Engineers Report

for

GURDWARA REDEVELOPMENT
2345 N. FRENCH RD.
TOWN OF AMHERST, NY

Revised Nov. 6, 2025

Prepared By:

tredo
ENGINEERS

CIVIL | STRUCTURAL | ENGINEERING

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Seal

For:

Trautman Associates
Buffalo, NY

tredo
ENGINEERS

SUMMARY

This project includes the redevelopment and construction of a 1-story +6470sf Place of Worship facility on a 1.04± acre parcel, located on the southeast corner of N. French Rd. at Hopkins Rd. in the Town of Amherst, New York. The R3-zoned parcel currently contains an operating 1-sty frame structure and a (32) car paved surface lot with driveway connections to N. French Rd. and Hopkins Rd. The property contains a public sanitary sewer easement parallel to Hopkins Rd. The redevelopment proposes complete demolition of the existing frame structure with basement, existing pavements, and utilities, disturbing approximately +0.84-acres. New facility shall abandon existing driveways in favor of a county-recommended single entrance from Hopkins Rd., to be relocated further from the signalized intersection.

Domestic and Fire-protection water services are sourced from the 8" public watermain located in Hopkins Road. A 4"x8" tapping sleeve and valve, 4"x2" tee, 4" and 2" gate valves and 2" meter shall be provided by Erie County Water Authority (ECWA). 2 inch K-copper domestic and 4-inch Ductile-iron pipe buried 5-ft shall extend into the facility mechanical room where metering and backflow devices are located. Waterline backflow application shall be made to the Water District for approval under separate cover on behalf of the Owner. The new facility contains a fire-protection sprinkler, alarm system, and fire-dept. sprinkler connector facing Hopkins Road. Existing public fire hydrants are located on the east (near) side of Hopkins Rd. approx. 115-ft north, and approx.250-ft south of the subject parcel.

A new 6-inch PVC (SDR35) gravity **wastewater lateral** shall run from the building exit point east wall and tap the 24" public sewer piping located along the north property line. The facility sanctuary capacity provides for 96 parishioners, served with a meal prepared in the cooking kitchen. A living residence is included in the floor plan with a 4-bed minor daily loading, utilizing the same cooking kitchen. The kitchen grease lateral shall be plumbed to an outdoor vehicle-rated tank trap with sizing as provided by the building plumbing engineer. Tap permit and grease trap sizing shall be approved by the Town of Amherst sewer district.

Storm water runoff from the +1.04-acre parcel currently flows overland and piped from paved parking lot and roof drains to existing roadside public drainage system. After the development occurs, runoff from the new roof, pavements and disturbed lawn areas are collected and conveyed to a surface detention basin prior to routing to the same storm conveyances off-site. This development will result in an increase in impervious surfaces on this site. In turn, there will be an increase in the rate of storm water runoff. Stormwater management of the additional runoff shall be based on criteria of the Town of Amherst. This project is **not** required to comply with the water quality and water quantity requirements of the NYSDEC SPDES Permit GP-025-001 for storm water discharges from a construction activity as the total soil disturbance area is less-than the one-acre threshold. Runoff is directed to the existing county highway system and Town Ditch 26A2. The subject parcel is located within the 100-yr floodplain of Tonawanda Creek. The parcel is fully developed and does not contain mapped wetlands.

Site Design Executive Summary Table			
	Existing Conditions	**Post-Developed Conditions**	**Remarks**
Parcel Area (ac)	1.04	1.04	
Impervious Cover (ac)	0.35	0.55	Net redeveloped 0.20ac
Trib Drainage Area this project (ac)	1.04	1.04	
Area of Disturbance this project(ac)	-	0.84	
Storm Events Runoff (cfs)			
10 year	2.05	**1.11**	
25 year	-	**1.28**	

I. WATER SERVICE

2- inch K-copper domestic and 4-inch Ductile-iron pipe buried 5-ft shall extend into the facility mechanical room where metering and backflow devices are located. Waterline backflow application shall be made to the Water District for approval under separate cover on behalf of the Owner by the building plumbing and fire-protection engineers, respectively. The new facility contains a fire-protection sprinkler, alarm system, and fire-dept. hose connector. Existing public fire hydrant is located on the east (near) side of Hopkins Rd. approx. 250-ft south of the subject parcel.

II. SANITARY SEWER SERVICE

A new 6-inch PVC (SDR35) gravity wastewater lateral at 2% slope, shall run from the building exit point to a tap on the 24" public sewer main. The proposed commercial cooking facility will contain a separate 4" PVC (SDR35) kitchen lateral and grease trap, size determined by the building plumbing engineer. The tank then exits into the 6" building lateral downstream of the building trap.

The facility contains worship space without upright seating, with a capacity for 96 persons. A full-time residence occupies the 4-bed dwelling unit within the facility contributing a minor daily load. The facility will generate a calculated average 2440 gal/day (gpd) of sanitary wastewater as per the following: (100 persons x 20gpd church hall+banquet dining*) + (4-bedx110gpd/bed*)= **2440 gpd.**

All meal preparations, including daily residential use, utilize a central cooking kitchen. The number of meals served daily varies, with anticipated kitchen use data provided herein by the Owner/Operator:

Mon-Fri: daily residential use (4-bed dwelling unit) ~ 440gpd
Sat-Sun: 30-50 meals + daily residential use ~1440gpd
Holiday/Events: 100 meals + daily residential use ~ 2440gpd

*Reference "NYS Design Standards for Intermediate Sized Treatment Works, March 2014"

III. BACKGROUND DRAINAGE INFORMATION

I. Existing (Pre-Development) Conditions

Parcel is currently developed with impervious building roof and parking lot covering approximately 0.35-acres of the 1.04 ac parcel. Storm water runoff generated by the site flows overland to off-site drainage conveyances found along the north and west property lines, without detention. Refer to pre-developed mapping in Appendix B for additional information.

II. Hydrologic Soil Group

Hydrologic soil groups (HSG) are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A,B,C, and D) and three dual classes (A/D, B/D, and C/D). the groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well-drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have high shrink-swell potential, soils that have a high-water table, soils that have a clay pan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The predominant soil types within the proposed project disturbance area consist of Ch, Cheektowaga & Cv, Cosad silt loam **HSG C/D**. Refer to soils map contained in Appendix A for additional information.

III. Proposed (Post-Development) Conditions

The development includes the construction of the new frame structure and associated repaved surface parking lot. Stormwater management is provided in a surface storage basin prior to discharge of runoff into the public conveyance located at the north property line. The design and detail of the proposed on-site drainage system shall meet the intent of the standard practices for stormwater management based on the existing soil type and capacity for infiltration into natural subsoils.

The proposed on-site basin and outlet structure will provide the stormwater volume controls required to attenuate the discharge of the increased storm water in accordance with the Town of Amherst requirements. Refer to post-developed mapping in Appendix B for additional information.

II. STORMWATER MANAGEMENT

I. Design Criteria

The design of the storm water facilities will be in accordance with the following:

i. Town of Amherst Storm Water Drainage Policy and Construction Standards

ii. NY BUFF SOP

a. Stormwater Conveyance

The stormwater runoff generated by this development will overland flow to a surface detention basin with control pipe outlet, discharging to the existing storm drainage facilities in N. French Rd. The mainly flat roof structure also contains shed roof downspout collection piping, which shall convey runoff directly to the basin.

Tributary areas were estimated for the drainage to each practice, quantities calculated using the Rational Method. The 10-year rainfall intensities were used to estimate the tributary runoff. Pipe sizing calculations are included in Appendix B.

b. Stormwater Detention

According to the Town of Amherst policy for storm water drainage, detention is required when the storm water runoff from a site is increased due to the increase in impervious surfaces resulting from a new development. The proposed construction of the building and paved surface parking areas will result in an increase in impervious surfaces. Therefore, storm water detention will be provided to limit the future peak discharge.

The primary outlet from the new surface detention basin, Hydrocad node 4P consists of a 6-inch dia. HDPE pipe. The hydrographs for the captured conditions 25 -year storm event was routed through the detention system, and including unmanaged

areas, to establish the peak outflows to the existing storm drainage path. This was then compared to the pre-developed runoff from the 10-year storm event.

The SCS Unit Hydrograph Method (TR-20) was utilized to estimate the peak discharges associated with the various storm events for both the existing and the proposed conditions. An elevation-storage-discharge relationship was established for the detention basin and the proposed outfall to the public storm drainage system. The results of the calculations are tabulated below:

Detention Basin [4P]	10-Year	25-Year
Pre-developed Outfall [3R]:	2.05	-
Peak Post-Dev Basin Inflow, cfs:	2.80	3.49
High Water Elevation Detention Basin, feet:	580.06	580.35
Peak Storage Volume Detention Basin, ac-ft:	0.038	0.055
Post-developed Outfall [4P]:	0.87	0.95
Post-developed Outfall [3R]:	**1.11**	**1.28**

The discharge rate 25-year developed conditions storm events are less-than or equal-to the existing conditions 10-year storm event in accordance with the district development standards. The basin rim el. 581.35 provides 1-ft of freeboard from the calculated 25-year high-water elevation.

The hydrographs, reservoir report, outlet structure information and routing calculations are included in Appendix B.

III. COMPONENTS OF EROSION CONTROL

Refer to Planned Erosion & Sediment Control Practices at the end of this report.

I. Daily Site Maintenance (Performed by Owner/Contractor)

At the beginning and end of each day of construction, the Contractor shall walk the site to determine the presence of any extraneous material (litter, packaging and debris) and to review all stormwater outfall locations. All debris shall be picked up and disposed of in an appropriate manner.

Construction chemicals shall be stored in an area that is away from any temporary or permanent stormwater drainage facilities and in an area that is elevated above ground surface, so that surface water runoff does not deteriorate the associated container/bag. All containers shall be adequately sealed at the end of each workday or

at the end of use. Large fuel tank(s), if required, shall be located within a secondary containment vessel, size equal to or greater than the capacity of the fuel tank used.

Construction debris shall be stockpiled in one area within the site that is located away from any permanent or temporary storm drainage facility. All construction debris shall be removed from the site and disposed of in an appropriate manner. Locate trash receptacle on high ground so as not to allow stormwater runoff to collect within the bin(s). The material/equipment storage shall be monitored daily for any identified chemical (oil, grease, etc.) spills.

II. Construction Sequence

- Obtain all necessary shop drawing approvals and applicable permits.
- Conduct a pre-construction meeting.
- Perform stakeout of property limits and facilities. Install orange construction fencing surrounding earthmoving limits.
- Install silt fencing or compost filter sock downslope from proposed disturbance area and as shown on plan; use existing pavement for equipment/ material storage area(s).
- Use stabilized construction entrance (existing paved driveway) and wheel wash station, and concrete wash pit;
- Maintain all erosion and sediment control devices throughout construction.
- Rough grade site area including placement and compaction of fill as needed.
- Construct and install building and pavements.
- Construct site utilities, stormwater drainage inlets, piping and basins. Install all remaining protection measures as detailed.
- Final grade entire site including topsoil placement, seed and mulch landscaped areas.
- Remove silt fence and other erosion control devices after vegetation has been established in topsoil/seeded areas.

III. Post Construction Operation & Maintenance (Performed by Owner)

α. On a quarterly basis and following rain events of 0.5-inch or greater, perform the following:

1. Inspect catch basins and storm piping for debris and sediments;
2. Remove and properly dispose of any collected debris from the structures;
3. Flush piping with water, if necessary to remove accumulated sediment.
4. Inspect grassed/landscaped areas for un-vegetated area or areas with less than 80% healthy stand of grass and reseed and mulch as necessary. Water areas daily if reseeded through July and August.
5. Maintain all lawn areas by regular mowing, including the grassed slopes and bottom of the stormwater detention basin and drainage swales. Any eroded areas shall be re-graded, seeded and mulched immediately.

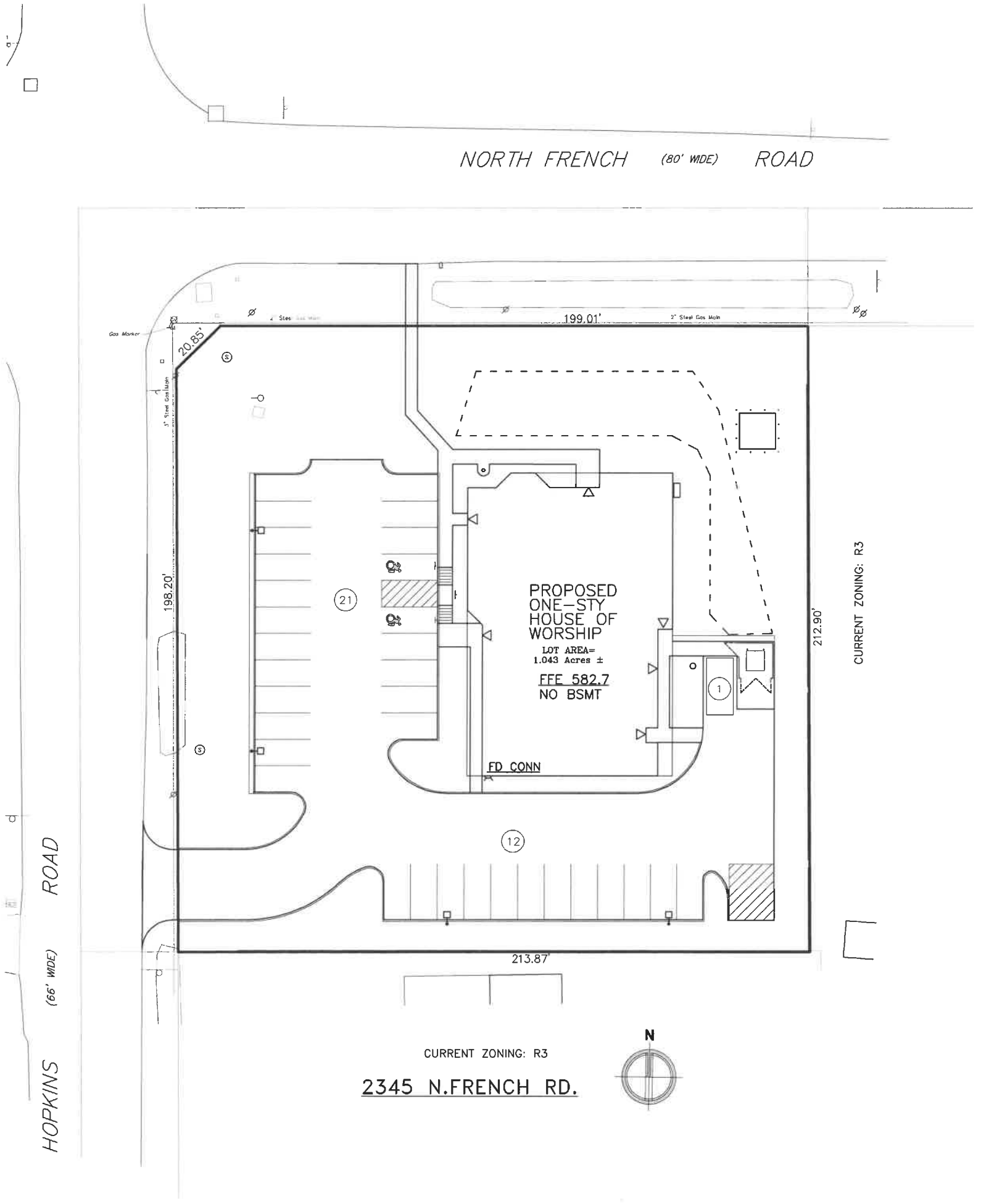
V. PERMITS

The proposed construction of the structure, parking areas, utilities and drainage must receive approval from the Town of Amherst Planning Board, Code Enforcement, Town of Amherst Sewer and ECWA districts. Curb cut, rivway and work in the public rights-of-way require an ECDPW Highway Work Permit

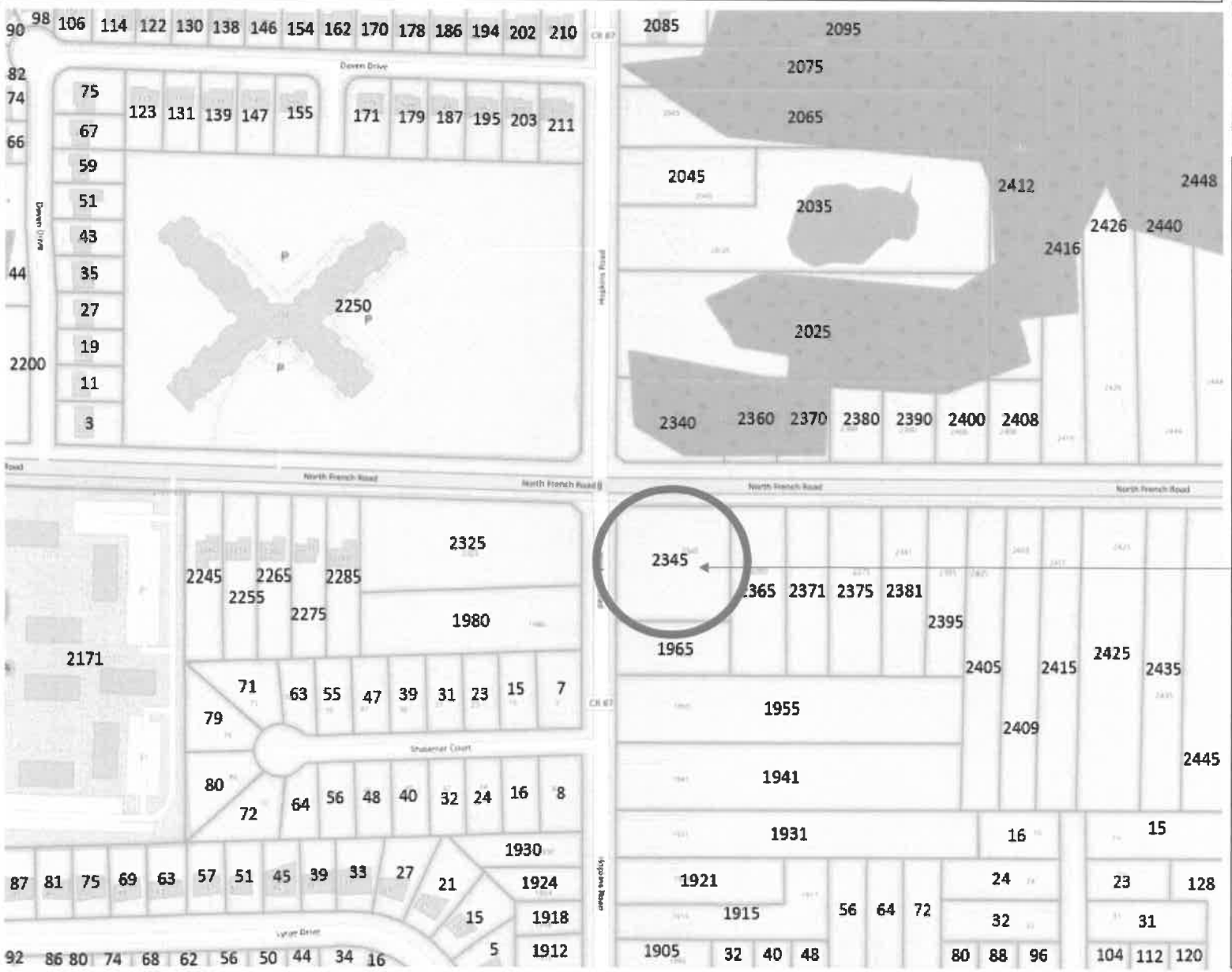
PLANNED EROSION AND SEDIMENTATION CONTROL PRACTICES

1. **Temporary Construction Entrance/Exit:** Contractors shall utilize the existing paved driveway from Hopkins Road. A wheel wash station shall be installed if necessary. Contractor shall utilize pubic hydrant if available, with proper backflow prevention and metering or provide water tank on-site. The public roadway shall be cleaned immediately of any sediment and stone deposited from a construction vehicle. A concrete wash pit shall be used by all contractors and cleaned periodically.
2. **Silt Fencing:** Sediment control fencing or 12” dia. compost filter sock shall be installed along the perimeter of the parcel or where shown. Temporary soil stockpiles shall also contain silt fence surround and be temporarily seeded if left unworked and barren for greater than 14-days.
3. **Surface Stabilization:** All disturbed soils shall be stabilized as soon as grade is established, either in fill or cut areas, with either vegetation and mulch or geotextile fabric and stone subbase in building pad and paved parking lot footprints. Temporary or permanent stabilization measures must be initiated by the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. No disturbed soils shall remain barren and un-worked for more than 14-days.
4. **Dust Control:** Dust shall be controlled by sprinkling during extended periods of soil exposure. See item #1 above for optional temporary water sources.
5. **Land Grading:** All temporary cut slopes shall not exceed 3h:1v to avoid instability due to wet weather. Cut slopes shall be fine graded immediately after rough grading and stabilized per Item #4 above. Fill areas shall be 2h:1v max with fill depths from 1-ft to 2-ft anticipated. Fill layers shall not exceed 8-inches in depth and compacted to 95% modified proctor in pavement areas, and 90% in lawn/landscape beds.

APPENDIX A


NORTH FRENCH (80' WIDE) ROAD
HOPKINS ROAD (66' WIDE)
199.01'
20.85'
198.20'
212.90'
213.87'
PROPOSED ONE-STY HOUSE OF WORSHIP
LOT AREA= 1.043 Acres ±
FFE 582.7
NO BSMT
FD CONN
21
12
1
CURRENT ZONING: R3
CURRENT ZONING: R3
2345 N.FRENCH RD.
N

Erie County On-Line Mapping Application



SUBJECT PARCEL
2345 N. FRENCH AT HOPKINS RD

Legend

- Parcels

0 0.07 0.1 Miles

WGS_1984_Web_Mercator_Auxiliary_Sphere
THIS MAP IS NOT TO BE USED FOR NAVIGATION

ERIE COUNTY
DEPARTMENT OF ENVIRONMENT & PLANNING
OFFICE OF GIS

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

1: 4,514

NOTES TO USERS

ap is for use in administering the National Flood Insurance Program. It does ssarily identify all areas subject to flooding, particularly from local drainage s of small size. The community map repository should be consulted for e updated or additional flood hazard information.

on more detailed information in areas where **Base Flood Elevations** (BFEs) floodways have been determined, users are encouraged to consult the Flood and Floodway Data and/or Summary of Stillwater Elevations tables contained he Flood Insurance Study (FIS) Report that accompanies this FIRM. Users be aware that BFEs shown on the FIRM represent rounded whole-foot ons. These BFEs are intended for flood insurance rating purposes only and not be used as the sole source of flood elevation information. Accordingly, evation data presented in the FIS Report should be utilized in conjunction with M for purposes of construction and/or floodplain management.

d **Base Flood Elevations** shown on this map apply only landward of 0.0' nerican Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be that coastal flood elevations are also provided in the Summary of Stillwater ons table in the Flood Insurance Study Report for this jurisdiction. Elevations in the Summary of Stillwater Elevations table should be used for construction floodplain management purposes when they are higher than the elevations on this FIRM.

eas of the floodways were computed at cross sections and interpolated n cross sections. The floodways were based on hydraulic considerations with to requirements of the National Flood Insurance Program. Floodway widths er pertinent floodway data are provided in the Flood Insurance Study Report jurisdiction.

areas not in Special Flood Hazard Areas may be protected by flood control ures. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Report for information on flood control structures for this jurisdiction.

ojection used in the preparation of this map was Universal Transverse or (UTM) zone 18. The horizontal datum was NAD 83, GRS 1980 d. Differences in datum, spheroid, projection or UTM zones used in the tion of FIRMs for adjacent jurisdictions may result in slight positional ces in map features across jurisdiction boundaries. These differences do not e accuracy of this FIRM.

levations on this map are referenced to the North American Vertical Datum of These flood elevations must be compared to structure and ground elevations ced to the same vertical datum. For information regarding conversion n the National Geodetic Vertical Datum of 1929 and the North American Datum of 1988, visit the National Geodetic Survey website at ww.ngs.noaa.gov or contact the National Geodetic Survey at the following s:

formation Services
N/NGS12
al Geodetic Survey
3, #8202
ast-West Highway
Spring, Maryland 20910-3282
13-3242

map information shown on this FIRM was derived from multiple sources, g the New York State Office of Cyber Security & Critical Infrastructure ation, and the USDA's Farm Service Agency. Aerial Photography Field Office, 2015.

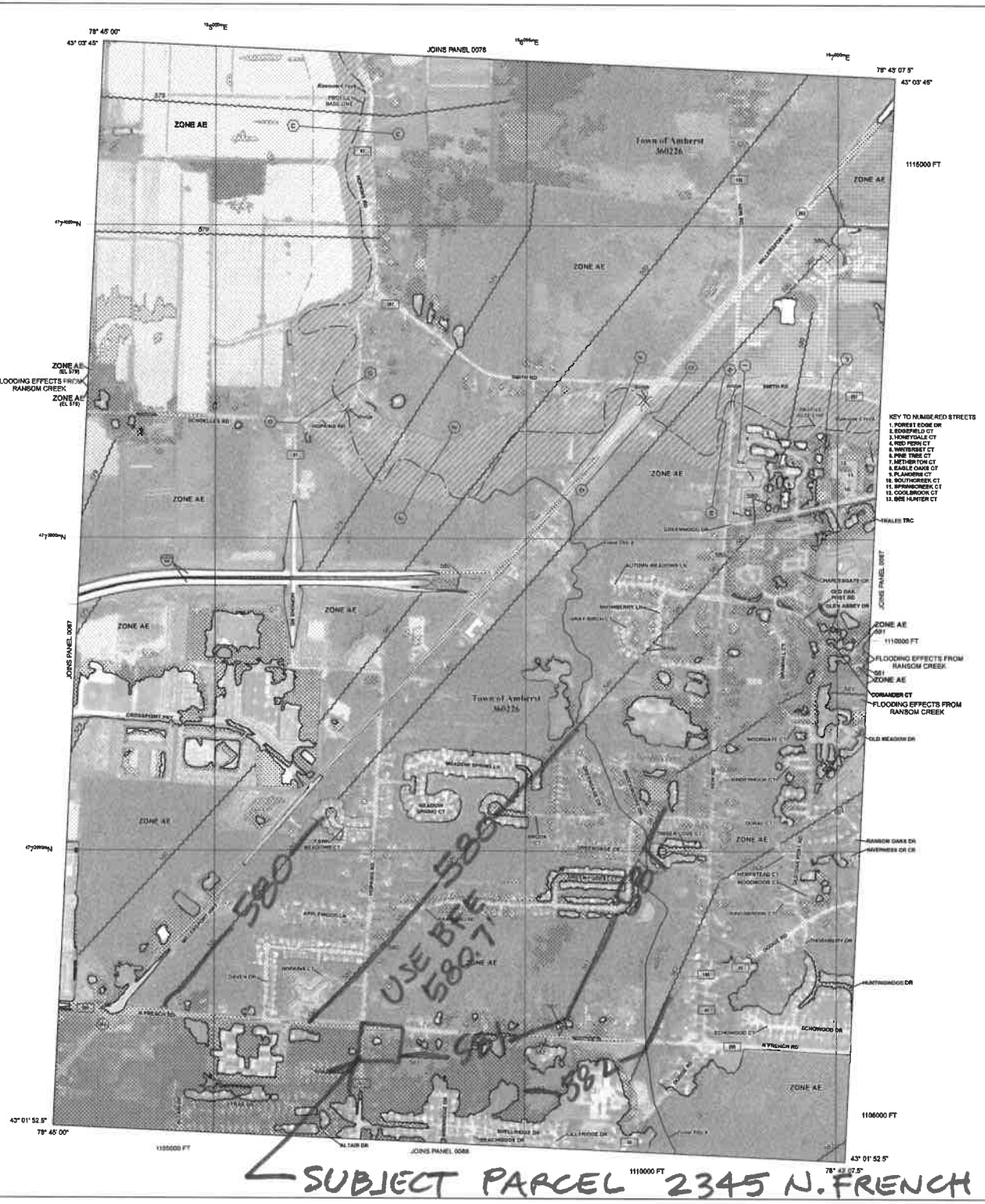
ap reflects more detailed and up-to-date **stream channel configurations** than hown on the previous FIRM for this jurisdiction. The floodplains and floodways re transferred from the previous FIRM may have been adjusted to confirm to ew stream channel configurations. As a result, the Flood Profiles and Floodway bles in the Flood Insurance Study Report (which contains authoritative c data) may reflect stream channel distances that differ from what is shown map.

rate limits shown on this map are based on the best data available at the time ication. Because changes due to annexations or de-annexations may have d after this map was published, map users should contact appropriate nity officials to verify current corporate limit locations.

refer to the separately printed **Map Index** for an overview map of the showing the layout of map panels; community map repository addresses; Listing of Communities table containing National Flood Insurance Program for each community as well as a listing of the panels on which each community ed.

rmation on available products associated with this FIRM visit the **Map** e Center (MSC) website at http://msc.fema.gov. Available products may previously issued Letters of Map Change, a Flood Insurance Study Report, digital versions of this map. Many of these products can be ordered or d directly from the MSC website.

have questions about this map, how to order products, or the National Insurance Program in general, please call the **FEMA Map Information** nge (FMIX) at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA at http://www.fema.gov/business/nfip.



SUBJECT PARCEL 2345 N. FRENCH

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood th a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Are the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surf elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.

ZONE AE — Base Flood Elevations determined.

ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Eleva determined.

ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); avera depths determined. For areas of alluvial fan flooding, velocities also dete

ZONE AR — Special Flood Hazard Areas formerly protected from the 1% annual chan flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to pro protection from the 1% annual chance or greater flood.

ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determ

ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Ele determined.

ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Eleva determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept encroachment so that the 1% annual chance flood can be carried without substantial increas flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% Annual Chance Floodplain Boundary

0.2% Annual Chance Floodplain Boundary

Floodway Boundary

Zone D Boundary

CBRS and OPA Boundary

Boundary dividing Special Flood Hazard Area Zones and bound dividing Special Flood Hazard Areas of different Base Flood El flood depths, or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevat feet*

*Referenced to the North American Vertical Datum of 1988

A — A — Cross section line

23 — 23 — Transect line

Culvert

Bridge

48° 02' 08", 83° 03' 12" — Geographic coordinates referenced to the North American Dat 1983 (NAD 83) Western Hemisphere

1100000 FT — 3000-foot ticks: New York State Plane West Zone (FIPS Zone 3103), Transverse Mercator projection

4660000 N — 1000-meter Universal Transverse Mercator grid values, zone 1

5000 — Bench mark (see explanation in Notes to Users section of this panel)

M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
June 7, 2019

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

100 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0086H

FIRM

FLOOD INSURANCE RATE MAP

ERIE COUNTY, NEW YORK (ALL JURISDICTIONS)

PANEL 86 OF 807

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

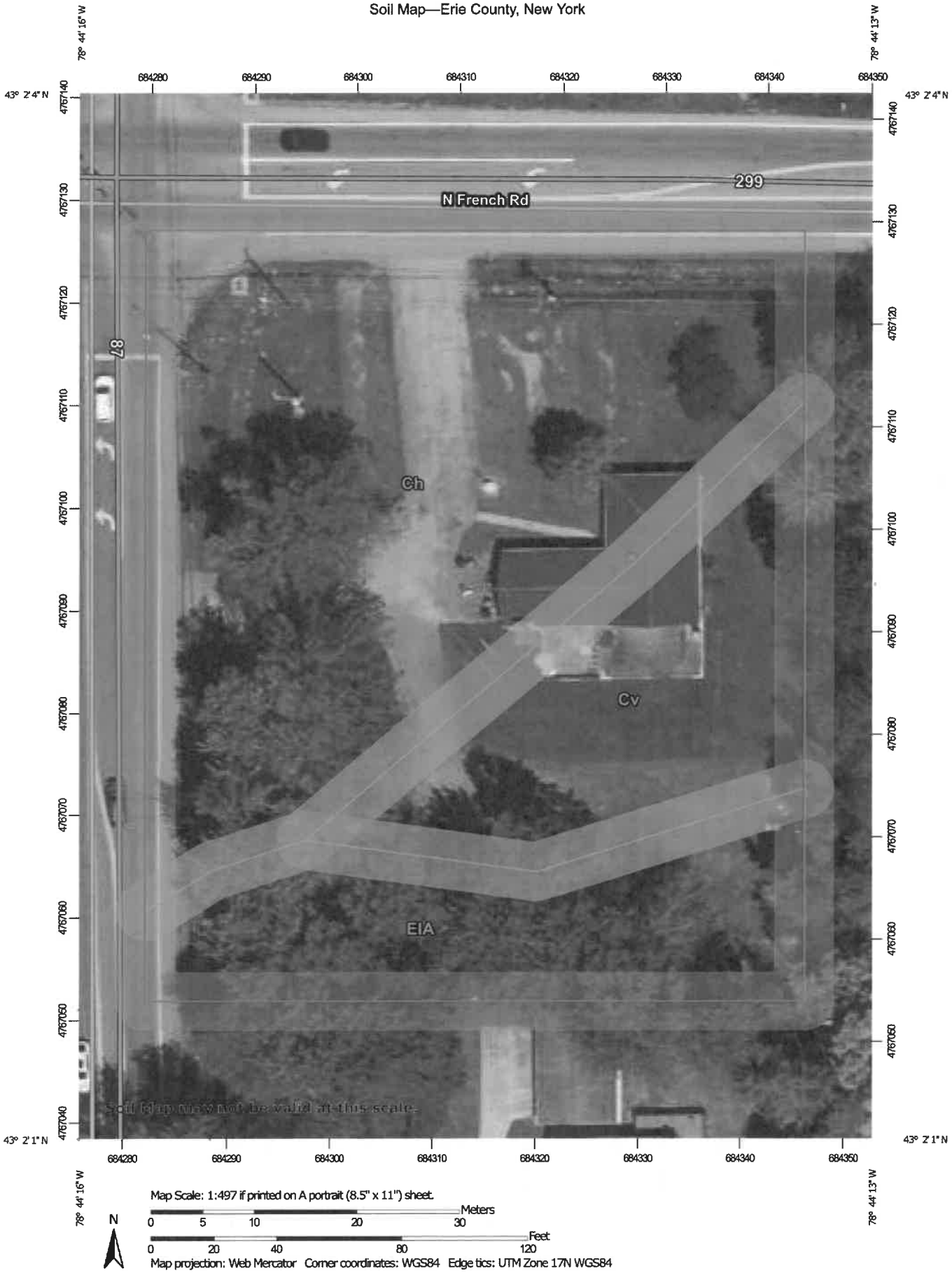
COMMUNITY	NUMBER	PANEL
AMHERST, TOWN OF	360279	0086

Notice to User: The Map Number shown should be used when placing map orde Community Number shown above sho used on insurance applications for the c community.

MAP NUMBER
36029C00

EFFECTIVE D
JUNE 7, 2

Federal Emergency Management Ag

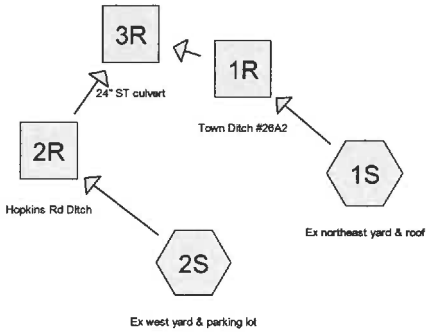

78° 44' 16" W
78° 44' 13" W
43° 2' 4" N
43° 2' 1" N
684280
684290
684300
684310
684320
684330
684340
684350
4767140
4767130
4767120
4767110
4767100
4767090
4767080
4767070
4767060
4767050
4767040
299
N French Rd
87
Ch
Cv
EIA
Soil map may not be valid at this scale.
Map Scale: 1:497 if printed on A portrait (8.5" x 11") sheet.
Meters
0 5 10 20 30
Feet
0 20 40 80 120
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ch	Cheektowaga fine sandy loam	0.7	59.1%
Cv	Cosad loamy fine sand	0.3	21.2%
EIA	Elnora loamy fine sand, 0 to 3 percent slopes	0.2	19.8%
Totals for Area of Interest		**1.2**	**100.0%**

HSG
C/D
C/D
A/D

APPENDIX B



Subcat Reach Pond Link

Routing Diagram for pre-developed
Prepared by Tredo Engineers, Printed 9/18/2025
HydroCAD® 10.20-7a s/n 07305 © 2025 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.654	80	>75% Grass cover, Good, HSG D (1S, 2S)
0.326	98	Paved parking, HSG D (2S)
0.024	98	Roofs, HSG D (1S)
1.004	**86**	**TOTAL AREA**

Summary for Subcatchment 1S: Ex northeast yard & roof

Runoff = 0.45 cfs @ 12.30 hrs, Volume= 0.041 af, Depth= 1.40"
Routed to Reach 1R : Town Ditch #26A2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs
NY-Buffalo 24-hr S0P 10-yr Rainfall=3.11"

Area (ac)	CN	Description
0.330	80	>75% Grass cover, Good, HSG D
0.024	98	Roofs, HSG D
0.354	81	Weighted Average
0.330		93.22% Pervious Area
0.024		6.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.5	150	0.0200	0.11		**Sheet Flow, overland to street** Grass: Dense n= 0.240 P2= 2.25"

Summary for Subcatchment 2S: Ex west yard & parking lot

Runoff = 1.87 cfs @ 12.07 hrs, Volume= 0.108 af, Depth= 2.00"
Routed to Reach 2R : Hopkins Rd Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs
NY-Buffalo 24-hr S0P 10-yr Rainfall=3.11"

Area (ac)	CN	Description
0.324	80	>75% Grass cover, Good, HSG D
0.326	98	Paved parking, HSG D
0.650	89	Weighted Average
0.324		49.85% Pervious Area
0.326		50.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	27	0.0350	0.09		**Sheet Flow, overland to rcvr** Grass: Dense n= 0.240 P2= 2.25"
1.6	123	0.0220	1.25		**Sheet Flow, overland to rcvr** Smooth surfaces n= 0.011 P2= 2.25"
1.1	70	0.0050	1.06	0.37	**Pipe Channel, pipe not found** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.030 Corrugated metal
7.5	220	Total			

Summary for Reach 1R: Town Ditch #26A2

Inflow Area = 0.354 ac, 6.78% Impervious, Inflow Depth = 1.40" for 10-yr event
Inflow = 0.45 cfs @ 12.30 hrs, Volume= 0.041 af
Outflow = 0.45 cfs @ 12.30 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 3R : 24" ST culvert

Routing by Stor-Ind+Trans method, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs

Summary for Reach 2R: Hopkins Rd Ditch

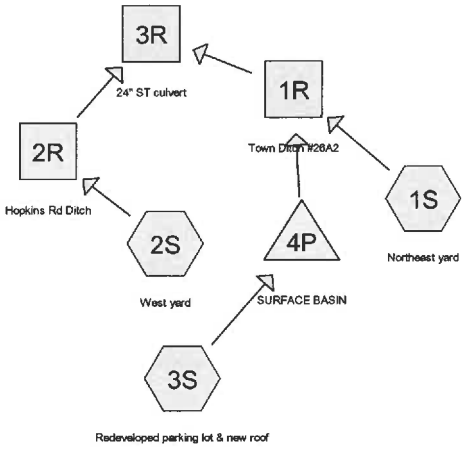
Inflow Area = 0.650 ac, 50.15% Impervious, Inflow Depth = 2.00" for 10-yr event
Inflow = 1.87 cfs @ 12.07 hrs, Volume= 0.108 af
Outflow = 1.87 cfs @ 12.07 hrs, Volume= 0.108 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 3R : 24" ST culvert

Routing by Stor-Ind+Trans method, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs

Summary for Reach 3R: 24" ST culvert

Inflow Area = 1.004 ac, 34.86% Impervious, Inflow Depth = 1.79" for 10-yr event
Inflow = 2.05 cfs @ 12.07 hrs, Volume= 0.150 af
Outflow = 2.05 cfs @ 12.07 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs



Subcat Reach Pond Link

Routing Diagram for post-developed
Prepared by Tredo Engineers, Printed 9/18/2025
HydroCAD® 10.20-7a s/n 07305 © 2025 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.488	80	>75% Grass cover, Good, HSG D (1S, 2S, 3S)
0.414	98	Paved parking, HSG D (2S, 3S)
0.138	98	Roofs, HSG D (3S)
1.040	**90**	**TOTAL AREA**

Summary for Subcatchment 1S: Northeast yard

Runoff = 0.08 cfs @ 12.30 hrs, Volume= 0.007 af, Depth= 1.33"
Routed to Reach 1R : Town Ditch #26A2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs
NY-Buffalo 24-hr S0P 10-yr Rainfall=3.11"

Area (ac)	CN	Description
0.066	80	>75% Grass cover, Good, HSG D
0.066		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.5	100	0.0100	0.07		**Sheet Flow, overland to ditch** Grass: Dense n= 0.240 P2= 2.25"
0.5	50	0.0100	1.61		**Shallow Concentrated Flow, overland to ditch** Unpaved Kv= 16.1 fps
23.0	150	Total			

Summary for Subcatchment 2S: West yard

Runoff = 0.22 cfs @ 12.11 hrs, Volume= 0.014 af, Depth= 1.47"
Routed to Reach 2R : Hopkins Rd Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs
NY-Buffalo 24-hr S0P 10-yr Rainfall=3.11"

Area (ac)	CN	Description
0.105	80	>75% Grass cover, Good, HSG D
0.010	98	Paved parking, HSG D
0.115	82	Weighted Average
0.105		91.30% Pervious Area
0.010		8.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0150	0.89		**Sheet Flow, overland to ditch** Smooth surfaces n= 0.011 P2= 2.25"
8.6	30	0.0100	0.06		**Sheet Flow, overland to ditch** Grass: Dense n= 0.240 P2= 2.25"
9.5	80	Total			

Summary for Subcatchment 3S: Redeveloped parking lot & new roof

Runoff = 2.80 cfs @ 12.05 hrs, Volume= 0.156 af, Depth= 2.17"
Routed to Pond 4P : SURFACE BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs
NY-Buffalo 24-hr S0P 10-yr Rainfall=3.11"

Area (ac)	CN	Description
0.138	98	Roofs, HSG D
0.404	98	Paved parking, HSG D
0.317	80	>75% Grass cover, Good, HSG D
0.859	91	Weighted Average
0.317		36.90% Pervious Area
0.542		63.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0150	1.03		**Sheet Flow, overland to basin** Smooth surfaces n= 0.011 P2= 2.25"
0.3	50	0.0150	2.49		**Shallow Concentrated Flow, overland to basin** Paved Kv= 20.3 fps
1.9	150	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach 1R: Town Ditch #26A2

Inflow Area = 0.925 ac, 58.59% Impervious, Inflow Depth = 2.11" for 10-yr event
Inflow = 0.95 cfs @ 12.29 hrs, Volume= 0.163 af
Outflow = 0.95 cfs @ 12.29 hrs, Volume= 0.163 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 3R : 24" ST culvert

Routing by Stor-Ind+Trans method, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs

Summary for Reach 2R: Hopkins Rd Ditch

Inflow Area = 0.115 ac, 8.70% Impervious, Inflow Depth = 1.47" for 10-yr event
Inflow = 0.22 cfs @ 12.11 hrs, Volume= 0.014 af
Outflow = 0.22 cfs @ 12.11 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 3R : 24" ST culvert

Routing by Stor-Ind+Trans method, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs

Summary for Reach 3R: 24" ST culvert

Inflow Area = 1.040 ac, 53.08% Impervious, Inflow Depth = 2.04" for 10-yr event
Inflow = 1.11 cfs @ 12.17 hrs, Volume= 0.177 af
Outflow = 1.11 cfs @ 12.17 hrs, Volume= 0.177 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs

Summary for Pond 4P: SURFACE BASIN

Inflow Area = 0.859 ac, 63.10% Impervious, Inflow Depth = 2.17" for 10-yr event
Inflow = 2.80 cfs @ 12.05 hrs, Volume= 0.156 af
Outflow = 0.87 cfs @ 12.27 hrs, Volume= 0.155 af, Atten= 69%, Lag= 13.5 min
Primary = 0.87 cfs @ 12.27 hrs, Volume= 0.155 af
Routed to Reach 1R : Town Ditch #26A2

Routing by Stor-Ind method, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs
Peak Elev= 580.06' @ 12.27 hrs Surf.Area= 0.050 ac Storage= 0.038 af

Plug-Flow detention time= 17.4 min calculated for 0.155 af (100% of inflow)
Center-of-Mass det. time= 16.3 min (810.3 - 794.0)

Volume	Invert	Avail.Storage	Storage Description
#1	579.00'	0.100 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	578.25'	0.122 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		0.222 af	Total Available Storage

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
579.00	0.001	0.000	0.000
580.00	0.022	0.012	0.012
581.00	0.044	0.033	0.044
582.00	0.067	0.055	0.100

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
578.25	0.000	0.000	0.000
579.00	0.013	0.005	0.005
580.00	0.025	0.019	0.024
581.00	0.049	0.037	0.061
582.00	0.073	0.061	0.122

Device	Routing	Invert	Outlet Devices
#1	Primary	578.40'	**6.0" Round 6" Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 578.40' / 578.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.87 cfs @ 12.27 hrs HW=580.05' (Free Discharge)
↑**1=6" Culvert** (Barrel Controls 0.87 cfs @ 4.45 fps)

Summary for Subcatchment 1S: Northeast yard

Runoff = 0.11 cfs @ 12.29 hrs, Volume= 0.010 af, Depth= 1.88"
Routed to Reach 1R : Town Ditch #26A2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs
NY-Buffalo 24-hr S0P 25-yr Rainfall=3.80"

Area (ac)	CN	Description
0.066	80	>75% Grass cover, Good, HSG D
0.066		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.5	100	0.0100	0.07		**Sheet Flow, overland to ditch** Grass: Dense n= 0.240 P2= 2.25"
0.5	50	0.0100	1.61		**Shallow Concentrated Flow, overland to ditch** Unpaved Kv= 16.1 fps
23.0	150	Total			

Summary for Subcatchment 2S: West yard

Runoff = 0.30 cfs @ 12.11 hrs, Volume= 0.019 af, Depth= 2.03"
Routed to Reach 2R : Hopkins Rd Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs
NY-Buffalo 24-hr S0P 25-yr Rainfall=3.80"

Area (ac)	CN	Description
0.105	80	>75% Grass cover, Good, HSG D
0.010	98	Paved parking, HSG D
0.115	82	Weighted Average
0.105		91.30% Pervious Area
0.010		8.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0150	0.89		**Sheet Flow, overland to ditch** Smooth surfaces n= 0.011 P2= 2.25"
8.6	30	0.0100	0.06		**Sheet Flow, overland to ditch** Grass: Dense n= 0.240 P2= 2.25"
9.5	80	Total			

Summary for Subcatchment 3S: Redeveloped parking lot & new roof

Runoff = 3.49 cfs @ 12.05 hrs, Volume= 0.202 af, Depth= 2.83"
Routed to Pond 4P : SURFACE BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs
NY-Buffalo 24-hr S0P 25-yr Rainfall=3.80"

Area (ac)	CN	Description
0.138	98	Roofs, HSG D
0.404	98	Paved parking, HSG D
0.317	80	>75% Grass cover, Good, HSG D
0.859	91	Weighted Average
0.317		36.90% Pervious Area
0.542		63.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0150	1.03		**Sheet Flow, overland to basin** Smooth surfaces n= 0.011 P2= 2.25"
0.3	50	0.0150	2.49		**Shallow Concentrated Flow, overland to basin** Paved Kv= 20.3 fps
1.9	150	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach 1R: Town Ditch #26A2

Inflow Area = 0.925 ac, 58.59% Impervious, Inflow Depth = 2.76" for 25-yr event
Inflow = 1.07 cfs @ 12.30 hrs, Volume= 0.212 af
Outflow = 1.07 cfs @ 12.30 hrs, Volume= 0.212 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 3R : 24" ST culvert

Routing by Stor-Ind+Trans method, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs

Summary for Reach 2R: Hopkins Rd Ditch

Inflow Area = 0.115 ac, 8.70% Impervious, Inflow Depth = 2.03" for 25-yr event
Inflow = 0.30 cfs @ 12.11 hrs, Volume= 0.019 af
Outflow = 0.30 cfs @ 12.11 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 3R : 24" ST culvert

Routing by Stor-Ind+Trans method, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs

Summary for Reach 3R: 24" ST culvert

Inflow Area = 1.040 ac, 53.08% Impervious, Inflow Depth = 2.68" for 25-yr event
Inflow = 1.28 cfs @ 12.17 hrs, Volume= 0.232 af
Outflow = 1.28 cfs @ 12.17 hrs, Volume= 0.232 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs

Summary for Pond 4P: SURFACE BASIN

Inflow Area = 0.859 ac, 63.10% Impervious, Inflow Depth = 2.83" for 25-yr event
Inflow = 3.49 cfs @ 12.05 hrs, Volume= 0.202 af
Outflow = 0.95 cfs @ 12.32 hrs, Volume= 0.202 af, Atten= 73%, Lag= 16.4 min
Primary = 0.95 cfs @ 12.32 hrs, Volume= 0.202 af
Routed to Reach 1R : Town Ditch #26A2

Routing by Stor-Ind method, Time Span= 1.00-32.00 hrs, dt= 0.05 hrs
Peak Elev= 580.35' @ 12.32 hrs Surf.Area= 0.063 ac Storage= 0.055 af

Plug-Flow detention time= 21.9 min calculated for 0.202 af (100% of inflow)
Center-of-Mass det. time= 20.9 min (805.8 - 784.8)

Volume	Invert	Avail.Storage	Storage Description
#1	579.00'	0.100 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	578.25'	0.122 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		0.222 af	Total Available Storage

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
579.00	0.001	0.000	0.000
580.00	0.022	0.012	0.012
581.00	0.044	0.033	0.044
582.00	0.067	0.055	0.100

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
578.25	0.000	0.000	0.000
579.00	0.013	0.005	0.005
580.00	0.025	0.019	0.024
581.00	0.049	0.037	0.061
582.00	0.073	0.061	0.122

Device	Routing	Invert	Outlet Devices
#1	Primary	578.40'	**6.0" Round 6" Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 578.40' / 578.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.95 cfs @ 12.32 hrs HW=580.35' (Free Discharge)
↑**1=6" Culvert** (Barrel Controls 0.95 cfs @ 4.85 fps)

Gurdwara N.French
Amherst, NY

STORM SEWER COMPUTATIONS (10 yr)

RUNOFF AND FLOW																
SEWER LOCATION			TRIBUTARY AREA (acres)		RUNOFF COEFFICIANT C									TIME OF CONC. T_c (min)	INTENSITY I (in/hr)	FLOW Q (cfs)
area	from	to	A	SUM A	c	cA	SUM cA	LENGTH	SLOPE	PREV. Tc	T. of conc. c	RUNOFF Tc				
1	west lot	basin	0.40	0.40	0.95	0.38	0.38	63.00	1.50		0.95	1.87	1.87	10.00	4.6	1.75

DESIGN									
MANNING n	SLOPE S (%)	DIAMETER D (in)	CAPACITY Q (cfs)	CAPACITY VELOCITY V (ft/sec)	% capacity	peak factor	FLOW VELOCITY V (ft/sec)	LENGTH L (ft)	
0.013	0.50	12	2.53	3.22	0.69	1.07	3.44	26	HDPE

APPENDIX C

GRAVITY GREASE INTERCEPTOR SIZING CALCULATION SHEET

Project: 25033 Gurdwara Sikh Center

Address: 2345 North French Road

Prepared by: Bara Husseini, Trautman Associates, 37 Franklin St, Suite 100, Buffalo, NY 14210

Date: October 20th, 2025

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1. Objective

To determine the required size of the gravity grease interceptor in accordance with the *Town of Amherst Grease Interceptor Sizing Criteria* [1] and supporting code methodologies.

2. Method 1: Town of Amherst Formula [1]

Interceptor Size (gal) = **[**[(1) GPM/fixture x (2) Fixture Rating] +(3) Direct Flow (GPM)**]** x Retention Time (min)

2.1 Manning Formula

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2} \text{ [2]}$$

Q = Flow rate (ft^2/s)
n = Manning's roughness coefficient
A = cross-sectional area of flow (ft^2)
R = Hydraulic radius (area/wetted perimeter, ft)
S = Slope of the pipe (ft/ft)

2.2 Fixture Data

Fixture	Trap Size	Flow (GPM)	Source
Floor Sink (3-Comp Sink)	4"	146	Manning formula (n = 0.011[PVC] [3], S = $\frac{1}{4}$"/ft)
Regular Sink	1.5"	15	TOA Reference [1]
Dishwasher	-	10	TOA Reference [1]

2.3 **Other Variables**

- Fixture Rating = 1 (Conservative, assumes same grease rating for regular sink and 3 compartment sink) [1]
- Peak Flow Ratio = 1/3 [1]
- Retention Time = 30 min [1]

2.4 **Calculation**

$$\textbf{Interceptor Volume} = \left[(146 + 15 + 10) * \frac{1}{3}\right] * 30 = \textbf{1710 gal}$$

3. **Method 2: "Meals Served" Method (EPA** [4] **/ ICC** [5] **Commentary)**

$$\text{Size (gal)} = M * GL * ST * 2.5 * LF \text{ [4]}$$

Parameter	Description	Value	Source
M	Meals per day	100	Design Criteria
GL	Gallons per meal	4.5	EPA's normal value [4]
LF	Loading Factor	1.0	Without garbage disposal value [4]
ST	Storage capacity factor	1.7	Min amount without onsite disposal [4]

$$\textbf{Interceptor Size} = 100 * 4.5 * 1.7 * 2.5 * 1.0 = \textbf{1912.5 gal}$$

4. **Summary of Results**

Method	**Calculated Volume** (gal)
Town of Amherst Formula	1710
EPA's Meals Method	1913

Based on the two sizing methodologies, calculated interceptor volumes range between 1,710 and 1,913 gallons. To align with commonly available gravity grease interceptor sizes and to provide a margin of safety, a **2,000-gallon** interceptor will be selected.

References

[1] T. o. Amherst, "Town of Amherst Grease Interceptor Sizing Criteria," [Online]. Available: https://www.amherst.ny.us/pdf/engineering/environmental/200923_2017_toa_sizing_reqs.pdf.

[2] The Engineering ToolBox, "Manning's Formula and Gravity Flow," [Online]. Available: https://www.engineeringtoolbox.com/mannings-formula-gravity-flow-d_800.html.

[3] The Engineering ToolBox, "Manning's Roughness Coefficients for Open Channel Flow," [Online]. Available: https://www.engineeringtoolbox.com/mannings-roughness-d_799.html.

[4] E. P. Agency, "Chapter 8.2.4," in *EPA's Design Manual: Onsite Wastewater Treatment and Disposal Systems*, 1980.

[5] ICC, "2015 International Plumbing Code Commentary," pp. 10-18.

[6] "2020 Plumbing Code of New York State," p. Table 709.1.

Appendix A

Method 1: In-Depth Calculation:

“When applying the Manning Formula, we arrive at the drainage rates of various pipe diameter sizes:” [1]

0.5 inch pipe diameter = 0.8 GPM/fixture

1.0 inch pipe diameter = 5.0 GPM/fixture

1.5 inch pipe diameter = 15 GPM/fixture

2.0 inch pipe diameter = 33 GPM/fixture

2.5 inch pipe diameter = 59 GPM/fixture

3.0 inch pipe diameter = 93 GPM/fixture

The manning equation is as follows:

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

Where

Q = Flow rate (ft^2/s)
n = Manning’s roughness coefficient
A = cross-sectional area of flow (ft^2)
R = Hydraulic radius (area/wetted perimeter, ft)
S = Slope of the pipe (ft/ft)

And to obtain gallons per minute, the following relationship is used:

$$GPM = Q * 448.831$$

The kitchen hosts the following fixtures

- 1 x 3 compartment sink
    - Each compartment will individually feed into a shared floor sink
- 1 x Regular sink (1.5” Waste drain, based off min trap size [6])
- 1 x Dishwasher

Obtaining The First Constant (1) = GPM/fixture

From Table 709.1 of the 2020 Plumbing Code of New York state [6], the DFU of each fixture that will be connected to the grease interceptor is identified. From that, the minimum trap size is obtained, and finally a GPM/fixture is acquired using the Manning Formula

1. Floor sink used by the 3-compartment sink.

   According to section 709.4 [6], the DFU load of an indirect waste receptor, such as this floor sink, shall be the sum of the DFU values of the fixtures that discharge to the receptor. Thus, the DFU

of the floor sink will be 3*DFU of Sink category (2) = 6. And from Table 709.2, the fixture drains or trap size for 6 DFU is 4”

Using the manning formula and Q to GPM relationship, where the pipe slope is ¼” per foot (0.0208 ft/ft) and a manning coefficient of 0.011 [3] (PVC pipe) , the flow for a 4” pipe is **146 GPM**

$$A = \frac{\pi\left(\frac{4}{12}\right)^2}{4} = 0.087266 \text{ ft}^2$$

$$P = \pi\left(\frac{4}{12}\right) = 1.047198 \text{ ft}$$

$$R = \frac{A}{P} = \frac{0.087266}{1.047198} = 0.083333 \text{ ft}$$

$$S = \frac{1/4 \text{ in}}{12 \text{ in}} = 0.020833 \text{ ft/ft}$$

$$Q = \frac{1.49}{0.011} * (0.087266)(0.083333)^{2/3}(0.020833)^{1/2}$$

$$Q = 0.32551 \text{ cfs}$$

$$GPM = 0.32551 * 448.831 \frac{\text{gpm}}{\text{cfs}} = \mathbf{146.10} \text{ gpm}$$

2. Regular Sink

   From Table 709.1, the sink DFU and min trap size is 2 and 1.5” respectively. From the manning formula calculations provided by the referenced Town of Amherst Document [1], the flow is 15 GPM.

3. Dishwasher

   From the Town of Amherst interceptor sizing document, the dishwasher flow is 10 GPM [1]

The Remaining Constants

The second Constant (Fixture rating) will be taken as 1 for all fixtures. This is a more conservative approach as the regular sink will assume the same grease rating as the 3-compartment sink.

The Peak Flow Ratio (PFR) is 1/3

The Retention Time = 30 min

$= [(146gpm * 1) + (15gpm * 1) + 10gpm] * 30 \text{ min} * \frac{1}{3} = \mathbf{1,710}\ gallons$

Method 2: In-Depth Calculation

Using the “Meals” method that is referenced in the 2015 International Plumbing Code Commentary [5] and in the EPA’s Design Manual: Onsite Waste water Treatment and Disposal Systems [4].

Grease interceptor size in gallons =

$$M * GL * ST * 2.5 * LF$$

Where:

M = number of meals served per day

100 meals will be served from this kitchen

GL = gallons of wastewater per meal,

Normally 4.5 gallons (as referenced by the ICC [4] *and EPA* [4]*)*

LF = Loading Factor

1.0 for kitchens without food waste grinders but with dishwashers [4]

ST = Storage capacity factor,

Minimum of 1.7 and onsite disposal corresponds to 2.5 [4]
1.7 will be used as there will not be onsite disposal for this grease interceptor

Thus, the formula becomes

$$GGI\ size = 100 * 4.5 * 1.0 * 1.7 * 2.5$$

$$GGI\ size = 1912.5\ Gallons$$