Water Preserve Areas Feasibility Study
Selected Plan
Seep3b design region (WCA-3B Seepage Management Area)

Levee, Canals, Earth and Sitework
Submission to EN-C
31 January 2001

1. Cost estimates are needed for design features associated with the WCA-3B Seepage Management Area within the Water Preserve Areas (WPA) Feasibility Study. This cost estimate will be used as the Selected Plan in the study.

2. The point of contact for this request is Mr. Keith Jones, at extension 1127. Let me know if I can be of more assistance.

Attachments Provided:

1. Spreadsheet Analysis Report – 3 pages
2. Geotechnical Data and Assumptions – 3 pages
3. 11″ x 17″ Layout Drawings – 4 pages
   - Site Layout (levees.dgn) – 2 pages (north and south) shows design and cross section location
   - Alignments/Locations (levees.dgn) – 2 pages (north and south) shows levee and canal centerlines, distances and areas used for calculation
4. Cross Section Profiles – 4 page
5. Seep3a Design Region Scope – 2 pages
   - Contains a comprehensive list of design and cost features

Water Preserve Areas Feasibility Study
Levees and Canals Summary of Material Quantities
WCA-3B Seepage Management and/or seep3b Design Region

		Gross Volume cu-yds	Rock Volume cu-yds	Overburden Volume cu-yds
Excavated Materials				
Conveyance or Seepage Canals		5365097	4763035	602061
F&W Littoral Shelves		0		
Intake and Discharge Basins		0		
Degraded Roads and Levees		1636		
Totals		**5366733**	**4763035**	**602061**
Amount reusable=	**70%**	**3756713**	**3334125**	**421443**
Amount spoil=	**30%**	**1610020**	**1428911**	**180618**
Quality Construction Material Required				
Fill Material Requirements		**101465**		
Spoil Material Disposal Areas				
Wind Breaks		0		
Borrow Pits/Mined Lakes		663913		
Fill Areas		158042		
Totals		**821955**		
Spoil Material Generated				
Excavated Materials		1610020		
Totals		**1610020**		

Notes:

Note: Due to the close proximity of US-27, earthwork will include 35300' in length of stormwater runoff design from US-27. The design will require earthwork grading to create a dry storage swale approximately 1' deep. Assume 20-30' width along the 35300' length. Assume one 10' long concrete weir every 500' (69 required).

Water Preserve Areas Feasibility Study
Levees and Canals Summary of Material Quantities
WCA-3B Seepage Management and/or seep3b Design Region

Excavation Requirements

Rock at Elevation = **4.0** ft-NGVD and below

Conveyance or Seepage Canals	Length feet	Inside Slope 1V on ?H	Outside Slope 1V on ?H	Bottom Width feet	Average Ground ft-NGVD	Canal Invert ft-NGVD	Canal Cut Depth feet	Cross Section Area sqft	Gross Volume cu-yds	Rock Volume cu-yds	Overburden Volume cu-yds	InRoads Length cu-yds	InRoads Volume cu-yds
C-500B													
S-32 to North Holy	26410	2.0	1.0	105.0	6.2	-10.0	16.2	2095	2048888	1725453	323434		
North Holy to S-502A	16825	2.0	1.0	105.0	6.4	-10.0	16.4	2125	1324464	1099233	225231		
C-500B Total	**43235**								**3373352**	**2824687**	**548665**	**43709**	**4690447**
C-502B													
C-6 to Krome	4575	1.0	1.0	120.0	4.1	-10.0	14.1	1891	320387	317878	2509		
Krome to S-30	2380	1.0	1.0	130.0	4.9	-11.0	15.9	2320	204487	191722	12765		
S-30 to South Holy	19110	1.0	1.0	130.0	6.1	-11.0	17.1	2515	1780351	1539417	240935		
Holy U Channel	2380	0.0	0.0	75.0	7.0	-11.0	18	1350	119000	99167	19833		
North Holy to S-502B	16120	1.0	1.0	130.0	5.6	-10.0	15.6	2271	1356086	1203627	152459		
C-502B Total	**44565**								**3780312**	**3351810**	**428502**	**44893**	**3982642**
C-502C - Holy Lakes	7090	2.0	2.0	5.0	6.1	0.0	6.1	105	27551	13655	13896		
C-6 from B-502 to S-516	2340	1.0	1.0	35.0	6.4	-13.8	20.2	1115	96637	81453	15184	**2350**	**101330**
New Conveyance Canal Totals	**97230**								**7277851**	**6271604**	**1006247**		
Existing Canals													
Existing L-33 Borrow Canal	39950	1.0	1.0	60.0	6.3	-8.0	14.3	1062	1572092	1278400	293692		
Existing US-27 Borrow Canal	35310	1.0	1.0	40.0	5.7	0.0	5.7	260	340663	230169	110494		
Existing Canals Totals	**75260**								**1912755**	**1508569**	**404186**		
Note1: Existing L-33 and US-27 Borrow Canals are subtracted from totals because they are along the new alignments of C-500B and C-502B													
New Conveyance Canals minus Existing Borrow Canals Totals									**5365097**	**4763035**	**602061**		**8774419**

F&W Littoral Shelves	Length feet	Width feet	Area Acres	Average Ground ft-NGVD	Invert ft-NGVD	Cut Depth feet	Cross Section Area sqft	Gross Volume cu-yds
Totals	**0**		**0.0**					**0**

Note: There are no Fish and Wildlife shelves along theses canals because the additional area used would impact existing wetlands.

Intake and Discharge Basins	Area sqft	Area Acres	Average Ground ft-NGVD	Invert ft-NGVD	Cut Depth feet	Gross Volume cu-yds
Totals		**0.0**				**0**

Degraded Roads	Length feet	Width feet	Area Acres	Average Ground ft-NGVD	Surface Elevation ft-NGVD	Cut Depth feet	Cross Section Area sqft	Gross Volume cu-yds
	0	0.0	0.0	0	0	0.0	0	0

Degrade Levees	Length feet	Inside Slope 1V on ?H	Outside Slope 1V on ?H	Top Width feet	Average Ground ft-NGVD	Top of Levee ft-NGVD	Levee Height feet	Cross Section Area sqft	Gross Volume cu-yds
South of Holy Lakes	2625	3.0	3.0	12	6.0	7.1	1.1	17	1636
Totals	**2625**								**1636**

Water Preserve Areas Feasibility Study
Levees and Canals Summary of Material Quantities
WCA-3B Seepage Management and/or seep3b Design Region

Fill Material Requirements

Levees	Length feet	Inside Slope 1V on ?H	Outside Slope 1V on ?H	Top Width feet	Average Ground ft-NGVD	Top of Levee ft-NGVD	Levee Height feet	Cross Section Area sqft	Gross Volume cu-yds	InRoads Length cu-yds	InRoads Volume cu-yds
C-6 South Bank	2075	3.0	3.0	12	6.4	10.0	3.6	82	6308		
C-6 North Bank	2075	3.0	3.0	12	6.4	10.0	3.6	82	6308		
West L-502B - C-6 to Krome	4565	3.0	3.0	12	4.1	7.0	2.9	60	10150		
East L-502B - C-6 to Krome	4675	3.0	3.0	12	4.1	7.0	2.9	60	10394		
L-502B - Krome to South Holy	21610	3.0	3.0	12	6.0	8.0	2.0	36	28813		
L-502C - Holy Lakes	7195	3.0	3.0	12	6.1	8.5	2.4	46	12279		
L-502B - North Holy to S-502B	15945	3.0	3.0	12	5.6	8.0	2.4	46	27213		
Totals	**58140**								**101465**		

Wind Breaks	Length feet	Inside Slope 1V on ?H	Outside Slope 1V on ?H	Top Width feet	Average Ground ft-NGVD	Top of Levee ft-NGVD	Levee Height feet	Cross Section Area sqft	Gross Volume cu-yds
Totals	**0**								**0**

Borrow Pits/Mined Lakes	Area sqft	Area acres	Bottom Depth ft-NGVD	Finished Depth ft-NGVD	Fill Depth feet	Gross Volume cu-yds
#1	391250	9.0	-20.0	-1.0	19.0	275324
#2	84140	1.9	-20.0	-1.0	19.0	59210
#3	32945	0.8	-20.0	-1.0	19.0	23184
#4 (C-9 west of US-27)	163665	3.8	-20.0	-1.0	19.0	115172
#5	253680	5.8	-20.0	-1.0	19.0	178516
#6 Canal South of Holy Lakes	11675	0.3	-10.0	-5.0	5.0	2162
#7W Canal South of Holy Lakes	25395	0.6	-5.0	6.0	11.0	10346
#7E Canal South of Holy Lakes	23945	0.5	-5.0	-5.0	0.0	0
Totals		**22.7**				**663913**

Fill Areas	Length feet	Width feet	Area sqft	Area acres	Average Ground ft-NGVD	Finished Height ft-NGVD	Fill Depth feet	Gross Volume cu-yds
East of C-502B/West of US-27			597035	13.7	6.3	8.5	2.2	48647
Northeast Of Holy Lakes			494650	11.4	5.2	8.0	2.8	51297
FPL Maintenance Access Roads								
8775' North/South Access Roads	8775	12.0	105300	2.4	7.0	7.5	0.5	1950
12760' North/South Access Roads	12760	12.0	153120	3.5	6.5	7.5	1.0	5671
20345' North/South Access Roads	20345	12.0	244140	5.6	5.3	7.5	2.2	19893
East/West Latteral Access Roads	13015	12.0	156180	3.6	6.2	7.5	1.3	7520
Totals	**54895**			**40.2**				**134978**

Backfill Canals	Length feet	Inside Slope 1V on ?H	Outside Slope 1V on ?H	Bottom Width feet	Average Ground ft-NGVD	Canal Invert ft-NGVD	Canal Cut Depth feet	Cross Section Area sqft	Gross Volume cu-yds
Backfill C-6 after/during realignment	1550	1.0	1.0	20.0	6.4	-6.0	12.4	402	23064
Total Fill Areas	**56445**								**158042**

[***]Geotechnical Data and Assumptions to Use for Feasibility Level Cost Estimates (Amended 1/28/01)

Design Region: seep3b

Notes:
1. Design region features for this area are mainly excavation of conveyance canals (minor levee L-502B only on C-502B).
2. L-502B contains flows in conveyance canal C-502B and is designed with minimal height so as minimize impacts on existing wetlands.
3. Overtopping of L-502B is a **remote event** and does not present a hazardous risk.

Compaction Factor for Sandy Overburden:
Answer: 0.85

Swell Factor for Sandy Overburden:
Answer: 1.10

Compaction Factor for Rock:
Answer: 0.85

Swell Factor for Rock:
Answer: 1.30

Material Makeup of Levee Embankment:
Answer: Material may be utilized from the sand and gravel overburden excavated for the seepage canals/Fish refugia. If additional material is required, crushed rock should be utilized. This material must be crushed to a maximum particle size of 3 inches or less in order to utilize for levee construction. It is estimated that overburden exists from ground surface to elevation +4. From +4 to elevation –13.5 feet NGVD limestone bedrock will be encountered with intermittent Sand lenses. At elevation –13.5 and deeper, mostly hard limestone is in place.

[***] Assumptions based upon limited subsurface information and prior projects, as of 1/28/01

Special Levee Construction Design Criteria:

Foundation Treatment:
Answer: None

Seepage Control
Answer: None

Slope Protection:
Answer: Upstream and downstream embankment perimeter will be grassed for erosion protection.

Where the material will come from?
Answer: Material for L-502B will be obtained from:
1. Usable excavated material from adjacent conveyance canal C-502B. This material will contain sand, clay, organic silt, peat and limestone according to available drill logs.

Excavation Procedure/Technique and/or Blasting Requirements (at this location only):

Answer: Assume some blasting of rock will be required (Rios from EN-G will supply blasting patterns/plan). After initial rock blasting some additional ripping will be required with backhoe with ripper attachment. Following blasting and ripping, normal excavation equipment may be utilized.

Percentage of Usable Excavated Material: Since the Levee L-502B will be designed as a levee and is not critical with respect to loss of life or much property damage should it fail, the percentage of usable excavated materials can be raised.

Percentage of Usable Excavated Overburden Soil Material:
Answer: Assume 90% of the material can be reused. The remaining 10% should be disposed of onsite or at an approved disposal area. Using excess unsuitable material to build wind breaks, boat ramps or to flatten interior slopes is recommended also. The distribution of overburden soil versus rock is detailed above in red.

Percentage of Usable Excavated Rock Material:

Answer: Assume 90% of the material can be reused. The remaining 10% should be disposed of onsite or at an approved disposal area. Using excess unsuitable material to build wind breaks, boat ramps or to flatten interior slopes is recommended also. The distribution of overburden soil versus rock is detailed above in red.

Other Considerations:

If additional rock material is required to construct C-9, a rock crushing plant may be setup within the Seepage management area to process excavated rock material prior to placement. Conveyor systems or multiple crushing plants may reduce the overall hauling costs.

Assume overburden soils have a unit weight of 115 pcf while limestone has unit weight of 145 pcf for hauling purposes.

When constructing the levee, the Contractor will be required to utilize 12 inch lifts which then will be compacted down to 10 to 11 inches. Compaction requirements will be to 98% maximum dry density based upon standard proctor compaction tests or a nuclear density meter. Also, control of excessive moisture shall be the responsibility of the Contractor.

Geotechnical Instrumentation:
NOTE: This instrumentation is required for monitoring and operational safety of project features within the design region.

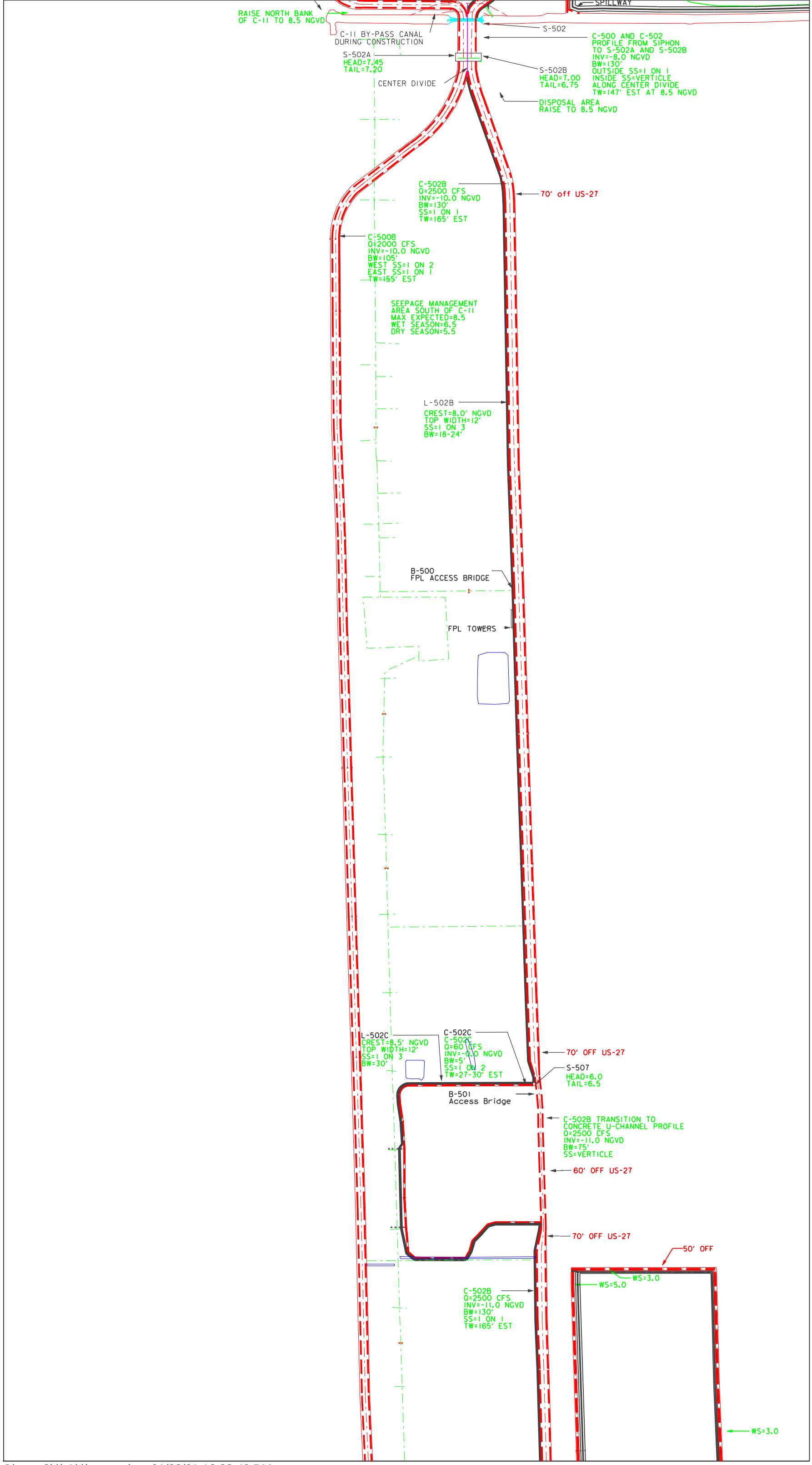
1. Shallow Depth Piezometers (∓ 5.0 feet from natural grade)
   Answer: None

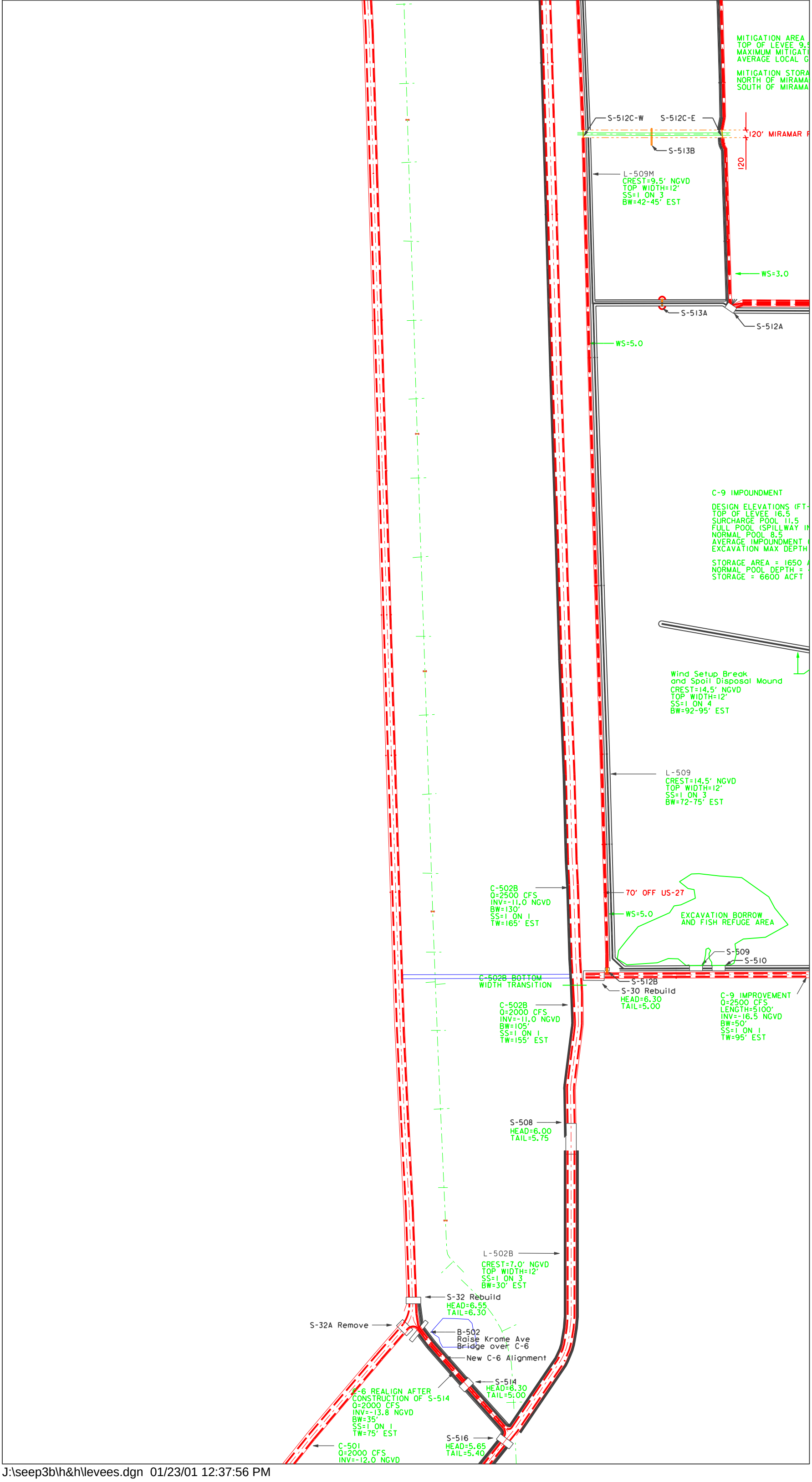
2. Medium Depth Piezometers (greater than 5.0 and less than 50 feet from natural grade) None

3. Deep Depth Piezometers (greater than 50 feet from natural grade) None

4. Inclinometers - None

5. Others


RAISE NORTH BANK
OF C-11 TO 8.5 NGVD
C-11 BY-PASS CANAL
DURING CONSTRUCTION
S-502A
HEAD=7.45
TAIL=7.20
CENTER DIVIDE
S-502
C-500 AND C-502
PROFILE FROM SIPHON
TO S-502A AND S-502B
INV=-8.0 NGVD
BW=130'
OUTSIDE SS=1 ON 1
INSIDE SS=VERTICLE
ALONG CENTER DIVIDE
TW=147' EST AT 8.5 NGVD
S-502B
HEAD=7.00
TAIL=6.75
DISPOSAL AREA
RAISE TO 8.5 NGVD
C-502B
Q=2500 CFS
INV=-10.0 NGVD
BW=130'
SS=1 ON 1
TW=165' EST
70' off US-27
C-500B
Q=2000 CFS
INV=-10.0 NGVD
BW=105'
WEST SS=1 ON 2
EAST SS=1 ON 1
TW=155' EST
SEEPAGE MANAGEMENT
AREA SOUTH OF C-11
MAX EXPECTED=8.5
WET SEASON=6.5
DRY SEASON=5.5
L-502B
CREST=8.0' NGVD
TOP WIDTH=12'
SS=1 ON 3
BW=18-24'
B-500
FPL ACCESS BRIDGE
FPL TOWERS
L-502C
CREST=8.5' NGVD
TOP WIDTH=12'
SS=1 ON 3
BW=30'
C-502C
Q=60 CFS
INV=-0.0 NGVD
BW=5'
SS=1 ON 2
TW=27-30' EST
70' OFF US-27
S-507
HEAD=6.0
TAIL=6.5
B-501
Access Bridge
C-502B TRANSITION TO
CONCRETE U-CHANNEL PROFILE
Q=2500 CFS
INV=-11.0 NGVD
BW=75'
SS=VERTICLE
60' OFF US-27
70' OFF US-27
C-502B
Q=2500 CFS
INV=-11.0 NGVD
BW=130'
SS=1 ON 1
TW=165' EST
50' OFF
WS=3.0
WS=5.0
WS=3.0



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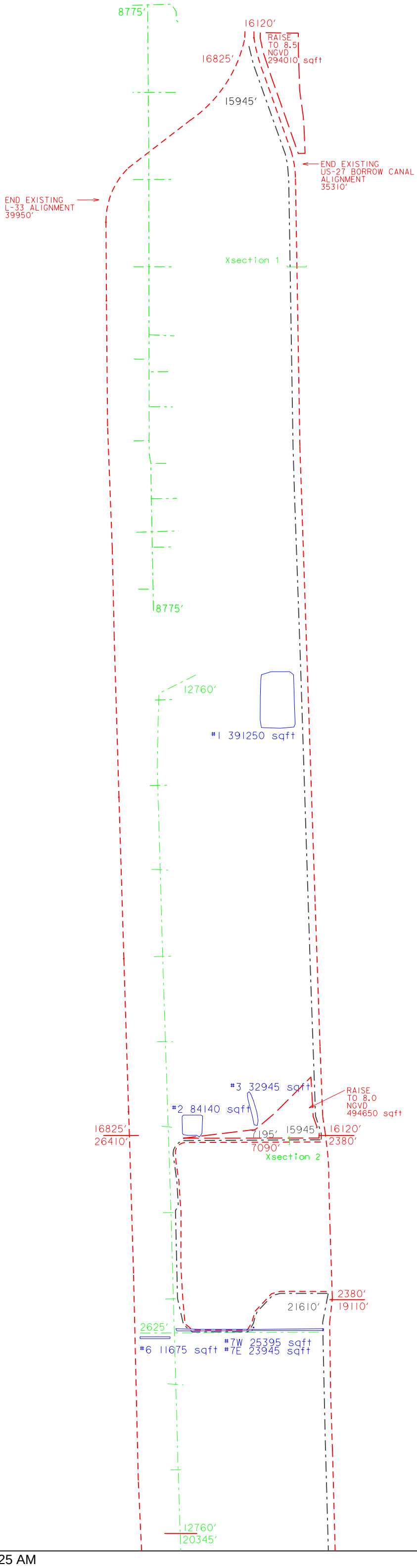
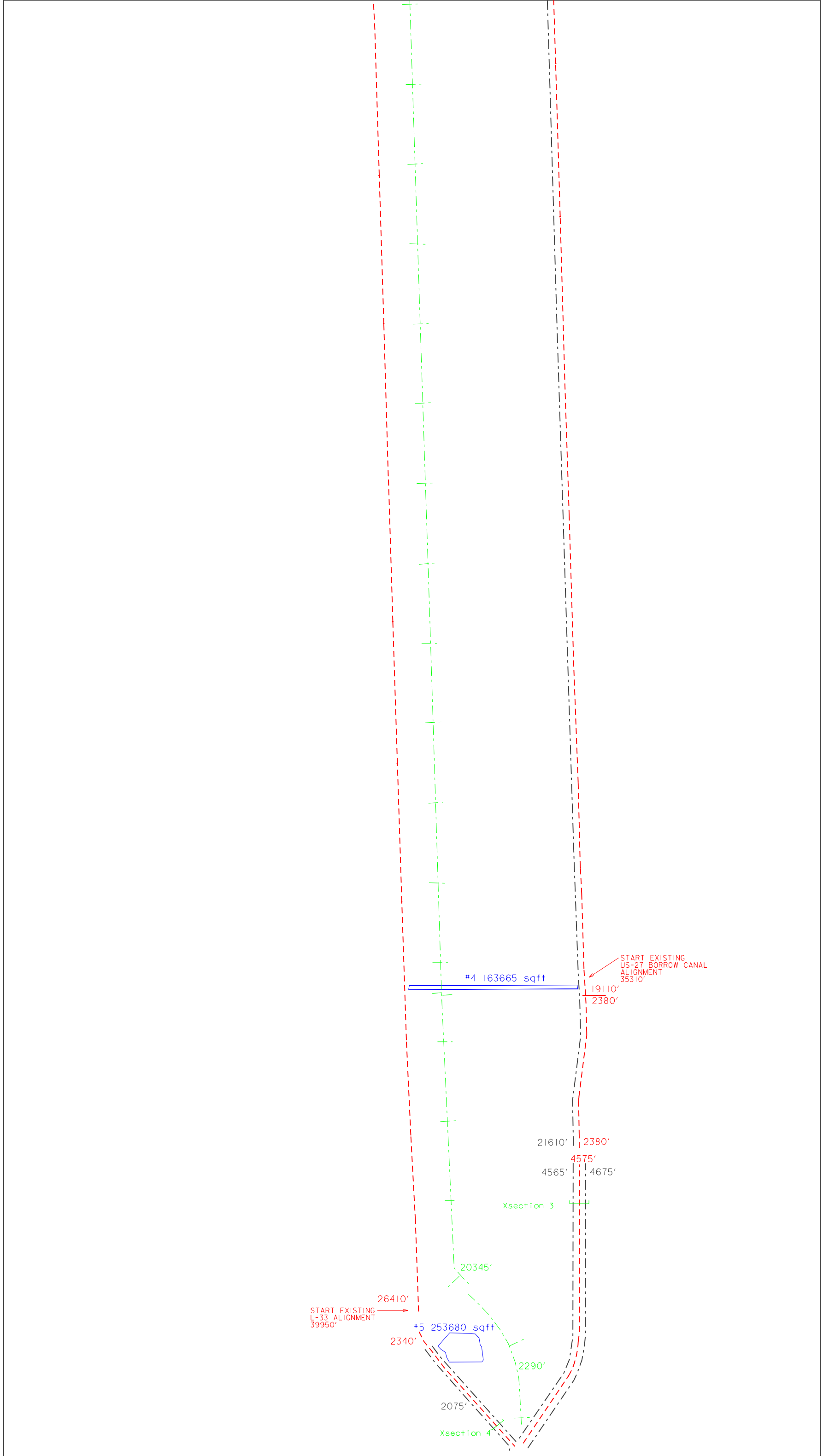

8775'
16120'
RAISE
TO 8.5
NGVD
294010 sqft
16825'
15945'
END EXISTING
US-27 BORROW CANAL
ALIGNMENT
35310'
END EXISTING
L-33 ALIGNMENT
39950'
Xsection 1
8775'
12760'
#1 391250 sqft
#3 32945 sqft
RAISE
TO 8.0
NGVD
494650 sqft
#2 84140 sqft
16825'
26410'
7195'
15945'
16120'
2380'
7090'
Xsection 2
2380'
21610'
19110'
2625'
#7W 25395 sqft
#6 116175 sqft #7E 23945 sqft
12760'
20345'



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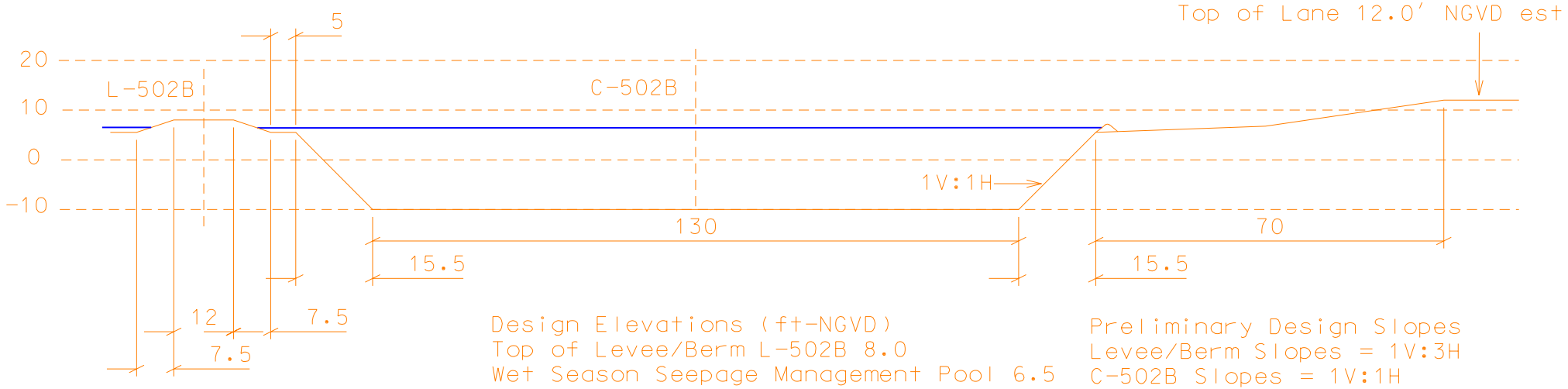
Xsection 1 of C-502B and L-502B
in proximity of US-27
Looking North



Design Elevations (ft-NGVD)
Top of Levee/Berm L-502B 8.0
Wet Season Seepage Management Pool 6.5
Dry Season Seepage Management Pool 5.5
C-502B Design Pool 6.3-6.7
Average Local Ground 5.5
C-502B Bottom -10.0

Preliminary Design Slopes
Levee/Berm Slopes = 1V:3H
C-502B Slopes = 1V:1H

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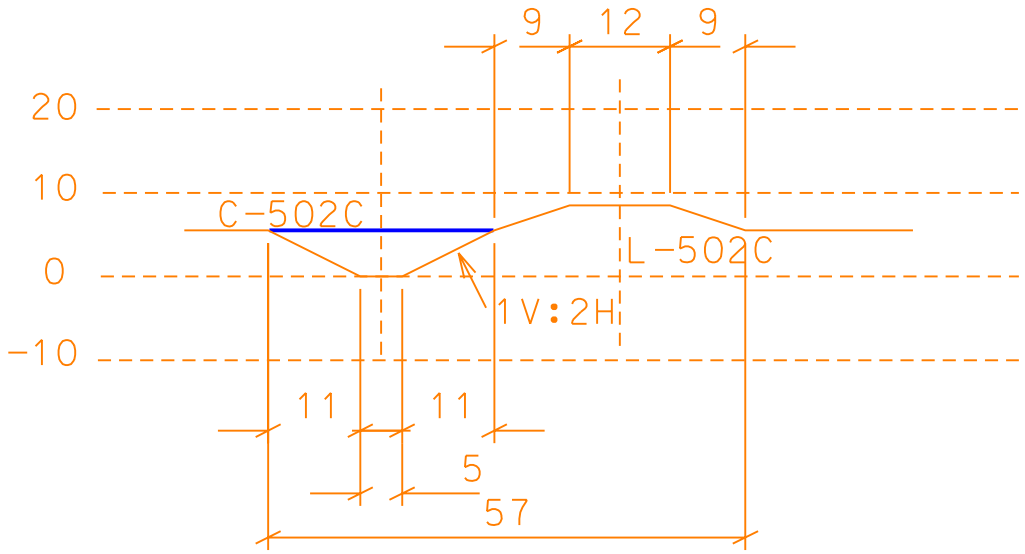
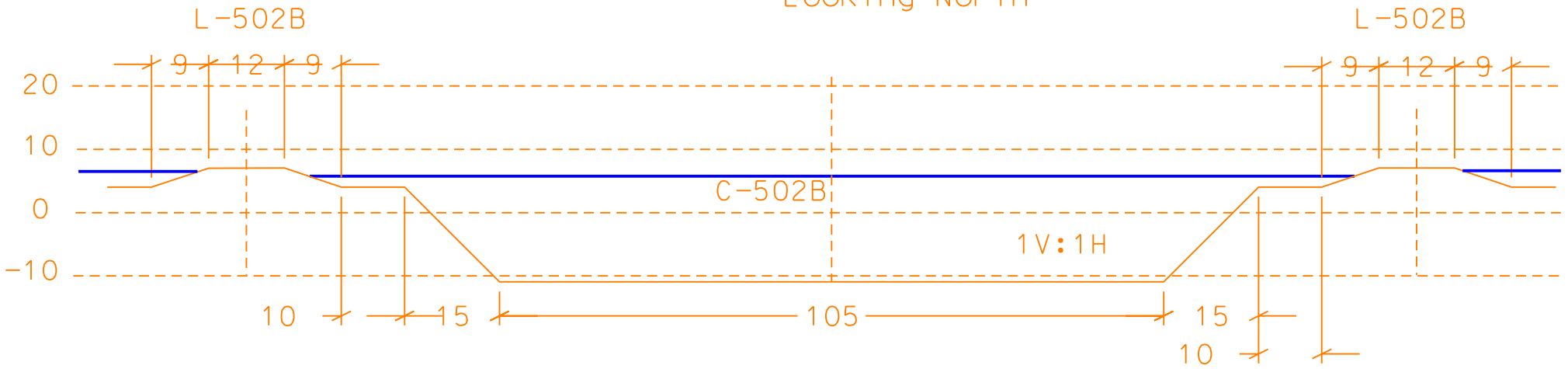
Xsection 2 of L-502C and C-502C at northern boundary of Holy Lake Mobile Home Community Looking West



Design Elevations (ft-NGVD)
Top of Levee/Berm L-502C 8.5
Wet Season Seepage Management Pool 6.5
Dry Season Seepage Management Pool 5.5
C-502C Design Pool 5.5
C-502C bottom Elevation 0.0
Average Local Ground 5.5

Preliminary Design Slopes
Levee/Berm Slopes = 1V:3H
C-502C Slopes = 1V:2H

Xsection 3 of C-502B and L-502B
in proximity of US-27 and Krome Ave
south of S-508
Looking North



Design Elevations (ft-NGVD)
Top of Levee/Berm L-502B 7.0
Wet Season Seepage Management Pool 6.5
Dry Season Seepage Management Pool 5.5
C-502B Design Pool 5.75
Average Local Ground 4.0
C-502B Bottom -11.0

Preliminary Design Slopes
Levee/Berm Slopes = 1V:3H
C-502B Slopes = 1V:1H

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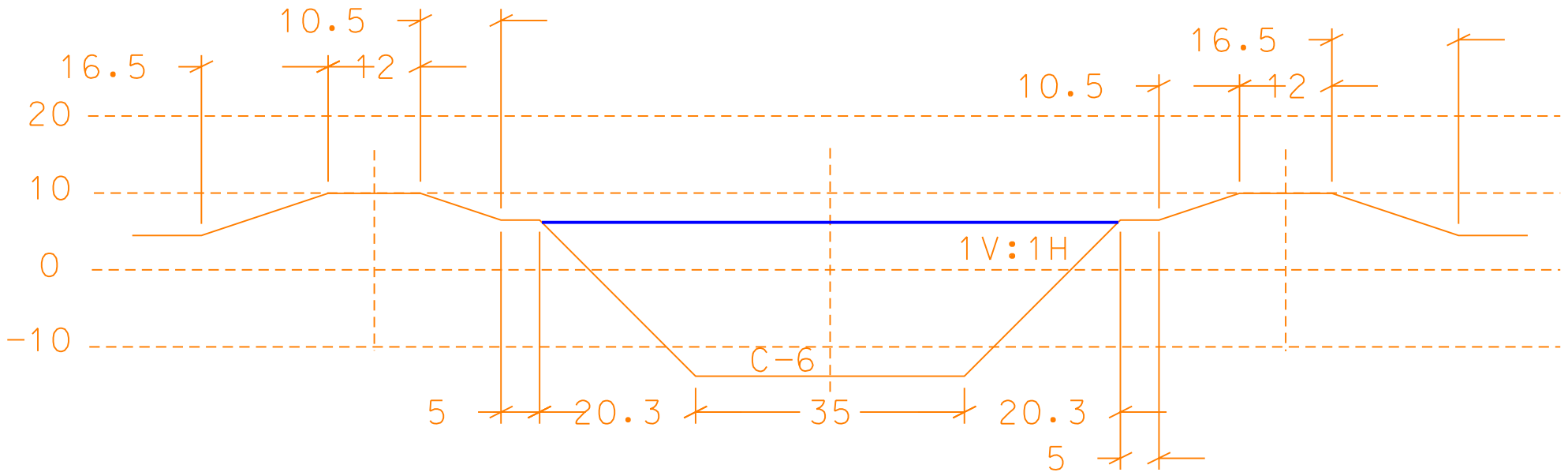
Xsection 4 of Realigned C-6 between Krome Ave and S-514 Looking West



Design Elevations (ft-NGVD)
Top of Levee 10.0
Inside Levee Bench 6.5
C-6 Design Pool 6.3
Average Local Ground 4.5-5.0
C-6 Bottom -13.8

Preliminary Design Slopes
Levee Slopes = 1V:3H
C-6 Slopes = 1V:1H

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Design Region: seep3b (WCA-3B Seepage Management Area)

Design:
a) Design conveyance canals, levees, gated culverts, gated spillways, tunnels, and a pump station.
b) Clear and grub Melaleuca areas

Pumps:
1. S-507 Holy Lake Mobile Home Community

Spillways:
1. S-32 Remove and rebuild
2. S-32A Removal
3. S-514
4. S-516

Gated Culverts:
1. S-515

Gated Tunnels:
1. S-30 Removal and rebuild – flow under US-27
2. S-508 Flow under Krome Ave

Levees:
1. L-502B
2. L-502C Holly Lake Mobile Community

Canals:
1. C-500B
2. C-502B
   - Includes concrete flume section between US-27 and Holly Lake Mobile Community
   - Due to the close proximity of US-27, earthwork will include 35300’ in length of stormwater runoff design from US-27. The design will require earthwork grading to create a dry storage swale approximately 1' deep. Assume 20-30' width along the 35300' length. Assume one 10' long concrete weir every 500' (69 required).
3. C-502C Holly Lake Mobile Home Community
4. C-6 Canal improvement to 2000 cfs for 2500’ southeast of the confluence of C-500B and C-6

   HW = 6.30 ft-NGVD
   TW = 6.10 ft-NGVD

   Bottom Elevation = -13.80 (20 ft deep)
   Bottom Width = 35 feet
   Top Width = 75 feet (at ground)
   Ground Elev used = 6.20 ft-NGVD (will need bank levees)

Side Slopes (both) = 1 on 1
Flow = 2000 cfs
Length of Improvement = 2500 feet
Channel Velocity = 1.82 fps

Bridges:

1. B-500 FPL Substation over C-502B
2. B-501 Holly Lake Mobile Home Community over C-502B
3. B-502 Krome Ave crossing at C-6

Notes:

1. ROW – Eastern boundary limits begins approximately 70’ from US-27 northbound lane.

Utilities:

1. Fiber optics along west side of US-27
2. FPL Substation
3. High tension FPL power lines
4. Phone and electric