Preliminary Engineering Report

North Monmouth Water Main Extension

Monmouth Water Association
Public Water System
PWSID ME0091020
Monmouth, Maine

January 18, 2023
Project Number 228084

Prepared for:

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NORTH MONMOUTH WATER MAIN EXTENSION
PRELIMINARY ENGINEERING REPORT
January 18, 2023

1.0 PROJECT PLANNING

1.1 Location

The Monmouth Water Association is exploring the feasibility of expanding municipal water service to a section of Monmouth referred to as North Monmouth. The proposed project area in North Monmouth is bounded by Wilson Pond Rd. (North), US Route 202 (South), North Main Street (east) and Blaisdell Road (west). New Street, Old Lewiston Road, Highland Terrace and Holeway Lane are also located in the project area. An existing 12" diameter ductile iron water main is located along the southerly side of US Route 2 with a 12" diameter stub at Blaisdell Road, an 8" diameter stub at Old Lewiston Road, and an 8" diameter stub on North Main Street. North Monmouth is primarily a residential area, but is also home to TexTech, a textile manufacturing facility.

A site location map is included in **Attachment A** and photographs of the service area are included in **Attachment B.**

1.2 Environmental Resources Present

A map encompassing the project area that identifies the presence of natural resources in the State of Maine's *Beginning with Habitat* database is included in **Attachment C.** This database includes, but is not limited to, the following natural resources:

- Wetlands;
- Water bodies and buffers;
- Public water supplies and source protection areas;
- Aquifers;
- Endangered, threatened and special concern species buffers;
- Rare plants and natural communities;
- Wild brook trout habitat;
- Atlantic salmon rearing and spawning habitat;
- Roseate tern, piping plover, least tern nesting areas;
- Deer wintering areas;
- Inland wading bird & waterfowl habitat;
- Seabird nesting islands;
- Shorebird habitat;
- Tidal wading bird & waterfowl habitat; and

- Significant vernal pools.

Wetlands, two streams (Wilson Stream & Tannery Brook), a public water supply system consisting of two wells (TexTech / ME0094323), and a portion of Wilson Pond are located within the project area. Numerous private water supply wells are also present throughout the service area, some of which have been impacted by per- and polyfluoroalkyl substances (PFAS). There are no underground storage tanks (USTs) in the project area. Two USTs were removed in 1989 from the TexTech facility. Soil and groundwater contamination associated with the former USTs are being monitored by consultants contracted by TexTech. Because the proposed water main installation work will be taking place within the road rights-of-way, some of which are already developed with existing sanitary sewer mains, there will be no new adverse impact to natural resources. Water main stream crossings streams will be installed using directional drilling to avoid impacts to streams.

1.3 Population Trends

The latest demographic information available for the Town of Monmouth (ACS 2020) is shown below.

Category	Monmouth
Population	4,129
Male	2,195
Female	1,934
Under 18	826
18 to 64	2,643
65 and over	660

Population trends for the Town of Monmouth from the US Census are shown below.

Census Year	Population	% +/-
1910	1,386	12.1
1920	1,372	-1.0
1930	1,344	-2.0
1940	1,500	11.6
1950	1,683	12.2
1960	1,884	11.9
1970	2,062	9.4
1980	2,888	40.1
1990	3,553	16.1
2000	3,785	12.9
2010	4,104	8.4
2020	4,129	0.6

Monmouth's population has been steadily growing since the 1940s, although growth has leveled off in the last 10 years. Population growth in the North Monmouth project area is expected to generally follow the growth trends for the overall Town, with slow growth projected over the next 20 years. For design purposes, water demand is being projected to increase by 10% over the next 20 years (an average annual growth of 0.5% per year) to reflect a similar growth trajectory to that from 2000 to 2020.

1.4 Community Engagement

The Monmouth Water Association and Winthrop Utilities District contracted with RCAP Solutions and The Water Store to conduct an outreach survey in 2022 to evaluate the community's interest in connecting to the Monmouth Water Association's municipal water system.

Based on 70 survey respondents in the North Monmouth area,

- 2 are already connected to the municipal water system and 68 utilize private wells for their water supply;
- 3 are renters and 67 are home/business owners;
- 12 will connect (18%), 24 will connect if no upfront cost (35%), 15 are unsure (22%), and 17 said they will not connect (25%) to the new municipal water system;
- 41 indicated that they have water quality concerns and 27 indicated they do not;

- 51 indicated that they have had their wells tested and 17 indicated they have not;
- 8 have homes or businesses within 200' of a dry fire hydrant or dry well for fire response, 28 are unsure, and 33 do not; and
- 51 indicated that they support the water main extension (74%), 10 are unsure (14%), and 8 indicated that they do not support the water main extension (12%).

2.0 EXISTING FACILITIES

2.1 Project Location

Monmouth Water Association's existing water system facilities include the following (see **Attachment D**):

- 200 feet of 2¼" diameter cast iron (1966);
- 11,600 feet of 8" diameter cast iron (1966, 1971);
- 6,200 feet of 12" diameter cast iron (1966);
- 800 feet of 6" diameter ductile iron pipe (1993);
- 6,274 feet of 8" diameter ductile iron (2003-2013)
- 13,000 feet of 12" diameter ductile iron (2002);
- 1,500 feet of 2" diameter plastic;
- 42 hydrants;
- A 250,000-gallon concrete water storage tank on Academy Road (1966); and
- A pump station on US Route 202 (2001).

The proposed project location is shown in **Attachment A** and consists of 137 parcels. Current land use in the project area consists of the following:

- Industrial – 4 parcels (TexTech and J&V Innovations LLC);
- Municipal / Governmental – 3 parcels (USPS, Monmouth Sanitary District pump station, Monmouth fire Department);
- Non-Profit – 3 parcels (Monmouth Museum, North Monmouth Community Church);
- Single-family Residential – 103 parcels;
- Duplex Residential – 6 parcels;
- Commercial – 1 parcel (self storage facility); and
- Vacant – 17 parcels.

2.2 History

In 1966, the Monmouth Water Association (the Association) constructed a public water system including approximately 25,000 feet of cast iron water main, a 250,000-gallon concrete storage tank and two public water supply wells.

In 2001, the Association constructed approximately 13,000 feet of 12” diameter ductile iron water main along US Route 202 and Main Street from the Winthrop / Monmouth town line to the existing 8” diameter water main on Main Street to tie into the Winthrop Utilities District system. The Association abandoned the existing public water supply wells and constructed a new pump station on US Route 202 to provide water to the existing 250,000-gallon storage tank from the Winthrop Utilities District (the District) system. Effective May 3, 2001, the Association entered into a twenty-year agreement with the District for potable water service where the Association purchases water for resale at 90% of the District’s published highest volume consumption tariff water rate on file with the Maine Public Utilities Commission. The Association also has an ongoing service agreement with the District for contract operation service. Under the terms of this agreement, the District provides the Association all general operations and maintenance services of its water system. The District also is responsible for all customer service support including billing, cash receipts and collections of water payments, and all customer records. In 2020, the Association and the District approved a ten year agreement extension.

The primary source of Winthrop Utilities District’s water is Narrows Pond and the secondary source of water is Maranacook Lake.

2.3 Condition of Existing Facilities

Approximately 18,000 feet of water mains in the distribution system were installed in 1971 and 1966, and are more than 50 years old. The Monmouth Water Association has a water pipe replacement schedule to replace 24,000 feet of water main by the year 2195. Since 2003, 1,000 feet of 6” diameter water main, 2,156 feet of 8” diameter water main and 200 feet of 1” diameter pipe have been replaced. The Monmouth Water Association plans to replace 2,450 feet of 8” water main in the next 20 years.

The condition and ages of existing private water supply wells in the proosed North Monmouth service area have not been evaluated. However, more than 50 of the drinking water wells have detectable levels of PFAS contamination (see **Section 3.1**).

2.4 Financial Status of Existing Facilities

This system serves both domestic connections and businesses. Jobs, population, and property values in this area are generally stable.

A summary of the financial status of the existing facilities follows:

Summary of Financial Status, Year Ended 2021	
Average annual single family home bill	$430
Annual amount billed (2021 FY)	$194,676
Taxes currently assessed	N/A
Annual taxes billed	N/A
Current long-term outstanding debt	$173,723
Current annual debt payment (through 2040)	$18,836
Current annual operation and maintenance costs	$29,934
Reserve fund value	$190,749

2.5 Water/Energy/Waste Audits

The Winthrop Utilities District (District) tracks unaccounted water for the Monmouth Water Association (Association). The following table provides data for 2017 – 2020.

Year	Water purchased by the Association from District	Water sold by the Association	Non-Revenue Water	Accounted for Non-Revenue Water	Unaccounted for Water
2017	17,207,740	16,155,000	1,052,740	150,000	902,740
2018	18,293,088	16,944,000	1,349,088	150,000	1,199,088
2019	17,461,312	16,392,000	1,069,312	150,000	919,312
2020	19,793,576	17,816,000	1,977,576	150,000	1,827,576

3.0 NEED FOR PROJECT

3.1 Health, Sanitation, and Security

When the Monmouth Water Association installed the 12” diameter ductile iron water main on US Route 202 in 2002, they made provisions to allow extension of municipal water service to the North Monmouth area. Eight-inch diameter stubs were installed at the North Main Street intersection and the Old Lewiston Road intersection, and a 12-inch diameter stub was installed at the Main Street / Blaisdell Road intersection.

Relatively recently, high levels of PFAS compounds have been discovered in a number of drinking water wells in the North Monmouth area, especially in drinking water wells the vicinity of the TexTech facility and the Monmouth Fire Station. Since September 2018, Katahdin Analytical Services, Wood E&I Solutions, Sanborn Head, The Town of Monmouth and the Maine Department of Environmental Protection have collected 66 water samples from 58 drinking water wells and analyzed them for the presence of PFAS substances (see **Attachment E**). The State of Maine has an interim drinking water standard of 20 ng/L for either individual or for the combined sum of the following six PFAS compounds: PFOA, PFOS, PFHpA, PFNA, PFDA, and PFHxS. Of the 58 drinking water wells, 3 wells had non-detectable levels of PFAS, 20 had PFAS levels below the interim drinking water standard, 26 had PFAS levels between 20 and 100 ng/L, and 8 had PFAS levels over 100 ng/L, one of which was close to 15,000 ng/L. For the drinking water wells with PFAS levels over 20 ng/L, TexTech and the Maine Department of Environmental Protection have provided PFAS water treatment devices for some residents and bottled drinking water for others. The presence of PFAS compounds in the drinking water wells in the North Monmouth area has led the Monmouth Water Association to evaluate the feasibility of extending municipal water service to the North Monmouth area at this time.

3.2 Aging Infrastructure

The proposed service area will provide a replacement for existing private water supply wells with aging well pumps.

3.3 Reasonable Growth

Based on the general population trend in Monmouth since 2000, we are evaluating the feasibility of extending municipal water service to the North Monmouth area with a 10% growth rate over the next 20 years (0.5% annual growth rate).

4.0 ALTERNATIVES CONSIDERED

4.1 Description

Multiple alternatives were evaluated for this project.

Alternative 1 is to install new water mains and associated water appurtenances to provide municipal water service to the entire North Monmouth area, which will address PFAS contamination issues and provide improved fire protection. The new water main would be a looped system located along North Main Street, Old Lewiston Road, New Street, Highland Terrace, Wilson Pond Road and Blaisdell Road, with connections to the existing Route 202 water main at the Blaisdell Road, Old Lewiston Road and North Main Street intersections.

Alternative 2 is to do nothing, and maintain the current condition of private water supply wells in the North Monmouth area. To date, Tex-Tech Industries has installed 25 point-of-service residential carbon treatment systems to treat water from residential wells that has tested over the State's interim drinking water standard for PFAS.

The following alternatives are variations of Alternative 1:

- Alternative 3 is to install new water mains and associated water appurtenances along North Main Street only, with one connection to the existing water main on Route 202. This alternative would create a dead-end system requiring additional maintenance, resulting in potential water quality issues, and would not address PFAS issues on Highland Terrace and New Street and fire protection in the broader North Monmouth area. Therefore, we did not evaluate this alternative in depth.

- Alternative 4 is to add new water mains and associated water appurtenances along Wilson Pond Road and Blaisdell Road to Alternative 3 to create a looped system with two (2) connections to the Route 202 water main. This would create a looped system, but would not address PFAS issues on Highland Terrace and New Street. Therefore, we did not evaluate this option in depth.

- Alternative 5 is to add new water mains and associated water appurtenances along New Street and Wilson Pond Road to Alternative 4 to treat PFAS issues on New Street as well. This would create a looped system, but would not address PFAS issues on Highland Terrace. Therefore, we did not evaluate this option in depth.

- Alternative 6 is to add new water mains and associated water appurtenances along Highland Terrace to Alternative 5 to treat PFAS issues on Highland Terrace as well. This alternative is similar to Alternative 1, but does not have the third connection to the Route 202 water main on Old Lewiston Road.

To address PFAS compounds in private drinking water wells and to provide fire protection water service in the North Monmouth area, we focused our analysis on evaluating the feasibility of Alternative 1.

4.2 Design Criteria

Design criteria for the water system include the following:

- Provide a minimum of 20 psi at all points of connection per Maine Drinking Water Rules;
- Provide a minimum of 500 gallons per minute (GPM) for fire flow;
- Provide domestic water service for residential, commercial, industrial, municipal / governmental, and non-profit users;
- For residential users, assume 3 bedroom dwelling units @ 270 gallons per day (GPD) per Maine Subsurface Wastewater rules;
- For the TexTech facility, it is assumed that the facility will connect to the new water main for drinking water and for sanitation purposes, but will retain their existing fire protection system. TexTech operates 24 hours per day 7 days per week. Maximum occupancy occurs on Monday through Thursday with 80 employees working the first shift and 10 employees working the second and third shifts for a total of 100 employees per day. According to the Maine Subsurface Wastewater rules, the water design flow rate for employees at a place of employment with no showers is 12 gallons per day per employee. Therefore, maximum daily demand for 100 employees at 12 GPD is 1,200 GPD. Peak flow will occur during the first shift on Monday through Thursday, which we assume to be 12 gallons per minute (80 employees x 12 GPD divided by 8 hours divided by 60 minutes times a peaking factor of 6);
- It is assumed that the water usage for the post office (closed), church, museum, pump station and fire station will be minimal, and the water usage was modeled the same as a residential use;
- New hydrant spacing is 800 feet minimum; and
- Provide potable water quality as defined in the Rules Relating to Drinking Water by the State of Maine Drinking Water Program in the Department of Health & Human Services.

4.3 Map

The site location map is included in **Attachment A** and site plans are included in **Attachment F**.

4.4 Environmental Impacts

The proposed water main extension will be constructed within existing paved roads and road shoulders. According to the Beginning with Habitat map in **Attachment C**, there are two streams (Wilson Stream and Tannery Brook), a portion of Wilson Pond and freshwater wetlands located within the project area. The proposed water main will cross Tannery Brook on North Main Street, Wilson Stream on Old Lewiston Road and Highland Terrace, and Wilson Pond on Wilson Pond Road. These water crossings will be installed by directional drilling below the stream beds to minimize any disturbance to the waterbodies.

An Environmental Assessment has been prepared for this project and indicates that this project will result in minimal environmental impacts and no impacts to historical or archeological resources.

4.5 Land Requirements

According to the preliminary utility plans, it does not appear that permanent land rights outside the existing road rights-of-way will be needed to implement this project. However, some temporary construction easements may be needed.

4.6 Potential Construction Problems

The proposed project consists of extending the existing water system within an established residential area. Existing utilities in the project area consist of municipal sanitary sewer, storm sewer and overhead electric / communications. Municipal sanitary sewer is located in North Main Street, Old Lewiston Road, Highland Terrace, and portions of New Street and Wilson Pond Road. No ledge was indicated on the 1976 sanitary sewer drawings. Minimal stormwater infrastructure is located on North Main Street in the vicinity of New Street and Wilson Pond Road.

Potential construction concerns include directional drilling below stream crossings, traffic control, and working around sanitary and stormwater infrastructure.

4.7 Sustainability Considerations

For Alternative 1, the new water system components will be designed to meet or exceed all modern drinking water system regulations for efficiency. Individually-operated water wells will be replaced with the municipal system, which may provide improved energy efficiency.

For Alternative 2, individual drinking water wells will continue to operate as well as GAC PFAS treatment equipment, which will require servicing and periodic carbon replacement.

4.8 Cost Estimates

The preliminary opinion of probable construction cost for Alternative 1 is **$5,953,020** (**Attachment G**), which is based on the following:

- 14,200 feet of 8” diameter ductile iron water main & associated appurtenances;
- 121 service connections to curb stops and boxes;

- 18 fire hydrant assemblies;
- 10’ wide asphalt pavement removal and replacement;
- 500 feet of 8” diameter HDPE water main installed below three (3) stream crossings by horizontal directional drilling;
- Traffic maintenance, erosion protection and sediment control;
- No ledge or unsuitable materials encountered; and
- 20% contingency.

The preliminary opinion of project cost with engineering design and allowances for legal/administrative costs and land/easement acquisition costs is **$7,062,200**.

5.0 SELECTION OF ALTERNATIVE

To address PFAS-contaminated drinking water wells and to provide safe and reliable high quality drinking water and fire protection in the North Monmouth area, Alternative 1 is the preferred alternative.

5.1 Life Cycle Analysis

A net present worth analysis of the project costs for Alternative 1 is included in **Attachment G**.

5.2 Non-Monetary Factors

Alternative 1 will address health and sanitation threats including:

1. Providing a potable water source free of PFAS contamination, which addresses the human health concerns for more than 50 private water supplies that have been impacted by PFAS contamination. The existing contamination could also have an effect on property values.

2. In case of a power outage, a well-based system is unable to provide water to occupants. The proposed water system expansion will be served by a water storage tank, providing water supply by gravity that is not interrupted by power outages.

3. Alternative 1 will provide additional hydrants for fire protection and to facilitate adequate flushing of the system to maintain water quality, as well as a looped system that will provide improved fire flows and will reduce aging water concerns.

6.0 PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

Based on the factors considered and discussed above, Alternative 1 is the recommended alternative for the Monmouth Water Association.

6.1 Preliminary Project Design

The proposed project includes installation of approximately 14,700 feet of water main, service connections to curb stops and boxes, gate valves, and hydrants. The preliminary project design plans are included in **Attachment F**.

A hydraulic model was developed for the proposed water main extension to select a recommended water main size and to evaluate whether the existing 250,000-gallon water storage tank will be sufficient to serve the North Monmouth area. A description of the model and modeling results are included in **Attachment G**. The existing water storage tank has the storage volume needed to serve the expanded service area. Water pressure in the existing service area remains the same or decreases slightly with the proposed water main extension. Water pressures in the expanded service area range from 23 psi to 95 psi. Fire flows generally decrease in the existing service area, but none fall below 500 GPM for locations that had adequate fire flow without the proposed water main extension.

6.2 Project Schedule

The project is planned for construction to begin in 2023 according to the following anticipated schedule:

Task	Dates
90% PER Public Informational Meeting	
Final Design	
Draft Environmental Report and 100% PER	
Bond Vote Warnings and Public Meeting	
Bond Vote (Voter Authorization to Incur Debt)	
Bid Phase	
Project Construction	

6.3 Permit Requirements

6.3.1 Maine Department of Transportation - A Location Permit and a Highway Opening Permit will be required by the Maine Department of Transportation for water main connections at the intersections of US Route 202 and Old Lewiston Road and US Route 202 and Blaisdell Road.

6.3.2 Maine Department of Environmental Protection – A Stormwater Permit-By-Rule, a Natural Resource Protection Act (NRPA) Permit-By-Rule and a Maine General Construction Permit will be required for this project by the Maine Department of Environmental Protection. A Stormwater Permit-By-Rule will be required because this project will disturb over 1 acre of land, but will result in no new impervious area. An NRPA Permit-By-Rule will be required because work will take place within 25 to 75 feet of a protected natural resource.

6.3.3 Maine Drinking Water Program – The project plans and specifications will be submitted to the Maine Drinking Water Program of the Division of Environmental and Community Health for review by Drinking Water Program staff for compliance with rules and regulations.

6.4 Sustainability Considerations

6.4.1 Water and Energy Efficiency

The new water system components will be designed to meet or exceed all drinking water system regulations for efficiency.

6.4.2 Green Infrastructure

The proposed water main extension will be installed below existing paved roads. Stream crossings will be installing with horizontal directional drilling to minimize environmental impacts to adjacent wetlands and streams. Erosion and sedimentation control best management practices as required by the Maine Department of Environmental Protection will be utilized during construction.

6.5 Total Project Cost Estimate (Engineer's Opinion of Probable Cost)

A Preliminary Opinion of Probable Construction Costs (OPCC) for the proposed project is included in **Attachment H**. The preliminary OPCC is **$5,953,020** based on the quantities estimated from the attached preliminary design plans. Based on the OPCC, a Preliminary Total Project Cost Summary Estimate is also included in **Attachment H**.

6.6 Annual Operating Budget

6.6.1 Monmouth Water Association Water Rates

Base rates are as follows:

Meter Size	Monthly Charge	Quarterly Charge	Seasonal Charge
5/8”	$14.96	$44.91	$179.67
3/4"	$22.45	$67.36	$269.46
1”	$37.42	$112.29	$449.18
1-1/2”	$74.85	$224.58	$898.32
2”	$134.75	$404.25	$1,617.02
3”	$269.50	$808.51	$3,234.05
4”	$450.02	$1,350.05	$5,400.20

The water usage rate is $3.93 per 1,000 gallons in addition to the base rates listed above. Effective January 1, 2023, the water usage rate per 1,000 gallons will increase to $4.52.

Fire protection rates are as follows:

Private Fire Protection Rates		
Item	**Quarterly Charge**	**Annual Charge**
2” Fire Service Line	$95.11	$380.44
4” Fire Service Line	$189.79	$759.18
6” Fire Service Line	$284.69	$1,138.77
8” Fire Service Line	$379.58	$1,518.33
Private Hydrant	$284.69	$1,138.77

Public fire protection is funded by the Town of Monmouth at 30% of revenues.

6.6.2 Annual Income, Operation and Maintenance Costs

A summary of the Monmouth Water Association's annual operating budget for the year ending December 31, 2021 is provided below.

Revenues	
Water Service	$125,407
Fire Protection	$69,269
Interest	$821
* Total Revenues	$195,497
Expenses	
Water * (Winthrop Utilities District)	$41,478
Operations & Maintenance ** (Winthrop Utilities District)	$29,934
Outside Labor ** (Winthrop Utilities District)	$26,671
Management & General (Monmouth Water Association)	$31,775
Depreciation	$36,553
Total Expenses	$166,411

The Monmouth Water Association purchases water for resale from the Winthrop Utilities District at 90% of the District's published highest volume consumption tariff water rate on file with the Maine Public Utilities Commission.

** The Monmouth Water Association has an ongoing service agreement with the Winthrop Utilties District for contract operation service. The District provides all general operations and maintenance services as well as all customer service support including billing, cash receipts and collections of water payments, and all customer records.

6.6.3 Debt Repayments

As of December 31, 2001, the Monmouth Water Association has one (1) bond payable to USDA Rural Development, maturing in 2033 with an interest rate of 3.375%. The balance of the bond is $173,723.

The following is a schedule of maturities per year on the Association's long-term debt:

Year	Principal	Interest	Total
2022	$12,973	$5,863	$18,836
2023	$13,411	$5,425	$18,836
2024	$13,863	$4,973	$18,836
2025	$14,331	$4,505	$18,836
2026	$14,815	$4,021	$18,836
2027-2031	$81,921	$12,259	$94,180
2032-2033	$22,409	$902	$23,311
	$173,723	$37,948	$211,671

6.6.4 Reserves

The Monmouth Water District has reserve funds held in a savings account which are to be used for repairs that exceed the annual amount budgeted. It is also considered seed money for system upgrades.

	2019 FY	2020 FY	2021 FY	2022 FY
Amount Available	$270,779	$187,654	$128,209	$208,`800
Amount Committed	$12,401	$14,284	$16,168	$18,052
Amount Remaining	$258,378	$173,370	$112,041	$190,749

7.0 CONCLUSIONS AND RECOMMENDATIONS

We recommend that the Monmouth Water Association install 14,700 feet of new 8" diameter water main, new service connections, hydrants and associated water appurtenances in the North Monmouth area. Based on modeling results, the proposed water main extension will allow for adequate flow and pressure under peak flow conditions.

Potential funding sources include the following:

- Community Development Block Grant (CDBG) – There is up to $1M in grant funding available. The next round of applications will be in early 2024. To qualify, however, Monmouth would need to meet the eligibility criteria of 51% low-to-moderate income.

- Drinking Water State Revolving Fund (DWSRF) – DWSRF will be accepting construction applications in September.

- USDA-Rural Development – Applications are accepted year-round for this funding.

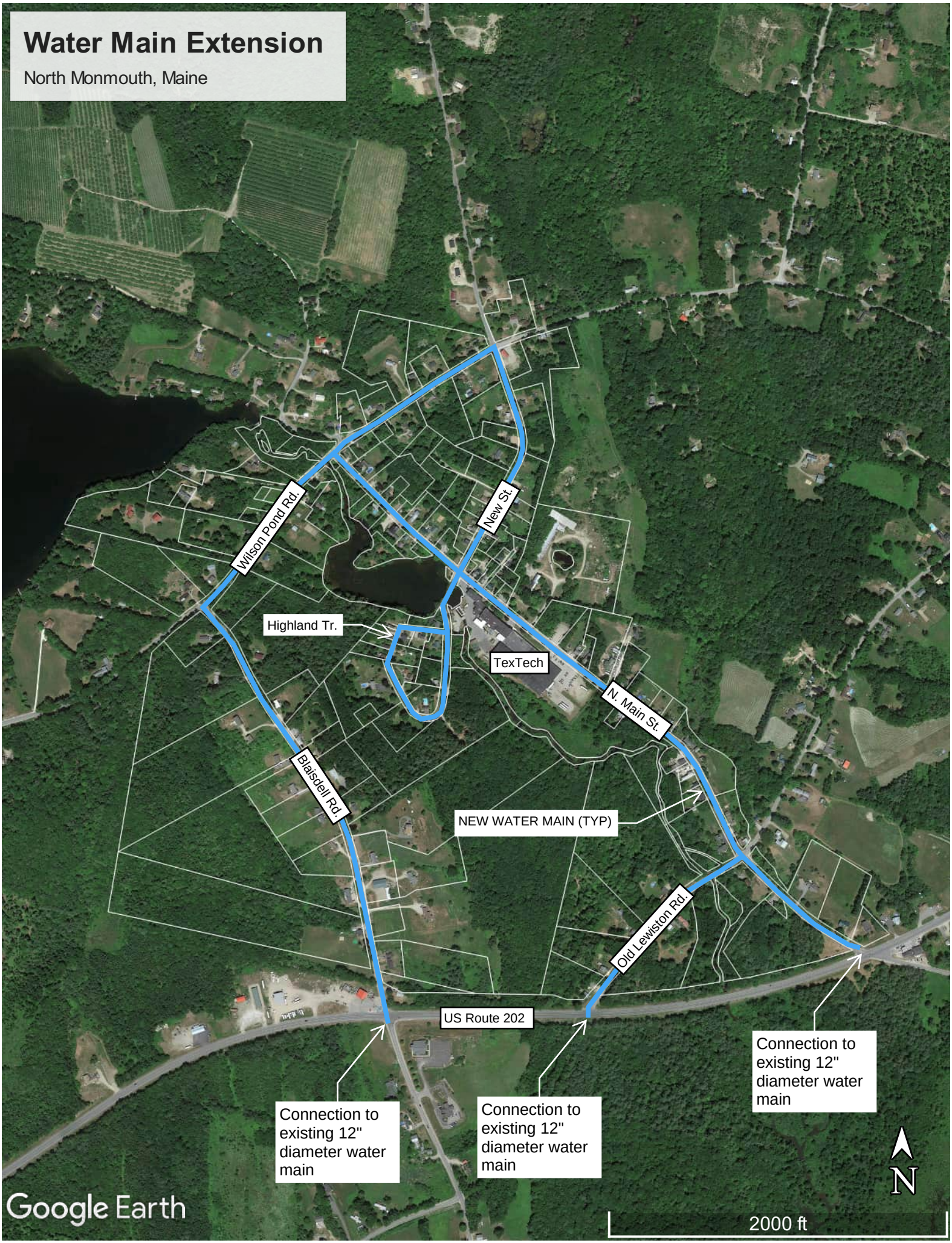
- Northern Border Regional Commission (NBRC) - There is up to $1M in funding available. Letters of interest will be requested in early 2023. Their focus is on how the funding will improve the economic development in the area.

- Community Project Funding and Congressionally Directed Spending – The Consolidated Appropriations Act, 2022 included provisions for 18 federal agencies to make nearly $9.1 billion available to about 5,000 specific projects at congressional members' requests. Maine received $190M for 127 projects, ranging from $23,000 to $12.9M. Last year, applications were requested in late spring. If this avenue of funding is to be pursued, then reaching out to Maine's congressional delegation would be prudent.

- ARPA Funds – Kennebec County ARPA funds may be available.

- Maine Department of Environmental Protection (MDEP) – Although the MDEP typically funds clean water rather than drinking water projects, they may be able to help due to the nature of the need.

Attachment A – Site Location Map


Water Main Extension
North Monmouth, Maine
Wilson Pond Rd.
New St.
Highland Tr.
TexTech
N. Main St.
Blaisdell Rd.
NEW WATER MAIN (TYP)
Old Lewiston Rd.
US Route 202
Connection to existing 12" diameter water main
Connection to existing 12" diameter water main
Connection to existing 12" diameter water main
N
2000 ft
Google Earth

Attachment B – Photographs of the Service Area

DuBois & King

PHOTOGRAPHIC LOG

Project Name:	Site Location:	Project No.:
North Monmouth Water Main Extension	North Monmouth, ME 04265	228084

Photo No.:	Date:
1	09/01/2022

Direction Photo Taken:
N/A

Photographer:
Google Earth

Description:
Photo Location Overview

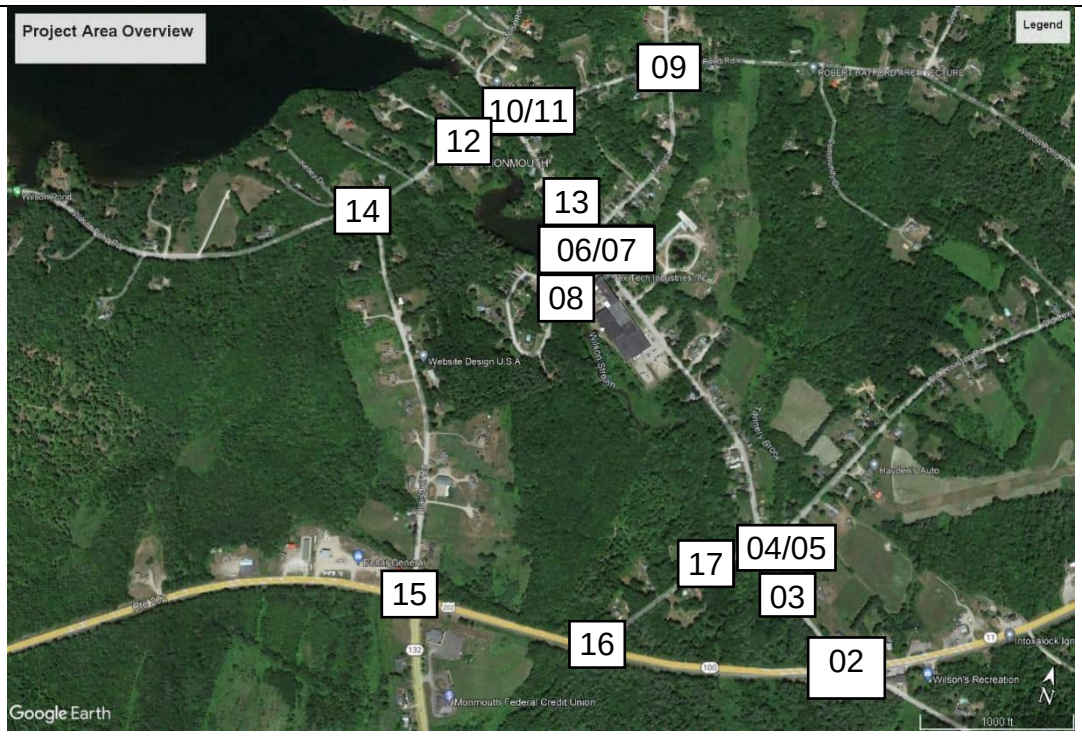


Photo No.:	Date:
2	09/01/2022

Direction Photo Taken:
North East

Photographer:
Google Earth / Streetview

Description:
N. Main @ Rt. 302

DuBois & King

PHOTOGRAPHIC LOG

Project Name:	Site Location:	Project No.:
North Monmouth Water Main Extension	North Monmouth, ME 04265	228084

Photo No.:	Date:
3	09/01/2022

Direction Photo Taken:
South East

Photographer:
Google Earth / Streetview

Description:
Pump Station on N. Main

Photo No.:	Date:
4	09/01/2022

Direction Photo Taken:
North East

Photographer:
Google Earth / Streetview

Description:
N. Main @ Old Lewiston

DuBois & King

PHOTOGRAPHIC LOG

Project Name:	Site Location:	Project No.:
North Monmouth Water Main Extension	North Monmouth, ME 04265	228084

Photo No.:	Date:
5	09/01/2022

Direction Photo Taken:
South East

Photographer:
Google Earth / Streetview

Description:
N. Main @ Old Lewiston-
Looking down Old Lewiston Rd

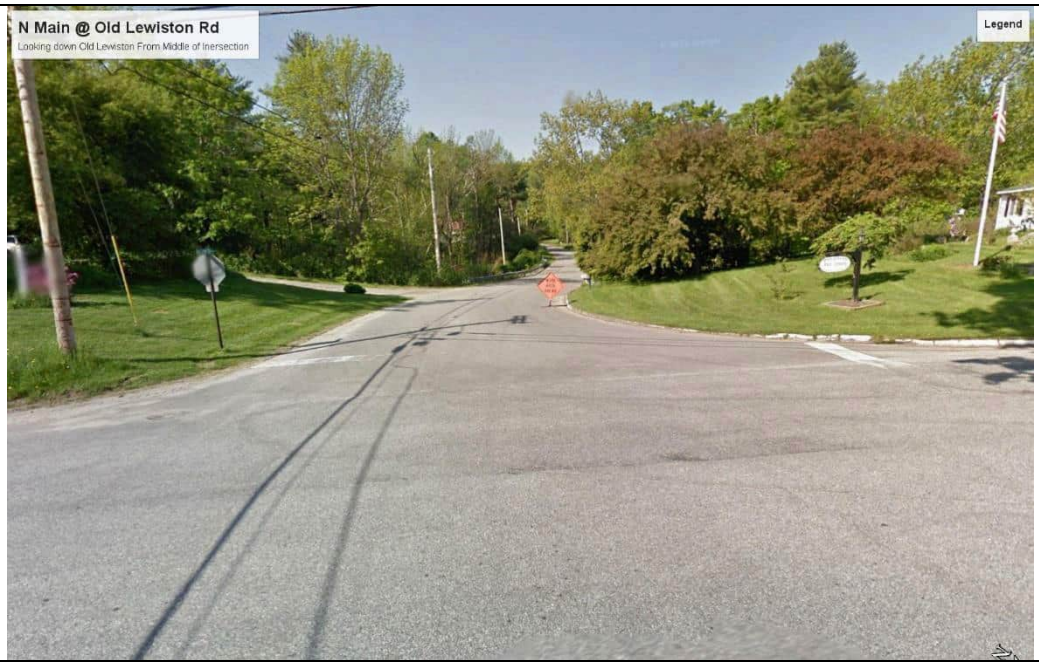
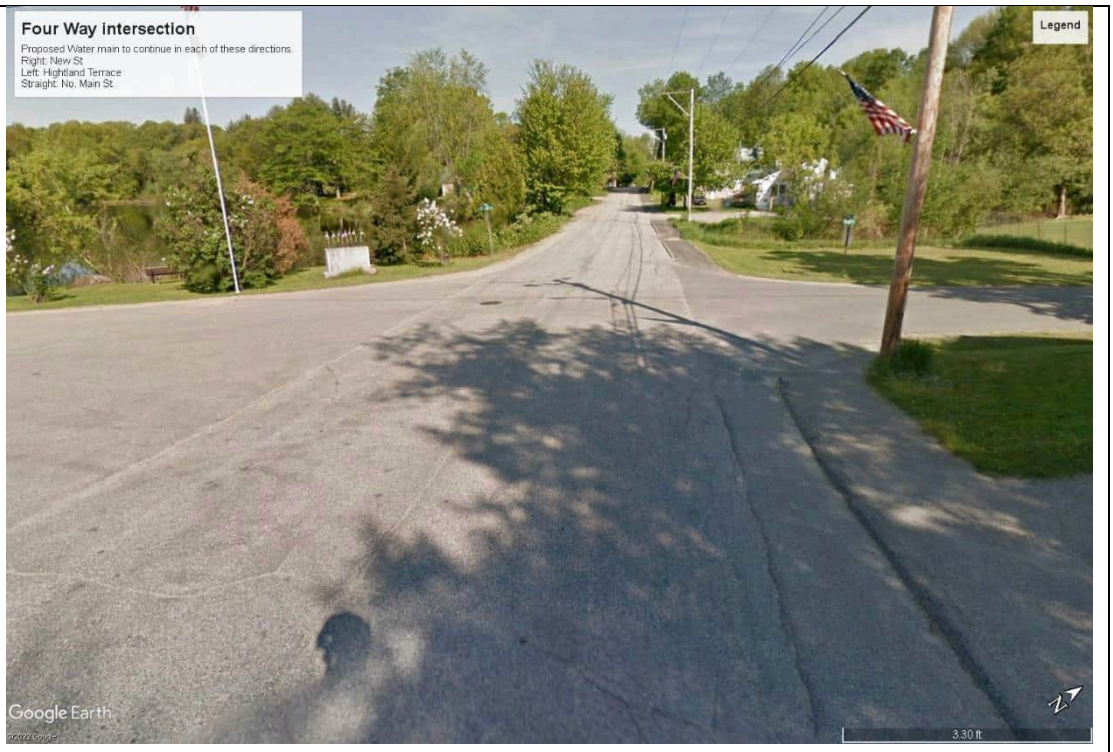


Photo No.:	Date:
6	09/01/2022

Direction Photo Taken:
North East

Photographer:
Google Earth / Streetview

Description:
Four Way intersection
Highland Terrace-Left
New St. – Right
N. Main St - Forward



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PHOTOGRAPHIC LOG

Project Name:	Site Location:	Project No.:
North Monmouth Water Main Extension	North Monmouth, ME 04265	228084

Photo No.:	Date:
7	09/01/2022

Direction Photo Taken:
South

Photographer:
Google Earth / Streetview

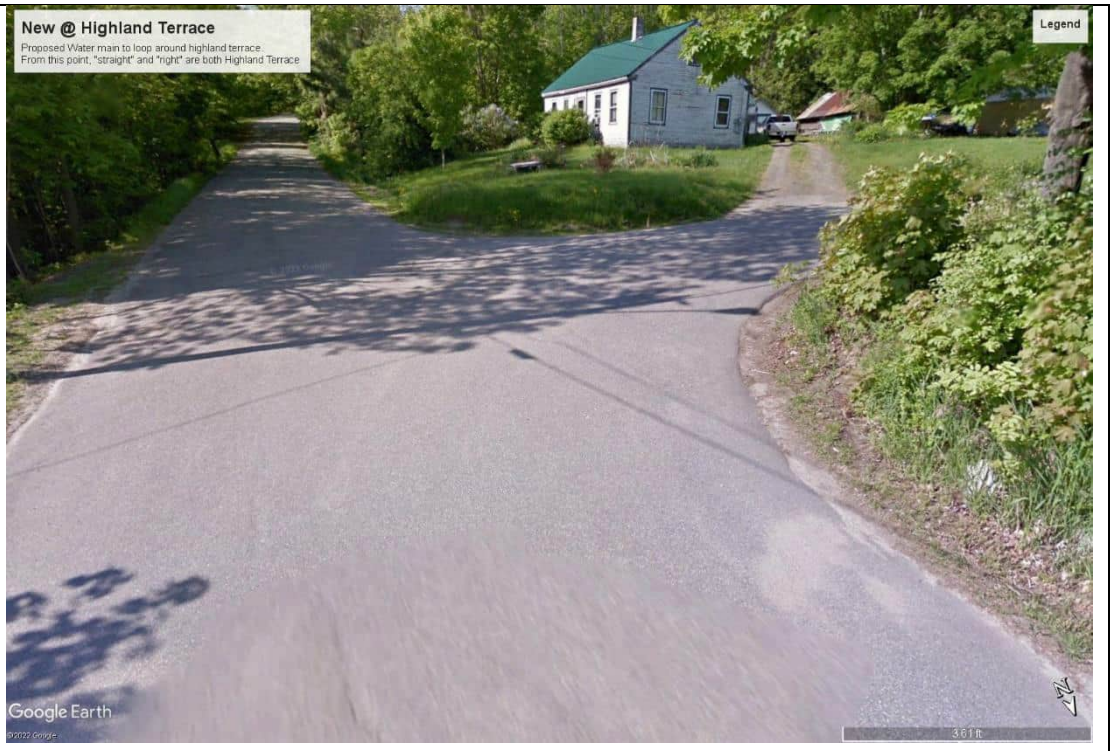
Description:
Bridge Crossing on Highland Terrace next to Tex Tech

Photo No.:	Date:
8	09/01/2022

Direction Photo Taken:
South

Photographer:
Google Earth / Streetview

Description:
New @ Highland Terrace loop



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PHOTOGRAPHIC LOG

Project Name:	Site Location:	Project No.:
North Monmouth Water Main Extension	North Monmouth, ME 04265	228084

Photo No.:	Date:
9	09/01/2022

Direction Photo Taken:
North

Photographer:
Google Earth / Streetview

Description:
Wilson Pond Rd @ New St

Photo No.:	Date:
10	09/01/2022

Direction Photo Taken:
South East

Photographer:
Google Earth / Streetview

Description:
Wilson Pond Rd @ Morse Rd approaching the N Main St intersection

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PHOTOGRAPHIC LOG

Project Name:	Site Location:	Project No.:
North Monmouth Water Main Extension	North Monmouth, ME 04265	228084

Photo No.:	Date:
11	09/01/2022

Direction Photo Taken:
South East

Photographer:
Google Earth / Streetview

Description:
N. Main St @ Wilson Pond Rd

Photo No.:	Date:
12	09/01/2022

Direction Photo Taken:
South East

Photographer:
Google Earth / Streetview

Description:
Wilson Pond Rd. stream crossing

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PHOTOGRAPHIC LOG

Project Name:	Site Location:	Project No.:
North Monmouth Water Main Extension	North Monmouth, ME 04265	228084

Photo No.:	Date:
13	09/01/2022

Direction Photo Taken:
North East

Photographer:
Google Earth / Streetview

Description:
Wetlands on N. Main St heading toward Wilson Pond Rd

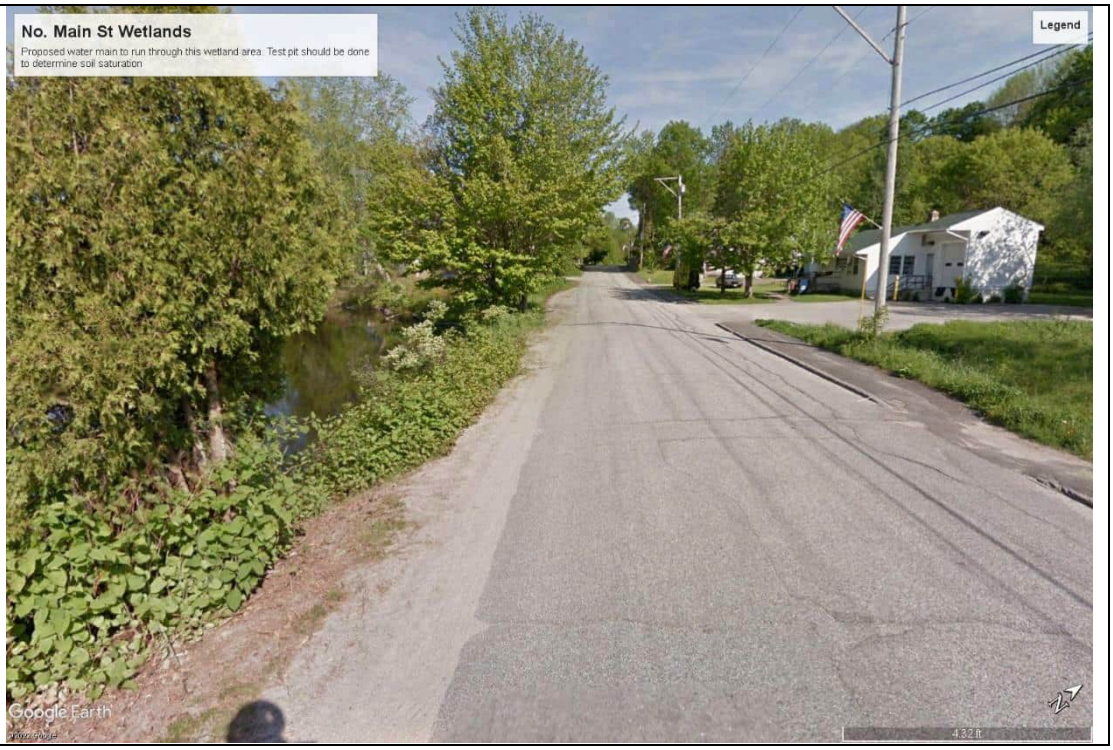
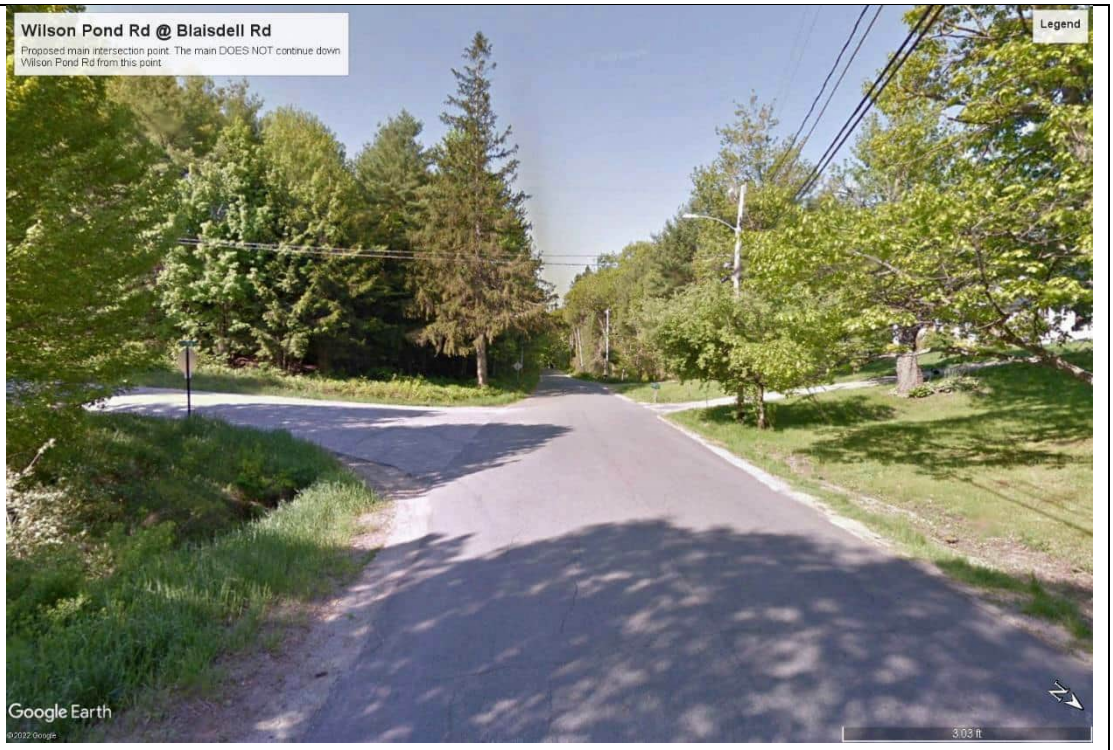


Photo No.:	Date:
14	09/01/2022

Direction Photo Taken:
West

Photographer:
Google Earth / Streetview

Description:
Wilson Pond Rd @ Blaisdell Rd



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PHOTOGRAPHIC LOG

Project Name:	Site Location:	Project No.:
North Monmouth Water Main Extension	North Monmouth, ME 04265	228084

Photo No.:	Date:
15	09/01/2022

Direction Photo Taken:
North East

Photographer:
Google Earth / Streetview

Description:
Rt. 202 @ Blaisdell

Photo No.:	Date:
16	09/01/2022

Direction Photo Taken:
South East

Photographer:
Google Earth / Streetview

Description:
Rt. 202 @ Old Lewiston Rd

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PHOTOGRAPHIC LOG

Project Name:	Site Location:	Project No.:
North Monmouth Water Main Extension	North Monmouth, ME 04265	228084

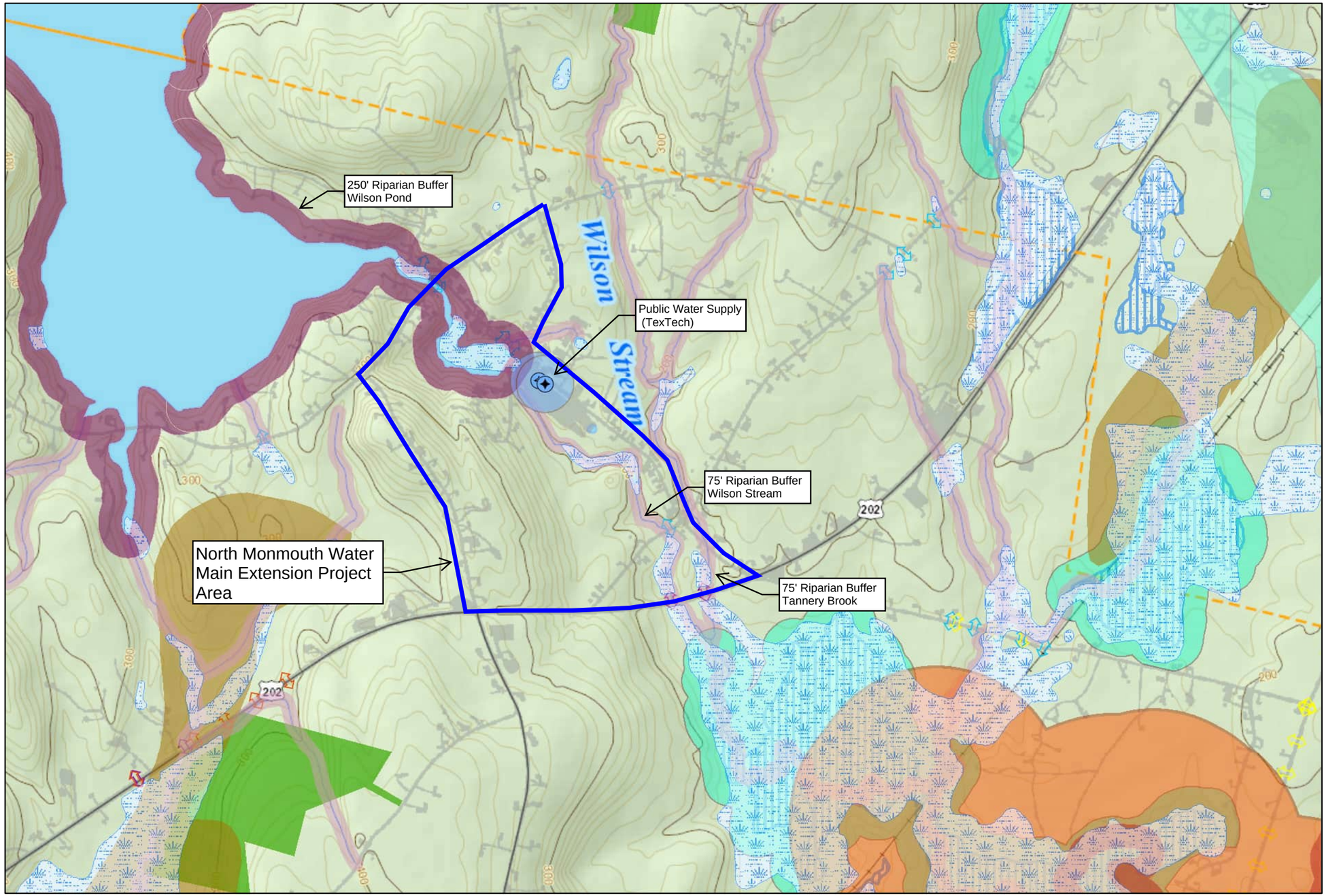
Photo No.:	Date:
17	09/01/2022

Direction Photo Taken:
North West

Photographer:
Google Earth / Streetview

Description:
Water Crossing on Old Lewiston Rd heading toward N Main St.

Attachment C – Natural Resources Map



BEGINNING WITH HABITAT

Legend

- City/Township
- 1
- 2
- Watershed Divide (HUC 12)
- Watershed Divide (HUC 10)
- Watershed Divide (HUC 8)
- Watershed Divide (HUC 6)
- Wetlands
- Great Ponds
- Stream_Buffers_75ft
- Shellfish Beds
- Public Water Supply Wells
- Source Protection
- Aquifers
- ETSC Animal Habitat Buffers
- Rare Plants and Natural Communities
- Natural Communities
- Wild Brook Trout Habitat
- Atlantic Salmon Rearing Habitat
- Atlantic Salmon Spawning Habitat
- Roseate Tern, Piping Plover or Least Tern Nesting Areas
- Deer Wintering
- Inland Wading Bird and Waterfowl Habitat
- Wildlife Wetlands
- Seabird Nesting Island
- Shorebird Habitat
- Tidal Wading Bird and Waterfowl Habitat
- Significant Vernal Pools
- Less than 2000 Vehicles/Day
- More than 2000 Vehicles/Day
- Less than 2000 Vehicles/Day
- More than 2000 Vehicles/Day
- Undeveloped Habitat Blocks
- Highway Bridge Connectors
- Maine Conserved Lands
- Federal
- Municipal
- Water Dist., etc.
- Private
- State
- Conserved Lands Easements
- Focus

State of Maine

The Nature Conservancy — Protecting nature. Preserving life.

Maine Audubon

Maine Coast Heritage Trust — A Statewide Land Conservation Organization

MaineDOT

N W E S

0 0.225 0.45 0.9 1.35 mi

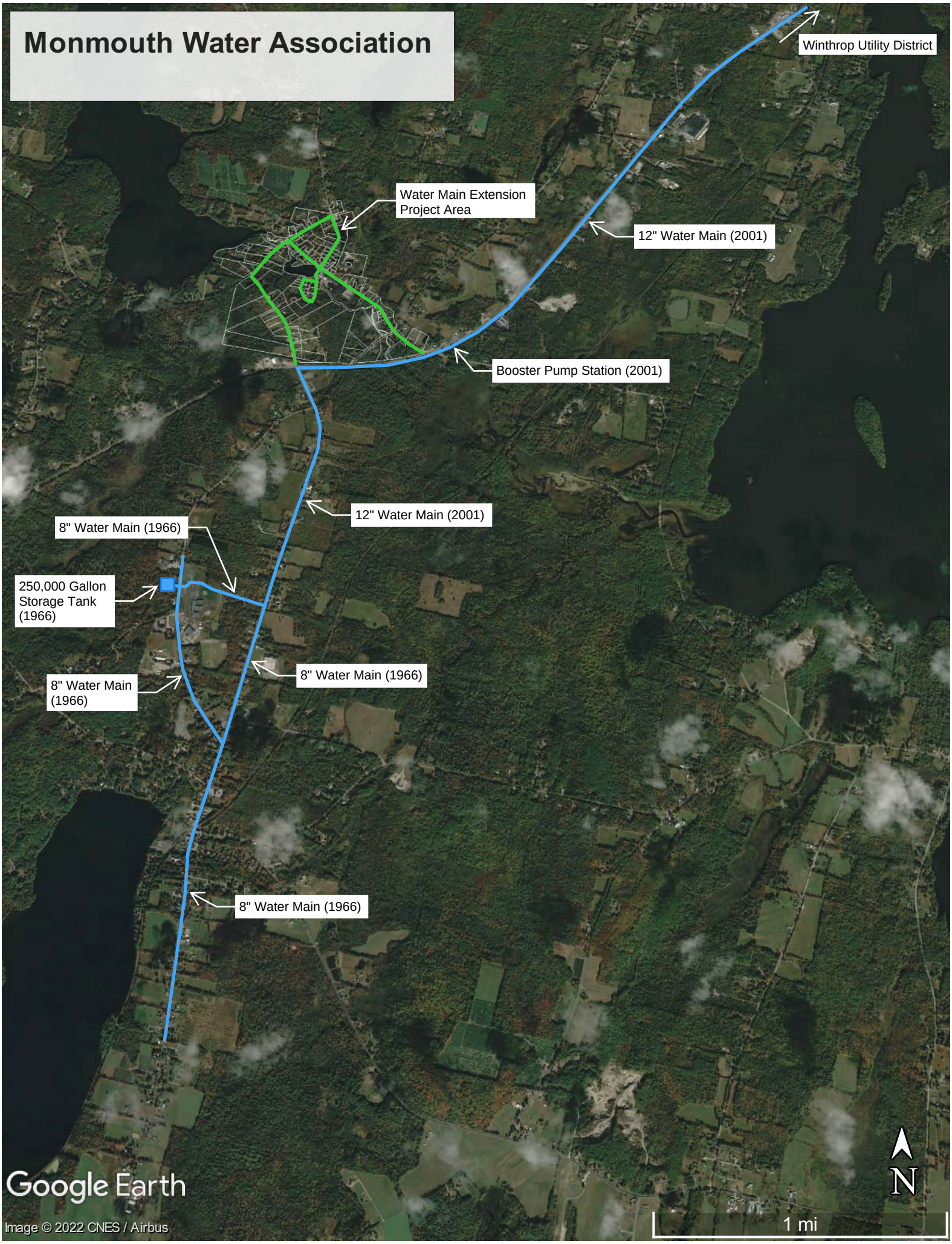
Supported in part by Maine Outdoor Heritage Fund lottery ticket sales

Map Prepared by Maine Department of Inland Fisheries & Wildlife
October 2022

Supported in part by Loon Conservation Plate funds

Attachment D – Monmouth Water Association Map

Monmouth Water Association



Attachment E – PFAS Results and Sampling Locations

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Path: P:\5100s\5197.00\Graphics Files\ArcGIS\Figures\202205 Figure\PFAS_Results_Expanded.mxd
Last Edited By: hlapointe

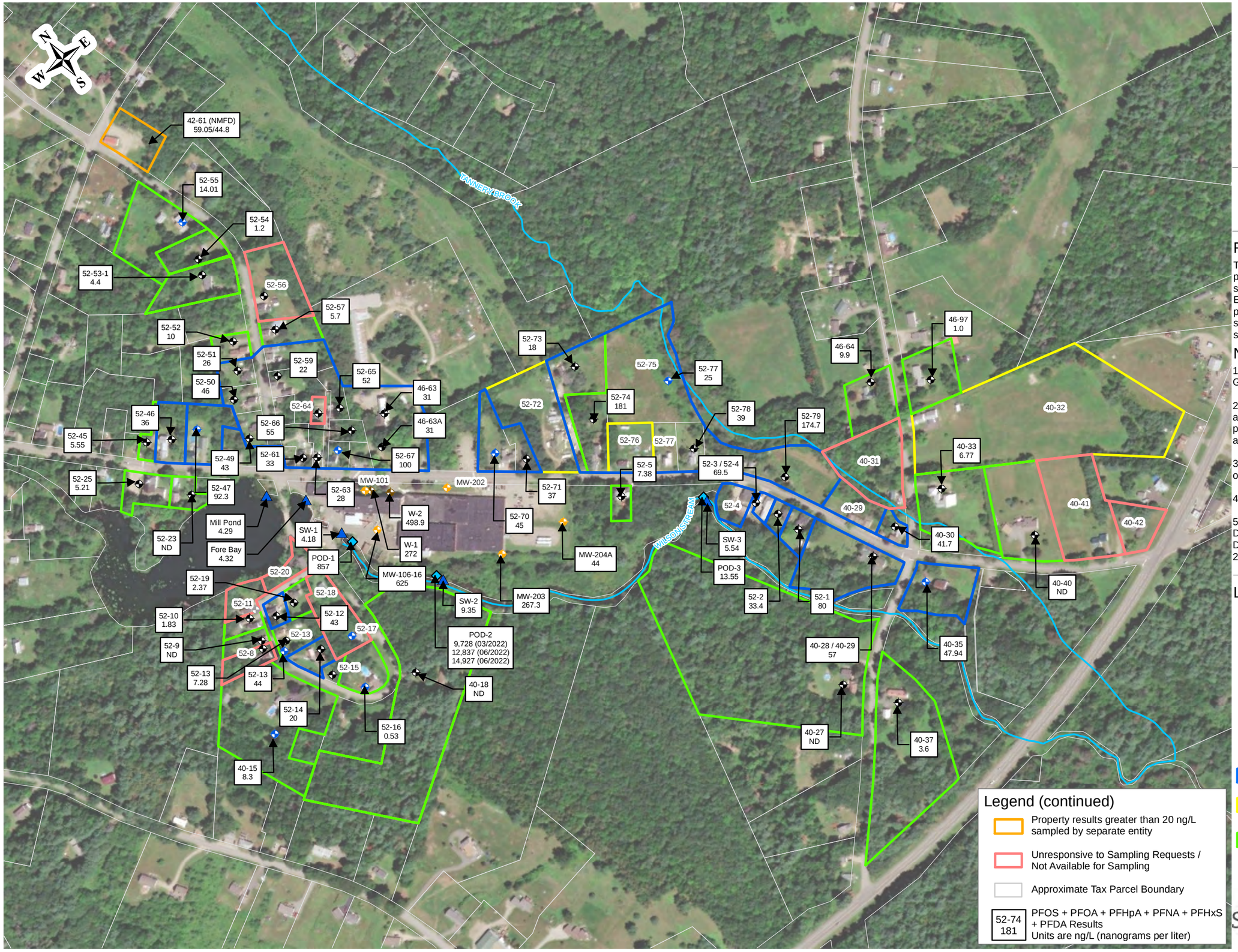


Figure 2

PFAS Results and Additional Sampling Locations

North Monmouth PFAS Site

North Monmouth, Maine

Drawn By:	H. LaPointe
Designed By:	A. Buchy
Reviewed By:	R. Abell
Project No:	5197.01
Date:	December 2022

Figure Narrative

This figure depicts the twenty-seven (27) properties whose drinking water wells have been sampled for the presence of PFAS by Wood Environmental, together with the thirty-five (35) properties either sampled (24) or planned for sampling (3) or unresponsive/unavailable for sampling (8).

Notes

1. Aerial Image Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community.

2. Locations georeferenced from "PFAS Results and Proposed Additional Sampling Locations" prepared by WOOD and should be considered approximate.

3. Data values displayed are for parent samples only, field duplicate data are not displayed.

4. ND = Non-detect

5. Property 42-61 (North Monmouth Fire Department) sampled by North Monmouth Fire Department in Feb 2022 and MEDEP in March 2022.

Legend

- Drilled Well
- Dug Well
- Driven Point Well
- Monitoring Well
- Extraction Well
- Pore Water
- Surface Water
- Areas to Provide Bottled Water
- Planned Additional Residential Well Sampling Locations
- Residential Well Sampling Locations below 20 ng/L

175 87.5 0 175 350 Feet

Legend (continued)

- Property results greater than 20 ng/L sampled by separate entity
- Unresponsive to Sampling Requests / Not Available for Sampling
- Approximate Tax Parcel Boundary
- 52-74 181 — PFOS + PFOA + PFHpA + PFNA + PFHxS + PFDA Results. Units are ng/L (nanograms per liter)

SANBORN HEAD

Table 2
Summary of Analytical Results
North Monmouth PFAS Site
North Monmouth, Maine

Sample Location	Sample Date	Sample Type	Perfluoroheptanoic Acid (PFHpA)	Perfluorooctanoic Acid (PFOA)	Perfluorononanoic Acid (PFNA)	Perfluorodecanoic Acid (PFDA)	Perfluorohexanesulfonic Acid (PFHxS)	Perfluorooctanesulfonic Acid (PFOS)	Total PFOA + PFOS + PFHpA + PFNA + PFDA + PFHxS
		Maine Interim Level	20	20	20	20	20	20	20
40-15	3/10/2022	N	<1.9	3.6	<1.9	<1.9	2.1	2.6	8.3
40-18	6/1/2022	N	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	ND
40-27	10/21/2022	N	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	ND
40-28/40-29	8/24/2022	N	6.7	**35**	<1.7	<1.7	3.3	12	**57**
40-30	8/24/2022	N	4.4	**27**	<1.7	<1.7	1.9	8.4	**41.7**
40-33	10/19/2022	N	0.56 J	3.3	<1.7	<1.7	0.51 J	2.4	6.77
40-35	8/25/2022	N	6.2	**27**	0.54 J	<1.6	2.2	12	**47.94**
40-37	10/20/2022	N	<1.6	2.4	<1.6	<1.6	<1.6	1.2 J	3.6
40-40	10/19/2022	N	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	ND
46-63	12/29/2021	N	3.1	**22**	<1.9	<1.9	1.8 J	3.8	**30.7**
46-63A	10/4/2019	N	1.1 J	7.9	<1.9	<1.9	1.3 JB	**29**	**39.3**
46-63A	2/3/2022	N	1.3 J	11	<1.6	<1.6	0.87 J	18	**31.17**
46-63A	2/3/2022	FD	0.71 J	5.9	<1.7	0.34 J	<1.7	**27**	**33.95**
46-64	10/21/2022	N	1.3 J	5.4	<1.7	<1.7	0.60 J	2.6	9.9
46-97	10/21/2022	N	<1.7	1.0 J	<1.7	<1.7	<1.7	<1.7	1.0
52-1	6/1/2022	N	7.1	**39**	<1.6	<1.6	5.9	**28** JHB	**80.0**
52-2	8/24/2022	N	2.7	18	<1.7	<1.7	1.7	11	**33.4**
52-3/52-4	8/24/2022	N	5.7	**39**	<1.6	<1.6	2.8	**22**	**69.5**
52-5	9/15/2022	N	1.3 J	5.4	<1.7	<1.7	0.68 J	<1.7	7.38
52-9	8/25/2022	N	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	ND
52-10	6/1/2022	N	<1.6	1.3 J	<1.6	<1.6	<1.6	0.53 JB	1.83
52-12	2/22/2022	N	3.6	**29**	<1.8	<1.8	2.7	7.8 I	**43.1**
52-13	3/17/2022	N	4.1	**25**	0.41 J	<1.8	2.4	12	**43.91**
52-13	9/15/2022	N	<1.6	3.9	<1.6	<1.6	0.88 J	2.5 I	7.28
52-14	3/17/2022	N	1.3 J	12	<1.9	<1.9	1.6 J	4.9 I	19.8
52-16	8/25/2022	N	<1.7	0.53 JB	<1.7	<1.7	<1.7	<1.7	0.53
52-19	8/25/2022	N	<1.6	1.8	<1.6	<1.6	<1.6	0.57 J	2.37
52-23	2/3/2022	N	<1.9	<1.9	<1.9	<1.9	<1.9	<1.9	ND
52-25	6/23/2022	N	0.50 J	3.2	<1.6	<1.6	0.59 J	0.92 J	5.21
52-45	6/1/2022	N	0.56 J	3.6	<1.7	<1.7	0.51 J	0.88 JB	5.55
52-46	3/10/2022	N	4.3	**25**	<1.8	<1.8	2.5	4.1 I	**35.9**
52-47	6/23/2022	N	8.4	**68**	<1.7	<1.7	5.9	10	**92.3**
52-49	2/10/2022	N	3.3	**33**	<1.9	<1.9	4.4	2.6 I	**43.3**
52-50	2/3/2022	N	3.4	**35**	<1.7	<1.7	4.9	2.6 I	**45.9**
52-50	2/3/2022	FD	3.3	**32**	<1.6	<1.6	4.6	2.5	**42.4**
52-51	2/3/2022	N	1.8	19	<1.7	<1.7	3.1	1.9 I	**25.8**
52-52	2/10/2022	N	0.66 J	6.3	<1.9	<1.9	1.1 J	2	10.06
52-53	2/10/2022	N	0.30 J	3.4	<1.9	<1.9	0.72 J	<1.9	4.42
52-54	2/3/2022	N	<1.8	1.2 J	<1.8	<1.8	<1.8	<1.8	1.2
52-55	6/23/2022	N	1.8	8.6	<1.7	<1.7	0.91 J	2.7	14.01
52-57	2/3/2022	N	<1.8	2.1	<1.8	<1.8	1.2 J	2.4 I	5.7
52-59	12/29/2021	N	1.6 J	16	<1.9	<1.9	2.6	1.6 JI	**21.8**
52-61	12/29/2021	N	2.6	**24**	<2.0	<2.0	3.7	2.5 I	**32.8**
52-63	12/29/2021	N	2.3	**21**	<1.9	<1.9	3.5	1.6 JI	**28.4**
52-65	12/29/2021	N	3.2	**36**	<2.0	<2.0	3.9	9.1 I	**52.2**
52-66	11/24/2021	N	3.9	**39**	<1.9	<1.9	3.5	8.4 I	**54.8**
52-67	12/29/2021	N	8.6	**53**	1.3 J	0.36 J	3.5	**33**	**99.76**
52-70	2/10/2022	N	6.7	**31**	0.26 J	<1.9	2.3	4.8 I	**45.06**
52-71	2/10/2022	N	5.8	**25**	0.26 J	<1.9	2.0	3.6	**36.66**
52-73	2/22/2022	N	2.4	14	<1.7	<1.7	2.0	<1.7	18.4
52-74	2/10/2022	N	**22**	**120**	2.2	0.79 J	6.5	**30**	**181.49**
52-77	3/10/2022	N	3.3	17	<1.8	<1.8	1.5 J	2.9	**24.7**
52-78	3/10/2022	N	3.3	**29**	<1.9	<1.9	3.9	2.6 I	**38.8**
52-79	6/1/2022	N	15 B	**88**	0.79 J	<1.6	5.9	**65** B	**174.69**
Fire Station	2/14/2022	N	6.74	**24.3**	<2	<2	2.21	**25.8**	**59.05**
Fire Station	3/24/2022	N	4.24	15.1	0.596 J	<1.83	1.95	**22.9**	**44.8**
Fore Bay	6/23/2022	N	0.82 J	2.1	<1.6	<1.6	<1.6	1.4 J	4.32
Mill Pond	6/23/2022	N	0.79 J	1.5 J	<1.6	<1.6	<1.6	2.0	4.29
MW-106-16	3/17/2022	N	**63**	**210**	17	**20**	15	**300**	**625**
MW-203C	4/1/2022	N	**31**	**140**	3.3	<1.9	10	**83**	**267.3**
MW-204A	10/4/2019	N	0.27 J	1.2 J	<2	<2	0.46 JB	2.0 I	3.93
MW-204A	4/1/2022	N	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	ND
MW-204B	4/1/2022	N	6.8	**29**	1.2 J	4.3	2	1.5 JI	**44.8**
POD-1	6/23/2022	N	**63**	**190**	**25**	**66**	13	**500**	**857**
POD-2	3/17/2022	N	**200**	**1,600**	**28** J	<100	**700**	**7,200**	**9,728**
POD-2 ¥	6/23/2022	N	**280**	**1,600**	**39**	8.2	**1,000**	**12,000**	**14,927**
POD-2	6/23/2022	N	**290**	**1,500**	**38**	9.1	**1,000**	**10,000**	**12,837**
POD-3	6/23/2022	N	1.4 J	3.4	0.75 J	<1.7	<1.7	8.0	13.55
SW-1	6/23/2022	N	0.98 J	1.9	<1.7	<1.7	<1.7	1.3 J	4.18
SW-2	6/23/2022	N	0.95 J	2.2	<1.6	<1.6	<1.6	6.2	9.35
SW-3	6/23/2022	N	0.94 J	2.2	<1.7	<1.7	<1.7	2.4	5.54
W-1	9/25/2018	N	**32**	**150**	8.5	8.1	9.2 B	**150**	**357.8**
W-1	12/29/2021	N	**20**	**120**	5.5	9.2	7.3	**110**	**272**
W-2	3/10/2022	N	**42**	**250**	7.7	7.2	12	**180**	**498.9**

Notes:
1. Samples from November 2021 were collected by Katahdin Analytical Services of Scarborough, Maine. Samples from September 2018 through April 2022 were collected by Wood E&I Solutions, Inc. of Portland, Maine.
Fire Station sample from February 2022 was collected by the Town of Monmouth, Maine. Fire Station sample from March 2022 was collected by Maine DEP.
Samples from June 2022 to present were collected by Sanborn Head.

2. Concentrations are presented in nanograms per liter (ng/L) which are equivalent to parts per trillion (ppt).

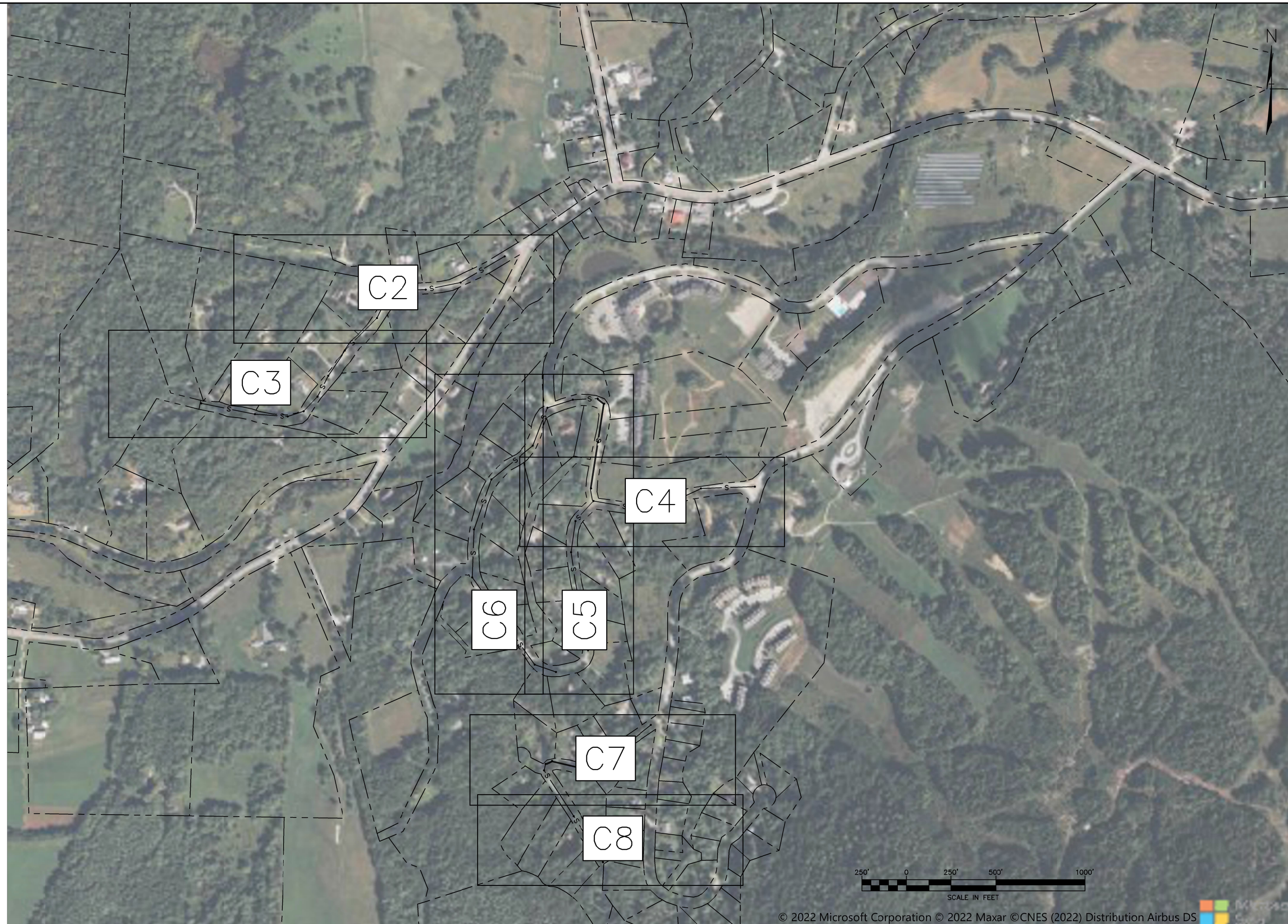
3. "FD" indicates a field duplicate sample was collected and analyzed.
"N" indicates normal parent sample collected and analyzed.
"ND" indicated non-detect.

4. "<" indicates the analyte was not detected above the indicated laboratory reporting limit (RL).
"B" indicates the the compound was present in the associated laboratory method blank or field QC blank.
"E" indicated the concentration of the analyte exceeds the range of the calibration curve and/or linear range of the instrument.
"F" and "I" indicates the result is an estimated maximum possible concentration.
"J" indicates the result is less than the laboratory RL but greater than or equal to the laborary method detection limit. The concentration is an approximate value.
"JH" indicates the ion transition ratio is outside of acceptance criteria and the concentration should be considered estimated with a potential high bias.
"¥" indicated the sample was centrifuged by the lab prior to analysis.

5. "Maine Interim Level" refers to the State of Maine drinking water standard for PFAS for the individually or combined sum of six different PFAS compounds of 20 ng/L: PFOA, PFOS, PFHpA, PFNA, PFDA, and PFHxS.

6. **Bold** values exceed the Maine Interim Level.

Attachment F – Site Plans



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PROFESSIONAL SEAL

NOT FOR CONSTRUCTION PRELIMINARY PLANS

NO.	DATE	DESCRIPTION	BY	CKD
1	00-00-0000	DESCRIPTION	XXX	XXX

TOWN OF WEST WINDSOR

PO BOX 6,
BROWNSVILLE,
VERMONT, 05037

WEST WINDSOR WASTEWATER FEASIBILITY STUDY

SHEET TITLE

SITE MAP

DRAWN BY	DATE
CHECKED BY	D&K PROJECT # 228026
PROJ. ENG.	D&K ARCHIVE #

SHEET NUMBER

C1

SHEET 1 OF 8

I:\2\228026 West Windsor Wastewater Feasibility Study\Drawings\Civil\WORKING\228026 West Windsor Feasibility Study2.dwg 1/12/2023 4:18 PM

60' 0 60' 120' 240'

SCALE IN FEET

SITE PLAN

PROFILE VIEW

DuBois & King inc.

ENGINEERING • PLANNING • MANAGEMENT • DEVELOPMENT

28 NORTH MAIN ST.
RANDOLPH, VT 05060
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PROFESSIONAL SEAL

NOT FOR CONSTRUCTION PRELIMINARY PLANS

NO.	DATE	DESCRIPTION	BY	CKD
1	00-00-0000	DESCRIPTION	XXX	XXX

TOWN OF WEST WINDSOR

PO BOX 6,
BROWNSVILLE,
VERMONT, 05037

WEST WINDSOR WASTEWATER FEASIBILITY STUDY

SHEET TITLE

SEEMS ROAD

DRAWN BY	DATE
CHECKED BY	D&K PROJECT # 228026
PROJ. ENG.	D&K ARCHIVE #

SHEET NUMBER

C2

SHEET 2 OF 8

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60' 0 60' 120' 240'

SCALE IN FEET

SITE PLAN

PROFILE VIEW

DuBois & King inc.

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RANDOLPH, VT 05060
TEL: (802) 728-3376
FAX: (802) 783-7101
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VERMONT, 05037

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SHEET TITLE

SEEMS ROAD

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SHEET 3 OF 8

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SCALE IN FEET

SITE PLAN

PROFILE VIEW

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1	00-00-0000		XXX	XXX

TOWN OF WEST WINDSOR

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VERMONT, 05037

WEST WINDSOR WASTEWATER FEASIBILITY STUDY

SHEET TITLE

SKYHAWK LANE

DRAWN BY	DATE
CHECKED BY	D&K PROJECT # 228026
PROJ. ENG.	D&K ARCHIVE #

SHEET NUMBER

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SHEET 4 OF 8

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60' 0 60' 120' 240'

SCALE IN FEET

SITE PLAN

PROFILE VIEW

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TOWN OF WEST WINDSOR

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WEST WINDSOR WASTEWATER FEASIBILITY STUDY

SHEET TITLE

SKYHAWK LANE

DRAWN BY	DATE
CHECKED BY	D&K PROJECT # 228026
PROJ. ENG.	D&K ARCHIVE #

SHEET NUMBER

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SHEET 5 OF 8

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60' 0 60' 120' 240'

SCALE IN FEET

SITE PLAN

PROFILE VIEW

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WEST WINDSOR WASTEWATER FEASIBILITY STUDY

SHEET TITLE

SKYHAWK LANE

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PROJ. ENG.	D&K ARCHIVE #

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SHEET 6 OF 8

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50' 0 50' 100' 200'

SCALE IN FEET

SITE PLAN

PROFILE VIEW

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WEST WINDSOR WASTEWATER FEASIBILITY STUDY

SHEET TITLE

VILLAGE LANE

DRAWN BY	DATE
CHECKED BY	D&K PROJECT # 228026
PROJ. ENG.	D&K ARCHIVE #

SHEET NUMBER

C7

SHEET 7 OF 8

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50' 0 50' 100' 200'

SCALE IN FEET

SITE PLAN

PROFILE VIEW

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SHEET TITLE

VILLAGE LANE

DRAWN BY	DATE
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PROJ. ENG.	D&K ARCHIVE #

SHEET NUMBER

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Attachment G – Hydraulic Model

36 Penn Plaza
Bangor, Maine 04401
(207) 573-4130

TECHNICAL MEMORANDUM

Date: December 6, 2022

Prepared By: John Kenney PE

Subject: North Monmouth Water Main Extension Hydraulic Model

This memorandum summarizes tasks completed for the Monmouth Water Association to evaluate the addition of a new water main in North Monmouth and the results of hydraulic modeling of the existing system with the proposed water main extension improvements. We understand that the proposed project consists of the addition of 14,200 feet of new 8" diameter ductile iron water pipe in North Main Street, New Street, Highland Terrace, Wilson Pond Road and Blaisdell Road. Connections to the existing 12" diameter ductile water main in US Route 202 will take place at the existing stubs at North Main Street, Old Lewiston road and Blaisdell Road.

The Monmouth Water Association's existing water system consists of a 250,000-gallon concrete storage tank, a pump station, 800 feet of 6" diameter ductile iron pipe, 11,600 feet of 8" diameter cast iron pipe, 6,275 feet of 8" diameter ductile iron pipe, 6,200 feet of 12" diameter cast iron pipe, 13,000 feet of 12" diameter ductile iron pipe and 42 hydrants. The base elevation of the 250,000-gallon storage tank is 422.25' and the water level elevation at maximum capacity is 434.17'. The pump turns on at tank elevation 431.75 (9.5'), turns off at elevation 433.75' (11.5'), and operates at approximately 200 GPM.

The Winthrop Utilities District provides water to the Monmouth Water Association from a 12" diameter water main in US Route 202. Water is sources from Narrows Pond and Maranacook Lake. The design capacity for the Winthrop Water Utilities District's water treatment plant is 1.2M GPD. Currently, the District is pumping 250,000 to 260,000 GPD.

Existing Conditions and Model Calibration

We used WaterCAD modeling software to evaluate the existing and proposed system. We received existing drawings, monthly water usage data from 1996 through August 2022, 33-minute storage tank elevation data from September 20, 2021 to September 26, 2022, and hydrant flow test data from September 18, 2018 for the Monmouth Water Association system from the Winthrop Utilities District. We derived the existing pipe network from existing drawings, pipe elevations from existing drawings and from 2' contour GIS spatial data obtained from the Maine Office of GIS, and calibrated the model with the hydrant flow test data. We used the 33-minute tank elevation data to determine the maximum existing peak flow from the storage tank, which was 152 GPM on July 25, 2022. We understand that this peak flow occurred when the

fields were irrigated. Typical non-irrigation flow values were below 75 GPM and the mean flow was 29 GPM. To account for future growth over the next 20 years, we added 10% to the peak flow rate, which is consistent with the population growth between 2000 and 2020. In the model, we applied the maximum peak flow value to node J-32 near Monmouth Memorial School (100 GPM + 10%) and to node J-34 at the intersection of Main Street and Academy Road (52 GPM + 10%). We also applied 500 GPM flow at node J-11 near the pump station to simulate fire flow demand. See Figure 1, Table 1 and Table 2 for pressure and flow information for the existing system.

Proposed Conditions

To model proposed water demand, we assume that all 115 residences in the North Monmouth area will connect to the new system and that water usage will be 270 GPD for each dwelling unit per Maine Subsurface Wastewater Disposal rules. According to Willie Robertson, the plant engineer at TexTech, we understand that TexTech plans to obtain potable water from the new system, but will retain their existing fire suppression system. Mr. Robertson said that the plant runs 7 days per week and 24 hours per day. On Monday through Thursday, there are 80 employees working the first shift, 10 employees working the second shift and 10 employees working the third shift. On Friday through Sunday, the day shift declines to 40 employees, but the second and third shifts remain the same. According to the Maine Subsurface Wastewater Disposal rules, employees at a place of employment without showers use 12 GPD. We assumed minimal water usage for the Monmouth Fire Station, the Monmouth sanitary pump station, the US Post Office (currently closed), the North Monmouth Community Church, the Monmouth Museum and a self-storage facility on Blaisdell Road. To account for future growth over the next 20 years, we added 10% to the peak flow rate, which is consistent with the population growth between 2000 and 2020.

Based on the above, we estimate daily water usage in the North Monmouth area as follows:

- 115 residences x 270 GPD/dwelling unit + 10% = 34,155 GPD
- 100 employees x 12 GPD/employee + 10% = 1320 GPD
- Total: 35,475 GPD

To calculate the proposed peak flow in the new system, we used the 33-minute tank elevation data to calculate a peaking factor to apply to GPD values. As stated above, we found that the mean existing water demand was 29 GPM and the peak flow was 152 GPM. However, the 152 GPM maximum peak flow occurred during a brief period of irrigation and would not be representative to use to calculate a peaking factor. Therefore, we removed irrigation flows and found a maximum peak flow of 83 GPM. The peaking factor is 83 GPM / 29 GPM, which we rounded up to 3.

The proposed maximum peak flow in the North Monmouth area that we applied to the model is as follows:

- Residential Peak flow: 115 residences x 270 GPD per residence / 16 hours per day / 60 minutes per hour x 3 (peaking factor) + 10% = 107 GPM
- TechTech Peak Flow: 80 employees x 12 GPD per employee / 8 hours per day / 60 minutes per hour x 3 (peaking factor) + 10% = 7 GPM
- Total Peak Demand = 114 GPM

The existing and proposed pipe network, demand flows, water pressures and fire flows at evaluation nodes are shown in Figure 1, Table 1 and Table 2. We found that water pressure in existing nodes remains the same or decreases slightly with the proposed water main extension and that water pressures in the North Monmouth area range from 25 psi to 95 psi. Fire flows generally decrease in the existing service area, but none fall below 500 GPM.

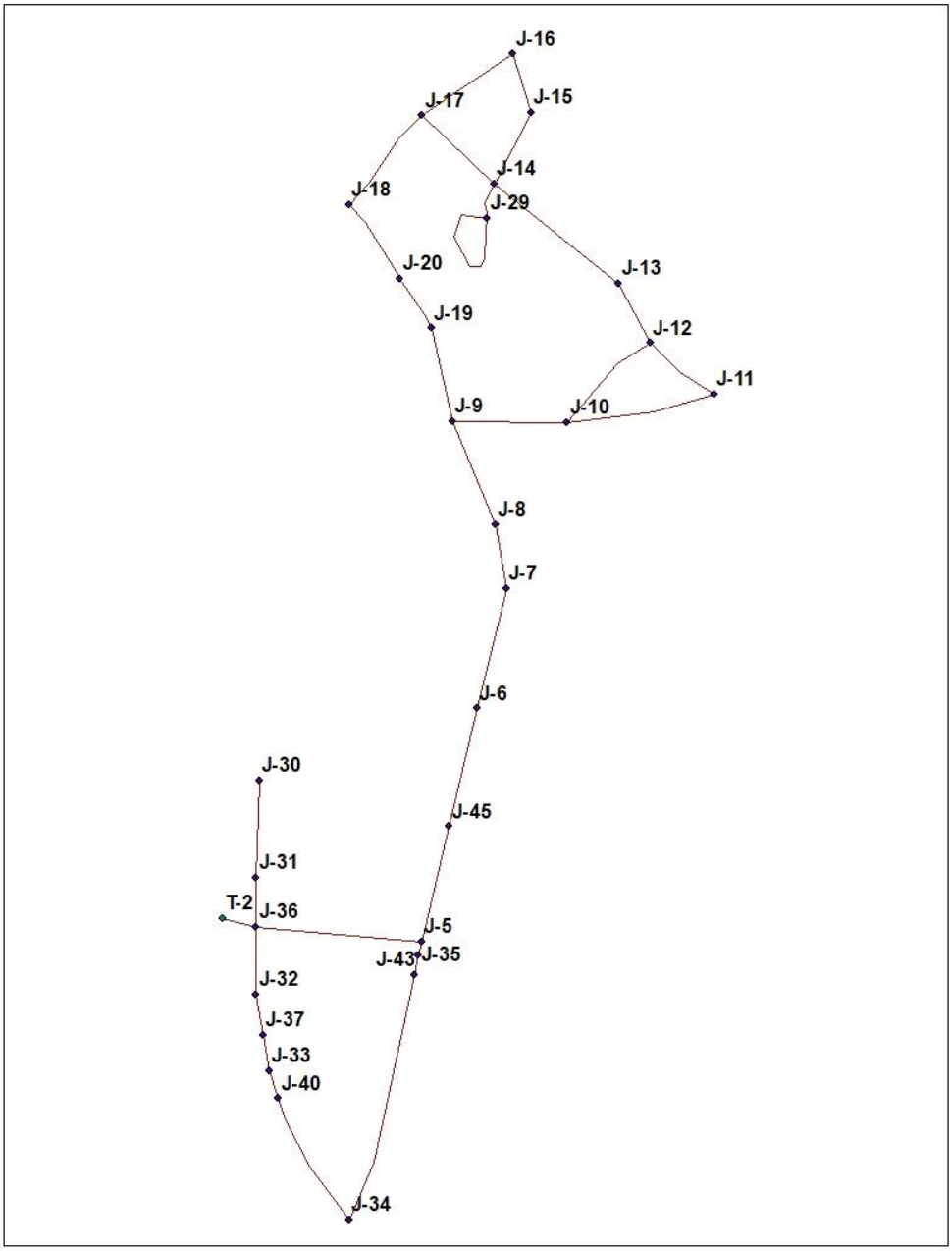
Water Storage Tank Capacity

The water storage tank needs to have capacity to store a 1 day supply of water with a two-hour 500 GPM fire flow. To estimate existing water usage by the Monmouth Water Association, we used the Monmouth Water Association's monthly water usage data collected between 1996 and 2022 and found that the maximum monthly water usage 2,126,288 gallons, which equates to approximately 71,210 GPD. For potential water usage in the North Monmouth area, we estimated that daily water demand will be 32,250 GPD, which is based on Maine Subsurface Wastewater Disposal water usage rates and 100% connectivity. To account for 0.5% annual growth over the next 20 years, we are applying a 10.5% growth factor to the water demand. Fire flow of 500 GPM for 2 hours equals 60,000 gallons.

- Existing Water Usage: 71,210 GPD + 10% growth factor = 78,331 GPD
- North Monmouth Water Usage Estimate: 35,475 GPD (see above)
- Fire Flow: 500 GPM x 120 minutes = 60,000 gallons

Therefore, the water storage tank needs to have the capacity to store at least 173,806 gallons. At storage tank elevation 431.75' (9.5') when the pump turns on, there are 185,192 gallons in the storage tank and close to 250,000 gallons when the pump turns off at 433.75' (11.5'). Therefore, the existing storage tank has the capacity to serve the new water main extension project.

Figure 1. Model Pipe Network



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Bangor, Maine 04401
(207) 573-4130

Table 1. Existing and Proposed Water Pressures at select nodes

		EXISTING			PROPOSED		
Node	Elevation (FT)	Demand (GPM)	Hydraulic Grade (FT)	Pressure (PSI)	Demand (GPM)	Hydraulic Grade (FT)	Pressure (PSI)
J-5	334	0	426.89	40	0	424.76	39
J-6	364	0	424.37	26	0	421.07	25
J-7	360	0	423.07	27	0	419.16	26
J-8	334	0	422.38	38	0	418.16	36
J-9	314	0	421.21	46	8	416.44	44
J-10	246	0	420	75	0	416.15	74
J-11	198	500	418.41	95	500	416.04	94
J-12	196				7	415.72	95
J-13	218				11	414.85	85
J-14	222				15	413	83
J-15	266				9	412.87	64
J-16	290				3	412.79	53
J-17	226				17	412.67	81
J-18	292				10	411.99	52
J-19	336				3	413.38	33
J-20	358				3	411.53	23
J-29	223				13	412.98	82
J-30	418	0	431.29	6	0	431.13	6
J-31	421	0	431.29	4	0	431.13	4
J-32	424	110	430.97	3	0	430.72	3
J-33	393	0	430.77	16	0	430.45	16
J-34	320	57	430.33	48	0	429.85	48
J-35	334	0	427.06	40	0	425	39
J-36	421	0	431.29	4	152	431.13	4
J-37	417	0	430.86	6	0	430.58	6
J-40	369	0	430.69	27	0	430.35	27
J-43	322	0	427.3	46	0	425.36	45
J-45	344	0	425.65	35	0	422.94	34

North Monmouth Nodes

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(207) 573-4130

Table 2. Fire Flows

			EXISTING		PROPOSED	
Label	Fire Flow (Needed) (GPM)	Pressure (Residual Lower Limit) (PSI)	Fire Flow (Available) (GPM)	Pressure (Calculated Residual) (PSI)	Fire Flow (Available) (GPM)	Pressure (Calculated Residual) (PSI)
J-5	500	20	1850	20	1750	20
J-6	500	20	903	20	803	20
J-7	500	20	906	20	806	20
J-8	500	20	1274	20	1174	20
J-9	500	20	1425	20	1325	20
J-10	500	20	1592	38	1328	47
J-11	500	20	1592	53	1324	66
J-12	500	20			1309	66
J-13	500	20			1277	54
J-14	500	20			1219	51
J-15	500	20			1213	29
J-16	500	20			1184	20
J-17	500	20			1205	50
J-18	500	20			1165	24
J-19	500	20			929	20
J-20	500	20			623	20
J-29	500	20			853	20
J-30	500	20	0	6	0	6
J-31	500	20	0	5	0	5
J-32	500	20	0	3	0	3
J-33	500	20	0	17	0	17
J-34	500	20	1794	39	1723	39
J-35	500	20	1838	20	1743	20
J-36	500	20	0	5	0	5
J-37	500	20	0	6	0	6
J-40	500	20	1732	21	1662	21
J-43	500	20	2047	20	1959	20
J-45	500	20	1442	20	1342	20

North Monmouth Nodes

Attachment H – Opinion of Probable Cost

JOB: North Monmouth Water Main Extension

PROJECT NO.: 228084
CALCULATED BY: JSK DATE: 11/23/22
CHECKED BY: JBA DATE: 12/01/22

Alternate 1 - Water Main Extension
OPCC: Conceptual

Opinion of Probable Construction Costs (OPCC) - Water System Extension

NOTE: In providing opinions of probable construction costs, the Client understands that DuBois & King, Inc. has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's methods of pricing, and that our Opinion of Probable Construction Costs are made on the basis of our professional judgment and experience. DuBois & King, Inc. makes no warranty, expressed or implied, that the bids or the negotiated costs of the Work will not vary from the Opinion of Probable Construction Cost provided herein.

Cost Level Type: Conceptual

Item No.	Description	Unit	Qty	Unit Cost	Cost	Asset Life
1	Mobilization/Demobilization	LS	1	4%	$ 171,810	
2	Connect 8" DI Water Main to 12" End Cap	EA	3	$ 5,200	$ 15,600	40
3	8 Inch DI Water Main	LF	14,200	$ 200	$ 2,840,000	40
4	8 Inch HDPE Water Main Directional Bore	LF	500	$ 125	$ 62,500	40
5	3/4 Inch Water Service Open Cut	LF	3,600	$ 75	$ 270,000	40
6	3/4" Curb Stop & Box	EA	120	$ 500	$ 60,000	40
7	2 Inch Water Service Open Cut	EA	30	$ 150	$ 4,500	40
8	2" Curb Stop & Box	EA	1	$ 750	$ 750	40
9	6 Inch Fire Hydrant Assembly	EA	18	$ 10,000	$ 180,000	40
10	8 Inch Gate Valve	EA	13	$ 1,830	$ 23,790	40
11	8 Inch x 8 Inch Tee	EA	8	$ 750	$ 6,000	40
12	8 Inch End Cap	EA	4	$ 2,500	$ 10,000	40
13	Asphalt Pavement Removal	SY	16,340	$ 5	$ 81,700	
14	19 mm Bituminous Concrete Pavement (2.5")	TN	2,250	$ 185	$ 416,250	20
15	12.5 mm Bituminous Concrete Pavement (1.5")	TN	1,350	$ 240	$ 324,000	20
16	Maintenance of Traffic	LS	1	1.5%	$ 64,430	
17	Erosion Protection and Sediment Control Plan	LS	1	2.0%	$ 85,910	
18	General Conditions and Miscellaneous Work	LS	1	8.0%	$ 343,610	
				OPCC Subtotal:	$ 4,960,850	
				20% Contingency:	$ 992,170	
				OPCC:	$ 5,953,020	
				Total Opinion of Probable Construction Costs:	**$ 5,953,020**	

JOB: North Monmouth Water Main Extension

PROJECT NO.: 228084
CALCULATED BY: JSK DATE: 11/23/22
CHECKED BY: JAB DATE: 12/01/22

Alternate 1 - Water Main Extension

Opinion of Probable Salvage Value

NOTE: In providing opinions of probable construction costs, the Client understands that DuBois & King, Inc. has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's methods of pricing, and that our Opinion of Probable Construction Costs are made on the basis of our professional judgment and experience. DuBois & King, Inc. makes no warranty, expressed or implied, that the bids or the negotiated costs of the Work will not vary from the Opinion of Probable Construction Cost provided herein.

Analysis Period: 30 **Years**
Real Discount Rate: 0.005 **%**

Water System Extension

Item No.	Description	Unit	Qty	Unit Cost	Asset Life	Salvage Value
2	Connect 8" DI Water Main to 12" End Cap	EA	3	$ 5,200	40	$ 3,900
3	8 Inch DI Water Main	LF	14,200	$ 200	40	$ 710,000
4	8 Inch HDPE Water Main Directional Bore	LF	500	$ 125	40	$ 15,625
5	3/4 Inch Water Service Open Cut	LF	3,600	$ 75	40	$ 67,500
6	3/4" Curb Stop & Box	EA	120	$ 500	40	$ 15,000
7	2 Inch Water Service Open Cut	EA	30	$ 150	40	$ 1,125
8	2" Curb Stop & Box	EA	1	$ 750	40	$ 188
9	6 Inch Fire Hydrant Assembly	EA	18	$ 10,000	40	$ 45,000
10	8 Inch Gate Valve	EA	13	$ 1,830	40	$ 5,948
11	8 Inch x 8 Inch Tee	EA	8	$ 750	40	$ 1,500
12	8 Inch End Cap	EA	4	$ 2,500	40	$ 2,500
14	19 mm Bituminous Concrete Pavement (2.5")	TN	2,250	$ 185	30	$ -
15	12.5 mm Bituminous Concrete Pavement (1.5")	TN	1,350	$ 240	30	$ -

Total Salvage Value (Present Worth): $ 747,700

JOB: North Monmouth Water Main Extension PER

PROJECT NO.: 228084
CALCULATED BY: JSK DATE: 11/23/22
CHECKED BY: JBA DATE: 12/01/22

LCCA for Alternative 1: 30

NOTE: In providing opinions of probable construction costs, the Client understands that DuBois & King, Inc. has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's methods of pricing, and that our Opinion of Probable Construction Costs are made on the basis of our professional judgment and experience. DuBois & King, Inc. makes no warranty, expressed or implied, that the bids or the negotiated costs of the Work will not vary from the Opinion of Probable Construction Cost provided herein.

Life Cycle Cost Analysis

Term of Analysis (Years): 30
Real Interest Rate: 0.5%

Capital Costs

Description		Amount	Notes
Opinion of Probable Construction Cost	$	5,953,020	
Engineering Preliminary Design Phase Cost	$	147,870	
Engineering Final Design Phase Cost	$	295,740	
Engineering Construction Phase Cost	$	542,190	
Legal/Fiscal Cost	$	60,000	1% of construction cost
Land/Easement Acquisition	$	60,000	1% of construction cost
Total Project Capital Cost	$	7,058,820	

O&M Costs

Description		Amount	Frequency	Notes
Water Collection System Increase in O&M	$	2,000	Every Year	$6,000 Per year
Total Present Worth of O&M Cost	$	55,590		

Salvage Value

Description		Amount	Frequency	Notes
Water Distribution System Extension	$	747,700		
Present Worth of Project Salvage Value After Analysis Term	$	747,700		

Total Net Present Value: $6,366,710

North Monmouth Water Main Extension, Monmouth, Maine
Revenue Summary
12/10/2022

Alternative 1 from Preliminary engineering Report			
OPINION OF PROJECT COST			
Opinion of Probable Construction Costs	$ 5,953,020		
Preliminary	$ 148,515		
Final Design	$ 297,030		
Construction	$ 544,555		
Legal/Administrative (1%)	$ 60,000		
Land /Easement Acquisition (1%)	$ 60,000		
SUBTOTAL PROJECT COSTS	**$ 7,063,120**		
ANNUAL REVENUE			
Percentage of Connections	100%	75%	53%
Number of Connections	115	86	60
Annual Residential Revenue (270 GPD)	$ 71,885	$ 53,757	$ 37,505
Annual Commercial Revenue (1200 GPD)	$ 3,597	$ 3,597	$ 3,597
Fire Protection Revenue (30%)	$ 22,644	$ 17,206	$ 12,331
TOTAL ANNUAL REVENUE	**$ 98,126**	**$ 74,560**	**$ 53,432**
ANNUAL EXPENSES			
Annual Residential Expenses (270 GPD)	$ 39,553	$ 29,579	$ 20,636
Annual Commercial Expenses (1200 GPD)	$ 1,529	$ 1,529	$ 1,529
Operations and Maintenance (estimate)	$ 2,000	$ 2,000	$ 2,000
TOTAL ANNUAL EXPENSES	**$ 43,082**	**$ 33,107**	**$ 24,165**
ANNUAL CHANGE IN NET ASSETS	**$ 55,044**	**$ 41,453**	**$ 29,268**
EXISTING CHANGE IN NET ASSETS (2021)	**$ 29,086**	**$ 29,086**	**$ 29,086**
ANNUAL PAYMENT ON NEW DWSRF LOAN (0% FOR 30 YEARS)	**$ 235,437.33**	**$ 235,437**	**$ 235,437**