



Fee: _____ Payment: _____ Received Date: _____
 Planning Board Approval: _____
 City Council Approval: _____
 Zoning Board of Appeals: _____

Zoning Application

Please select the appropriate Zoning Application you are requesting. The directions for each are listed on the following page.

Zoning Applications

_____ Rezoning \$200	_____ Zoning Board of Appeals \$150
_____ Planned Unit Development (PUD)	_____ Planning Commission Regular Business \$35
_____ Street Vacation \$200	(i.e., Sign Reviews)
_____ Special Land Use \$150	_____ Site Plan Reviews \$85 (Includes 2 reviews
_____ Plat (includes Preliminary & Final) \$200	Additional reviews charged \$50/Hr by Fire Marshall)

Owner Name _____ Owner Telephone _____

Owner Address _____ Owner Email _____

Applicant/Representative _____ Applicant Telephone _____

Applicant Address _____ Applicant Email _____

Subject Property Address _____

Legal Description of Subject Property ***Legal Description is preferred submitted electronically in WORD Format***

Total Acreage _____ Building Dimensions (LxWxH) _____

Construction Type _____ Number of Stories _____

Zone Classification: Present _____ Proposed _____

Present Use of Property _____

Proposed Use of Property _____

The City of Cadillac must be given knowledge of every person having legal or equitable interest in land subject to this petition. It must include:

NAME, ADDRESS, EMAIL ADDRESS, PHONE NUMBER, and INTEREST

1. _____
2. _____
3. _____
4. _____

I hereby certify that I have a legal or equitable interest in all land subject to this petition and hereby grant permission allowing City personnel on the premises.

Signature of Owner

Date

Signature of Applicant

Date

REZONING APPLICATION PROCEDURE

Application must be completed, with support documents, and fee paid before it will be processed. Incomplete applications will not be accepted. Support documents must include a scaled diagram indicating dimensions of property, dimensions and location of all existing buildings in relation to property lines, streets, sidewalk, alleys, easements, and other public rights-of-way abutting the property. (Scale shall be 1-inch equals 40 feet, unless otherwise approved by Zoning Administrator for larger projects). Submit a narrative description describing:

1. The proposed use of the property if rezoned; and,
2. Why the subject site is appropriate for the proposed use?

Depending on the proposed zone district classification and/or proposed use, an applicant may be required to submit information regarding the potential impact of the classification and/or use on surrounding properties and public infrastructure. Examples include, but not limited to, traffic impact and surface water drainage studies, wetland impact determinations, and environmental assessments.

Regular Planning Board meetings are held on the fourth Monday of each month. Applications must be submitted at least thirty (30) days prior to the meeting. The application process includes:

1. Application is filed with the Planning Board. Incomplete applications **are not** accepted. Receipt of application by the City does not guarantee placement on next available agenda.
2. Publication of the application and notification to all property owners within 300 feet of the applicant by the City not less than 15 days before meeting.
3. After a public hearing, a recommendation is sent to the City Council, for final action. Entire rezoning process takes approximately three (3) months to complete.

The Planning Board will use the following standards to review any request for rezoning:

- ✓ Conformance with the Master Plan
- ✓ Conformance with the Zoning Ordinance
- ✓ Conformance with adjacent zones and uses
- ✓ Whether there is a change of conditions in the neighborhood that supports the proposed rezoning
- ✓ The need for the rezoning at the location proposed

ALL OTHER APPLICATION PROCEDURES

Applications to the Planning Board for PUDs, SLUs and Street and Alley Vacating have the same application deadline as a rezoning. PUD and SLU applications do not go before City Council. Applications must be received no less than thirty (30) days prior to the meeting. Applications must include:

- A narrative that describes the project, its need in the community, how it will affect the community and any other relevant information as may be required by City staff or Planning Board.
- A proposed site plan that is drawn to scale showing the shape and dimension of lots, existing and proposed buildings to be erected, altered, or use changed. The Site Plan Checklist is below.
- Any other information with regard to the lot or neighboring lots, proposed or existing deemed necessary for review.

Zoning Board of Appeals applications are due thirty (30) days prior to the scheduled meeting, the third Thursday of each month. Required submittals include the fee, completed application form, site plan, and narrative explaining why the code cannot be met and detailing the hardship or practical difficulty.

Required Coordinate System: As required by the City, deliverables shall be in AutoCAD compatible format referenced to Michigan State Plane Central coordinates (NAD83) with International feet as the units, rectified at the base elevation of 1300 feet. Vertical datum: City of Cadillac datum (NAVD 1927 datum).



COMMUNITY DEVELOPMENT DEPARTMENT
200 N. Lake Street
(231)775-0181
twaldo@cadillac-mi.net

SITE PLAN REVIEW CHECKLIST*
CITY OF CADILLAC

#	✓	Item
1		Complete and signed application.
2		Legal description of the site. The legal description may be placed on the plan or attached separately. An electric WORD version of the description must be provided.
3		Plan date.
4		North arrow.
5		Plan scale. The scale and dimensions must be such that all information is fully legible.
6		Site location map (insert map).
7		Name, address, and telephone number of the property owner and applicant (if not the property owner).
8		Name, address, email address and telephone number of the person or firm responsible for plan preparation.
9		Site plan elements – site features detailing location and dimensions: a) Site area in square feet and acres j) Drives b) Open space in square feet k) Sidewalks/paths c) Lot lines l) Adjacent street right-of-way d) Buildings and building setbacks – existing and proposed m) Housing Units by size and type e) Spacing between structures n) Utilities – location, type and size f) Parking areas, parking lot setbacks, and surface composition o) Dumpsters/trash disposal – location and shielding g) Number of parking spaces p) Natural features – wetlands, floodplains, etc. h) Typical parking space size q) Zone classifications of property i) Curb cuts openings – size and curb radii r) Other site Elements
10		Landscape plan depicting the type, location, and size of existing and proposed landscape and irrigation.
11		Building elevations with dimensions.
12		Fences or screening, if applicable. Indicate the type, location, and size.
13		Surface (storm) water management facilities.
14		Signs – location, type, and size.
15		Project phases and timing.

***Notes:**

- Depending on the scope of a project, certain requirements may be waived by the Zoning Administrator.
- Additional project information may be required if needed to determine compliance with the standards of the ordinance. Examples include, but are not limited to, site topography, traffic impact assessments, utility assessments, and market information.
- Required Coordinate System: As required by the City, deliverables shall be in AutoCAD compatible format referenced to Michigan State Plane Central coordinates (NAD83) with International feet as the units, rectified at the base elevation of 1300 feet. Vertical datum: City of Cadillac datum (NAVD 1927 datum).

City of Cadillac Stormwater Design Requirements

1. Refer to NOAA Point Precipitation Rainfall Estimates for site.
 - a. https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html
 - b. Rainfall estimates change regularly. Please provide a current chart for your specific site.
2. All onsite piping shall be sized to handle the maximum flow rate calculated for a 10 year event using the rational method ($Q_{peak}=C*i*A$)
 - a. Use calculated time of concentration (minimum 10 minutes)
3. 10 year, 24 hour event over all impervious surfaces shall be retained and infiltrated on-site
 - a. Infiltration rate of 2 inches per hour over bottom contour can be used for sandy soils
 - b. Greater infiltration rates allowed with testing
4. Site piping may be attached to city storm system, but must be designed as an overflow.
5. Stormwater Design Review submittal requirements
 - a. NOAA Point Precipitation Estimates
 - b. Site Plan with contributing areas and weighted C values
 - c. Drainage Calculations for pipe and basin sizing
 - d. Soil Infiltration testing results (if applicable)

CONCRETE SEWER SLOPE AND CAPACITY

Manning's N

0.013 for concrete pipe

Size (in)	Minimum Slope	Capacity at Minimum Slope (cf/s)
12	0.48%	2.48
15	0.36%	3.89
18	0.28%	5.57
24	0.17%	9.35
30	0.15%	15.93
36	0.12%	23.17
42	0.12%	34.95
48	0.10%	45.55
54	0.09%	59.15

PLASTIC SEWER SLOPE AND CAPACITY

Manning's N

0.012 for smooth wall HDPE pipe

Size (in)	Minimum Slope	Capacity at Minimum Slope (cf/s)
12	0.48%	2.68
15	0.36%	4.21
18	0.28%	6.04
24	0.17%	10.13
30	0.15%	17.26
36	0.12%	25.10
42	0.12%	37.86
48	0.10%	49.34
54	0.09%	64.08

10 YEAR - 24 HOUR RAINFALL DEPTH EXAMPLE

NOAA Atlas 14, Volume 8, Version 2 CADILLAC

Station ID: 20-1176

Location name: Cadillac, Michigan, USA*

Latitude: 44.2656°, Longitude: -85.3967°

Elevation:

Elevation (station metadata): 1295 ft**

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffrey Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.281 (0.227-0.360)	0.335 (0.270-0.430)	0.428 (0.343-0.551)	0.510 (0.407-0.658)	0.630 (0.485-0.844)	0.728 (0.544-0.984)	0.830 (0.597-1.15)	0.939 (0.643-1.33)	1.09 (0.714-1.58)	1.21 (0.767-1.77)
10-min	0.412 (0.332-0.528)	0.491 (0.395-0.629)	0.627 (0.503-0.806)	0.747 (0.595-0.964)	0.922 (0.710-1.24)	1.07 (0.797-1.44)	1.22 (0.874-1.68)	1.38 (0.941-1.94)	1.60 (1.05-2.31)	1.77 (1.12-2.59)
15-min	0.502 (0.405-0.643)	0.598 (0.482-0.767)	0.765 (0.613-0.983)	0.911 (0.726-1.18)	1.13 (0.866-1.51)	1.30 (0.972-1.76)	1.48 (1.07-2.05)	1.68 (1.15-2.37)	1.95 (1.27-2.82)	2.16 (1.37-3.15)
30-min	0.715 (0.576-0.916)	0.851 (0.685-1.09)	1.09 (0.873-1.40)	1.30 (1.04-1.68)	1.61 (1.24-2.16)	1.87 (1.40-2.53)	2.14 (1.54-2.96)	2.43 (1.66-3.43)	2.83 (1.85-4.10)	3.15 (2.00-4.60)
60-min	0.946 (0.762-1.21)	1.11 (0.897-1.43)	1.42 (1.13-1.82)	1.69 (1.35-2.18)	2.10 (1.62-2.83)	2.45 (1.83-3.32)	2.82 (2.03-3.90)	3.22 (2.21-4.56)	3.79 (2.48-5.49)	4.24 (2.69-6.19)
2-hr	1.18 (0.960-1.49)	1.38 (1.12-1.74)	1.74 (1.41-2.20)	2.08 (1.68-2.64)	2.59 (2.03-3.45)	3.02 (2.30-4.06)	3.49 (2.55-4.78)	4.01 (2.79-5.61)	4.74 (3.15-6.79)	5.33 (3.43-7.68)
3-hr	1.33 (1.09-1.66)	1.54 (1.26-1.93)	1.93 (1.58-2.42)	2.30 (1.87-2.89)	2.87 (2.27-3.79)	3.36 (2.57-4.47)	3.89 (2.87-5.29)	4.48 (3.14-6.23)	5.32 (3.57-7.57)	6.02 (3.89-8.59)
6-hr	1.59 (1.32-1.96)	1.81 (1.51-2.24)	2.24 (1.86-2.77)	2.66 (2.19-3.29)	3.31 (2.66-4.32)	3.88 (3.02-5.10)	4.51 (3.37-6.05)	5.21 (3.71-7.15)	6.22 (4.23-8.74)	7.06 (4.63-9.94)
12-hr	1.84 (1.56-2.24)	2.08 (1.76-2.53)	2.55 (2.14-3.10)	3.00 (2.50-3.66)	3.71 (3.03-4.78)	4.34 (3.43-5.63)	5.04 (3.82-6.67)	5.82 (4.20-7.88)	6.96 (4.80-9.64)	7.90 (5.25-11.0)
24-hr	2.10 (1.79-2.50)	2.36 (2.01-2.81)	2.86 (2.43-3.42)	3.35 (2.83-4.02)	4.13 (3.41-5.23)	4.82 (3.85-6.14)	5.58 (4.28-7.27)	6.43 (4.70-8.58)	7.67 (5.36-10.5)	8.70 (5.86-11.9)
2-day	2.38 (2.06-2.79)	2.67 (2.31-3.13)	3.23 (2.78-3.80)	3.77 (3.23-4.46)	4.63 (3.88-5.77)	5.39 (4.37-6.76)	6.23 (4.84-7.99)	7.16 (5.30-9.40)	8.51 (6.03-11.5)	9.63 (6.57-13.0)
3-day	2.59 (2.26-3.01)	2.91 (2.54-3.39)	3.52 (3.06-4.10)	4.10 (3.54-4.80)	5.02 (4.22-6.18)	5.81 (4.74-7.22)	6.69 (5.24-8.49)	7.66 (5.72-9.96)	9.06 (6.47-12.1)	10.2 (7.03-13.7)
4-day	2.79 (2.45-3.22)	3.14 (2.75-3.62)	3.78 (3.30-4.38)	4.39 (3.81-5.10)	5.35 (4.52-6.53)	6.17 (5.06-7.60)	7.07 (5.57-8.91)	8.07 (6.05-10.4)	9.51 (6.82-12.6)	10.7 (7.40-14.2)
7-day	3.34 (2.96-3.80)	3.74 (3.31-4.26)	4.46 (3.94-5.10)	5.14 (4.51-5.89)	6.18 (5.27-7.42)	7.07 (5.85-8.57)	8.03 (6.39-9.97)	9.09 (6.89-11.6)	10.6 (7.68-13.8)	11.8 (8.28-15.6)
10-day	3.83 (3.42-4.32)	4.27 (3.81-4.82)	5.07 (4.51-5.74)	5.80 (5.12-6.59)	6.90 (5.92-8.19)	7.84 (6.53-9.40)	8.84 (7.08-10.9)	9.93 (7.58-12.5)	11.5 (8.38-14.9)	12.7 (8.98-16.6)
20-day	5.21 (4.72-5.78)	5.79 (5.24-6.43)	6.79 (6.12-7.56)	7.66 (6.86-8.56)	8.93 (7.73-10.3)	9.96 (8.38-11.7)	11.0 (8.93-13.2)	12.2 (9.38-15.0)	13.7 (10.1-17.4)	15.0 (10.7-19.2)
30-day	6.40 (5.85-7.03)	7.10 (6.48-7.80)	8.26 (7.51-9.09)	9.24 (8.34-10.2)	10.6 (9.23-12.1)	11.7 (9.90-13.5)	12.8 (10.4-15.1)	13.9 (10.8-16.9)	15.4 (11.4-19.3)	16.6 (11.9-21.1)
45-day	7.98 (7.35-8.66)	8.81 (8.11-9.58)	10.2 (9.31-11.1)	11.3 (10.2-12.3)	12.7 (11.1-14.3)	13.8 (11.8-15.8)	14.9 (12.2-17.4)	16.0 (12.5-19.2)	17.4 (13.0-21.5)	18.4 (13.3-23.2)
60-day	9.36 (8.68-10.1)	10.3 (9.55-11.1)	11.8 (10.9-12.8)	13.0 (11.9-14.1)	14.5 (12.8-16.1)	15.6 (13.4-17.7)	16.7 (13.8-19.3)	17.7 (13.9-21.1)	18.9 (14.2-23.2)	19.8 (14.5-24.8)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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10 YEAR - 10 MINUTE RAINFALL INTENSITY EXAMPLE



NOAA Atlas 14, Volume 8, Version 2
Location name: Cadillac, Michigan, USA*
Latitude: 44.2656°, Longitude: -85.3967°
Elevation: 1292.36 ft**
* source: ESRI Maps
** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffrey Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aeriels](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	3.37 (2.72-4.32)	4.02 (3.24-5.16)	5.14 (4.12-6.61)	6.12 (4.88-7.90)	7.56 (5.82-10.1)	8.74 (6.53-11.8)	9.96 (7.16-13.8)	11.3 (7.72-15.9)	13.1 (8.57-18.9)	14.5 (9.20-21.2)
10-min	2.47 (1.99-3.17)	2.95 (2.37-3.77)	3.76 (3.02-4.84)	4.48 (3.57-5.78)	5.53 (4.26-7.42)	6.40 (4.78-8.65)	7.30 (5.24-10.1)	8.25 (5.65-11.7)	9.58 (6.27-13.8)	10.6 (6.74-15.5)
15-min	2.01 (1.62-2.57)	2.39 (1.93-3.07)	3.06 (2.45-3.93)	3.64 (2.90-4.70)	4.50 (3.46-6.03)	5.20 (3.89-7.03)	5.93 (4.26-8.19)	6.71 (4.59-9.48)	7.79 (5.10-11.3)	8.64 (5.48-12.6)
30-min	1.43 (1.15-1.83)	1.70 (1.37-2.18)	2.18 (1.75-2.80)	2.60 (2.07-3.36)	3.22 (2.48-4.32)	3.74 (2.80-5.06)	4.28 (3.08-5.91)	4.85 (3.33-6.86)	5.66 (3.71-8.19)	6.31 (4.00-9.20)
60-min	0.946 (0.762-1.21)	1.11 (0.897-1.43)	1.42 (1.13-1.82)	1.69 (1.35-2.18)	2.10 (1.62-2.83)	2.45 (1.83-3.32)	2.82 (2.03-3.90)	3.22 (2.21-4.56)	3.79 (2.48-5.49)	4.24 (2.69-6.19)
2-hr	0.588 (0.480-0.742)	0.688 (0.561-0.870)	0.870 (0.706-1.10)	1.04 (0.838-1.32)	1.29 (1.01-1.72)	1.51 (1.15-2.03)	1.75 (1.28-2.39)	2.00 (1.39-2.80)	2.37 (1.58-3.39)	2.67 (1.71-3.84)
3-hr	0.442 (0.364-0.553)	0.512 (0.421-0.641)	0.642 (0.525-0.806)	0.765 (0.621-0.963)	0.954 (0.756-1.26)	1.12 (0.857-1.49)	1.30 (0.954-1.76)	1.49 (1.05-2.07)	1.77 (1.19-2.52)	2.00 (1.30-2.86)
6-hr	0.265 (0.221-0.327)	0.303 (0.252-0.373)	0.375 (0.310-0.463)	0.444 (0.365-0.550)	0.553 (0.444-0.722)	0.648 (0.504-0.852)	0.753 (0.563-1.01)	0.870 (0.619-1.19)	1.04 (0.707-1.46)	1.18 (0.773-1.66)
12-hr	0.153 (0.129-0.186)	0.173 (0.146-0.210)	0.211 (0.177-0.257)	0.249 (0.207-0.303)	0.308 (0.251-0.397)	0.360 (0.284-0.467)	0.418 (0.317-0.554)	0.483 (0.349-0.654)	0.577 (0.398-0.800)	0.655 (0.435-0.910)
24-hr	0.087 (0.075-0.104)	0.098 (0.084-0.117)	0.119 (0.101-0.143)	0.139 (0.118-0.168)	0.172 (0.142-0.218)	0.201 (0.160-0.256)	0.232 (0.178-0.303)	0.268 (0.196-0.357)	0.320 (0.223-0.437)	0.363 (0.244-0.496)
2-day	0.050 (0.043-0.058)	0.056 (0.048-0.065)	0.067 (0.058-0.079)	0.079 (0.067-0.093)	0.097 (0.081-0.120)	0.112 (0.091-0.141)	0.130 (0.101-0.166)	0.149 (0.110-0.196)	0.177 (0.126-0.239)	0.201 (0.137-0.271)
3-day	0.036 (0.031-0.042)	0.040 (0.035-0.047)	0.049 (0.042-0.057)	0.057 (0.049-0.067)	0.070 (0.059-0.086)	0.081 (0.066-0.100)	0.093 (0.073-0.118)	0.106 (0.079-0.138)	0.126 (0.090-0.168)	0.142 (0.098-0.190)
4-day	0.029 (0.026-0.034)	0.033 (0.029-0.038)	0.039 (0.034-0.046)	0.046 (0.040-0.053)	0.056 (0.047-0.068)	0.064 (0.053-0.079)	0.074 (0.058-0.093)	0.084 (0.063-0.109)	0.099 (0.071-0.131)	0.111 (0.077-0.148)
7-day	0.020 (0.018-0.023)	0.022 (0.020-0.025)	0.027 (0.023-0.030)	0.031 (0.027-0.035)	0.037 (0.031-0.044)	0.042 (0.035-0.051)	0.048 (0.038-0.059)	0.054 (0.041-0.069)	0.063 (0.046-0.082)	0.070 (0.049-0.093)
10-day	0.016 (0.014-0.018)	0.018 (0.016-0.020)	0.021 (0.019-0.024)	0.024 (0.021-0.027)	0.029 (0.025-0.034)	0.033 (0.027-0.039)	0.037 (0.029-0.045)	0.041 (0.032-0.052)	0.048 (0.035-0.062)	0.053 (0.037-0.069)
20-day	0.011 (0.010-0.012)	0.012 (0.011-0.013)	0.014 (0.013-0.016)	0.016 (0.014-0.018)	0.019 (0.016-0.022)	0.021 (0.017-0.024)	0.023 (0.019-0.028)	0.025 (0.020-0.031)	0.029 (0.021-0.036)	0.031 (0.022-0.040)
30-day	0.009 (0.008-0.010)	0.010 (0.009-0.011)	0.011 (0.010-0.013)	0.013 (0.012-0.014)	0.015 (0.013-0.017)	0.016 (0.014-0.019)	0.018 (0.014-0.021)	0.019 (0.015-0.023)	0.021 (0.016-0.027)	0.023 (0.017-0.029)
45-day	0.007 (0.007-0.008)	0.008 (0.008-0.009)	0.009 (0.009-0.010)	0.010 (0.009-0.011)	0.012 (0.010-0.013)	0.013 (0.011-0.015)	0.014 (0.011-0.016)	0.015 (0.012-0.018)	0.016 (0.012-0.020)	0.017 (0.012-0.021)
60-day	0.007 (0.006-0.007)	0.007 (0.007-0.008)	0.008 (0.008-0.009)	0.009 (0.008-0.010)	0.010 (0.009-0.011)	0.011 (0.009-0.012)	0.012 (0.010-0.013)	0.012 (0.010-0.015)	0.013 (0.010-0.016)	0.014 (0.010-0.017)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
Please refer to NOAA Atlas 14 document for more information.

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STORMWATER CALCULATION EXAMPLES

ONSITE STORAGE REQUIRED

Given

$A_{\text{impervious}} := 15000 \text{ft}^2$ measured impervious contributing area

$d_{10\text{yr}_24\text{hr}} := 3.35 \text{in}$ depth of 10 year, 24 hour rainfall event (NOAA Atlas-14)

$A_{\text{bott_basin}} := 500 \text{ft}^2$ area of bottom of basin (measured / designed)

$i_{\text{soil}} := 2 \frac{\text{in}}{\text{hr}}$ infiltration rate of sandy soil (assumed, can be more if tested)

Calculations

$V_{\text{storm}} := A_{\text{impervious}} \cdot d_{10\text{yr}_24\text{hr}} = 4187.5 \cdot \text{ft}^3$ total volume of storm

$V_{\text{infiltrated}} := A_{\text{bott_basin}} \cdot i_{\text{soil}} \cdot 24\text{hr} = 2000 \cdot \text{ft}^3$ total volume percolated during storm

$V_{\text{onsite_min}} := V_{\text{storm}} - V_{\text{infiltrated}} = 2187.5 \cdot \text{ft}^3$ minimum basin size required

PIPE SIZING

Given

$A_{\text{roof}} := 0.5 \text{acre}$ measured area of roof

$A_{\text{lawn}} := 0.3 \text{acre}$ measured area of lawn

$i := 4.48 \frac{\text{in}}{\text{hr}}$ rainfall intensity for calculated time of concentration

$C_{\text{roof}} := 0.95$ runoff coefficient for roof

$C_{\text{lawn}} := 0.30$ runoff coefficient for lawn

Calculations

$C_{\text{weighted}} := \frac{A_{\text{roof}} \cdot C_{\text{roof}} + A_{\text{lawn}} \cdot C_{\text{lawn}}}{A_{\text{roof}} + A_{\text{lawn}}} = 0.71$ weighted (average) runoff coefficient

$Q_{\text{pipe}} := C_{\text{weighted}} \cdot i \cdot (A_{\text{roof}} + A_{\text{lawn}}) = 2.55 \cdot \frac{\text{ft}^3}{\text{sec}}$ peak flow in pipe

For pipe system, add upstream peak flow to current pipe peak flow to determine pipe capacity