

Flood Protection Level of Service Assessment for C7 Basin

Sponsored by: FEMA & SFWMD

Conducted by: SFWMD, ADA Consulting, Deltares and Rand

With Support from: Miami-Dade County and Municipalities in the C7 Basin

March 24 2017 presentation to stakeholders in the C7 Basin

Flood Protection Level of Service Program

- Purpose of Flood Protection Level of Service program is to identify and prioritize long-term District infrastructure needs.
- Level of Service projects provide a process to establish flood protection thresholds for each basin. These thresholds initiate retrofit and other adaptation efforts.
- Adaptation will be coordinated with the annual structure maintenance program



Flood Protection Level of Service: C-7, C-8 and C-9 basins

➤ Purpose

- Determine the existing Flood Protection Level of Service for C-7, C-8 and C-9 basins
- Determine the future Flood Protection Level of Service for three sea level rise scenarios
- Develop flood protection strategies with Miami-Dade County and develop FEMA Local Mitigation Strategy (LMS)
 - Project Cost (Fiscal year 2016-2017)
 - \$300,000 FEMA
 - \$150,000 SFWMD cost share



Project Milestones

- SFWMD Structure Operations Atlas
- Assessment of existing level of flood protection
- Assessment of 2065 level of flood protection assuming no infrastructure changes
- Identification and assessment of alternate flood protection mitigation strategies
- Development of Local Mitigation Strategy document



Risk Assessment [process]

PRE-MEETING:
Requirements and data compilation, local government, citizen engagement, clarify partnership roles, identify potential measures

Deep Uncertainty Analyses

MEETING #1:
Develop Adaptation Strategies
(Robust Decision Making Process)

MEETING #2:
Analyze Strategy timing, sequencing, components, costs, benefits
(Dynamic Adaptation Policy Pathways)

Adaptation Policy Plan – options, timing, financial needs

- Implementation**
- infrastructure improvements (LMS)
 - policy and regulatory changes
 - refine / monitor implementation thresholds
 - funding options

Adaptation Strategy Evaluation [tools]

Flood Drivers

- Rainfall
- Coastal Storm Surge
- Sea Level Rise

IMPLEMENTATION SCENARIOS: DRIVEN BY MODELS

Suite of 16 Simulations – 4 rainfall x 4 sea levels

- Initial Run – No Action Strategy (Current Infrastructure)
- Subsequent Runs – Adaptation Strategies (Defined by strategy evaluation process)

C7 XPSWMM

Level of Flood Protection

Damage Assessments

(modify model as needed)

Strategy Evaluation

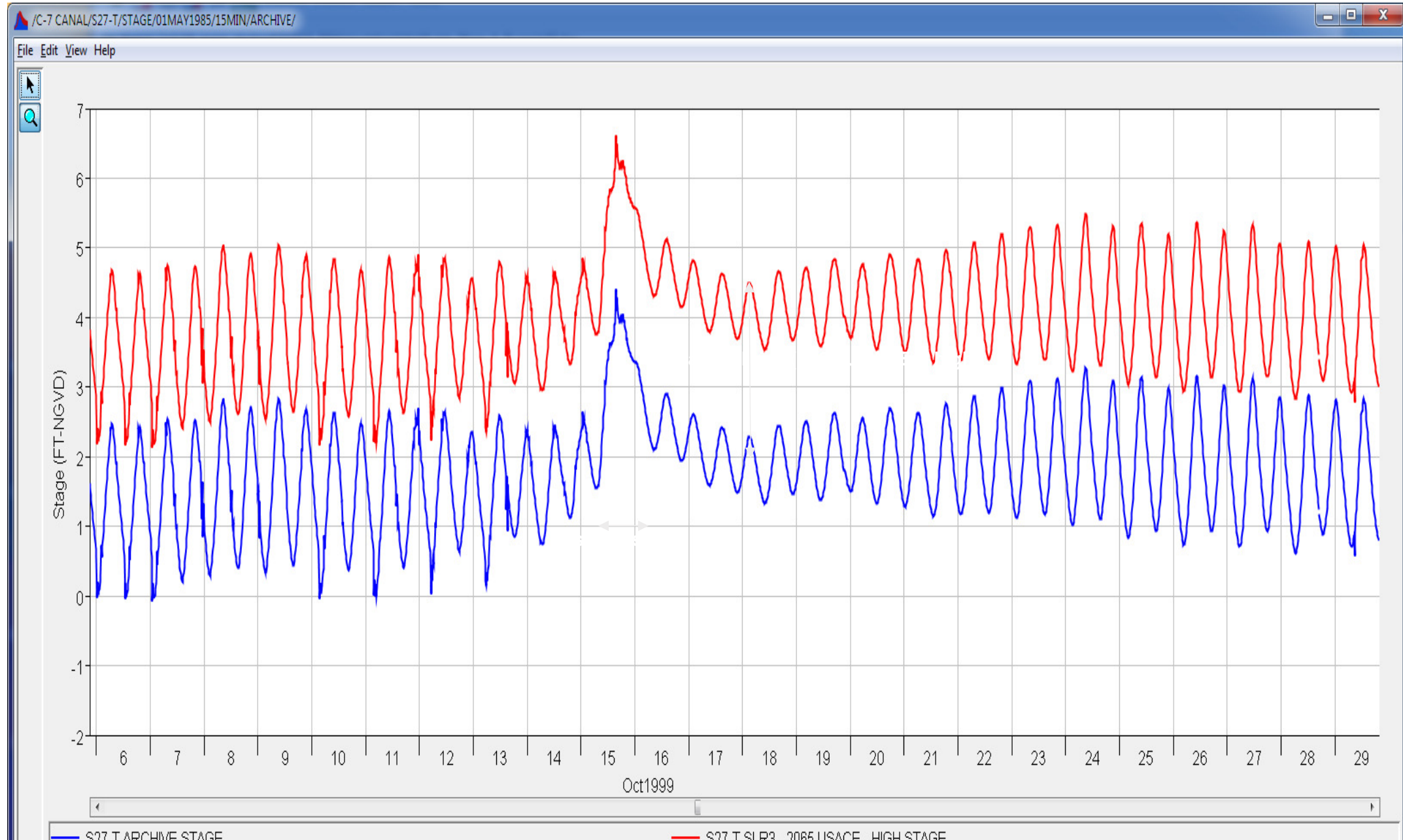
WORK PROCESS

Preliminary Results of Sea Level Rise Flood Modeling

March 24 2017 presentation to stakeholders in the C7 Basin

Why does Sea Level Rise cause flooding upstream of S-27?

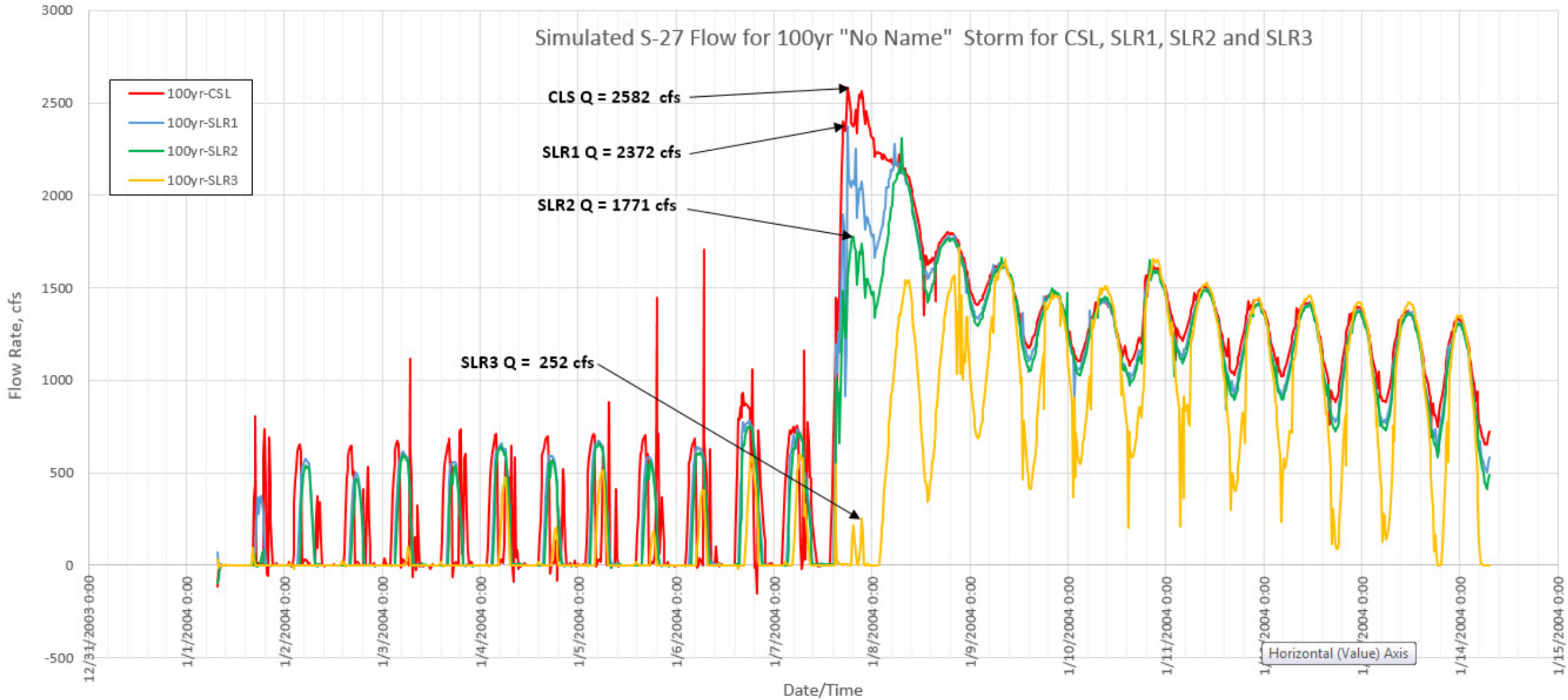
10-year
Storm Surge
at S27
Tailwater:
CSL and
SLR3



Preliminary Modeling Assumptions:

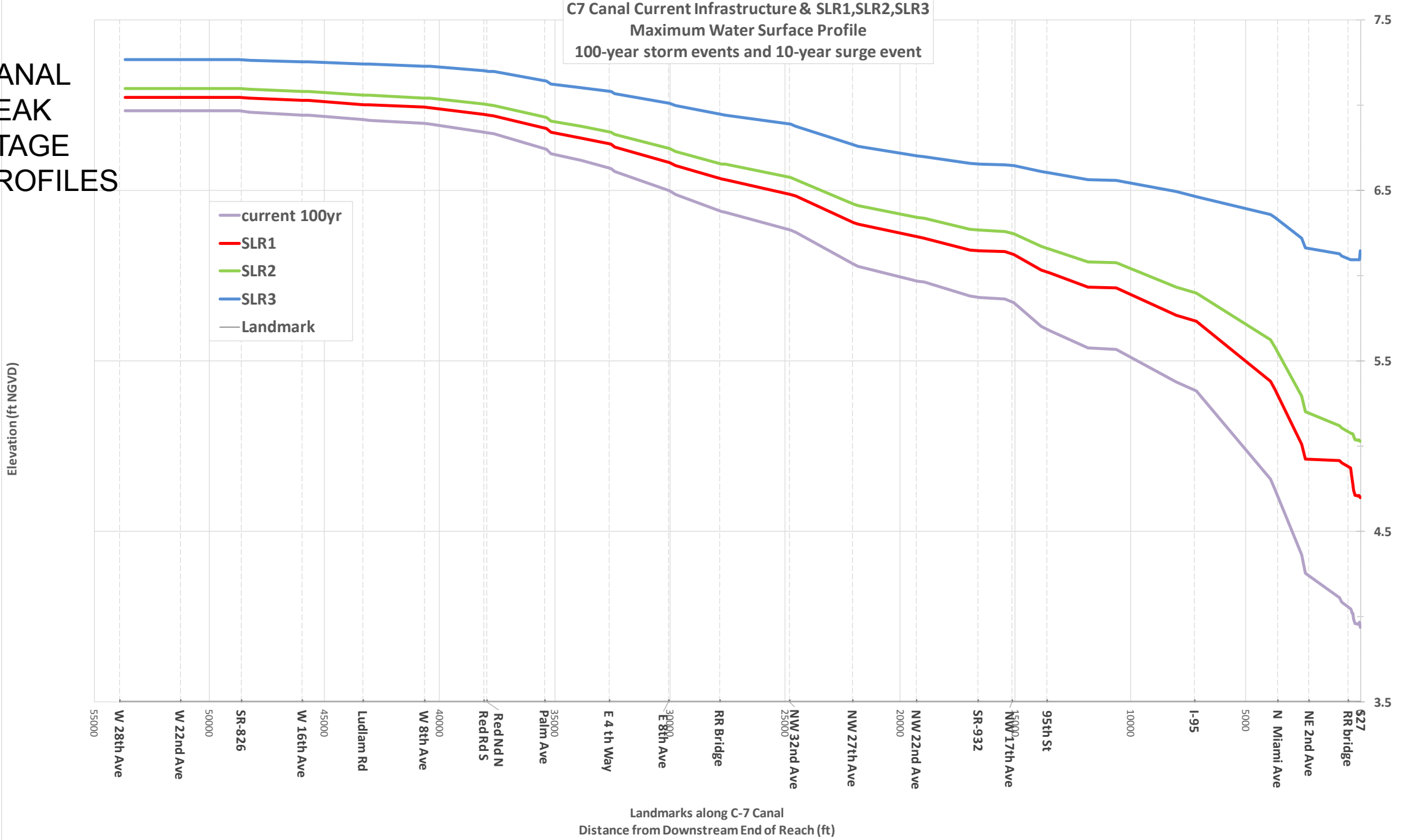
- 5-year, 10-year, 25-year, 100-year Rainfall volumes
 [only 100-year rainfall events presented today]
- Rainfall Pattern of the Oct 2000 No-Name Event
- No-Name Storm Surge (10-year return period)
- October Average Groundwater (no effect of sea level rise on groundwater in these preliminary results)
- Four Sea Level Thresholds:
 - Current Sea Level (CSL)
 - SLR1 (+0.76 ft)
 - SLR2 (+1.09 ft)
 - SLR3 (+2.21 ft)
- NO BACKFLOW FROM OCEAN TO BASIN

Flows at S27



CANAL PEAK STAGE PROFILES

C7 Canal Current Infrastructure & SLR1,SLR2,SLR3
Maximum Water Surface Profile
100-year storm events and 10-year surge event

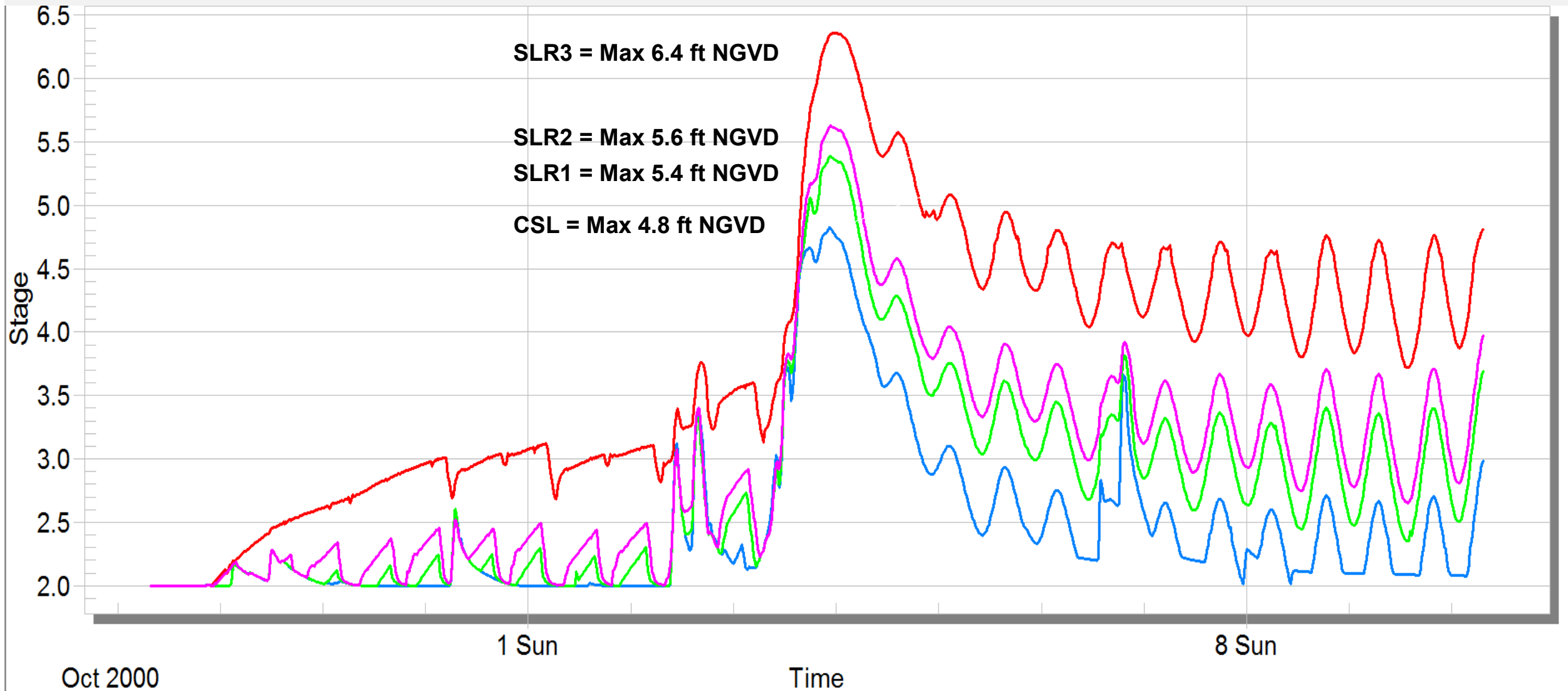


- current 100yr
- SLR1
- SLR2
- SLR3
- Landmark

55000 W 28th Ave 50000 W 22nd Ave SR-826 45000 W 16th Ave Ludlam Rd 40000 W 8th Ave Red Rd N Red Rd S 35000 Palm Ave E 4 th Way 30000 E 8th Ave RR Bridge 25000 NW 32nd Ave NW 27th Ave 20000 NW 22nd Ave SR-932 15000 NW 17th Ave 95th St 10000 I-95 5000 N Miami Ave NE 2nd Ave RR bridge \$27

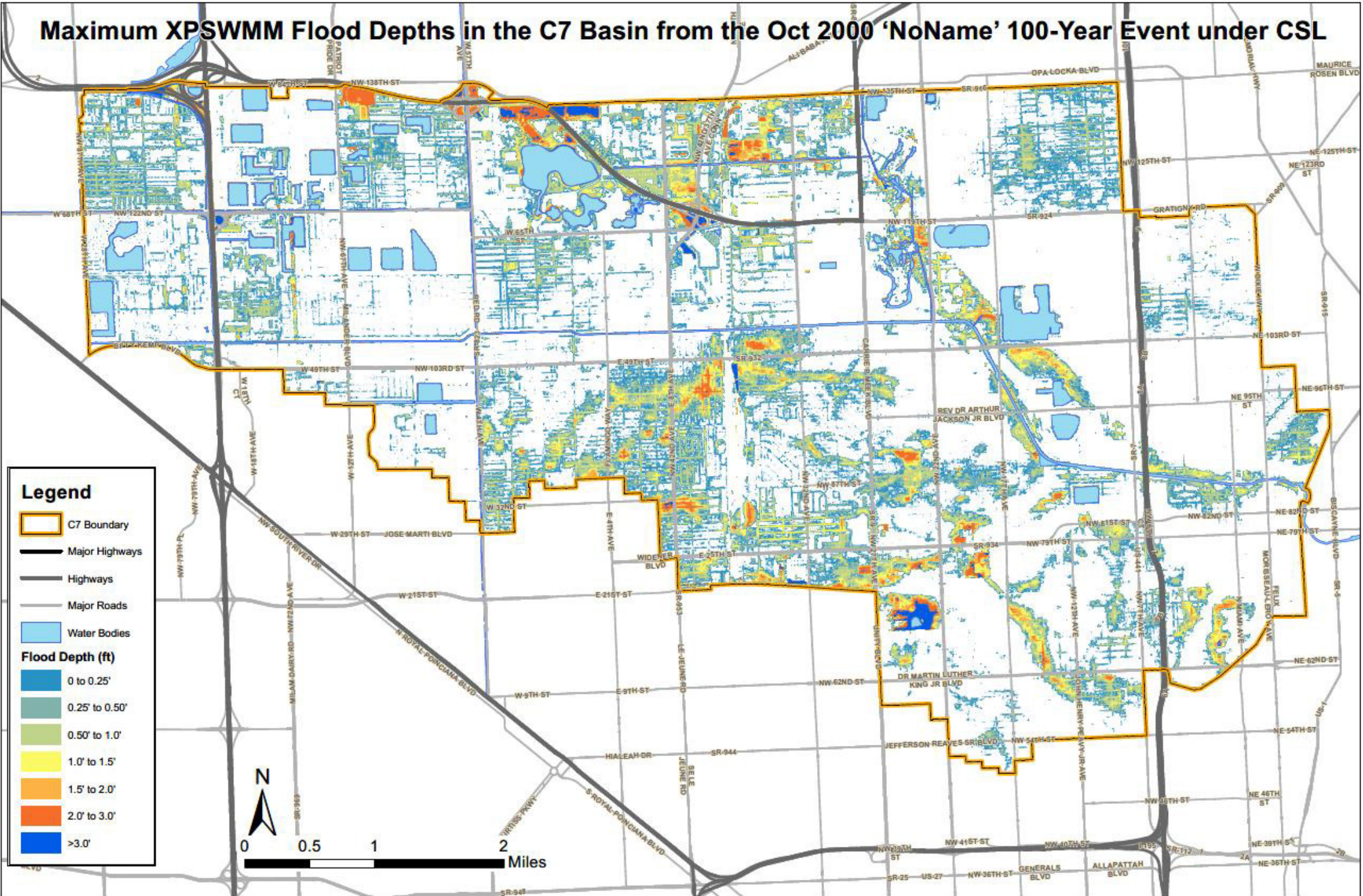
Landmarks along C-7 Canal
Distance from Downstream End of Reach (ft)

Computed peak stages for the 100-y Rainfall with 10-yr Surge for CSL, SLR1, SLR2 and SLR3 Sub-basin C7-S-16



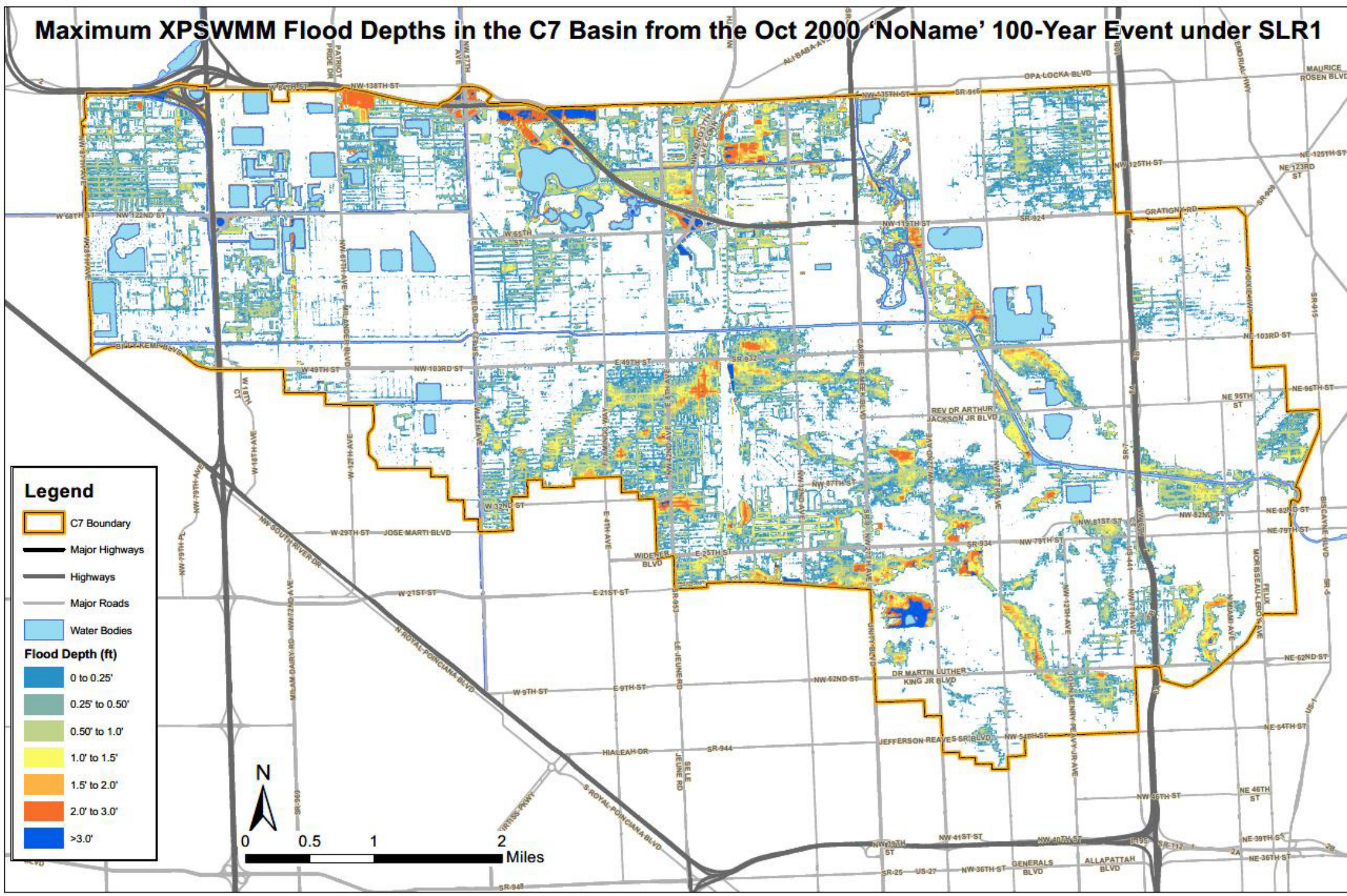
Maximum XPSWMM Flood Depths in the C7 Basin from the Oct 2000 'NoName' 100-Year Event under CSL

Current
Sea
Level



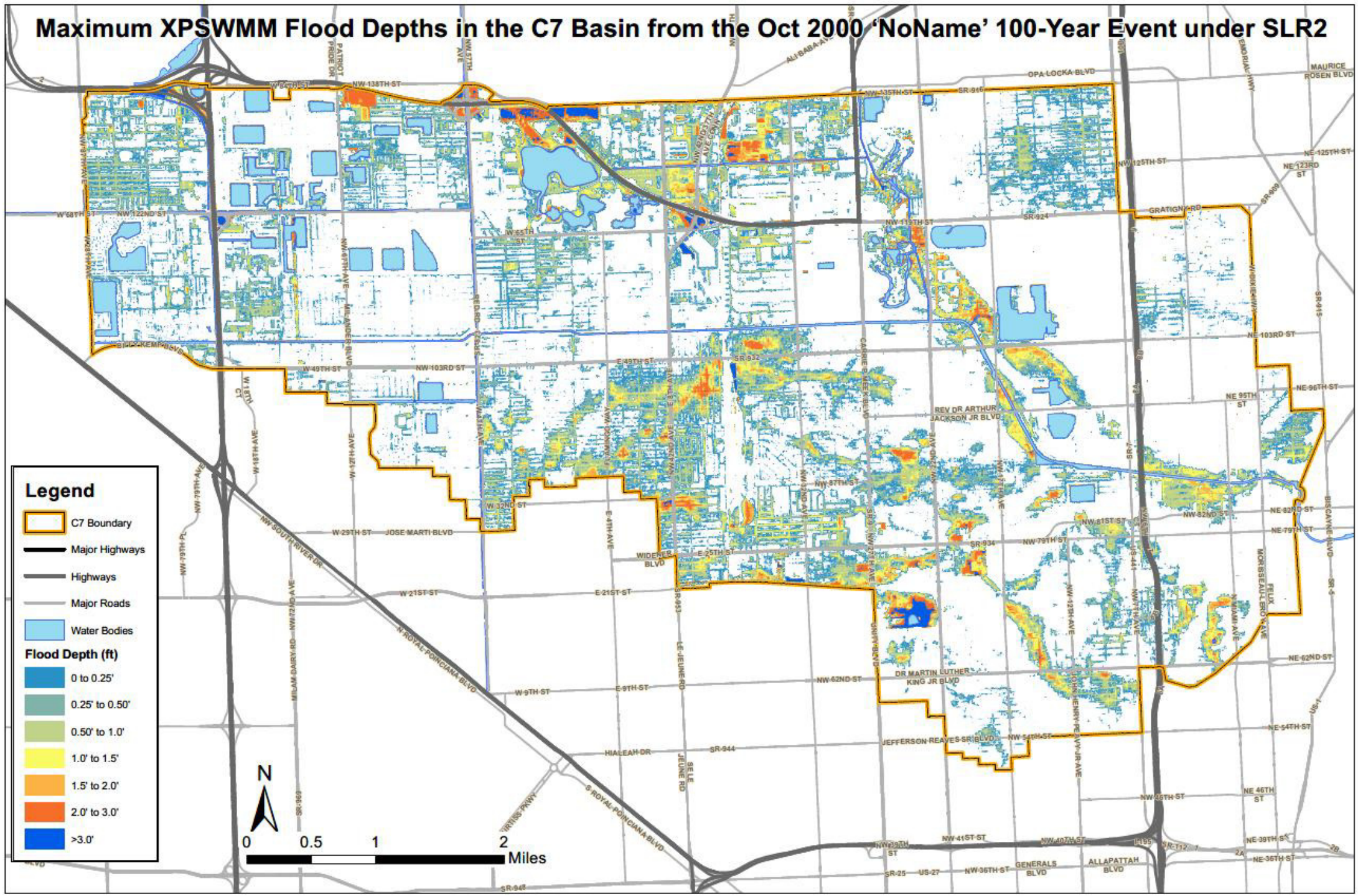
Maximum XPSWMM Flood Depths in the C7 Basin from the Oct 2000 'NoName' 100-Year Event under SLR1

SLR1
=
CSL
+
0.76 feet



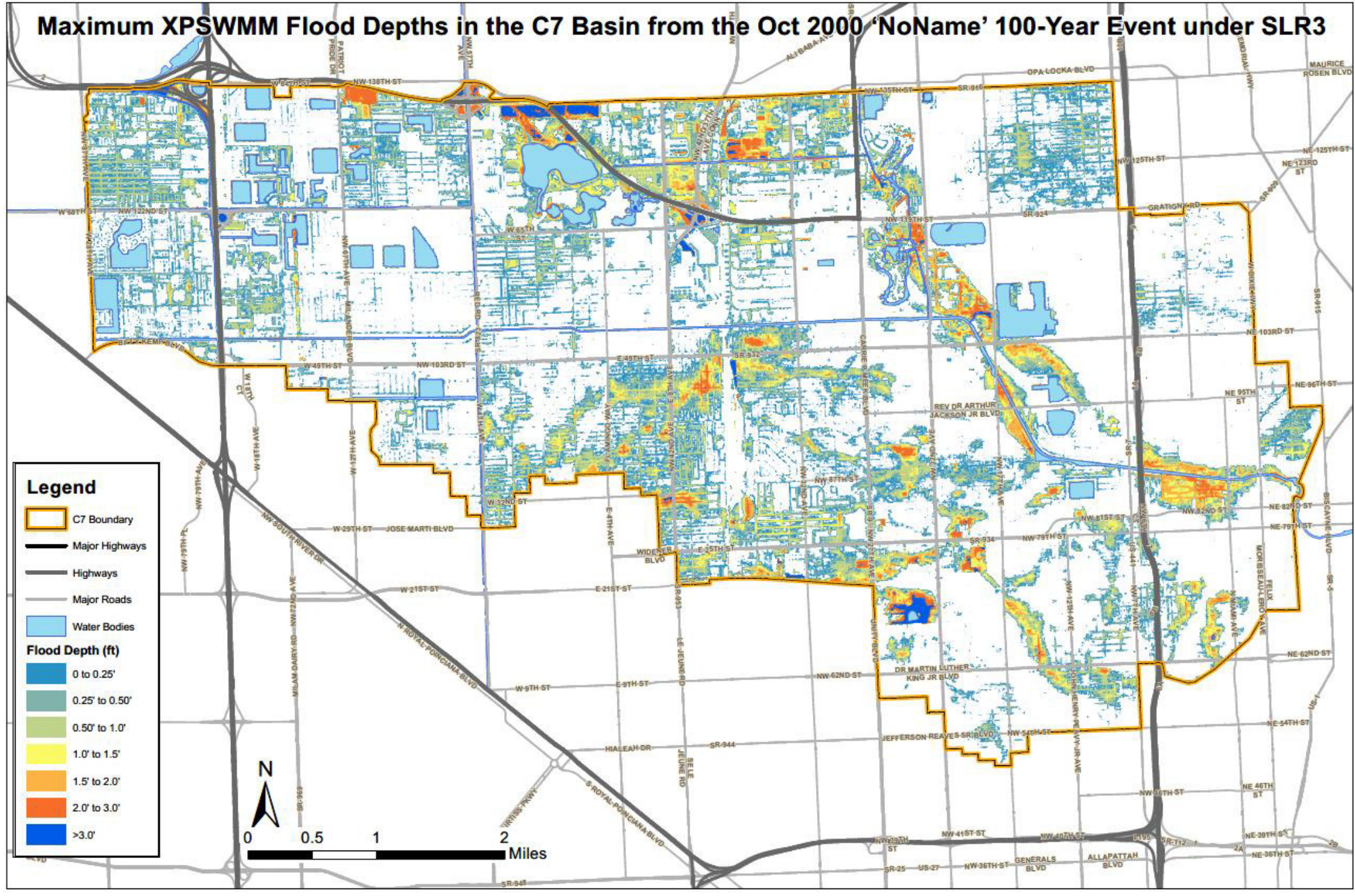
Maximum XPSWMM Flood Depths in the C7 Basin from the Oct 2000 'NoName' 100-Year Event under SLR2

**SLR2
=
CSL
+
1.09 feet**



Maximum XPSWMM Flood Depths in the C7 Basin from the Oct 2000 'NoName' 100-Year Event under SLR3

**SLR3
=
CSL
+
2.21 feet**



Legend

- C7 Boundary
- Major Highways
- Highways
- Major Roads
- Water Bodies

Flood Depth (ft)

- 0 to 0.25'
- 0.25' to 0.50'
- 0.50' to 1.0'
- 1.0' to 1.5'
- 1.5' to 2.0'
- 2.0' to 3.0'
- >3.0'



FLOOD MITIGATION STRATEGIES FOR CONSIDERATION

- Improve Storm Surge Protection
- Maintain basin discharge while sea levels rise
- Land-use Change
- Implement operational strategies at S27 structure to maintain flood protection as sea levels rise
- Maintain canal conveyance while sea levels rise
- Increase basin storage



STRATEGY: Improve Storm Surge Protection

- Raise elevation of tie-back levees (bypass elevation now 4 ft) and also raise overflow elevation of S27 structure (now at 5 ft?)



STRATEGY: Maintain basin discharge while sea levels rise

- Add pumps at S27:
 - Full-service pumps (replace S27 spillway) OR
 - Booster pumps (like the pumps at S25b and S26 structures)
- Redesign structures to operate with lower head differential (current differential is 0.5 ft)
- Deep well injection of flood waters
- Divert portion of flood waters to adjoining C6 and C8 Canals. Discharge to WCA1 via the C6 canal might be possible but would require treatment and back-pumping.



STRATEGY: Land-use Change

- Bring in dirt to raise ground elevations in high-risk flood prone areas (need to consider the potential loss of conveyance if area is in flow way)
- convert high-risk flood prone areas to different land-use (parks, marsh, ...) to limit flood damage
- reduce impervious surface areas
- increase on-site infiltration & ET



STRATEGY: Implement operational strategies at S27 structure to maintain flood protection as sea levels rise

- Implement pre-storm drawdown to increase groundwater storage:
 - using gravity drained local drainage systems (slow, probably would require a change in the wet-season water control level for the basin to provide significant increase in storage)
 - using municipal pumping facilities (faster, but may require pump at S27 to provide significant increase in groundwater storage)



STRATEGY: Maintain canal conveyance while sea levels rise

- Raise water levels in canal so that runoff still occurs even though sea levels are raised
 - Add flood levees along critical sections of C7 canals
 - Add municipal pumps to provide local drainage behind the levees (efficiency of pumps should consider return flow from C7 canal back into local drainage system)
- Widen canal and remove constrictions
- Add a new water control structure in the C7 canal to protect vulnerable downstream areas



STRATEGY: Increase basin storage

- Interconnect and actively manage water levels in larger lakes
- Add stormwater reservoir (like the C4 stormwater reservoir)

