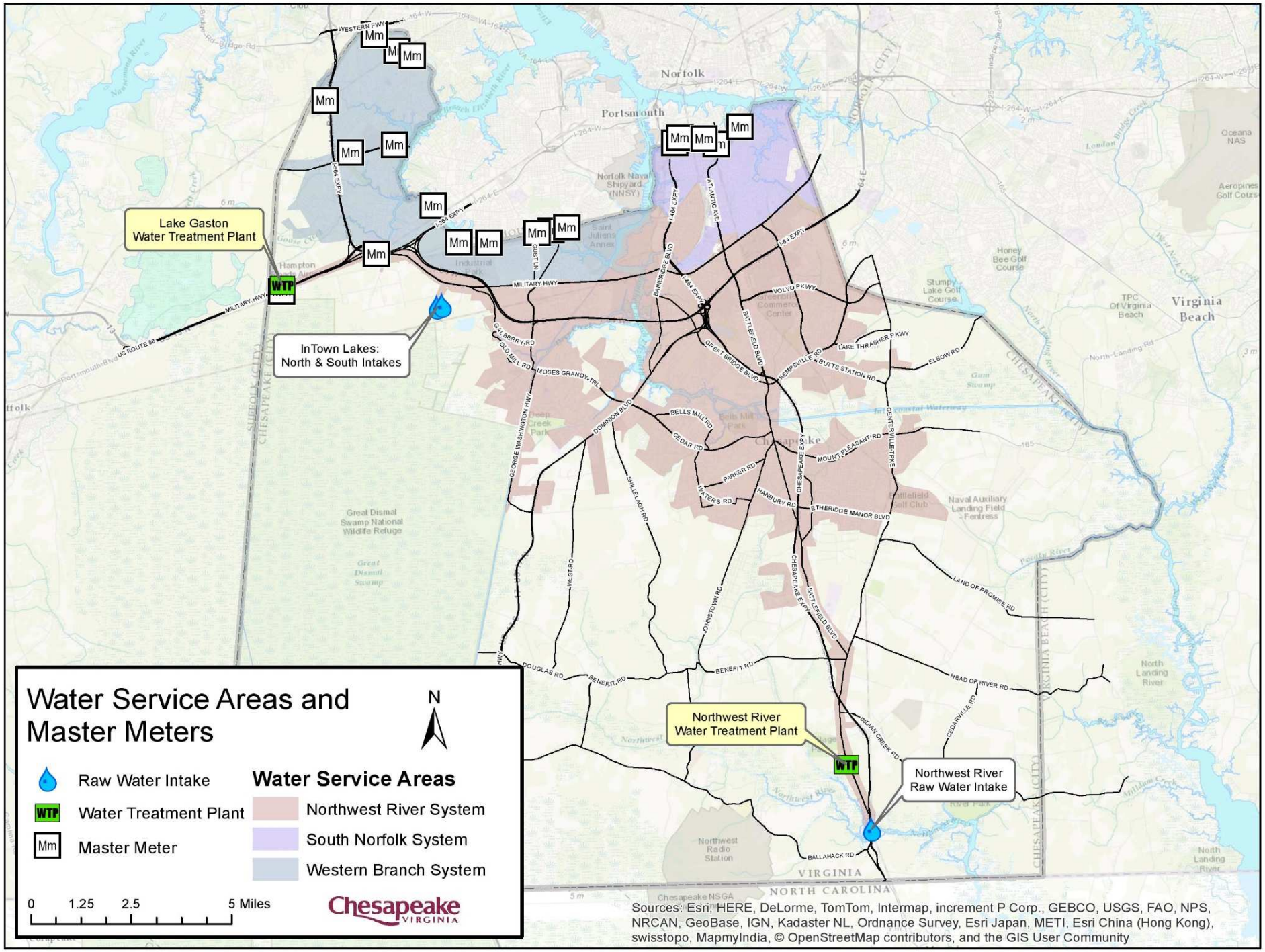
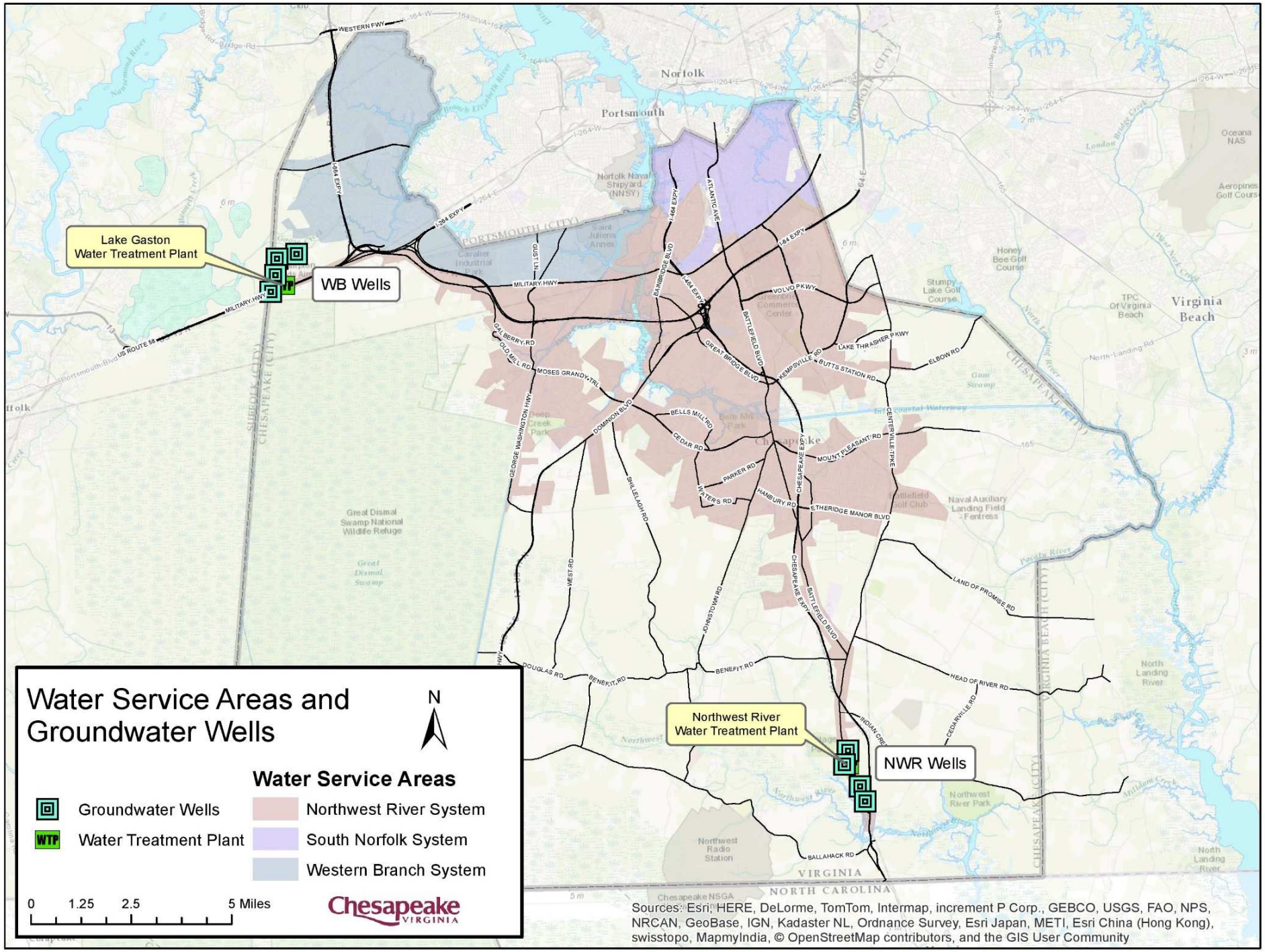
CITY OF CHESAPEAKE DEPARTMENT OF PUBLIC UTILITIES OCTOBER 27, 2015

The Role of ASR

Water Resources Progression

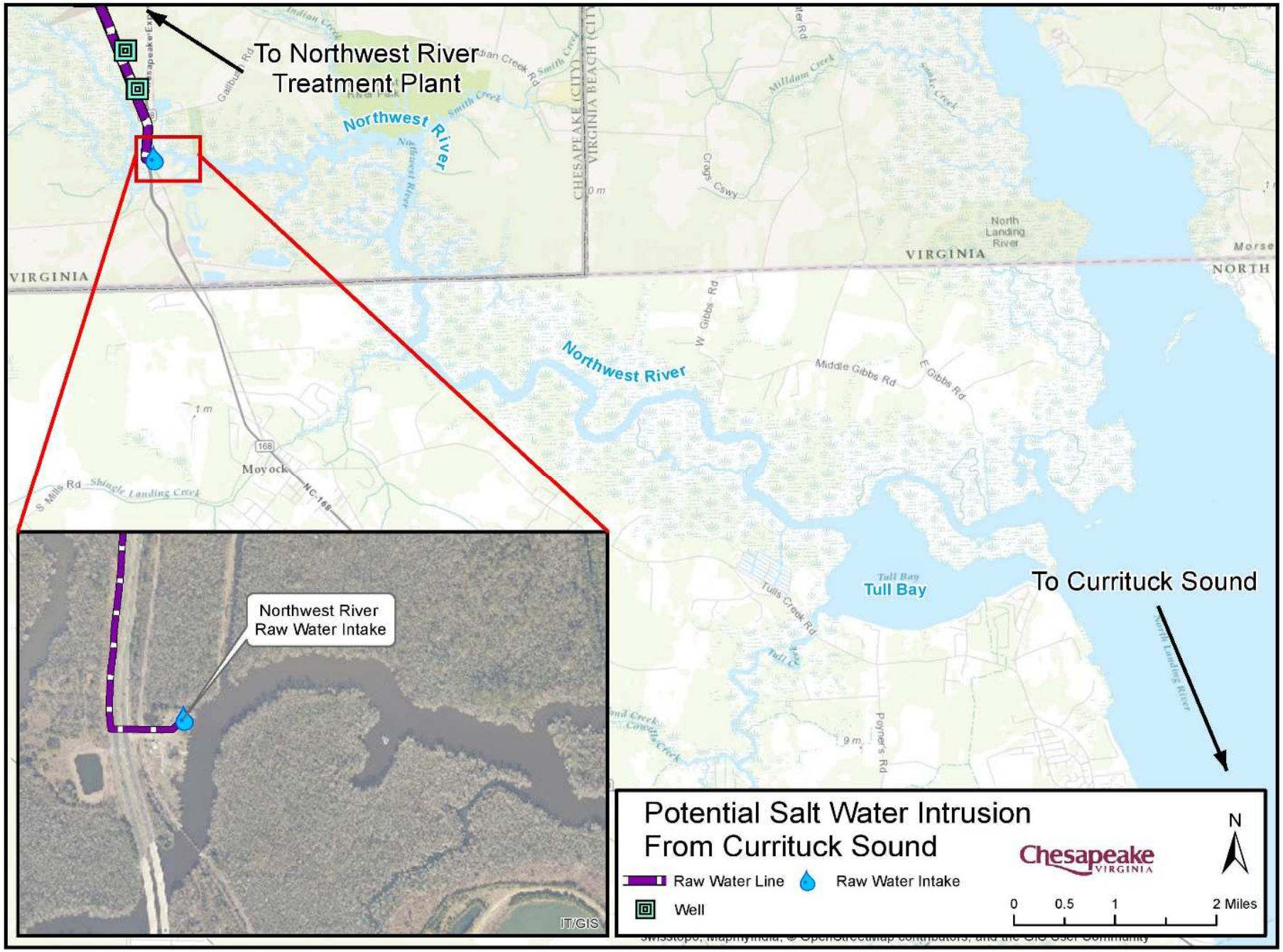
- Prior to March, 1980
  - No treatment facilities - All water purchased
- March, 1980
  - Northwest River WTP online
- 1987
  - Western Branch Wells 1-3 online
- 1989
  - ASR online
- 1996 to 1999
  - Reverse Osmosis Upgrade to Northwest River WTP
- 2006
  - Lake Gaston WTP online


Water Service Areas and Master Meters
N
Raw Water Intake
Water Treatment Plant
Master Meter
Water Service Areas
Northwest River System
South Norfolk System
Western Branch System
0 1.25 2.5 5 Miles
Chesapeake VIRGINIA
Lake Gaston Water Treatment Plant
InTown Lakes: North & South Intakes
Northwest River Water Treatment Plant
Northwest River Raw Water Intake
Norfolk
Portsmouth
Virginia Beach
Chesapeake
VIRGINIA
NORTH CAROLINA
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

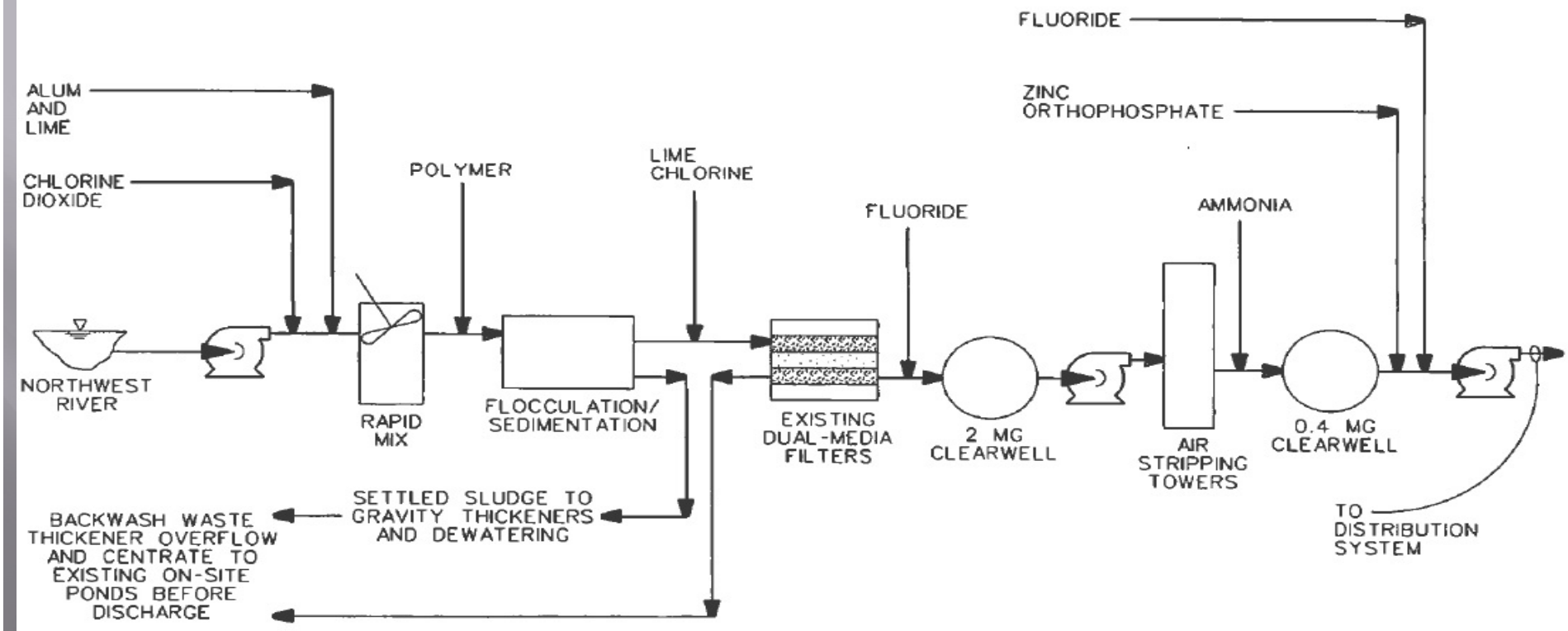

Water Service Areas and Groundwater Wells
N
Water Service Areas
Groundwater Wells
Water Treatment Plant
Northwest River System
South Norfolk System
Western Branch System
0 1.25 2.5 5 Miles
Chesapeake VIRGINIA
Lake Gaston Water Treatment Plant
WB Wells
Northwest River Water Treatment Plant
NWR Wells
Norfolk
Portsmouth
Virginia Beach
Chesapeake
VIRGINIA
NORTH CAROLINA
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Water Quality
Northwest River

- Color: 150 - 450 CU (Typical – 200 CU)
- Turbidity: 2 - 30 NTU (Typical- 2 NTU)
- pH: 5.8 - 7.3 (Typical 6.7)
- DO: 0.64 - 16.8 mg/L (Typical – 5.5 mg/L)
- Alkalinity: 17 – 61 mg/L (Typical – 35 mg/L)
- TOC: 13 - 75 mg/L (Typical – 27 mg/L)
- Chloride: 25 - 1,600 mg/L (Typical - 40 mg/L)
- Alum Dose: 150-350 mg/L (Typical - 200 mg/L)

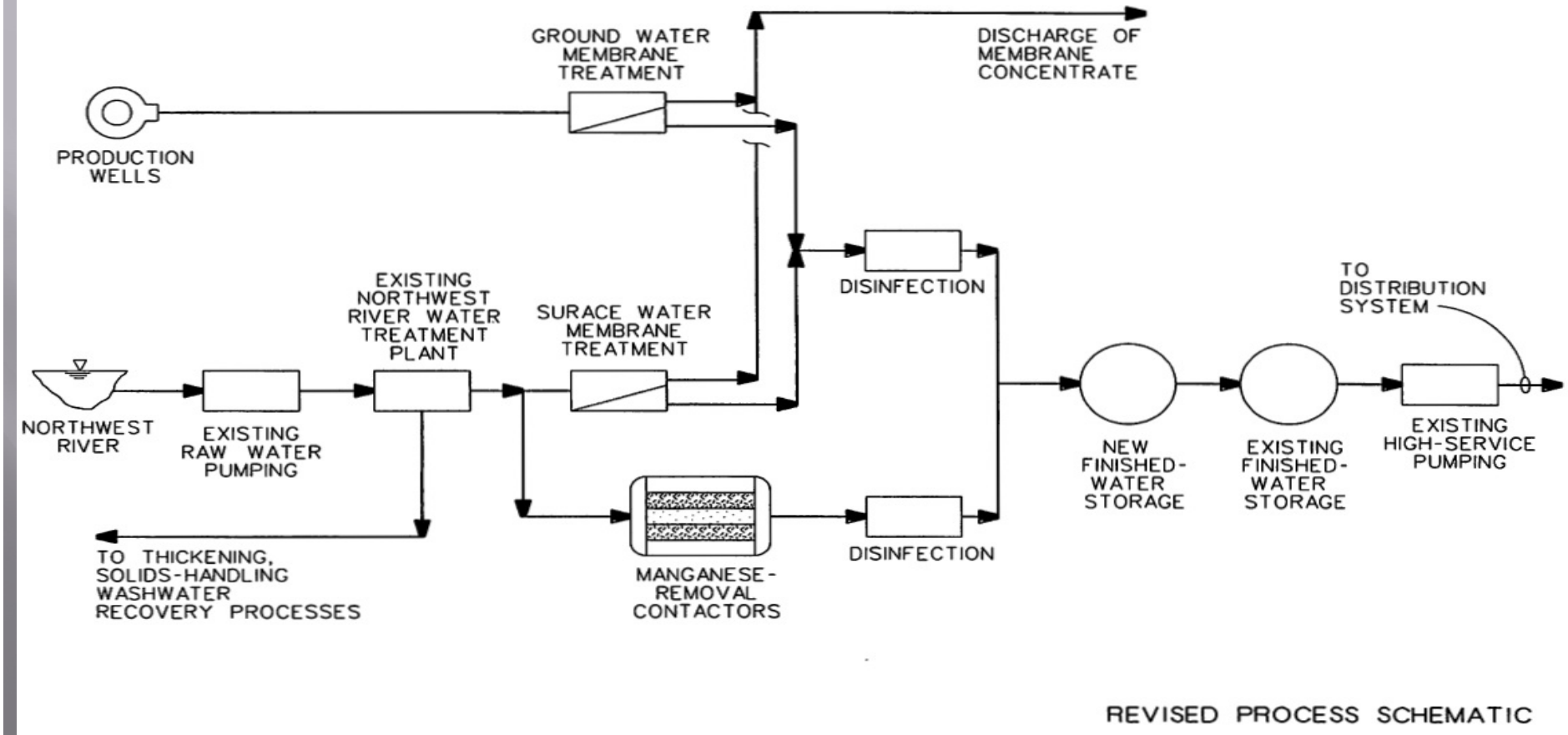

To Northwest River
Treatment Plant
Northwest River
Northwest River
VIRGINIA
VIRGINIA
NORTH
CHESAPEAKE (CITY)
VIRGINIA BEACH (CITY)
North Landing River
Middle Gibbs Rd
E Gibbs Rd
W Gibbs Rd
Moyock
S Mills Rd
Shingle Landing Creek
NC-168
168
Tull Bay
Tull Bay
Tulls Creek Rd
Poyner's Rd
To Currituck Sound
Northwest River
Raw Water Intake
IT/GIS
Potential Salt Water Intrusion
From Currituck Sound
Raw Water Line
Raw Water Intake
Well
Chesapeake
VIRGINIA
N
0
0.5
1
2 Miles

Flow Schematic
NWR WTP-Pre RO Upgrade



EXISTING PROCESS SCHEMATIC

Flow Schematic
NWR WTP-Post RO Upgrade



REVISED PROCESS SCHEMATIC

March 1996

December 1996

November 1998

Water Balance-NWR WTP

- Pre-RO upgrade capacity: 10 MGD

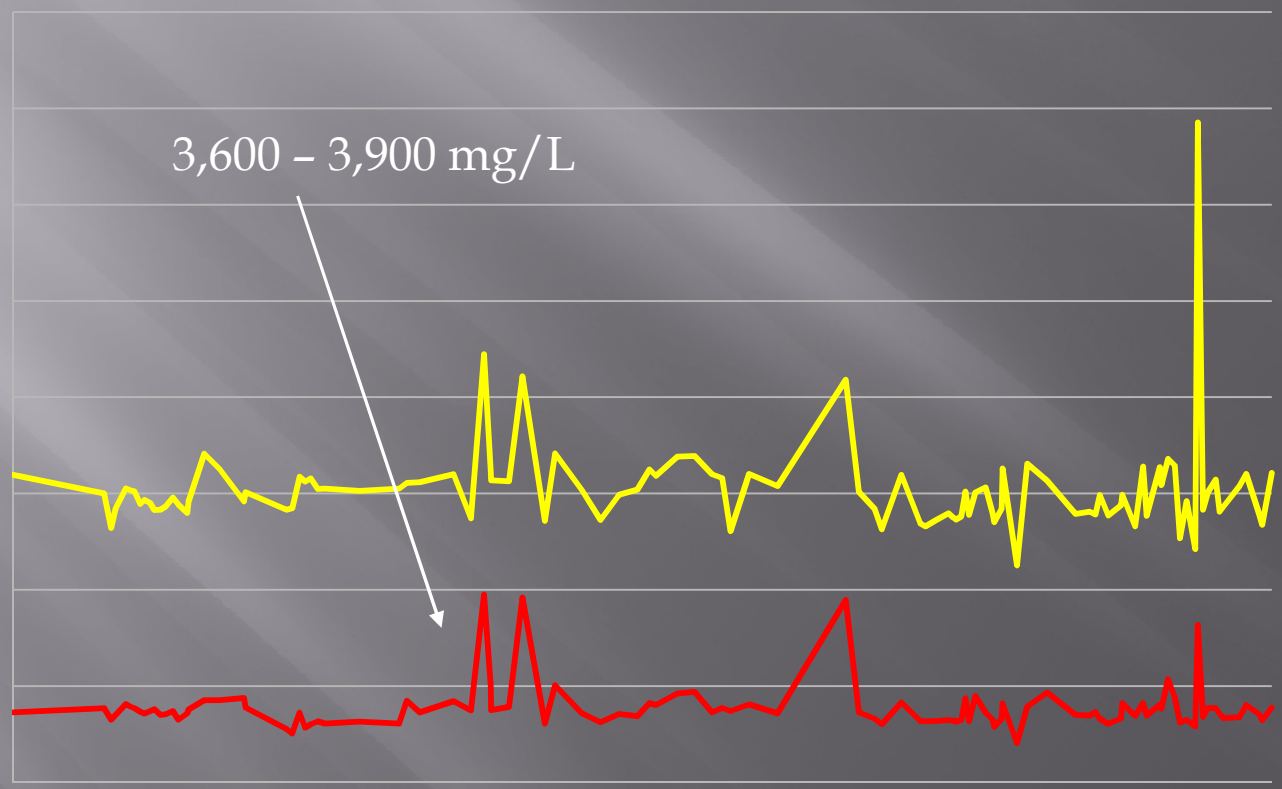
- Post-RO upgrade capacity:
  - 10 MGD SW – 30% (rejection) = 7 MGD
  - 5 MGD brackish GW – 30% (rejection) = 3.5 MGD

  - 7 MGD + 3.5 MGD = 10.5 MGD
  - Less 0.5 MGD (internal losses for conventional plant)
  - Yields 10 MGD- original (pre-RO upgrade) capacity

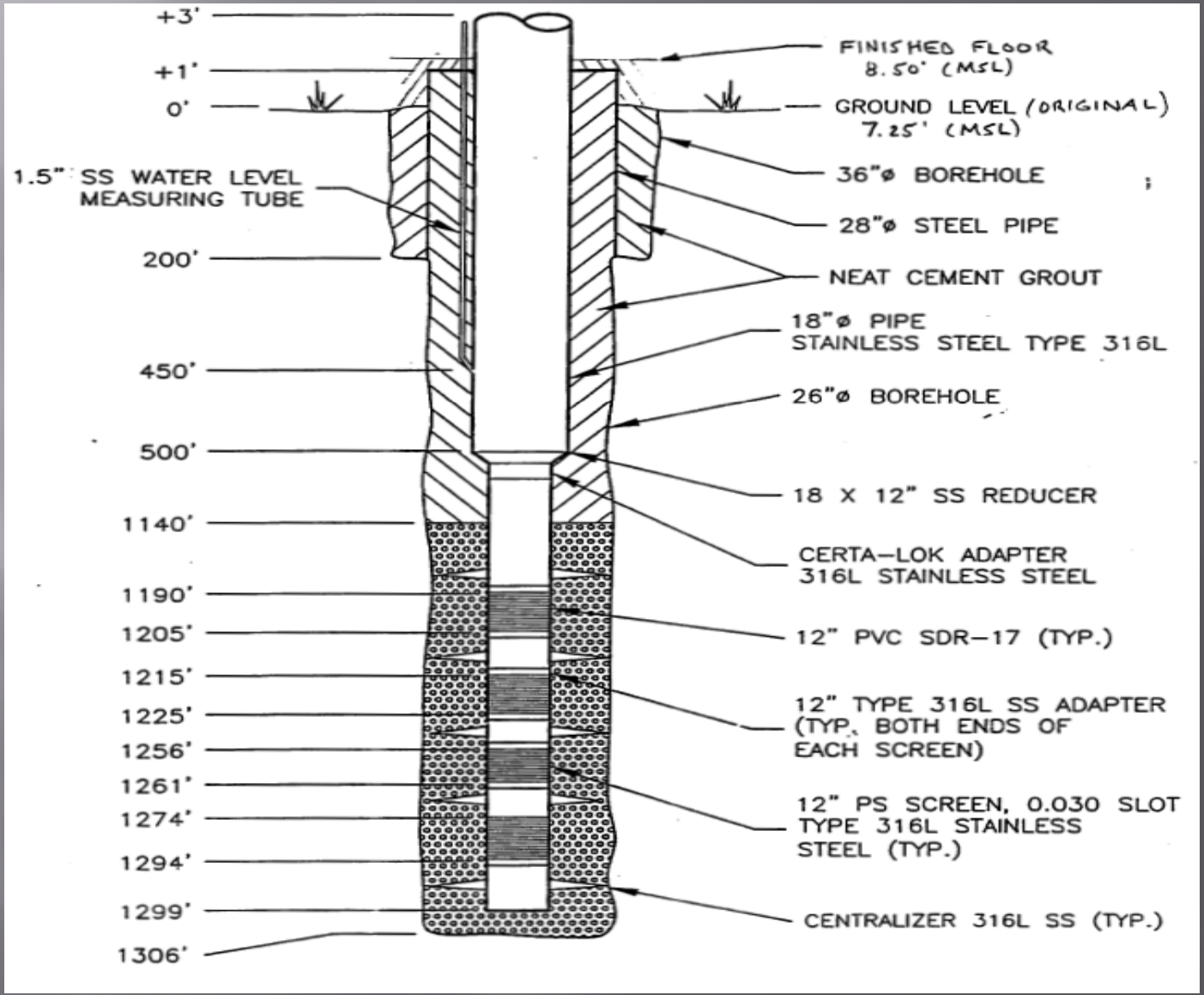
Groundwater Supply to the Northwest River WTP

- Four brackish GW wells
  - One on-site, three near WTP on Battlefield Blvd
- Well capacity: 950 to 2,085 GPM
- Well depths: 1,300 to 1,408 feet
  - Screened from 1,152 to 1,294 feet
  - Lower Potomac Aquifer
- Temperature: 23-26°C (73-79° F)
- Chloride level: 3,600 mg/L to 3,900 mg/L

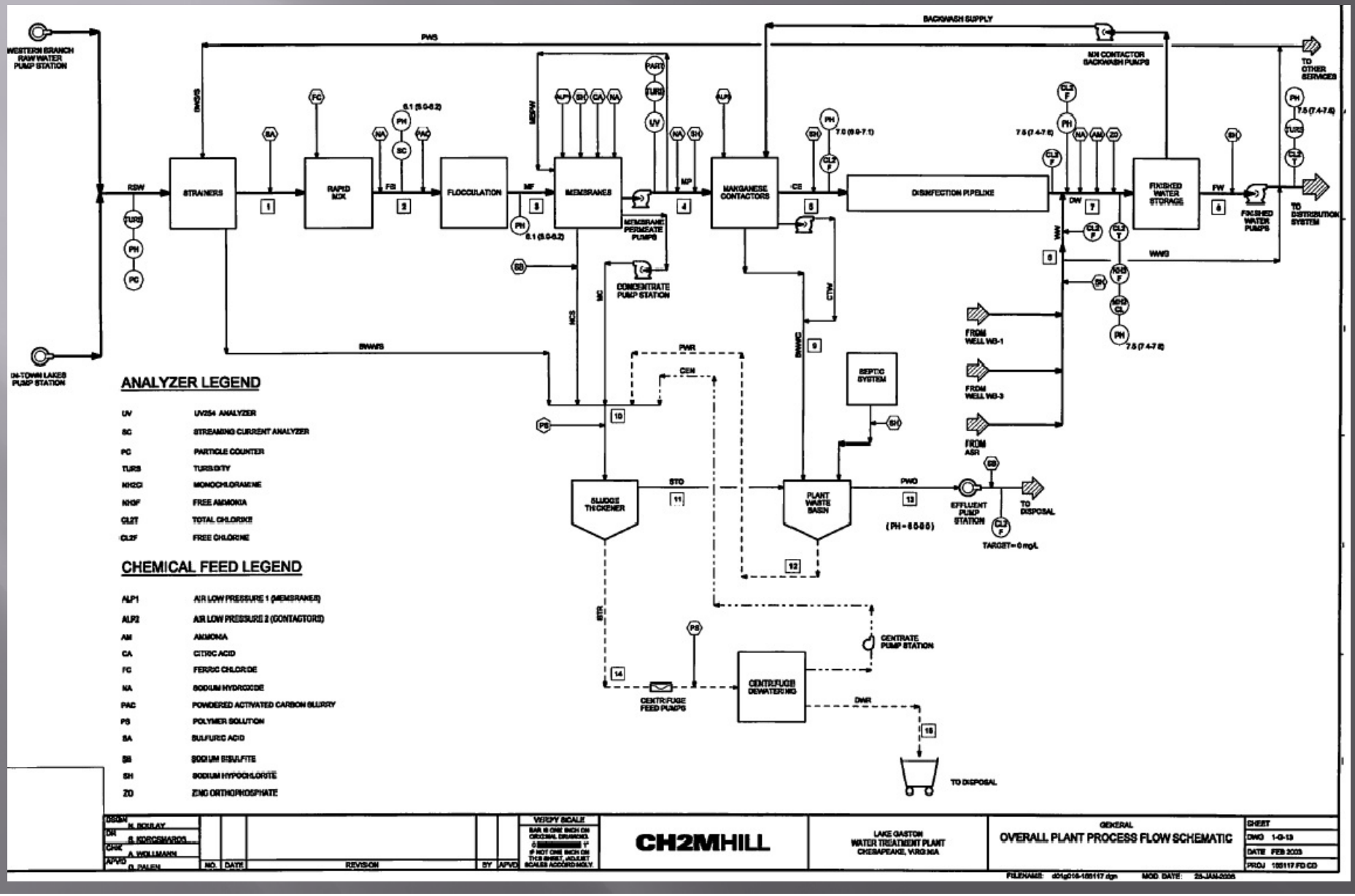
Chloride Trend in Groundwater Supply to NWRWTP



NWR Brackish Water Well



Flow Schematic - LGWTP



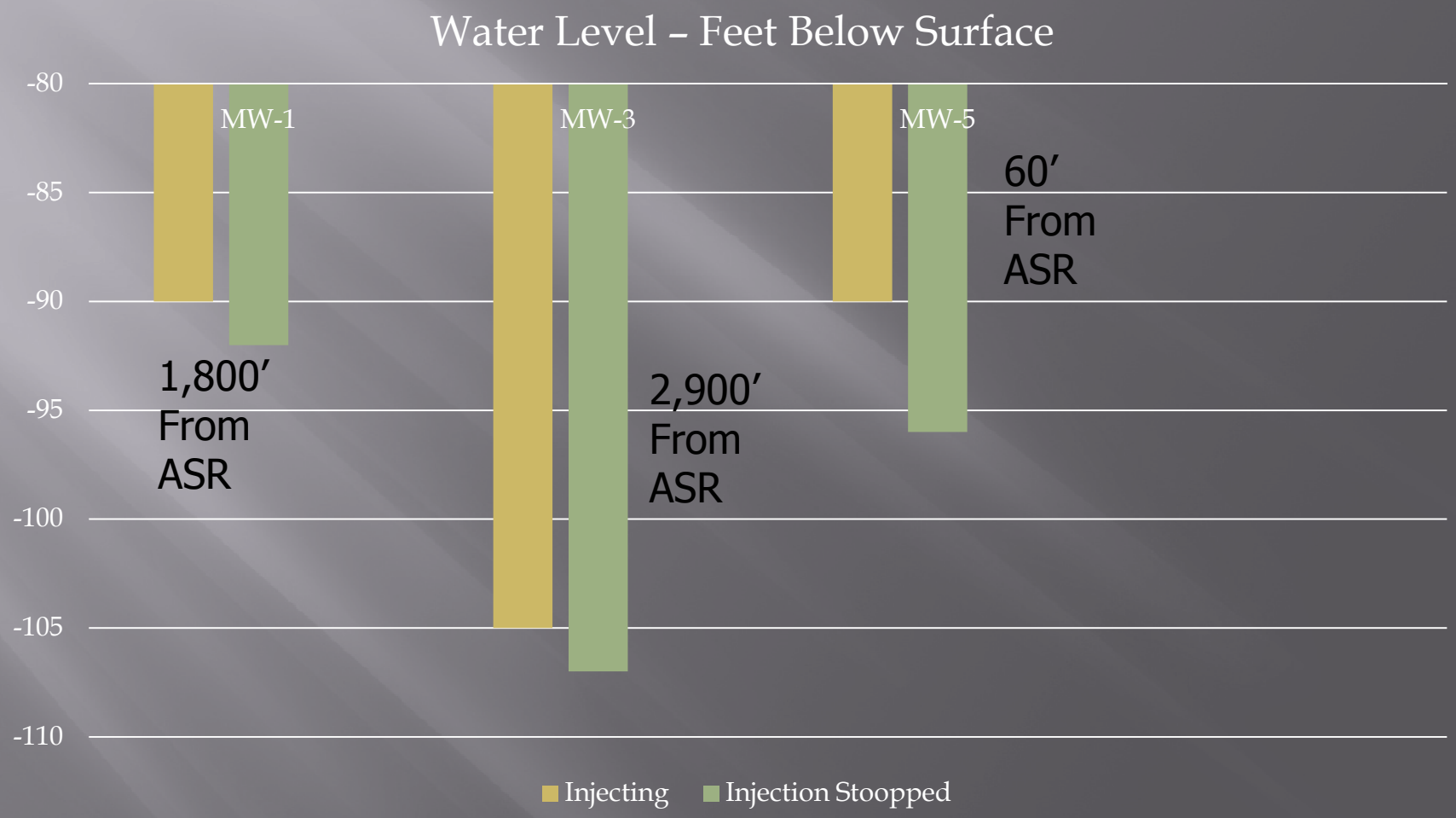
Considerations for the Selection of ASR

- High quality source of drinking water to meet peak demands.
- Minimal treatment cost.
- Minimal operational cost.
- The experience of visited ASR installations was very positive.
- Native water from nearby Western Branch wells was high in fluoride.

Typical Water Quality Western Branch Wells

- pH: 8.1
- Chloride: 95 mg/L
- Fluoride: 4.0 mg/L
- Alkalinity: 430 mg/L ($CaCO_3$)
- Hardness: 10 mg/L
- Iron: 0.03 mg/L

Monitoring Well Response to Termination of Injection (Oct-14)

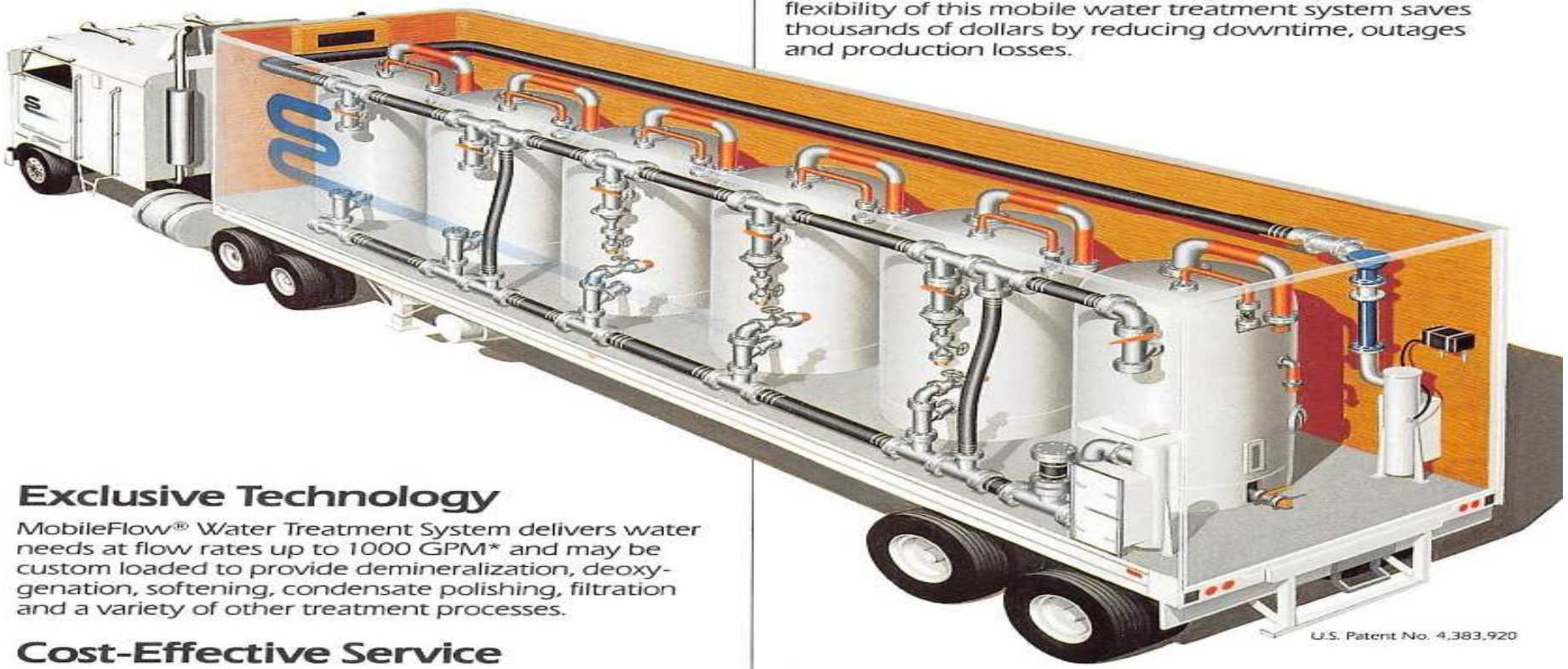


ECOLOCHEM®, Inc.

PRODUCT BULLETIN

MobileFlow® Water Treatment System

Ecolochem's Exclusive "Water Plant on Wheels" delivers high purity water custom engineered for your industrial needs. The superior engineering and greater flexibility of this mobile water treatment system saves thousands of dollars by reducing downtime, outages and production losses.



U.S. Patent No. 4,383,920

Exclusive Technology

MobileFlow® Water Treatment System delivers water needs at flow rates up to 1000 GPM* and may be custom loaded to provide demineralization, deoxygenation, softening, condensate polishing, filtration and a variety of other treatment processes.

Cost-Effective Service

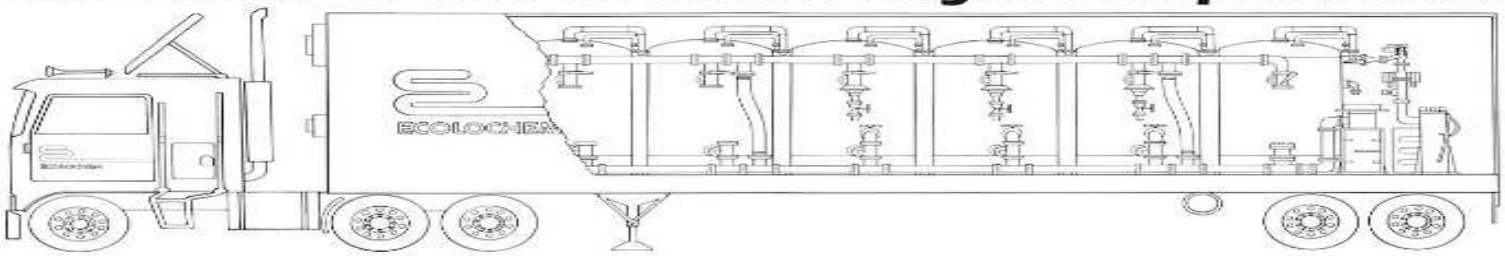
Ecolochem, through its four major service centers, offers individual sales assistance and technical application advice, price-secured contracts, and specialty resin regeneration services.

*1000 GPM System may require special piping and connections.

Immediate Response

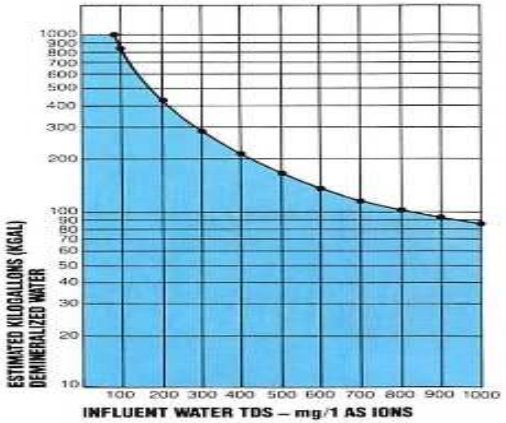
Our toll-free response number gives you instant access to our Dispatch Headquarters. MobileFlow Water Treatment System service is available 24 hours a day, 7 days a week.

MobileFlow® Water Treatment System Specifications

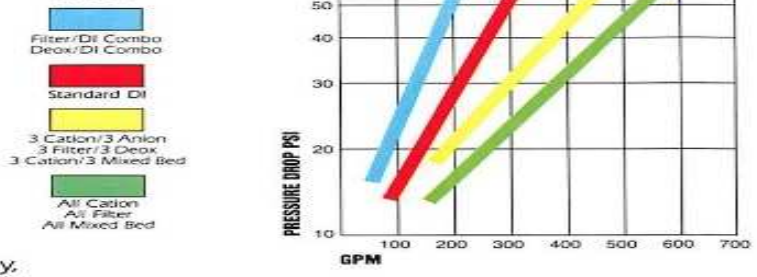


Dimensions and Weights	
Overall length with tractor:	55'-0" (16.76m)
Trailer length:	43'-0" (13.11m)
Trailer height:	13'-6" (4.11m)
Trailer width:	8'-0" (2.44m)
Gross trailer operating weight:	90,000 lbs. (40,824kg)
Electrical	
Electric power requirements:	110 V, 20 amps
Specifications	
Inlet/outlet connections:	2½" NST, male fire hose, 3 inlet, 3 outlet Also available: 4" flange, bolted, 1 inlet, 1 outlet
Pressure vessels:	6 per trailer, ASME code, 100 psi W.P., rubber lined
Resin capacity:	In excess of 5 million grains
Inlet water strainer:	4" with suitable mesh element
Outlet resin trap:	4" with suitable mesh element
Suitable media:	Ion exchange resins, synthetic adsorbents, activated carbons, granular filter media, manganese zeolite, etc.
Instrumentation:	Two conductivity meters, one with strip chart recorder and alarm. Hi/Lo temperature alarms. Complete pressure instrumentation. Rate of flow indicator. Totalizing flow meter.
Controls:	Adjustable pressure reducing valve on inlet. Isolation valves on all pressure vessels. Automatic shut down system. External audible alarms.
Heating:	Propane fired, thermostatically controlled, designed to prevent freezing at −20°F outside temperature

MobileFlow Demineralizer
Processing Capacity



MobileFlow Pressure Drop Curves
at 60°F



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MFPRSK1/91

ASR Well Site

ASR Well Piping

ASR Well Head Configuration

ASR Mn Removal Contactor

Mn Contactor Piping

Mn Contactor Interior

ASR Injection Piping at LGWTP

Lessons Learned

- Geochemistry impacts can be difficult to anticipate.
- Redundancy is inadequate with only one ASR well.
- Operational best practices are essential for maintaining overall system health (e.g., back-flushing protocol).
- Impractical design considerations can be crippling (e.g., losing a level transducer in the well casing).
- A highly trained technical consultant is essential.

Questions?