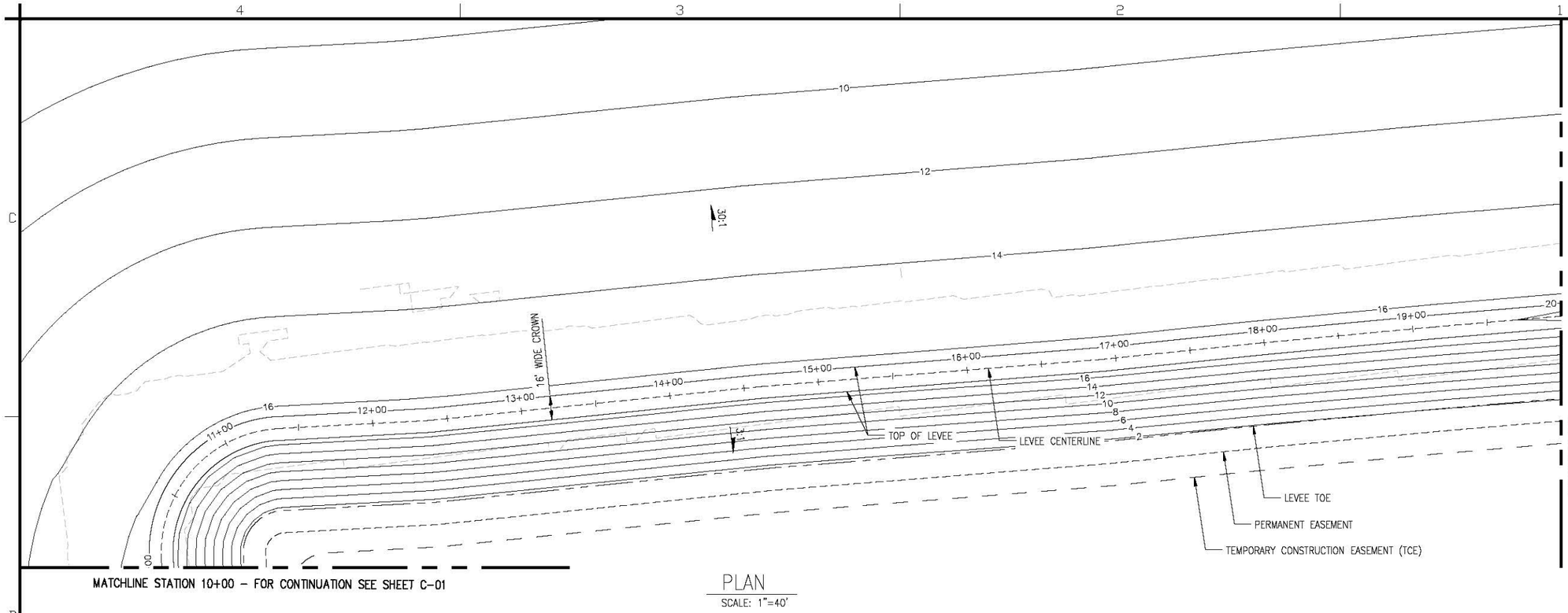
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95833-4210

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 0+00 TO STA 10+00

Sheet reference number:
C-01

UPDATE



PLAN

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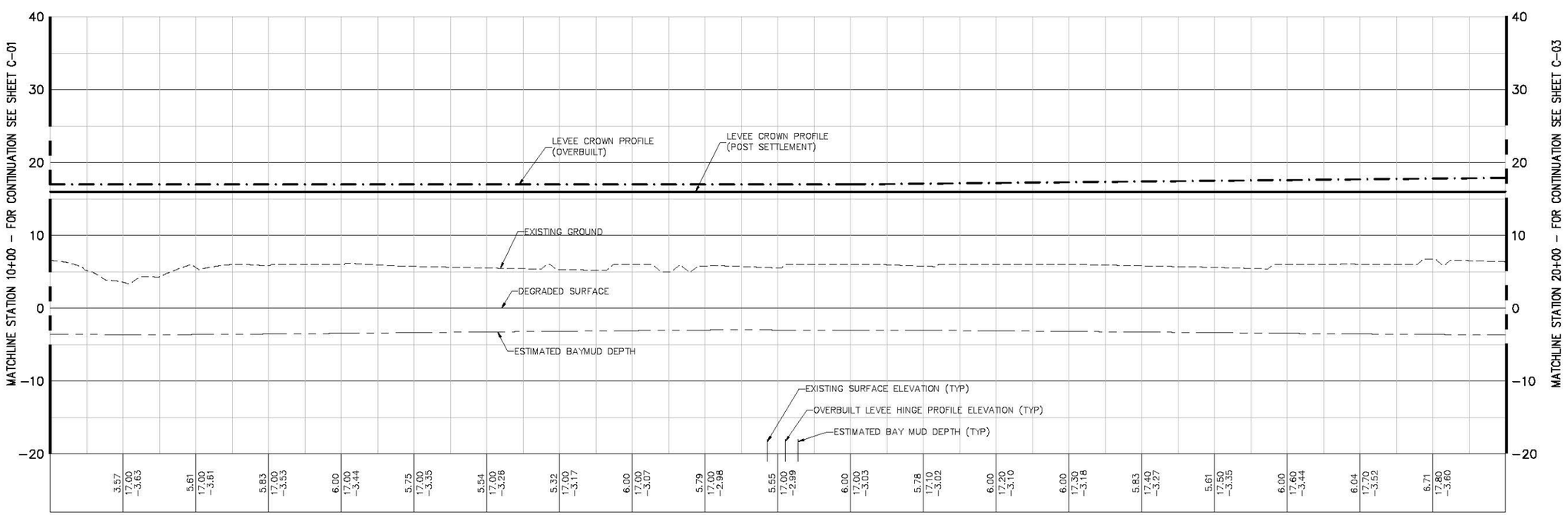

PROFILE

V: SCALE: 1"=5'

H = 1"=40'

V = 1"=5'

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. Rosso
Spec No: XX
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
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Drawing Code:
File name: C-01
Plot scale:
Dwg size:
Rev: XX

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95833-4210

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 10+00 TO STA 20+00

Sheet reference number:
C-02

UPDATE

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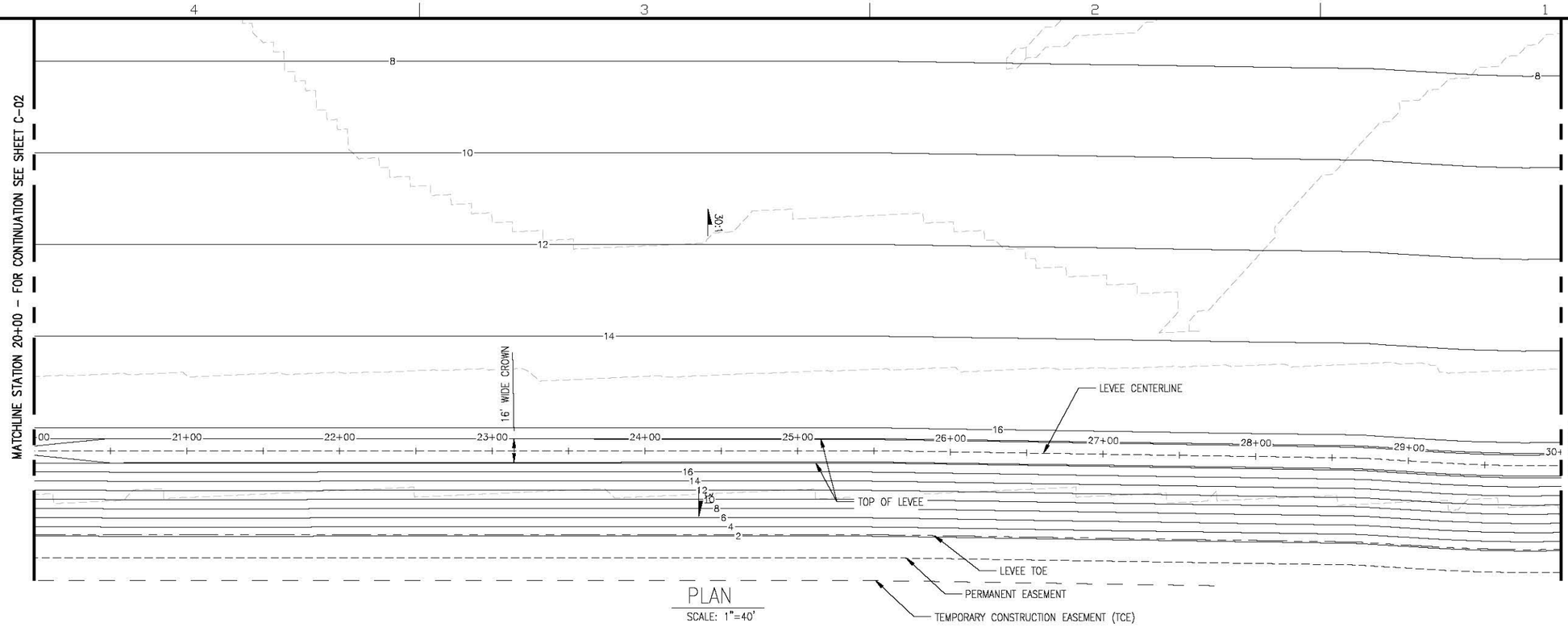

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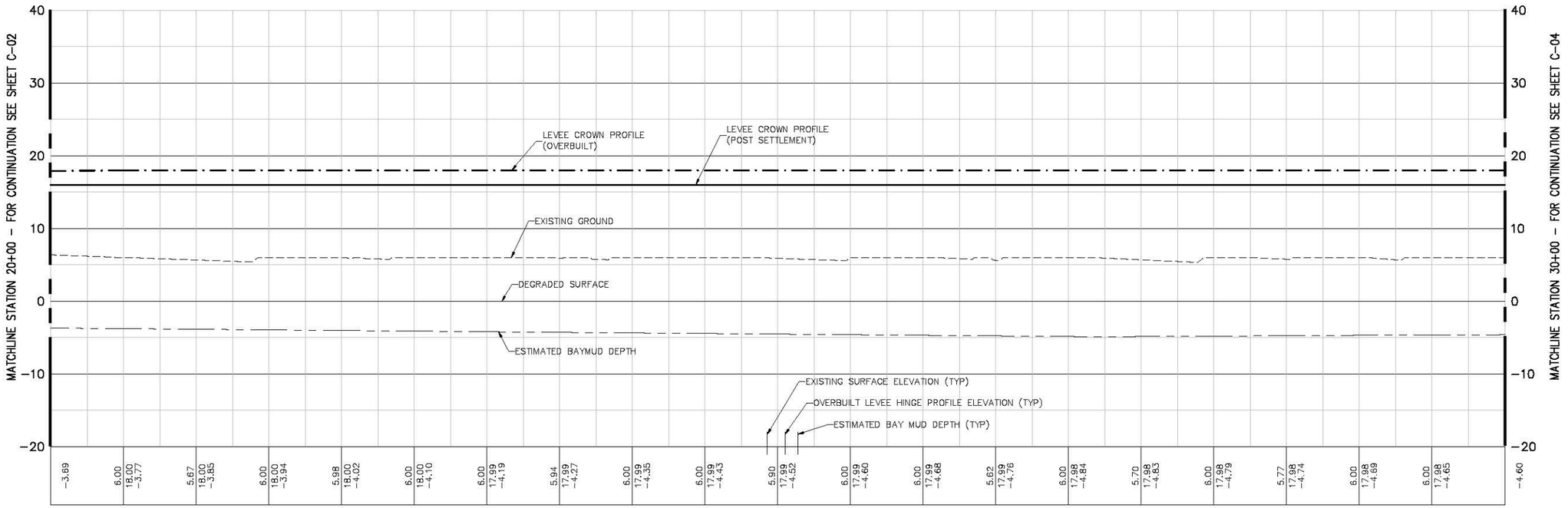

PROFILE

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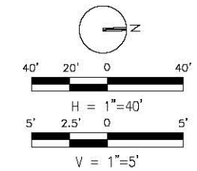


US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. RASSU
Spec No: XX
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
Design File No: XXX
Drawing Code:
File name: C-01
Plot date:
Dwg status:
Rev. XX

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

HDR Engineering, Inc. SACRAMENTO, CA 95899-4210
2379 GATEWAY OAKS
SUITE 200

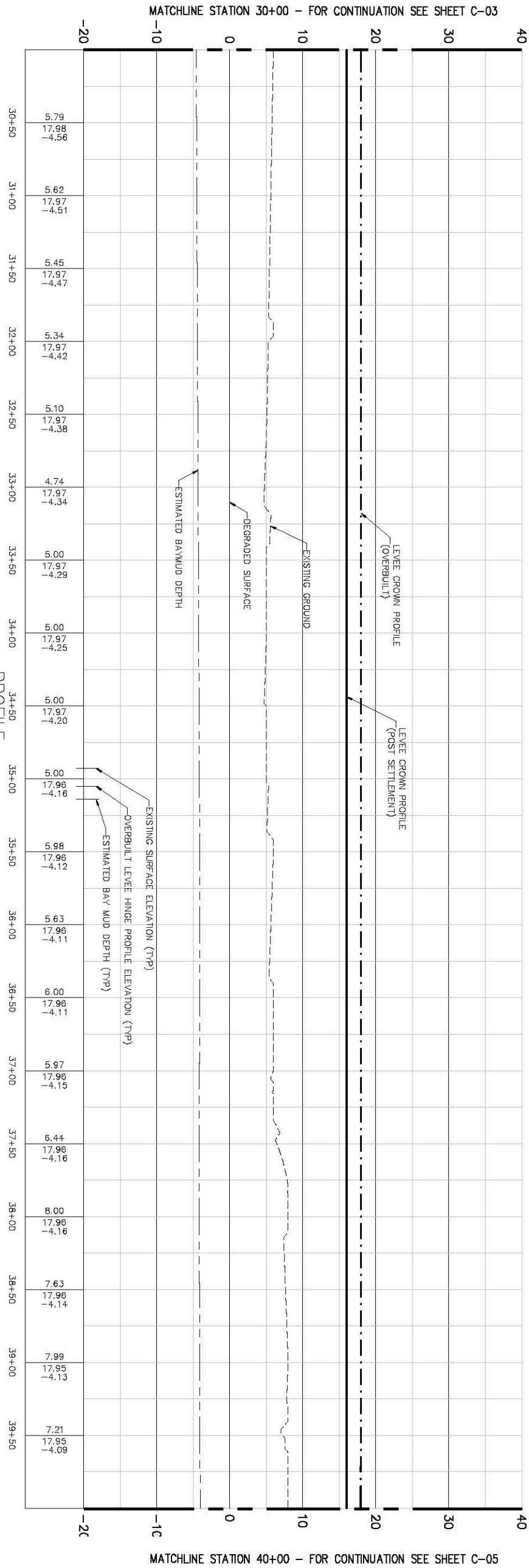
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 20+00 TO STA 30+00

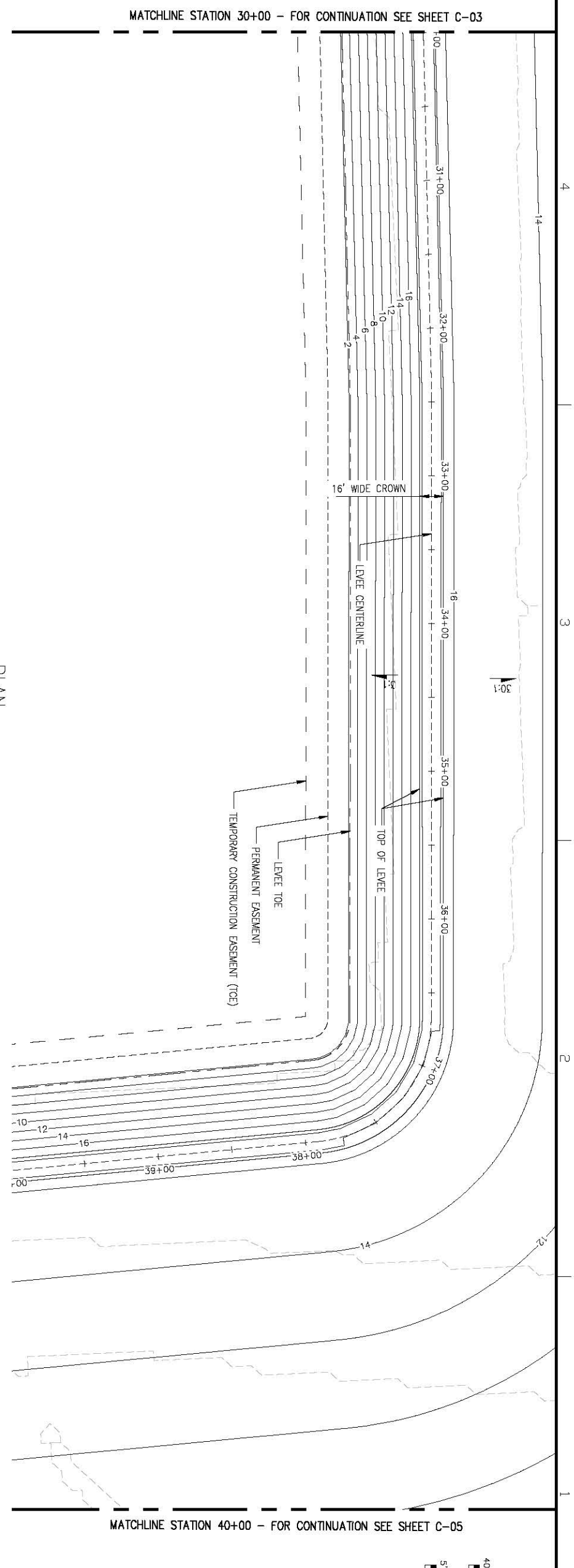
Sheet reference number:
C-03

UPDATE

Border Revised 08/26/04, DESPRESENG

Border Revised 08/30/04, COESHT02.DWG





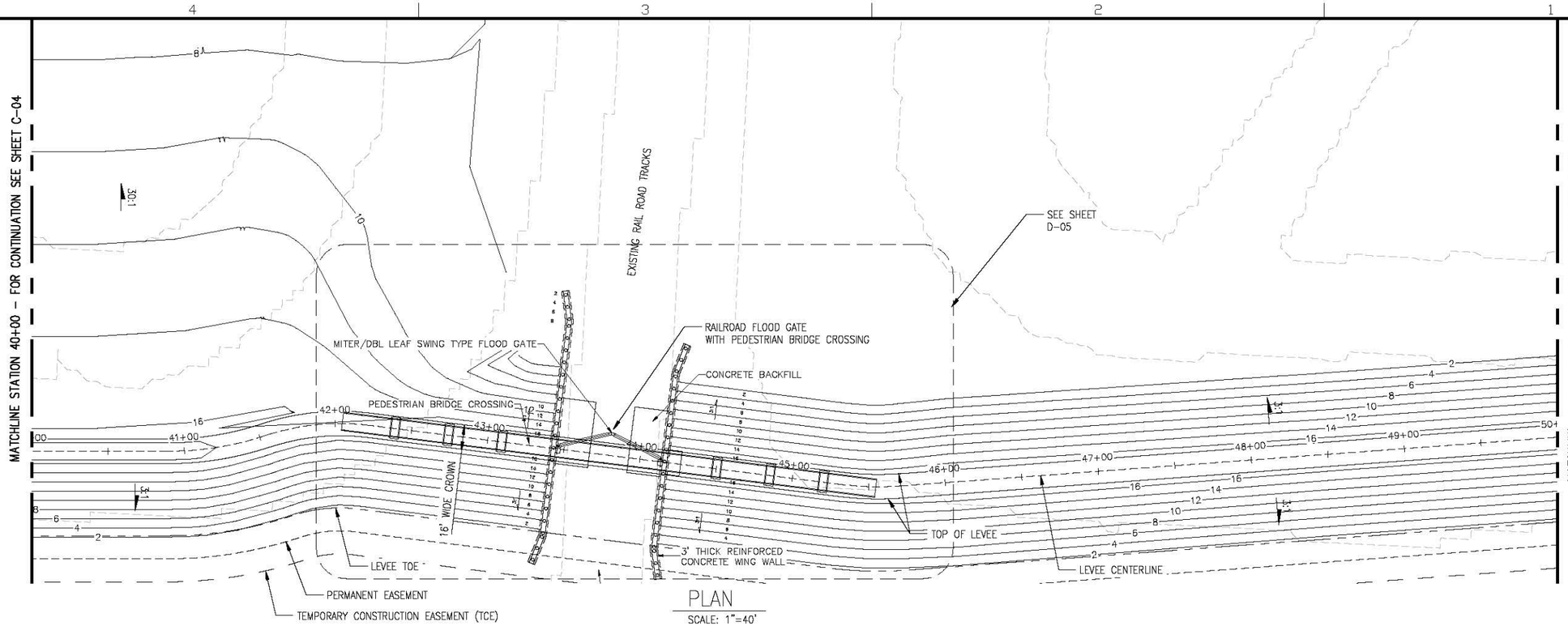
H = 1"=40'
V = 1"=5'

Sheet reference number: C-04	SOUTH SAN FRANCISCO BAY SHORELINE FLOOD RISK MANAGEMENT FEASIBILITY STUDY SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE PLAN AND PROFILE STA 30+00 TO STA 40+00	DEPARTMENT OF THE ARMY CORPS OF ENGINEERS SACRAMENTO, CALIFORNIA HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95899-4240	Designed by: S. JIMENEZ; Date: 06/24/2014; Rev. XX Dwn by: V. RUSSO; Spec No: XX; Design file no: XXX Reviewed by: XX; Drawing Code: Submitted by: S. JIMENEZ; File name: C-01; Plot date:; Dwg scale:

Symbol	Description	Date	Approved

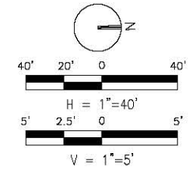
US Army Corps of Engineers San Francisco District

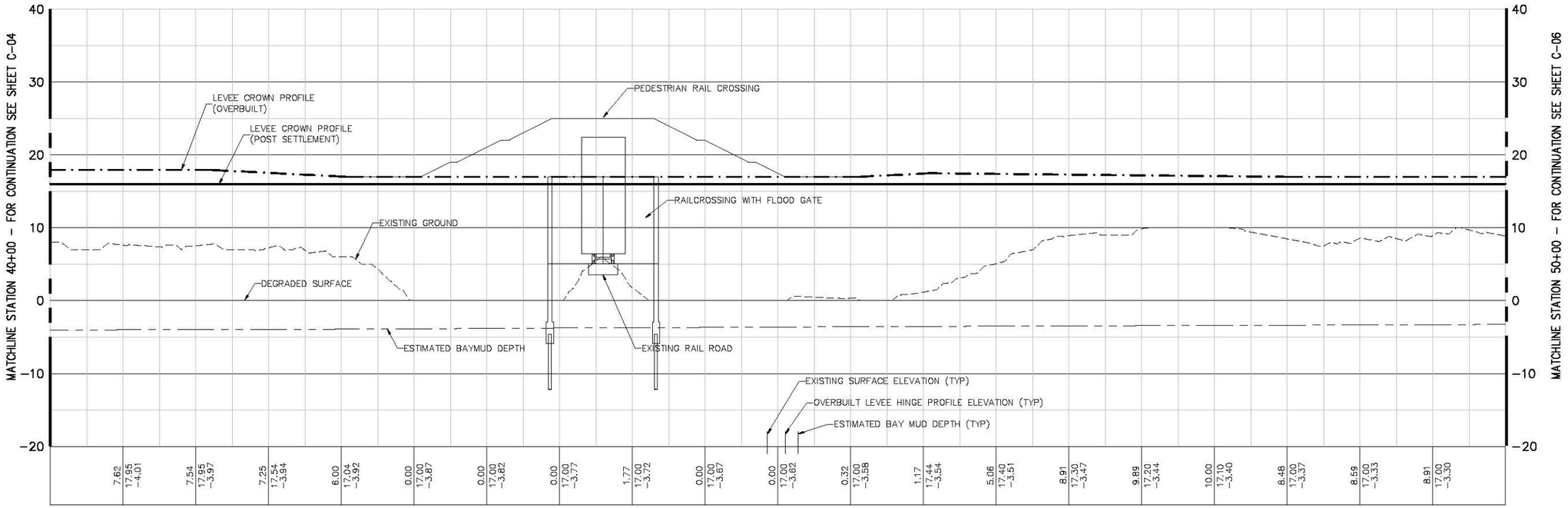
UPDATE



PLAN

SCALE: 1"=40'





PROFILE

V: SCALE: 1"=5'

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. KUSCU
Spec No: XX
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
Design File No: XXX
Drawing Code:
File name: C-01
Plot date:
Dwg scale:
Rev. XX

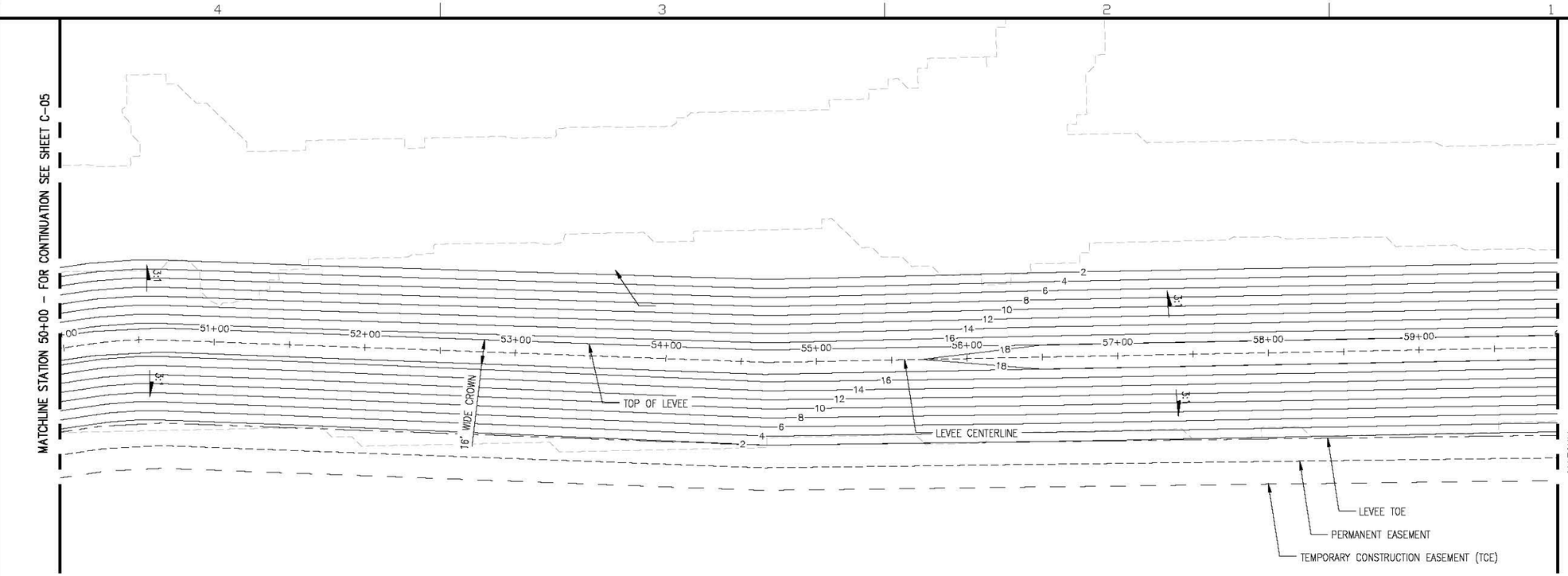
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

HDR Engineering, Inc.
2379 GATEWAY OAKS
SUITE 200
SACRAMENTO, CA 95833-4210

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 40+00 TO STA 50+00

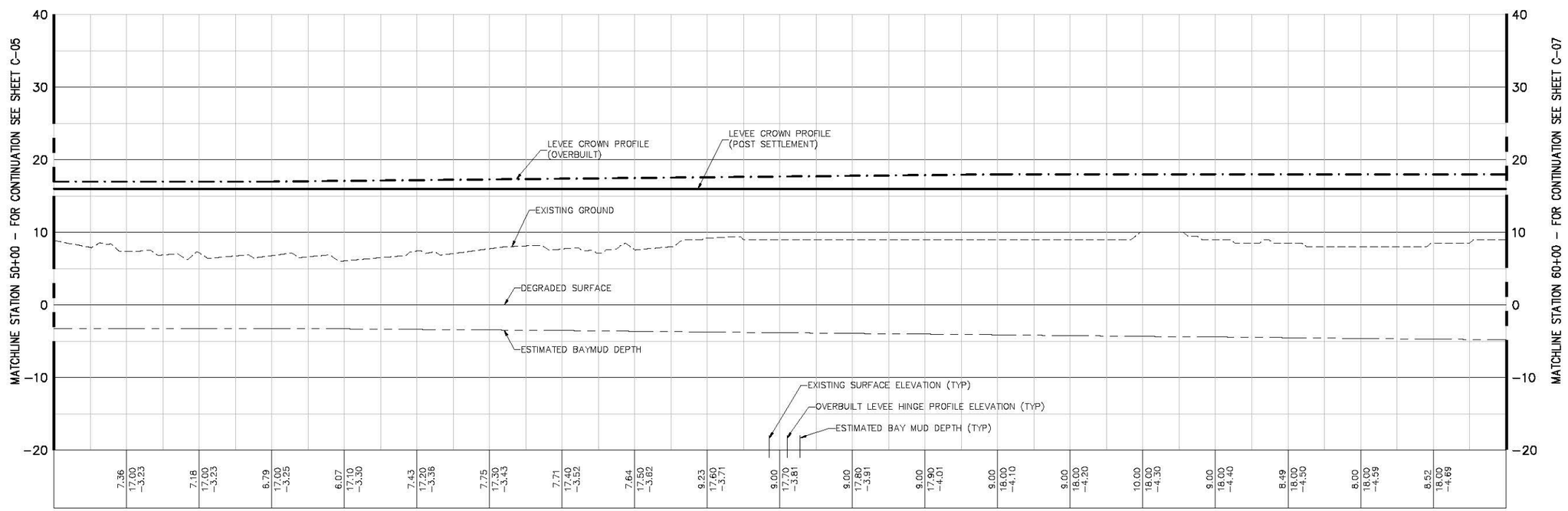
Sheet reference number:
C-05

UPDATE



PLAN

SCALE: 1"=40'



PROFILE

V: SCALE: 1"=5'

US Army Corps of Engineers
San Fransisco District

H = 1"=40'

V = 1"=5'

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. RUSSO
Spec No: XX
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
Design File no: XXX
Drawing Code:
File name: C-01
Plot date:
Dwg size:
Rev: XX

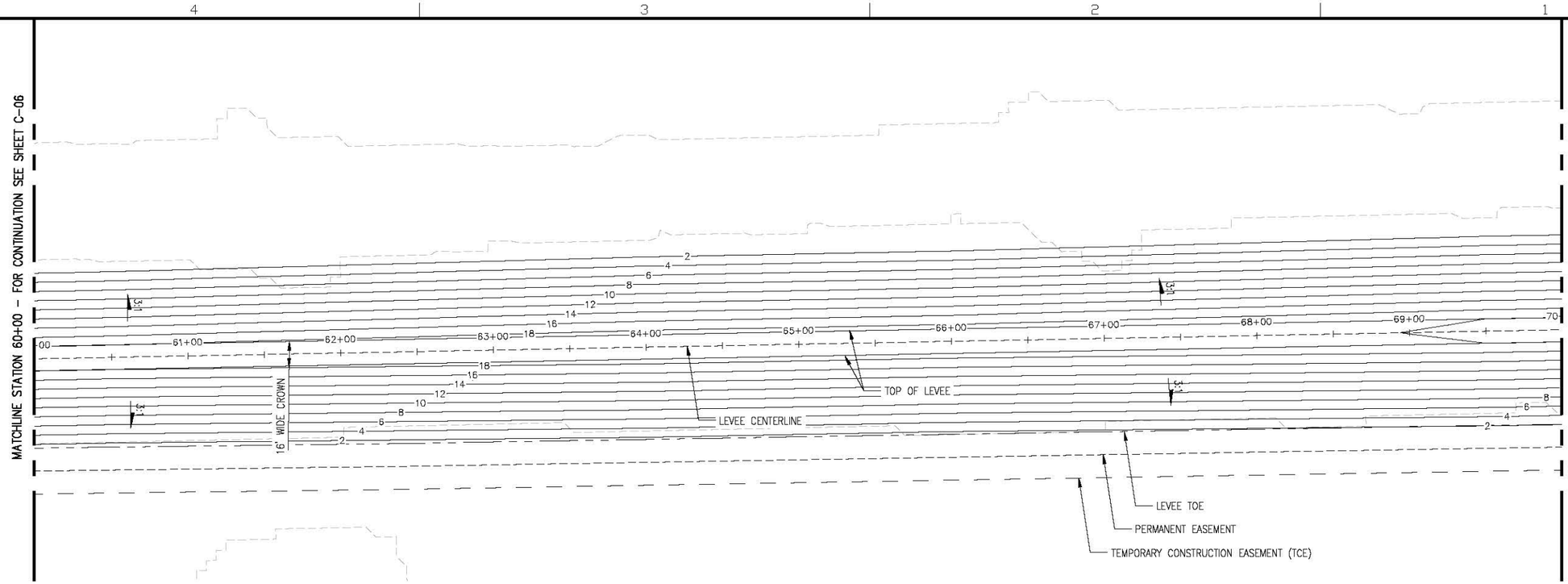
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95833-4210

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 50+00 TO STA 60+00

Sheet reference number:
C-06

UPDATE



PLAN

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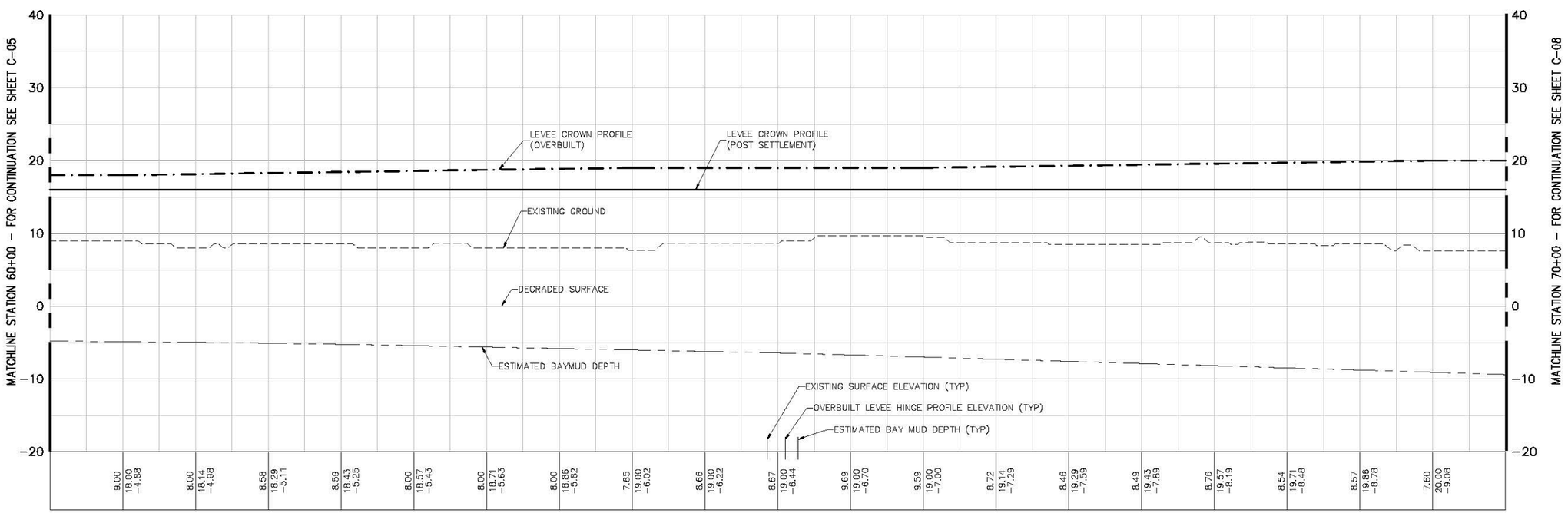


PROFILE

V: SCALE: 1"=5'

N

40' 20' 0 40'

H = 1"=40'

5' 2.5' 0 5'

V = 1"=5'

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. Russo
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
Spec No: XX
Design File No: XXX
Drawing Code:
File name: C-01
Plot scale:
Dwg size:
Rev: XX

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

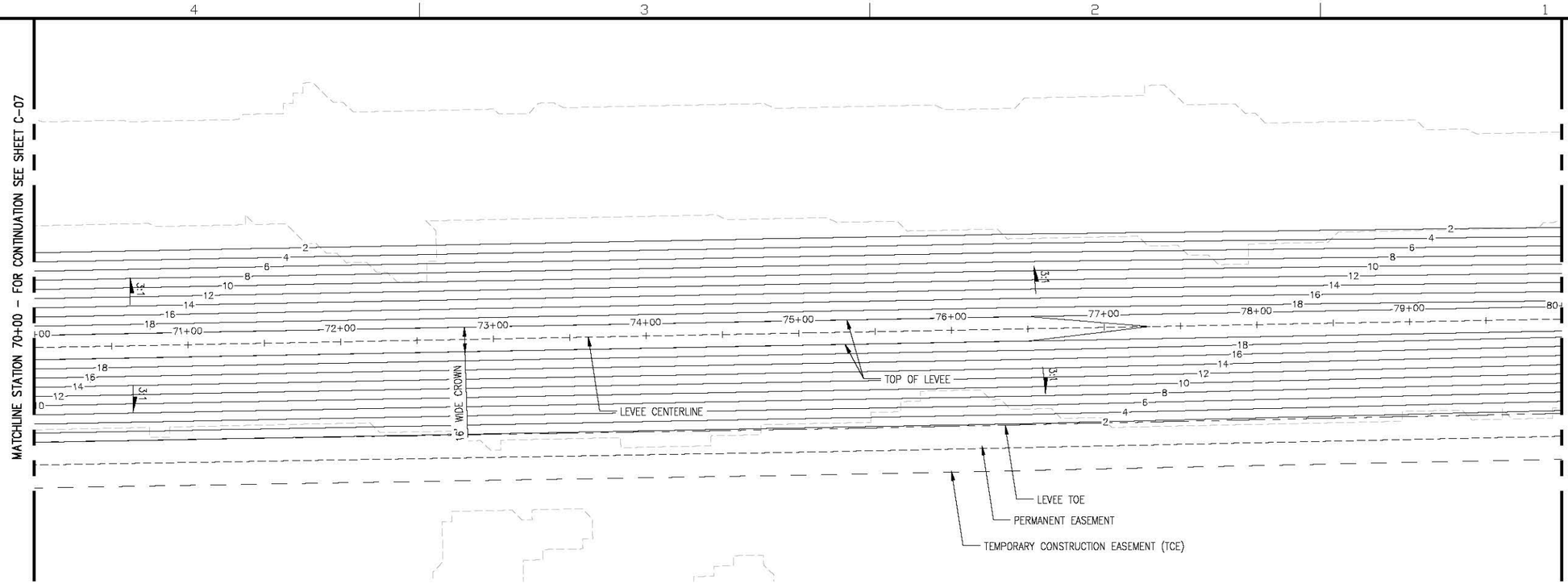
HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95833-4210

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 60+00 TO STA 70+00

Sheet reference number: C-07

UPDATE

Server: Revised 08/28/14, 12:39:17 PM



PLAN

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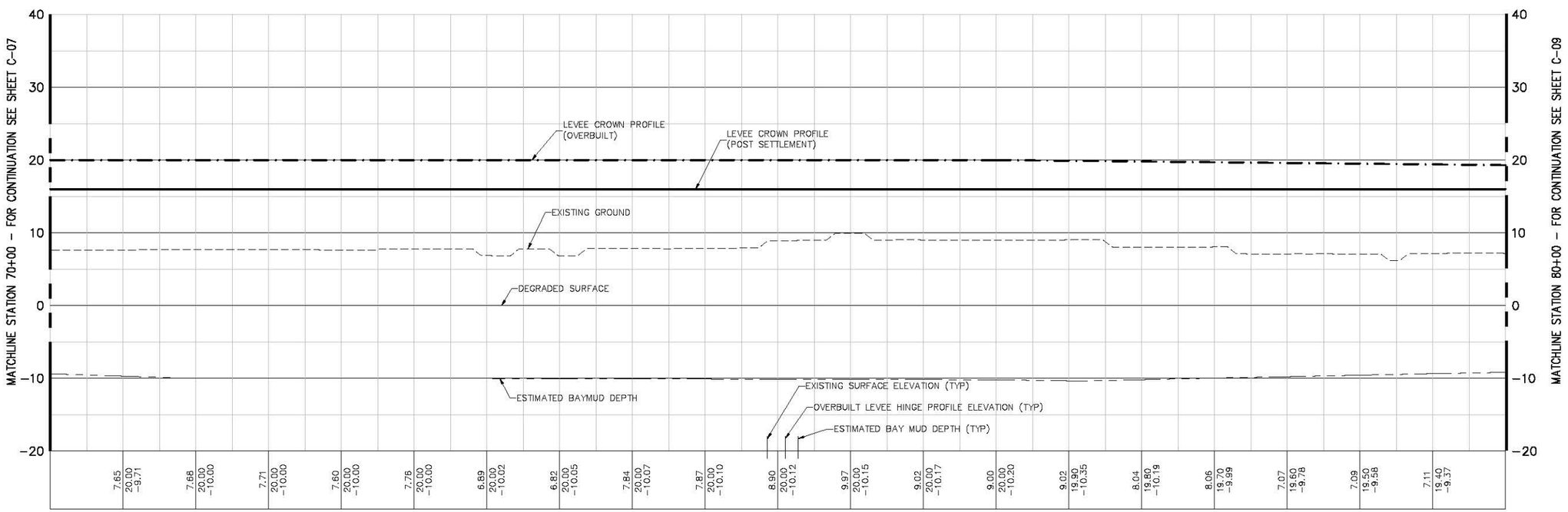


PROFILE

V: SCALE: 1"=5'

US Army Corps of Engineers
San Fransisco District

H = 1"=40'

V = 1"=5'

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. RUSSO
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
Spec No: XX
Design File No: XXX
Drawing Code:
File name: C-01
Plot date:
Dwg size:
Rev: XX

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

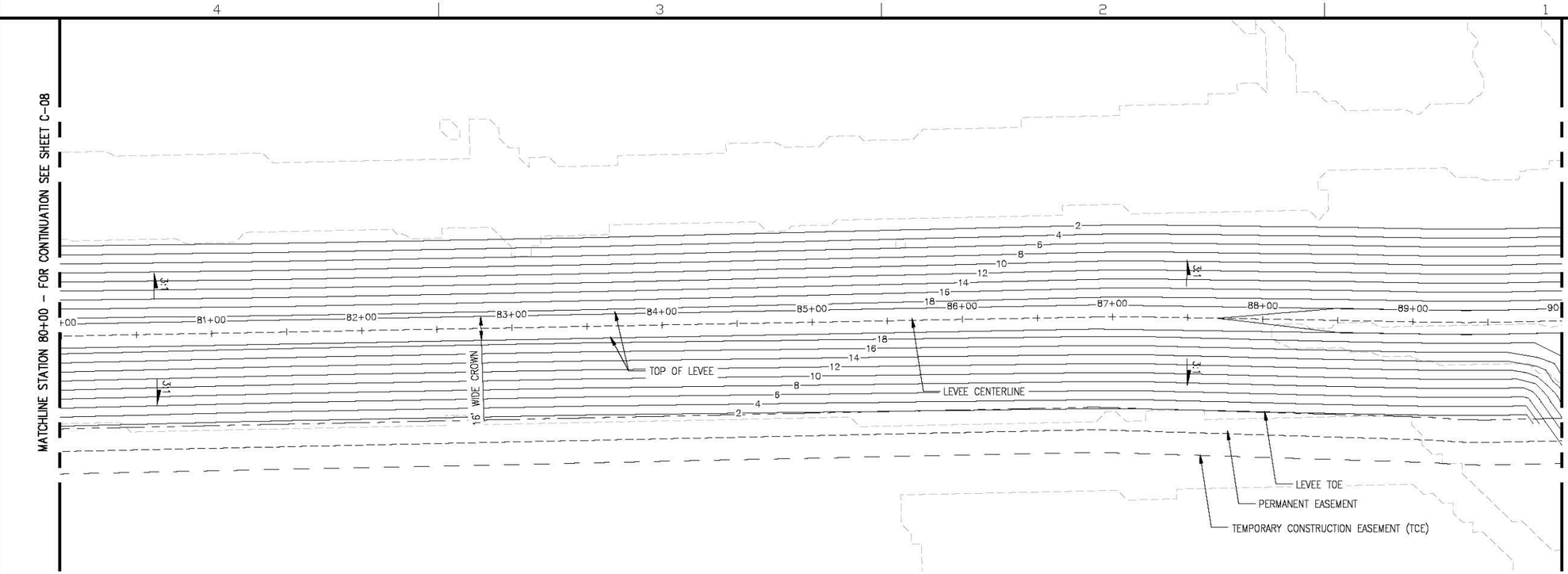
HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95699-4210

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 70+00 TO STA 80+00

Sheet reference number:
C-08

UPDATE

Server: Revised 08/28/14, 12:33:17 PM



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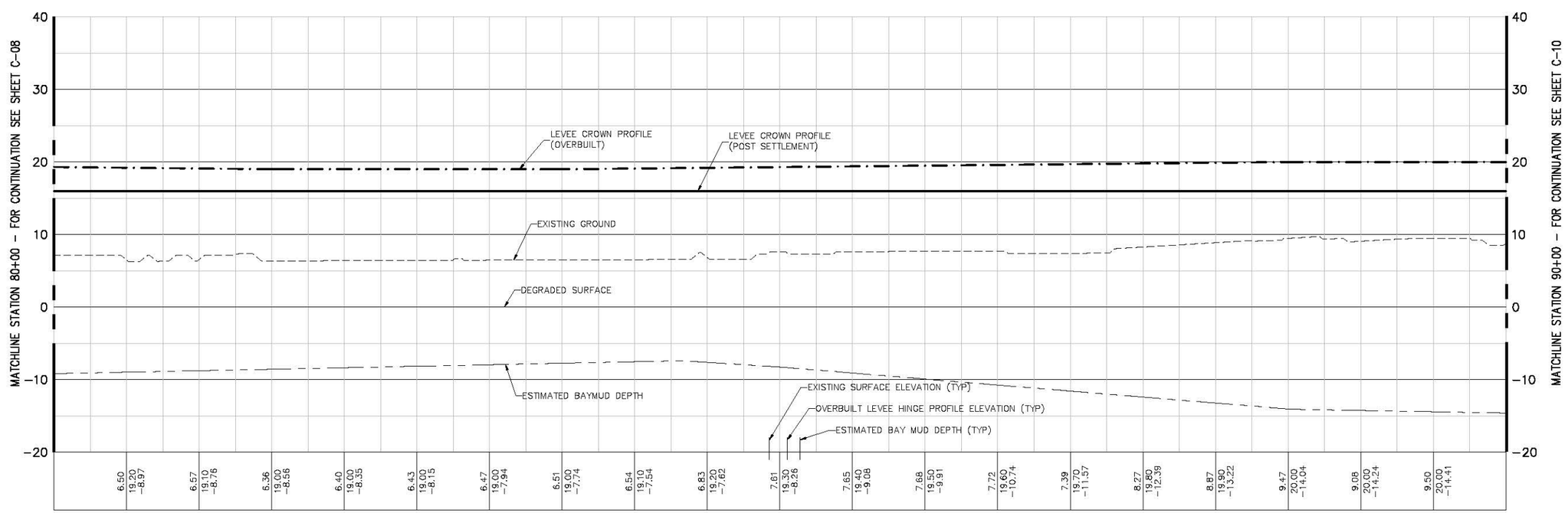
SCALE: 1"=40'



PROFILE

V: SCALE: 1"=5'

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. RUSSO
Reviewed by: XX
Submitted by: S. JIMENEZ
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File name: C-01
Plot scale:
Dwg scale:
Rev. XX

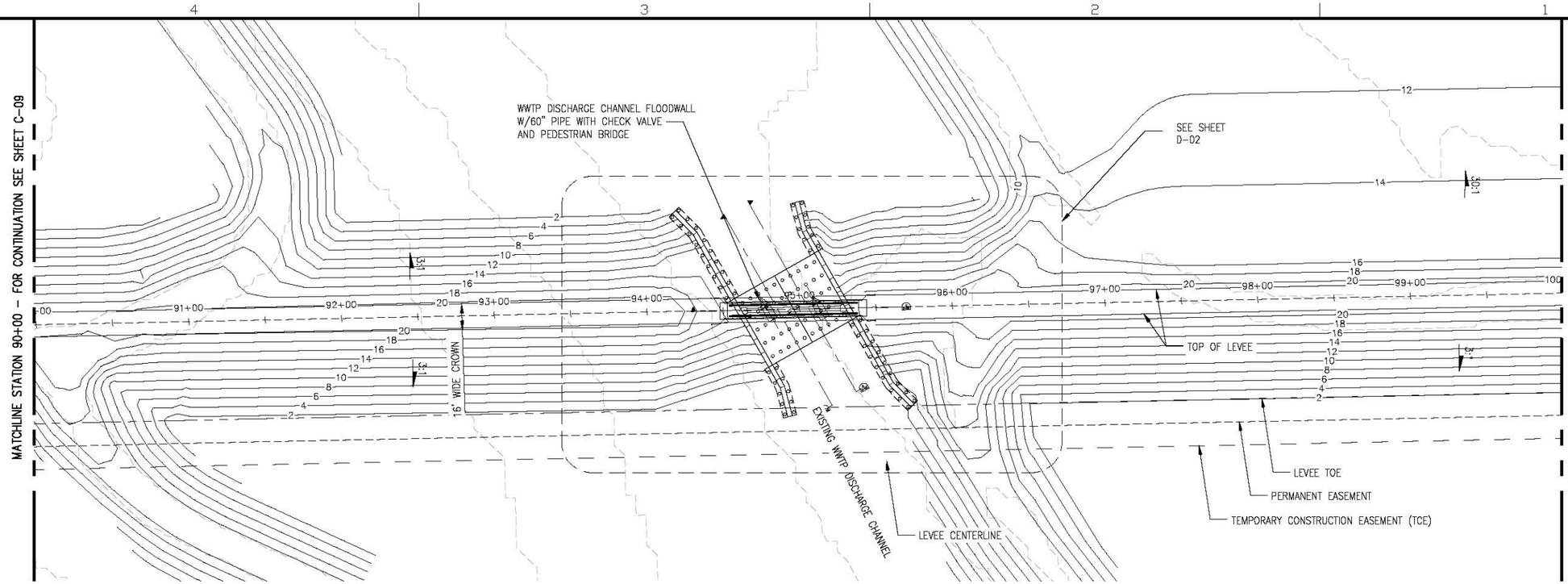
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95833-4210

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 80+00 TO STA 90+00

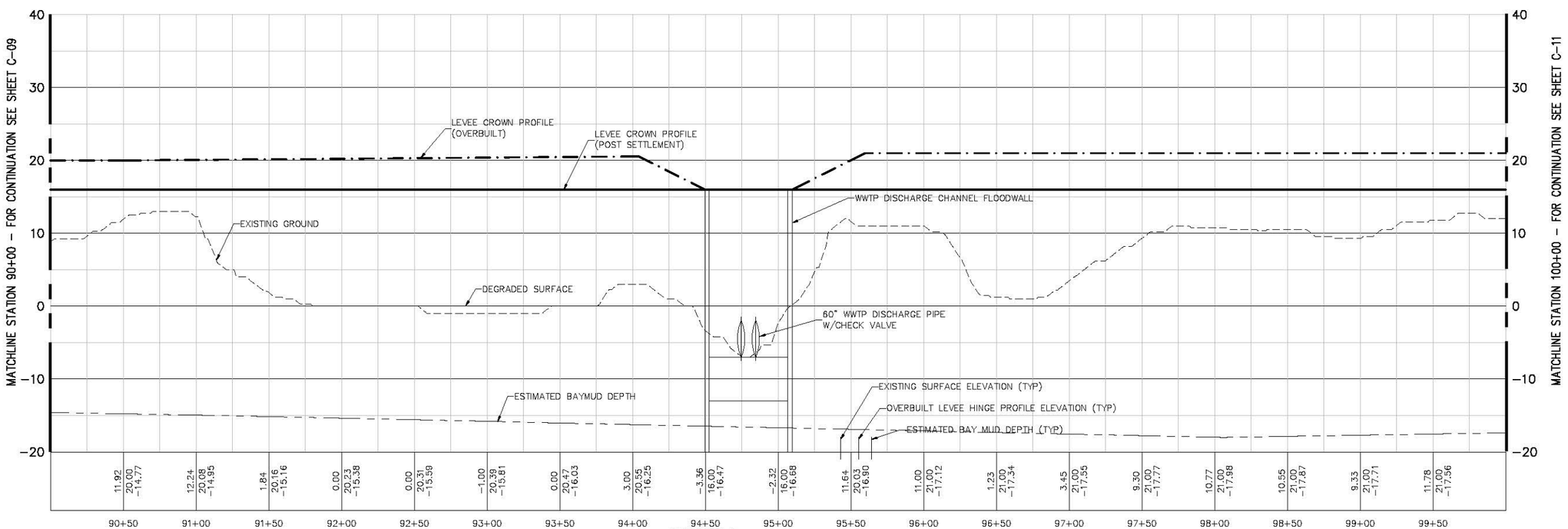
Sheet reference number:
C-09

UPDATE



PLAN

SCALE: 1"=40'



PROFILE

V: SCALE: 1"=5'

N

40' 20' 0 40'

H = 1"=40'

5' 2.5' 0 5'

V = 1"=5'

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. RUSSO
Spec No: XX
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
Design File no: XXX
Drawing Code:
File name: C-01
Plot scale:
Dwg scale:
Rev. XX

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

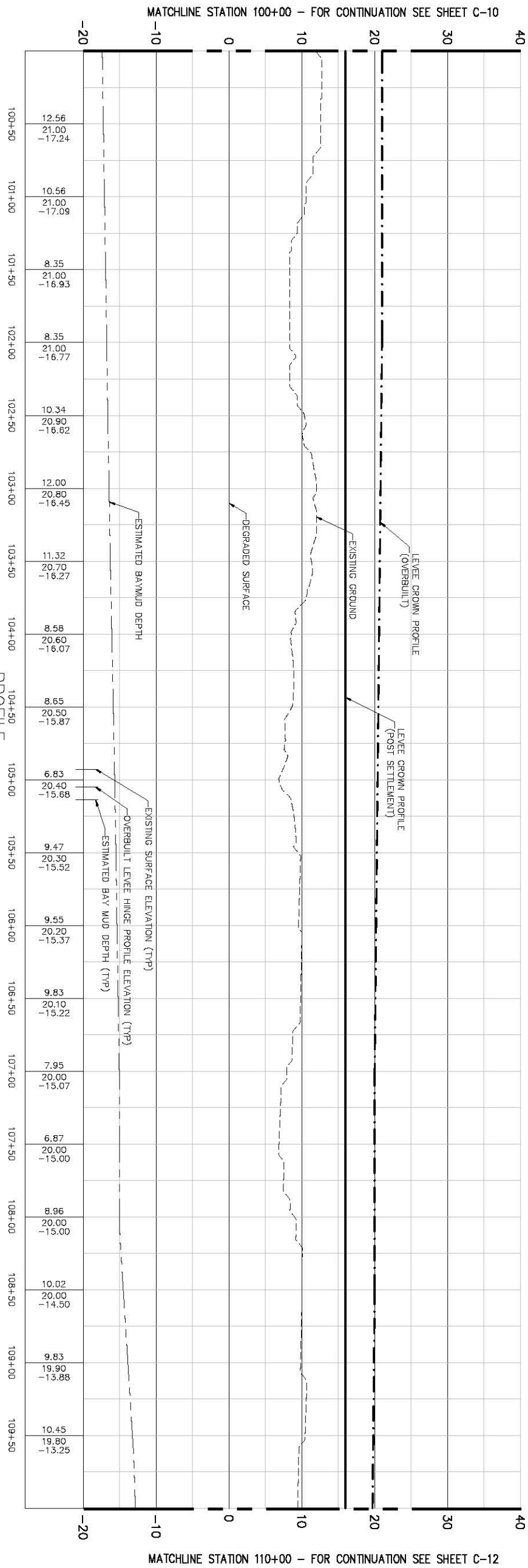
HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95833-4210

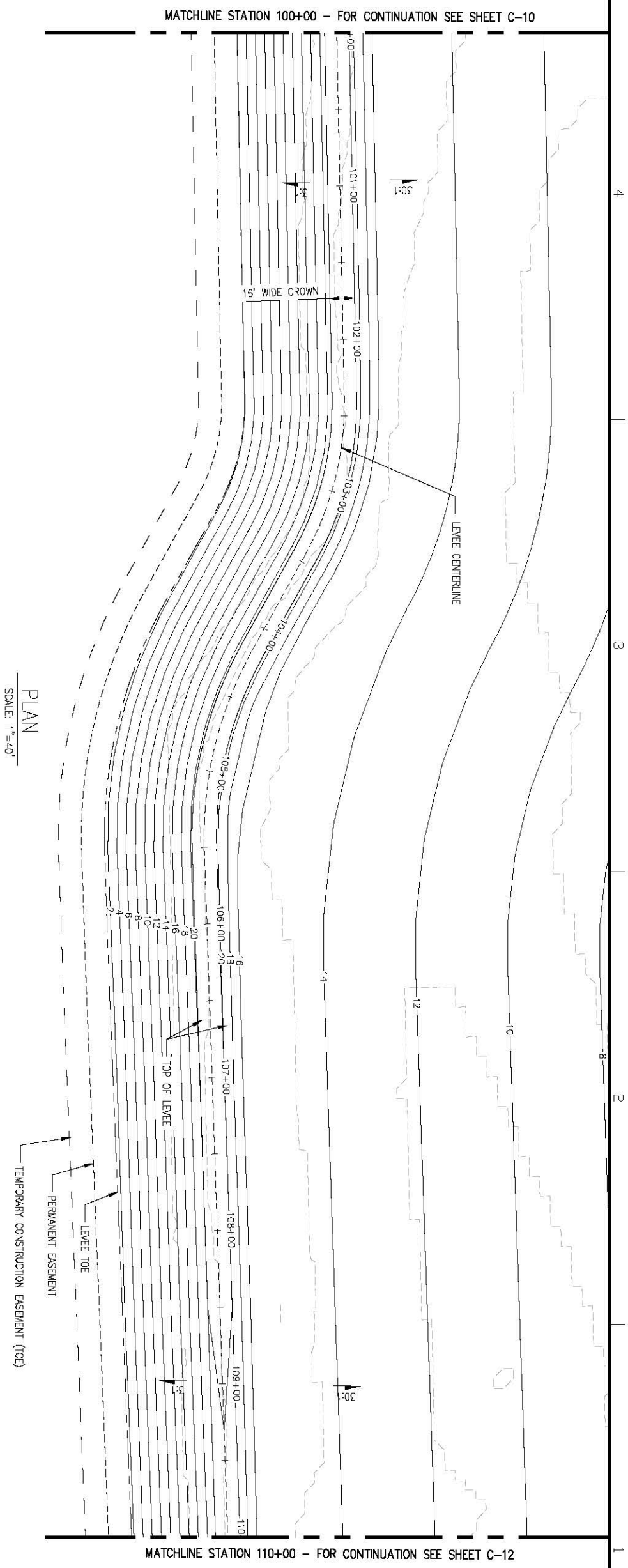
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 90+00 TO STA 100+00

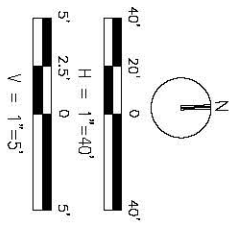
Sheet reference number:
C-10

UPDATE

Border Revised 08/30/04, COESHT02.DWG







Sheet reference number: C-11

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 100+00 TO STA 110+00

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

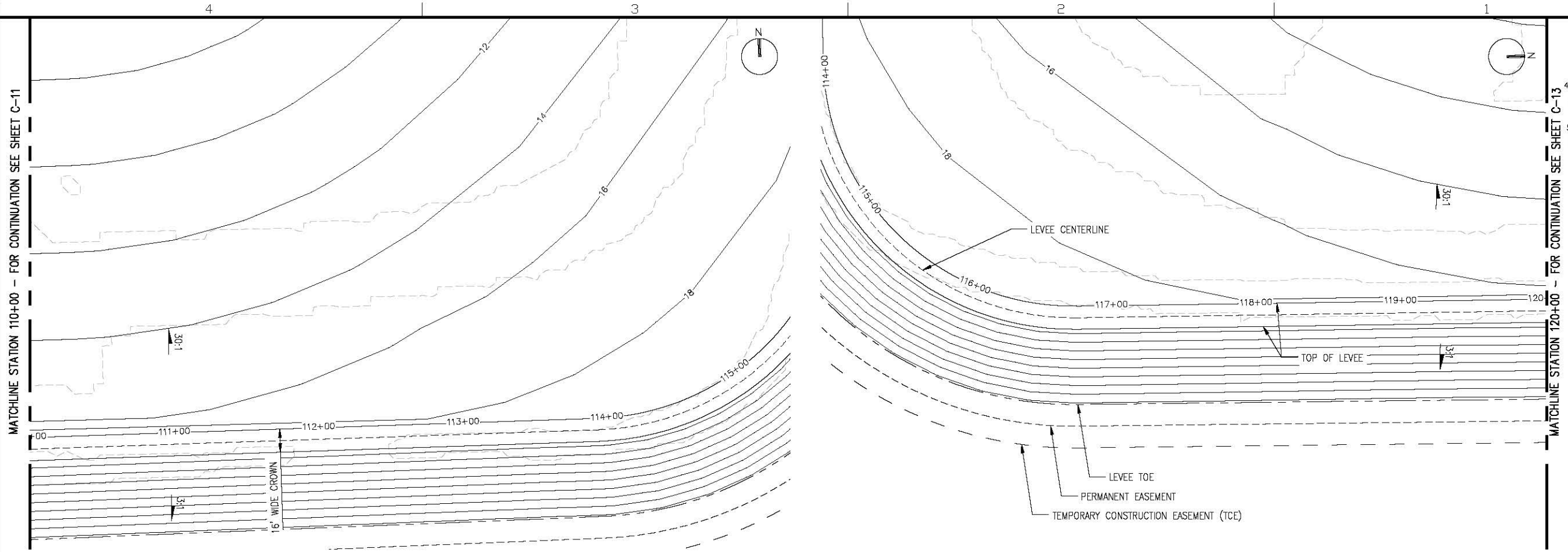
HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95899-4240

Designed by: S. JIMENEZ		Date: 06/24/2014	Rev. XX
Dwn by: V. RUSSO	Spec No: XX	Design file no: XXX	
Reviewed by: XX		Drawing Code:	
Submitted by: S. JIMENEZ		File name: C-01 Plot date: Dwg scale:	

Symbol	Description	Date	Approved

US Army Corps of Engineers San Francisco District

UPDATE

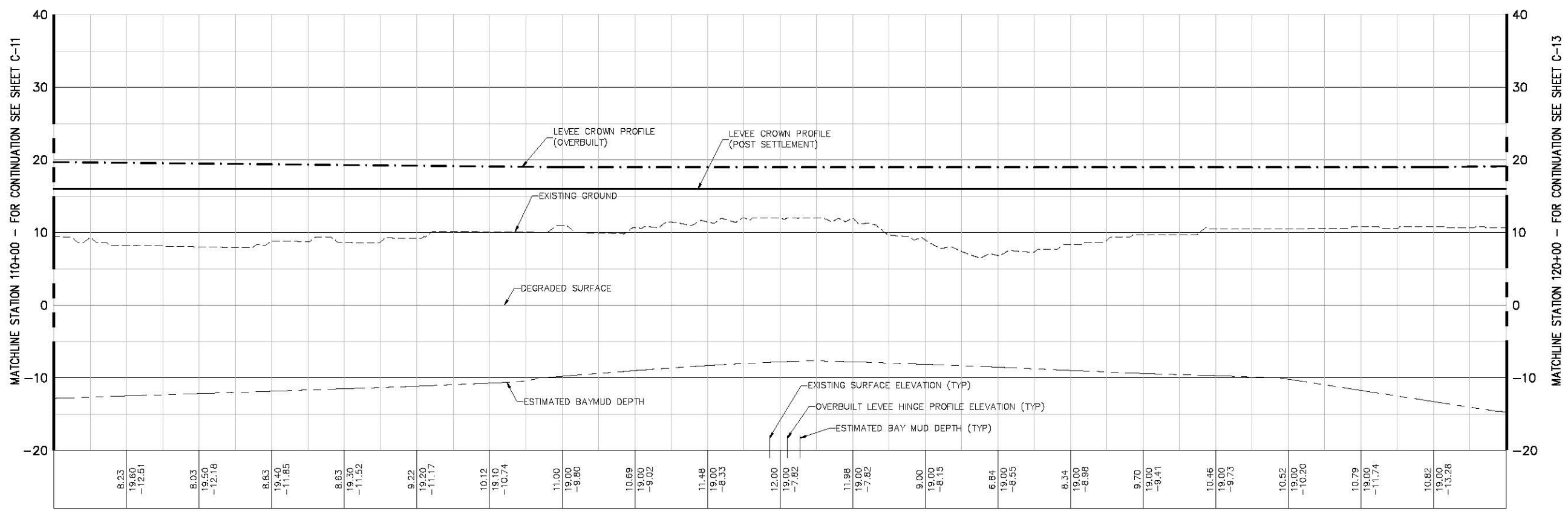


PLAN

SCALE: 1"=40'

H = 1"=40'

V = 1"=5'



PROFILE

V: SCALE: 1"=5'

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Date: 06/24/2014
Rev: XX
Dwn by: V. Russo
Spec No: XX
Design File no: XXX
Reviewed by: XX
Submitted by: S. JIMENEZ
Drawing Code:
File name: C-01
Plot scale:
Dwg size:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

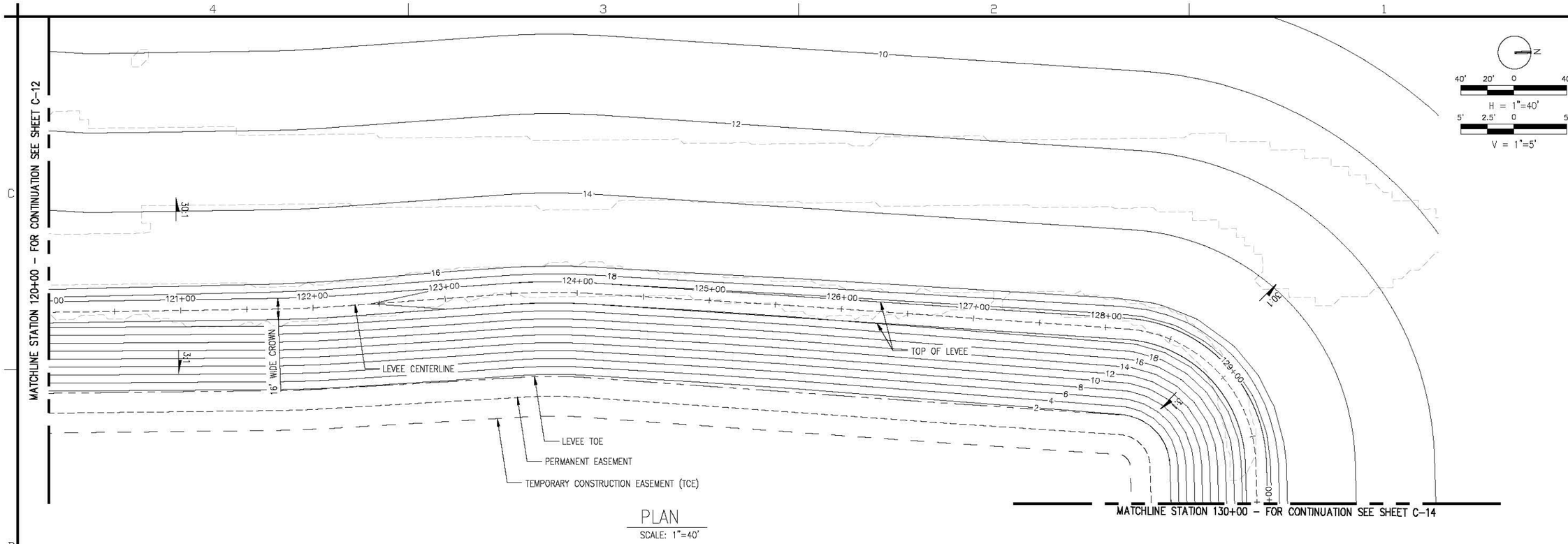
HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95833-4210

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 110+00 TO STA 120+00

Sheet reference number:
C-12

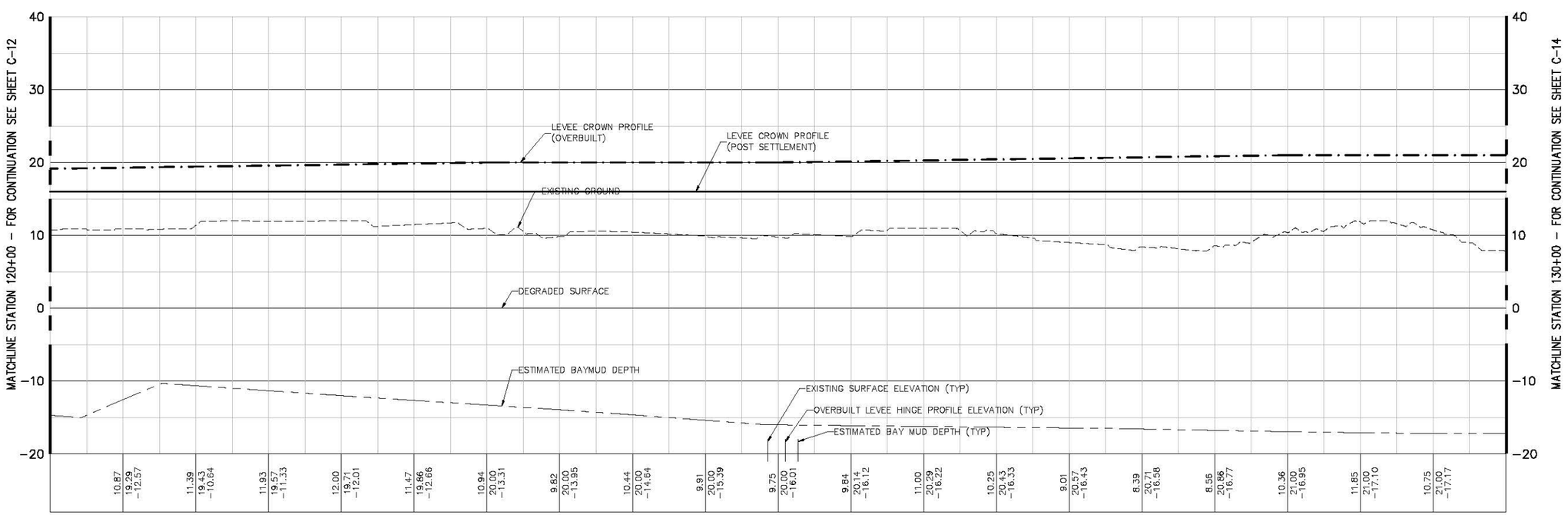
UPDATE

Server: Revised 08/20/14, 02:39:17 PM



PLAN

SCALE: 1"=40'



PROFILE

V: SCALE: 1"=5'

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. RUSSO
Spec No: XX
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
Design File no: XXX
Drawing Code:
File name: C-01
Plot date:
Dwg scale:
Rev: XX

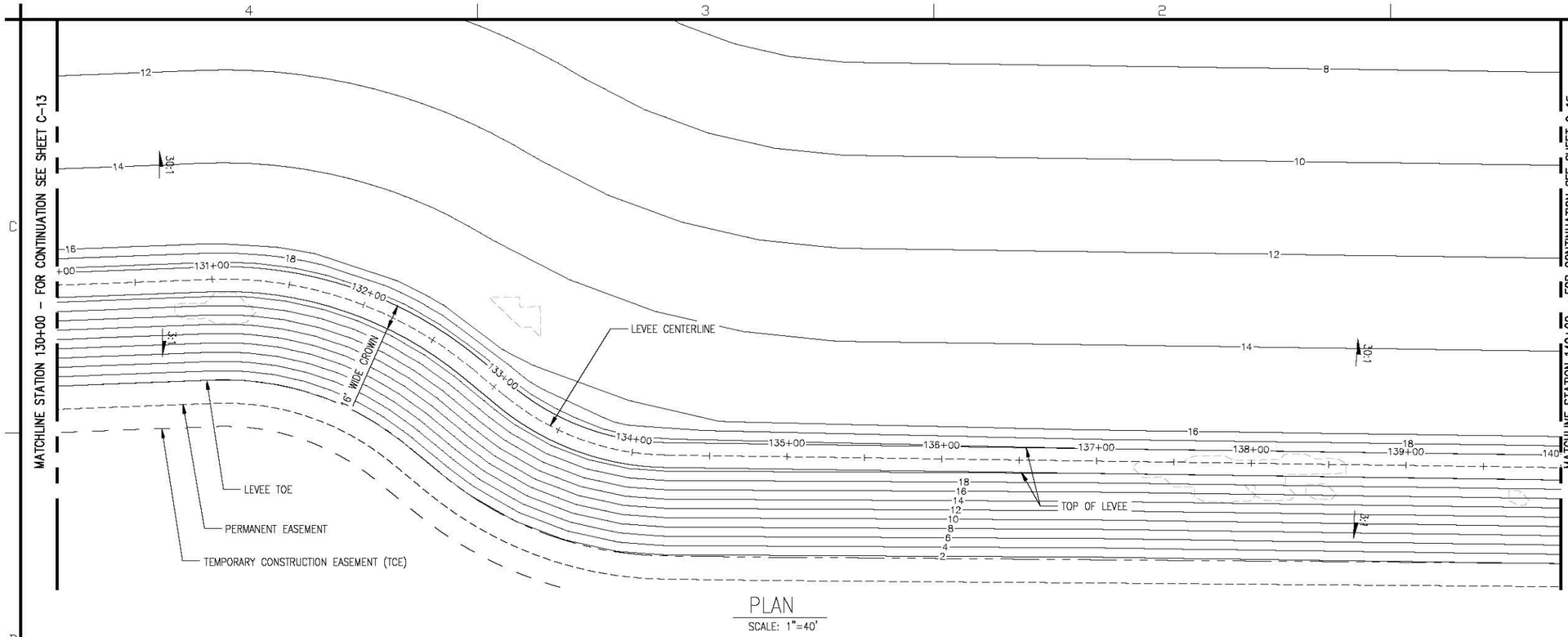
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95699-4240

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 120+00 TO STA 130+00

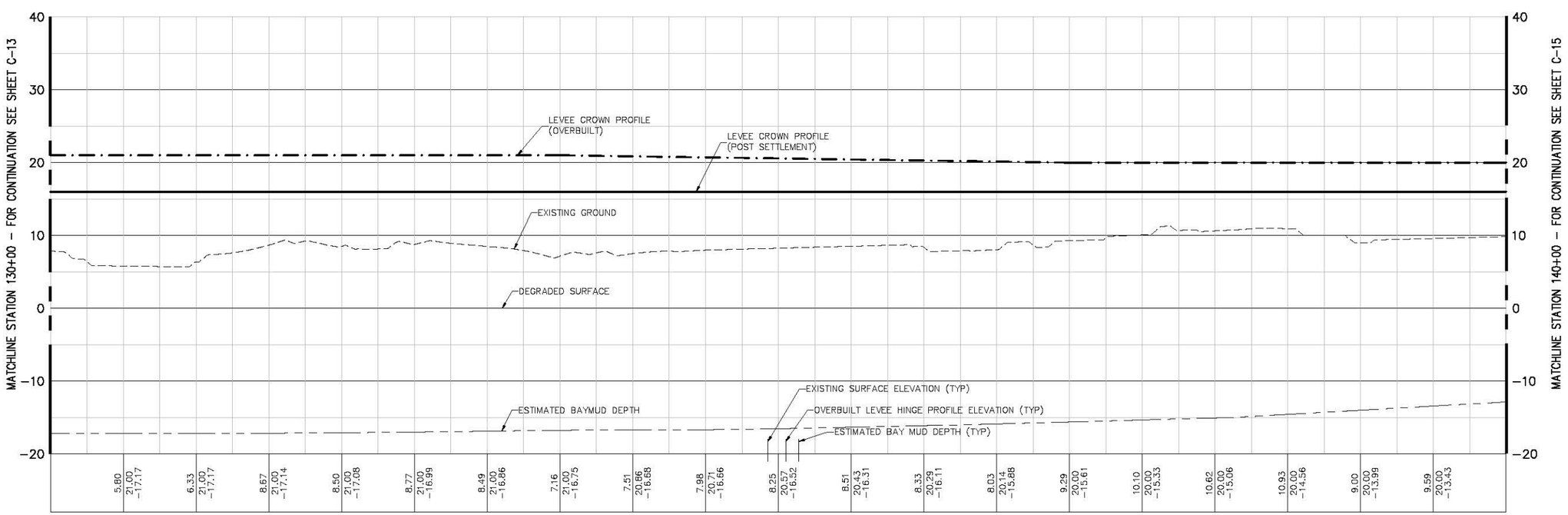
Sheet reference number: C-13

UPDATE



PLAN

SCALE: 1"=40'



PROFILE

V: SCALE: 1"=5'

N

40' 20' 0 40'

H = 1"=40'

5' 2.5' 0 5'

V = 1"=5'

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Date: 06/24/2014
Rev. XX
Dwn by: V. Russo
Spec No: XX
Design File no: XXX
Reviewed by: XX
Drawing Code:
Submitted by: S. JIMENEZ
File name: C-01
Plot date:
Dwg size:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

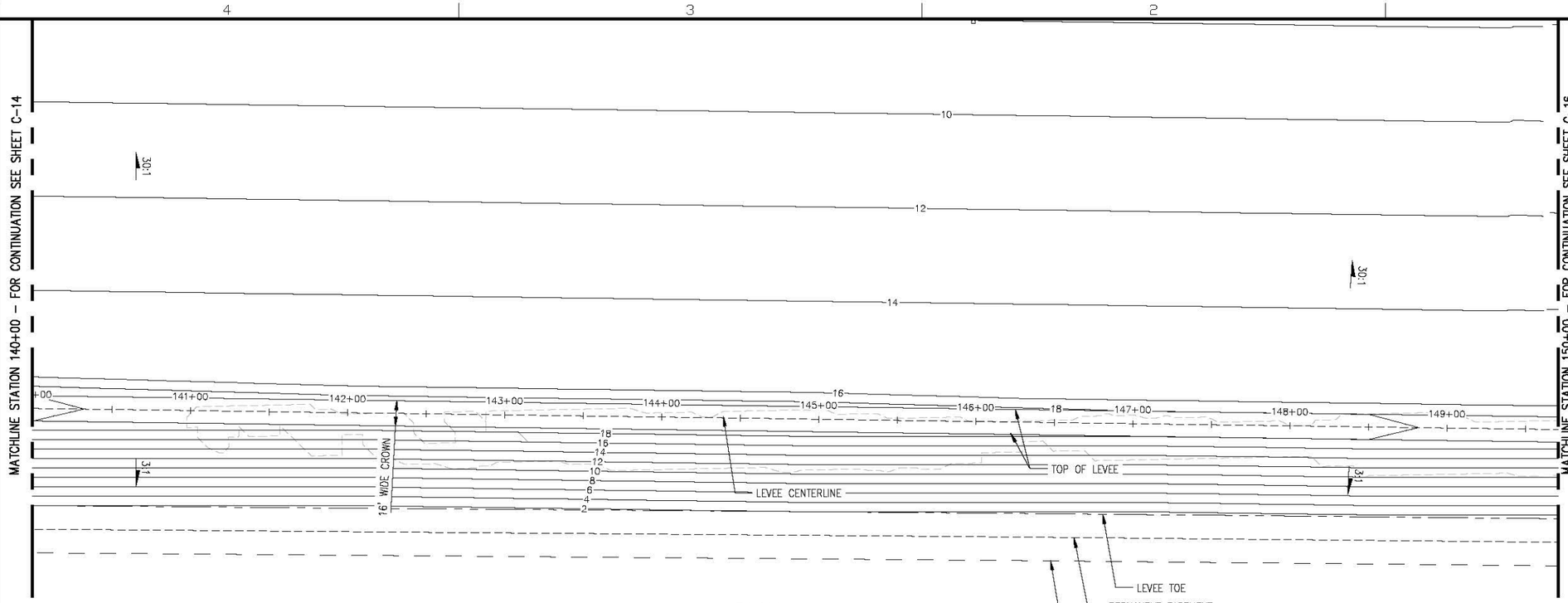
HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95833-4210

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 130+00 TO STA 140+00

Sheet reference number:
C-14

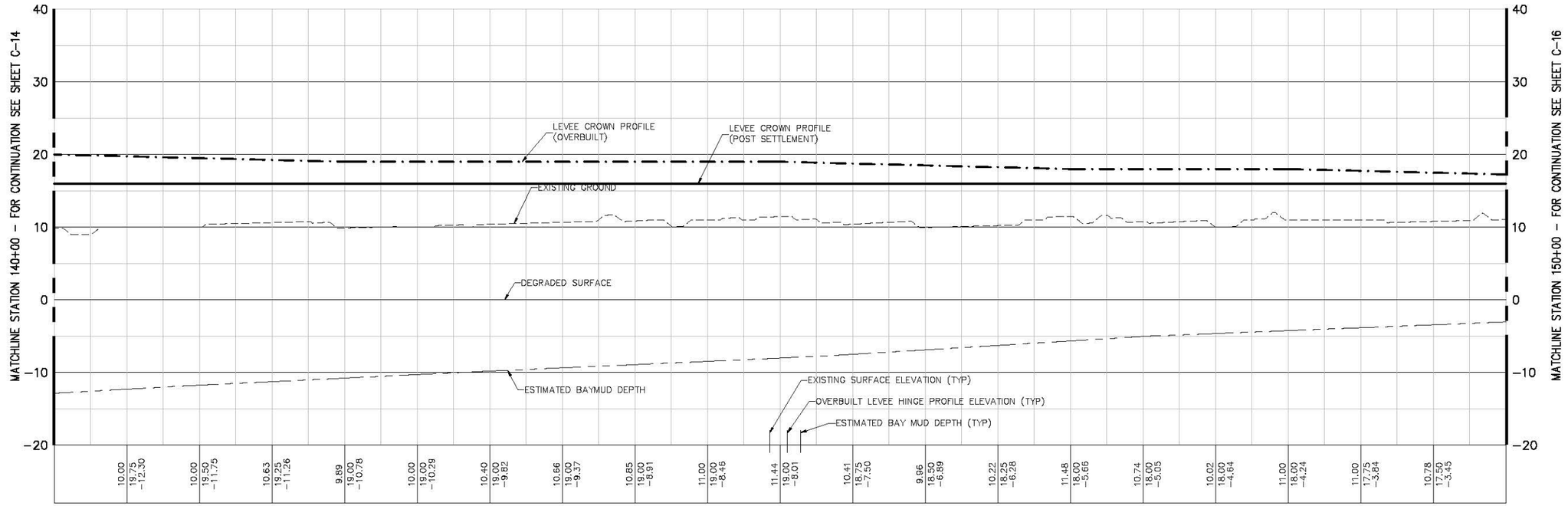
UPDATE

Server: Revised 03/20/14, 12:33:17 PM



PLAN

SCALE: 1"=40'



PROFILE

V: SCALE: 1"=5'

N

40' 20' 0 40'

H = 1"=40'

5' 2.5' 0 5'

V = 1"=5'

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. RASSU
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
Spec No: XX
Design File no: XXX
Drawing Code:
File name: C-01
Plot date:
Dwg status:
Rev.: XX

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

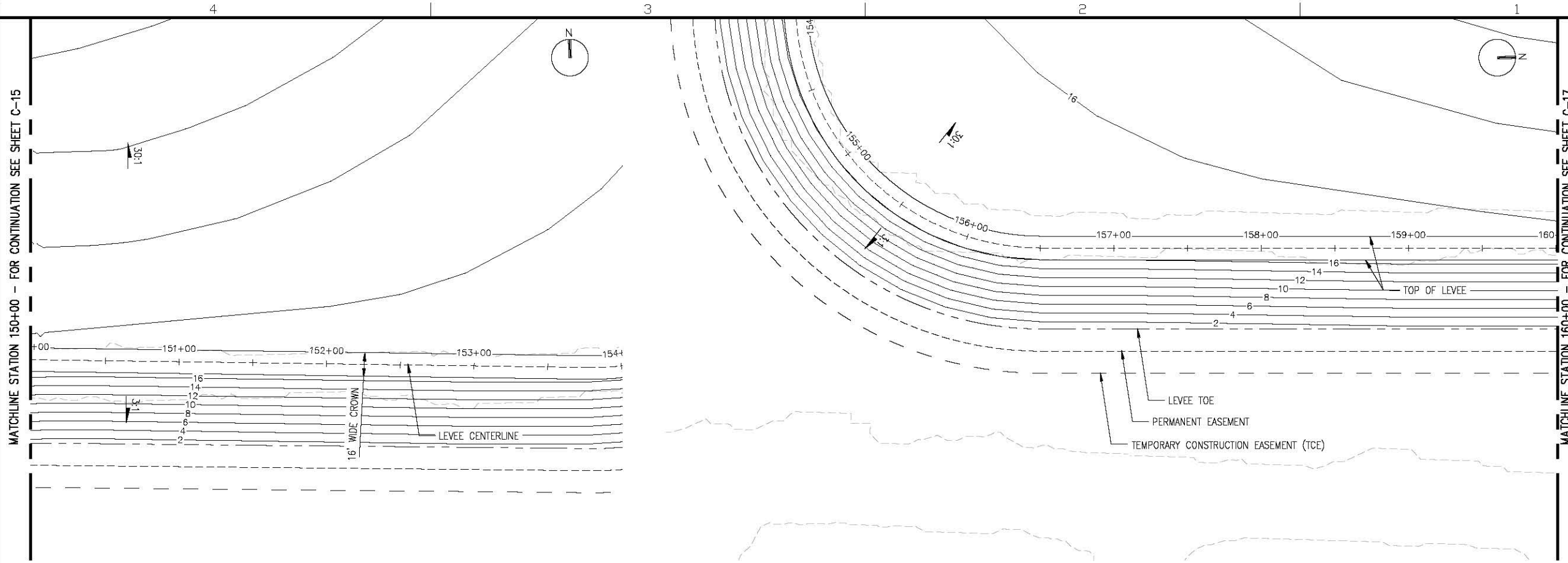
HDR
HDR Engineering, Inc. SACRAMENTO, CA 95899-4210
2379 GATEWAY OAKS
SUITE 200

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 140+00 TO STA 150+00

Sheet reference number:
C-15

UPDATE

Border Revised 08/30/04, DESIGTEAM

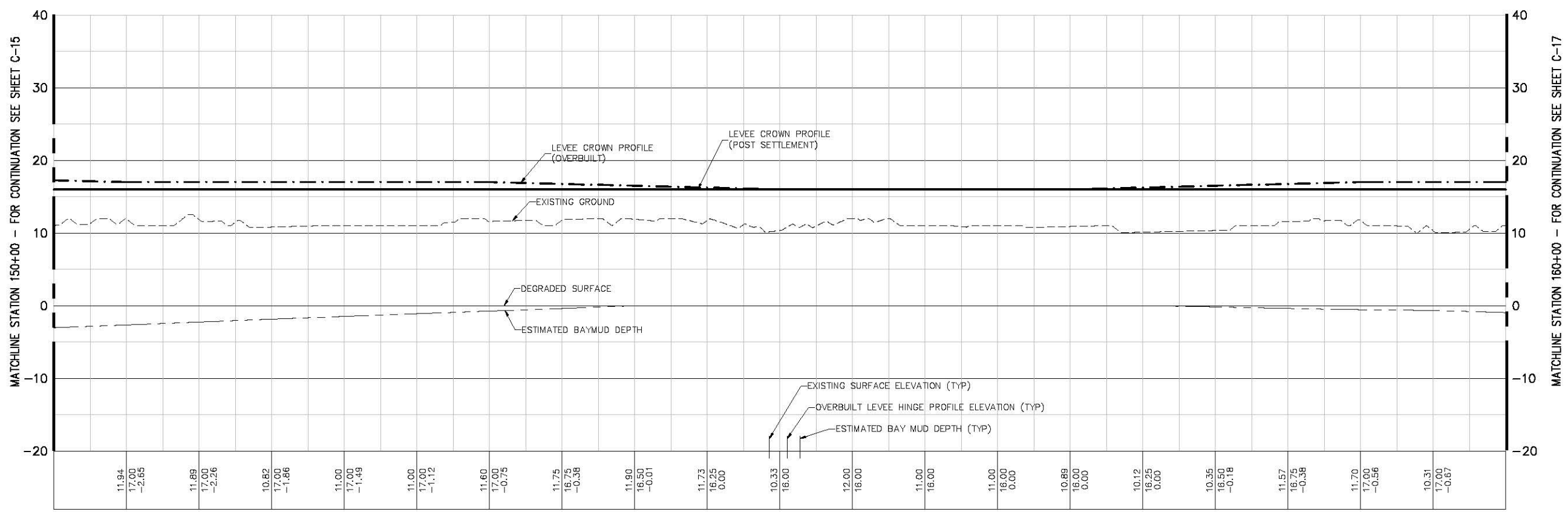


PLAN

SCALE: 1"=40'

H = 1"=40'

V = 1"=5'



PROFILE

V: SCALE: 1"=5'

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. Rosso
Spec No: XX
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
Design File no: XXX
Drawing Code:
File name: C-01
Plot scale:
Dwg scale:
Rev: XX

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

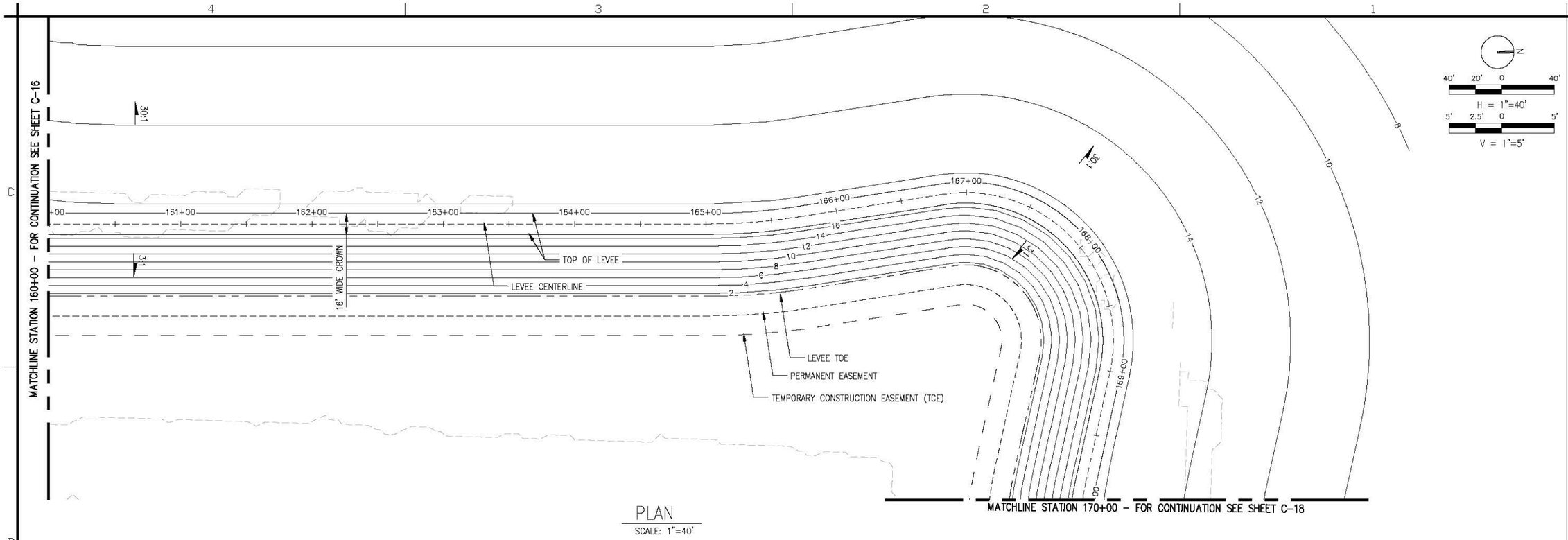
HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95833-4210

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 150+00 TO STA 160+00

Sheet reference number:
C-16

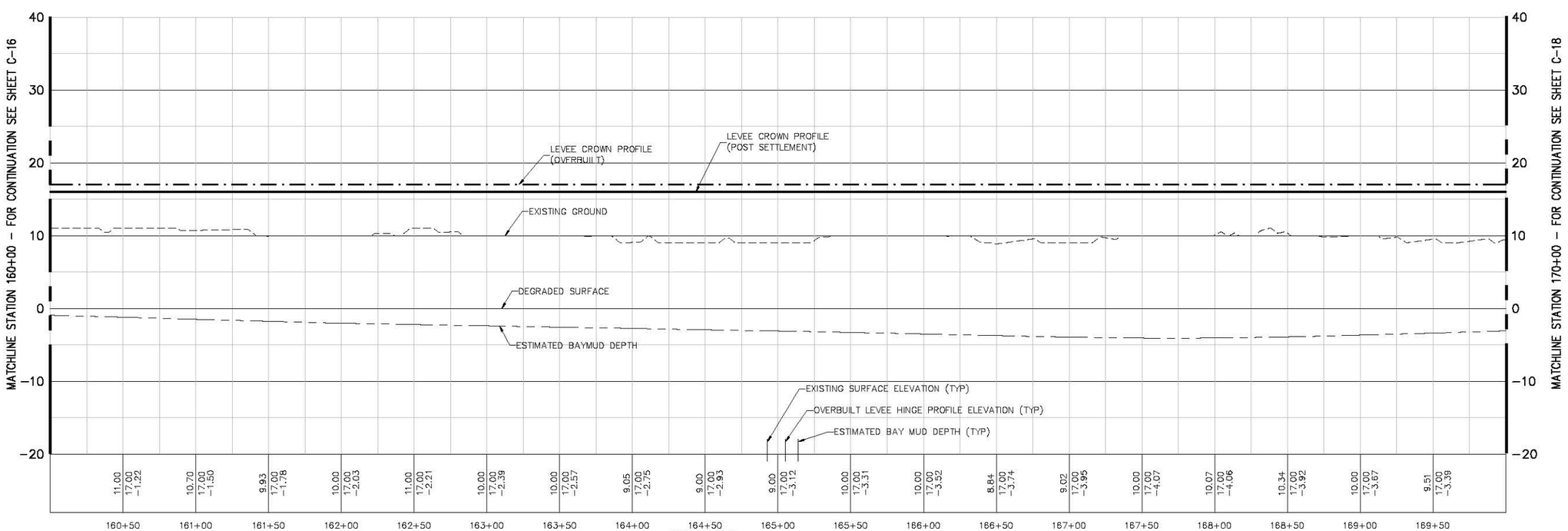
UPDATE

Server: Revised 08/20/14, 02:39:17 PM



PLAN

SCALE: 1"=40'



PROFILE

V: SCALE: 1"=5'

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. RUSSO
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
Spec No: XX
Design File no: XXX
Drawing Code:
File name: C-01
Plot date:
Dwg scale:
Rev: XX

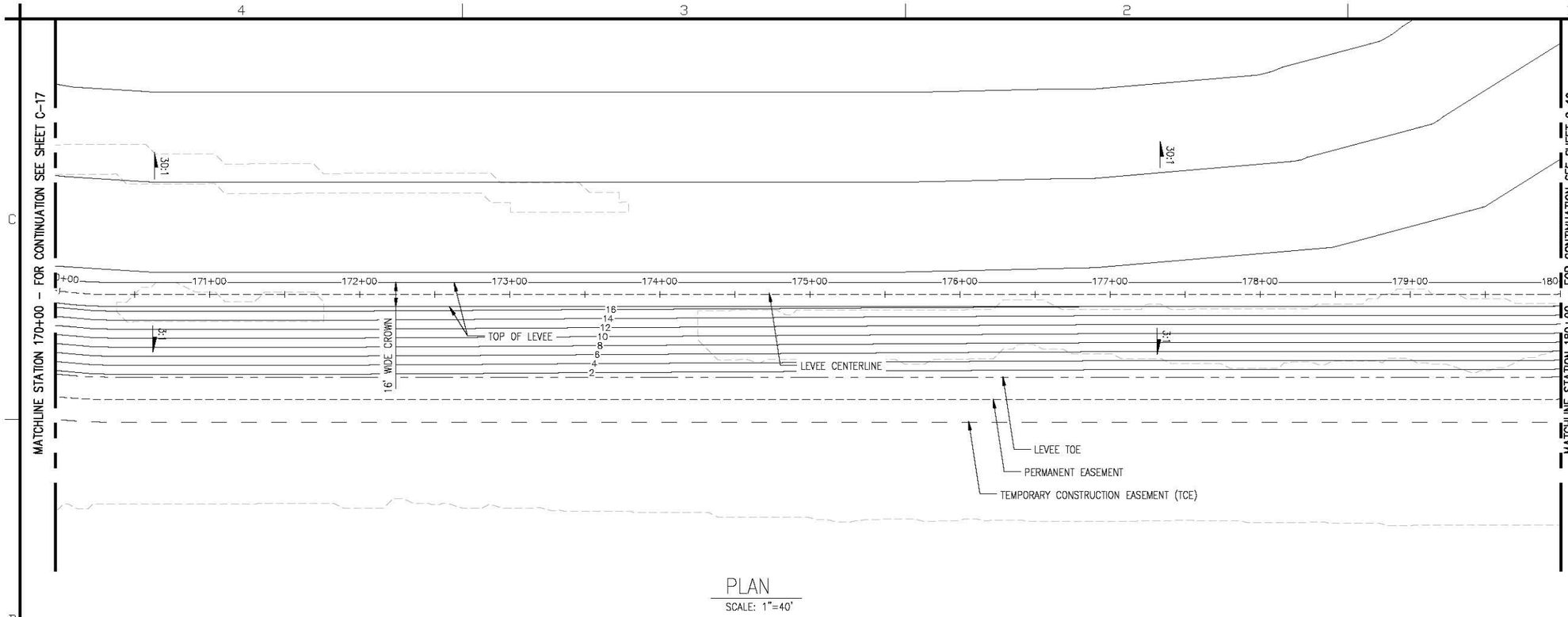
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95833-4210

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 160+00 TO STA 170+00

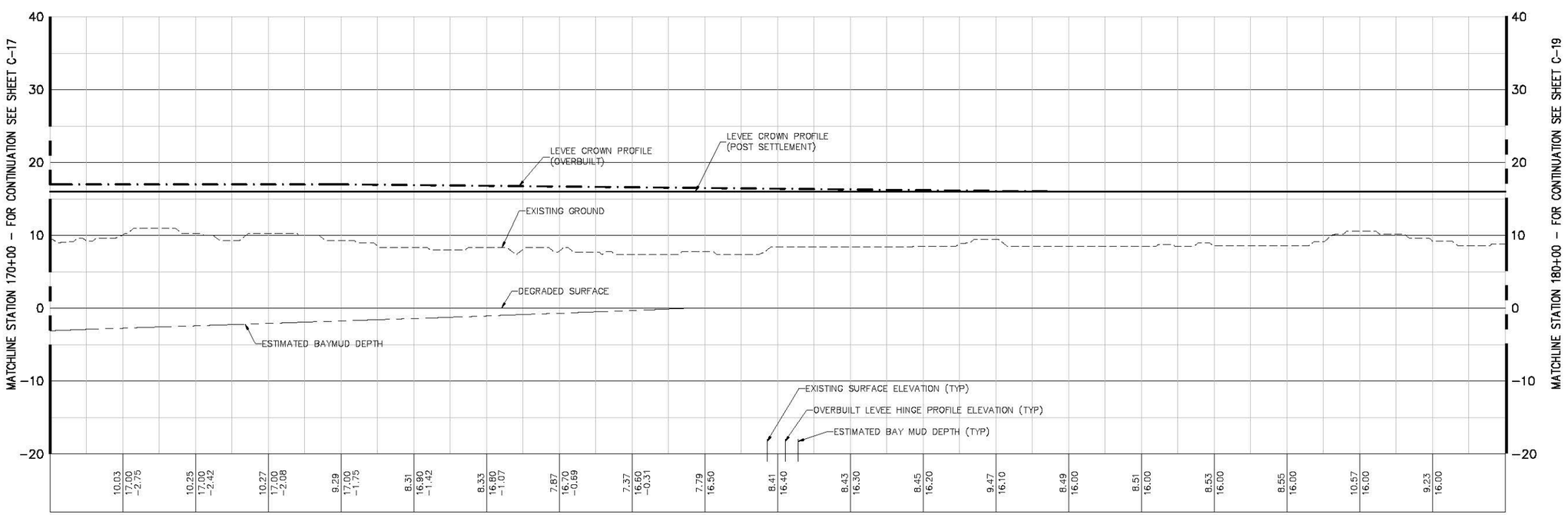
Sheet reference number: C-17

UPDATE



PLAN

SCALE: 1"=40'



PROFILE

V: SCALE: 1"=5'

N

40' 20' 0 40'

H = 1"=40'

5' 2.5' 0 5'

V = 1"=5'

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Date: 06/24/2014
Design File No: XXX
Drawing Code:
File name: C-01
Plot date:
Dwg scale:
Rev. XX

Designed by: S. JIMENEZ
Dwn by: V. RUSSO
Spec No: XX
Reviewed by: XX
Submitted by: S. JIMENEZ

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

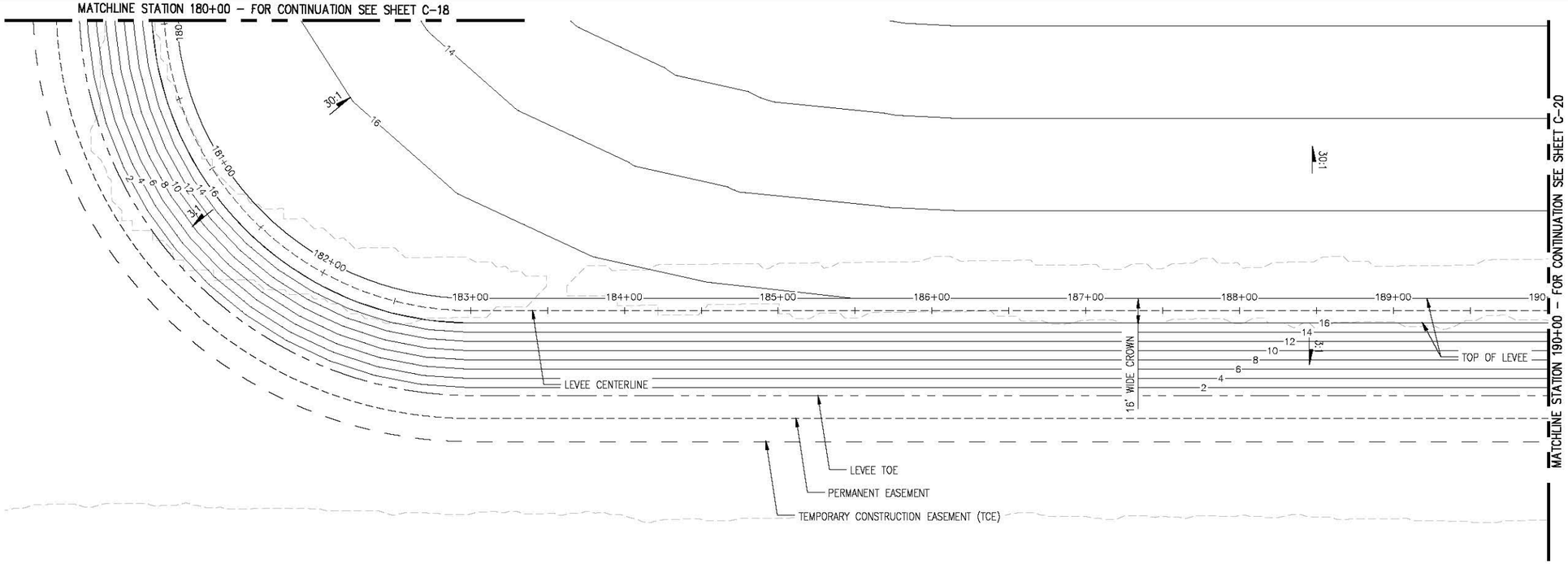
HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95833-4210

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 170+00 TO STA 180+00

Sheet reference number:
C-18

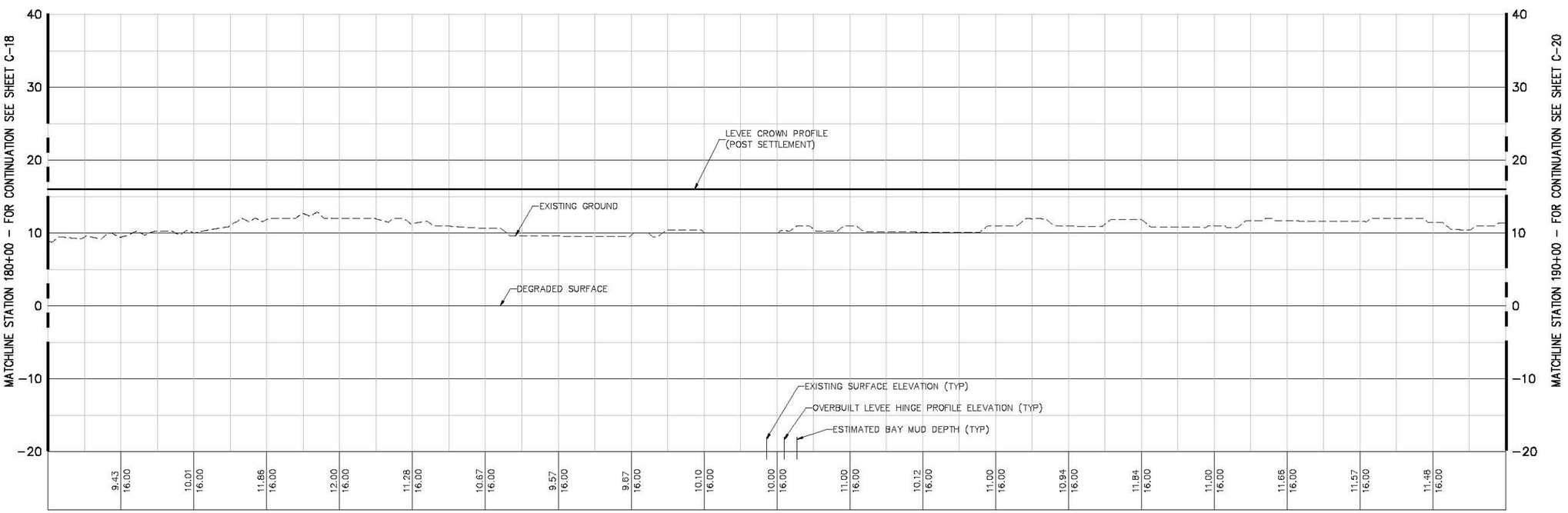
UPDATE

Border: Revised 03/26/14, CEOSPTSEWD



PLAN

SCALE: 1"=40'



PROFILE

V: SCALE: 1"=5'

H = 1"=40'

V = 1"=5'

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. RUSSO
Spec No: XX
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
Design File no: XXX
Drawing Code:
File name: C-01
Plot date:
Dwg scale:
Rev: XX

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

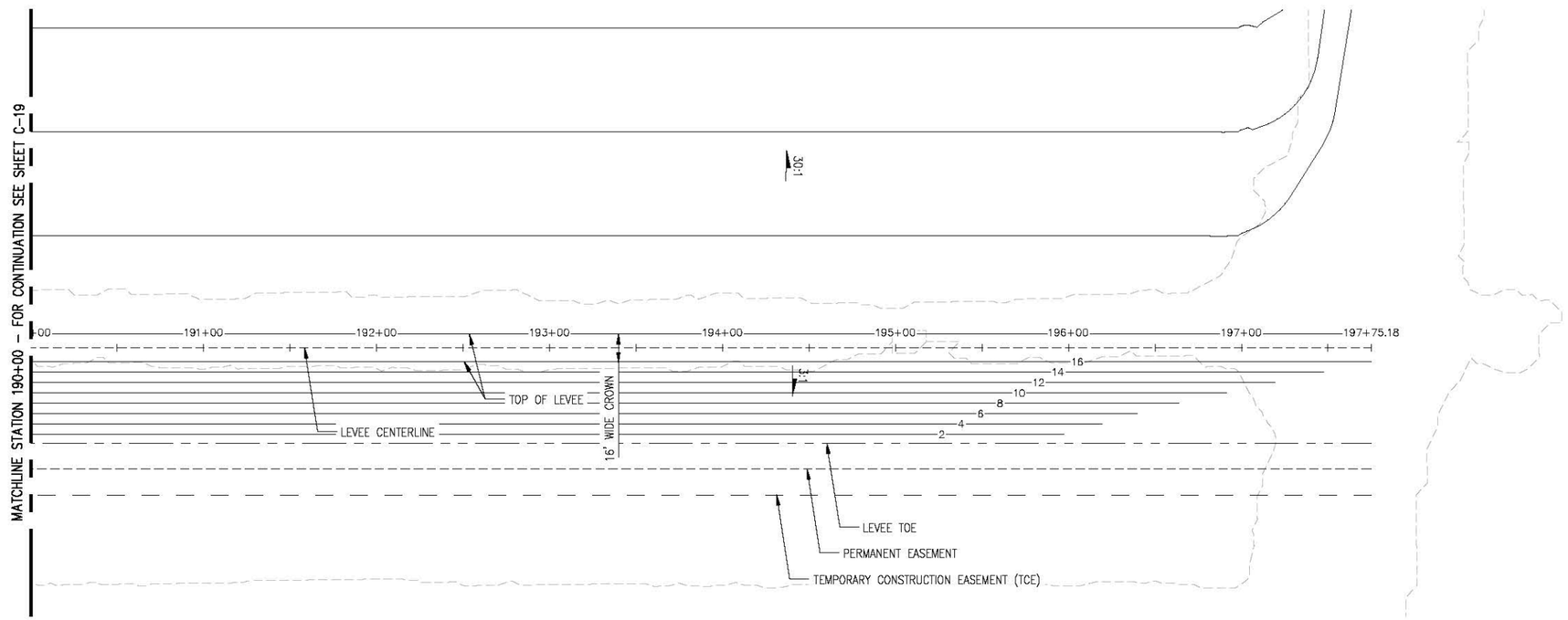
HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95833-4210

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 180+00 TO STA 190+00

Sheet reference number: C-19

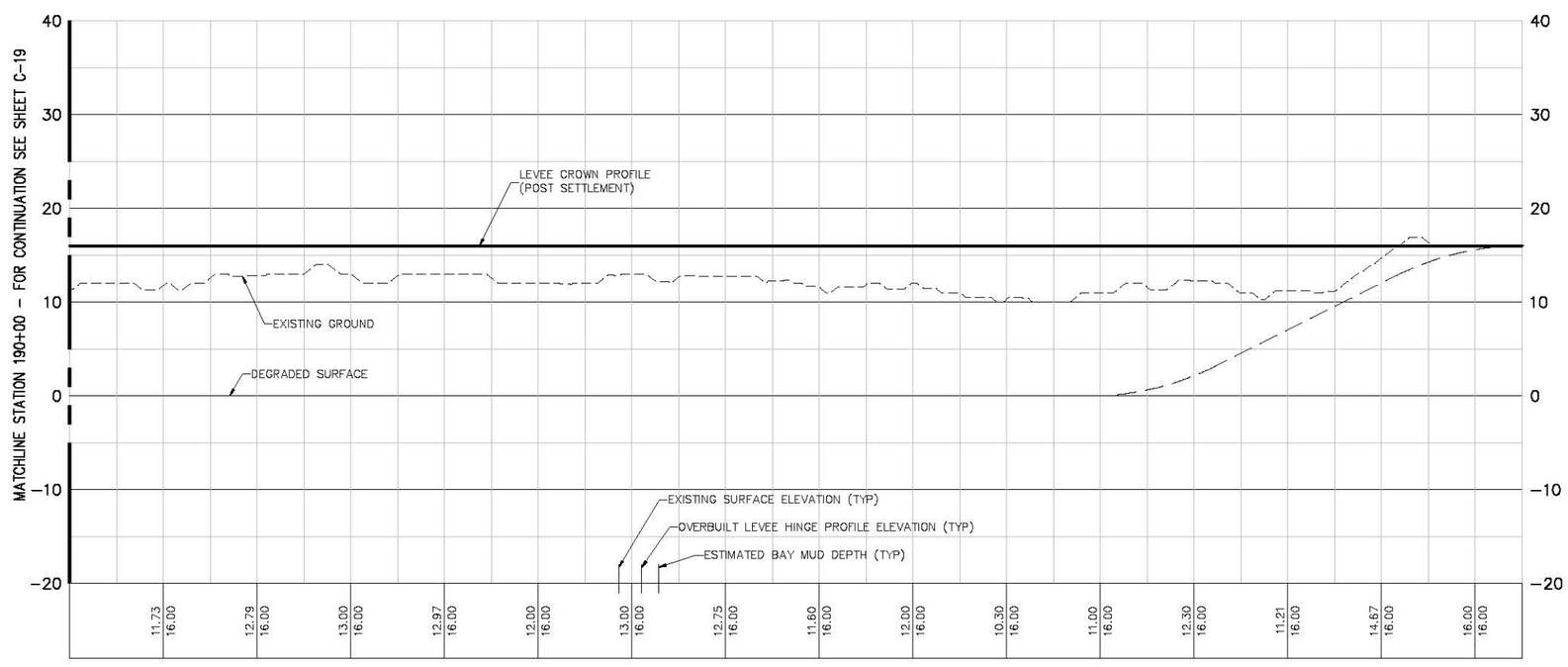
UPDATE

Server: Revised 08/20/14, 08:39:12 PM



PLAN

SCALE: 1"=40'



PROFILE

V: SCALE: 1"=5'

N

40' 20' 0 40'

H = 1"=40'

5' 2.5' 0 5'

V = 1"=5'

US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. RUSSO
Spec No: XX
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
Design File no: XXX
Drawing Code:
File name: C-01
Plot date:
Dwg scale:
Rev: XX

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

HDR Engineering, Inc. 2379 GATEWAY OAKS SUITE 200 SACRAMENTO, CA 95833-4210

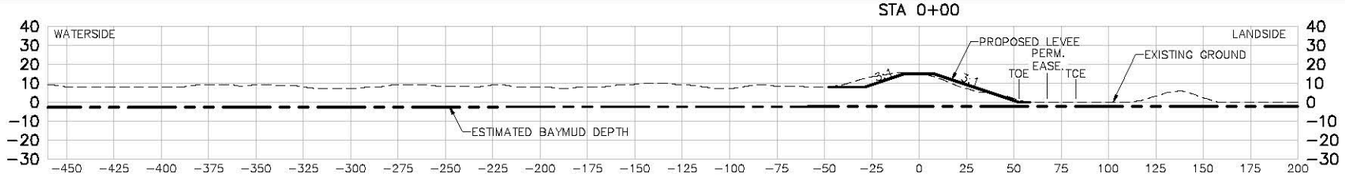
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
PLAN AND PROFILE STA 190+00 TO STA 197+75

Sheet reference number:
C-20

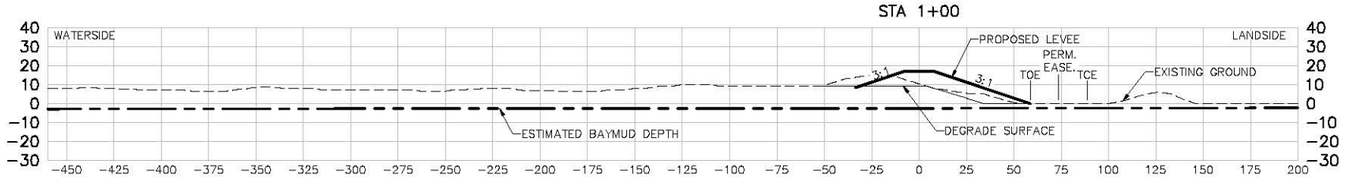
UPDATE

Server: Revised 06/20/14, 12:33:17 PM

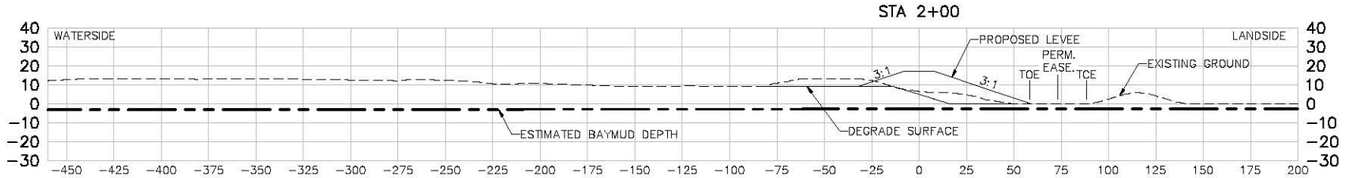
STA 0+00



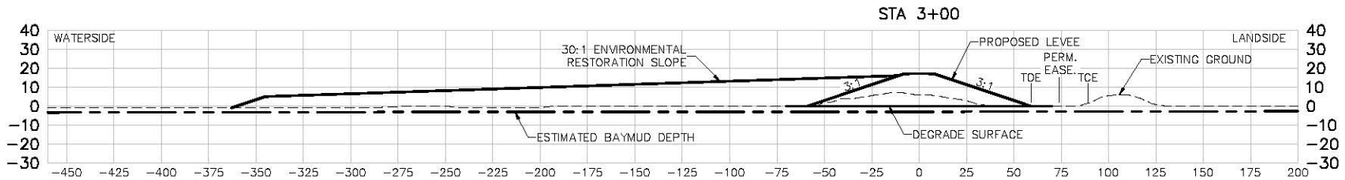
STA 1+00



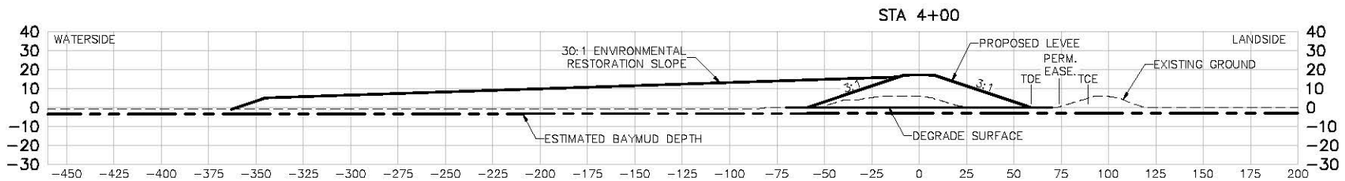
STA 2+00



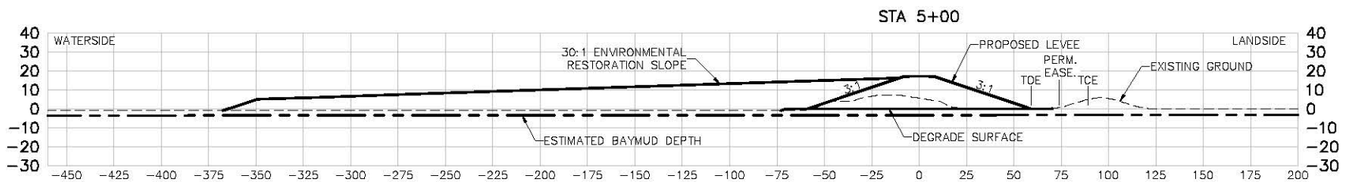
STA 3+00



STA 4+00



STA 5+00



US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Dwn by: V. RUSSO
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
Spec No: XX
Design File No: XXX
Drawing Code:
File name: C-21 Sections
Plot scale:
Dwg size:
Rev. XX

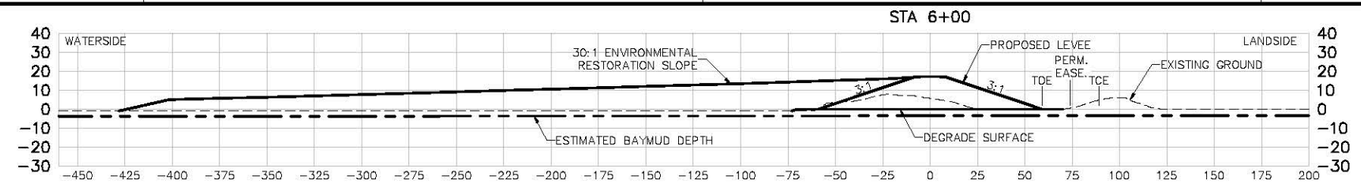
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

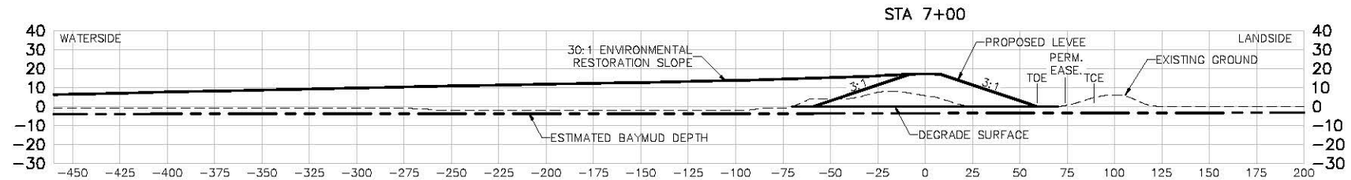
HDR
HDR Engineering, Inc.
2379 GATEWAY OAKS
SUITE 200
SACRAMENTO, CA 95833-4210

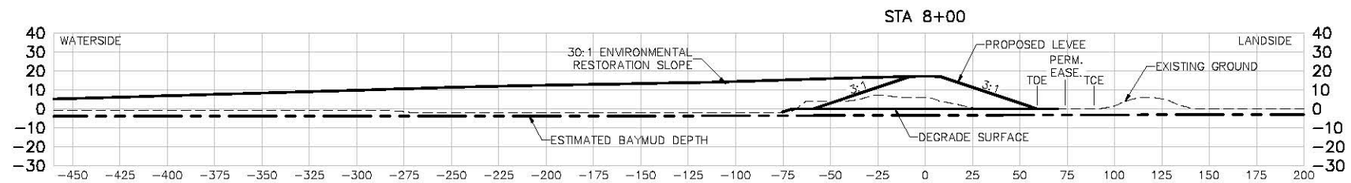
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 0+00 TO STA 5+00

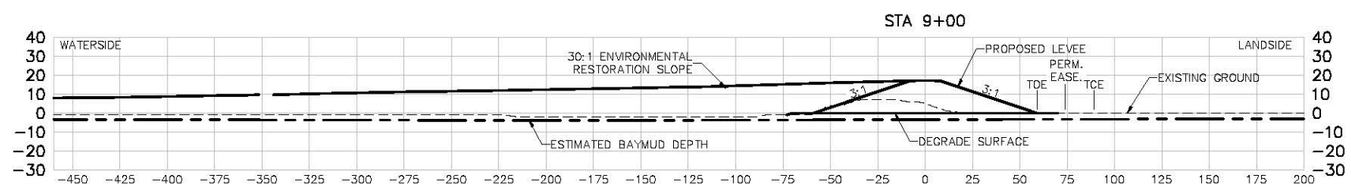
Sheet reference number:
C-21

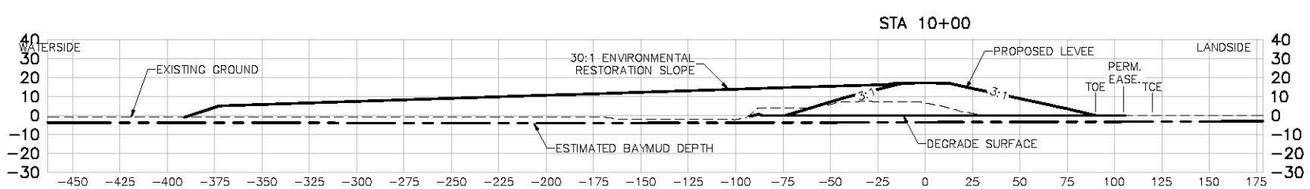
UPDATE

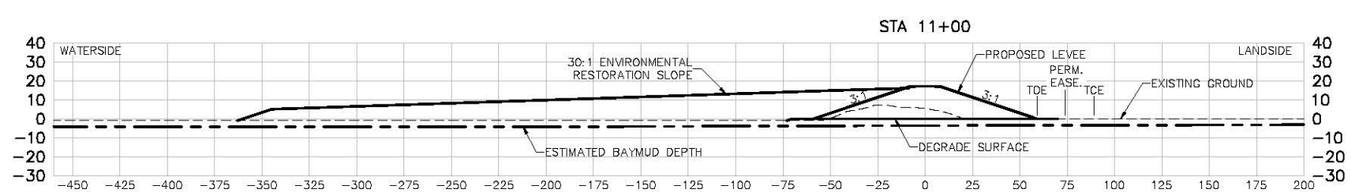












US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Date: 06/24/2014
Rev. XX
Designed by: S. JIMENEZ
Spec No: XX
Design File No: XXX
Dwn by: V. RUSSO
Drawing Code:
Reviewed by: XX
Submitted by: S. JIMENEZ
File name: C-21 Sections
Plot scale:
Dwg scale:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

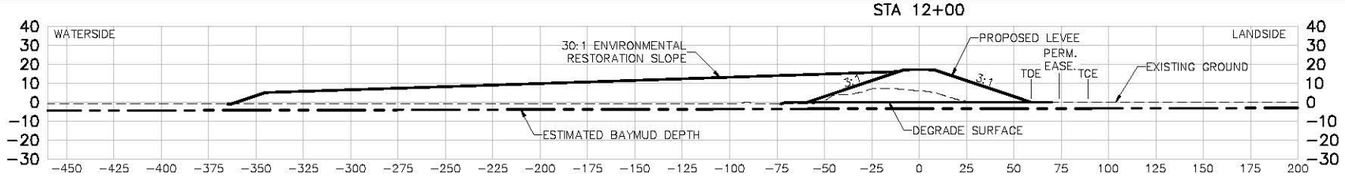
HDR
HDR Engineering, Inc.
2379 GATEWAY OAKS
SUITE 200
SACRAMENTO, CA 95833-4210

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 6+00 TO STA 11+00

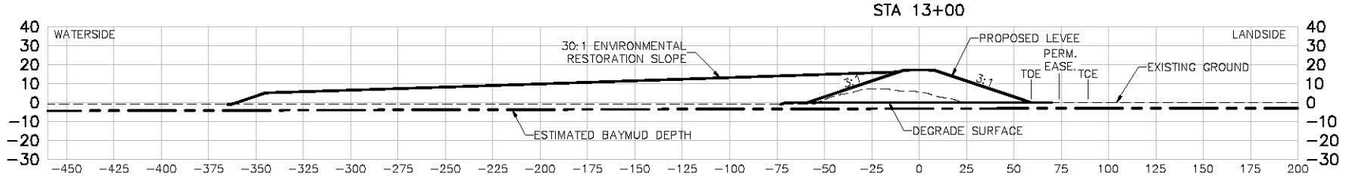
Sheet reference number:
C-22

UPDATE

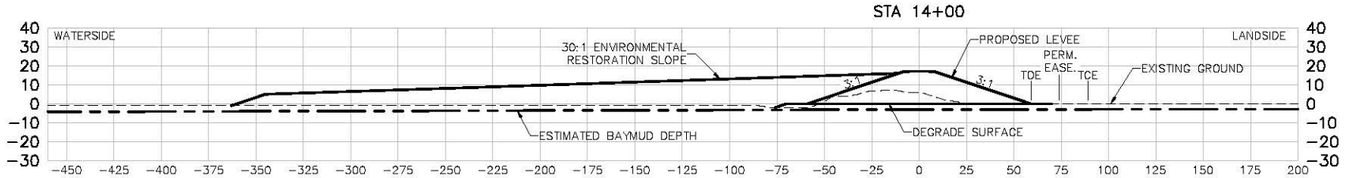
STA 12+00



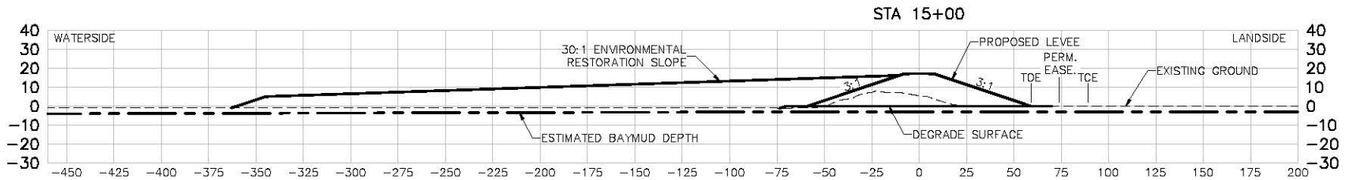
STA 13+00



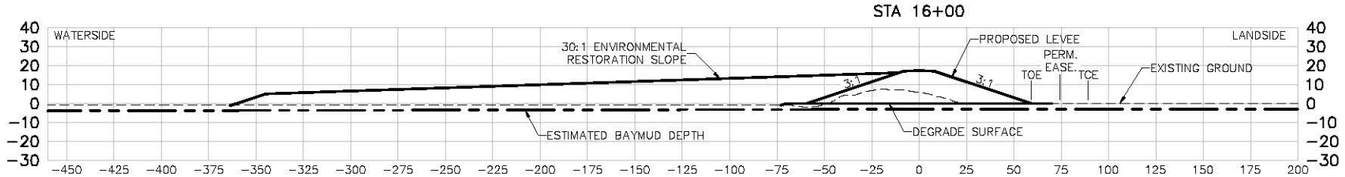
STA 14+00



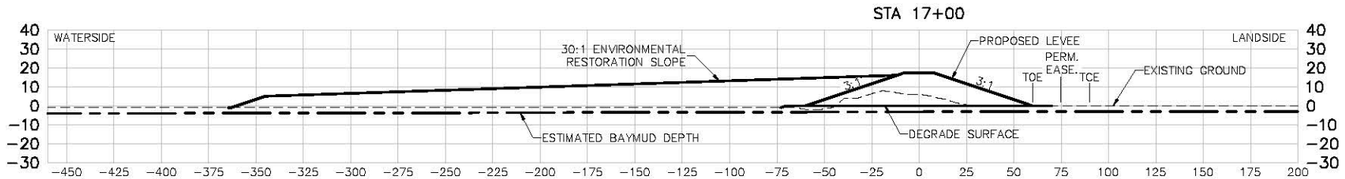
STA 15+00



STA 16+00



STA 17+00



US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Date: 06/24/2014
Rev. XX
Designed by: S. JIMENEZ
Spec No: XX
Design File No: XXX
Dwn by: V. RUSSO
Drawing Code:
Reviewed by: XX
Submitted by: S. JIMENEZ
File name: C-21 Sections
Plot scale:
Dwg scale:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

HDR
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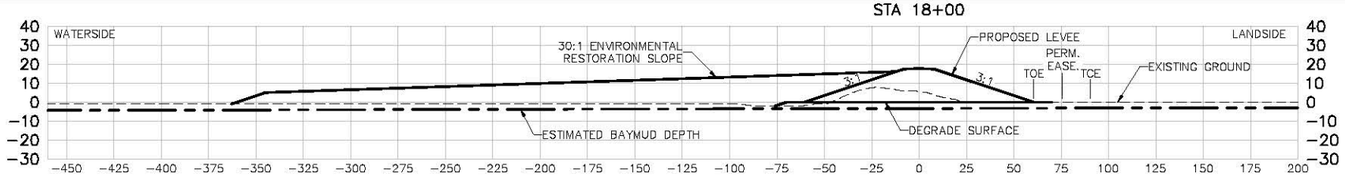
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 12+00 TO STA 17+00

Sheet reference number:
C-23

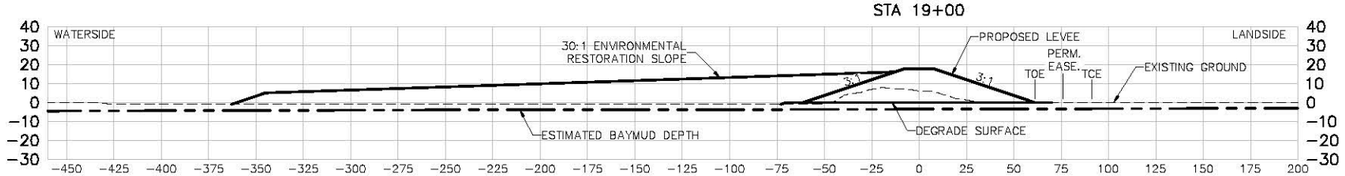
UPDATE

Border Revised 08/30/04, DESCRIPTION

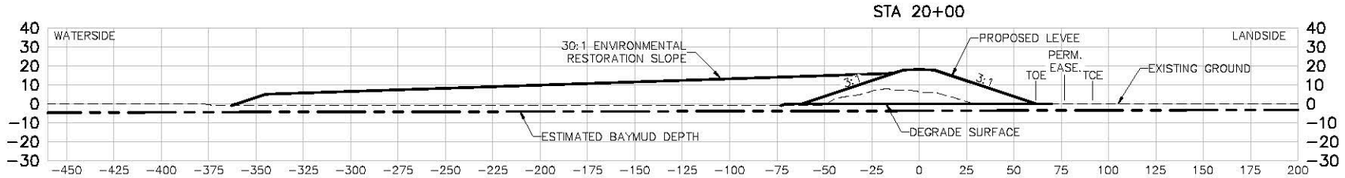
STA 18+00



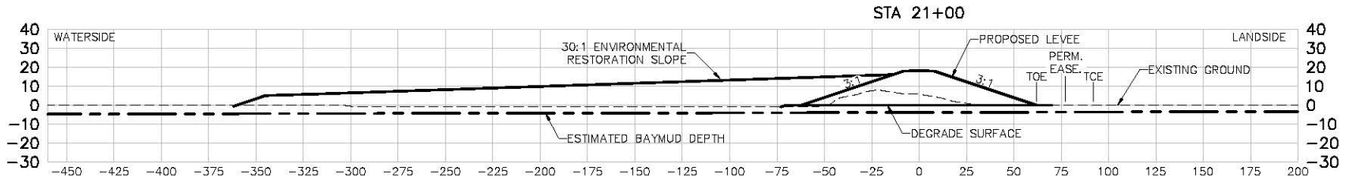
STA 19+00



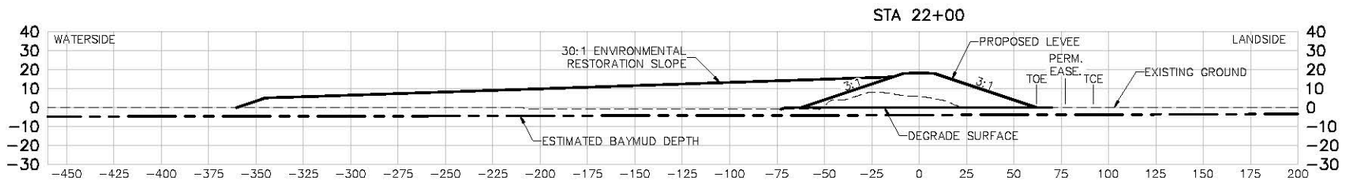
STA 20+00



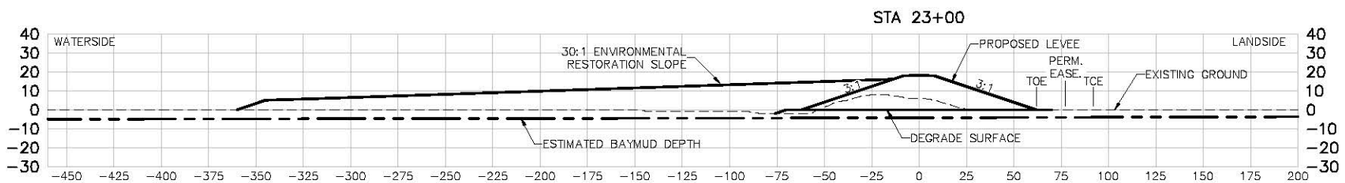
STA 21+00



STA 22+00



STA 23+00



US Army Corps of Engineers
San Fransisco District

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File name: C-21 Sections
Plot scale:
Dwg scale:

DEPARTMENT OF THE ARMY
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SACRAMENTO, CALIFORNIA

HDR
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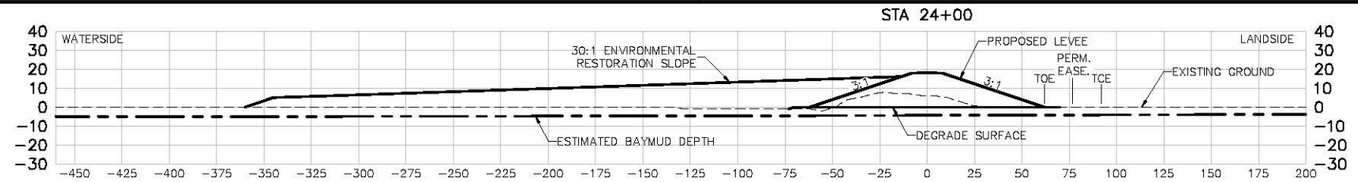
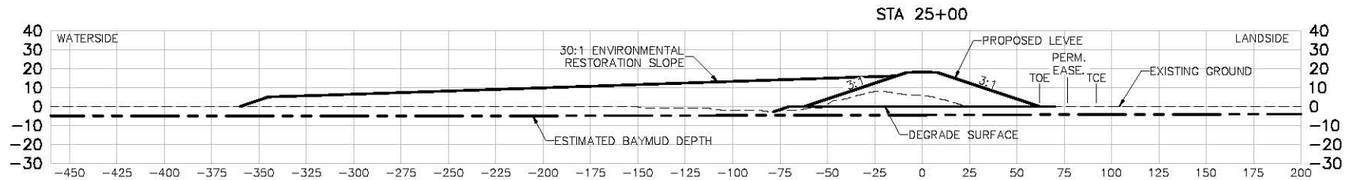
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 18+00 TO STA 23+00

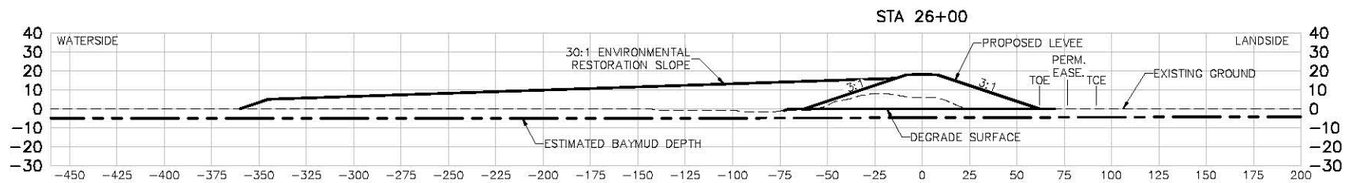
Sheet reference number:
C-24

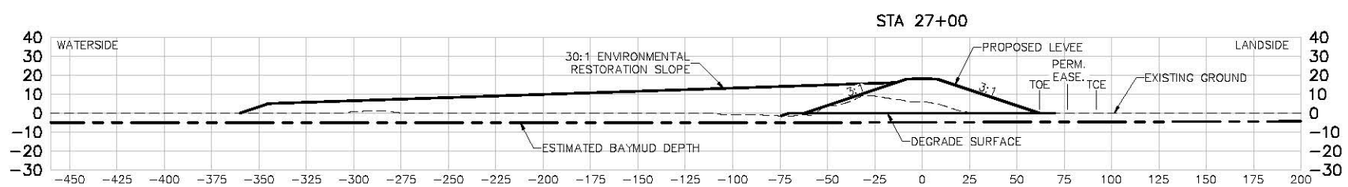
UPDATE

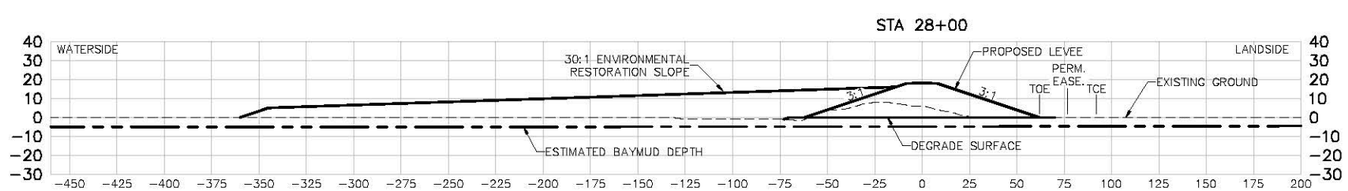
Border Revised 08/30/04, DESCRIPTIONS

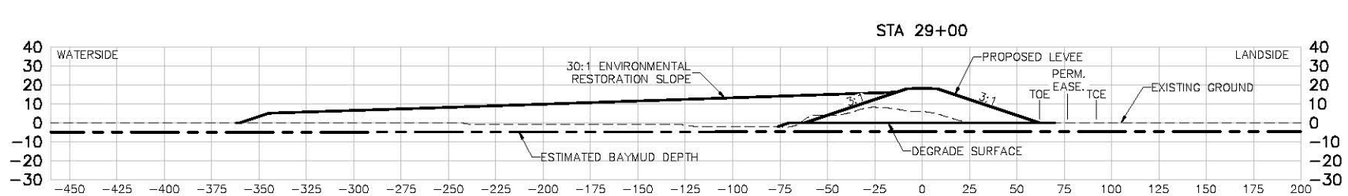












US Army Corps of Engineers
San Fransisco District

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Spec No: XX
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Submitted by: S. JIMENEZ
File name: C-21 Sections
Plot scale:
Dwg scale:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

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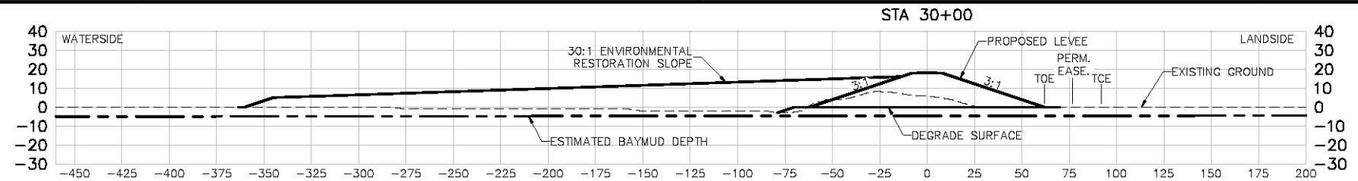
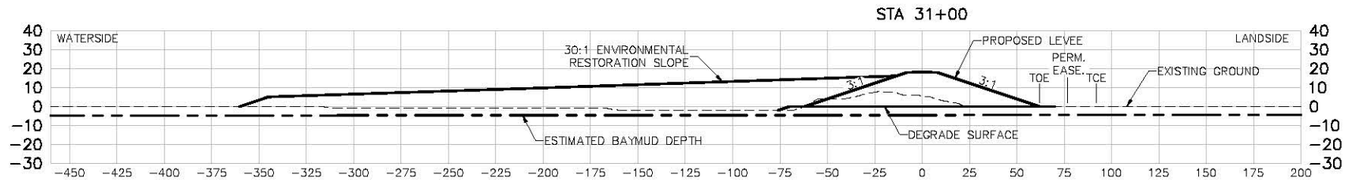
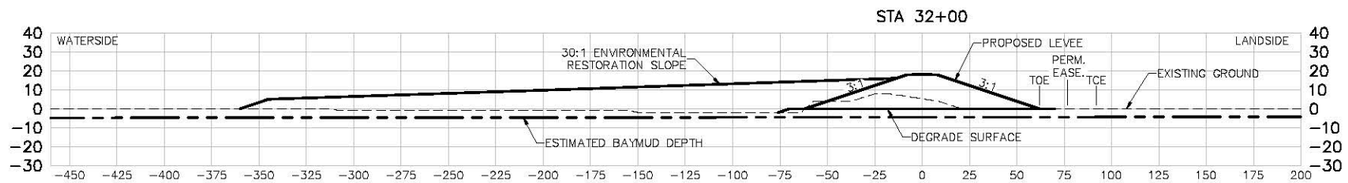
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 24+00 TO STA 29+00

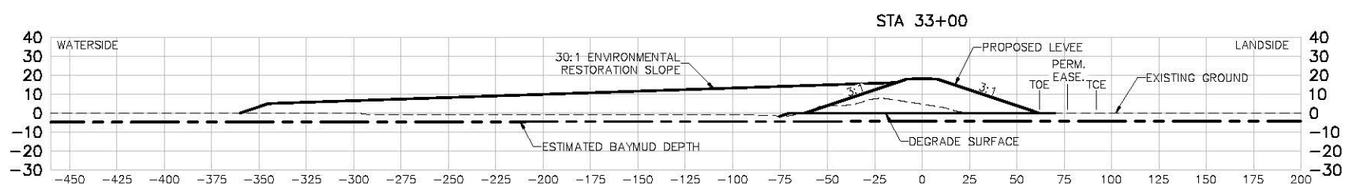
Sheet reference number:
C-25

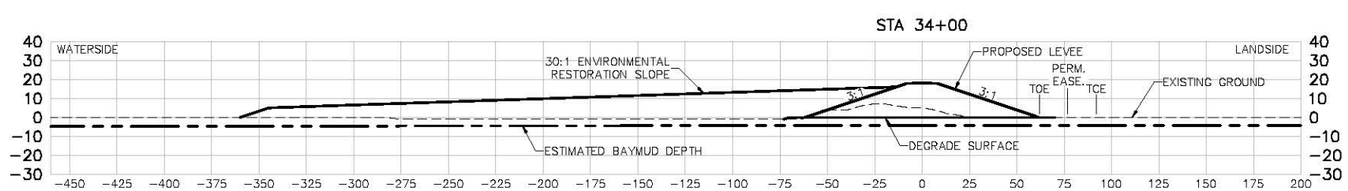
UPDATE

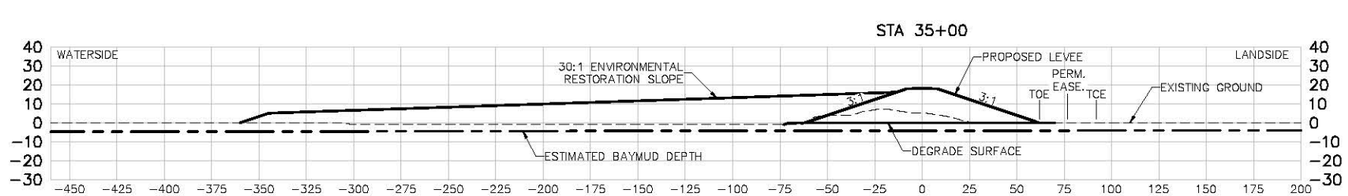












US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Date: 06/24/2014
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Designed by: S. JIMENEZ
Spec No: XX
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Dwn by: V. RUSSO
Drawing Code:
Reviewed by: XX
Submitted by: S. JIMENEZ
File name: C-21 Sections
Plot scale:
Dwg scale:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

HDR
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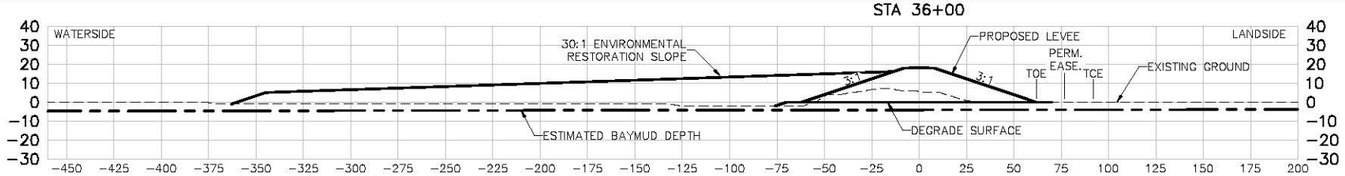
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 30+00 TO STA 35+00

Sheet reference number:
C-26

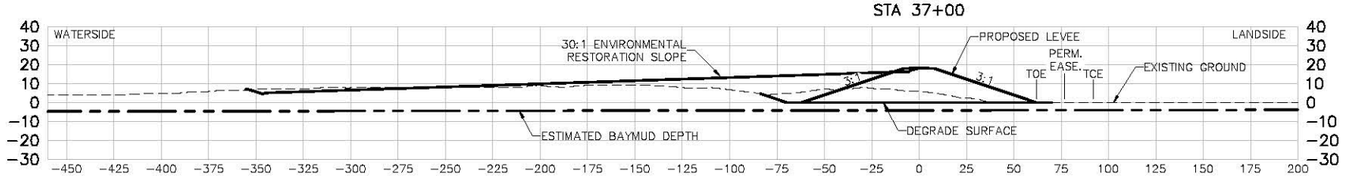
UPDATE

Border Revised 08/30/04, DESCRIPTIONS

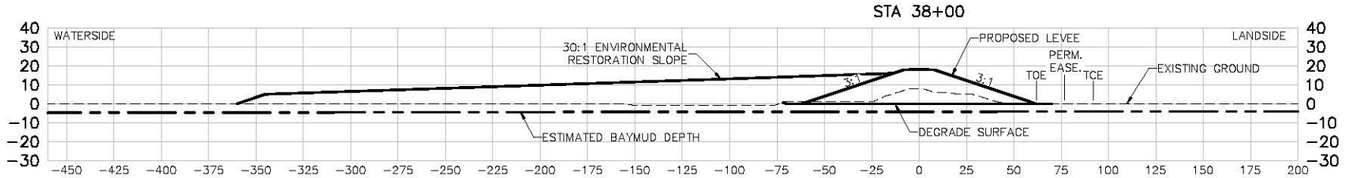
STA 36+00



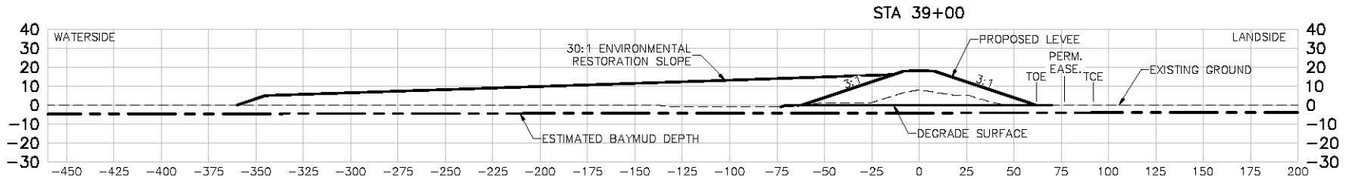
STA 37+00



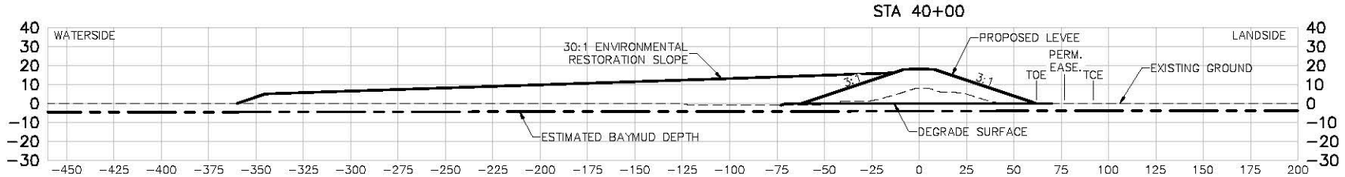
STA 38+00



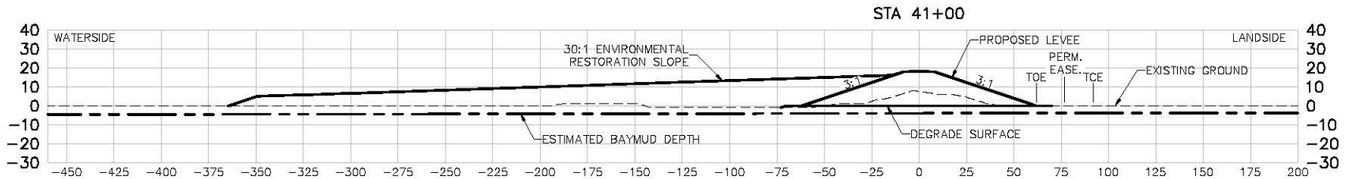
STA 39+00



STA 40+00



STA 41+00



US Army Corps of Engineers
San Fransisco District

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Date: 06/24/2014
Rev. XX
Designed by: S. JIMENEZ
Spec No: XX
Design File No: XXX
Dwn by: V. RUSSO
Drawing Code:
Reviewed by: XX
Submitted by: S. JIMENEZ
File name: C-21 Sections
Plot scale:
Dwg scale:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

HDR
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2379 GATEWAY OAKS
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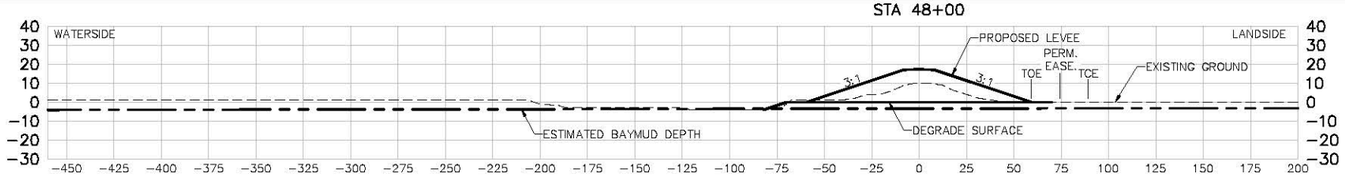
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 36+00 TO STA 41+00

Sheet reference number:
C-27

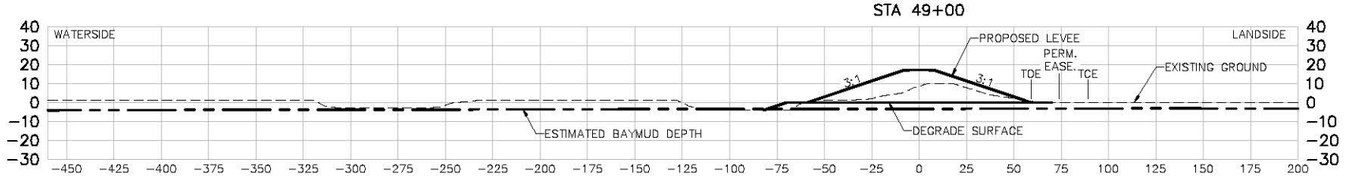
UPDATE

Border Revised 08/30/04, DESCRIPTIONS

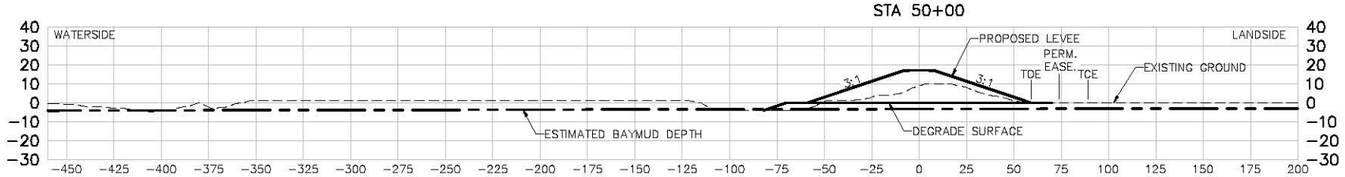
STA 48+00



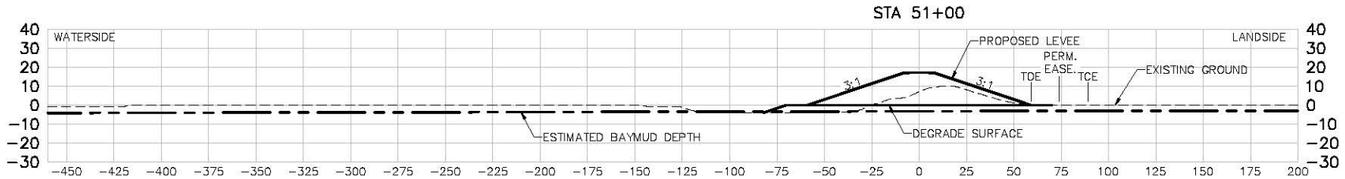
STA 49+00



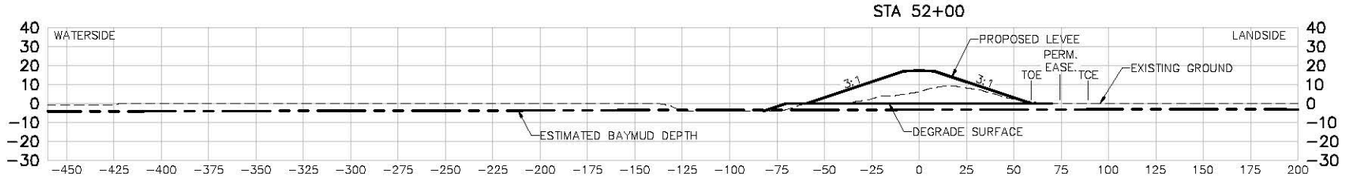
STA 50+00



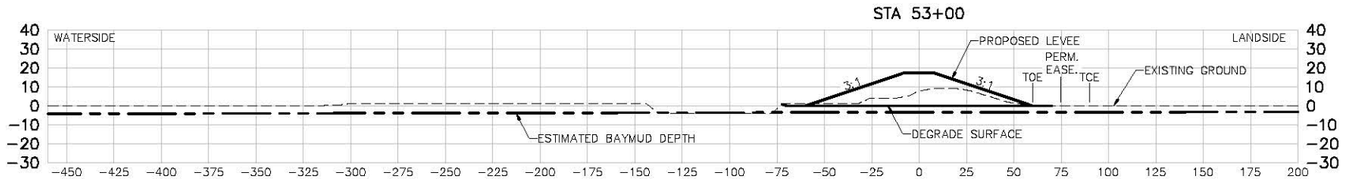
STA 51+00



STA 52+00



STA 53+00



US Army Corps of Engineers
San Fransisco District

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Designed by: S. JIMENEZ
Dwn by: V. RUSSO
Reviewed by: XX
Submitted by: S. JIMENEZ
Date: 06/24/2014
Spec No: XX
Design File No: XXX
Drawing Code:
File name: C-21 Sections
Plot scale:
Dwg scale:
Rev. XX

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

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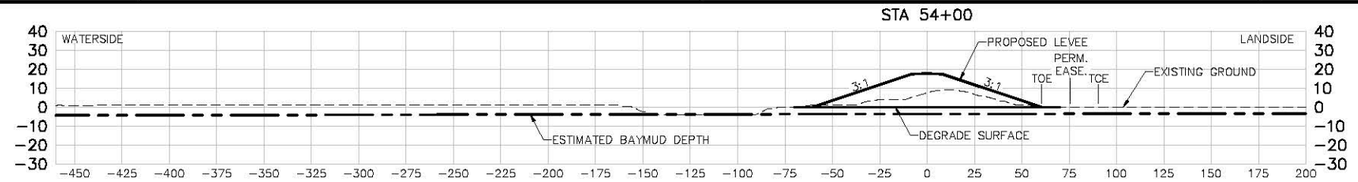
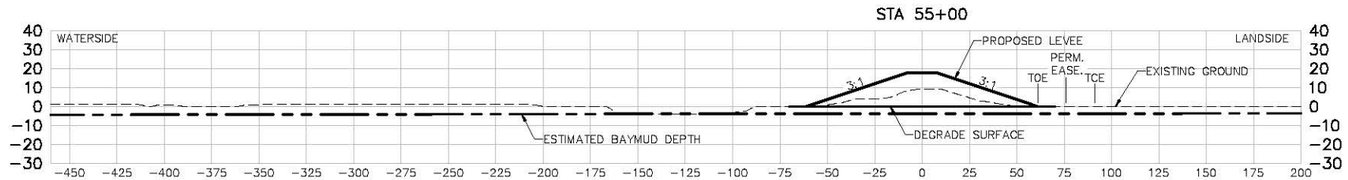
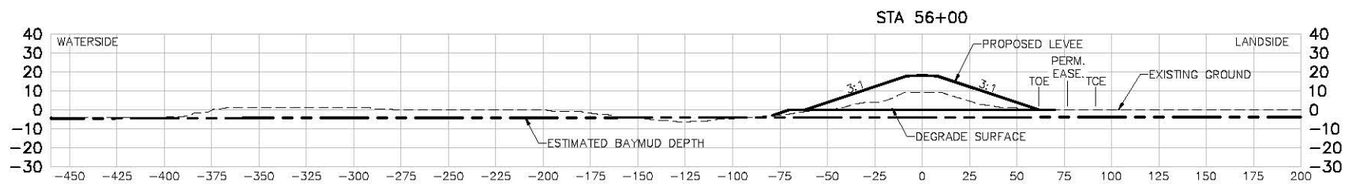
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 48+00 TO STA 53+00

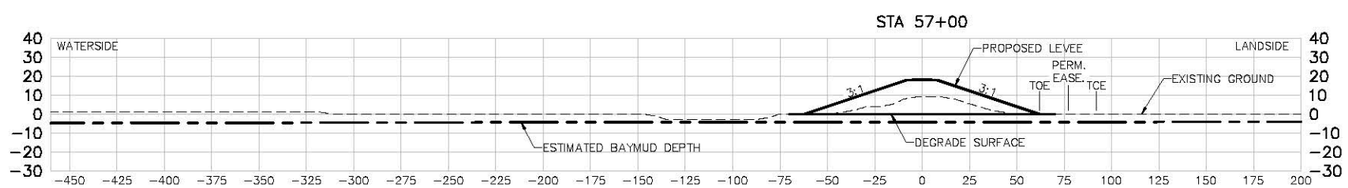
Sheet reference number:
C-29

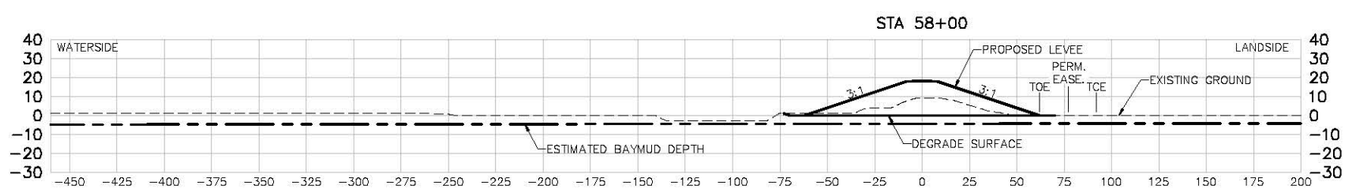
UPDATE

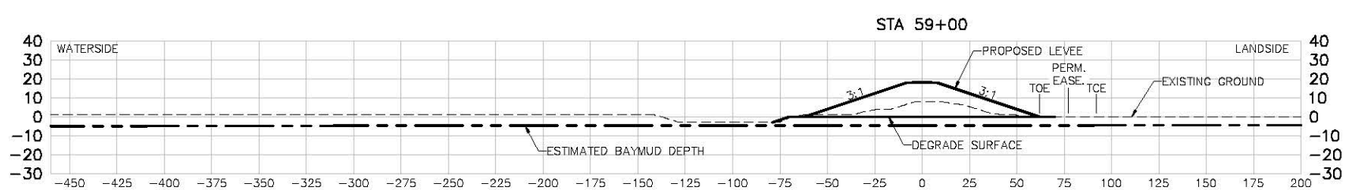












US Army Corps of Engineers
San Fransisco District

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Date: 06/24/2014
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Dwn by: V. RUSSO
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Reviewed by: XX
Submitted by: S. JIMENEZ
Drawing Code:
File name: C-21 Sections
Plot scale:
Dwg scale:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

HDR
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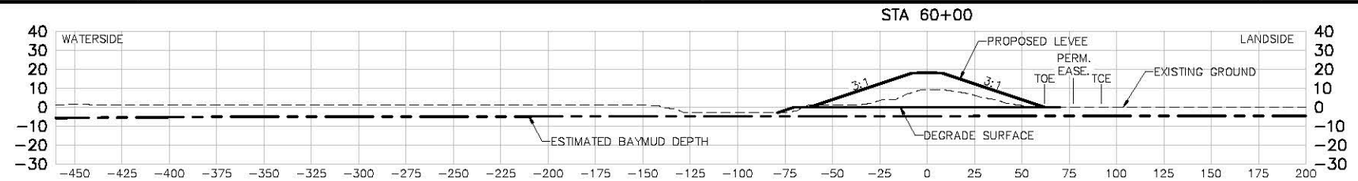
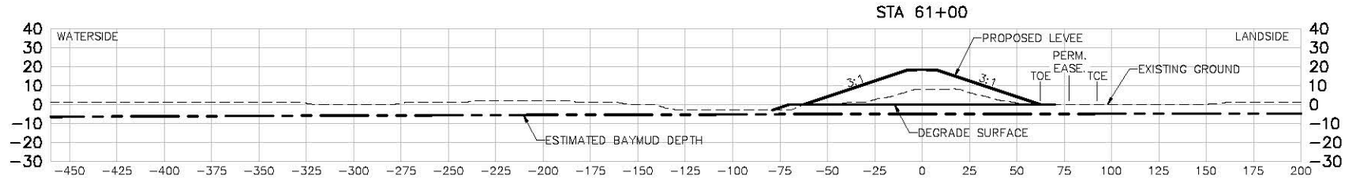
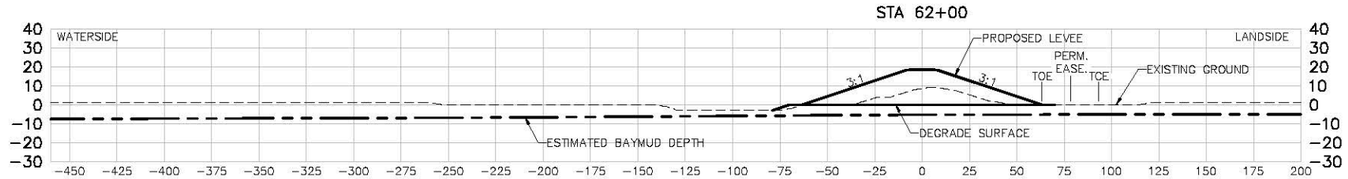
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 54+00 TO STA 59+00

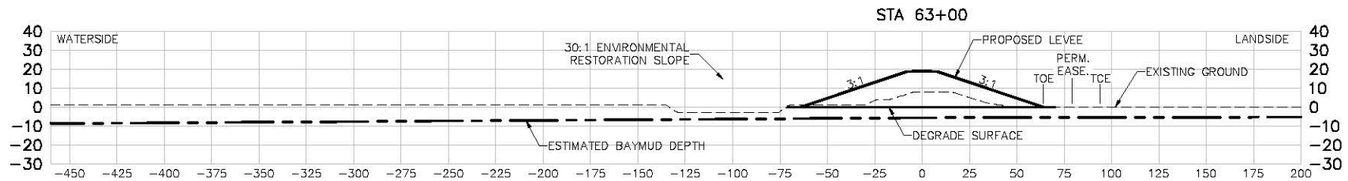
Sheet reference number:
C-30

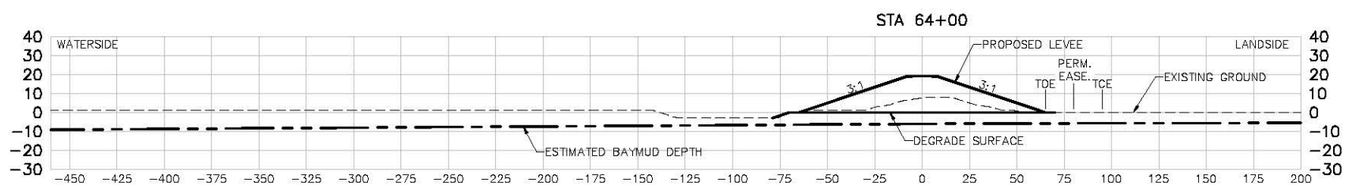
UPDATE

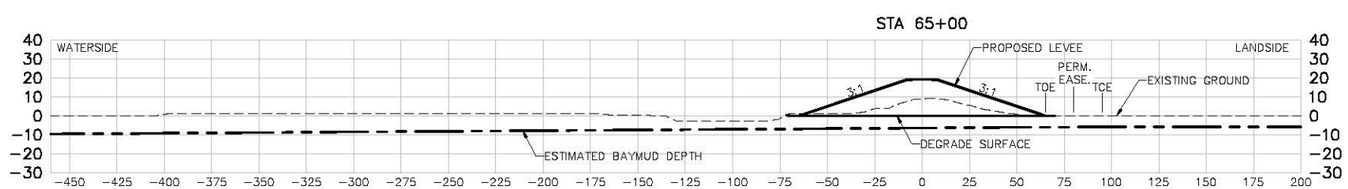












US Army Corps of Engineers
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Symbol	Description	Date	Approved

Designed by: S. JIMENEZ
Date: 06/24/2014
Rev. XX
Dwn by: V. RUSSO
Spec No: XX
Design File No: XXX
Reviewed by: XX
Drawing Code:
Submitted by: S. JIMENEZ
File name: C-21 Sections
Plot scale:
Dwg scale:

DEPARTMENT OF THE ARMY
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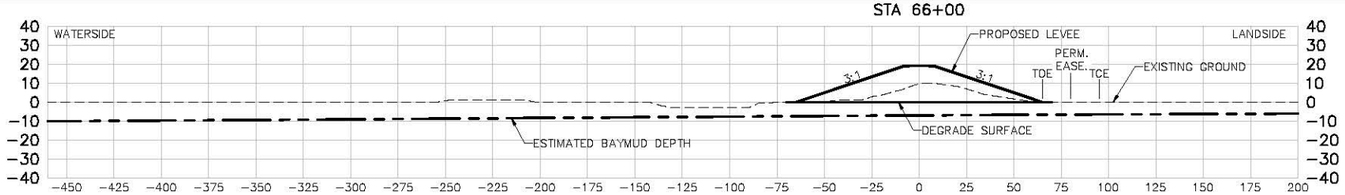
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 60+00 TO STA 65+00

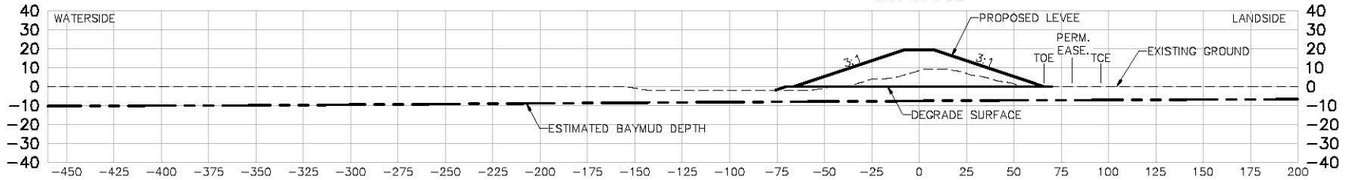
Sheet reference number:
C-31

UPDATE

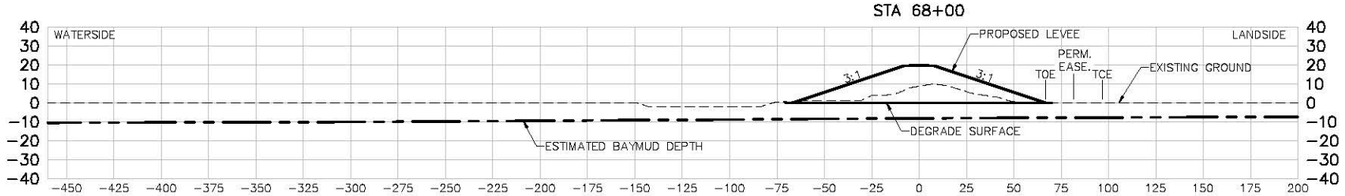
STA 66+00



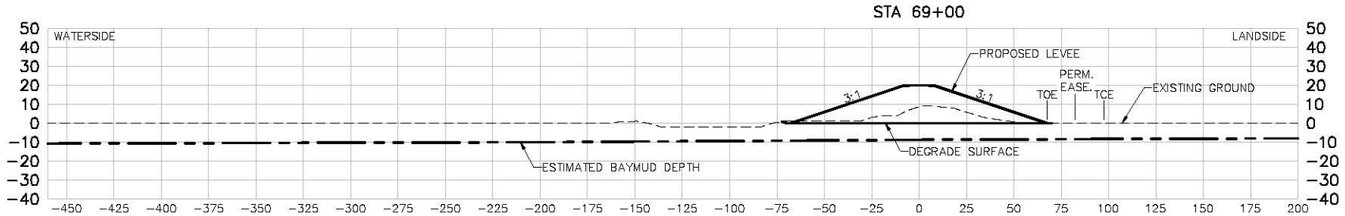
STA 67+00



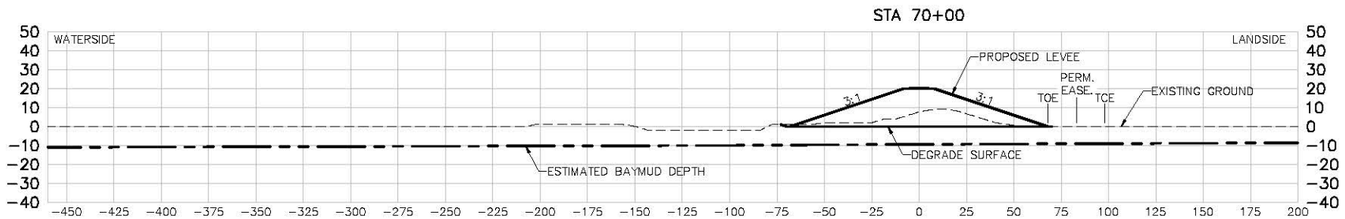
STA 68+00



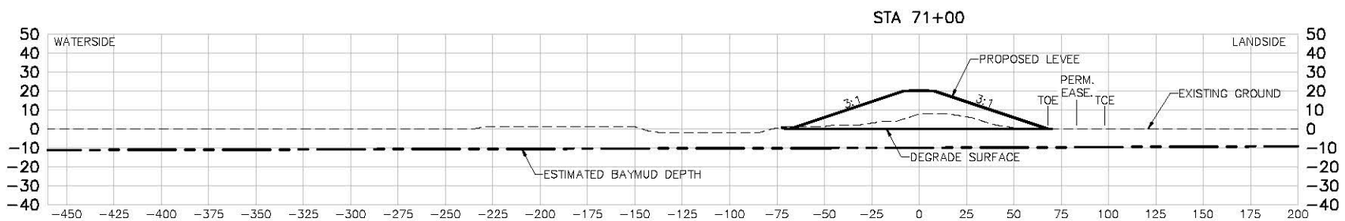
STA 69+00



STA 70+00



STA 71+00



US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Date: 06/24/2014
Rev. XX
Designed by: S. JIMENEZ
Spec No: XX
Design File No: XXX
Dwn by: V. RUSSO
Drawing Code:
Reviewed by: XX
Submitted by: S. JIMENEZ
File name: C-21 Sections
Plot scale:
Dwg scale:

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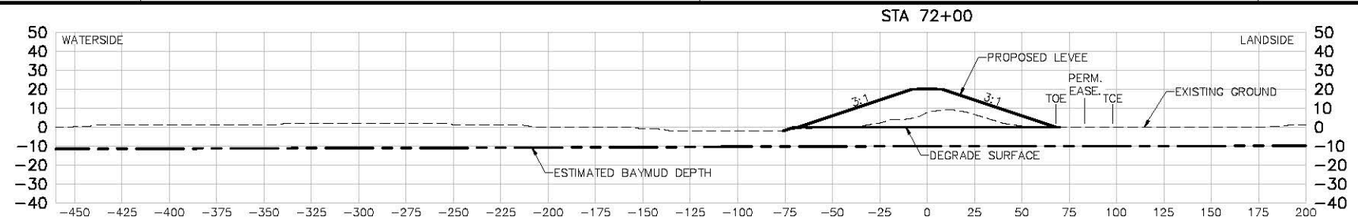
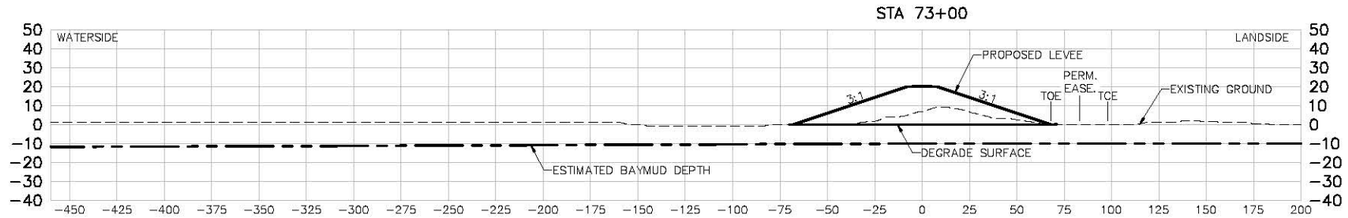
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 66+00 TO STA 71+00

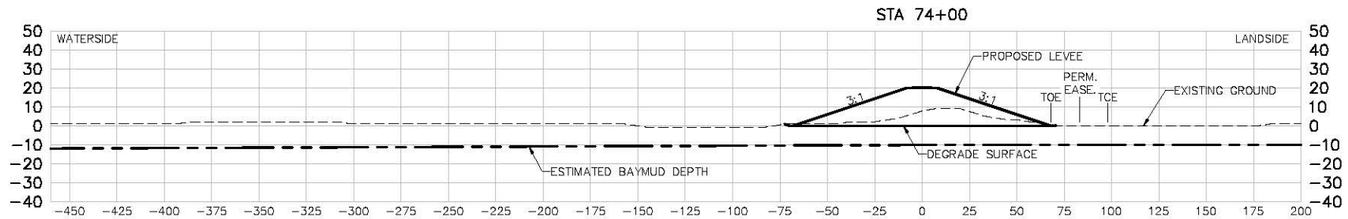
Sheet reference number:
C-32

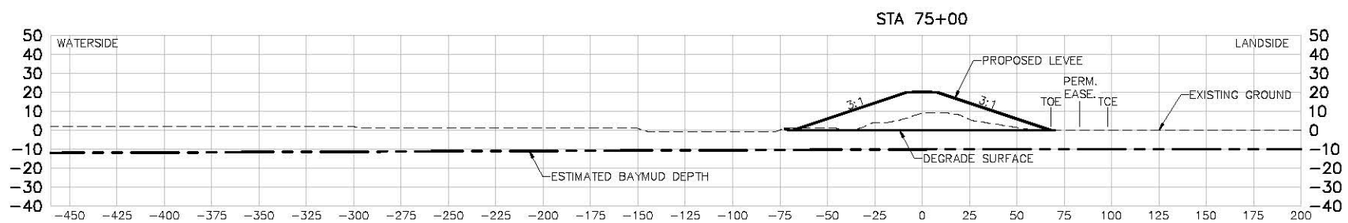
UPDATE

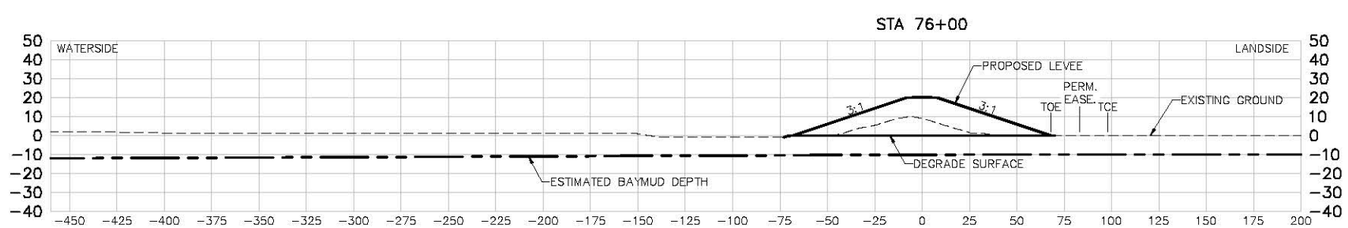
Border Revised 08/30/04, DESCRIPTIONS

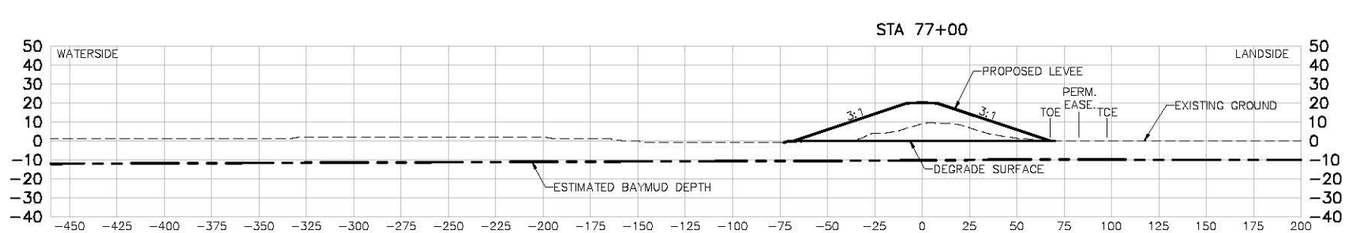












US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Rev. XX

Date: 06/24/2014
Design File No: XXX
Drawing Code:
File name: C-21 Sections
Plot scale:
Dwg. size:

Designed by: S. JIMENEZ
Dwn by: V. RUSSO
Spec No: XX
Reviewed by: XX
Submitted by: S. JIMENEZ

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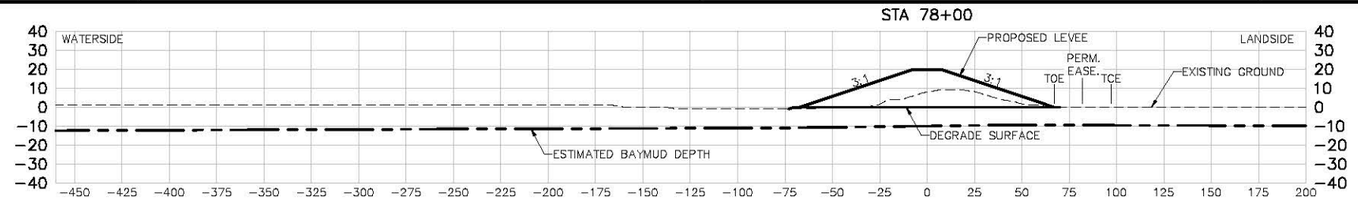
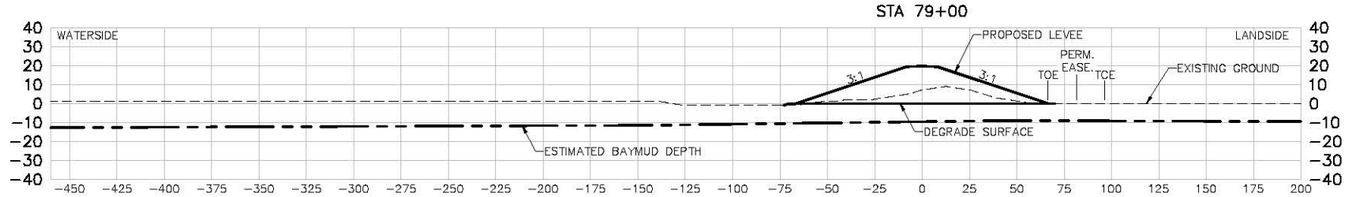
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 72+00 TO STA 77+00

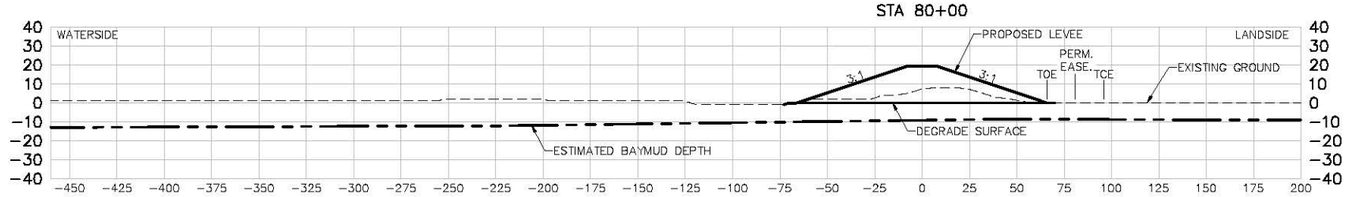
Sheet reference number:
C-33

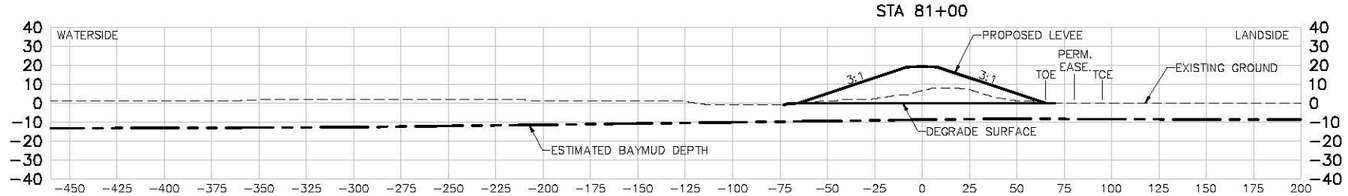
UPDATE

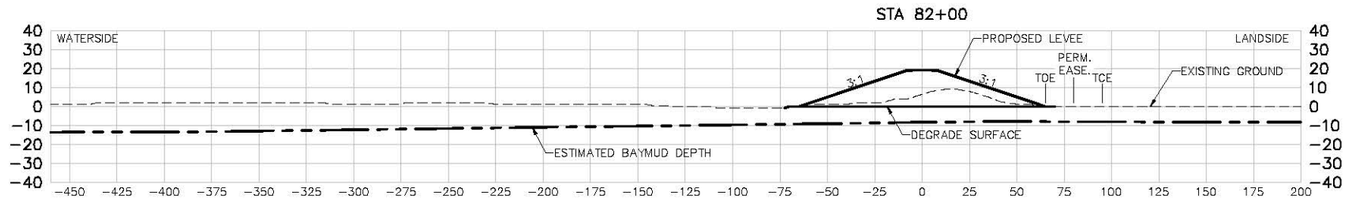
Border Revised 08/30/04, DESCRIPTIONS

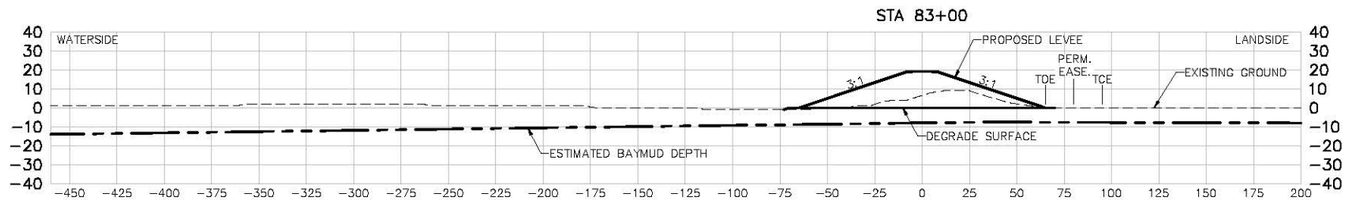












US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Rev. XX

Date: 06/24/2014
Design File no: XXX
Drawing Code:
File name: C-21 Sections
Plot scale:
Dwg scale:

Designed by: S. JIMENEZ
Dwn by: V. RUSSO
Spec No: XX
Reviewed by: XX
Submitted by: S. JIMENEZ

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SACRAMENTO, CALIFORNIA

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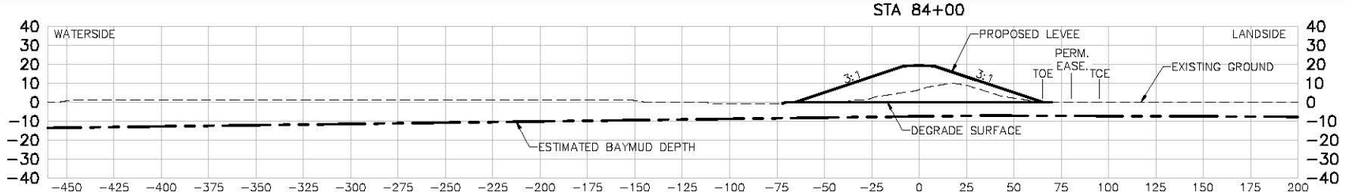
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 78+00 TO STA 83+00

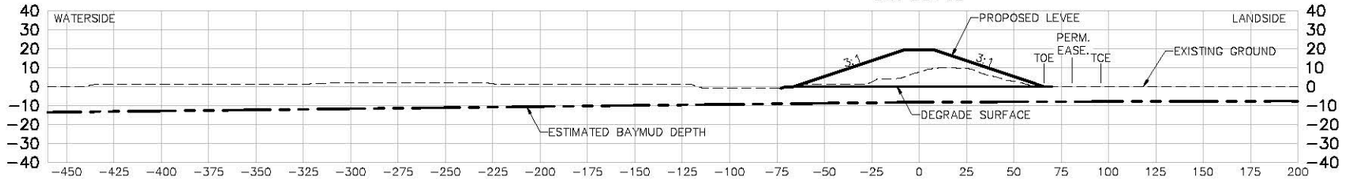
Sheet reference number:
C-34

UPDATE

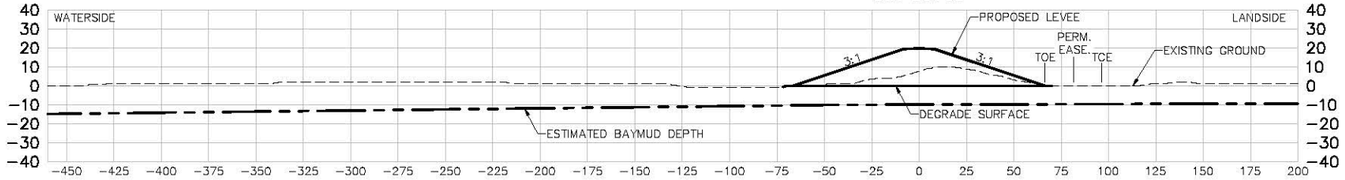
STA 84+00



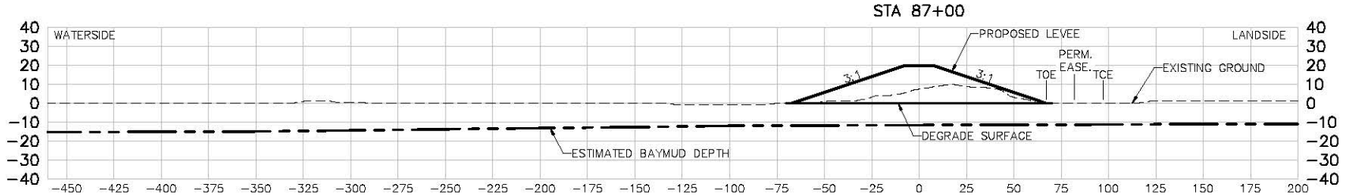
STA 85+00



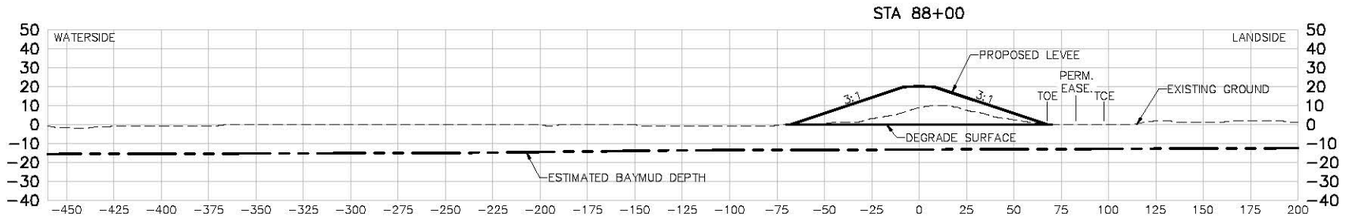
STA 86+00



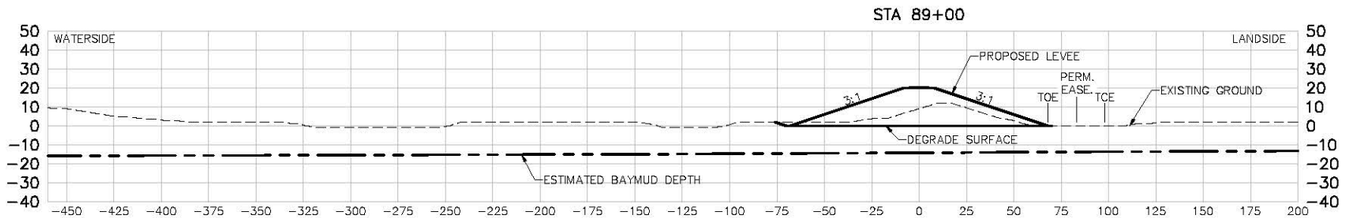
STA 87+00



STA 88+00



STA 89+00



US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Date: 06/24/2014
Rev. XX
Designed by: S. JIMENEZ
Spec No: XX
Design File No: XXX
Dwn by: V. RUSSO
Drawing Code:
Reviewed by: XX
Submitted by: S. JIMENEZ
File name: C-21 Sections
Plot scale:
Dwg scale:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

HDR
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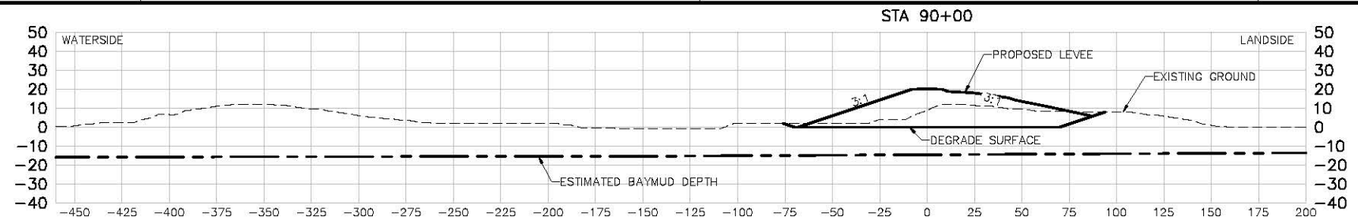
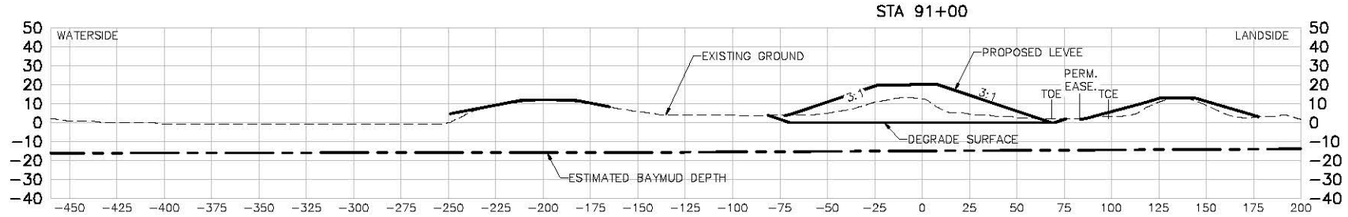
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 84+00 TO STA 89+00

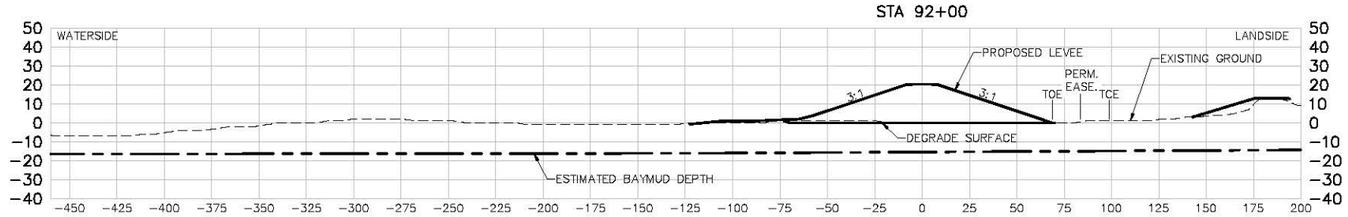
Sheet reference number:
C-35

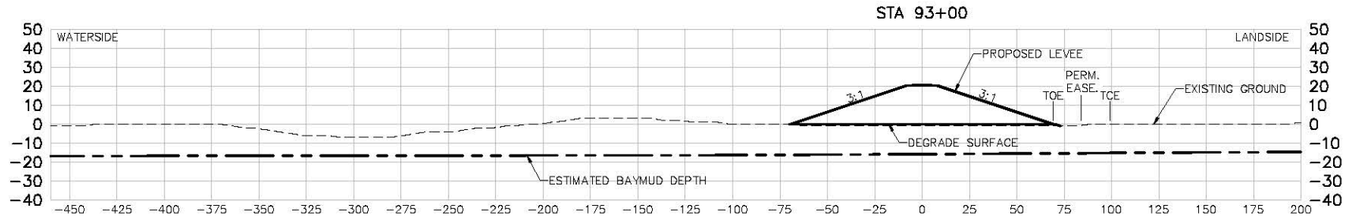
UPDATE

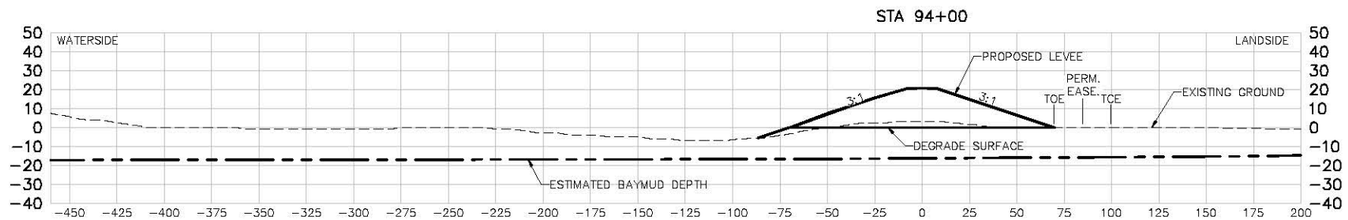
Border Revised 08/30/04, DESCRIPTIONS

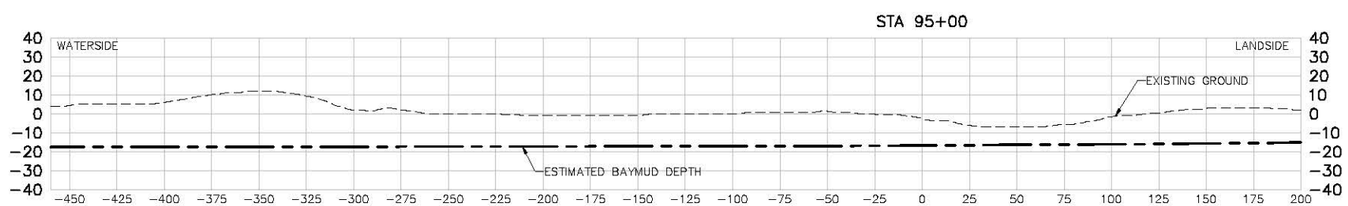












US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Date: 06/24/2014
Rev. XX
Design File No: XXX
Spec No: XX
Drawing Code:
Designed by: S. JIMENEZ
Dwn by: V. RUSSO
Reviewed by: XX
Submitted by: S. JIMENEZ
File name: C-21 Sections
Plot scale:
Dwg scale:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

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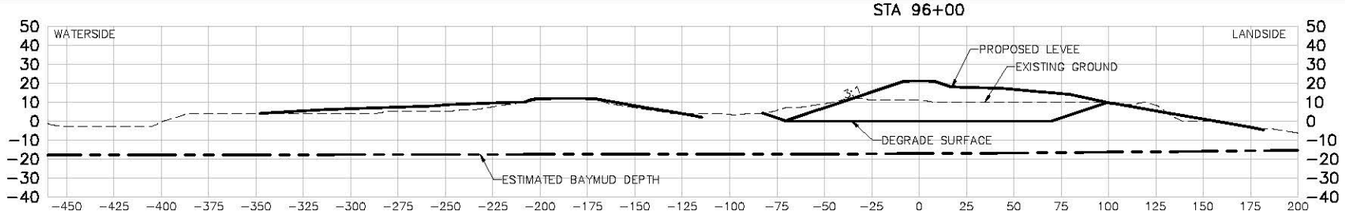
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 90+00 TO STA 95+00

Sheet reference number:
C-36

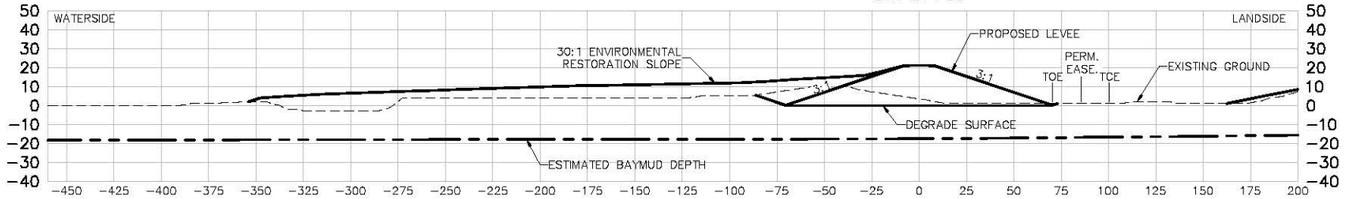
UPDATE

Border Revised 08/30/04, DESCRIPTION

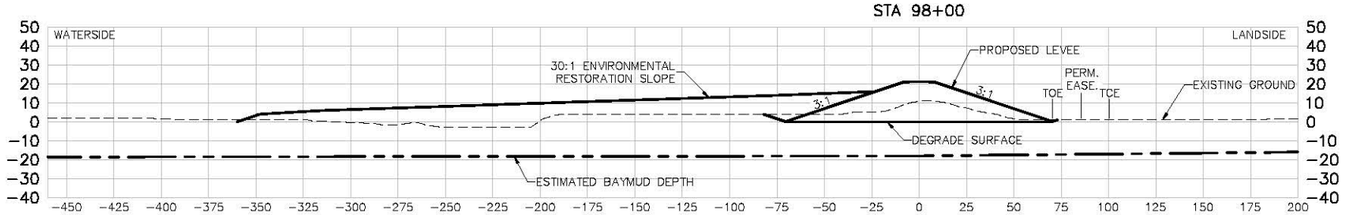
STA 96+00



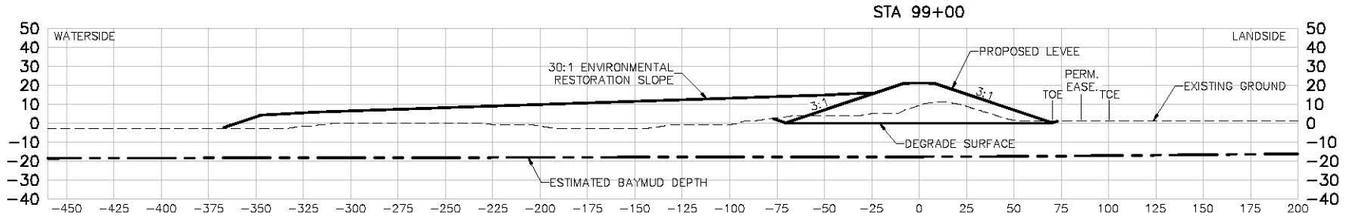
STA 97+00



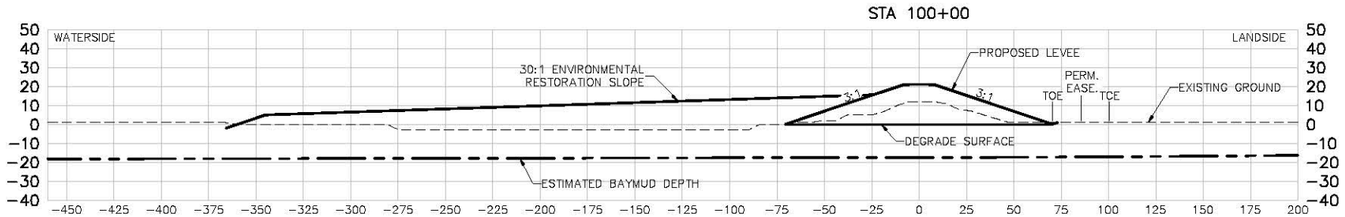
STA 98+00



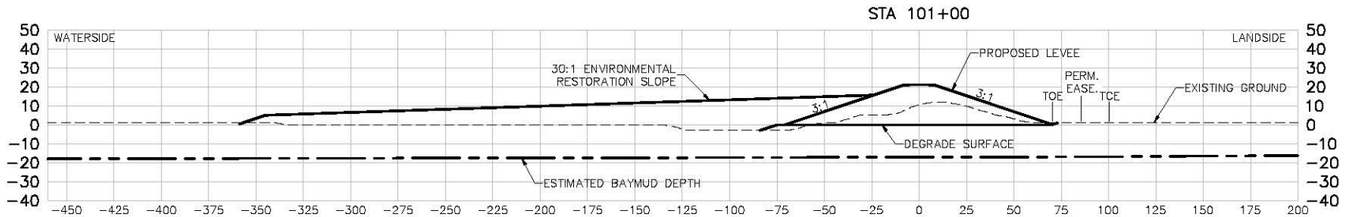
STA 99+00



STA 100+00



STA 101+00



US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Date: 06/24/2014
Rev. XX
Designed by: S. JIMENEZ
Dwn by: V. RUSSO
Spec No: XX
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Drawing Code:
Reviewed by: XX
Submitted by: S. JIMENEZ
File name: C-21 Sections
Plot scale:
Dwg scale:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

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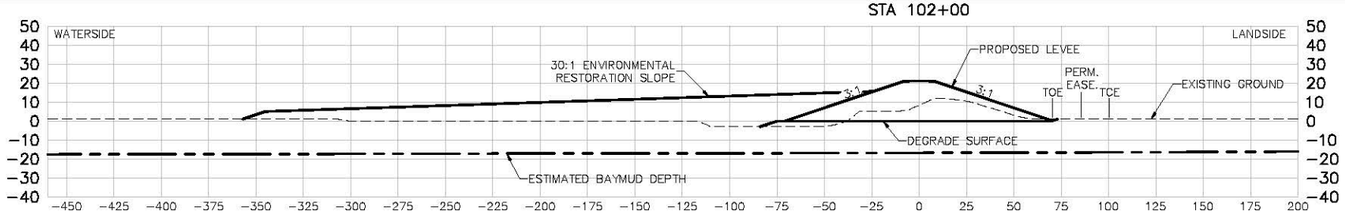
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 96+00 TO STA 101+00

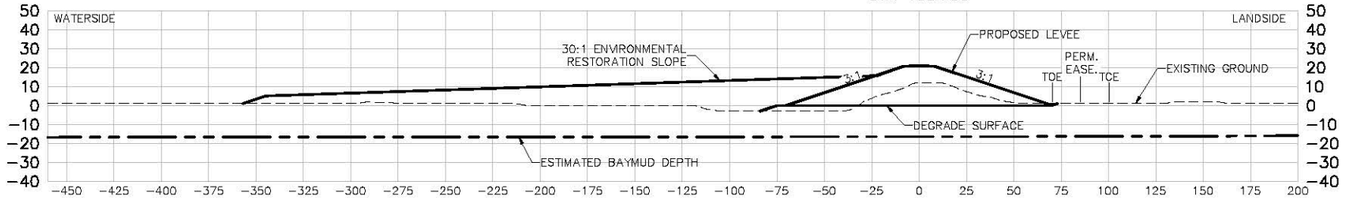
Sheet reference number:
C-37

UPDATE

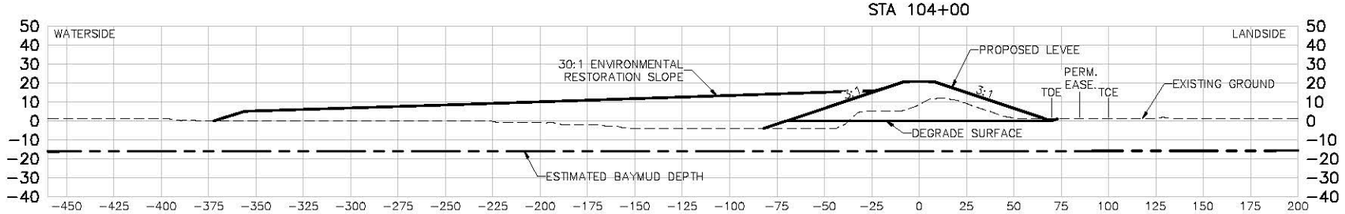
STA 102+00



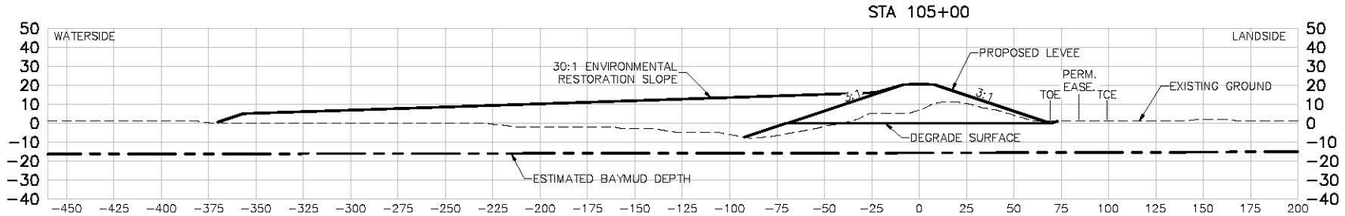
STA 103+00



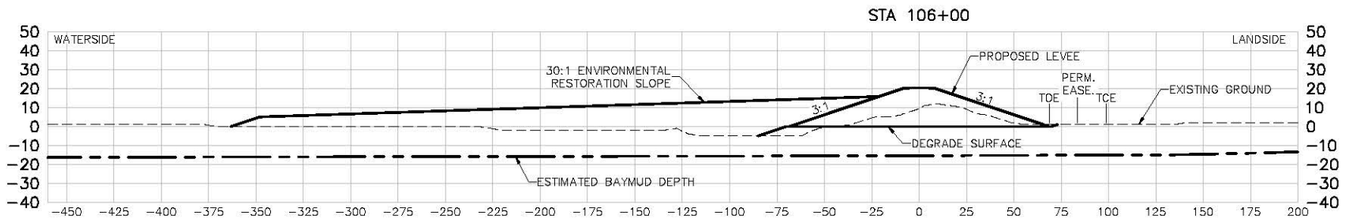
STA 104+00



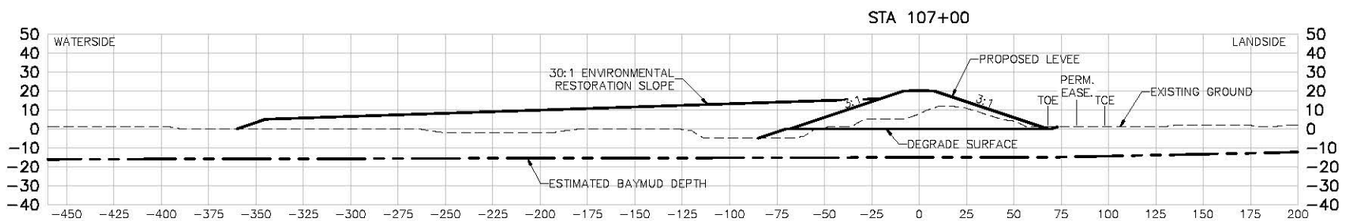
STA 105+00



STA 106+00



STA 107+00



US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Date: 06/24/2014
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Designed by: S. JIMENEZ
Spec No: XX
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Submitted by: S. JIMENEZ
File name: C-21 Sections
Plot scale:
Dwg scale:

DEPARTMENT OF THE ARMY
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SACRAMENTO, CALIFORNIA

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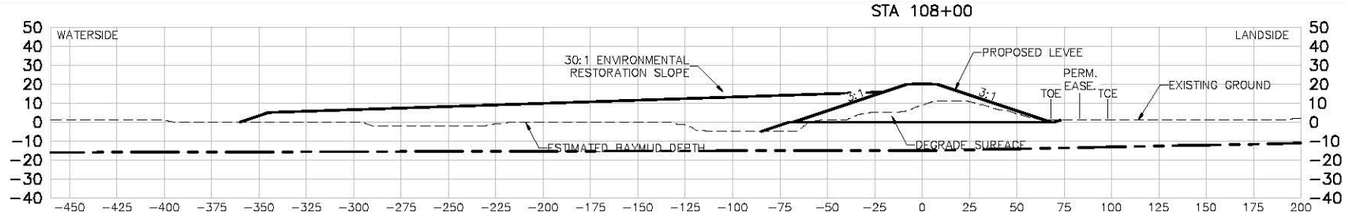
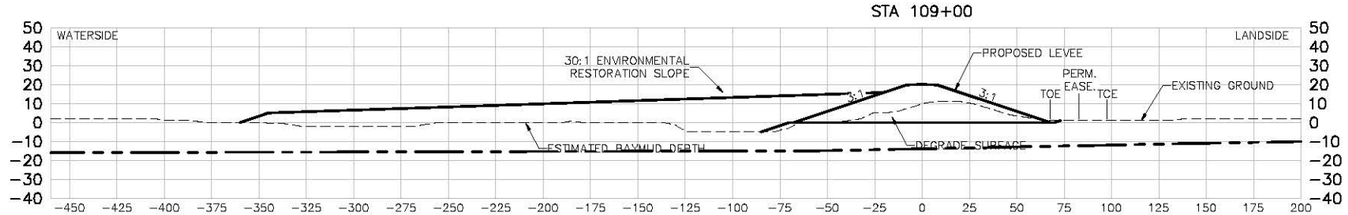
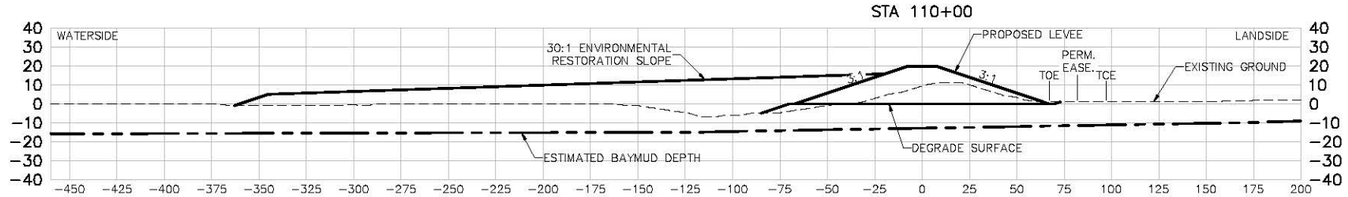
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 102+00 TO STA 107+00

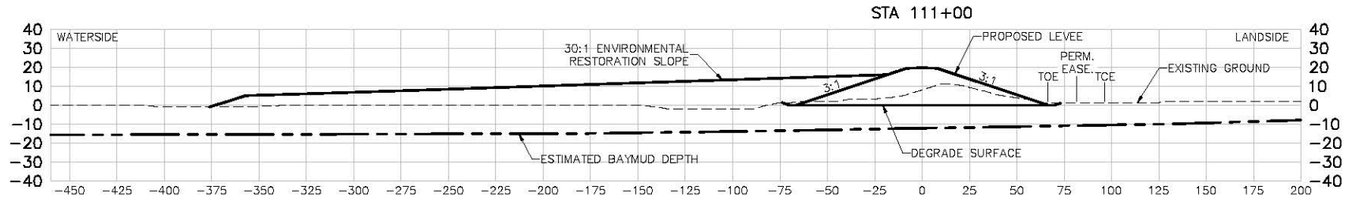
Sheet reference number:
C-38

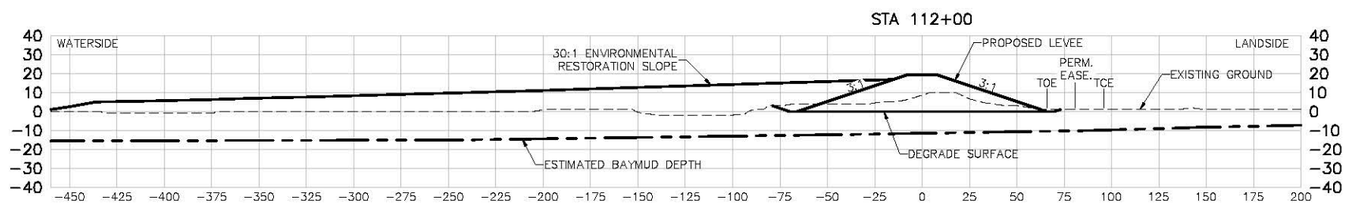
UPDATE

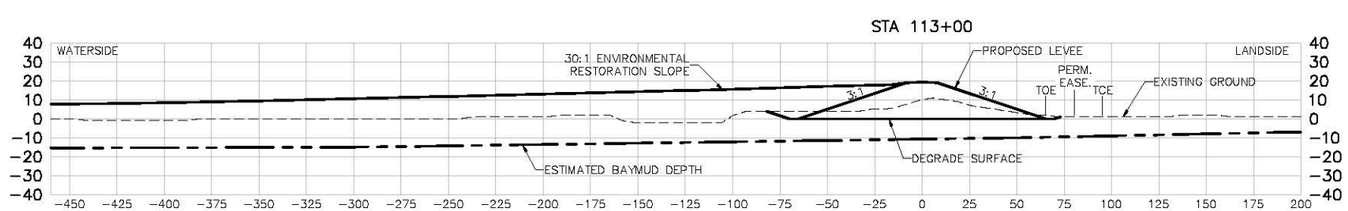












US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Date: 06/24/2014
Rev. XX
Designed by: S. JIMENEZ
Spec No: XX
Design File No: XXX
Dwn by: V. RUSSO
Drawing Code:
Reviewed by: XX
Submitted by: S. JIMENEZ
File name: C-21 Sections
Plot scale:
Dwg scale:

DEPARTMENT OF THE ARMY
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SACRAMENTO, CALIFORNIA

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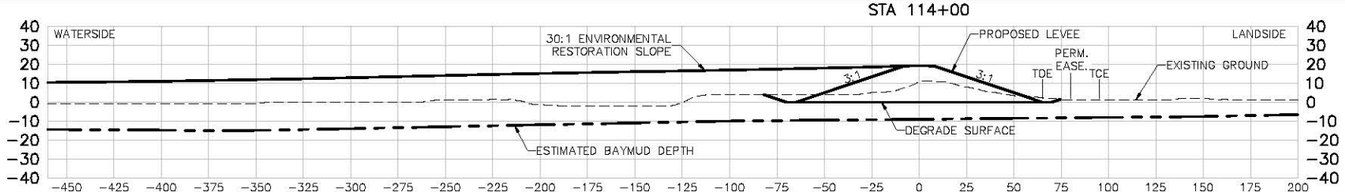
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 108+00 TO STA 113+00

Sheet reference number:
C-39

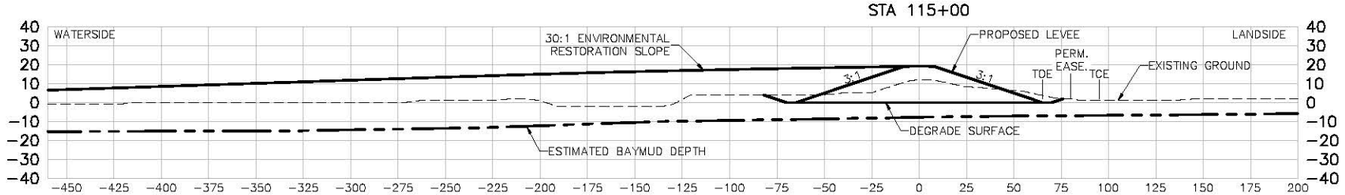
UPDATE

Border: Revised 08/30/04, DESCRIPTIONS

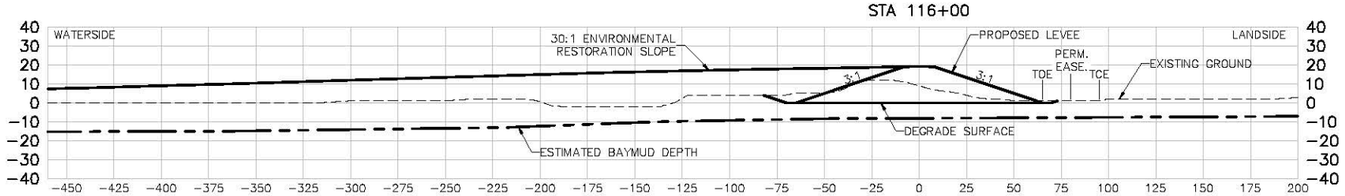
STA 114+00



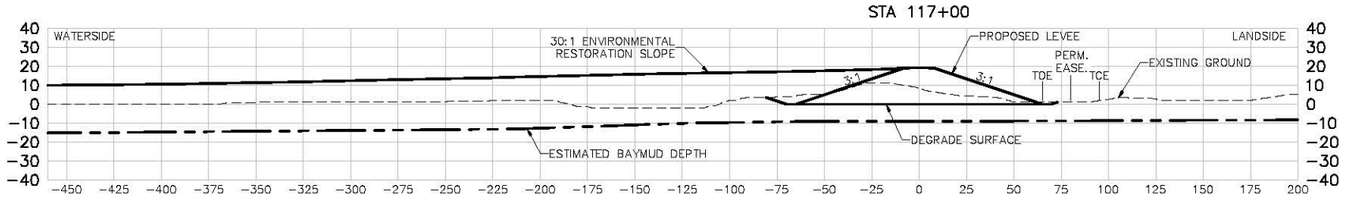
STA 115+00



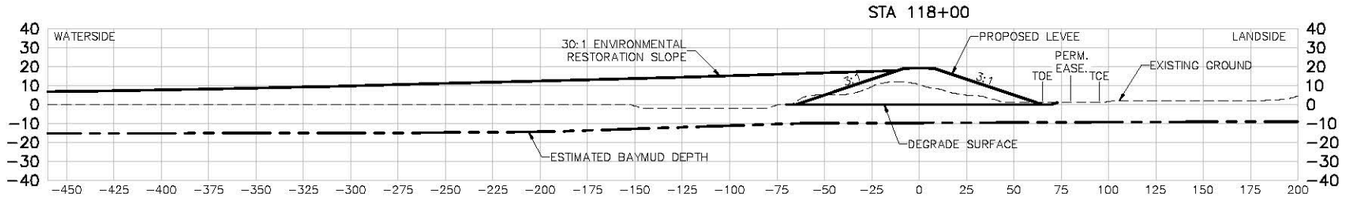
STA 116+00



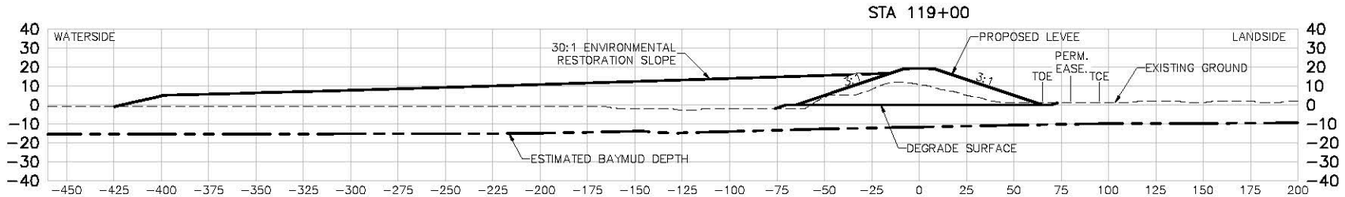
STA 117+00



STA 118+00



STA 119+00



US Army Corps of Engineers
San Fransisco District

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File name: C-21 Sections
Plot scale:
Dwg size:

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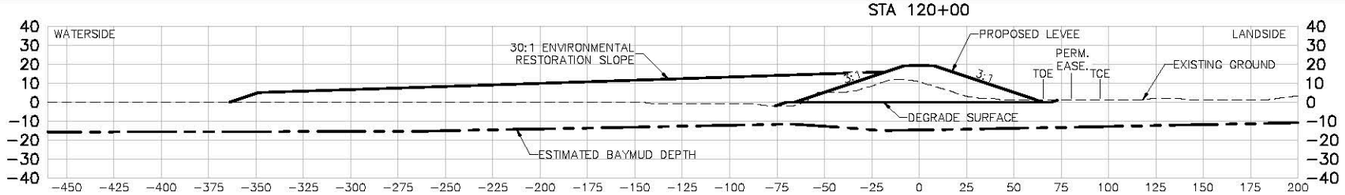
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 114+00 TO STA 119+00

Sheet reference number:
C-40

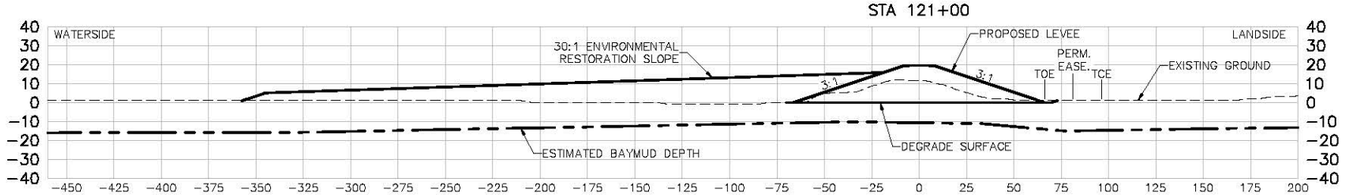
UPDATE

Border Revised 08/30/04, DESCRIPTIONS

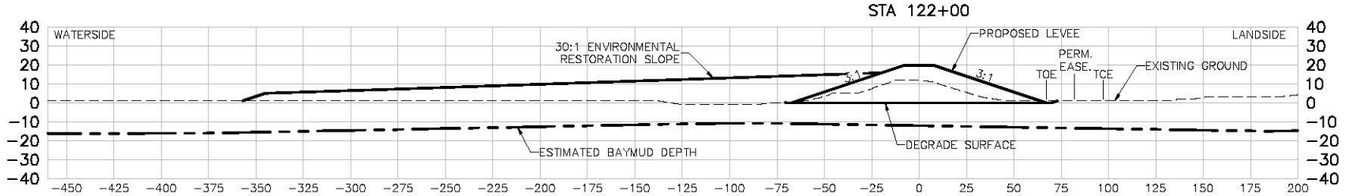
STA 120+00



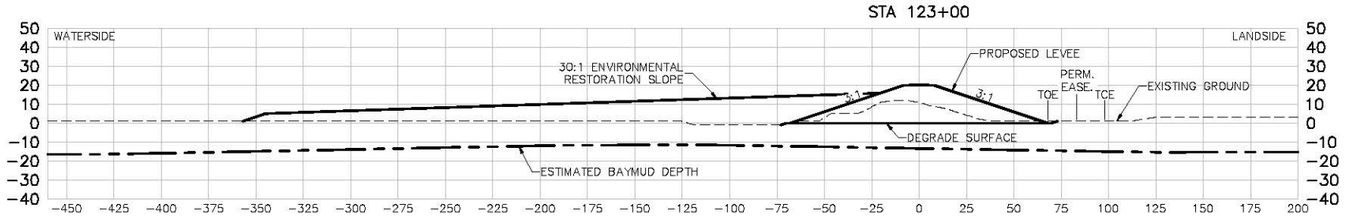
STA 121+00



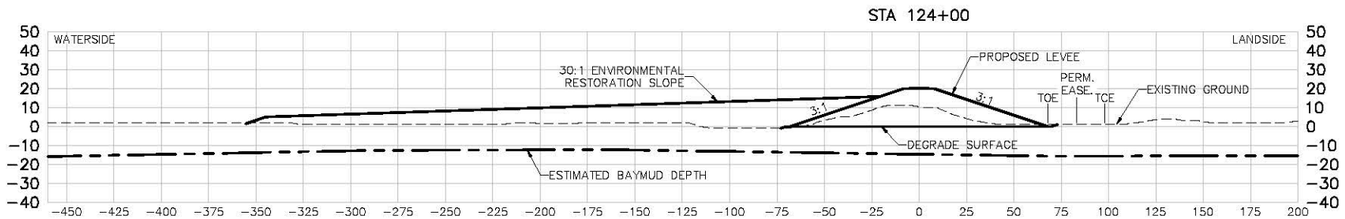
STA 122+00



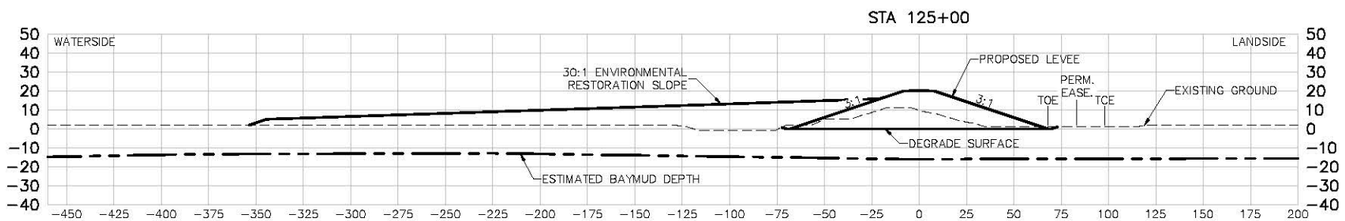
STA 123+00



STA 124+00



STA 125+00



US Army Corps of Engineers
San Fransisco District

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File name: C-21 Sections
Plot scale:
Dwg scale:

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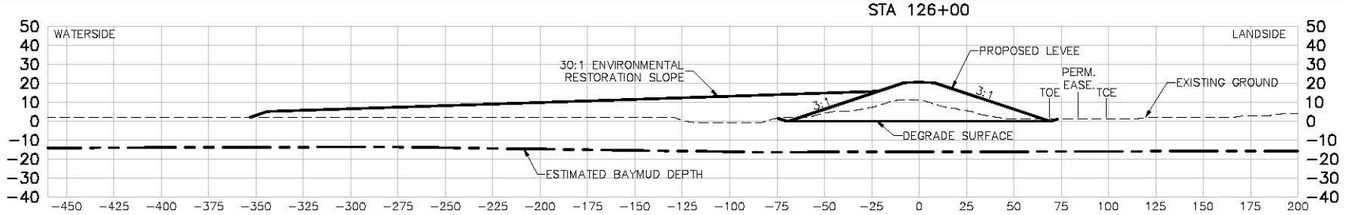
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 120+00 TO STA 125+00

Sheet reference number:
C-41

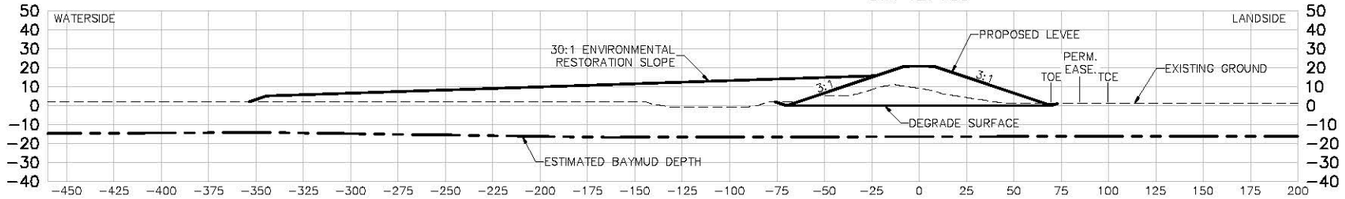
UPDATE

Border Revised 08/30/04, DESCRIPTIONS

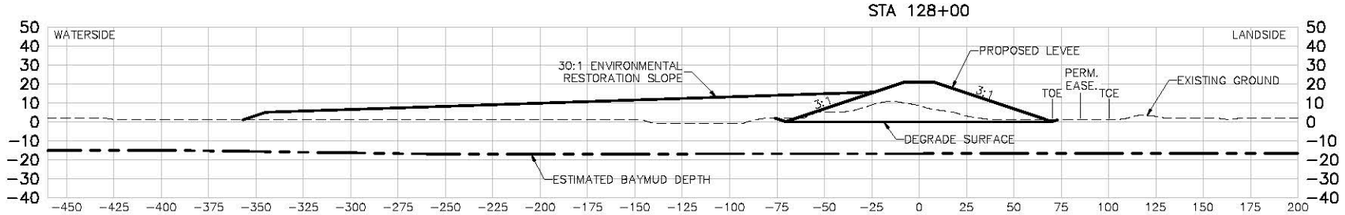
STA 126+00



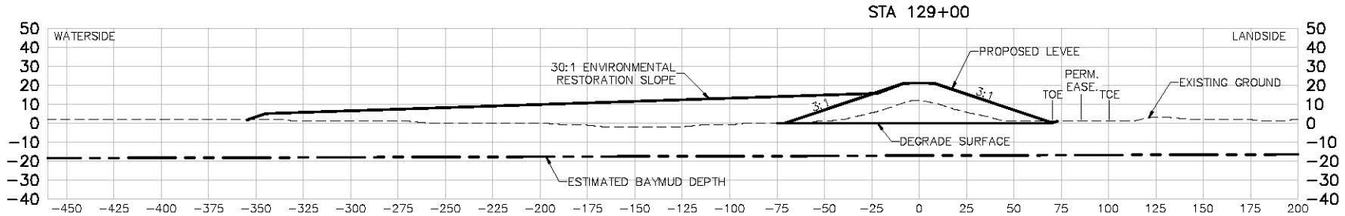
STA 127+00



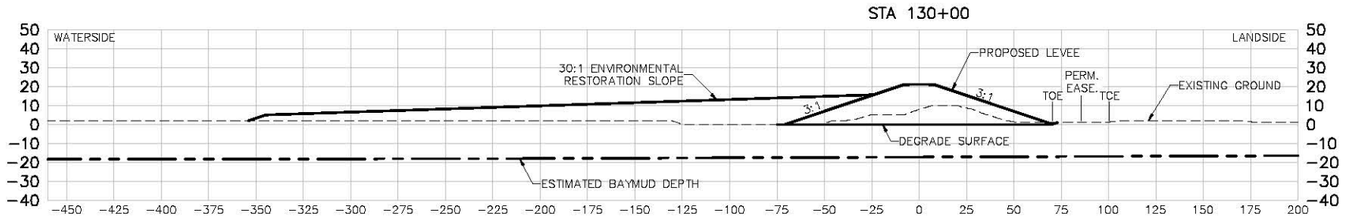
STA 128+00



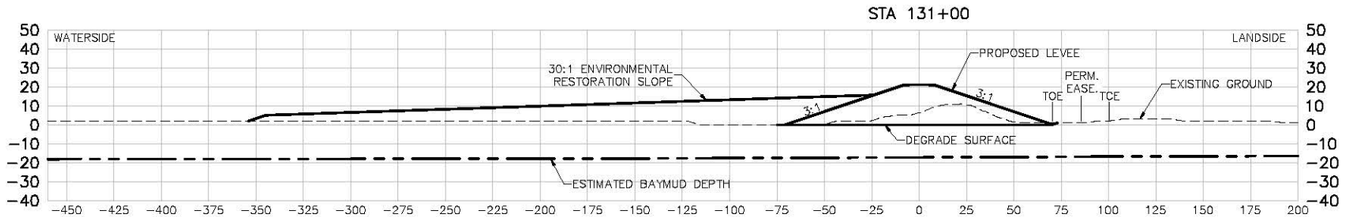
STA 129+00



STA 130+00



STA 131+00



US Army Corps of Engineers
San Fransisco District

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File name: C-21 Sections
Plot scale:
Dwg size:

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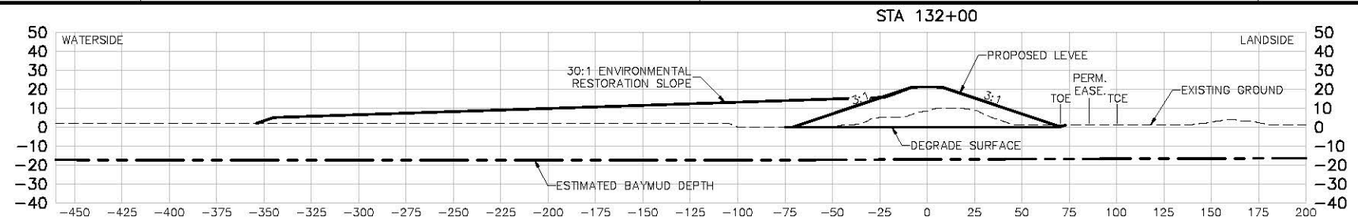
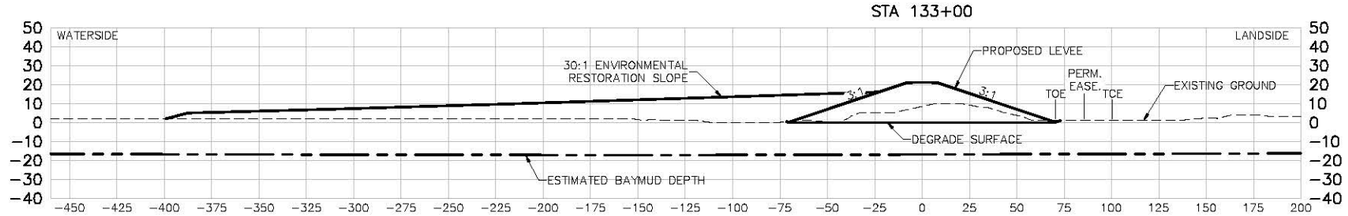
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 128+00 TO STA 131+00

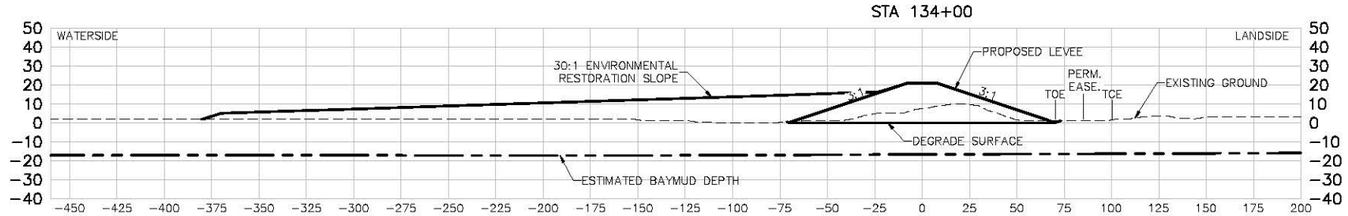
Sheet reference number:
C-42

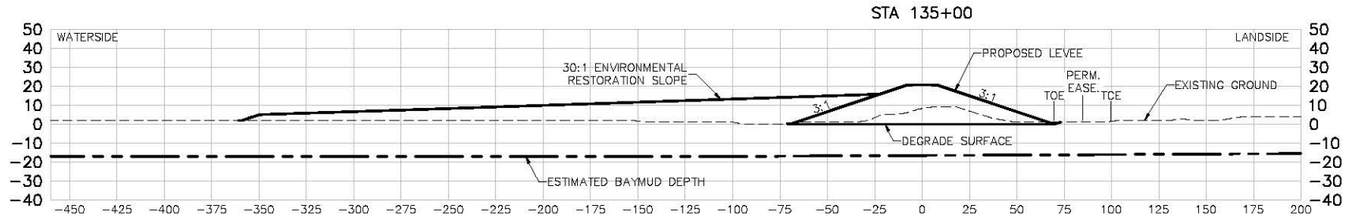
UPDATE

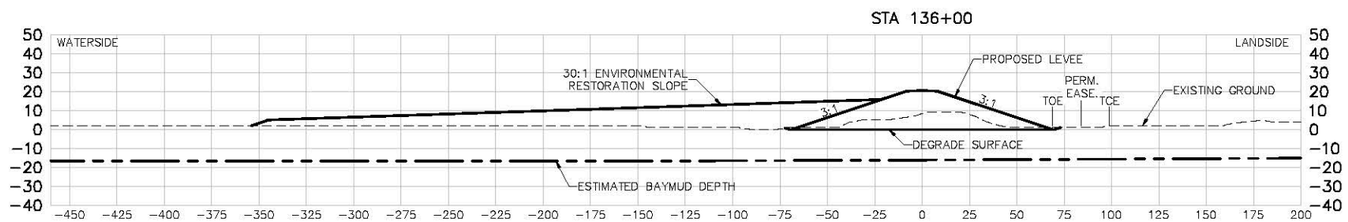
Border Revised 08/30/04, DESCRIPTIONS

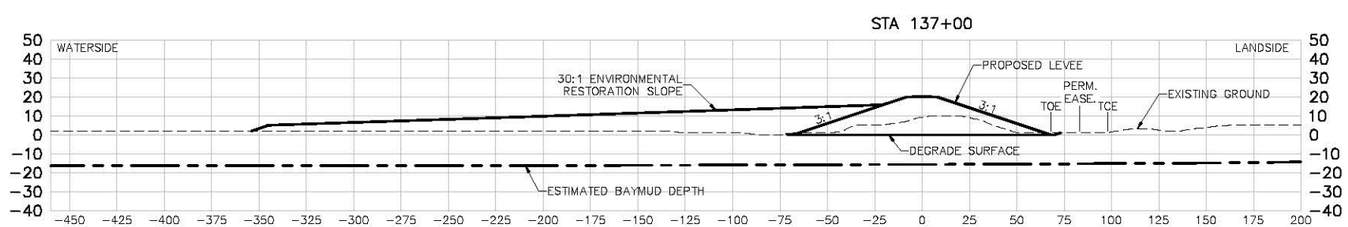












US Army Corps of Engineers
San Fransisco District

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Date: 06/24/2014
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Spec No: XX
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File name: C-21 Sections
Plot scale:
Dwg size:

DEPARTMENT OF THE ARMY
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SACRAMENTO, CALIFORNIA

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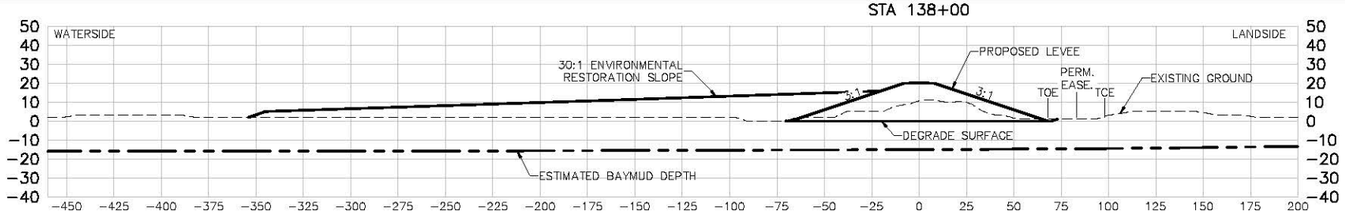
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 132+00 TO STA 137+00

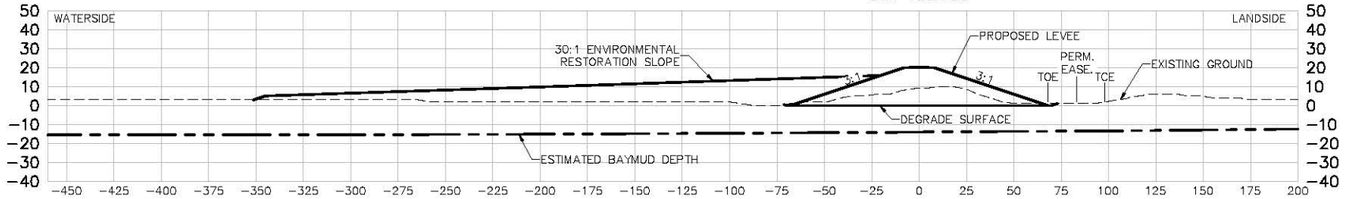
Sheet reference number:
C-43

UPDATE

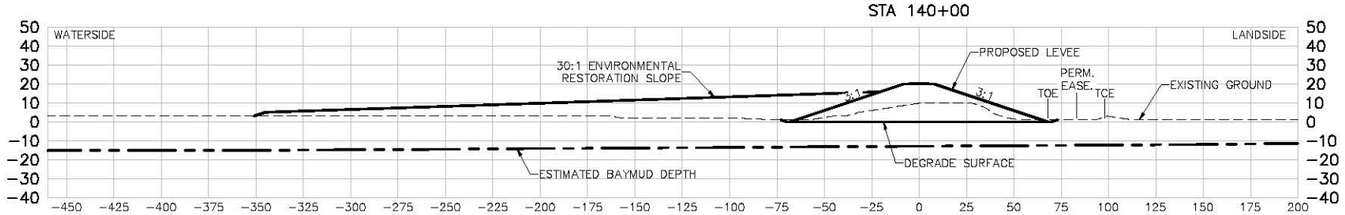
STA 138+00



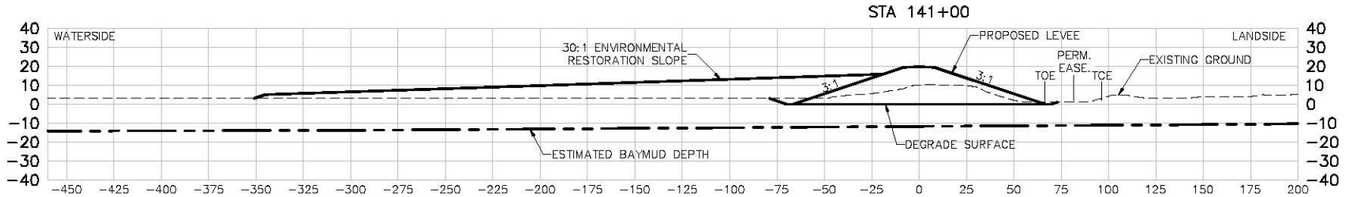
STA 139+00



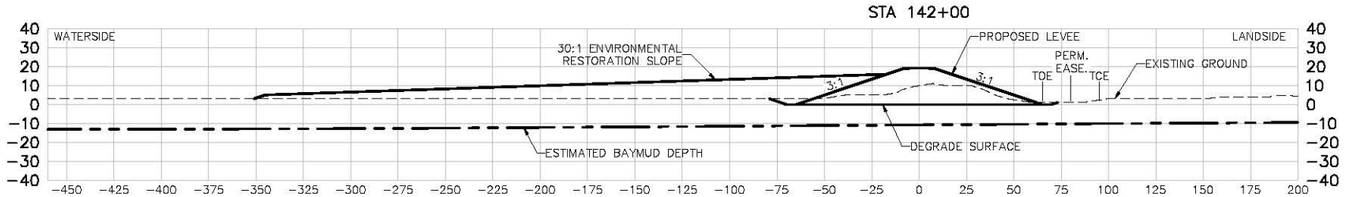
STA 140+00



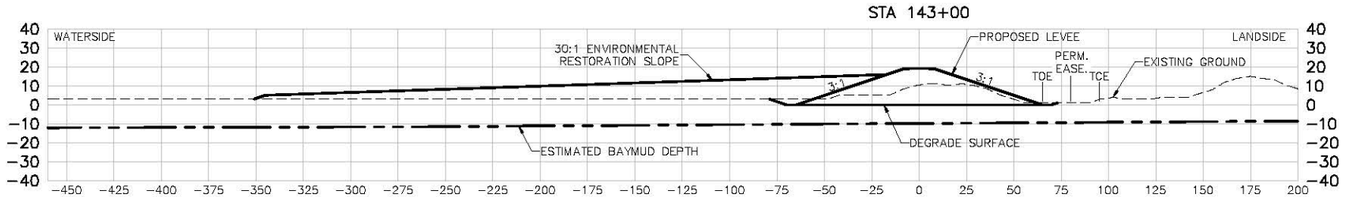
STA 141+00



STA 142+00



STA 143+00



US Army Corps of Engineers
San Fransisco District

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File name: C-21 Sections
Plot scale:
Dwg size:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

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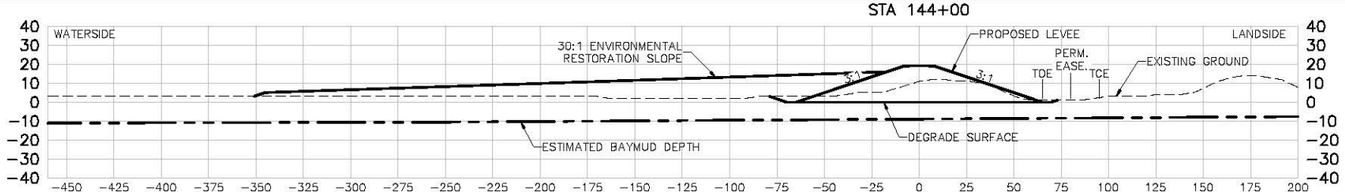
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 138+00 TO STA 143+00

Sheet reference number:
C-44

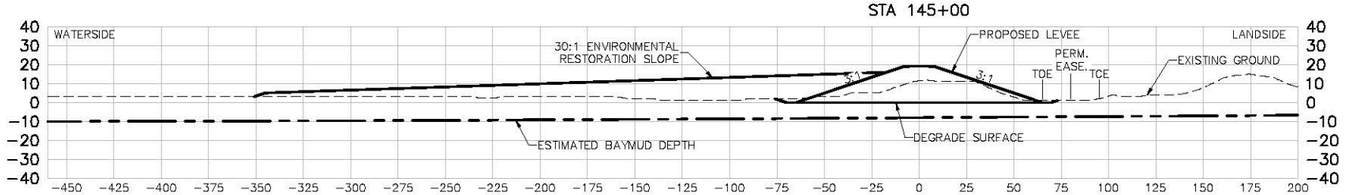
UPDATE

Border Revised 08/30/04, DESCRIPTIONS

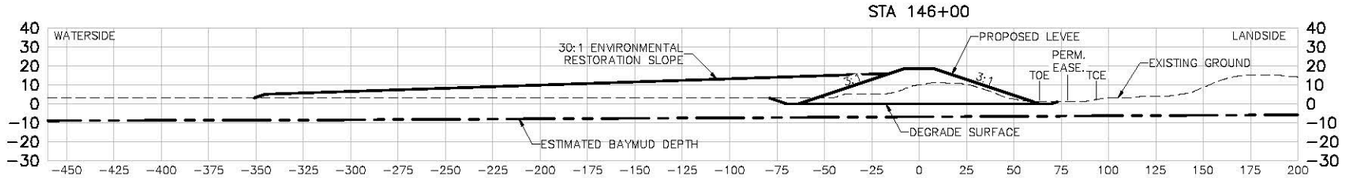
STA 144+00



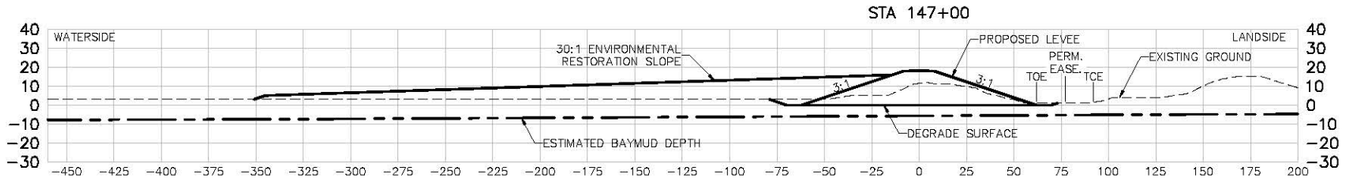
STA 145+00



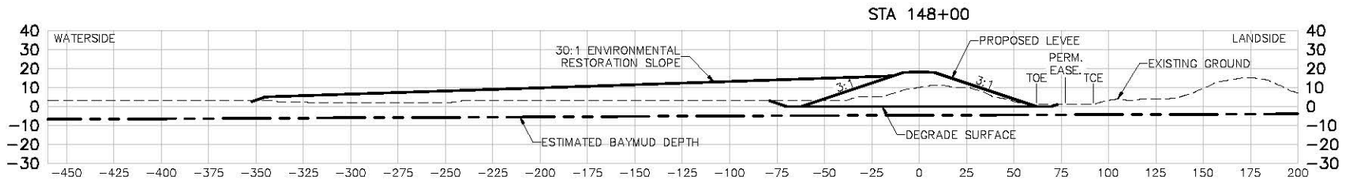
STA 146+00



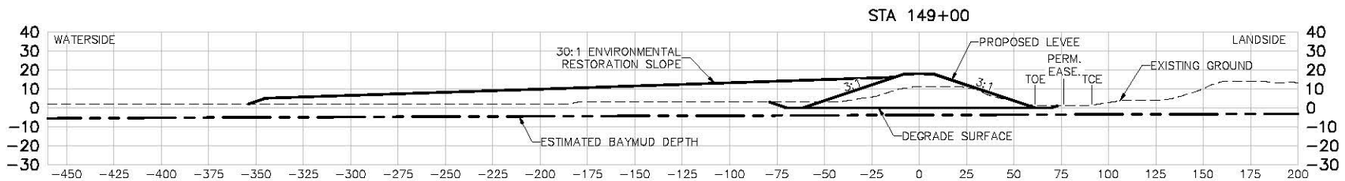
STA 147+00



STA 148+00



STA 149+00



US Army Corps of Engineers
San Fransisco District

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File name: C-21 Sections
Plot scale:
Dwg scale:

DEPARTMENT OF THE ARMY
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SACRAMENTO, CALIFORNIA

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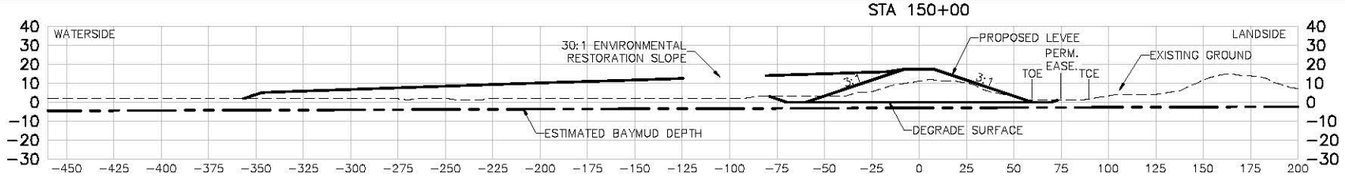
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 144+00 TO STA 149+00

Sheet reference number:
C-45

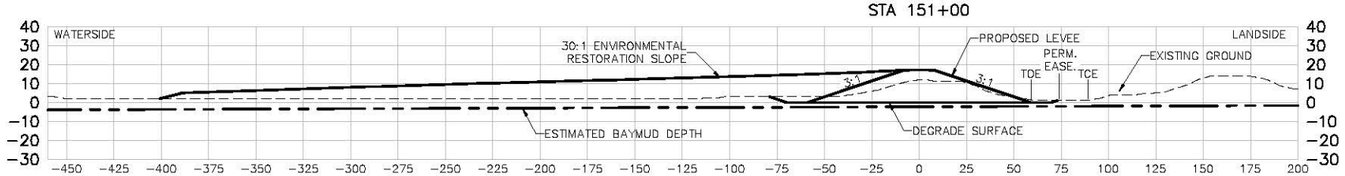
UPDATE

Border: Revised 08/30/04, DESCRIPTIONS

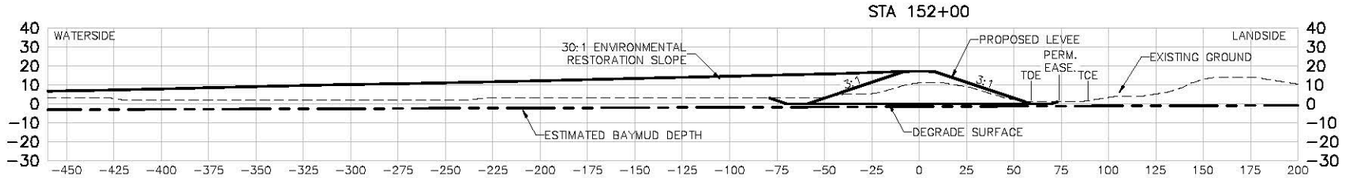
STA 150+00



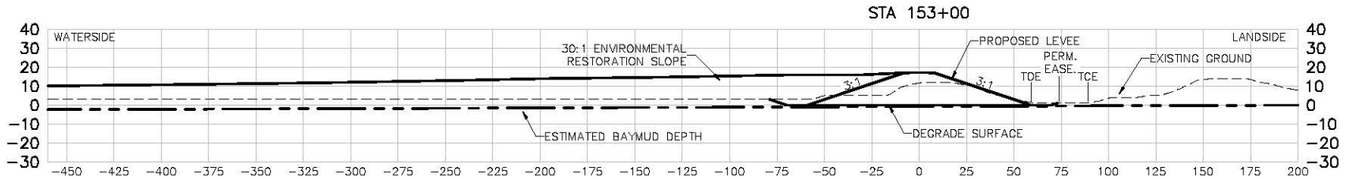
STA 151+00



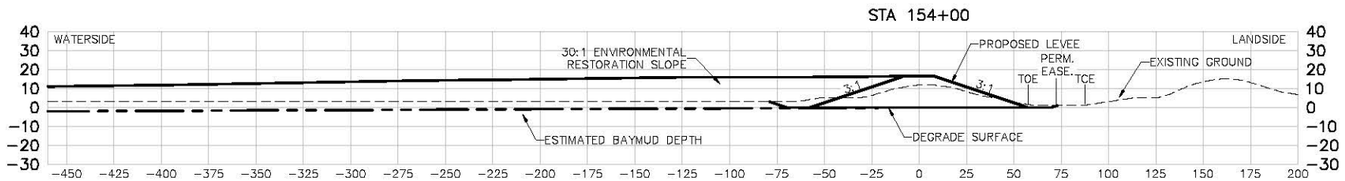
STA 152+00



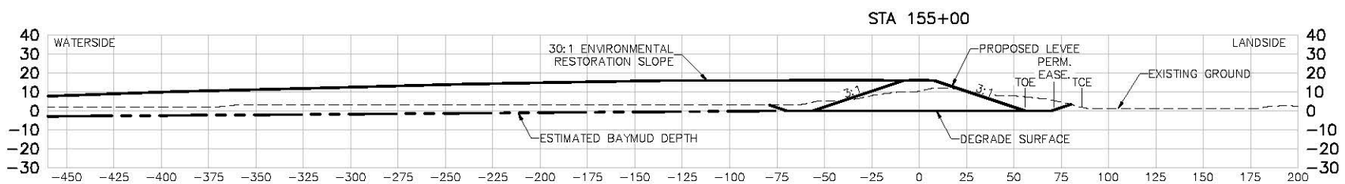
STA 153+00



STA 154+00



STA 155+00



US Army Corps of Engineers
San Fransisco District

Symbol	Description	Date	Approved

Date: 06/24/2014
Rev. XX
Designed by: S. JIMENEZ
Spec No: XX
Design File No: XXX
Dwn by: V. RUSSO
Drawing Code:
Reviewed by: XX
Submitted by: S. JIMENEZ
File name: C-21 Sections
Plot scale:
Dwg scale:

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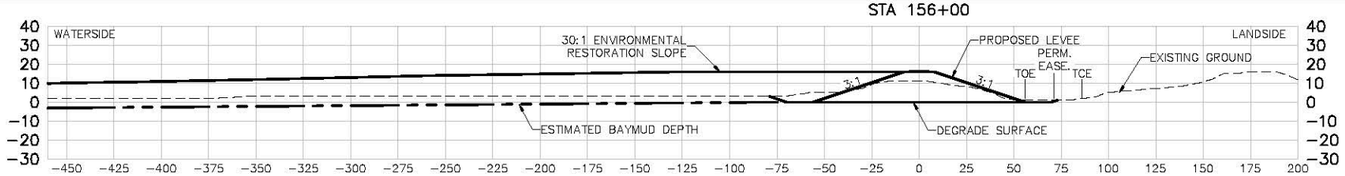
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 150+00 TO STA 155+00

Sheet reference number:
C-46

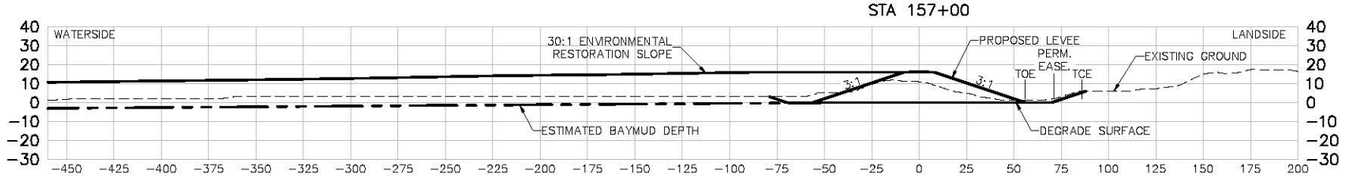
UPDATE

Border Revised 08/30/04, DESCRIPTIONS

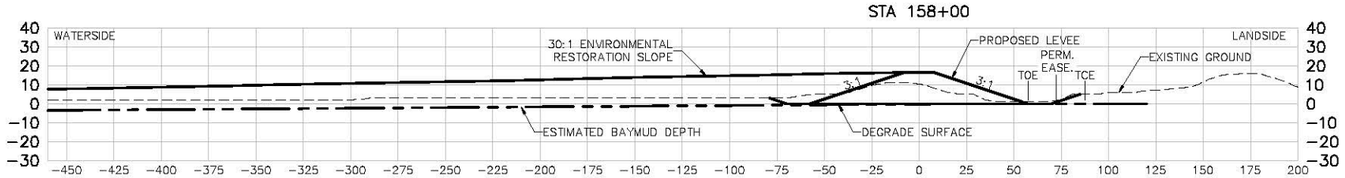
STA 156+00



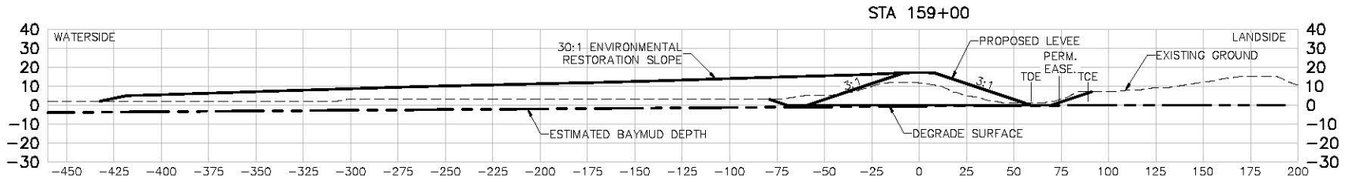
STA 157+00



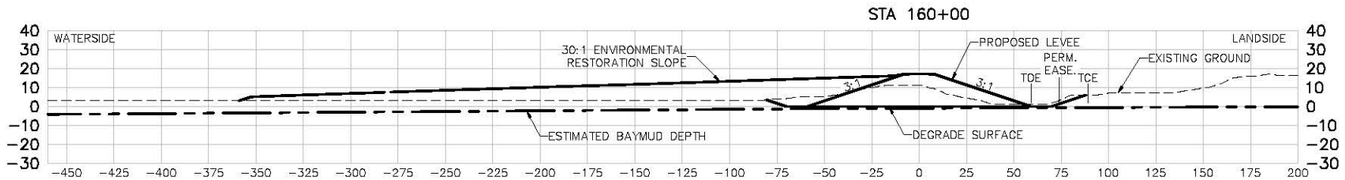
STA 158+00



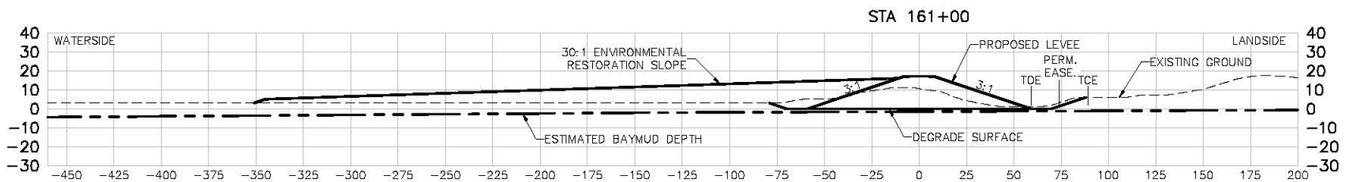
STA 159+00



STA 160+00



STA 161+00



US Army Corps of Engineers
San Fransisco District

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Plot scale:
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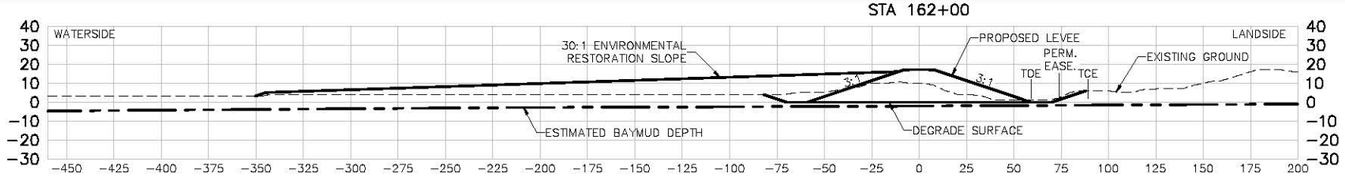
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 156+00 TO STA 161+00

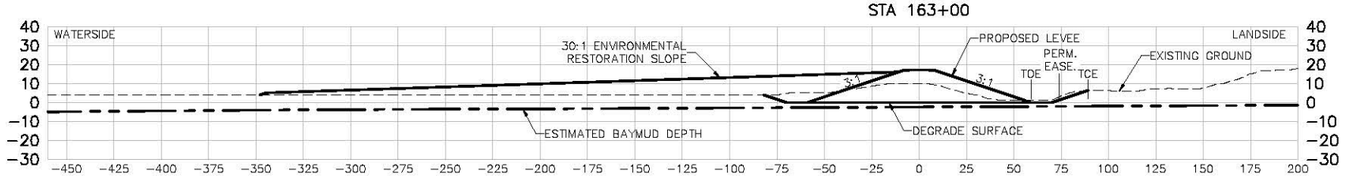
Sheet reference number:
C-47

UPDATE

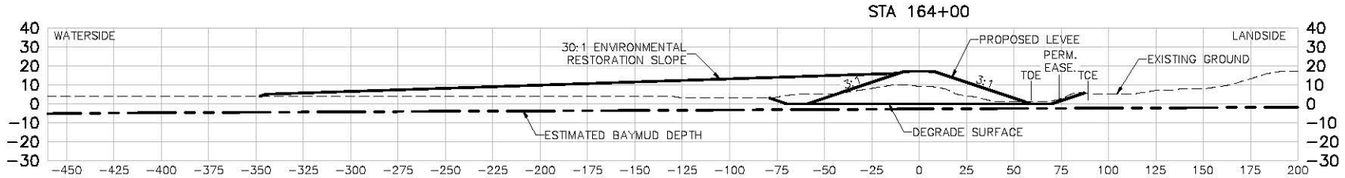
STA 162+00



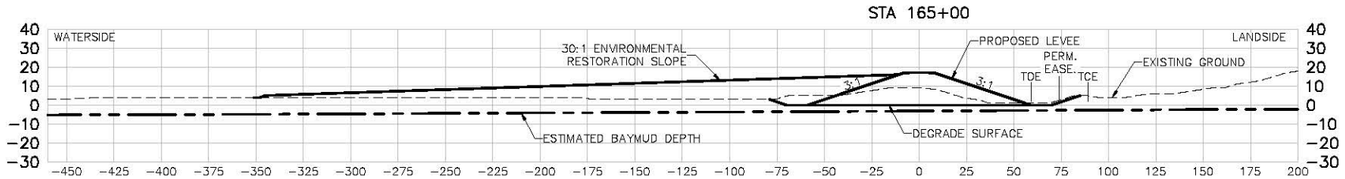
STA 163+00



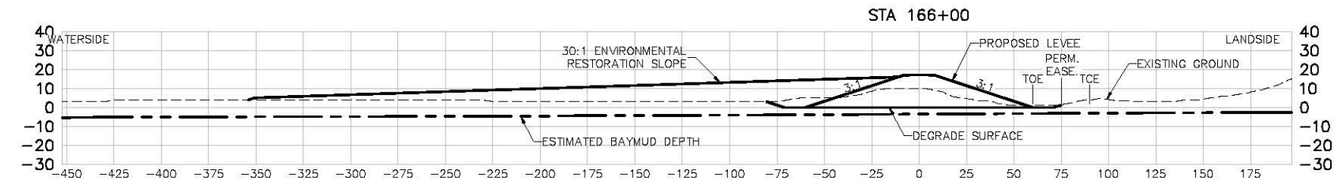
STA 164+00



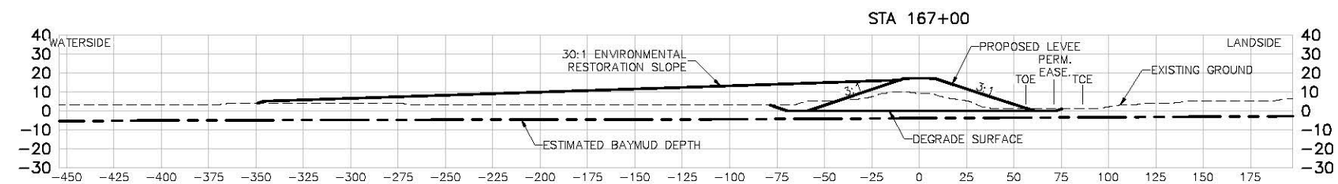
STA 165+00



STA 166+00



STA 167+00



US Army Corps of Engineers
San Fransisco District

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File name: C-21 Sections
Plot scale:
Dwg scale:

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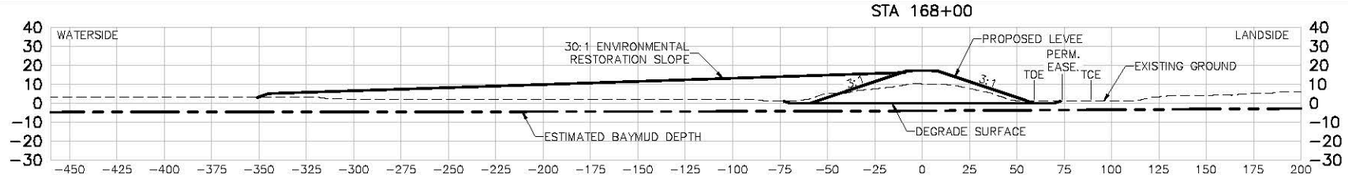
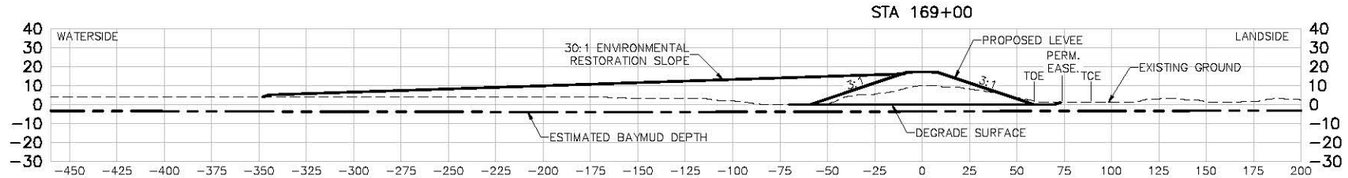
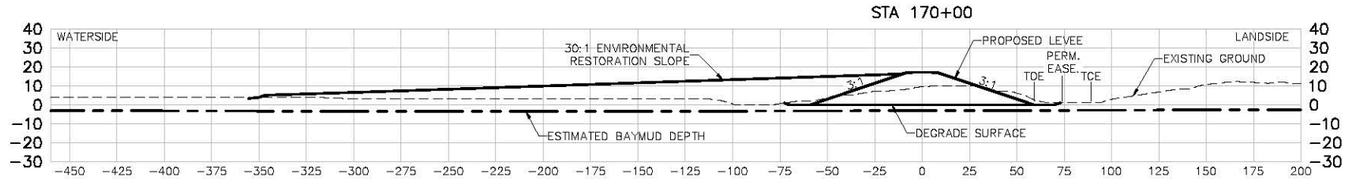
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 162+00 TO STA 167+00

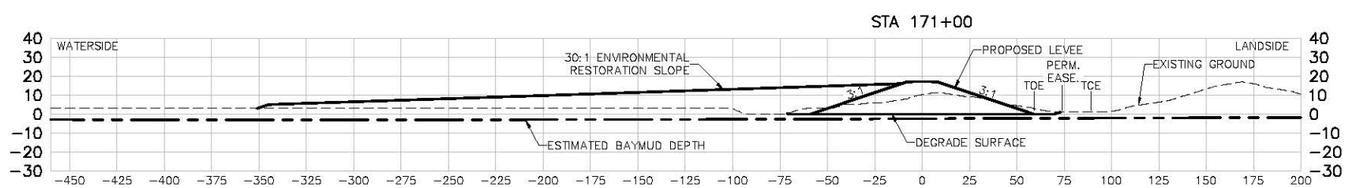
Sheet reference number:
C-48

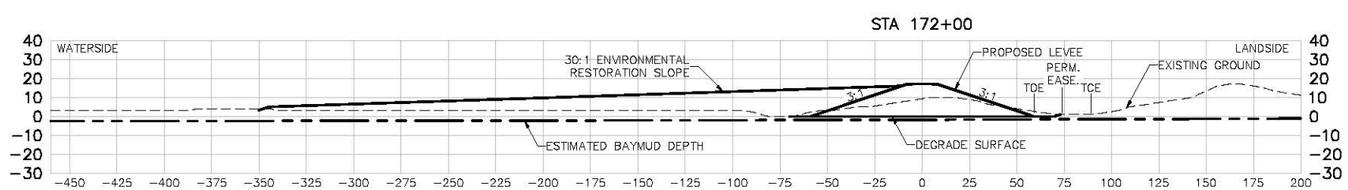
UPDATE

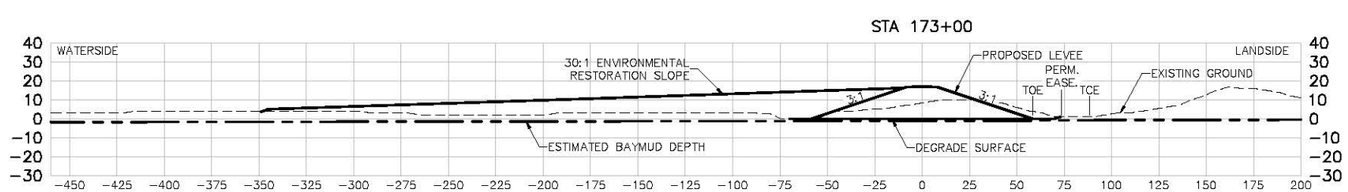












US Army Corps of Engineers
San Fransisco District

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File name: C-21 Sections
Plot scale:
Dwg scale:

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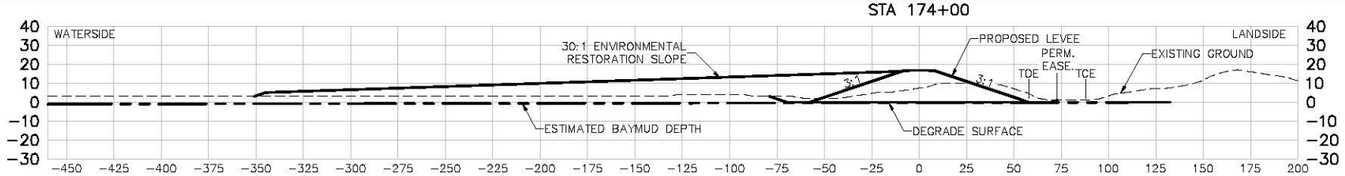
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 168+00 TO STA 173+00

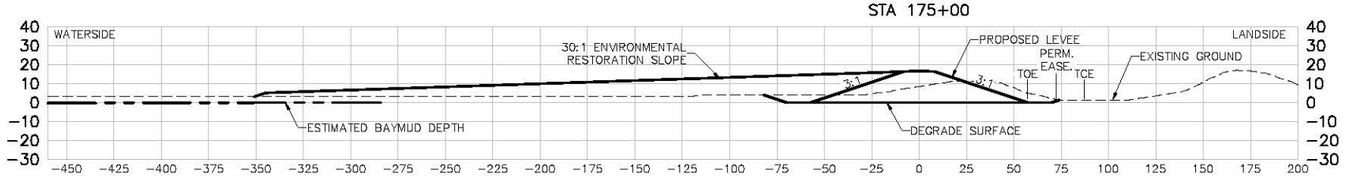
Sheet reference number:
C-49

UPDATE

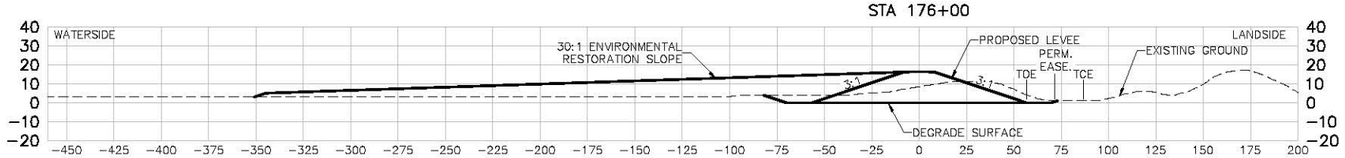
STA 174+00



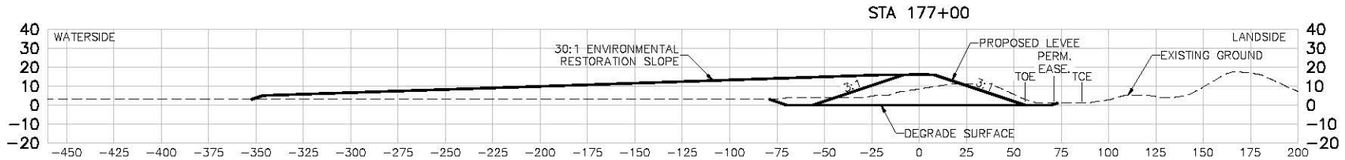
STA 175+00



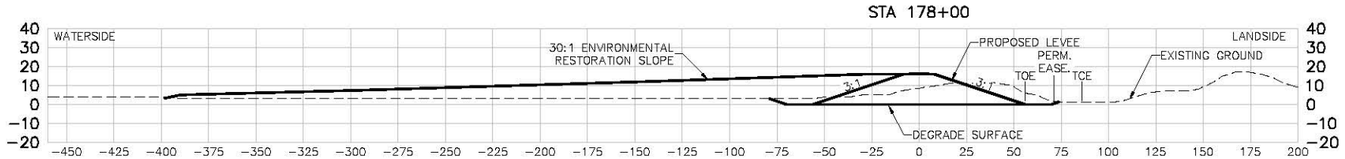
STA 176+00



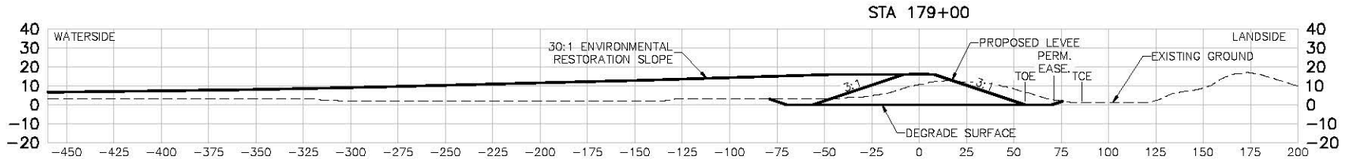
STA 177+00



STA 178+00



STA 179+00



US Army Corps of Engineers
San Fransisco District

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Designed by: S. JIMENEZ
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File name: C-21 Sections
Plot scale:
Dwg scale:

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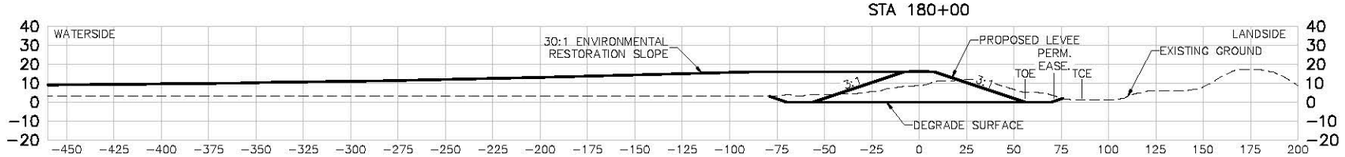
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 174+00 TO STA 179+00

Sheet reference number:
C-50

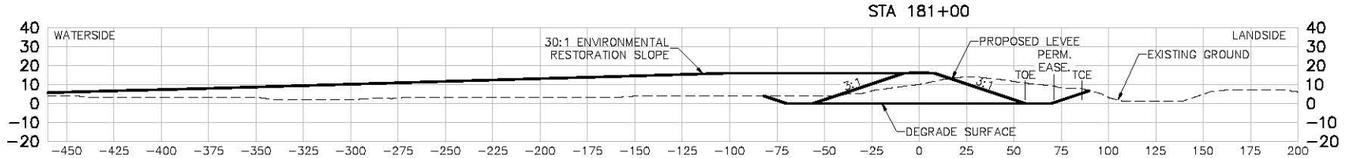
UPDATE

Border Revised 08/30/04, DESCRIPTION

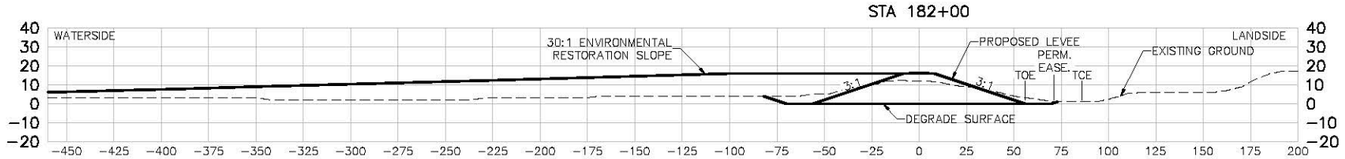
STA 180+00



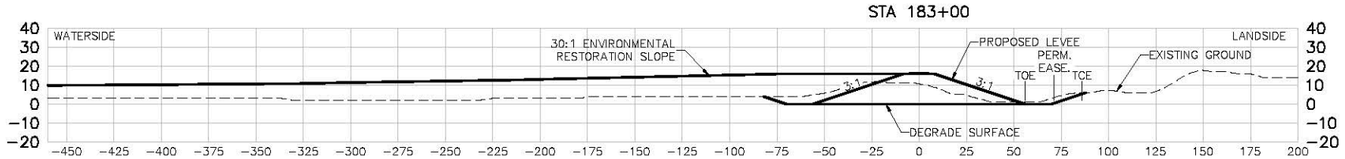
STA 181+00



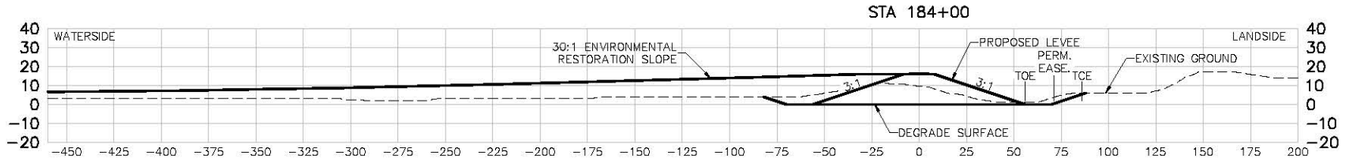
STA 182+00



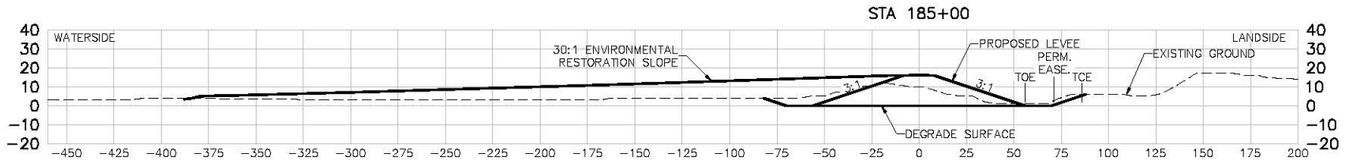
STA 183+00



STA 184+00



STA 185+00



US Army Corps of Engineers
San Fransisco District

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Spec No: XX
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File name: C-21 Sections
Plot scale:
Dwg scale:

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SACRAMENTO, CALIFORNIA

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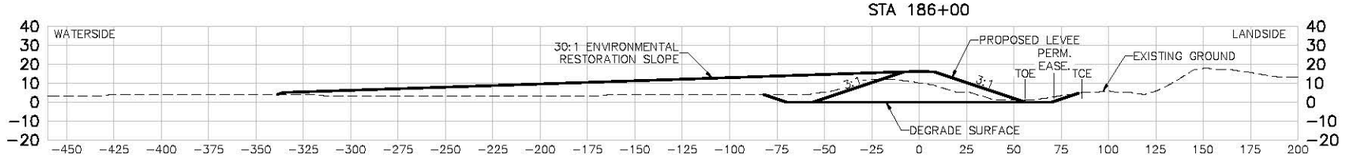
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 180+00 TO STA 185+00

Sheet reference number:
C-51

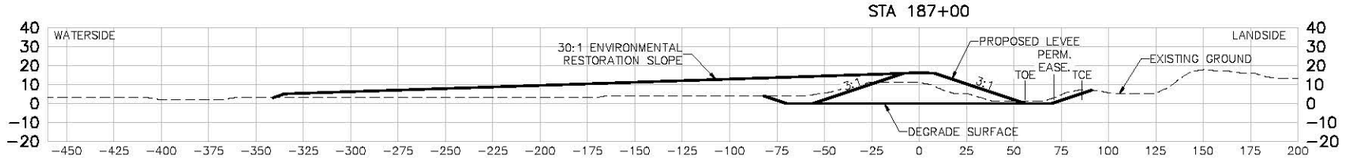
UPDATE

Border Revised 08/30/04, DESCRIPTION

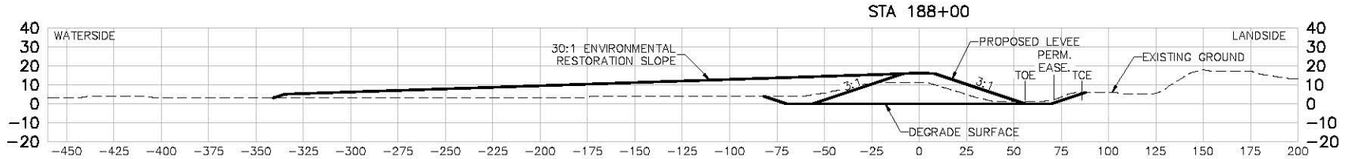
STA 186+00



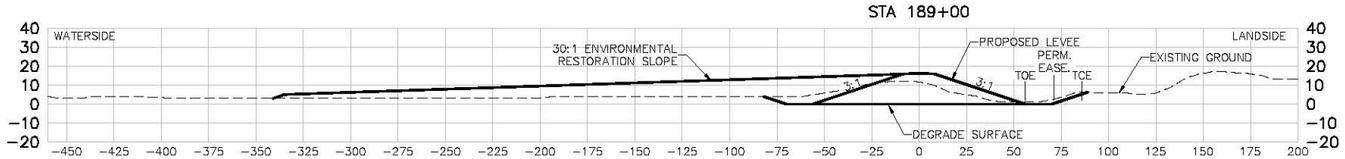
STA 187+00



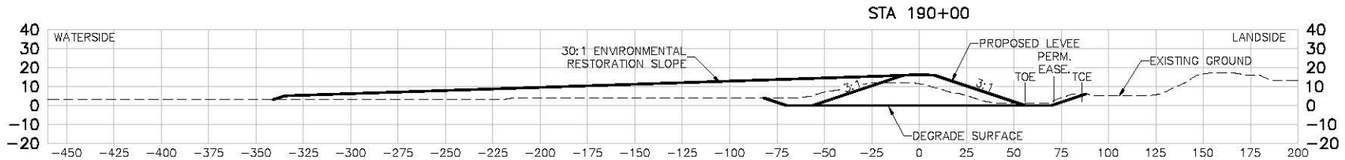
STA 188+00



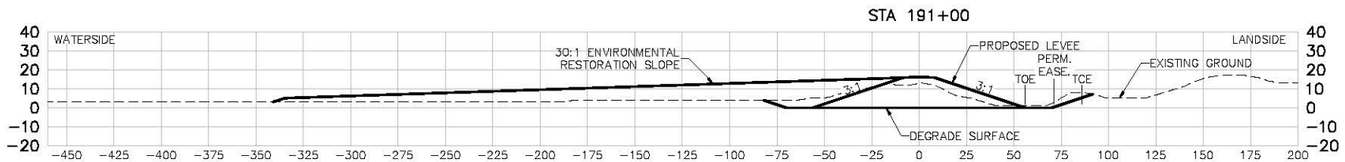
STA 189+00



STA 190+00



STA 191+00



US Army Corps of Engineers
San Fransisco District

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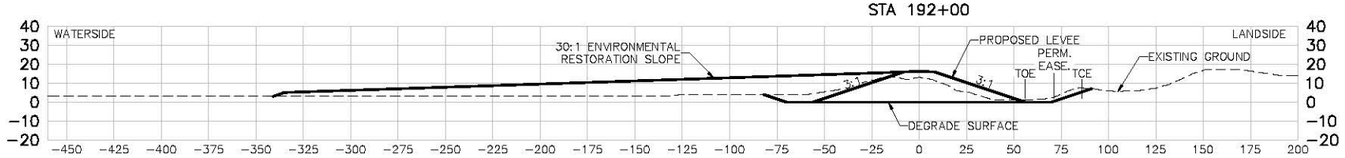
SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 186+00 TO STA 191+00

Sheet reference number:
C-52

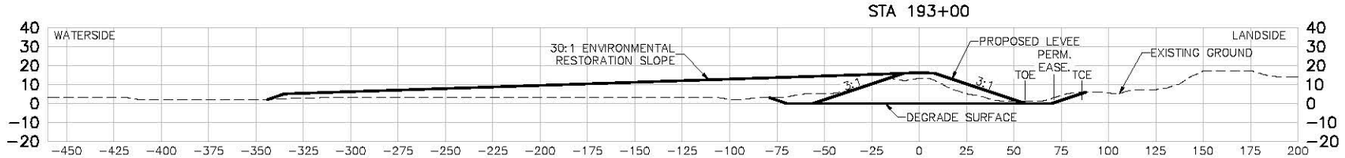
UPDATE

Border Revised 08/30/04, DESCRIPTION

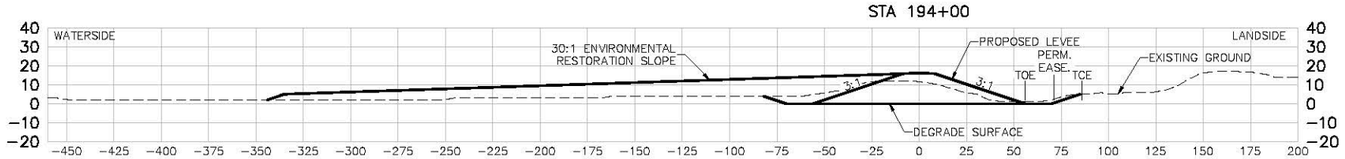
STA 192+00



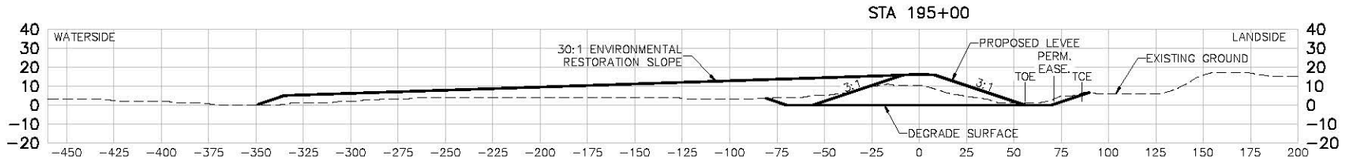
STA 193+00



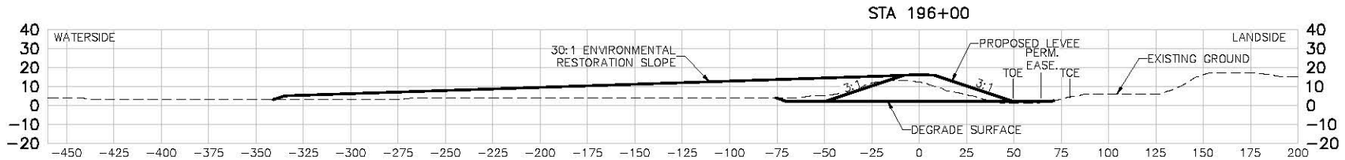
STA 194+00



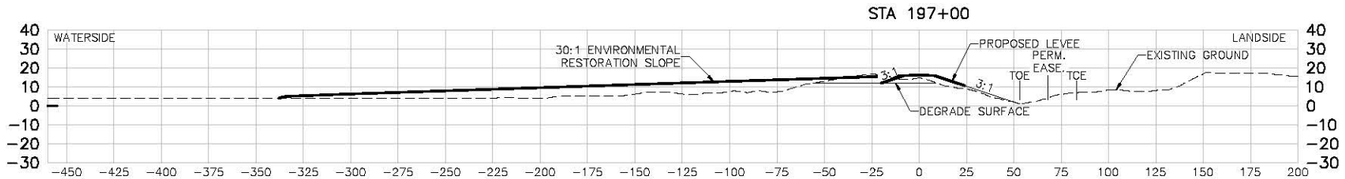
STA 195+00



STA 196+00



STA 197+00



US Army Corps of Engineers
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SACRAMENTO, CALIFORNIA

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SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTIONS STA 192+00 TO STA 197+00

Sheet reference number:
C-53

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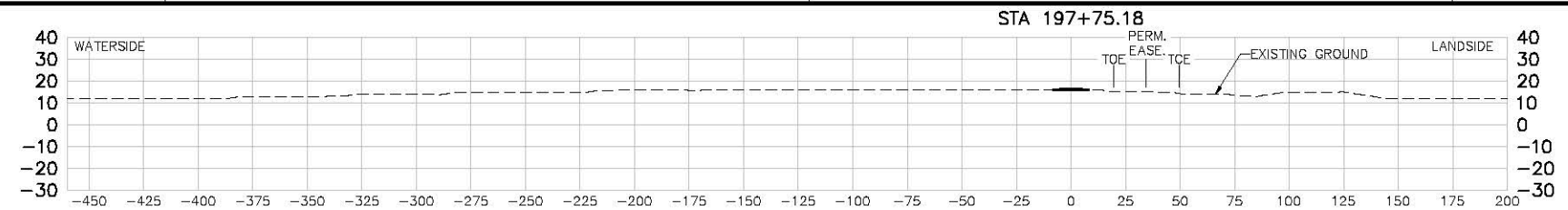

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SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
SECTION STA 197+75.18

Sheet reference number:
C-54

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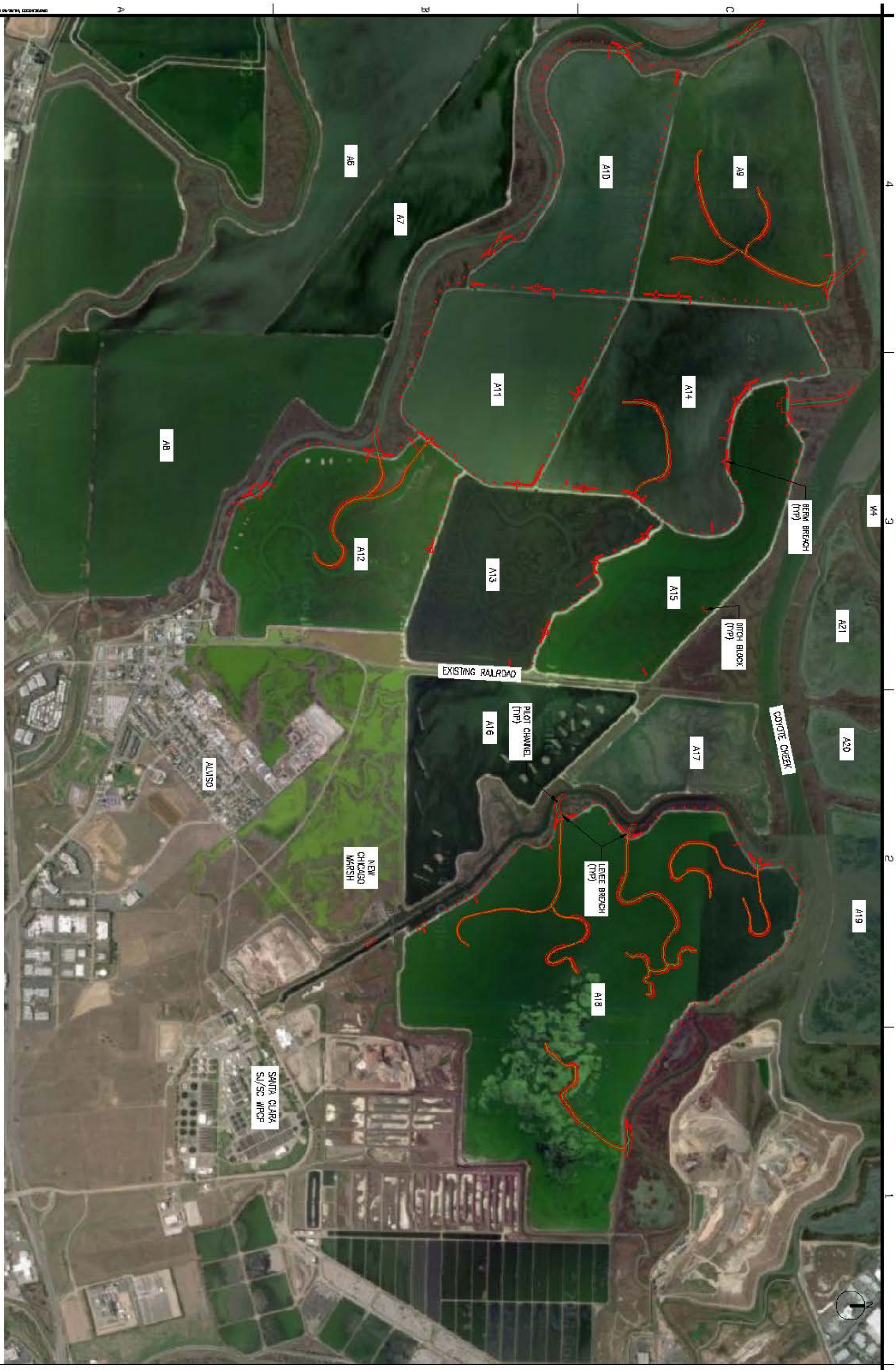

SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
IN POND RESTORATION PLAN

Sheet reference number: C-55

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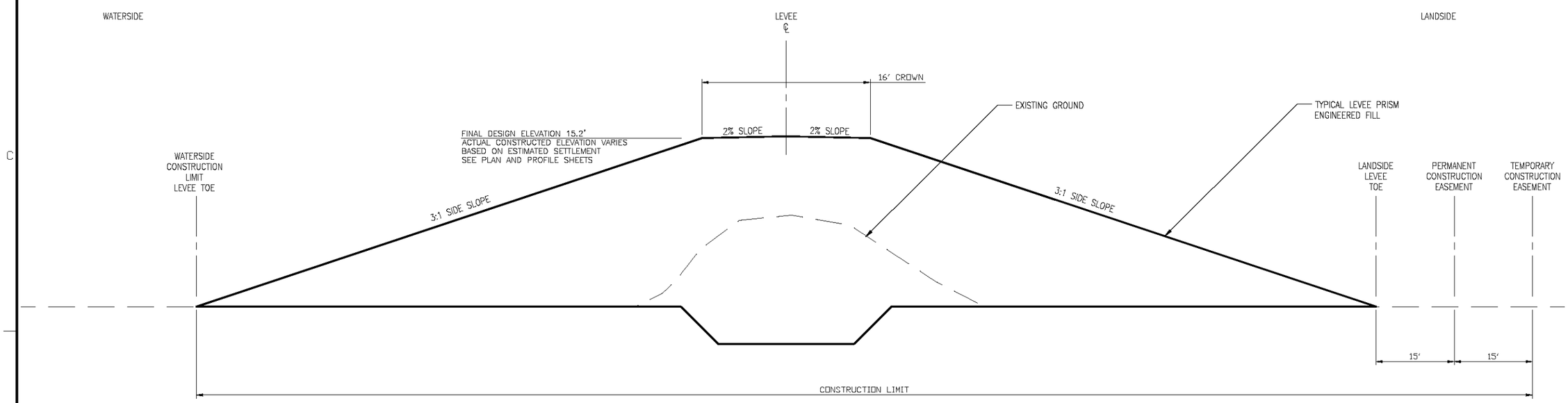

TYPICAL LEVEE CROSS SECTION

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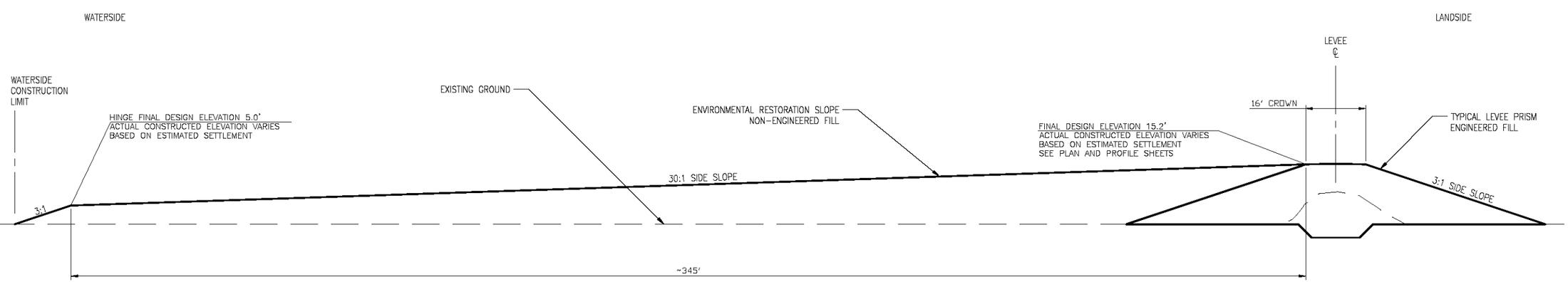

TYPICAL LEVEE CROSS SECTION
W/ENVIRONMENTAL RESTORATION SLOPE

SCALE: NTS

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SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
TYPICAL LEVEE CROSS SECTIONS

Sheet reference number:
D-01

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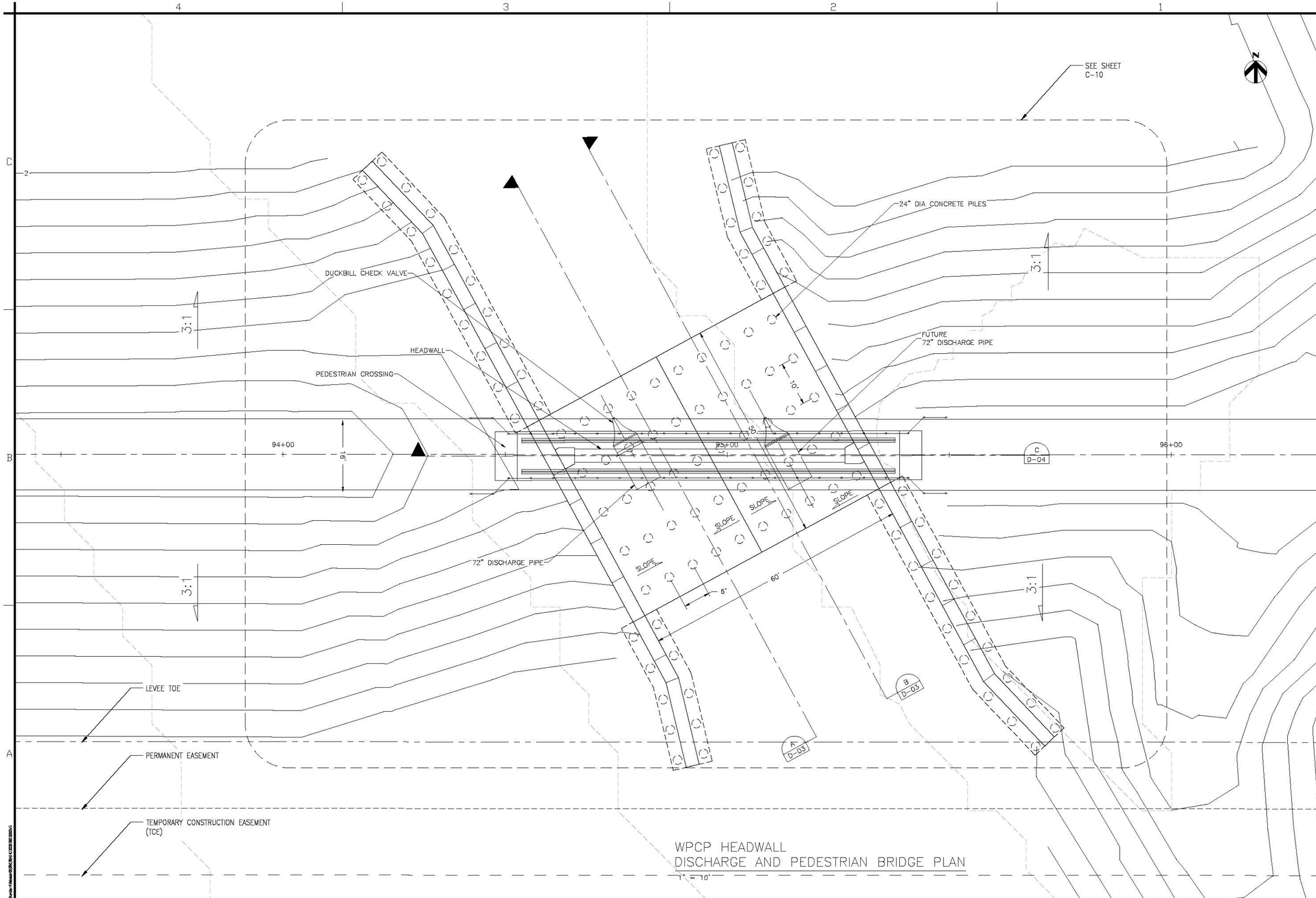

WPCP HEADWALL
DISCHARGE AND PEDESTRIAN BRIDGE PLAN
1" = 10'

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SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
WWTP FLOOD WALL PLAN VIEW

Sheet reference number:
D-02

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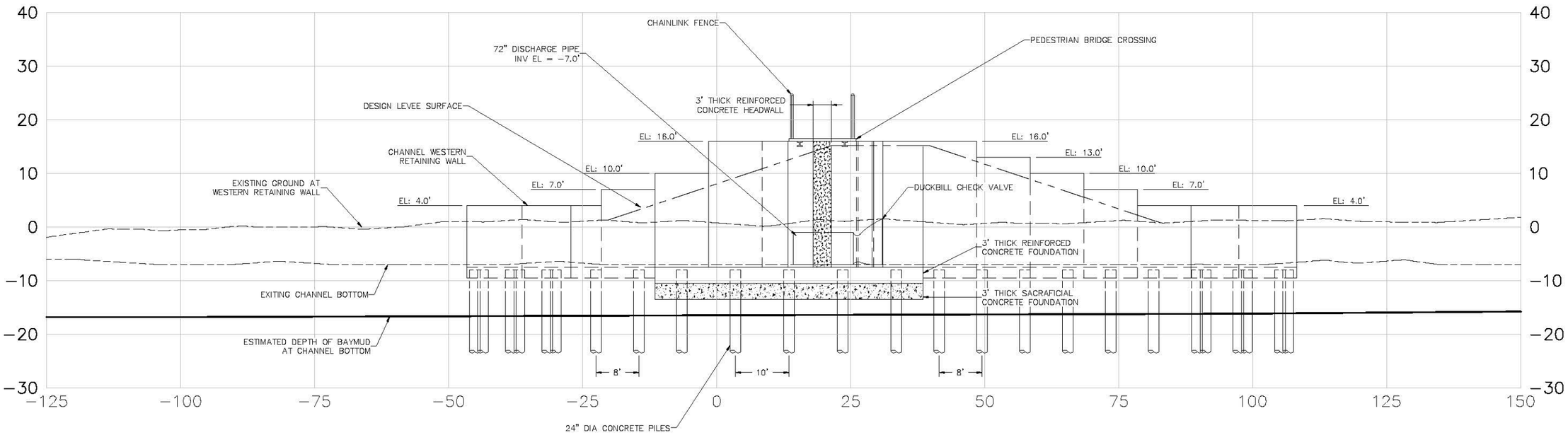
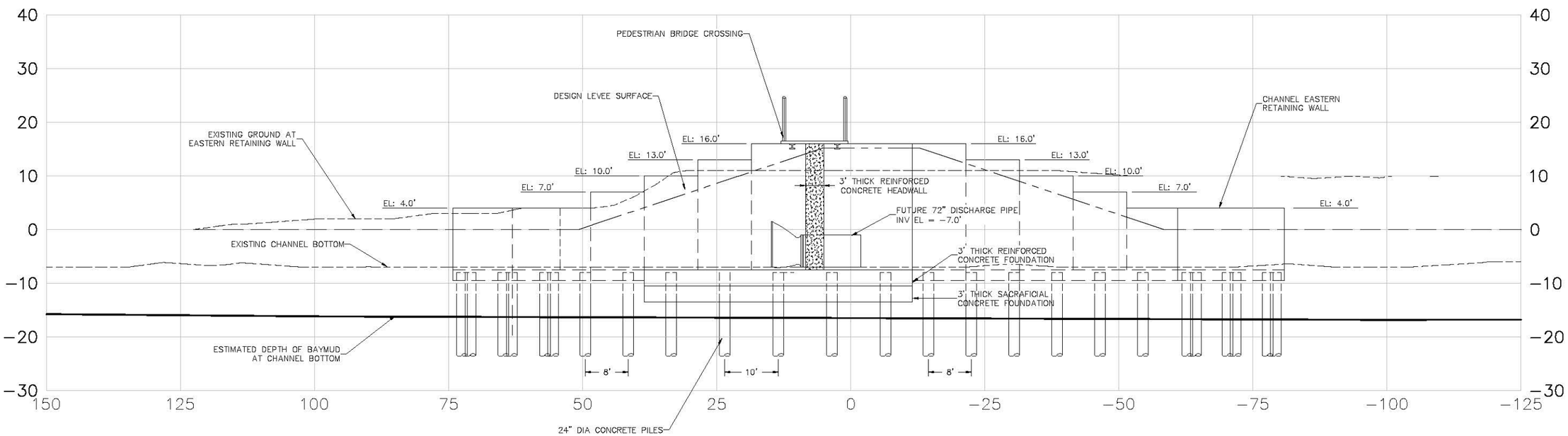


WESTERN SECTION VIEW (A / D-02)

1" = 10'



EASTERN SECTION VIEW (B / D-02)

1" = 10'

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Submitted by: S. JIMENEZ
File name: D-03
Plot date:
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SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
WWTP FLOOD WALL SECTIONS I

Sheet reference number:
D-03

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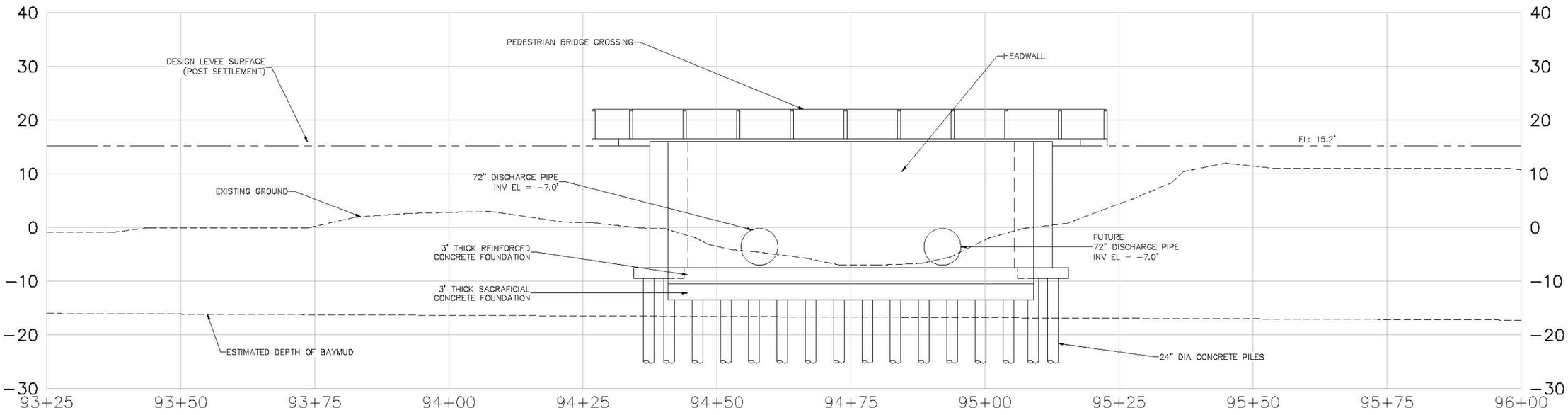

SOUTHERN SECTION VIEW

C
–

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Design File no: XXX
Drawing Code:
File name: D-04
Plot date:
Dwg status:
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SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
WWTP FLOOD WALL SECTIONS II

Sheet reference number:
D-04

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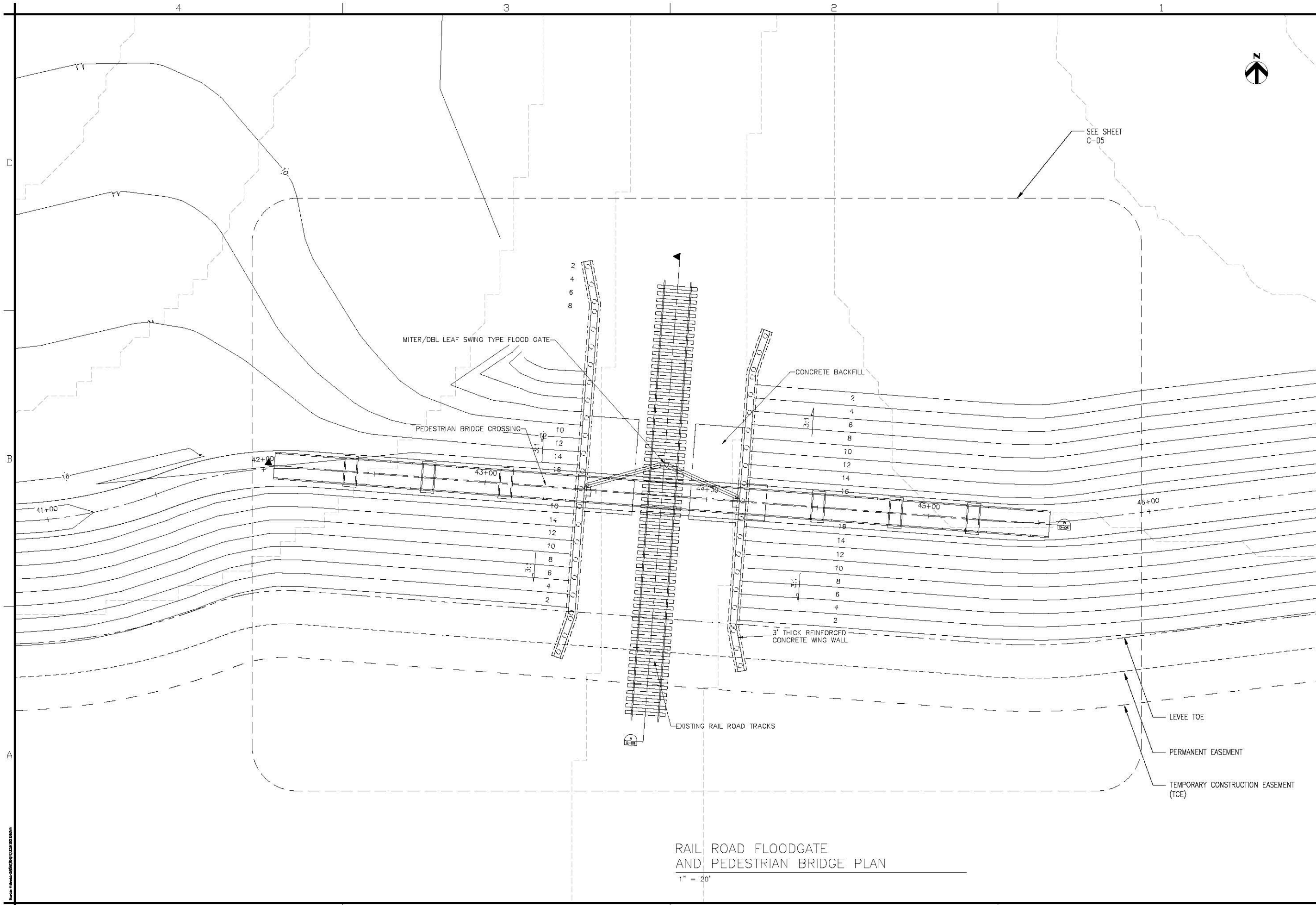

RAIL ROAD FLOODGATE
AND PEDESTRIAN BRIDGE PLAN

1" = 20'

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San Fransisco District

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File name: D-05
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SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
RAIL ROAD FLOODGATE PLAN

Sheet reference number:
D-05

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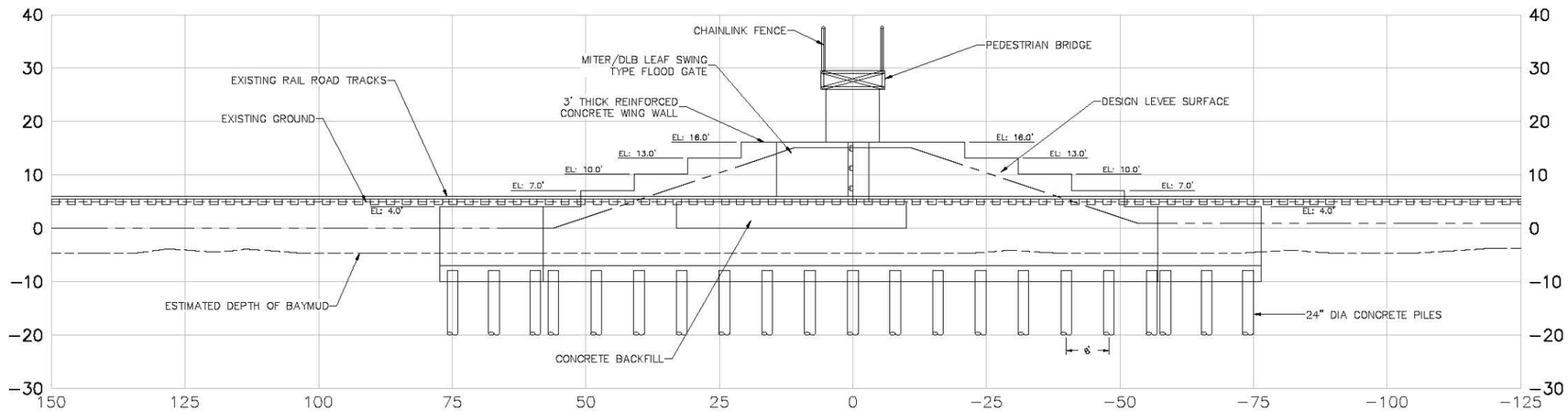
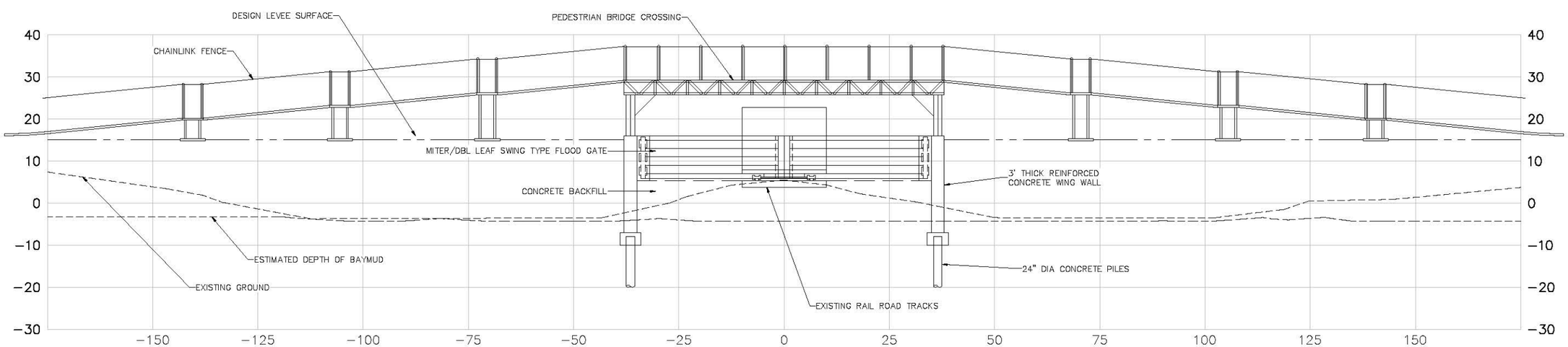


SECTION VIEW
NTS
A
–



SECTION VIEW
NTS
B
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Submitted by: S. JIMENEZ
File name: D-06
Plot date:
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SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
WWTP FLOOD WALL SECTIONS I

Sheet reference number:
D-06

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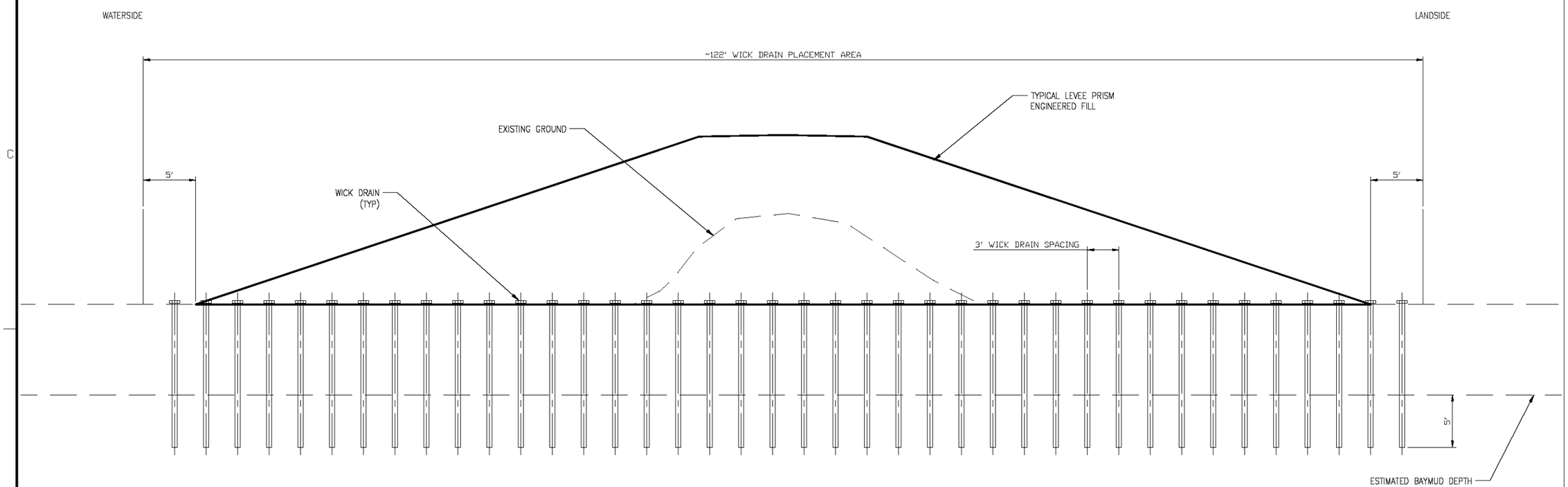
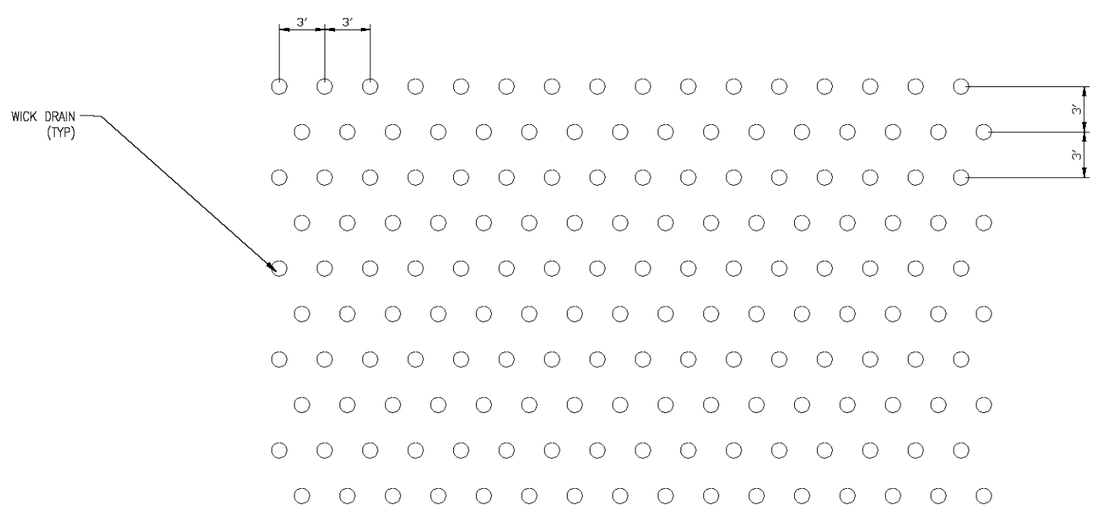


TYPICAL WICK DRAIN PLACEMENT SECTION

SCALE: NTS



TYPICAL WICK DRAIN PLACEMENT PLAN

SCALE: NTS

US Army Corps of Engineers
San Fransisco District

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Submitted by: S. JIMENEZ
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Spec No: XX
Design File No: XXX
Drawing Code:
File name:
Plot date:
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SOUTH SAN FRANCISCO BAY SHORELINE
FLOOD RISK MANAGEMENT FEASIBILITY STUDY
SHORELINE LOCAL PREFERRED PLAN ALTERNATIVE
WICK DRAIN DETAILS

Sheet reference number:
D-07

UPDATE

Border: Revised 08/30/04, CESPT/ECING

Existing Utility Information Technical Memo Appendix

EXISTING UTILITY INFORMATION

South San Francisco Bay Shoreline Study ***September 29, 2011***

Reviewed by: Sergio Jimenez, PE

Prepared by: Daniel Teak, EIT

1.0 Introduction

Under task item 3b from the Schedule of Services for *South San Francisco Bay Shoreline Study* dated 17 May 2011, the contractor is required to gather utility data that may be impacted by the project. The following utility information is a preliminary accounting and summary of the existing utilities in the project area that may be impacted by flood risk management features. Following identification of the NED/NER and Locally Preferred Plan, more focused utility surveys and site visit will be conducted to update the technical memo.

2.0 Sources of Utility Information

Multiple sources were used to gather information on existing utilities in the project area. They are listed and described below:

- Water Pollution Control Plant (WPCP) GIS Database – HDR was provided with a GIS database from the City of San Jose. The database included descriptions and locations of underground utilities operated by the WPCP. This information has been summarized in Tables 1A, and 1B (**Attachment 1**) and has been mapped in Figures 1A, 1B, and 1C (**Attachment 2**).

- City of San Jose Utility Database (https://cpms.sanjoseca.gov/emap/) – This website was recommended for use for as a preliminary accounting of utilities. It consists of maps showing location and use of existing utilities. The information gathered from this website has been summarized in Table 2 (**Attachment 1**) and mapped in Figure 2 (**Attachment 2**).

- Aerial and street level photography – A series of aerial and street level photography was used to identify approximate locations of utilities not identified by either of the previous databases. This information has been summarized in Table 3 (**Attachment 1**) and Figure 3 (**Attachment 2**).

3.0 Existing Utilities

In total, there are over 80 known utilities that may be impacted by construction of flood control features. Utilities operated by the WPCP comprise of a large portion of the existing utilities potentially impacted. The majority of the WPCP's 61 known utilities in the project footprint are sited along both sides of Artesian Slough between the WPCP and the Don Edwards Center.

A PG&E owned power line runs south through Pond A18, crosses Artesian Slough, and runs on the southern side of Grand Blvd. Storm drains, sanitary sewers, and other utilities potentially conflict on the west and east side of Alviso and along Grand Blvd.

Attachment 1 – Tables

Table 1A: Plant Pipeline Utilities

Map Label	Location	Diameter	Material	Use	Status	Owner	Length	Notes	Required Modification						
									1A	1B	1C	1D	2	3	4
1	Buried. East of Artesian Slough, just north of plant	6"	VCP	Storm Drain	In-Use	--	321.1	--			X				
2	Buried. East of Artesian Slough to proposed tide gate.	6"	STL	Sulfur Dioxide Solution	In-Use	--	358.0	Originates from SO2 Bldg			X				
3	Buried. East of Artesian Slough to proposed tide gate.	4"	PVC	Sulfur Dioxide Vacuum	In-Use	--	483.4	--			X				
4	Buried. Discharges on east side of Artesian Slough	77" x 121"	RCBC	Plant Effluent	In-Use	--	496.3	--			X				
5	Above Ground, At southern tip of Artesian Slough	1"	PVC	Sodium Bisulfite Solution	In-Use	--	6.5	--			X				
6	Above Ground, At southern tip of Artesian Slough	1"	PVC	Sodium Bisulfite Solution	In-Use	--	7.1	--			X				
7	Buried. Discharges on east side of Artesian Slough	84"	RCP	Plant Effluent	In-Use	--	492.9	--			X				
8	Buried. South of Artesian Slough.	8"	--	Recycled Water	Abandoned	--	2.4	--			X				
9	Above Ground. South of Artesian Slough.	8"	DIP	Recycled Water	Abandoned	--	1.7	--			X				
10	Above Ground. South of Artesian Slough.	8"	DIP	Recycled Water	Abandoned	--	2.1	--			X				
11	Floating on Water at northen end of eastern side of artesian slough	1.5"	PVC	Sulfur Dioxide Vacuum	In-Use	--	26.5	Flexible PVC Hose to Sulfur Dioxide Induction Unit located in Outfall Channel			X				
12	Buried. West of Artesian Slough, next to North side of Zanker Road Landfill	??	RCBC	Storm Drain	In-Use	--	26.5	Flows to Outfall Stormwater Pump Station, gates closed. Can flow to Artesian Slough.			X				
13	Buried. Along West side of Artesian Slough	4"	PVC	Sodium Bisulfite Solution	In-Use	--	2,712.7	Terminates at Plant Outfall Channel			X				
14	Buried. Along East side of Artesian Slough	6"	PVC	Sulfur Dioxide Vacuum	Abandoned	--	2,614.3	Cut and Capped in 2010 as part of Alternative Disinfection Project			X				
15	Buried. Along East side of Artesian Slough	6"	PVC	Sulfur Dioxide Vacuum	Abandoned	--	478.2	--			X				
16	Buried. Northern on east side of artesian and facility	4"	PVC	Sulfur Dioxide Vacuum	In-Use	--	6.5	--			X				
17	Buried. Northern on east side of artesian and facility	4"	PVC	Sulfur Dioxide Vacuum	In-Use	--	1.6	--			X				
18	Above Ground. South of Artesian Slough.	8"	DIP	Recycled Water	Abandoned	--	6.4	--			X				
19	Floating on Water, ties into 2, 3, or 15.	1.5"	PVC	Sulfur Dioxide Vacuum	In-Use	--	31.1	Flexible PVC Hose to Sulfur Dioxide Induction Unit located in Outfall Channel			X				
20	Buried. Along East side of Artesian Slough	4"	PVC	Sulfur Dioxide Vacuum	In-Use	--	2,665.3	--			X				
21	Buried. At southern tip of Artesian Slough	8"	--	Recycled Water	Abandoned	--	29.1	--			X				
22	Above Ground. At souther tip of Artesian Slough	1"	STL	Sodium Bisulfite Solution	In-Use	--	8.8	--			X				
23	Above Ground. At souther tip of Artesian Slough	1"	STL	Sodium Bisulfite Solution	In-Use	--	9.1	--			X				
24	Buried. Dischargest on southwest side of Artesian Slough	45"	RCP	Plant Effluent	Abandoned	--	487.0	Abandoned in 1975			X				
25	Buried. Discharges on east side of Artesian Slough	84"	RCP	Plant Effluent	Abandoned	--	297.6	--			X				
26	Above Ground. South of Artesian Slough.	8"	--	Recycled Water	Abandoned	--	4.7	--			X				
27	Above Ground. South of Artesian Slough.	8"	--	Recycled Water	Abandoned	--	4.4	--			X				
28	Above Ground. South of Artesian Slough.	8"	--	Recycled Water	Abandoned	--	4.7	--			X				
29	Above Ground. South of Artesian Slough.	8"	--	Recycled Water	Abandoned	--	28.8	--			X				
30	Buried. Southeast of Artesian Slough	8"	--	Recycled Water	Abandoned	--	29.5	--			X				
31	Above Ground. At southern tip of Artesian Slough	8"	DIP	Recycled Water	Abandoned	--	15.1	--			X				
32	Buried. Dischargest southeast of Artesian Slough	8"	DIP	Recycled Water	Abandoned	--	71.4	--			X				
33	Above Ground. At southern tip of Artesian Slough	8"	DIP	Recycled Water	Abandoned	--	12.2	--			X				
34	Buried. At southern tip of Artesian Slough	8"	DIP	Recycled Water	Abandoned	--	70.9	--			X				
35	Above Ground. South of Artesian Slough.	8"	--	Recycled Water	Abandoned	--	7.4	--			X				
36	Buried. South of Artesian Slough.	8"	--	Recycled Water	Abandoned	--	30.6	--			X				
37	Buried. Nothern on east side. Connects to 11.	1.5"	PVC	Sulfur Dioxide Vacuum	In-Use	--	44.7	--			X				
38	Buried. Just north of treatment plant	16"	DIP	Recycled Water	In-Use	--	177.3	--			X				
39	Buried. south of Artesian slough	8"	DIP	Recycled Water	Abandoned	--	165.8	--			X				
40	Above Ground. Runs north south to southeast of artesian slough	8"	DIP	Recycled Water	Abandoned	--	174.8	--			X				
41	Above Ground. South of Artesian Slough.	8"	DIP	Recycled Water	Abandoned	--	11.5	--			X				
42	Above Ground. South of Artesian Slough.	8"	DIP	Recycled Water	Abandoned	--	8.0	--			X				
43	Above Ground. Runs north south to southeast of artesian slough	8"	DIP	Recycled Water	Abandoned	--	167.3	--			X				
44	Buried, To Southeast side of Artesian Slough	1.5"	PVC	Sodium Bisulfite Solution	In-Use	--	918.4	Unable to find Record Drawings for this pipe. Likely goes to the Outfall			X				
45	Buried, To Southeast side of Artesian Slough	16"	DIP	Recycled Water	Abandoned	--	418.7	--			X				

46	Buried. Northern on east side of artesian. Connects to 19.	1.5"	PVC	Sulfur Dioxide Vacuum	In-Use	--	42.8	--			X				
47	Buried. From facility at plant connecting to 48.	84"	RCP	Plant Effluent	Abandoned	--	87.2	--			X				
48	Buried. Burried, connects 47 and 25.	84"	RCP	Plant Effluent	Abandoned	--	20.7	--			X				
49	Bured. Discharges South of Artesian Slough	48" X 76"	ERCP	Storm Drain	In-Use	--	606.0	--			X				
50	Buried, along spreckles, Los Esteros, and to plant.	84"	RCP	Plant Effluent	In-Use	--	79.9	--			X				
51	Buried. Runs north out of plant	4"	PVC	Sodium Bisulfite Solution	In-Use	--	66.7	Terminates at Outfall, ran through former 6" SDV pipe when crossing under Los Esteros Rd			X				
52	Buried. Runs east-west in front of plant.	10"	ACP	Force Main	In-Use	City of San Jose Department of Public Works	5,656.4	--			X				

Note: '--' indications unknown or not provided.

Table 1B: Plant Electrical Utilities

Map Label	Location	Diameter	Status	Owner	Length	Notes	Required Modification						
							1A	1B	1C	1D	2	3	4
1	Buried, along east side of Artesian Slough	--	In-Use	--	2,998.3	--			X				
2	Buried, south of artesian, along front of plant	--	In-Use	--	256.3	--			X				
3	Buried, front plant to 2	--	In-Use	--	194.4	--			X				
4	Buried, from plant to 1	2-4"	Verify if Abandoned	PG&E	480.5	Electrical supply to now abandoned SBWR Pump Station			X				
5	Buried, along west side of Artesian Slough	??	Verify if Abandoned	PG&E	1,560.7	Electrical supply to Outfall Stormwater Pump/Lift Station			X				
6	Buried, from to south of Artesian	2"	Verify if Abandoned	PG&E	369.1	Electrical Supply to CSC Chlorine Station			X				
7	Buried, between 1 and 9 around structure at proposed tide gate location on east side of alviso slough	--	--	--	80.0	--			X				
8	Buried, along east side of Artesian Slough	--	--	--	658.1	--			X				
9	Buried, along east side of Artesian Slough, north of proposed flood gate	--	Installed	--	684.8	Electrical supply to A18 Weir	X	X	X	X	X	X	X

Note: '--' indications unknown or not provided.

Table 2: City of San Jose Utility Map

Map Label	Sheet	Location	Utility	Status	Owner	Length	Notes	Required Modification						
								1A	1B	1C	1D	2	3	4
1	19	Running North-South between Ponds A15, A13, A12, and Pond A16, NCM, and Alviso	Railroad	in-use	--	~5000'	--	X	X	X	X	X	X	X
2	19, 20	Running East-West through NCM crossing through Grand Bvld	Railroad	in-use	--	~5000'	--	X	X	X	X	X	X	X
3	19D	Crossing RR from NCM to Alviso Slough, and north of city (multiple potential crossing of levee alignment)	Storm Drain	in-use	--	~550'	--							X
4	19D	Crossing Spreckles Ave north of City	Storm Drain	in-use	--	~100'	--							X
5	5, 20	North South through Pond A18 and into WPCP area	Power Lines	in-use	PG&E	~6000'	--	X	X	X	X	X	X	X
6	20	Connecting to powerlines (previous), crossing Artesian Slough, and running across Grand Blvd	Power Lines	in-use	PG&E	~6000'	--			X		X	X	X
7	20C	Crossing Grand Blvd just south of Los Esteros	Storm Drain	in-use	--	~100'	--							X
8	20C SS	Along Spreckles connecting to Grand Blvd	Sanitary Sewer	in-use	--	~1800'	--							X
9	20C SS	Along Grand Blvd, from RR to Essex	Sanitary Sewer	in-use	--	~3300'	--							X

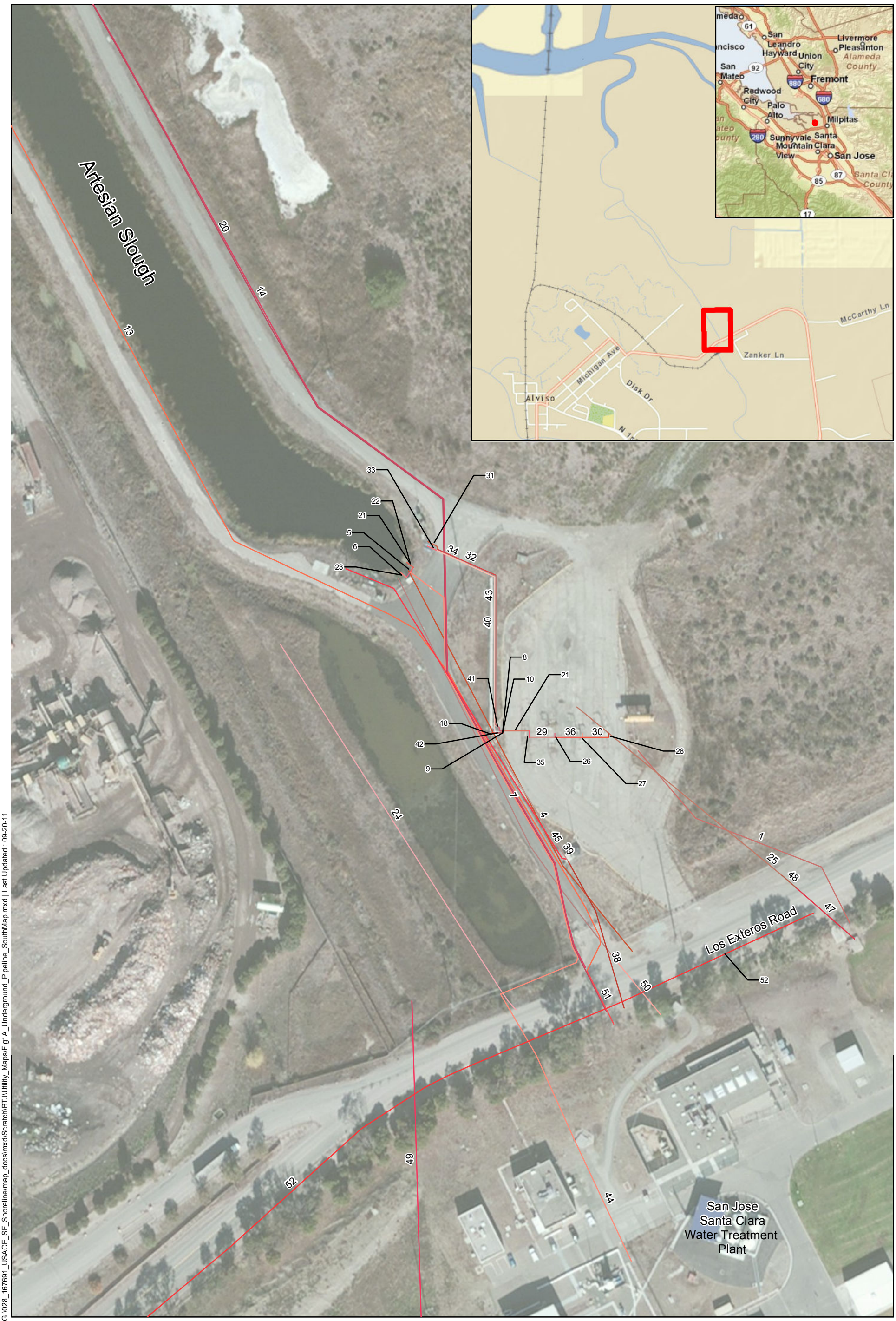
Note: '--' indications unknown or not provided.

Table 3: Aerial and Street Level Phtograph Utilities

Sheet	Location	Utility	Status	Owner	Length	Notes	Required Modification						
							1A	1B	1C	1D	2	3	4
1	Grand Blvd, to south of Don Edwards	Utility Access / USA	--	--	--	--			x				
2	Grand Blvd, to south of Don Edwards	Utility Access	--	--	--	--			x				
3	Grand Blvd, to south of Don Edwards	USA	--	--	--	--			x			x	x
4	Grand Blvd, to east of RR	Utility Access	--	--	--	--						x	x
5	Grand Blvd, to east of RR	Utility Access	--	--	--	--						x	x
6	Grand Blvd, just west of RR	SS MH	--	--	--	--						x	x
7	Grand Blvd, near intersection with Los Esteros	USA	--	--	--	--						x	x
8	Grand Blvd, near intersection with Los Esteros	USA	--	--	--	--						x	x
9	Grand Blvd, west of intersection with Los Esteros	Utility Access	--	--	--	--						x	x

Note: '--' indications unknown or not provided.

Attachment 2 – Figures



G:\028_167691_USACE_SF_Shoreline\map_docs\mxd\Scratch\BTJ\Utility_Maps\Fig1A_Underground_Pipeline_SouthMap.mxd | Last Updated : 09-20-11

0 100 200 Feet

1 inch = 100 feet

SJ-SC WTP Underground Pipeline Map South Figure 1A

HDR
ONE COMPANY | *Many Solutions*℠

USACE SF Shoreline

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0 100 200 Feet

1 inch = 100 feet

SJ-SC WTP Underground Pipeline Map North Figure 1B

USACE SF Shoreline

HDR ONE COMPANY | *Many Solutions*℠

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0 500 1,000 Feet

1 inch = 250 feet

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SJ-SC WTP Underground Electrical Figure 1C

USACE SF Shoreline

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0 1,000 2,000 Feet

1 inch = 600 feet

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City of San Jose Utilities Database Figure 2A

USACE SF Shoreline

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0 1,000 2,000 Feet

1 inch = 600 feet

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City of San Jose Utilities Database Figure 2B

USACE SF Shoreline

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0 1,000 2,000 Feet

1 inch = 600 feet

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Aerial and Street Level Photos of Utilities
Figure 3
USACE SF Shoreline

Geotechnical Appendix

CESPN –ET –EG

5 AUGUST 2011

PROJECT: South San Francisco Bay Shoreline Study

SUBJECT: Geotechnical Support for Alternatives Evaluation and Plan Formulation

Background

The Geo-Sciences Section of the San Francisco District of the Army Corps of Engineers (SPN) has been tasked with providing geotechnical input that will be used to develop cost estimates for various project alternatives as part of the plan formulation process. This memorandum is intended as an interim document that provides general guidance in schematic plan an alternative development. It is anticipated that additional geotechnical consultation may be required at various times during the alternative formulation process to support alternative designs and evaluation. This memo is intended to provide consolidation magnitude and time-rate settlements for various foundation bay mud and fill configurations.

Documents that have been relied upon in preparation of this memorandum are:

- Geotechnical Engineering Appendix in support of the Feasibility Scoping Meeting (2010). This document includes geotechnical investigation, laboratory testing and engineering analysis of the outboard levees performed by Geomatrix (under contract to the California Coastal Conservancy) and by SPN Geo-Sciences, geotechnical investigation and laboratory testing of the inboard levees performed by Geomatrix(under contract to the California Coastal Conservancy, 2010) and engineering analysis performed by the SPN Geo-Sciences Section.
- Conceptual Design information provided by the Santa Clara Valley Water District, in a June 28, 2011 email.

Scope of Work of Memorandum

A brief discussion of geotechnical needs for the current conceptual feasibility analysis was provided in a June 17, 2001 email. Six (6) items were proposed by Geosciences as tasks that would assist in the development of better project cost estimates for feasibility level planning and design. The tasks are summarized below:

1) Estimate settlement vs. fill height for various levee fill and foundation conditions
2) Estimates settlement rate for various fill and foundation conditions, including discussion of ways to increase rate of settlement, as appropriate.
3) Estimate maximum fill heights that could be placed at one time without overstressing the foundation soil for various fill height and slope configurations.
4) Typical fill specifications for levee fill.
5) Narrative discussion of geotechnical construction concerns for the proposed alternatives.

6) Narrative discussion of geotechnical concerns/considerations for proposed environmental earthwork.

This memorandum is intended to address items 1-6, above. This discussion is prepared in a DRAFT and INTERIM format and is provided to the PDT team (USACE and non-federal sponsors) for review and comment. After comments, this document will be submitted for District Quality Assurance review. The analysis, recommendations and other conclusions presented in interim technical memoranda are intended to be compiled in a geotechnical report appendix for the next major planning milestone (Alternatives Formulation Briefing).

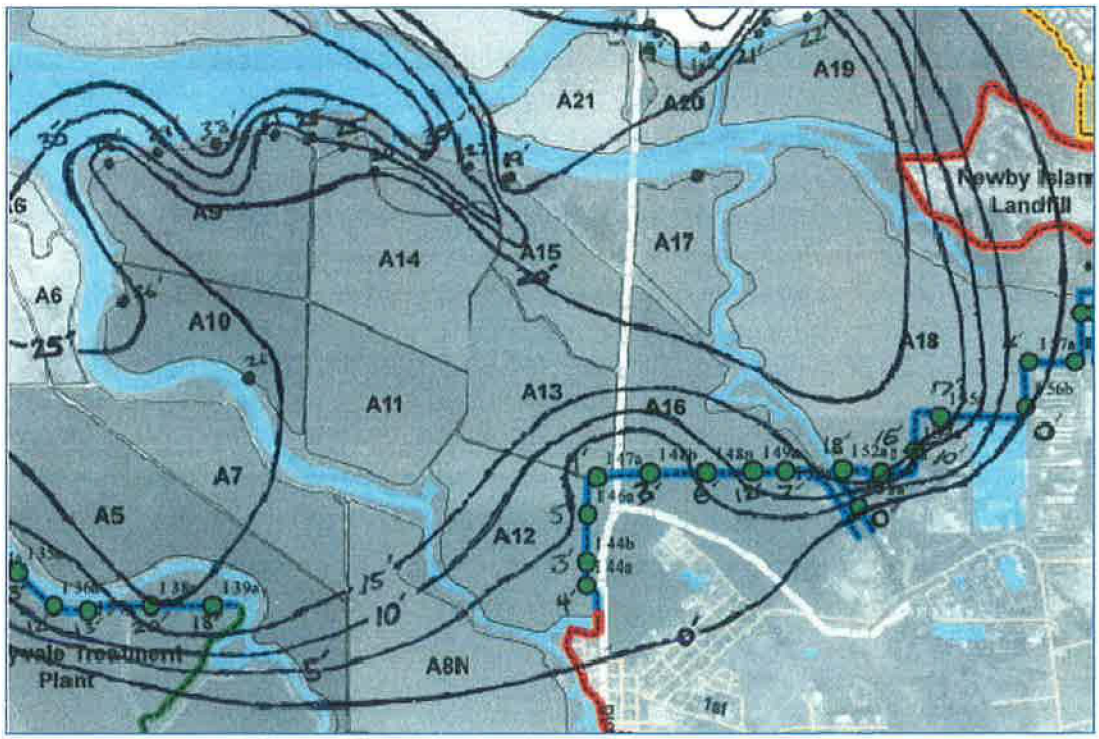


Figure 1 - Contours of Bay Mud Thickness

Task 1. Settlement Estimates

The project area is underlain by approximately 0 to 40 feet of marine soil deposits, locally known as Bay Mud. Bay Mud is generally normally consolidated, highly compressible and very weak clayey/silty soil. Bay Mud is commonly classified as CL/CH/ML/MH or OH depending on the location in the bay. Bay Mud was deposited underwater. Figure 1 shows Corps interpretation of the bay mud thickness for the project area. Along the edges of the deposit, the upper few feet (1-3 feet) has been observed to have slightly less compressibility, higher strength and higher over consolidation ratios, due to some desiccation drying of the soil during tidal cycles. This upper layer is commonly identified as Bay Mud "crust".

It is anticipated that the primary settlement concern for the project will be Bay Mud primary consolidation due to construction of earth or other structures on the Bay Mud. Consolidation

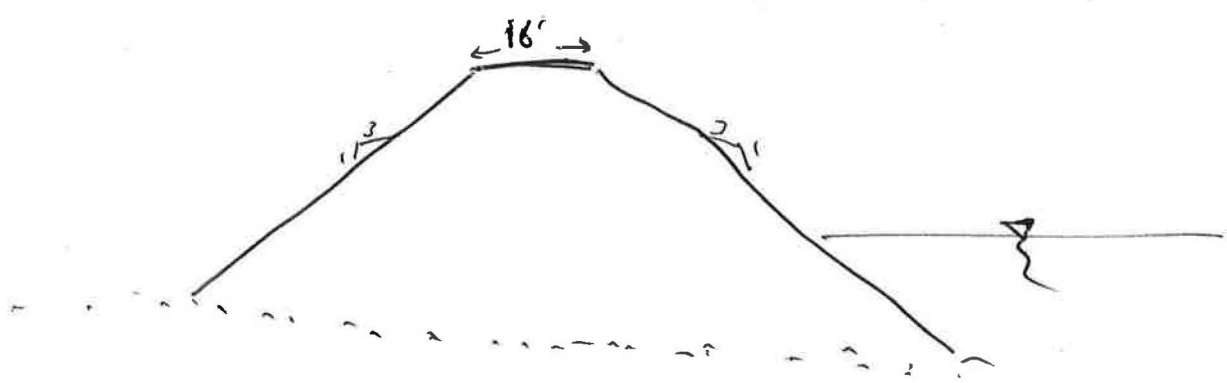
settlement has complex soil mechanics that depends on the soil permeability, stress history, applied loads, existing loads, load geometry and other factors. The discussion below is intended to be general and detailed enough in nature to have suitable confidence in consolidation estimation for feasibility level design and cost comparisons, however more detailed settlement calculations are likely to be required once more refined designs are developed.

Three graphs estimating earthwork settlement are presented below. Several key assumptions were made in the analysis, as follows.

- Bay Mud is normally consolidated under the existing loads, and that all settlement due to existing loads is complete.
- The upper 2 feet of Bay Mud is over consolidated, with an over consolidation ratio (OCR) of 2.
- Bay Mud will generally remain in-place beneath new construction
- Bay Mud has a virgin compression index (strain based) of 0.32
- Bay Mud has a recompression index (strain based) of 0.03.
- New levees will have a crest width of 16 feet and 3:1 (H:V) side slopes on both landside and waterside of the levees (note that this may be different based on additional stability and seepage analysis).
- New fill will have a total unit weight of 125 pounds per cubic foot
- Existing levee fills are assumed to have a total unit weight of 115 pounds per cubic foot.
- Bay Mud crust has a total unit weight of 100 pounds per cubic foot
- Normally consolidated bay mud has a total unit weight of 97 pounds per cubic foot
- Bay Mud is 100 percent saturated at all depths

Graph 1 shows the estimated Bay Mud consolidation settlement for a large mass fill area, such as may be required for very wide environmental island construction, unusually large levees, and other large fill areas.

Graph 2 shows the estimated Bay Mud consolidation settlement for levees constructed directly on Bay Mud (no existing fills present). Settlements will be reduced if new levees can be constructed along the same alignment as existing levee fill alignments. Conceptual sketches provided by the SCVWD have indicated that some of the alternatives are proposed along the same alignment as existing levee fills. Settlement potential is lower if levee alignments are constructed along existing alignments. On an initial estimating basis, the design grade change should be the difference between levee crest elevations (new – existing) to estimate settlement, if the center lines of the levee crest are collinear.



To use Charts 1 and 2 below an iterative process is required, such that;

Fill thickness – settlement = design change in grade

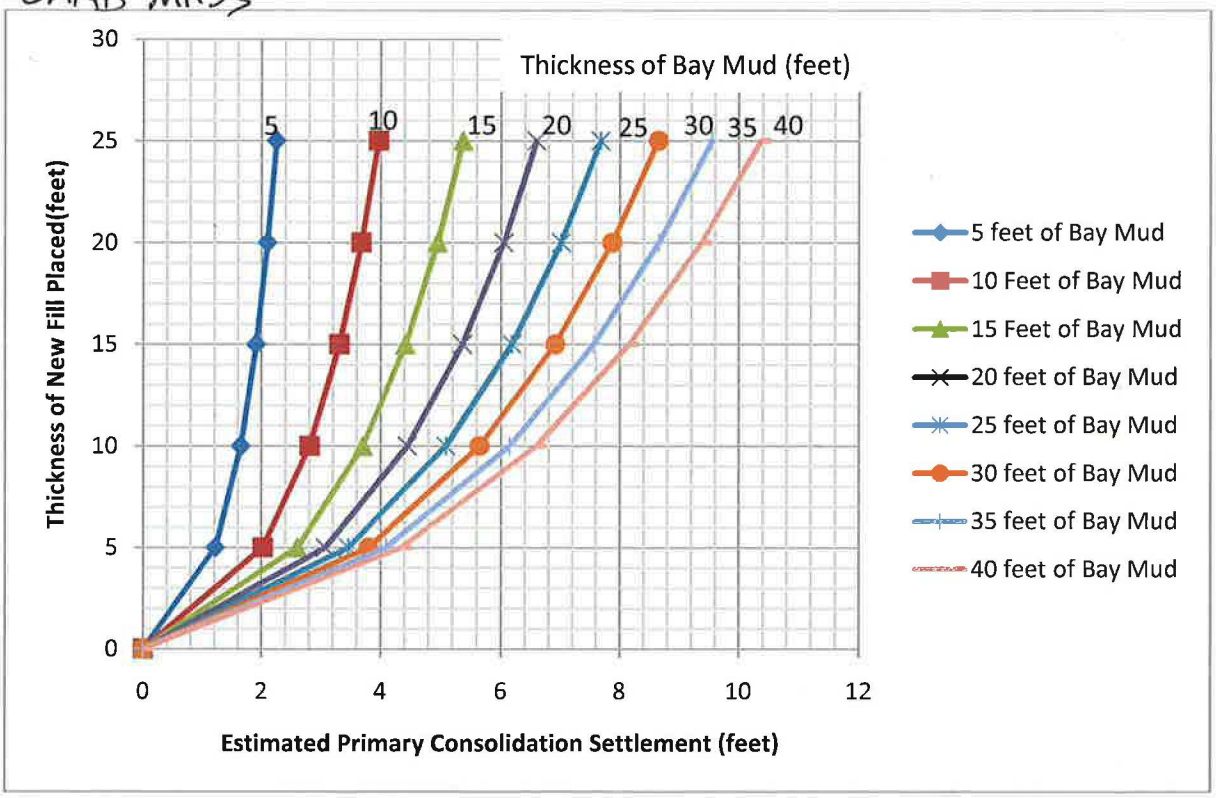
For example: if the existing elevation = 0 feet

Design elevation = 10 feet

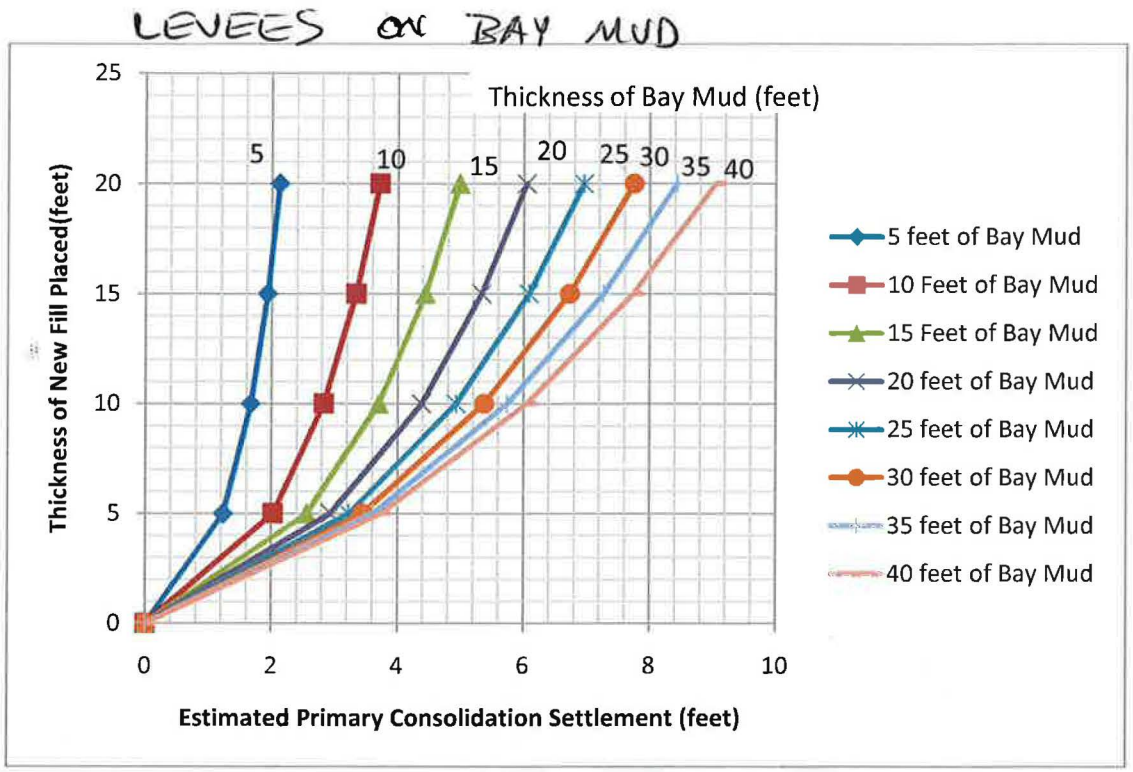
From Chart 1 , for a Bay Mud thickness of 20 feet the solution would be about 15 feet of fill

15 feet of fill - ~ 5 feet of settlement = design elevation of 10 feet.

LAND MASS



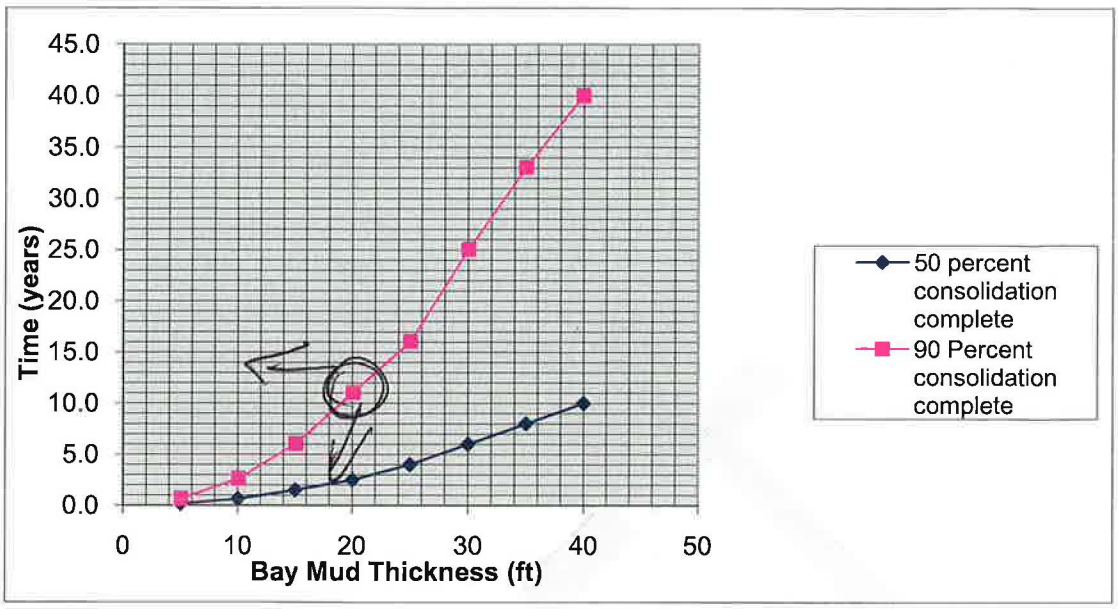
Graph 1. Estimated Bay Mud Consolidation Settlement for Large Areal Fills



Graph 2. Estimated Bay Mud Consolidation Settlement at Center of Crest for Levees with 3:1 (H:V) Slopes

Task 2. Consolidation Rates

Graph 3 and Table 1, present the estimated time for 50 percent and 90 percent consolidation for various Bay Mud thicknesses. Assumptions in the time rate consolidation include the assumption that double drainage will occur and that the coefficient of consolidation for the bay mud is 8 ft^2/yr. The time for consolidation is relatively short (less that 1 year for 90 percent consolidation) for thin bay mud thicknesses (5 feet or less). If it is desired to reduce the time for consolidation, which may be especially important if the required fill cannot be place at one time due to foundation and bearing capacity limitations of the Bay Mud, vertical drains can be installed. Typically vertical drains extend the entire thickness of the bay mud and are spaced on 2 to 6 foot centers depending on the drain material, and the project settlement time constraints. Additionally, surcharge fills can be placed to further reduce the time line in some situations. Vertical drains will allow the dissipation of construction pore pressures over months instead of years, which will allow additional fill stages to be placed in months rather than waiting years.



Graph 3. Estimated Consolidation Rates for Bay Mud

Table 1. Estimated Consolidation Rates for Bay Mud

Bay Mud Thickness (feet)	Time for 50% consolidation (years)	Time for 90% consolidation (years)
5	0.2	0.7
10	0.7	2.6
15	1.5	6.0
20	2.5	11.0
25	4.0	16.0
30	6.0	25.0
35	8.0	33.0
40	10.0	40.0

Task 3. Estimated Maximum Fill Thickness that Can Be Placed at One Time

Because the underlying Bay Mud for the project area is weak and slowly draining the weak Bay Mud will only support limited fill thicknesses without being overstressed. Overfilling Bay Mud will cause slope instability and bearing failures. Filling to design grades may be required in stages to allow for pore pressure dissipation before each new stress is applied. Overfilling on bay mud is a well documented phenomenon and should be carefully considered in design and construction activities. In addition to new structures, construction activities that may include stockpiles, heavy equipment, or excavations should be carefully planned do avoid overstressing the Bay Mud. Piezometric monitoring bay mud pore pressures in fill areas during construction is recommended, to determine when pore pressures have dissipated enough to allow additional filling. Table 2, below includes estimated allowable first filling thicknesses for various fill side slopes, of 3:1(H:V) to 5:1 (H:V). In areas where fills are planned where previously placed fills were/are located, allowable fill heights will be somewhat higher. The

recommendations below are based on allowable end-of-construction (undrained loading) factors of safety of 1.3. Bay Mud was assumed to have an undrained strength ratio of 0.32 (S_u/σ') for the normally consolidated bay mud and 500 psf for the upper 2 feet (Bay Mud "crust"). Fill was assumed to have a unit weight of 125 pounds per cubic foot and an undrained shear strength of 800 psf.

From the analysis it appears that where bay mud is shallow (about 5 feet or less) all of the required fill can be placed in one stage. However, for areas of the project with more than 5 feet of Bay Mud, fill will need to be placed in stages for significant grade changes. It is assumed that undrained (end-of-construction) conditions will control slope designs, and that rapid drawdown and seepage loading will be satisfactory if end-of-construction factors of safety exceed 1.3. Additional fill stages may not be able to include as much fill thickness as the first stage, and will require careful planning.

Table 2. Estimated Fill Thickness Placement Limits for first fill stage for 3:1 to 5:1 Slopes on 5 to 40 feet of Bay Mud

Bay Mud Thickness (ft)	Side Slope of Fill (H:V)		
	3:1	4:1	5:1
5	20 feet	20 feet	20 feet
10	11 feet	11 feet	16 feet
15	9 feet	10 feet	14 feet
20	9 feet	10 feet	12 feet
40	8 feet	10 feet	12 feet

Task 4. Levee Material Specifications

Almost any soil can be used in the construction of levees, if the levee is properly designed for the fill used. In general, it is anticipated that the only on-site available borrow would be Bay Mud. Bay Mud would require significant processing (aeration, mixing, and possible chemical treatment) before it would be practical to use as a levee fill, additionally it may not meet levee fill specifications that reflect local engineering practice. In general levee fill that meet the following specifications is preferred. It is anticipated that fill materials meeting the following specifications will be available at a number of nearby quarries or construction sites. If material meeting the following specifications is not available, revisions to specifications is likely to be possible to avoid excessively long haul distances, although levee designs may require some revision to accommodate different specifications.

1) USCS soil types: CL, SC, or GC
2) At least 50 percent passing the number 200 sieve
3) At least 75 percent passing the No.4 sieve
4) 100 percent less than 4 inches in greatest dimension
5) No more than 15 percent larger than 2 ½ inches.
6) Plasticity Index of 10 to 20
7) Liquid Limit less than 40
8) Free of organic content

9) Non-dispersive clay minerals
10) Low hydraulic conductivity (less that 10^{-6} cm/sec)
11) Minimum undrained shear strength of 800 psf
12) Minimum effective friction angle of 32 degrees
13) Fill should be clean of environmental contaminants

Task 5. Discussion of Geotechnical Aspects of Proposed Cross Sections

The Santa Clara Valley Water District has performed some initial design in order to estimate costs of various levee alternatives. Figures 2 and 3 show several possible levee alignments and a typical levee cross section that the SCVWD has provided in alternative planning and discussion. USACE understands that detailed refined design has not occurred, and the provided designs are a starting point for discussion.

A brief discussion of the geotechnical considerations for each proposed alignment is presented below.

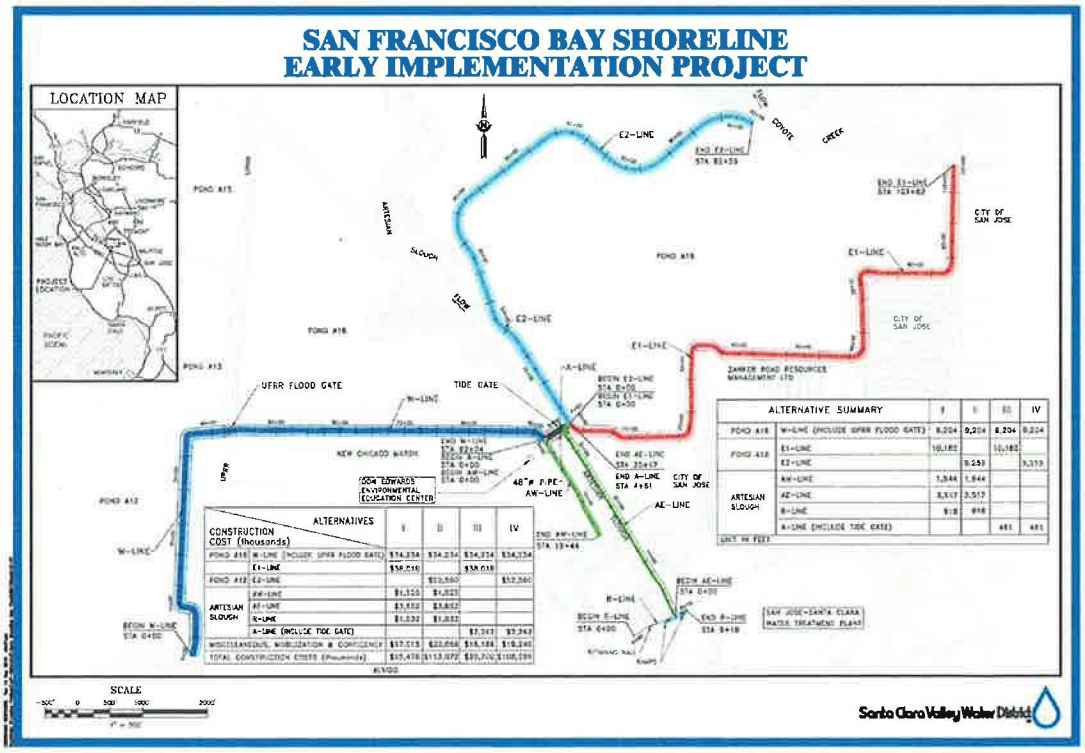


Figure 2. Alignments of Possible Flood Damage Reduction alternatives

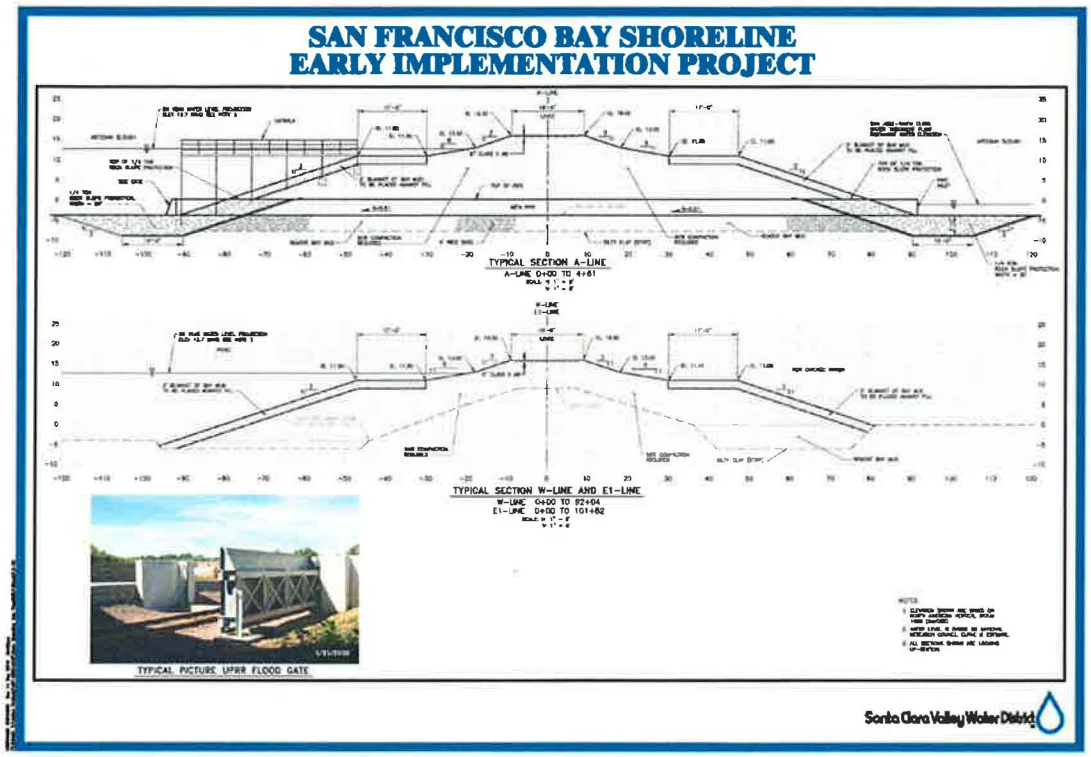


Figure 2. Typical Cross Sections

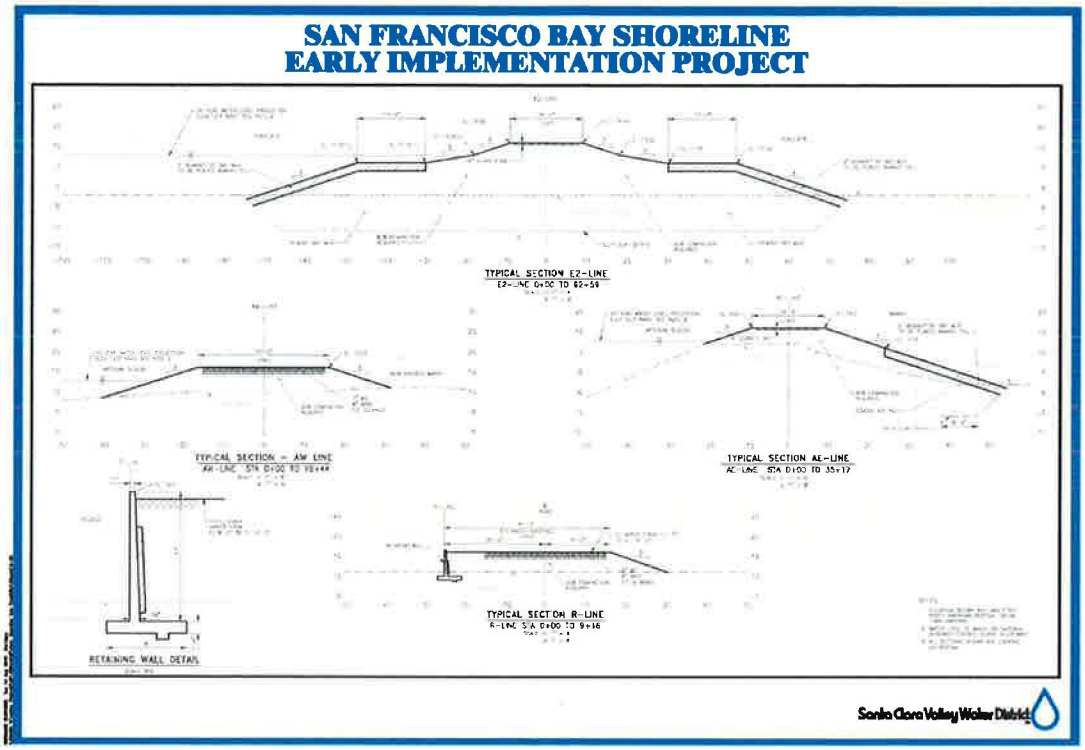


Figure 3. Typical Cross Sections

<u>Proposed alignment Line E-2</u>

- Bay Mud thickness is anticipated to be on the order of 20 feet. Excavation to deeper stiff soil would be very expensive and require very significant dewatering and soil disposal costs. Excavating to deep soil would reduce settlement and stability problem potential.
- It is anticipated that construction directly on Bay Mud with vertical drains and staged construction would be more practical.
- Total fill grade change would be about 13 feet, which would require a fill thickness on the order of 19 feet. This would require at least two fill stages to construct.
- There does not appear to be significant geotechnical value (perhaps there is a vegetation benefit to a bay mud levee surface?) to the 2-foot bay mud blanket on either side of the levee. This detail would add a construction difficulty.
- The slope designs appear to have included some thought that the relatively flat configuration, with slope benches would allow construction in a single stage, however it is not anticipated that in the current alignments single stage fill placement would be possible. However, if two stages of earthwork are performed steeper slopes may be practical.

- If low permeability fills are used seepage concerns are not anticipated. In order to add seepage performance reliability, a landside toe drain would add both stability and seepage performance reliability.
- Drainage features (conduits crossing from landside to bay) would need to have appropriate pipe bedding, joint flexibility and camber.

Proposed tide gate alignment Line A-2

- Bay Mud thickness is anticipated to be on the order of 20 feet. Excavation to deeper stiff soil would be very expensive and require very significant dewatering and soil disposal costs. Excavating to deep soil would reduce settlement and stability problem potential.
- It is anticipated that construction directly on Bay Mud with vertical drains and staged construction would be more practical.
- Total fill grade change would be about 13 feet, which would require a fill thickness on the order of 19 feet. This would require at least two fill stages to construct.
- There does not appear to be significant geotechnical value (perhaps there is a vegetation benefit to a bay mud levee surface?) to the 2-foot bay mud blanket on either side of the levee. This detail would add a construction difficulty.
- The slope designs appear to have included some thought that the relatively flat configuration, with slope benches would allow construction in a single stage, however it is not anticipated that in the current alignments single stage fill placement would be possible. However, if two stages of earthwork are performed steeper slopes may be practical.
- If low permeability fills are used seepage concerns are not anticipated. In order to add seepage performance reliability, a landside toe drain would add both stability and seepage performance reliability.
- Conduits would need to have appropriate pipe bedding, joint flexibility and camber. Possibly filling would be required first, with construction of gates, post levee settlement.
- Recommend consideration of concrete structure supported on deep foundations.
- Differential settlement will need to be considered at gate/levee joint due to differing stress histories.

Proposed AE and AW alignments

- Differing foundations will lead to differential settlement along each alignment. Design should account for this.
- There does not appear to be significant geotechnical value (perhaps there is a vegetation benefit to a bay mud levee surface?) to the 2-foot bay mud blanket on either side of the levee. This detail would add a construction difficulty.
- Practically, construction of thin slope wedges is very difficult. Consider how the construction benching and compaction into the existing levee will be performed in earthwork estimates.