Hydrological and Transportation Improvements to 3rd and 2nd Ave in Brooklyn, NY

Engineering Services Proposal Presentation

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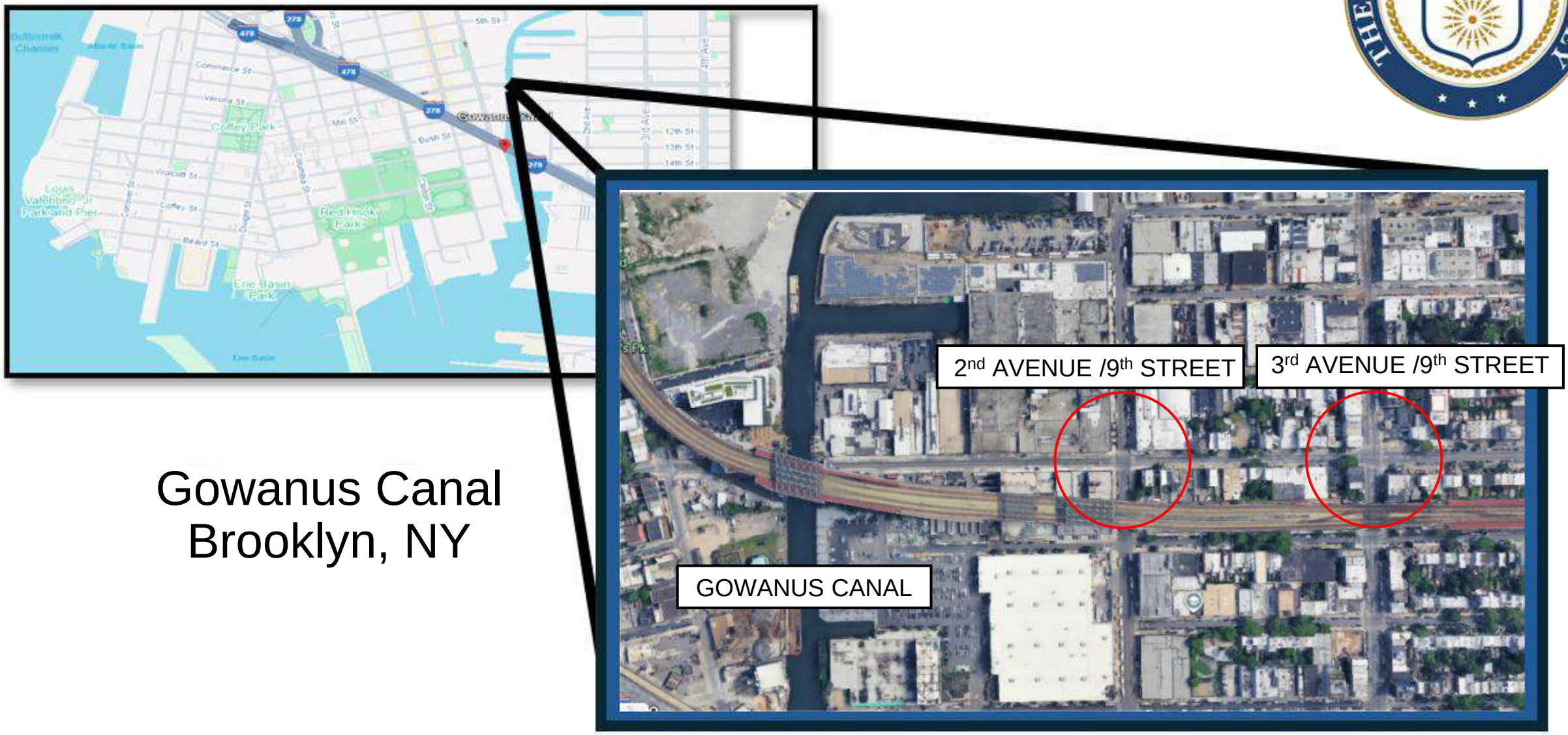
Advisors: Thomas Brennan and Michael Horst

Agenda

1. Background
2. Constraints
3. Tools & Standards
4. Design Alternatives
5. Schedule & Cost Estimates

Site Overview



Gowanus Canal
Brooklyn, NY

Problem Statement and Background

- Heavy flooding during rain events
- Contamination from back-flow of combined sewage and stormwater system
- Unsafe pedestrian crossings, lack of ADA accessibility, and poorly designed bike lanes
- Significant congestion along 9th St

Realistic Constraints

- **Economic:** Excavation, Materials, Labor
- **Sustainability:** Long-term Flood Mitigation, Durability, Multi-Modal Traffic
- **Environmental:** Contaminants, Water Quality, Runoff Impacts, Envision Principles
- **Constructability:** Dense Urban Area, Limited Access
- **Political:** NYC DOT, Community Boards, MTA / FDNA Coordination
- **Ethical & Legal:** NYC Zoning, Right of Ways
- **Health & Safety:** Flood Reduction, Construction Safety Hazards

Hydrological Analysis Methodology

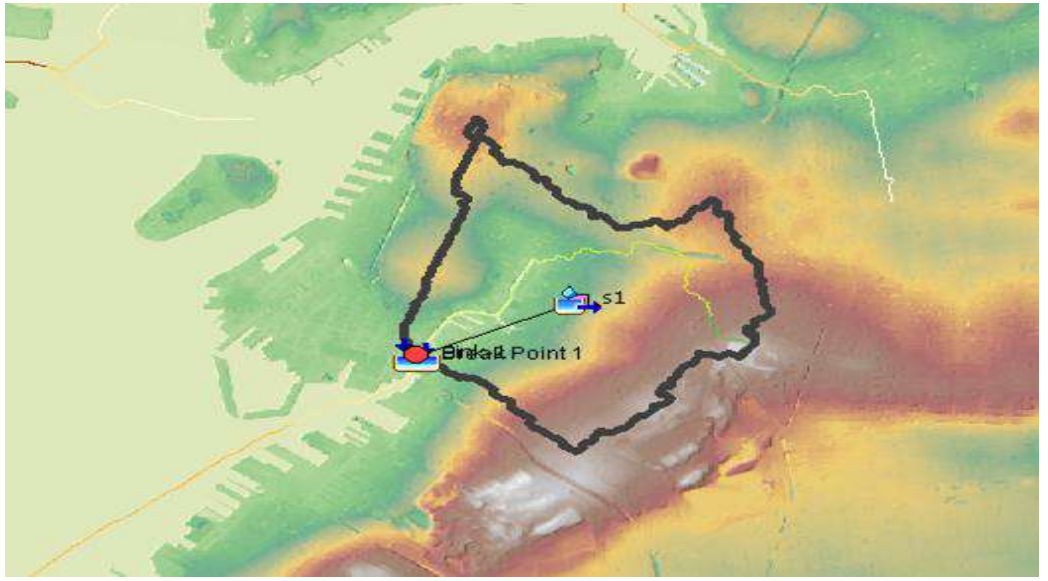
Data Sets:

- Terrain Characteristics, watershed delineation, flow paths, soil groups, rainfall

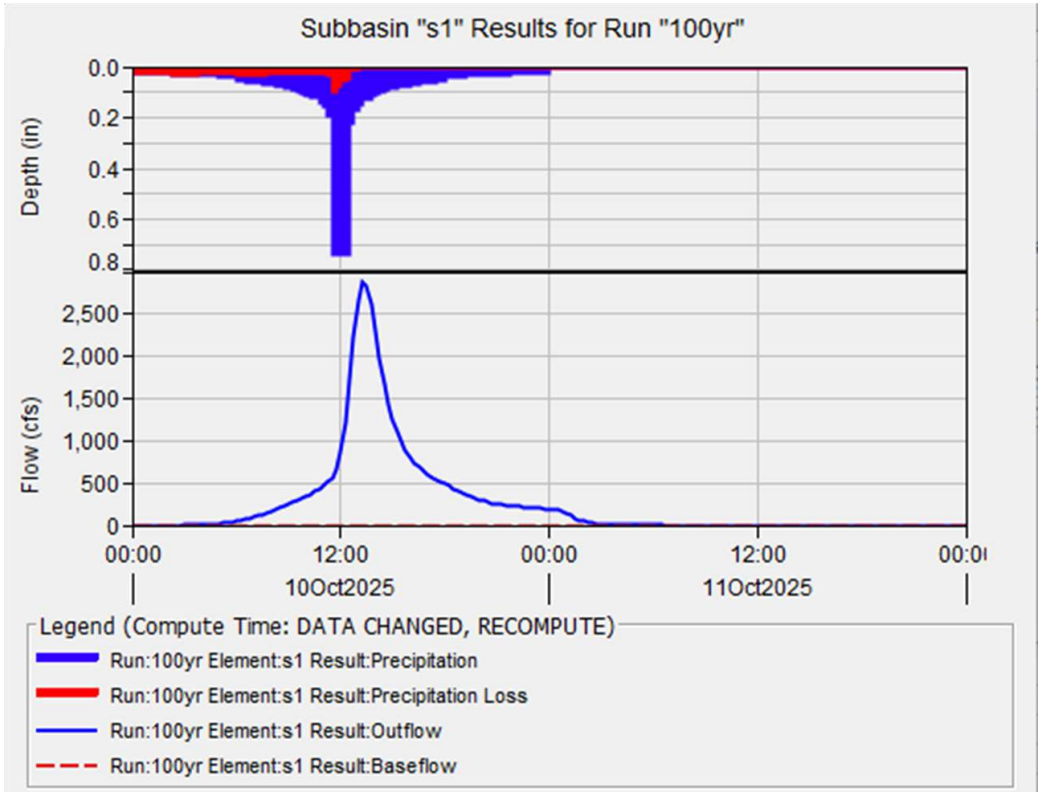
Sources:

- United States Geological Survey (USGS)
- United States Department of Agriculture (USDA)
- National Oceanic & Atmospheric Administration (NOAA)

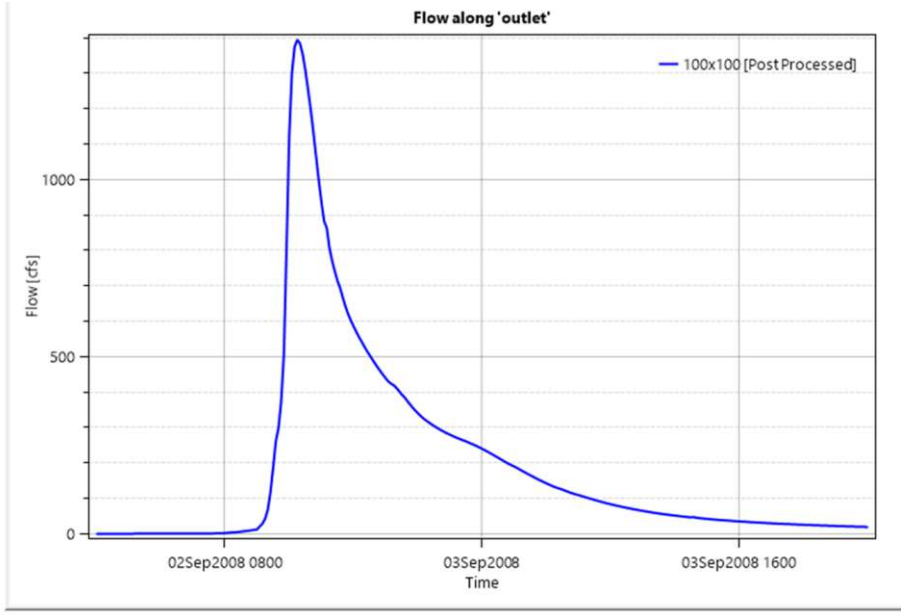
Design Constraints- Hydrological (HMS)



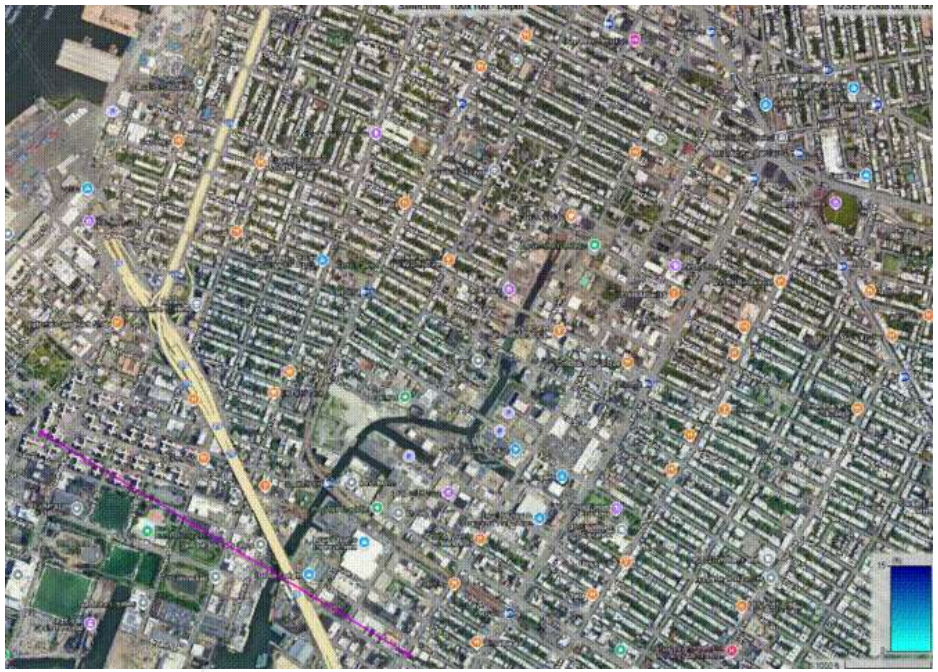
- Drainage Area: 2.72 sq mi
- Curve Number: 86
- Longest Flow Path Length: 17,231 ft
- Basin Slope: 4.28%
- Peak Discharge: 2875.4 cfs
- Direct Runoff Volume: 1001.6 acre-ft

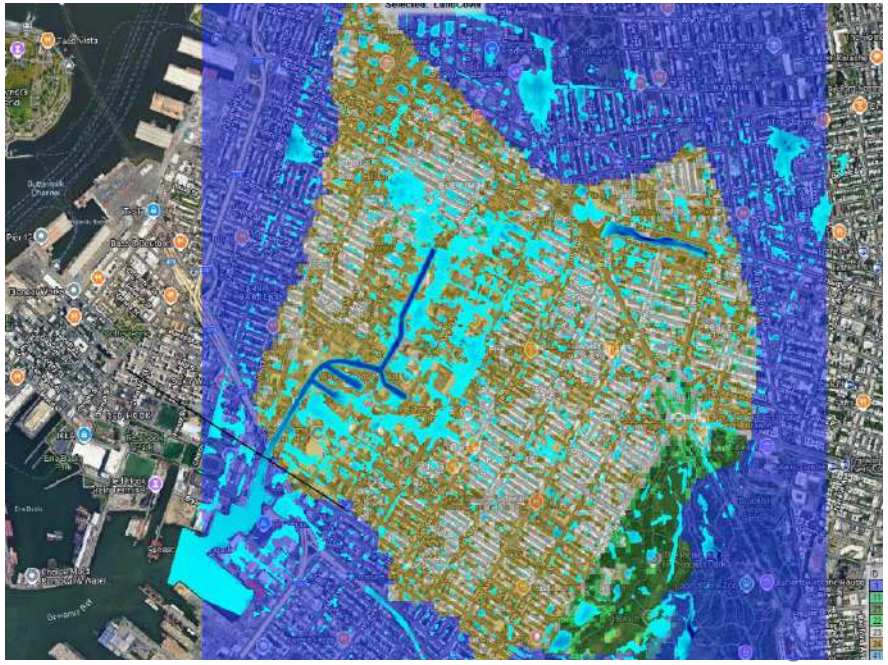


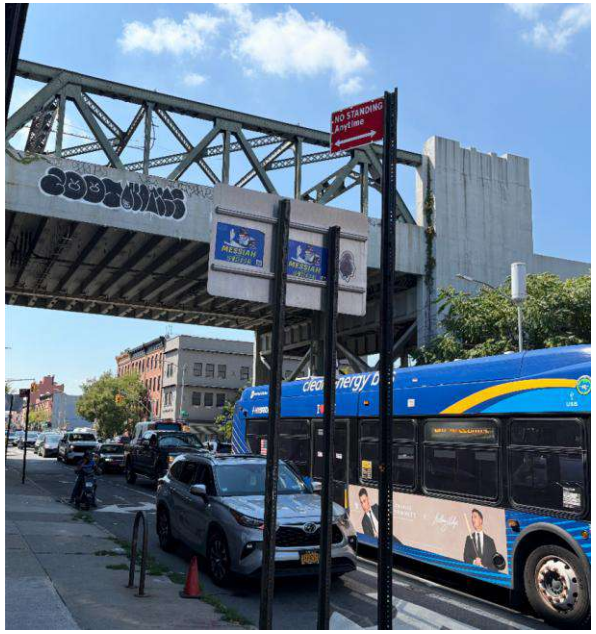
Design Constraints- Hydrological (RAS)



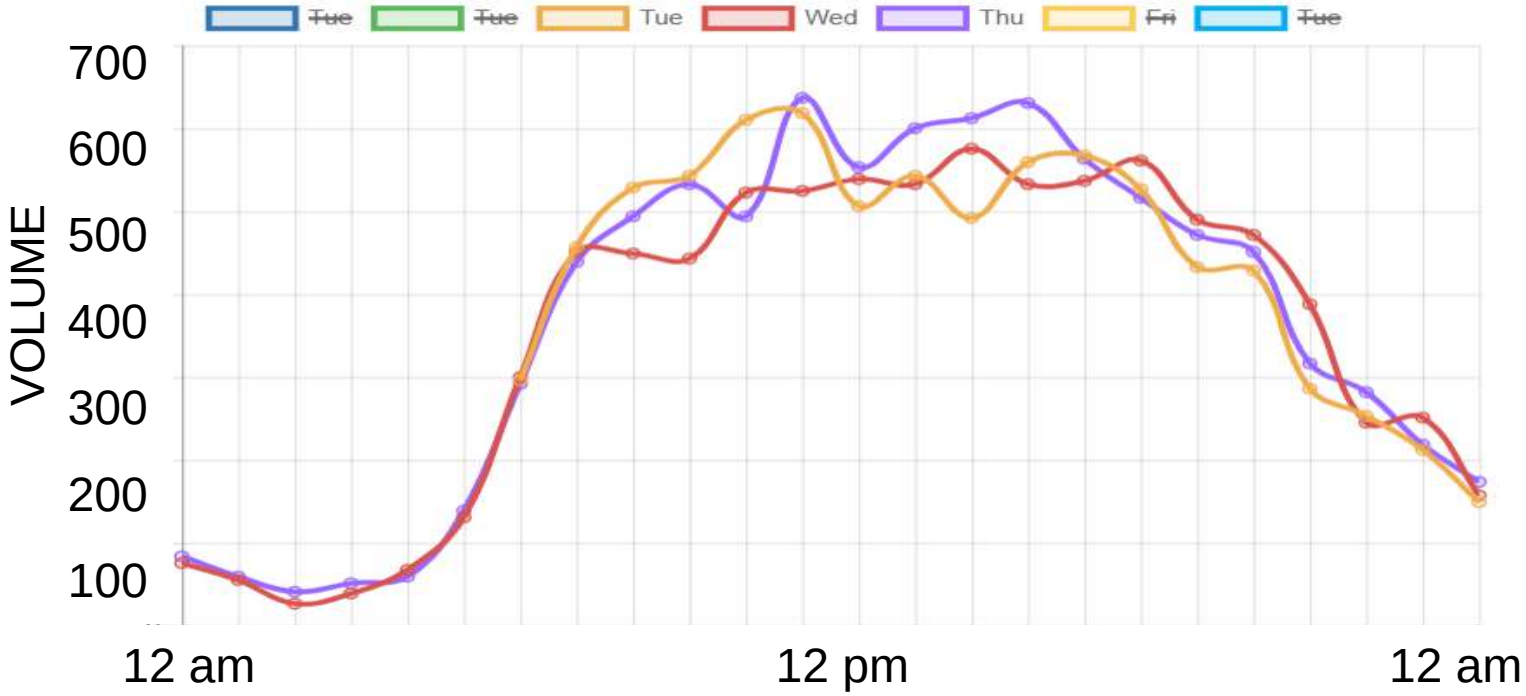
- Peak Discharge: 1403.76 cfs







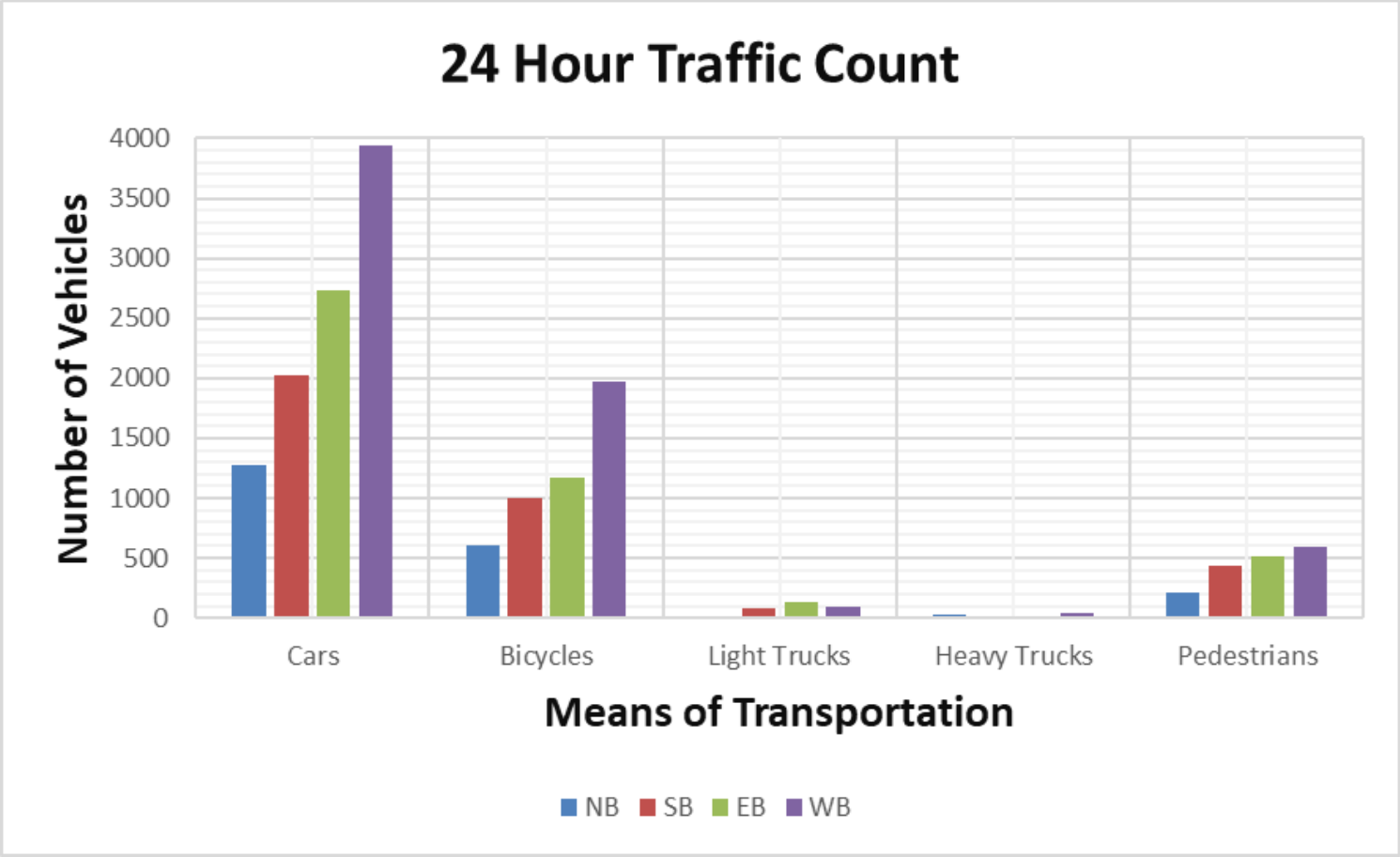
9th Street Traffic Daily Volume 2025



Design Constraints - Transportation

- Heavy traffic observed throughout the area.
- High pedestrian and bicyclist activity noted.
- Indicates a busy area needing improved traffic and safety measures.

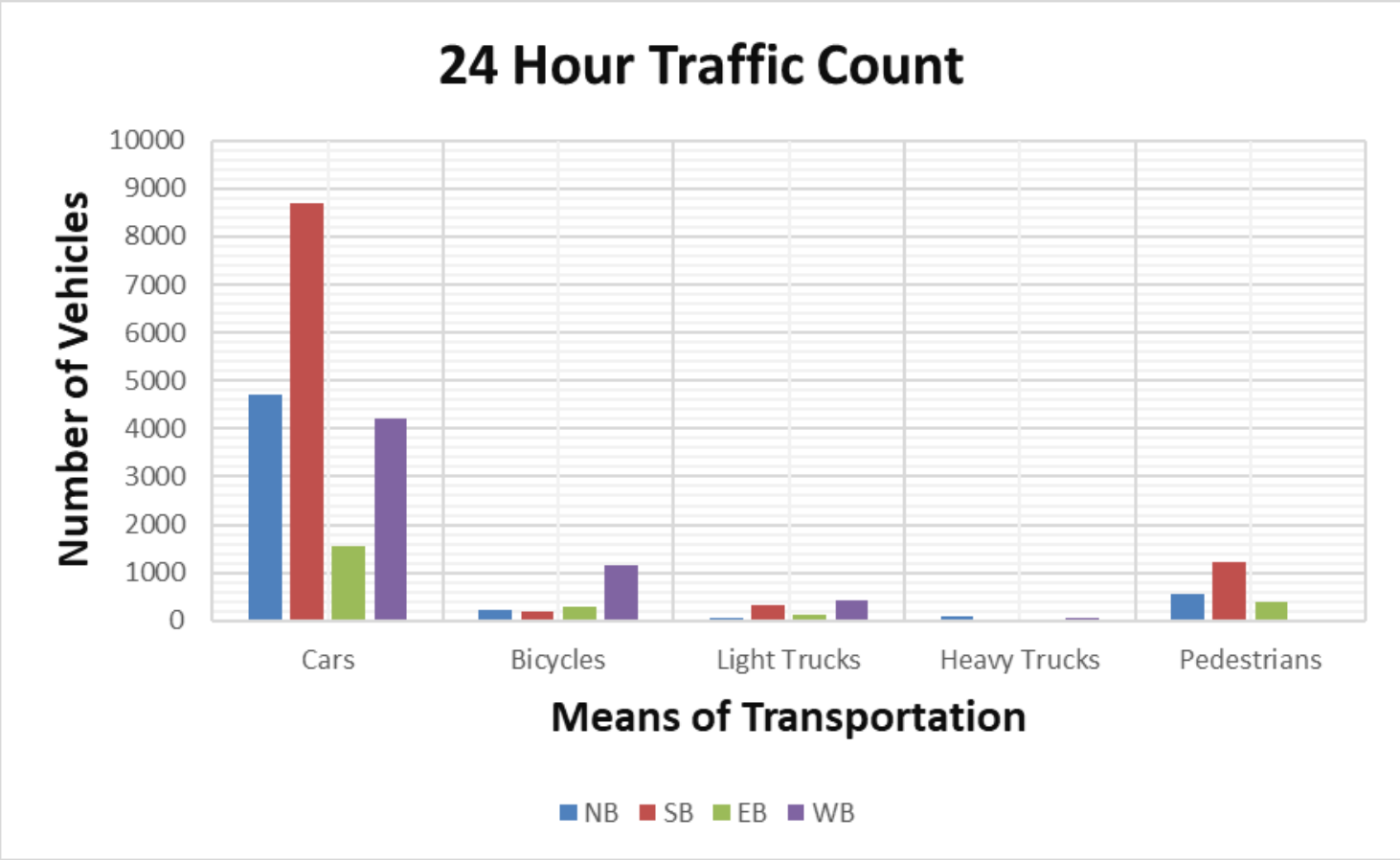
Transportation Analysis: 2nd Avenue/9th Street Traffic Counts



NYSDOT Data Collected: January 31, 2024

Transportation Analysis:

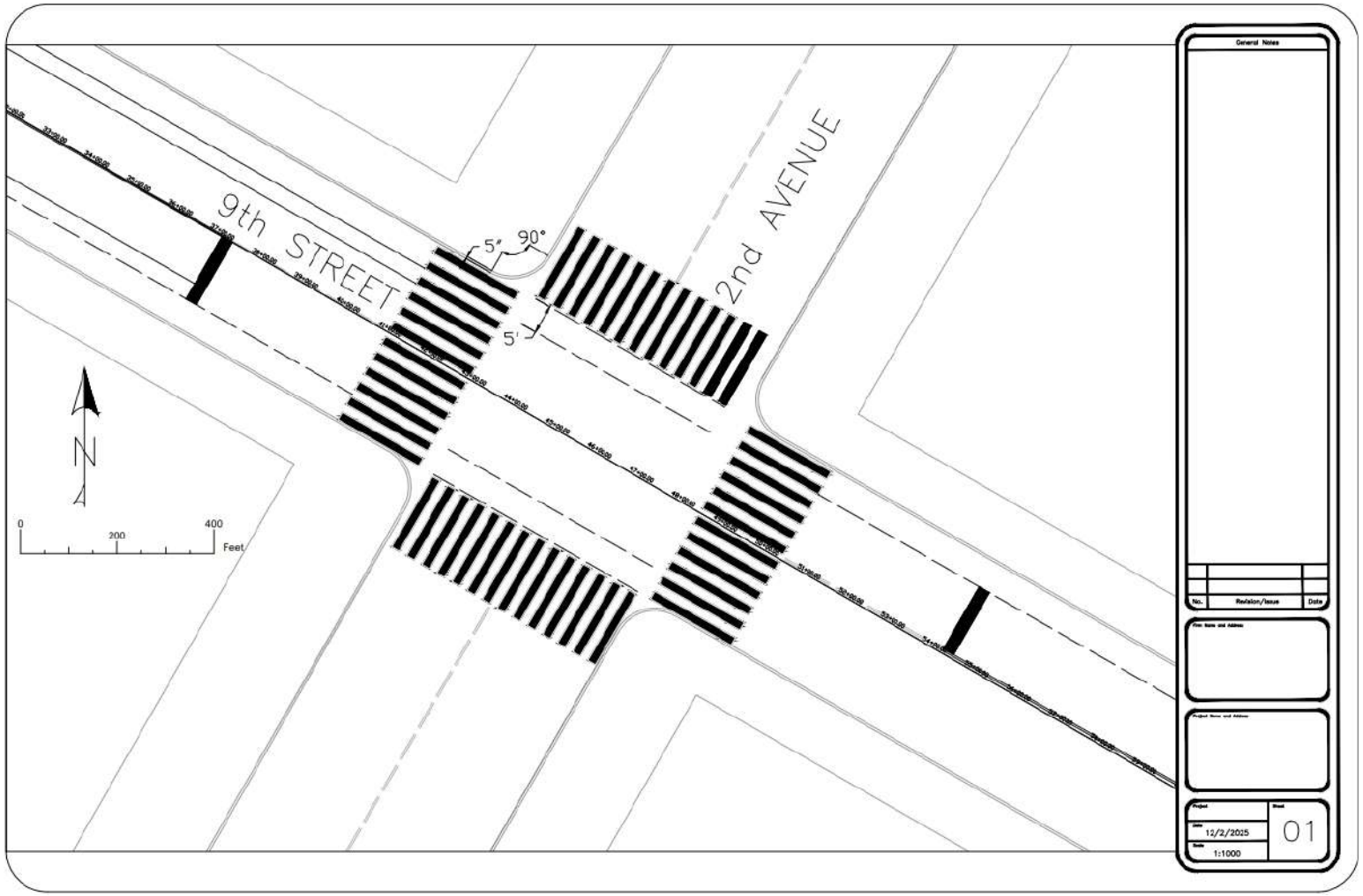
3rd Avenue/9th Street Traffic Counts



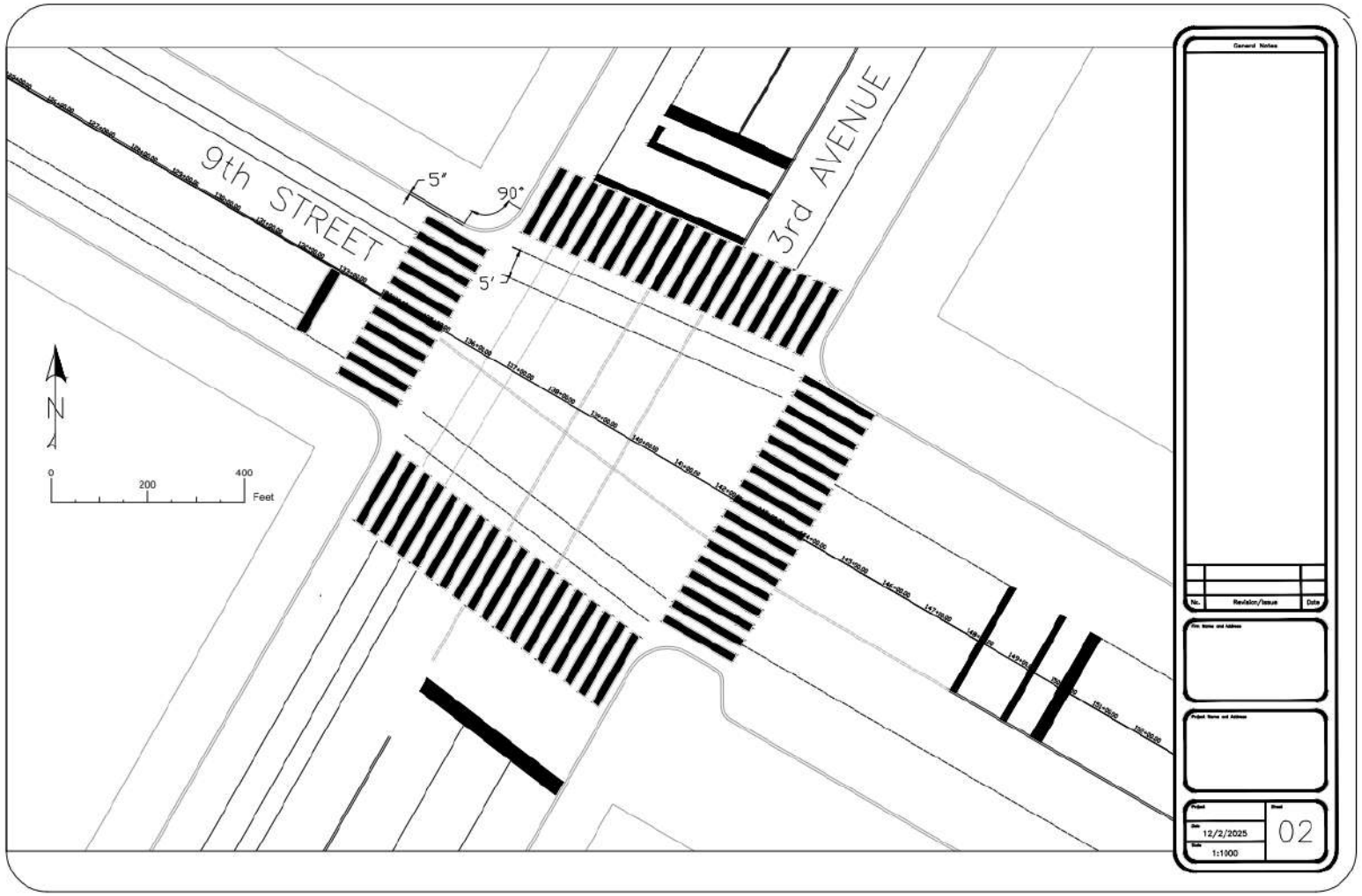
NYSDOT Data Collected: January 31, 2024

Existing Synchro

Existing CAD- 2nd Avenue



Existing CAD- 3rd Avenue

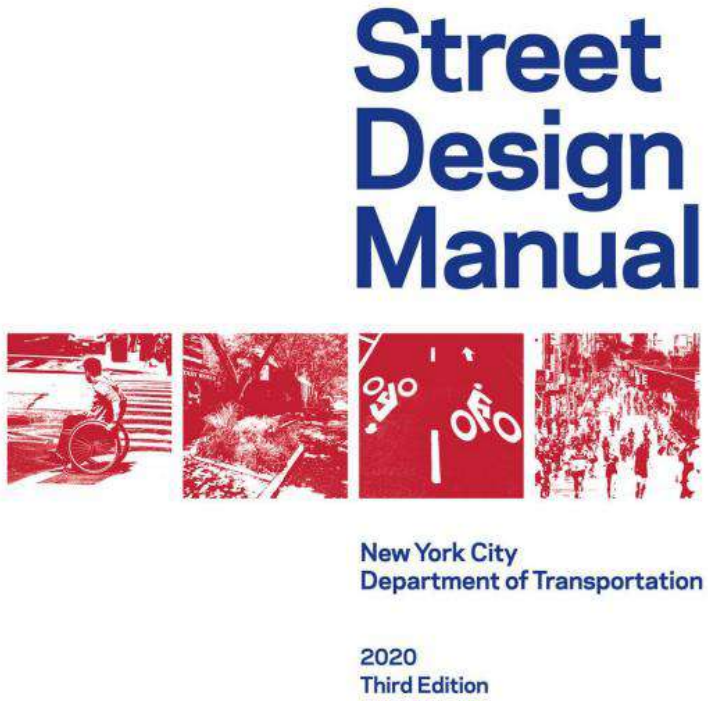


Modern Engineering Tools

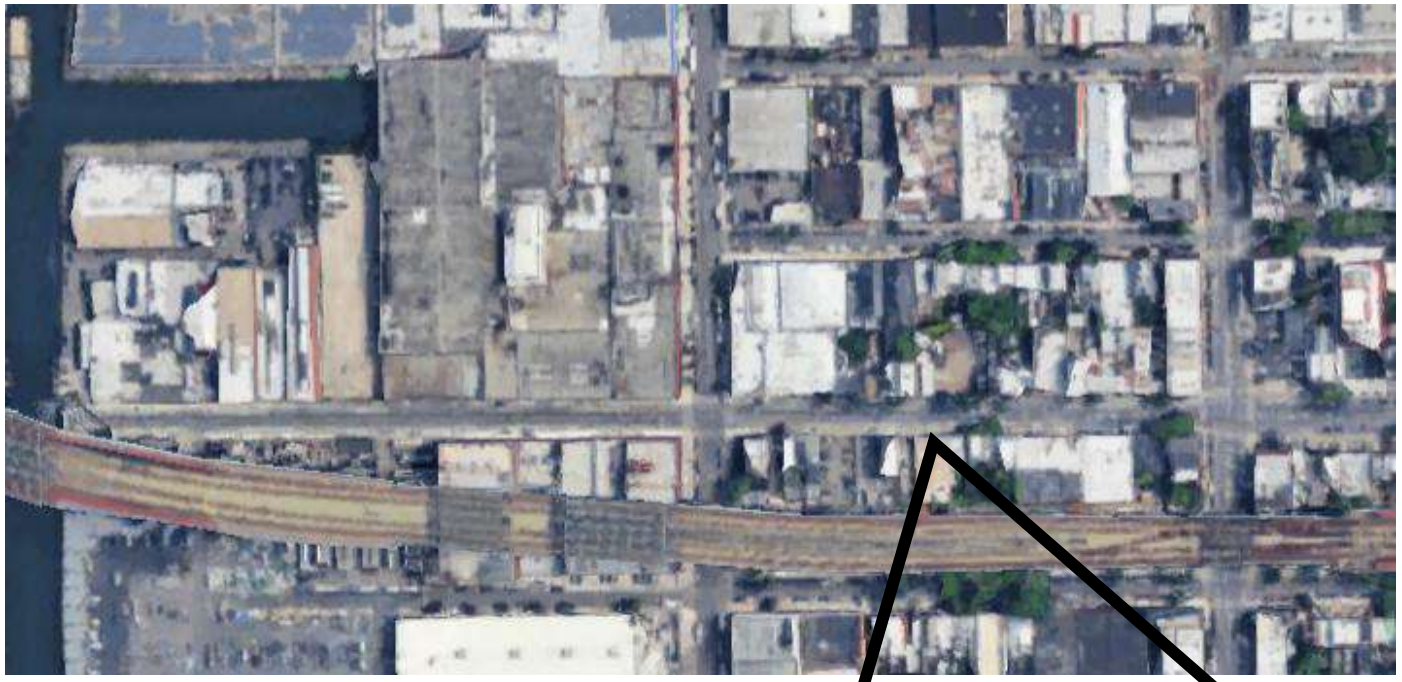
- SYNCHRO 12
  - Traffic Volume Analysis
- Auto CAD
  - Design Plan Drafting
- HEC-HMS
  - Stormwater Runoff Analysis
- HEC-RAS
  - River Hydraulic Modeling

Applicable Standards

- NYSDOT Roadway Design
- Manual - NYS Complete Streets
- NYC Street Design Manual
- Design Standards – NYDEP
- Ordinances - ADA Compliance
- FEMA floodplain and Coastal Standards
- Standards - Brooklyn Zoning



Existing Site Layout for 2nd Avenue/9th St and 3rd Avenue/9th St



1st Alternative – Extended roundabout with median

2nd Alternative – One roundabout in a one-way street

3rd Alternative - Turn 9th Street into a one way, add a median and bus lane, promote complete street

3rd Alternative - Introducing parking lot and park

Design Selection Matrix – Transportation

Criteria	Weight	Alternative 1	Alternative 2	Alternative 3
Traffic Flow Improvements	5	3	2	2
Sustainability	4	2	1	3
Pedestrian Accessibility	3	2	1	3
Vehicular Accessibility	2	3	2	2
Constructability	1	1	2	3
Total Score		**36**	**23**	**38**

Hydrologic Design Alternatives

Modify Pipes

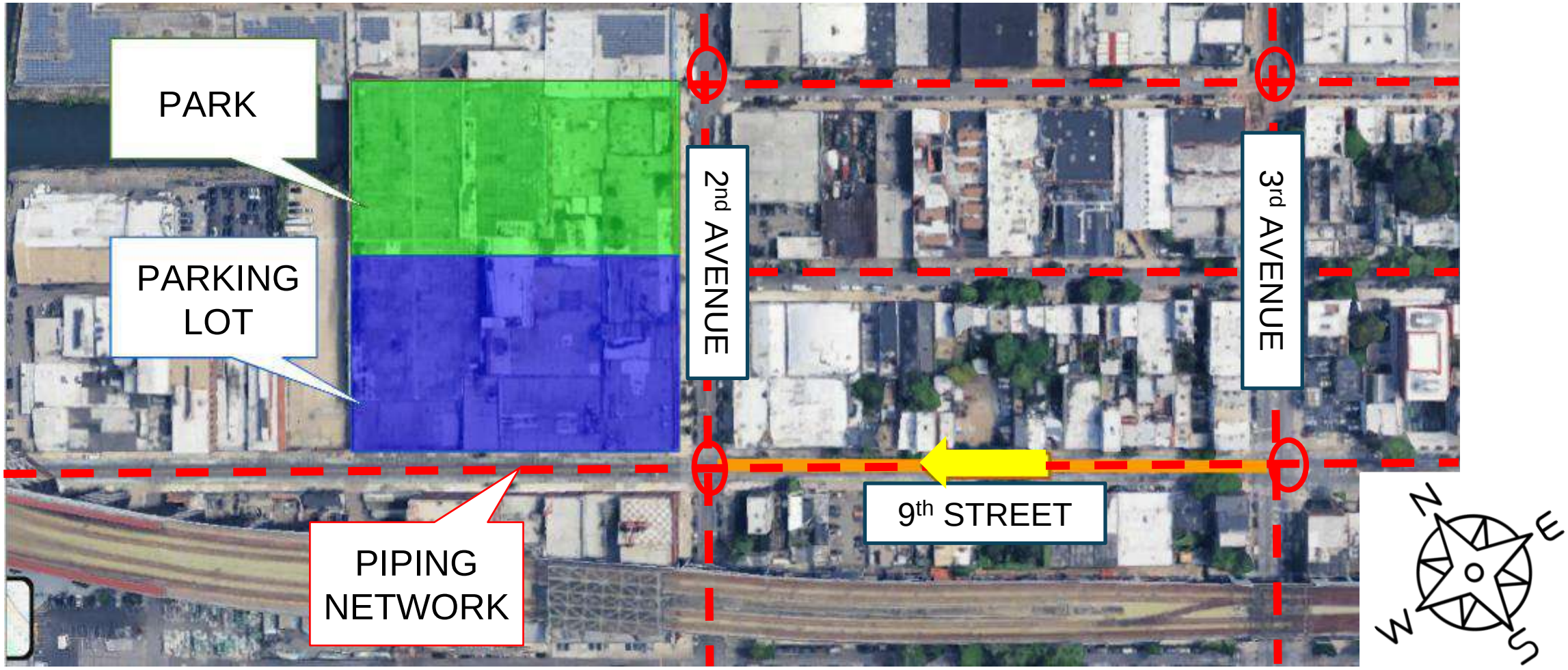
Floodwall

Detention Basin

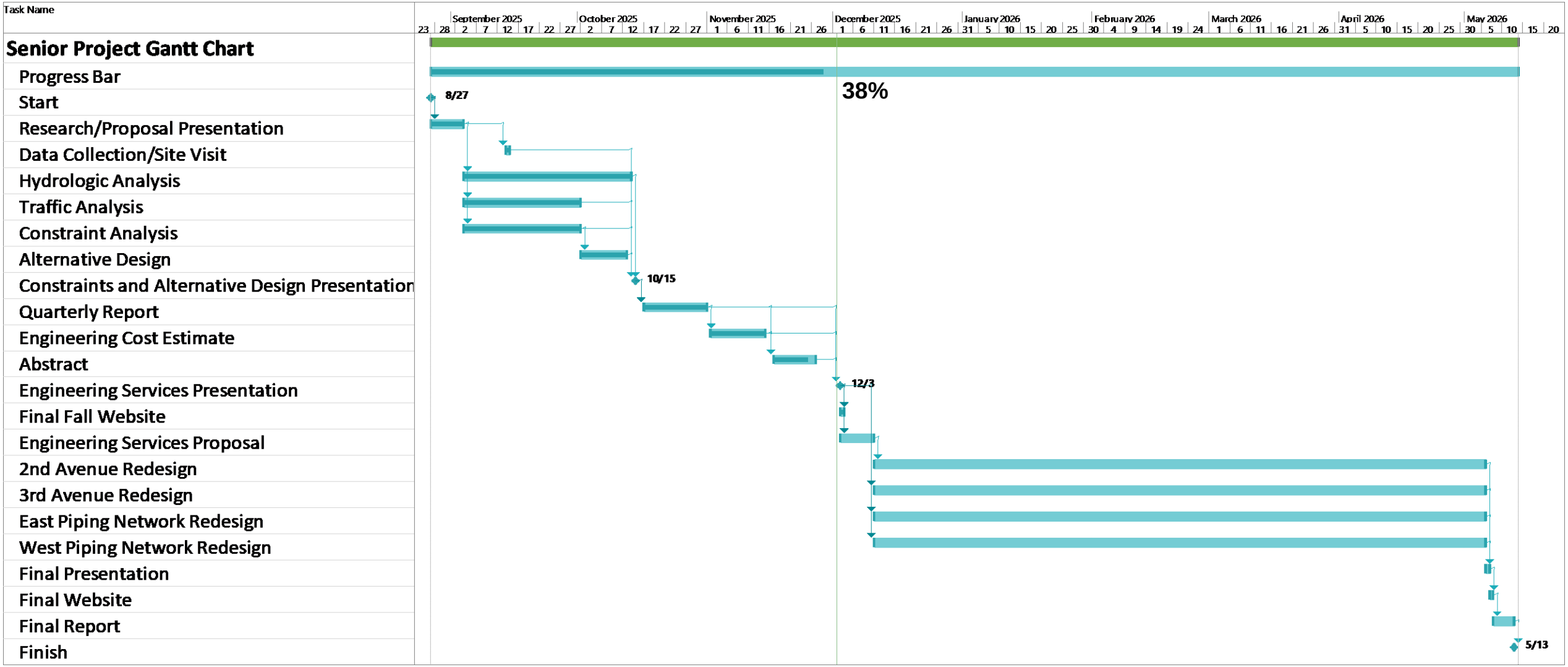
Design Selection Matrix - Hydrological

Criteria	Weight	Alternative 1	Alternative 2	Alternative 3
Sustainability	5	5	2	3
Health and Safety	4	2	2	1
Constructability	3	1	3	2
Economic	2	2	5	4
Ethical & Legal	1	3	1	1
Total Score		**43**	**38**	**34**

Final Design Selection



Gantt Chart


Task Name
September 2025
October 2025
November 2025
December 2025
January 2026
February 2026
March 2026
April 2026
May 2026
Senior Project Gantt Chart
Progress Bar
Start
Research/Proposal Presentation
Data Collection/Site Visit
Hydrologic Analysis
Traffic Analysis
Constraint Analysis
Alternative Design
Constraints and Alternative Design Presentation
Quarterly Report
Engineering Cost Estimate
Abstract
Engineering Services Presentation
Final Fall Website
Engineering Services Proposal
2nd Avenue Redesign
3rd Avenue Redesign
East Piping Network Redesign
West Piping Network Redesign
Final Presentation
Final Website
Final Report
Finish
38%
8/27
10/15
12/3
5/13

Engineering Cost - Fall Semester

Task	Dr. Thomas Brennan Engineering Dir.	Dr. Michael Horst Engineering Dir.	Terrell Osei-Kyei Project Engineer	Fizza Salman Design Engineer	Maria Paulo Design Engineer	Gloria Afotey Design Engineer
Site Visit	0	0	5	5	5	5
Research	1	0	2	2	2	2
Proposal Presentation	0	0	4	3	3	3
Hydrologic Analysis	0	3	15	0	0	16
Traffic Analysis	2	0	0	8	8	0
Constraint Analysis	0	0	3	2	3	2
Alternative Design	1	1	2	2	2	3
Constraints and Alternative Design Presentation	1	1	7	7	7	7
Design Selection	0	0	2	1	2	1
Estimate of Engineering Cost and Schedule	0	0				
Quarterly Report	0	0	5	4	4	5
Engineering Services Proposal Prep	2	2	8	8	8	8
Engineering Services Proposal Presentation	1	1	10	10	10	10
Total						
Total Hours	8	8	63	52	54	62
Hourly Rate	$ 95.00	$ 95.00	$ 40.00	$ 35.00	$ 35.00	$ 35.00
Total Individual Cost	$ 760.00	$ 760.00	$ 2,520.00	$ 1,820.00	$ 1,890.00	$ 2,170.00
				Total Cost		$ 9,920.00

Overhead	150%	$ 14,880.00
Fixed Fee	10%	$ 995.00
Total		$ 16,000.00

Engineering Cost - Spring Semester

Task	Dr. Thomas Brennan Engineering Dir.	Dr. Michael Horst Engineering Dir.	Terrell Osei-Kyei Project Engineer	Fizza Salman Design Engineer	Maria Paulo Design Engineer	Gloria Afotey Design Engineer
Transportation – 2nd Avenue Redesign	5	0	0	20	0	0
Transportation – 3rd Avenue Redesign	5	0	0	0	17	0
Hydrological – East Piping Network Redesign	0	5	0	0	0	22
Hydrological – West Piping Network Redesign	0	5	21	0	0	0
Final Proposal Prep & Presentation	1	1	6	6	6	6
Final Report	3	2	12	12	12	12
Final Website	3	2	8	7	7	8
Total						
Total Hours	17	15	47	45	42	48
Hourly Rate	$ 95.00	$ 95.00	$ 40.00	$ 35.00	$ 35.00	$ 35.00
Total Individual Cost	$ 1,615.00	$ 1,425.00	$ 1,880.00	$ 1,575.00	$ 1,470.00	$ 1,680.00
				Total Cost		$ 9,645.00

Overhead	150%	$ 14,470.00
Fixed Fee	10%	$ 1,000.00
Total		$ 15,500.00

Thank You

Questions?