

Town of Falmouth MA

New Silver Beach Wastewater System

NEWEA Small Community Seminar

7/15/16

Amy Lowell

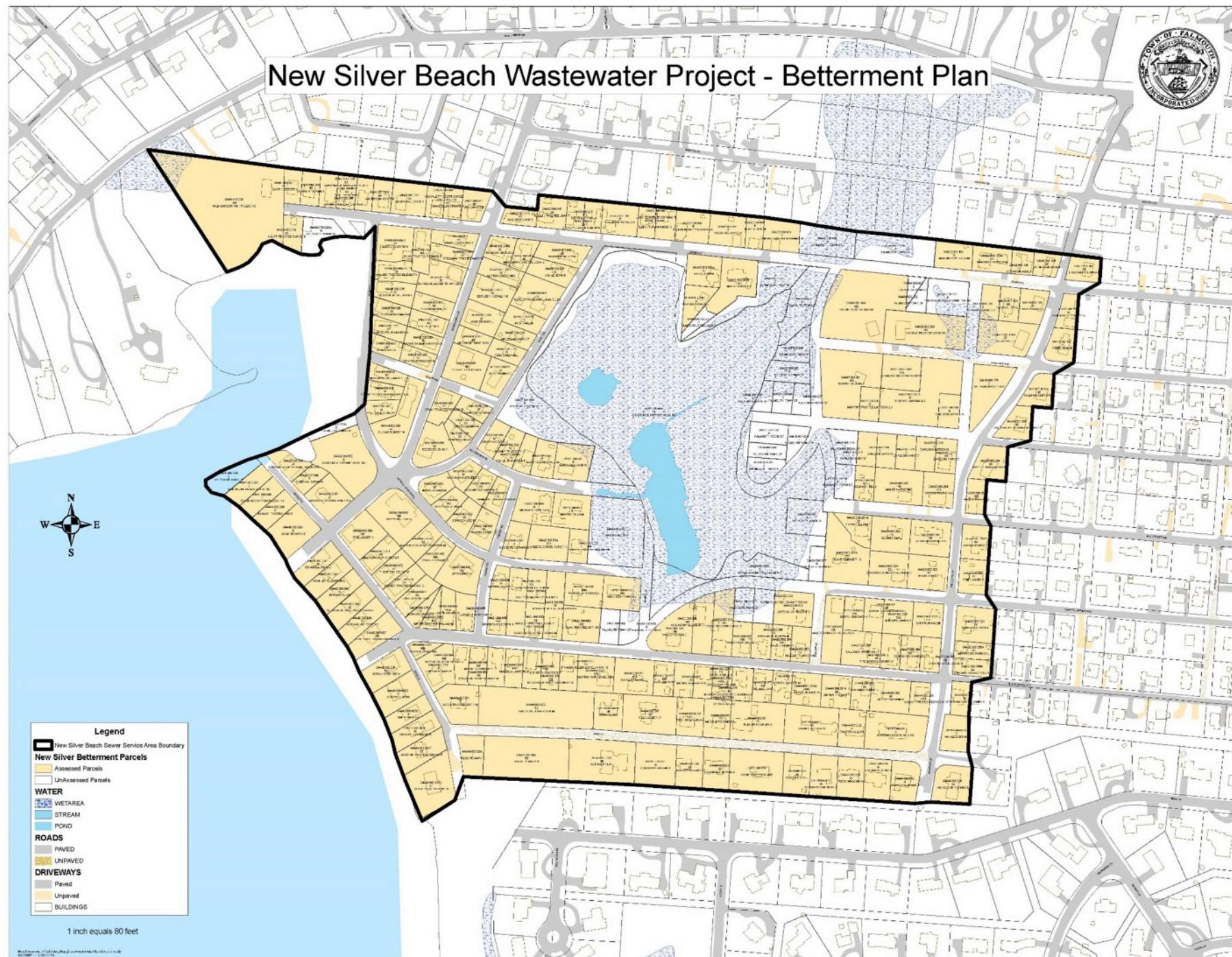
Town of Falmouth Wastewater Superintendent

Outline

- Background/Planning/Permitting
- Design
- Construction
- Costs
- Operation
- Low flow challenges
- Performance

New Silver Beach (NSB) Area Background

- Seasonal community developed around a marsh, next to the beach
- After extreme storm event, Board of Health declared a health emergency due to septic system/cesspool issues
- Board of Health began the process of planning a sewer system



Project Alternatives

Individual onsite treatment systems

- Small lots, insufficient depth to groundwater. 66 properties would need high mound with concrete retaining wall

Tight Tanks

- Estimate need pump out every 8 days in summer (if 2000 gall)

Several Treatment Plant Sites

- Several sites fell through - unwilling sellers or other dead ends

Pump to Main WWTF

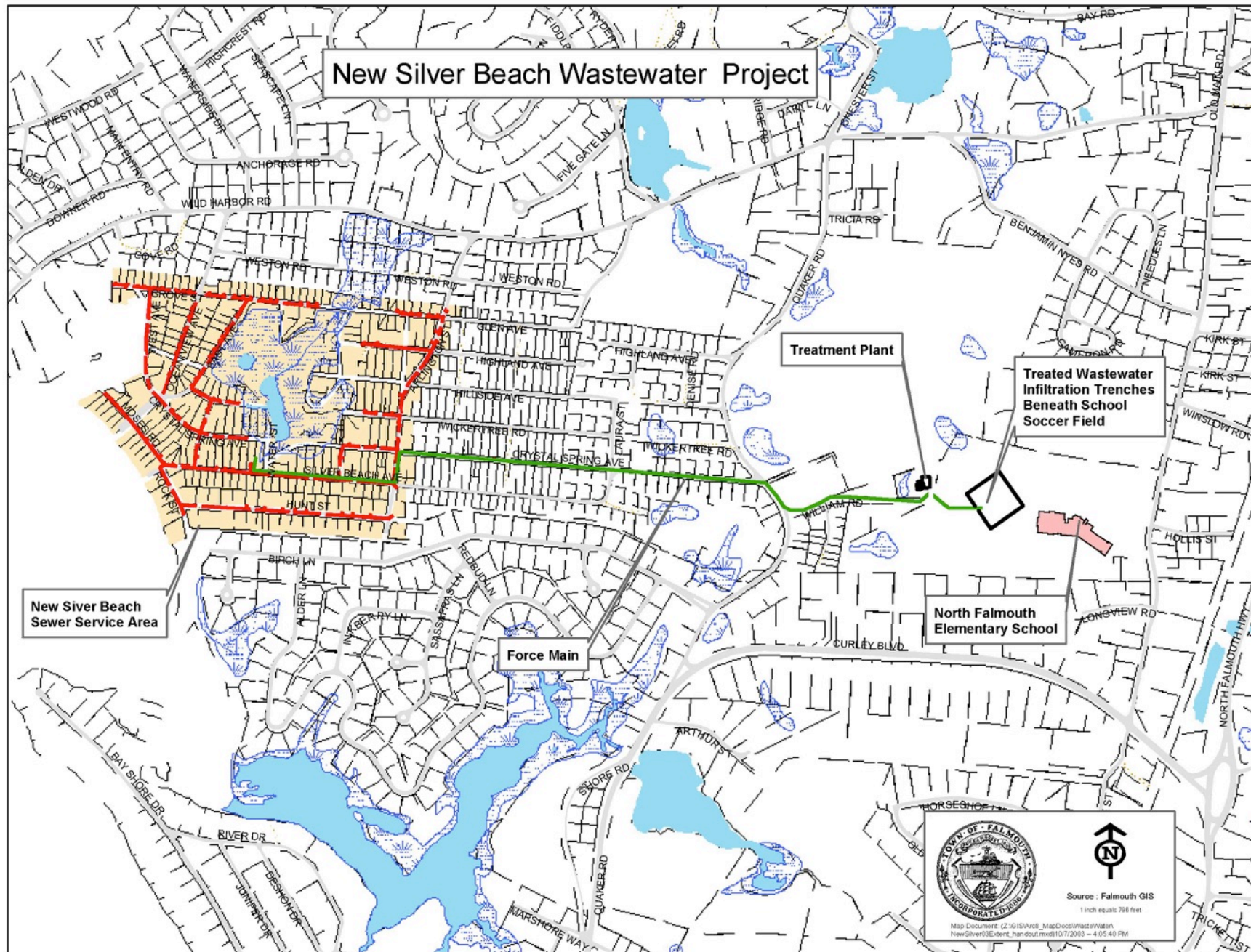
- Would have required ~ 4.2 mile force main and 2 lift stations
- Considered later in process – would have needed new permitting, additional time, lose loan, etc

Permitting History

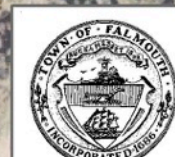
- 3 permits, all appealed
 - Wetland permit for treatment plant
 - Wetland permit for collection system
 - Groundwater discharge permit
- Town ultimately prevailed
- Process took many years – bid project twice

Design

- Service Area: ~ 220 single family residential homes in NSB area + North Falmouth Elementary School
- One lift station, 2 small grinder pump stations serving 3-5 homes (municipal, located within road right of way)
- ~ 2 miles of gravity main, ~ 1 mile of FM
- WWTF
- Effluent to infiltration beds beneath school soccer field (by project)



New Silver Beach Wastewater Project



Source : Falmouth GIS
1 inch equals 347 feet

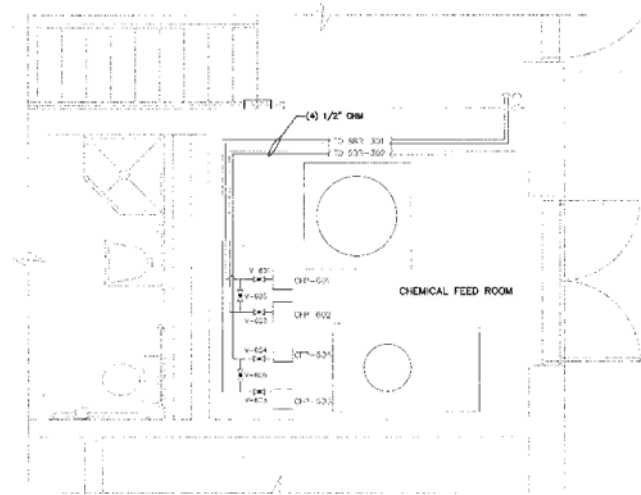
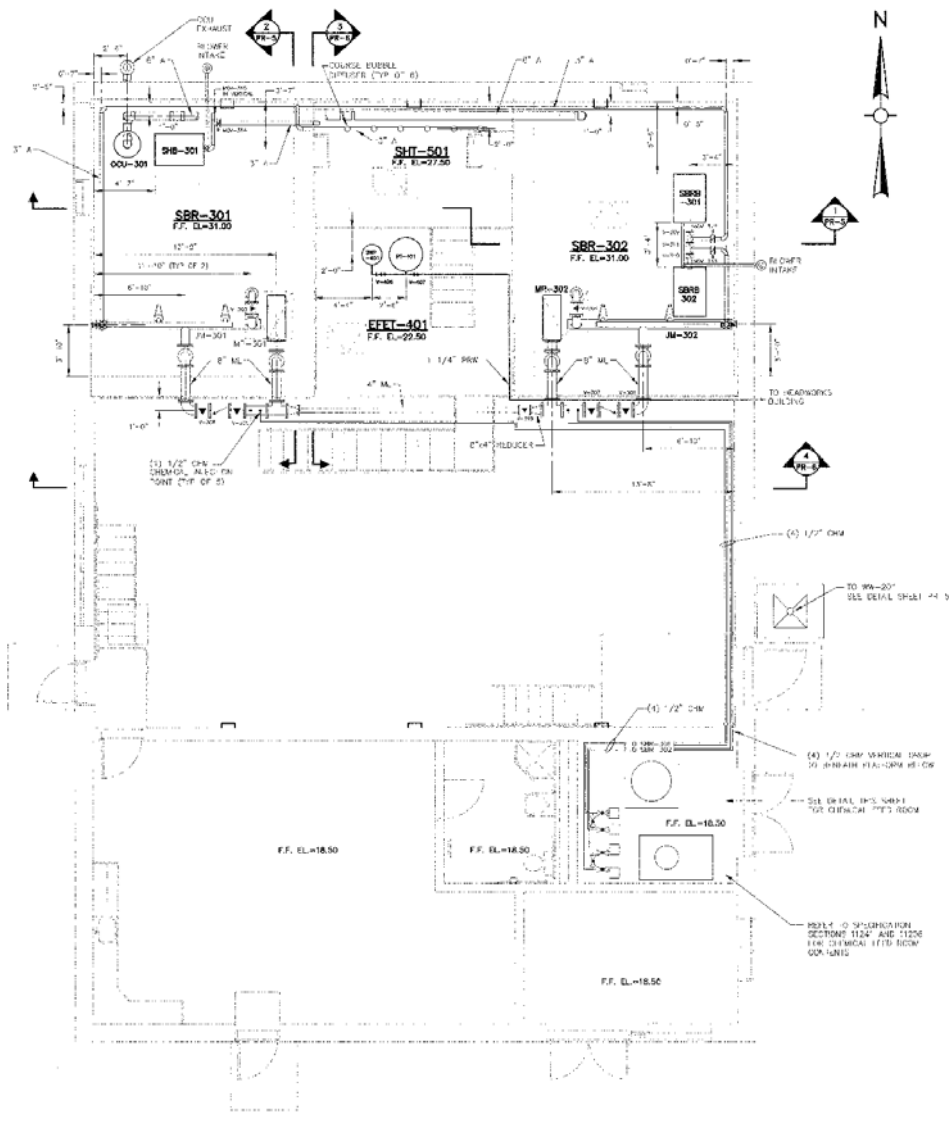
Map Document (Z:\GIS\Arc\MapDocs\WasteWater\NewSilver_handout.mxd)
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Design (Continued)

- Design Flows – based on Title V factors
 - 40,000 gpd peak flow from service area + 15,000 peak flow school = 55,000 gpd. Rounded up to 60,000 gpd total.
- Discharge Permit Limits:
 - Total Suspended Solids = 30 mg/L
 - Biochemical Oxygen Demand = 30 mg/L
 - Total Nitrogen (and nitrate) = 10 mg/L

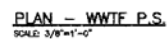
Construction

- Took ~ 1 year to complete
- Main construction challenges: Dewatering, existing utilities in poor condition and locations not well recorded, bulkhead, small WWTF site adjacent to wetlands at the end of a residential street
- Started up 2009



RECORD DRAWING

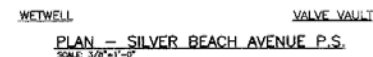
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Technical drawing of a well structure, showing various components and elevations. The drawing includes a cross-section of the well shaft and surrounding structures. Key components and labels include:

- Top Section:**
 - 2" x 6" x 7'-6" UNCH. (INSULATE UNDOSE WITH POLYSTYRENE INSULATION BOARD TOP)
 - CONDUIT SEALS (TYP. OF 2)
 - 2" x 6" x 4'-8" HATCH
 - PIPE SUPPORT AS REQ'D
- Left Side (Well Wall/Structure):**
 - EL. 16.0
 - 3'-0"
 - DRAIN TO 1 CY CRUSHED STONE
 - WATERPROOFING (TYP.)
 - REFER TO SPEC. SECTION 02335
 - 2" CAP & CHAIN
 - 2" HOSE CONNECTION
 - FORCE MAIN INV. EL. 11.0
 - 6" TYP.
 - BOTTOM OF VAULT EL. 0.5
 - 6" OF SCREENED GRAVEL
 - ADJUSTABLE PIPE SUPPORT (TYP.)
 - 1/4" CONC. FILL SLOPE
 - UNDISTURBED MATERIAL
 - COMPACTED SCREENED GRAVEL FILL
- Internal Well Components:**
 - W.H. STEPS (TYP.)
 - EXTENDED VALVE OPERATOR
 - PLUG VALVE
 - CHECK VALVE
 - 3'-0" BEND
 - SLUMP
 - RESTRAINED SLEEVE COUPLING (TYP.)
 - 4" DRAIN PIPE SLOPE 1/4" PER FT.
 - 4" BACKWATER VALVE
 - INTERMEDIATE RAIL SUPPORT AS NECESSARY
 - 2' x 3' REMOVER
 - HYDRAULICALLY SEALED DISCHARGE FLANGE
 - 2' x 3' REMOVER
- Right Side (Well Head/Access):**
 - WATERPROOFING (TYP.)
 - BACKFILL W/ GRAVEL BOTTOM (TYP.)
 - FLOAT SWITCH SUPPORT PIPE
 - 6" SUP. & RET. BYPASS
 - PUMP GUIDE RAIL
 - NET WELL. REFER TO SPEC. SECTION 02335
 - INFILTRANT SEWER WITH TEE AND DROP PIPE EL. 2.50
 - LSH-201 FLOAT EL. 1.80
 - LSH-201
 - 4" TYP.
 - BOTTOM OF WELL EL. -2.00
 - CONCRETE FILL (TYP.)
 - PIPE SUPPORT AS REQ'D
 - SUBMERSIBLE PUMP-CLOG
- Bottom Section:**
 - 6" OF SCREENED GRAVEL
 - 2' x 3' REMOVER
 - HYDRAULICALLY SEALED DISCHARGE FLANGE
 - SUBMERSIBLE PUMP-CLOG

SECTION 1
N.T.S. C-8



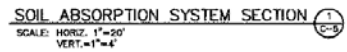
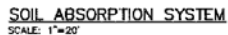
PROVIDE VALVE BOXES ABOVE EACH PLUG VALVE AND EXTEND VALVE OPERATOR TO 6" BELOW TOP SLAB. PROVIDE SUPPORTS AS REQUIRED.
 6. CONTRACTOR TO VERIFY ELEVATION OF SEWERS/FORCEMAIN WITH WORK IN CONTRACT 2602-03.

2" GALVANIZED PIPE W/DOOR CONTROL CANISTER
 EXPLOSION-PROOF JUNCTION BOXES (TYP. OF 2)
 PIPE SUPPORT AS REQ'D.
 2" x 4" 4'-8" W/ATCH
 WATERPROOFING (TYP.)
 BACKFILL W/GRAVEL BODISON (TYP.)
 FLOOD SWITCH SUPPORT PIPE
 PUMP GUIDE RAIL
 REFER TO SPEC. SECTION 05050
 LEVEL ALARM FLOAT EL. -7.60
 EFFLUENT SENSOR EL. -7.72
 LGW-1101 EL. -7.75
 LE/LUT-1101
 -1101 FLOAT EL. -11.35
 8" TYP.
 BOTTOM OF WELL EL. -13.85
 CONCRETE FILL (TYP.)
 PIPE SUPPORT AS REQ'D.
 SUBMERSIBLE NON-CLOG SERVICE PUMP
 HYDRAULICALLY SEALED DISCHARGE FLANGE
 4"x6" REDUCER
 CONDUIT SEALS (TYP. OF 2)
 6" x 2" x 2" MATCH (GALV. UNDERLIE WITH 4" INSULATING INSULATION BOARD TYP.)
 EL. 6.0
 5'-0"
 1/4" SLABS
 ROAD CONCRETE TO CONTROL PANEL (TYP. OF 2)
 5 CABLES
 2 CABLES
 8"x8" BOND
 2" HOSE CONNECTION
 VALVE VALVE REFER TO SPEC. SECTION 05050
 2" GAP & CHAIN
 CHECK VALVE
 PLUG VALVE
 EXTENDED VALVE OPERATOR
 FORCE MAIN INV. EL. 1.0
 8" TYP.
 BOTTOM OF VALVE EL. 0.0
 6" OF SCREENED GRAVEL
 4" CHAIN PIPE SLOPE 1/4" PER FT.
 4" BACKWATER VALVE
 INTERMEDIATE RAIL SUPPORT AS NECESSARY
 1'-4" TYP.
 1'-4" TYP.
 6" OF SCREENED GRAVEL
 ADJUSTABLE PIPE SLOPE 1/4" PER FT. TO SLUMP
 UNDISTURBED MATERIAL
 COMPACTED SCREENED GRAVEL FILL

SECTION 2
N.T.S. C-8

C-8
SHEET 9 of 59

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TOWN OF FALMOUTH, MASSACHUSETTS
BOARD OF SELECTMAN
NEW SILVER BEACH WASTEWATER TREATMENT FACILITY AND PUMP STATION
DISPOSAL FIELD DETAILS

C-5

WWTF Site Before Construction



WWTF Near Completion



2009/04/23

Lift Station



Shared municipal grinder pump – before and after modification



Project Appropriation and Borrowing

Year	Amount Appropriated
1997	\$3,567,000
2002	\$1,200,000
2006	\$7,733,000
	\$12,500,000

Borrowed

Bonded Total	\$1,650,000
SRF Loan Total – DEP held 0%	\$7,775,000
Total:	\$9,425,000

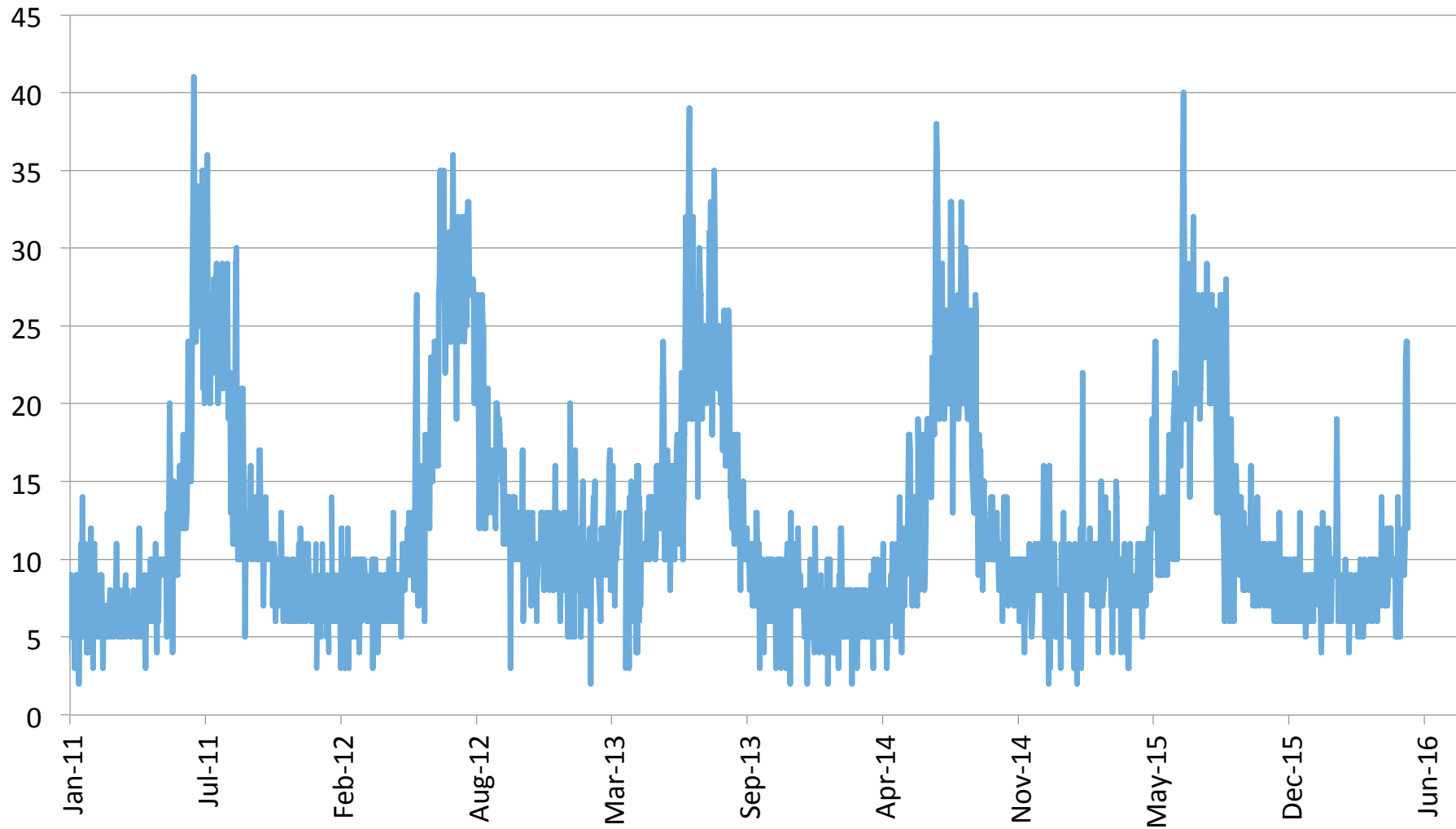
Cost Apportionment

Total Final Project Cost for Betterment	\$9,103,055.82
Paid By Property Owners - Betterments (70%)	\$6,372,139.07
Paid By Town (30%)	\$2,730,916.74
Number of Assessed Properties	231
Betterment Cost Per Property	\$27,585.02

Operation

- Process flow – Fine Screen, Influent Equalization Tank, Wet Well, Sequencing Batch Reactors, Effluent EQ Tank, [UV – not required yet]
- Sequencing Batch Reactors – Fluidyne
 - Changed from time-based control to dissolved oxygen control after start up – with fluctuating influent flow very difficult to get consistent performance using time-based control
- No sludge handling onsite. Remove sludge as necessary, truck to main WWTF for thickening/disposal.

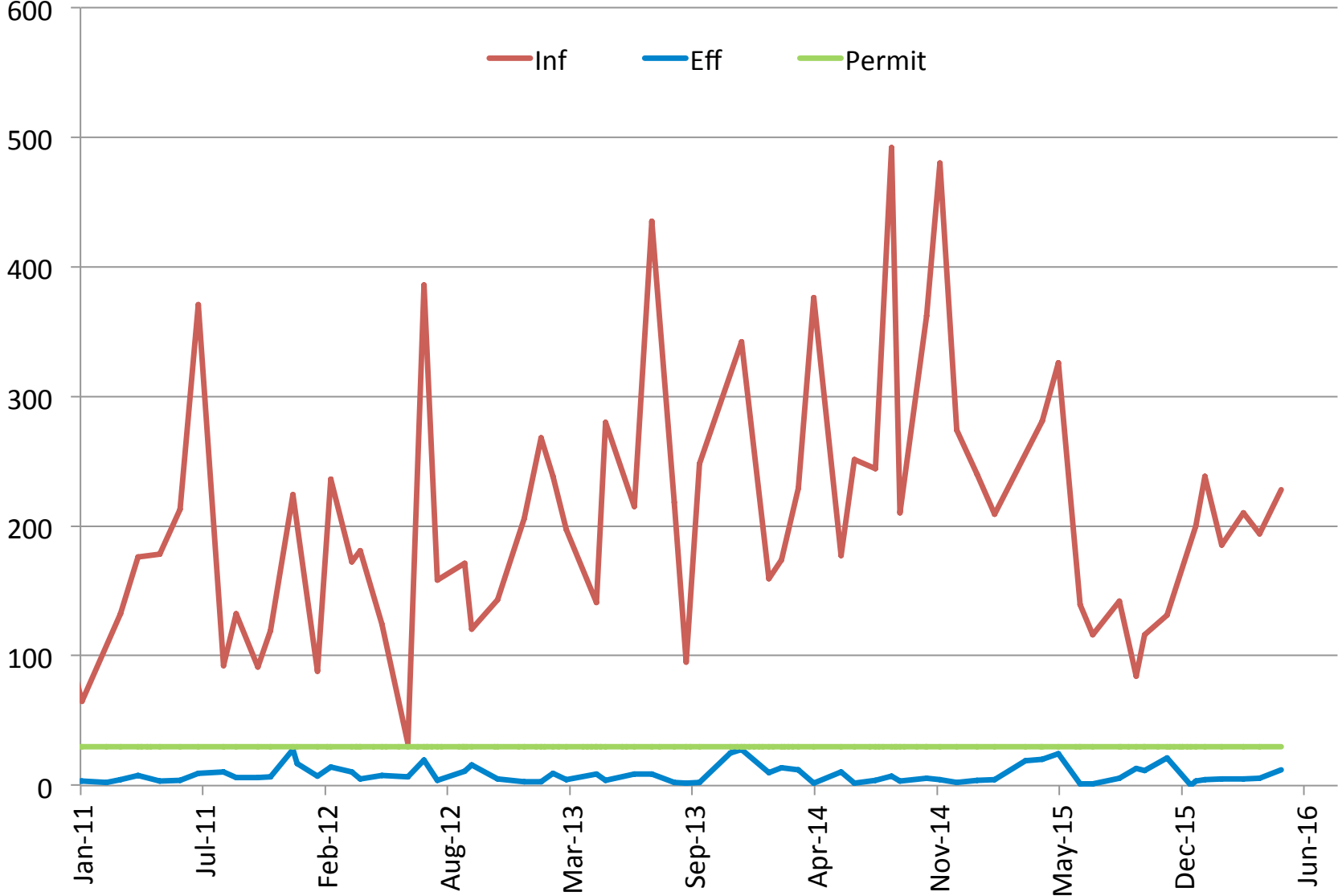
NSB WWTF Effluent Flow Over the Past ~ 5 Years (gpd x 1000)



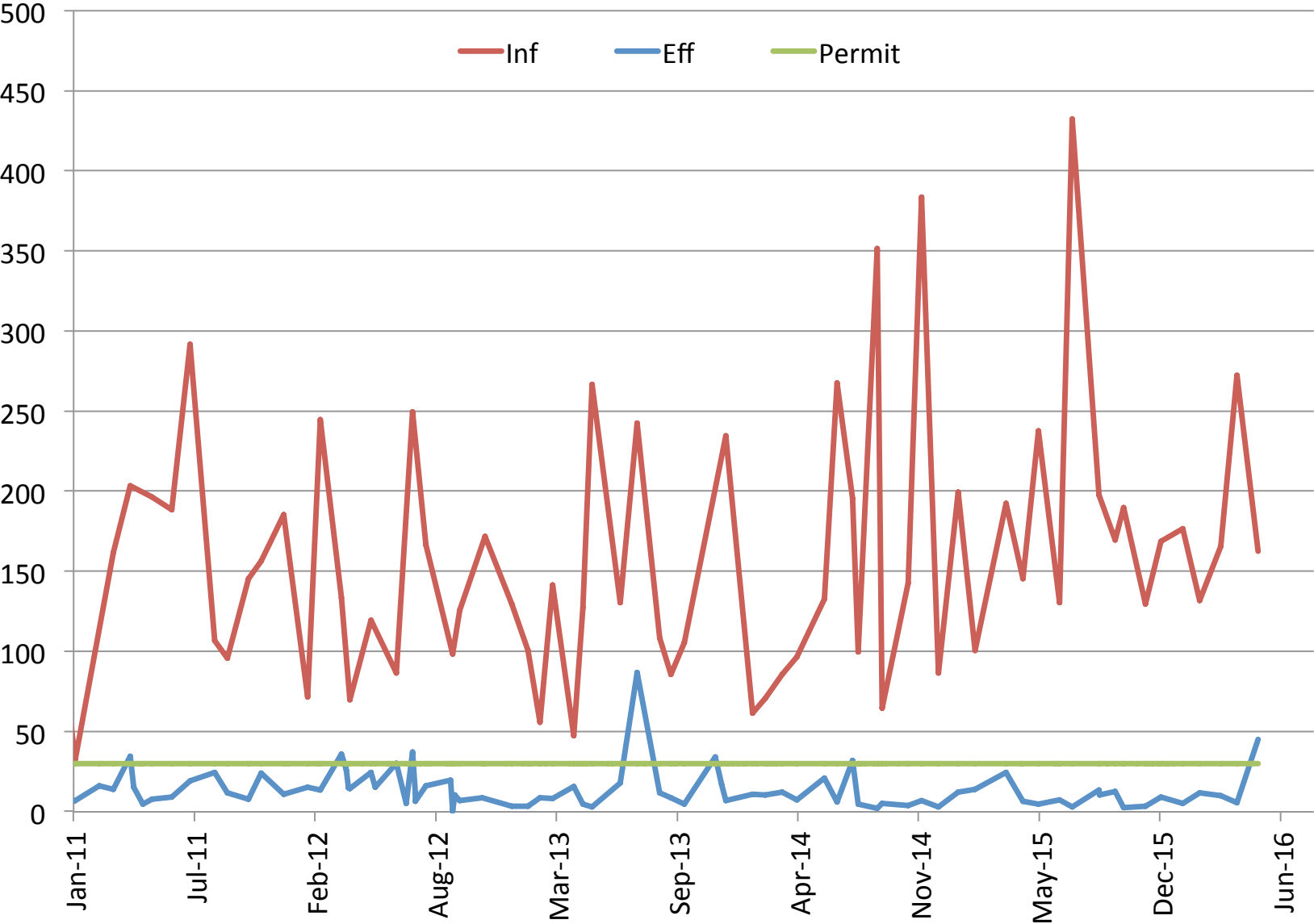
Low Flow Challenges

- Low flow means more variable influent concentrations
 - Individual dischargers and events can have a significant impact on the WWTF, especially during low flow periods – ex: school floor cleaning
- Seasonal flow changes require seasonal operational adjustments – tank set point levels, cycle times, etc
 - Seasonal rise and fall is not steady – also fluctuates day to day
- Time for O&M is not proportional to flow
- Plant performance/discharge permit can get as much attention from regulators and others as higher flow permit (attention also not proportional to flow)
- Despite challenges, WWTF has generally performed quite well

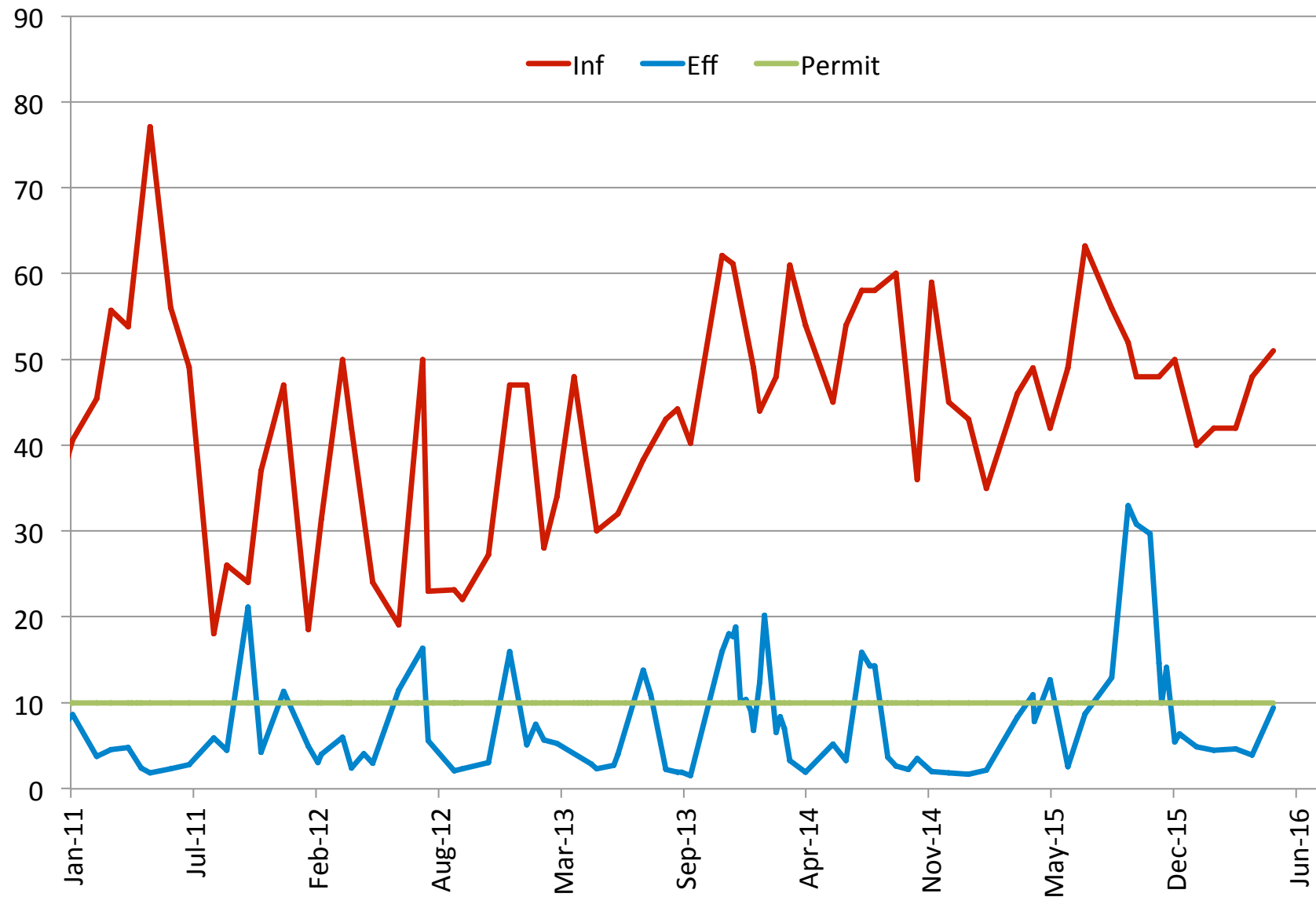
NSB WWTF Influent and Effluent Biochemical Oxygen Demand Over the
Past ~ 5 Years (mg/L)



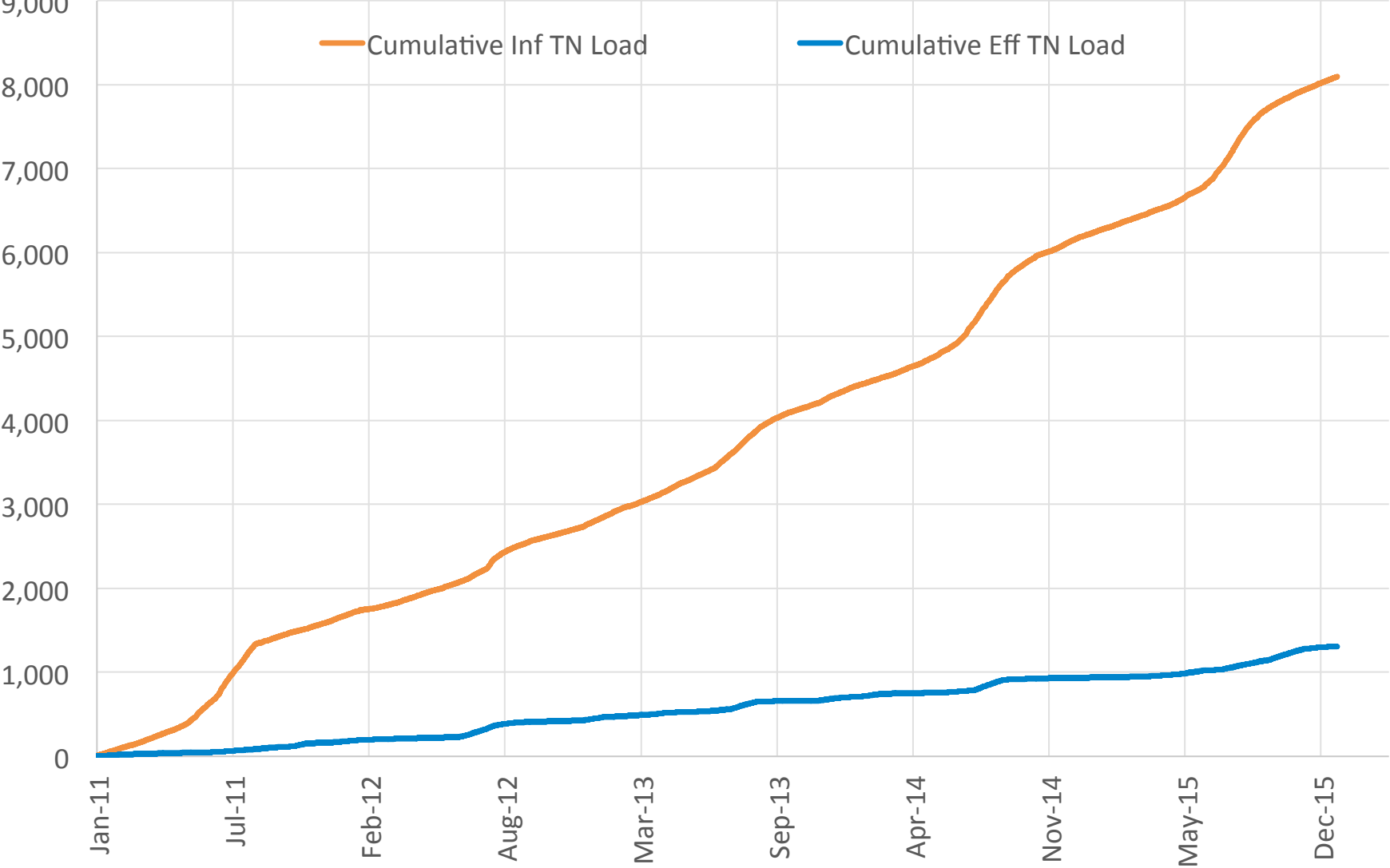
**NSB WWTF Influent and Effluent Total Suspended Solids Concentration
Over the Past ~ 5 Years (mg/L)**



NSB WWTF Influent and Effluent Total Nitrogen Concentration (mg/L)
Over the Past 5 Years



NSB WWTF - Cumulative Influent and Effluent Nitrogen Load
(lbs)
Over the Past 5 Years



Questions?