# Drainage Report & SWPPP

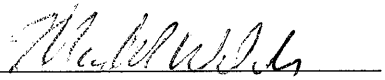
For

# 504 Development PUD

Kasson, MN

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional under the laws of the State of Minnesota.

Print Name: Mark R Welch

Signature: 

Date: 10-13-22 License #: 42736

# Hydrology Summary & Stormwater Pollution Prevention Plan (SWPPP)

# 504 Development PUD

# Multiple residential buildings

**Kasson, MN**

**Site Address:**
General vicinity of 1509 4th Ave Ln NE, Kasson, MN

**Property Owner:**
504 Development LLC
Attn: Aaron Thompson
1647 16th Ave NW #8
Rochester, MN 55901

**Site Work Contractor:**
Snow Contracting
Attn: Dalton Snow
684 Marcus Place NE
Byron, MN 55920

**Site Engineering Firm:**
G-Cubed Inc.
Mark Welch
14070 Hwy 52 SE
Chatfield, MN 55923
507-867-1666 ext 105
markw@ggg.to

**SWPPP Prepared by:**
Certified SWPPP designer: Mark R. Welch, P.E. – SWPPP certified thru 2025
Certified SWPPP construction site manager: Mark R. Welch, PE – certified thru 2024

**Estimated Construction Dates:**
Start of Construction: Building #1 under construction. Storm/driveway fall 2022. Future buildings and apartment building as market dictates.
Completion of Construction: Summer 2023
This SWPPP shall be updated as needed to meet the requirements of any City of Kasson ordinances, Dodge County ordinances, or as needed to provide the Best Management Practices available.

Last Revised Date: 10/12/2022

# SITE EVALUATION, ASSESSMENT, AND PLANNING

## Site Overview:

The property is located within the City of Kasson, MN in Dodge County. It is located south of 16th Street NE and west of 5th Ave NE. To the west is a single family house adjacent to the northerly 2/3s of the property with the south 1/3 and south side of the property abutting land owned by the Kasson School District #204. There is one existing residence on the property which was replatted to allow for construction of three - four unit residential buildings and one lot designated for an apartment building. One lot in the northeast corner of the development will be excavated for a stormwater detention basin to meet City and State stormwater discharge requirements.

The property was platted as Thompson Addition. Lots 1 thru 4 have the first of the four plex building located on them. Lots 5 thru 8 and 10 thru 13 are the locations for the other two four plex buildings. Lot 9 is the lot proposed for a 33 unit apartment building with understory parking. Lot 14 has the existing house located on it and Lot 15 is the lot planned for stormwater treatment facilities. There is an outlot which is the common private drive that the existing house and four plex buildings take access from. The apartment would have a parking lot and access off Outlot A but would have a garage access off 5th Ave NE.

The closest natural receiving water is Masten Creek which is located approximately three-quarters of a mile to the east. The closest impaired water is the Middle Fork of the Zumbro River which lies over one mile to the north. The site is therefore not subject to Parts C.1 of Appendix A of the NPDES permit. All disturbed and exposed soils shall be completely stabilized within 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.

Soils within the area of the project are Readlyn silt loam (Soil Series M511A) which have a profile of 0 to 15 inches of silt loam above about 5 five inches of loam over about 22 inches of clay loam over more loam. There are no restrictions (bedrock) to over 80 inches but the historically observed water table can be within 12 to 42 inches of the surface. The soil is not hydric but has a Hydrologic Soil Group of C/D. Infiltration is not allowed but filtration with underdrains are potential water quality volume options in addition to wet sedimentation basins.

The property is not subject to flooding. The project falls within FIRM map panel 2705480100B with an effective date of 9/24/1982. The City of Kasson is not in the flood area designations of this FIRM panel.

The property address of the first four plex is 1505 4th Ave Lane NE, Kasson Mn. Latitude: 43.0431° N (decimal degrees) Longitude: 92.7433° W (decimal degrees) per Google Earth web site.

This project is not in Indian Country. It is not part of a federal facility.

NPDES permit tracking Number: **C**_____

An EAW was not performed for this project because the project does not meet the threshold for mandatory review.

## Project Area Summary:

Total Area: 1.58 acres
Area of disturbance: 1.38 acres
Existing impervious surfacing: 0.10 acres (6.3%)
Proposed new impervious surfacing: 0.89 acres (56.3%)

### Existing Drainage Patterns

All runoff currently drains west to east. There are catchbasins in both 16th Street NE and 5th Ave NE adjacent to the property. Other than capacity of pipes due to the increases associated with Atlas 14 rainfall distribution, there are no other physical drainage deficiencies that have been brought to our attention. A map is attached in the appendix.

### Proposed Drainage Patterns

The roof pitch and slope away from the new structures significantly changes drainage patterns. Instead of all runoff sloping west to east into 5th Ave, there are now four distinct watersheds within the site. A map is attached in the appendix.

- **East** is an area of 0.22 acres of which 0.04 acres are impervious. This is the back half of the southeasterly four plex and a small portion of the existing house and associated greenspace which tops east towards 5th Ave. There are provisions for roof drains off the four plexes to connect to a pipe that will connect to the existing catchbasin east of the apartment building. This will reduce the surface flows that reach 5th Ave.
- **South** is the area of the south half of the apartment roof and associated greenspace which would sheet flow into the channel on the school property to the west and south. The roof will have gutters which will be connected to the existing catchbasin in 5th Ave described above. This watershed is 0.24 acres of which 0.15 acres are the roof area.
- **West** is an area of 0.19 acres which includes the westerly half of the westerly two four plex units. A swale is shaped within the property along the west property line to direct this runoff north to outlet into 16th Street where the runoff can enter a catchbasin located directly west of the private drive.
- **Basin** is the bulk of the property including the north half of the apartment roof, the apartment parking lot, the private drive and fronts of all three of the four plex buildings. Greenspace within the 0.93 acres watershed consists of the areas around the buildings and a stormwater basin designed in the northeast corner of the property. Overall there is 0.61 acres of impervious surfacing. For capture, there will be a buried pipe for connecting the north half of the apartment site, a

catchbasin connecting the roof drain and capturing the apartment runoff, a second catchbasin capturing the private drive and four plexes and the pipe routing these flows into the stormwater basin. The stormwater basin is a dry design with a foot of Media Mix D and underdrain. There is an outlet control structure that routes to another catchbasin in the private drive at the north property line. That routes to a new storm manhole this then connects to the existing catchbasin along the property in 16th Street. The basin controls the rates at which runoff leaves the site so that overall runoff rates are in line with those computed from existing conditions.

**Existing versus Proposed Conditions**

Existing vs proposed conditions were modeled in HydroCad ® with all proposed watersheds linked to a Total Proposed node. The results are summarized below.

| Catchment | Acres | % impervious | 2yr | 10 yr | 100 yr |
|---|---|---|---|---|---|
| Existing | 1.58 | 6.3% | 3.55 cfs | 7.13 cfs | 15.42 cfs |
| Proposed | 1.58 | 56.3% | 1.98 cfs | 7.31 cfs | 14.50 cfs |

The rate of release for the 2 yr event is significantly reduced while the 10 year event has a small increase (3%) and the 100 year event is reduced 6%. We adjusted the outlet elevations trying to create reductions across the board but were not able to achieve additional reduction of the 10 year event without adding a more complex outlet structure. We feel this small increase for a 10 year event model is acceptable considering the reductions provided during the 2 year event which is much more common.

## NPDES permit information:

Existing impervious surfacing = 0.10 acres
New impervious surfacing = 0.79 acres
Total impervious surfacing = 0.89 acres

The site does exceed an acre disturbed so an NPDES stormwater permit is required. The site does not exceed an acre of new impervious so NPDES requirements for Water Quality Volume are not a requirement. The basin provided on site addresses rate control which is a provision of the City of Kasson to ensure the project does not add excessive rates of runoff to the City's overall storm system.

## Additional Information:

**Receiving Waters within one mile:**

City storm system before reaching Masten Creek

Assessment unit: Not applicable

Impairments: Not defined

**Stormwater Treatment Measures:**

Estimated quantities, included but not limited are as follows:

| | |
|---|---|
| Silt Fence or approved linear sediment control device | 1040 lin. Ft. |
| Erosion Control Blanket | 460 sq yd |
| Temporary Seeding | 1.38 acres |
| Permanent Sod or Seeding & Mulch | 0.59 acres |

**Temporary Stormwater Treatment Measures:**
Temporary treatment measures are shown on the plans and shall consist of a combination of silt fence, erosion control blanket, protected swales and temporary seeding. All exposed soil areas must be stabilized as soon as possible to limit soil erosion but in no case later than seven (7) days after the construction activity in that portion of the site has temporarily or permanently ceased.

Temporary sedimentation basin:
Not required.

**Permanent Stormwater Treatment Measures**:
Not required for the NPDES permit. The site does not exceed 1.0 acres of new impervious. A rate control basin is provided to maintain acceptable site release rates.

# CONTACT INFORMATION

**Property Owner/Developer/Architect/Builder:**
504 Development LLC
Attn: Aaron Thompson
1647 16th Ave NW #8
Rochester, MN 55901

**Site Work Contractor:**
Snow Contracting
Attn: Dalton Snow
684 Marcus Place NE
Byron, MN 55920

**Site Engineering Firm:**
G-Cubed Inc.
Mark Welch
14070 Hwy 52 SE
Chatfield, MN 55923
507-867-1666 ext 105
markw@ggg.to

# GENERAL SITE INFORMATION

Permits and other approvals:

- A NPDES permit is required for this project based on area disturbed. The increase in impervious surfacing is less than one acre and therefore does not warrant permanent storm water treatment at this phase of development.
- This project requires authorization through a grading permit issued by the City of Kasson, MN.
- Other authorizations by federal, state, county, and city related to the project are required but are outside of the scope required for a SWPPP.
- As of Feb. 1, 2010, the individual(s) preparing the SWPPP for the project; individual(s) overseeing implementation of, revising, and amending the SWPPP and individual(s) performing inspections need to have received training (Part III.A2). Persons certified shall be identified on the front page of this SWPPP.

# EROSION PREVENTION AND SEDIMENT CONTROL BMP'S

Refer to the projects plans for locations and a detail of the BMP's designed for this project. Additional BMP's may be necessary as the construction progresses.

Temporary protection and prevention:
Will consist of silt fence, inlet protection, rock construction entrance, temporary seeding and mulching and other BMP's as determined necessary or described on the Erosion Control Plan. All exposed soil areas must be stabilized as soon as possible to limit soil erosion but in no case later than seven (7) days after the construction activity in that portion of the site has temporarily or permanently ceased. Additional BMP's will to be installed as determined necessary.

Permanent protection and prevention:
A regional pond is in place for treatment of storm water runoff from this property and adjacent properties. This project is not required to provide permanent facilities.

Concrete washouts:
Concrete washouts, which prohibit washout liquid and solid wastes from contacting the ground and entering the groundwater, may be; approved facilities offsite, portable onsite facilities, or facilities constructed onsite. All washouts facilities constructed on site must be in approved communal locations and/or located on the individual lot being developed. On site constructed facilities shall have a leak-proof, impermeable liner and follow the construction, maintenance and removal processes as recommended on the MPCA website (*http://www.pca.state.mn.us/publications/wq-strm2-24.pdf*).

Order of Activities:

1. Install erosion control measures such as silt fence and any applicable BMPs shown on the plan.
2. Removed topsoil. Stockpiles of materials shall have erosion controls installed immediately downstream of the stockpile.
3. Grading of the site shall take place.
4. Stabilize denuded areas and stockpiles within 7 days of last construction activity in that area.
5. Install utilities and construct buildings
6. Install surfacing and complete final grading and as well as permanent seeding and/or sod.
7. When all construction activity is complete and the site is stabilized, remove temporary erosion control devices and reestablish areas disturbed during the removal.

Process to Final Stabilization:

All exposed soil areas must be stabilized as soon as possible to limit soil erosion but in no case later than seven (7) days after the construction activity in that portion of the site has temporarily or permanently ceased. The Contractor shall maintain all erosion control until the vegetation is fully established and all evidence of erosion is addressed.

# IMPLEMENTATION AND INSPECTIONS

Training:
Recommend reading and following publication Stormwater Compliance Assistance Toolkit for small Construction Operators published by the Minnesota Pollution Control Agency, August 2008 wq-strm2-09 and can be found at link to document and/or on-file with our office.

Training your staff and subcontractors is an effective BMP. As with the other steps you take to prevent stormwater problems at your site, you should document the training that you conduct for your staff, for those with specific stormwater responsibilities (e.g. installing, inspecting, and maintaining BMPs), and for subcontractors.

Include dates, number of attendees, subjects covered, and length of training.

For more on this subject, see SWPPP Guide, Chapter 8.

General Stormwater and BMP awareness training for staff and subcontractors

Detailed training for staff and subcontractors with specific stormwater responsibilities

Identify Individual(s) Responsible for Training:

Implementation:
The implementation of this plan shall be overseen by the respective owner and contractors, general and sub, of the pertinent processes this SWPPP encompasses.

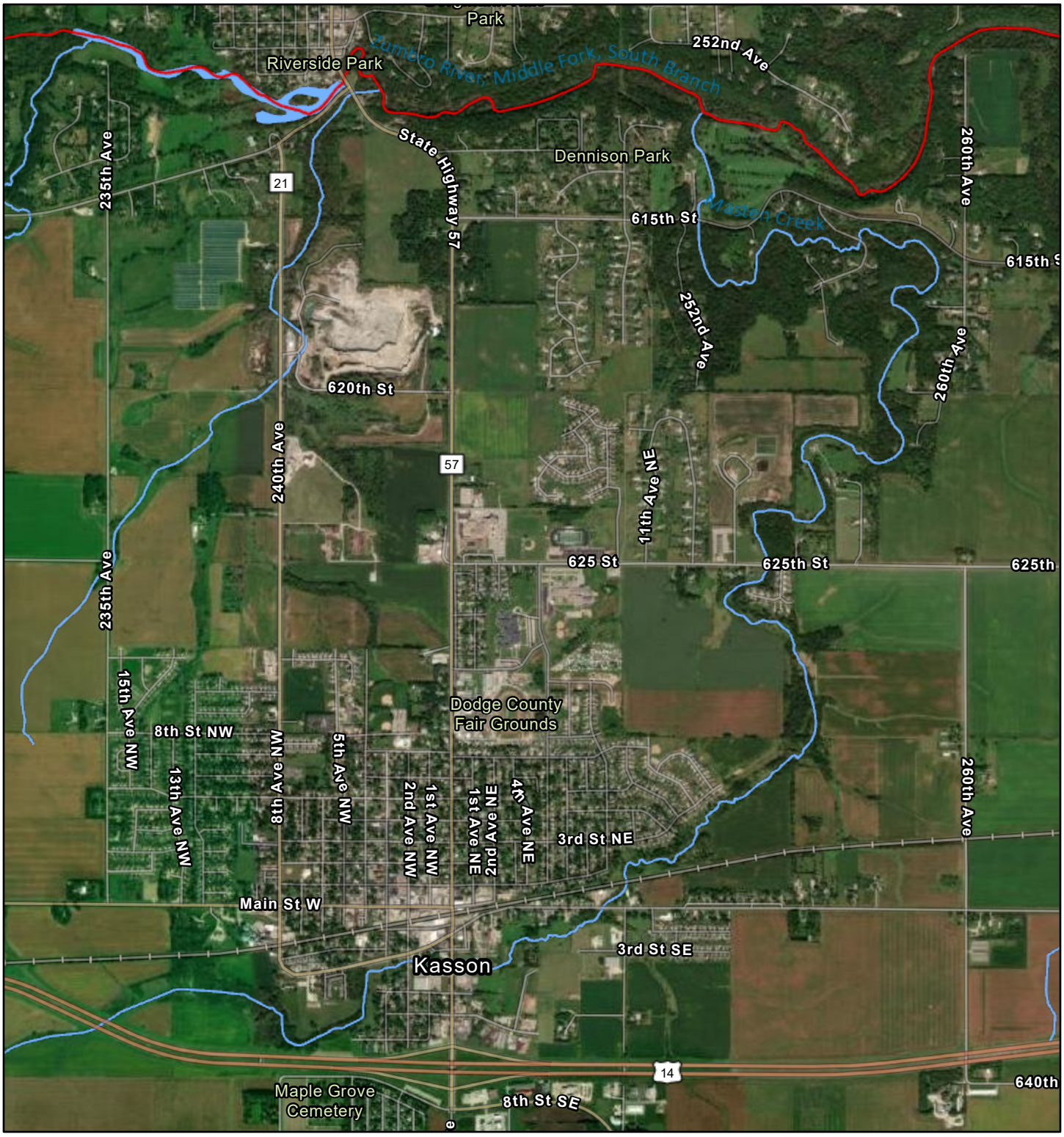
Inspections:
The General Contractor shall comply with all the requirements of the grading plan and shall be responsible for filling out inspection reports a minimum of once every 7 days during active construction and within 24 hours after a rainfall greater than 0.5 inches in 24 hours. All reports shall be kept on file and retained with the SWPPP.
*They shall include:*

A Date and time
B Name of person conducting inspection
C Finding of inspection, including recommendation for corrective actions.
E Date and time of rainfall events greater than 0.5 inches in 24 hours
F Documentation of changes made to the SWPPP

The Contractor's work shall include making adjustments in the field in order to minimize erosion and maximize the control of sediment.

# Special/Impaired Waters Map
# &
# Web Soil Survey - NRCS

# MPCA's Construction Stormwater Special Waters Search




10/12/2022, 9:10:53 AM

1:36,112

0 0.23 0.45 0.9 mi

0 0.35 0.7 1.4 km

Waterbody Units - Lakes (1)

Waterbody Units - Streams (1)

Impaired Streams with additional construction requirements

Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, Maxar

United States Department of Agriculture

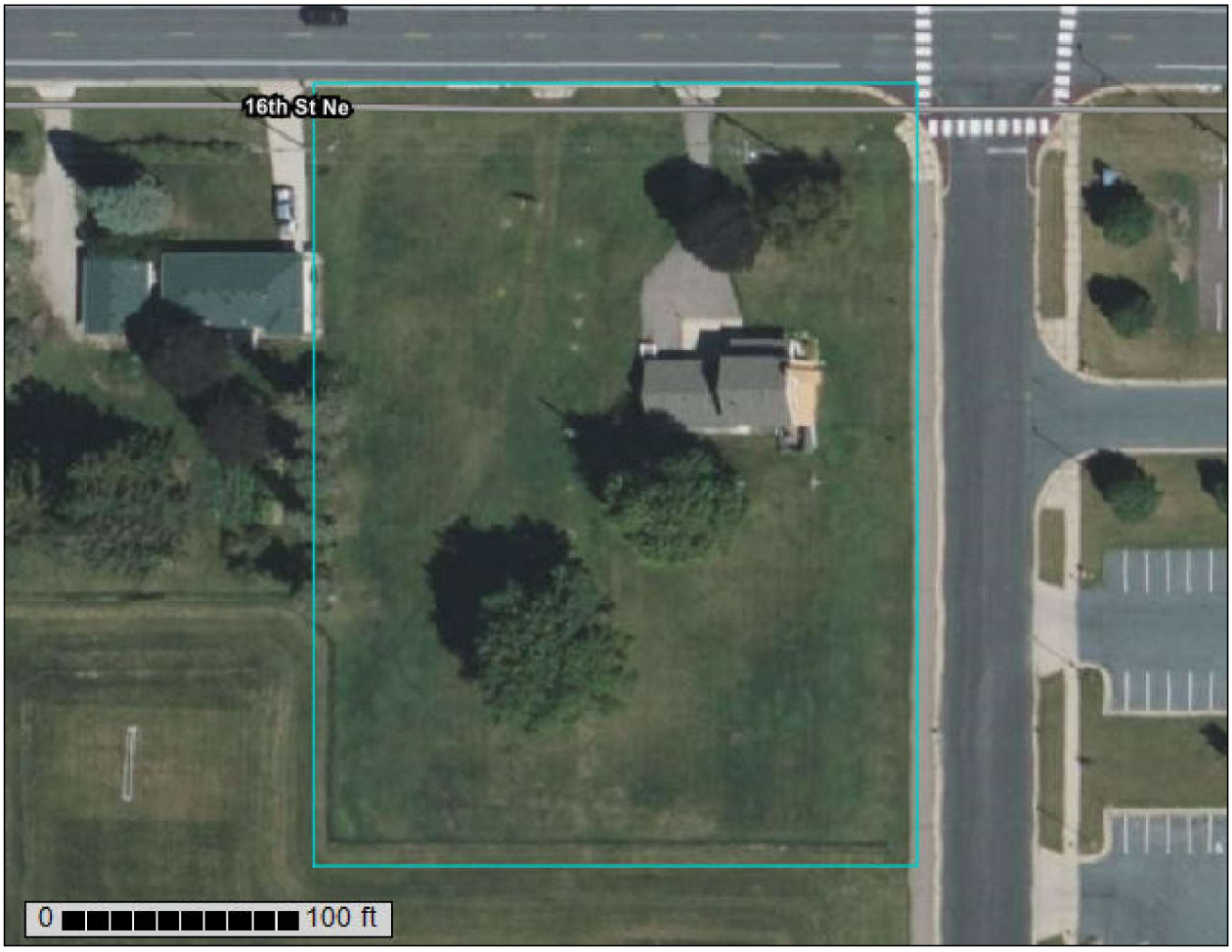
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

# Custom Soil Resource Report for Dodge County, Minnesota

## kasson




October 12, 2022

# Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

# Contents

**Preface**.....2
**How Soil Surveys Are Made**.....5
**Soil Map**.....8
Soil Map.....9
Legend.....10
Map Unit Legend.....11
Map Unit Descriptions.....11
Dodge County, Minnesota.....13
M507B—Marquis silt loam, 2 to 6 percent slopes.....13
M511A—Readlyn silt loam, 1 to 3 percent slopes.....14
M518B—Clyde-Floyd complex, 1 to 4 percent slopes.....15
**References**.....18

# How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

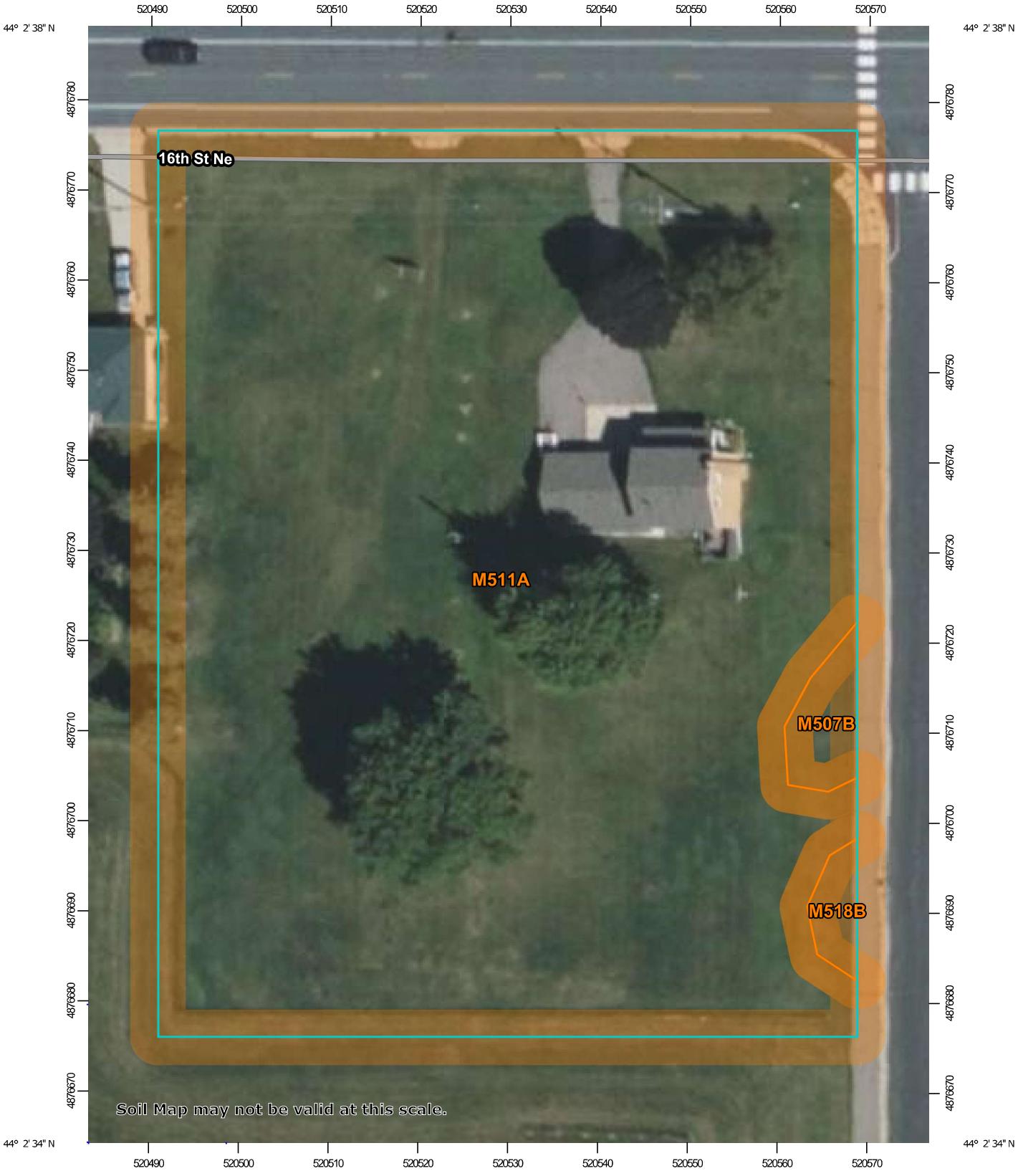
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

# Custom Soil Resource Report
## Soil Map




Map Scale: 1:603 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 5 10 20 30

Feet
0 25 50 100 150

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

## MAP LEGEND

**Area of Interest (AOI)**
- Area of Interest (AOI)

**Soils**
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

**Special Point Features**
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

**Water Features**
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Dodge County, Minnesota
Survey Area Data: Version 19, Sep 6, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 17, 2020—Sep 2, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| M507B | Marquis silt loam, 2 to 6 percent slopes | 0.0 | 1.3% |
| M511A | Readlyn silt loam, 1 to 3 percent slopes | 1.9 | 97.9% |
| M518B | Clyde-Floyd complex, 1 to 4 percent slopes | 0.0 | 0.8% |
| **Totals for Area of Interest** | | **1.9** | **100.0%** |

# Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

# Dodge County, Minnesota

## M507B—Marquis silt loam, 2 to 6 percent slopes

### Map Unit Setting

*National map unit symbol:* 2vw41
*Elevation:* 950 to 1,380 feet
*Mean annual precipitation:* 31 to 34 inches
*Mean annual air temperature:* 44 to 45 degrees F
*Frost-free period:* 160 to 171 days
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

*Marquis and similar soils:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Marquis

#### Setting

*Landform:* Interfluves
*Landform position (two-dimensional):* Summit, shoulder, backslope
*Landform position (three-dimensional):* Nose slope, side slope, crest
*Down-slope shape:* Convex
*Across-slope shape:* Convex
*Parent material:* Erosional sediments from fine-loamy till over loamy till

#### Typical profile

*Ap - 0 to 9 inches:* silt loam
*A - 9 to 19 inches:* silt loam
*Bw1 - 19 to 24 inches:* silt loam
*2Bw2 - 24 to 32 inches:* loam
*2Bw3 - 32 to 42 inches:* loam
*2Bw4 - 42 to 54 inches:* loam
*2BC - 54 to 79 inches:* loam

#### Properties and qualities

*Slope:* 2 to 6 percent
*Surface area covered with cobbles, stones or boulders:* 0.0 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Moderately well drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.14 in/hr)
*Depth to water table:* About 24 to 30 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum content:* 10 percent
*Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
*Available water supply, 0 to 60 inches:* High (about 10.1 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 2e
*Hydrologic Soil Group:* C

*Ecological site:* R104XY005IA - Loamy Upland Prairie
*Hydric soil rating:* No

**Minor Components**

**Readlyn**
*Percent of map unit:* 10 percent
*Landform:* Interfluves
*Landform position (two-dimensional):* Summit, backslope
*Landform position (three-dimensional):* Interfluve, side slope
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Ecological site:* R104XY005IA - Loamy Upland Prairie
*Hydric soil rating:* No

**Kenyon**
*Percent of map unit:* 5 percent
*Landform:* Interfluves
*Landform position (two-dimensional):* Summit, shoulder, backslope
*Landform position (three-dimensional):* Nose slope, side slope, crest
*Down-slope shape:* Convex
*Across-slope shape:* Convex
*Ecological site:* R104XY005IA - Loamy Upland Prairie
*Other vegetative classification:* Sloping Upland, Neutral (G104XS002MN)
*Hydric soil rating:* No

## M511A—Readlyn silt loam, 1 to 3 percent slopes

**Map Unit Setting**
*National map unit symbol:* 2y8pb
*Elevation:* 520 to 1,310 feet
*Mean annual precipitation:* 23 to 41 inches
*Mean annual air temperature:* 43 to 54 degrees F
*Frost-free period:* 155 to 210 days
*Farmland classification:* All areas are prime farmland

**Map Unit Composition**
*Readlyn and similar soils:* 95 percent
*Minor components:* 5 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Readlyn**

**Setting**
*Landform:* Interfluves
*Landform position (two-dimensional):* Summit
*Landform position (three-dimensional):* Interfluve, side slope
*Down-slope shape:* Convex
*Across-slope shape:* Linear
*Parent material:* Erosional sediments fine-loamy over loamy till

**Typical profile**

*Ap - 0 to 9 inches:* silt loam
*A - 9 to 15 inches:* silt loam
*BA - 15 to 19 inches:* loam
*Bw - 19 to 24 inches:* loam
*2Bg1 - 24 to 35 inches:* clay loam
*2Bg2 - 35 to 46 inches:* clay loam
*2BCg - 46 to 60 inches:* loam
*2BC - 60 to 79 inches:* loam

**Properties and qualities**

*Slope:* 1 to 3 percent
*Surface area covered with cobbles, stones or boulders:* 0.0 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Somewhat poorly drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.14 in/hr)
*Depth to water table:* About 12 to 42 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum content:* 25 percent
*Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
*Available water supply, 0 to 60 inches:* Moderate (about 6.9 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 1
*Hydrologic Soil Group:* C/D
*Ecological site:* R104XY005IA - Loamy Upland Prairie
*Forage suitability group:* Sloping Upland, Acid (G104XS006MN)
*Other vegetative classification:* Sloping Upland, Acid (G104XS006MN)
*Hydric soil rating:* No

**Minor Components**

**Tripoli**

*Percent of map unit:* 5 percent
*Landform:* Interfluves
*Landform position (two-dimensional):* Summit
*Landform position (three-dimensional):* Interfluve, head slope
*Down-slope shape:* Linear
*Across-slope shape:* Concave
*Ecological site:* R104XY006IA - Wet Loamy Upland Prairie
*Hydric soil rating:* Yes

## M518B—Clyde-Floyd complex, 1 to 4 percent slopes

**Map Unit Setting**

*National map unit symbol:* 1hh5d

*Elevation:* 980 to 1,310 feet
*Mean annual precipitation:* 28 to 33 inches
*Mean annual air temperature:* 43 to 48 degrees F
*Frost-free period:* 140 to 160 days
*Farmland classification:* Prime farmland if drained

**Map Unit Composition**

*Clyde and similar soils:* 55 percent
*Floyd and similar soils:* 40 percent
*Minor components:* 5 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Clyde**

**Setting**

*Landform:* Drainageways on till plains
*Down-slope shape:* Concave
*Across-slope shape:* Linear
*Parent material:* Loamy sediments over loamy till

**Typical profile**

*A,AB - 0 to 23 inches:* silty clay loam
*Bg1 - 23 to 41 inches:* silty clay loam
*Bg2 - 41 to 44 inches:* sandy loam
*BCg - 44 to 60 inches:* loam

**Properties and qualities**

*Slope:* 1 to 3 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Poorly drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.13 to 0.60 in/hr)
*Depth to water table:* About 0 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum content:* 10 percent
*Available water supply, 0 to 60 inches:* High (about 11.7 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 2w
*Hydrologic Soil Group:* B/D
*Ecological site:* R104XY012IA - Wet Upland Drainageway Sedge Meadow
*Forage suitability group:* Level Swale, Neutral (G104XS001MN)
*Other vegetative classification:* Level Swale, Neutral (G104XS001MN)
*Hydric soil rating:* Yes

**Description of Floyd**

**Setting**

*Landform:* Till plains
*Landform position (two-dimensional):* Footslope
*Down-slope shape:* Concave
*Across-slope shape:* Linear
*Parent material:* Silty sediments over loamy till

**Typical profile**

*Ap,A - 0 to 17 inches:* silt loam
*Bw - 17 to 39 inches:* sandy clay loam
*2Bw - 39 to 49 inches:* loam
*2BC - 49 to 60 inches:* loam

**Properties and qualities**

*Slope:* 1 to 4 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Somewhat poorly drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.13 to 0.60 in/hr)
*Depth to water table:* About 18 to 24 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum content:* 10 percent
*Available water supply, 0 to 60 inches:* High (about 11.5 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 1
*Hydrologic Soil Group:* B/D
*Ecological site:* R104XY005IA - Loamy Upland Prairie
*Forage suitability group:* Sloping Upland, Acid (G104XS006MN)
*Other vegetative classification:* Sloping Upland, Acid (G104XS006MN)
*Hydric soil rating:* No

**Minor Components**

**Clyde, swales**

*Percent of map unit:* 5 percent
*Landform:* Drainageways on till plains
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Ecological site:* R104XY012IA - Wet Upland Drainageway Sedge Meadow
*Other vegetative classification:* Level Swale, Neutral (G104XS001MN)
*Hydric soil rating:* Yes

# References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

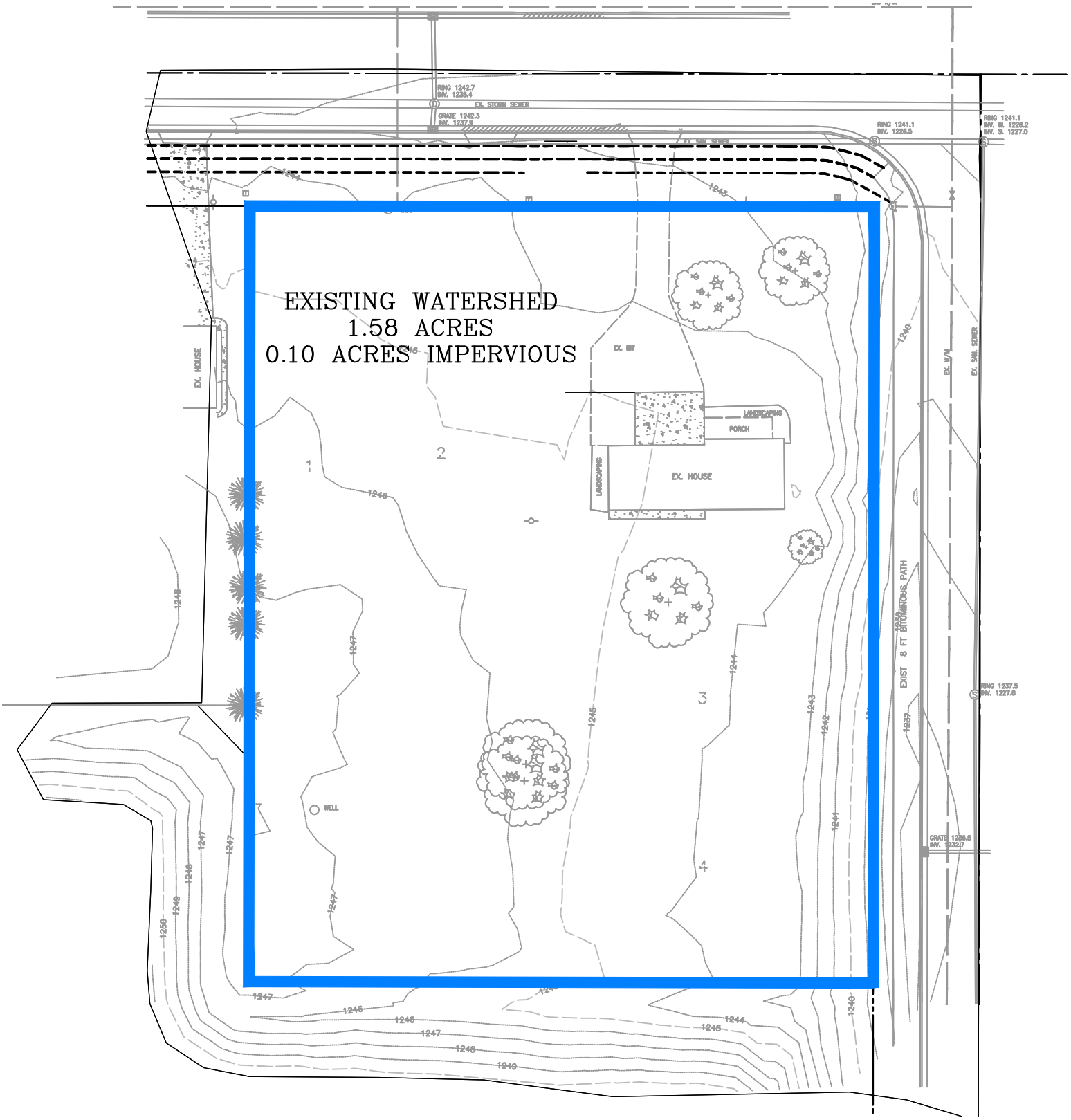
United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

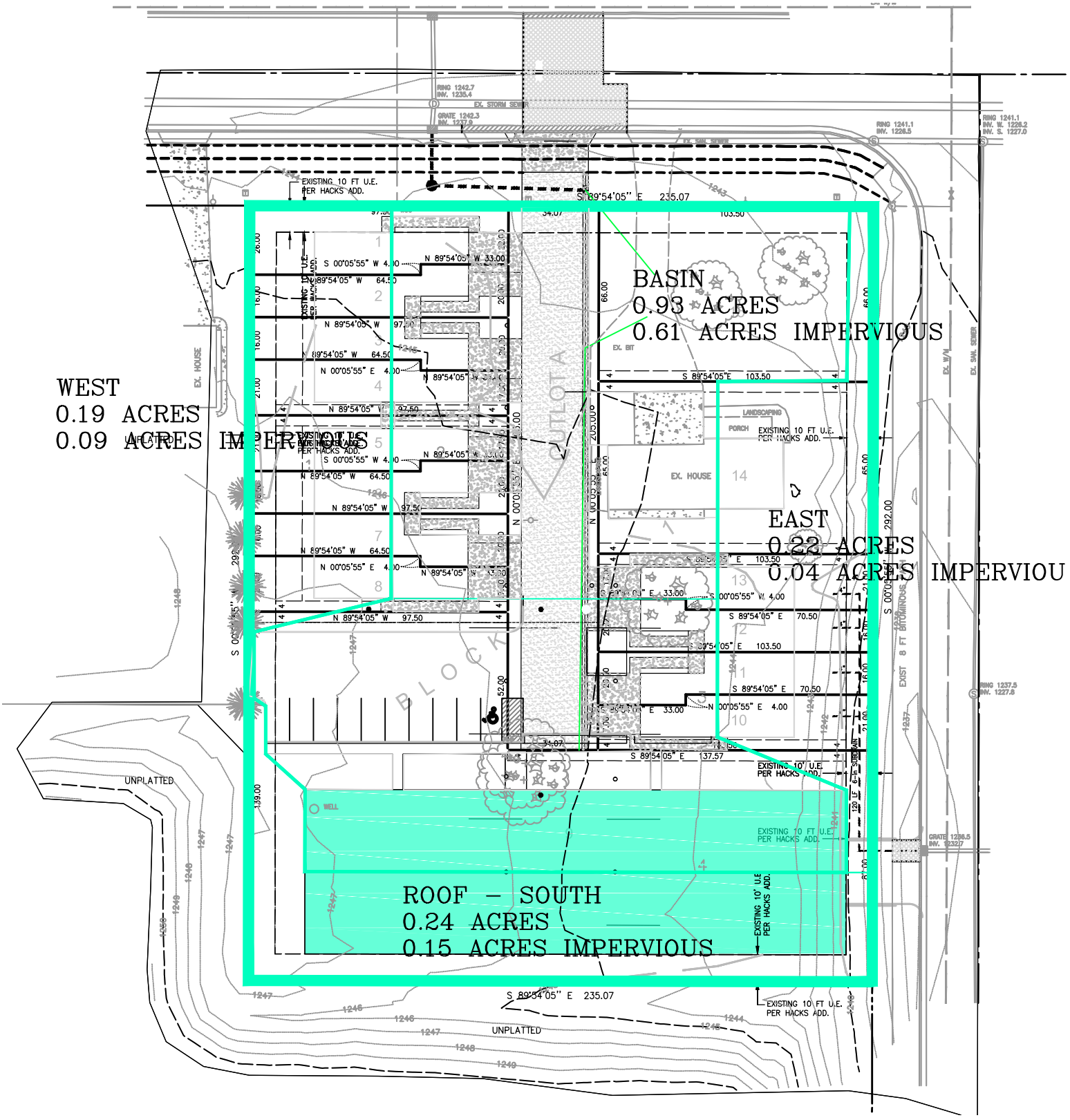
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

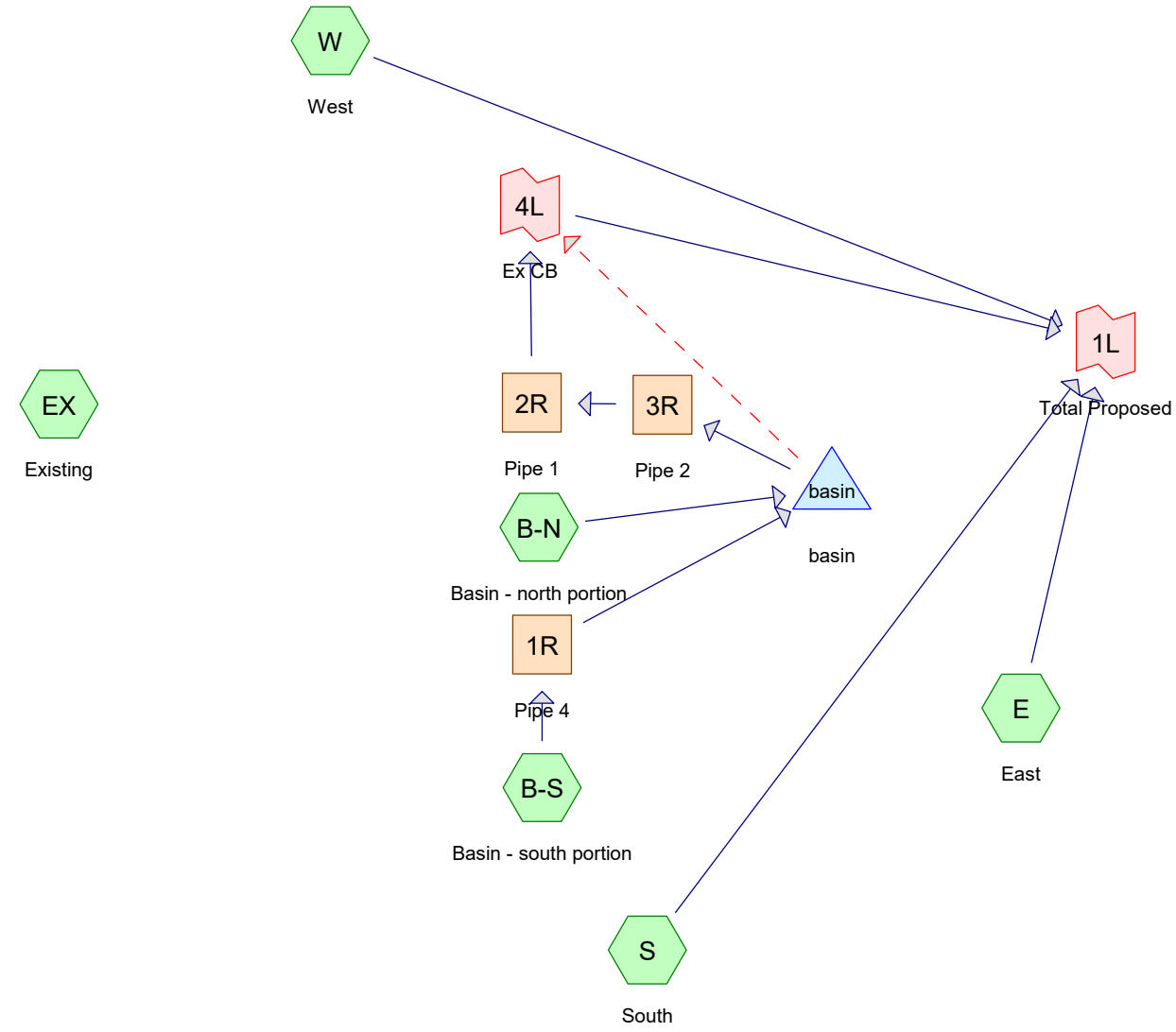
United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

# Existing and Proposed Drainage Maps & HydroCad® Report


EXISTING WATERSHED
1.58 ACRES
0.10 ACRES IMPERVIOUS
EX. HOUSE
EX. BIT
LANDSCAPING
PORCH
LANDSCAPING
EX. HOUSE
WELL
EX. HOUSE
EX. W/M
EX. SAN. SEWER
EXIST 8 FT BITUMINOUS PATH
RING 1242.7
INV. 1235.4
EX. STORM SEWER
GRATE 1242.3
INV. 1237.9
RING 1241.1
INV. 1228.5
RING 1241.1
INV. W. 1228.2
INV. S. 1227.0
RING 1237.5
INV. 1227.8
GRATE 1236.5
INV. 1232.7


BASIN
0.93 ACRES
0.61 ACRES IMPERVIOUS
WEST
0.19 ACRES
0.09 ACRES IMPERVIOUS
EAST
0.22 ACRES
0.04 ACRES IMPERVIOU
ROOF – SOUTH
0.24 ACRES
0.15 ACRES IMPERVIOUS
EXISTING 10 FT U.E. PER HACKS ADD.
S 89°54'05" E 235.07
EX. HOUSE
EX. BIT
LANDSCAPING
PORCH
UNPLATTED
BLOCK 1
OUTLOT A
EXIST 8 FT BITUMINOUS
EX. SAN. SEWER
EX. W/M
EX. STORM SEWER
RING 1242.7
INV. 1235.4
GRATE 1242.3
INV. 1237.9
RING 1241.1
INV. W. 1226.2
INV. S. 1227.0
RING 1237.5
INV. 1227.8
GRATE 1236.5
INV. 1232.7
WELL




Subcat Reach Pond Link

**Routing Diagram for Kasson Apartment**

Prepared by {enter your company name here}, Printed 10/12/2022

## Area Listing (all nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 1.480 | 79 | 50-75% Grass cover, Fair, HSG C (EX) |
| 0.560 | 74 | >75% Grass cover, Good, HSG C (B-N, B-S, E, S, W) |
| 0.740 | 98 | Paved parking, HSG C (B-N, B-S) |
| 0.380 | 98 | Unconnected roofs, HSG C (E, EX, S, W) |
| **3.160** | **85** | **TOTAL AREA** |

## Soil Listing (all nodes)

| Area (acres) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 0.000 | HSG A | |
| 0.000 | HSG B | |
| 3.160 | HSG C | B-N, B-S, E, EX, S, W |
| 0.000 | HSG D | |
| 0.000 | Other | |
| **3.160** | | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (acres) | HSG-B (acres) | HSG-C (acres) | HSG-D (acres) | Other (acres) | Total (acres) | Ground Cover | Subcatchment Numbers |
|---|---|---|---|---|---|---|---|
| 0.000 | 0.000 | 1.480 | 0.000 | 0.000 | 1.480 | 50-75% Grass cover, Fair | EX |
| 0.000 | 0.000 | 0.560 | 0.000 | 0.000 | 0.560 | >75% Grass cover, Good | B-N, B-S, E, S, W |
| 0.000 | 0.000 | 0.740 | 0.000 | 0.000 | 0.740 | Paved parking | B-N, B-S |
| 0.000 | 0.000 | 0.380 | 0.000 | 0.000 | 0.380 | Unconnected roofs | E, EX, S, W |
| **0.000** | **0.000** | **3.160** | **0.000** | **0.000** | **3.160** | **TOTAL AREA** | |

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment B-N: Basin - north portion** Runoff Area=0.470 ac 63.83% Impervious Runoff Depth=1.85"
Tc=6.0 min CN=89 Runoff=1.58 cfs 0.072 af

**Subcatchment B-S: Basin - south portion** Runoff Area=0.460 ac 95.65% Impervious Runoff Depth=2.60"
Tc=6.0 min CN=97 Runoff=1.97 cfs 0.100 af

**Subcatchment E: East** Runoff Area=0.220 ac 18.18% Impervious Runoff Depth=0.97"
Tc=6.0 min UI Adjusted CN=76 Runoff=0.40 cfs 0.018 af

**Subcatchment EX: Existing** Runoff Area=1.580 ac 6.33% Impervious Runoff Depth=1.21"
Tc=6.0 min CN=80 Runoff=3.55 cfs 0.159 af

**Subcatchment S: South** Runoff Area=0.240 ac 62.50% Impervious Runoff Depth=1.85"
Tc=6.0 min CN=89 Runoff=0.81 cfs 0.037 af

**Subcatchment W: West** Runoff Area=0.190 ac 47.37% Impervious Runoff Depth=1.54"
Tc=6.0 min CN=85 Runoff=0.54 cfs 0.024 af

**Reach 1R: Pipe 4** Avg. Flow Depth=0.48' Max Vel=4.50 fps Inflow=1.97 cfs 0.100 af
15.0" Round Pipe n=0.010 L=180.0' S=0.0056 '/' Capacity=6.26 cfs Outflow=1.95 cfs 0.100 af

**Reach 2R: Pipe 1** Avg. Flow Depth=0.28' Max Vel=6.32 fps Inflow=1.27 cfs 0.070 af
15.0" Round Pipe n=0.010 L=20.0' S=0.0200 '/' Capacity=11.88 cfs Outflow=1.27 cfs 0.070 af

**Reach 3R: Pipe 2** Avg. Flow Depth=0.28' Max Vel=6.32 fps Inflow=1.27 cfs 0.070 af
15.0" Round Pipe n=0.010 L=58.0' S=0.0200 '/' Capacity=11.88 cfs Outflow=1.27 cfs 0.070 af

**Pond basin: basin** Peak Elev=1,242.55' Storage=3,697 cf Inflow=3.53 cfs 0.172 af
Discarded=0.02 cfs 0.068 af Primary=1.27 cfs 0.070 af Secondary=0.00 cfs 0.000 af Outflow=1.30 cfs 0.138 af

**Link 1L: Total Proposed** Inflow=1.98 cfs 0.149 af
Primary=1.98 cfs 0.149 af

**Link 4L: Ex CB** Inflow=1.27 cfs 0.070 af
Primary=1.27 cfs 0.070 af

**Total Runoff Area = 3.160 ac Runoff Volume = 0.410 af Average Runoff Depth = 1.56"**
**64.56% Pervious = 2.040 ac 35.44% Impervious = 1.120 ac**

## Summary for Subcatchment B-N: Basin - north portion

Runoff = 1.58 cfs @ 12.13 hrs, Volume= 0.072 af, Depth= 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Rainfall=2.94"

| Area (ac) | CN | Description |
|---|---|---|
| 0.300 | 98 | Paved parking, HSG C |
| 0.170 | 74 | >75% Grass cover, Good, HSG C |
| 0.470 | 89 | Weighted Average |
| 0.170 | | 36.17% Pervious Area |
| 0.300 | | 63.83% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

## Summary for Subcatchment B-S: Basin - south portion

Runoff = 1.97 cfs @ 12.13 hrs, Volume= 0.100 af, Depth= 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Rainfall=2.94"

| Area (ac) | CN | Description |
|---|---|---|
| 0.440 | 98 | Paved parking, HSG C |
| 0.020 | 74 | >75% Grass cover, Good, HSG C |
| 0.460 | 97 | Weighted Average |
| 0.020 | | 4.35% Pervious Area |
| 0.440 | | 95.65% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, Direct - Minimum** |

## Summary for Subcatchment E: East

Runoff = 0.40 cfs @ 12.14 hrs, Volume= 0.018 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Rainfall=2.94"

| Area (ac) | CN | Adj | Description |
|---|---|---|---|
| 0.180 | 74 | | >75% Grass cover, Good, HSG C |
| 0.040 | 98 | | Unconnected roofs, HSG C |
| 0.220 | 78 | 76 | Weighted Average, UI Adjusted |
| 0.180 | | | 81.82% Pervious Area |
| 0.040 | | | 18.18% Impervious Area |
| 0.040 | | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

## Summary for Subcatchment EX: Existing

Runoff = 3.55 cfs @ 12.14 hrs, Volume= 0.159 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Rainfall=2.94"

| Area (ac) | CN | Description |
|---|---|---|
| 1.480 | 79 | 50-75% Grass cover, Fair, HSG C |
| 0.100 | 98 | Unconnected roofs, HSG C |
| 1.580 | 80 | Weighted Average |
| 1.480 | | 93.67% Pervious Area |
| 0.100 | | 6.33% Impervious Area |
| 0.100 | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

## Summary for Subcatchment S: South

Runoff = 0.81 cfs @ 12.13 hrs, Volume= 0.037 af, Depth= 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Rainfall=2.94"

| Area (ac) | CN | Description |
|---|---|---|
| 0.090 | 74 | >75% Grass cover, Good, HSG C |
| 0.150 | 98 | Unconnected roofs, HSG C |
| 0.240 | 89 | Weighted Average |
| 0.090 | | 37.50% Pervious Area |
| 0.150 | | 62.50% Impervious Area |
| 0.150 | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

## Summary for Subcatchment W: West

Runoff = 0.54 cfs @ 12.13 hrs, Volume= 0.024 af, Depth= 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Rainfall=2.94"

| Area (ac) | CN | Description |
|---|---|---|
| 0.100 | 74 | >75% Grass cover, Good, HSG C |
| 0.090 | 98 | Unconnected roofs, HSG C |
| 0.190 | 85 | Weighted Average |
| 0.100 | | 52.63% Pervious Area |
| 0.090 | | 47.37% Impervious Area |
| 0.090 | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

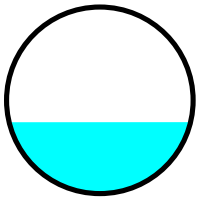
## Summary for Reach 1R: Pipe 4

Inflow Area = 0.460 ac, 95.65% Impervious, Inflow Depth = 2.60" for 2-yr event
Inflow = 1.97 cfs @ 12.13 hrs, Volume= 0.100 af
Outflow = 1.95 cfs @ 12.14 hrs, Volume= 0.100 af, Atten= 1%, Lag= 0.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.50 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.24 fps, Avg. Travel Time= 2.4 min

Peak Storage= 78 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.48'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 6.26 cfs

15.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 180.0' Slope= 0.0056 '/'
Inlet Invert= 1,242.00', Outlet Invert= 1,241.00'



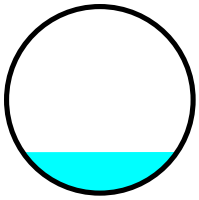
## Summary for Reach 2R: Pipe 1

Inflow Area = 0.930 ac, 79.57% Impervious, Inflow Depth = 0.90" for 2-yr event
Inflow = 1.27 cfs @ 12.27 hrs, Volume= 0.070 af
Outflow = 1.27 cfs @ 12.27 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.32 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.25 fps, Avg. Travel Time= 0.1 min

Peak Storage= 4 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 11.88 cfs

15.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 20.0' Slope= 0.0200 '/'
Inlet Invert= 1,238.30', Outlet Invert= 1,237.90'



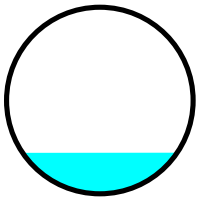
## Summary for Reach 3R: Pipe 2

Inflow Area = 0.930 ac, 79.57% Impervious, Inflow Depth = 0.90" for 2-yr event
Inflow = 1.27 cfs @ 12.27 hrs, Volume= 0.070 af
Outflow = 1.27 cfs @ 12.27 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.32 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.25 fps, Avg. Travel Time= 0.4 min

Peak Storage= 12 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 11.88 cfs

15.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 58.0' Slope= 0.0200 '/'
Inlet Invert= 1,239.46', Outlet Invert= 1,238.30'



## Summary for Pond basin: basin

Inflow Area = 0.930 ac, 79.57% Impervious, Inflow Depth = 2.22" for 2-yr event
Inflow = 3.53 cfs @ 12.13 hrs, Volume= 0.172 af
Outflow = 1.30 cfs @ 12.27 hrs, Volume= 0.138 af, Atten= 63%, Lag= 8.1 min
Discarded = 0.02 cfs @ 12.27 hrs, Volume= 0.068 af
Primary = 1.27 cfs @ 12.27 hrs, Volume= 0.070 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 1,242.55' @ 12.27 hrs Surf.Area= 3,016 sf Storage= 3,697 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 433.9 min ( 1,209.8 - 775.8 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 1,241.00' | 8,851 cf | **Custom Stage Data (Conic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|
| 1,241.00 | 1,800 | 0 | 0 | 1,800 |
| 1,242.00 | 2,556 | 2,167 | 2,167 | 2,574 |
| 1,243.00 | 3,420 | 2,978 | 5,145 | 3,459 |
| 1,244.00 | 4,000 | 3,706 | 8,851 | 4,078 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 1,240.26' | **15.0" Round Culvert**<br>L= 40.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,240.26' / 1,239.46' S= 0.0200 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf |
| #2 | Secondary | 1,243.25' | **10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64 |
| #3 | Discarded | 1,241.00' | **0.300 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 1,232.00' |
| #4 | Device 1 | 1,242.40' | **R-4342 grate Special & User-Defined**<br>Head (feet) 0.00 0.10 0.30 0.50 0.70 1.00 1.60 2.00 2.50<br>Disch. (cfs) 0.000 0.600 3.300 5.500 8.100 9.600 12.200 13.600 15.200 |

**Discarded OutFlow** Max=0.02 cfs @ 12.27 hrs HW=1,242.55' (Free Discharge)
↑—**3=Exfiltration** ( Controls 0.02 cfs)

**Primary OutFlow** Max=1.27 cfs @ 12.27 hrs HW=1,242.55' TW=1,239.74' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 1.27 cfs of 7.62 cfs potential flow)
↑—**4=R-4342 grate Special & User-Defined** (Custom Controls 1.27 cfs)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=1,241.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Summary for Link 1L: Total Proposed

Inflow Area = 1.580 ac, 64.56% Impervious, Inflow Depth = 1.13" for 2-yr event
Inflow = 1.98 cfs @ 12.25 hrs, Volume= 0.149 af
Primary = 1.98 cfs @ 12.25 hrs, Volume= 0.149 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

## Summary for Link 4L: Ex CB

Inflow Area = 0.930 ac, 79.57% Impervious, Inflow Depth = 0.90" for 2-yr event
Inflow = 1.27 cfs @ 12.27 hrs, Volume= 0.070 af
Primary = 1.27 cfs @ 12.27 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment B-N: Basin - north portion** Runoff Area=0.470 ac 63.83% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=89 Runoff=2.72 cfs 0.128 af

**Subcatchment B-S: Basin - south portion** Runoff Area=0.460 ac 95.65% Impervious Runoff Depth=4.12"
Tc=6.0 min CN=97 Runoff=3.04 cfs 0.158 af

**Subcatchment E: East** Runoff Area=0.220 ac 18.18% Impervious Runoff Depth=2.11"
Tc=6.0 min UI Adjusted CN=76 Runoff=0.86 cfs 0.039 af

**Subcatchment EX: Existing** Runoff Area=1.580 ac 6.33% Impervious Runoff Depth=2.44"
Tc=6.0 min CN=80 Runoff=7.13 cfs 0.321 af

**Subcatchment S: South** Runoff Area=0.240 ac 62.50% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=89 Runoff=1.39 cfs 0.065 af

**Subcatchment W: West** Runoff Area=0.190 ac 47.37% Impervious Runoff Depth=2.88"
Tc=6.0 min CN=85 Runoff=1.00 cfs 0.046 af

**Reach 1R: Pipe 4** Avg. Flow Depth=0.61' Max Vel=5.05 fps Inflow=3.04 cfs 0.158 af
15.0" Round Pipe n=0.010 L=180.0' S=0.0056 '/' Capacity=6.26 cfs Outflow=3.02 cfs 0.158 af

**Reach 2R: Pipe 1** Avg. Flow Depth=0.53' Max Vel=8.99 fps Inflow=4.46 cfs 0.180 af
15.0" Round Pipe n=0.010 L=20.0' S=0.0200 '/' Capacity=11.88 cfs Outflow=4.46 cfs 0.180 af

**Reach 3R: Pipe 2** Avg. Flow Depth=0.53' Max Vel=8.99 fps Inflow=4.46 cfs 0.180 af
15.0" Round Pipe n=0.010 L=58.0' S=0.0200 '/' Capacity=11.88 cfs Outflow=4.46 cfs 0.180 af

**Pond basin: basin** Peak Elev=1,242.81' Storage=4,496 cf Inflow=5.73 cfs 0.286 af
Discarded=0.03 cfs 0.071 af Primary=4.46 cfs 0.180 af Secondary=0.00 cfs 0.000 af Outflow=4.48 cfs 0.251 af

**Link 1L: Total Proposed** Inflow=7.31 cfs 0.330 af
Primary=7.31 cfs 0.330 af

**Link 4L: Ex CB** Inflow=4.46 cfs 0.180 af
Primary=4.46 cfs 0.180 af

**Total Runoff Area = 3.160 ac Runoff Volume = 0.756 af Average Runoff Depth = 2.87"**
**64.56% Pervious = 2.040 ac 35.44% Impervious = 1.120 ac**

## Summary for Subcatchment B-N: Basin - north portion

Runoff = 2.72 cfs @ 12.13 hrs, Volume= 0.128 af, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

| Area (ac) | CN | Description |
|---|---|---|
| 0.300 | 98 | Paved parking, HSG C |
| 0.170 | 74 | >75% Grass cover, Good, HSG C |
| 0.470 | 89 | Weighted Average |
| 0.170 | | 36.17% Pervious Area |
| 0.300 | | 63.83% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

## Summary for Subcatchment B-S: Basin - south portion

Runoff = 3.04 cfs @ 12.13 hrs, Volume= 0.158 af, Depth= 4.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

| Area (ac) | CN | Description |
|---|---|---|
| 0.440 | 98 | Paved parking, HSG C |
| 0.020 | 74 | >75% Grass cover, Good, HSG C |
| 0.460 | 97 | Weighted Average |
| 0.020 | | 4.35% Pervious Area |
| 0.440 | | 95.65% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, Direct - Minimum** |

## Summary for Subcatchment E: East

Runoff = 0.86 cfs @ 12.14 hrs, Volume= 0.039 af, Depth= 2.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

| Area (ac) | CN | Adj | Description |
|---|---|---|---|
| 0.180 | 74 | | >75% Grass cover, Good, HSG C |
| 0.040 | 98 | | Unconnected roofs, HSG C |
| 0.220 | 78 | 76 | Weighted Average, UI Adjusted |
| 0.180 | | | 81.82% Pervious Area |
| 0.040 | | | 18.18% Impervious Area |
| 0.040 | | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

## Summary for Subcatchment EX: Existing

Runoff = 7.13 cfs @ 12.13 hrs, Volume= 0.321 af, Depth= 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

| Area (ac) | CN | Description |
|---|---|---|
| 1.480 | 79 | 50-75% Grass cover, Fair, HSG C |
| 0.100 | 98 | Unconnected roofs, HSG C |
| 1.580 | 80 | Weighted Average |
| 1.480 | | 93.67% Pervious Area |
| 0.100 | | 6.33% Impervious Area |
| 0.100 | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

## Summary for Subcatchment S: South

Runoff = 1.39 cfs @ 12.13 hrs, Volume= 0.065 af, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

| Area (ac) | CN | Description |
|---|---|---|
| 0.090 | 74 | >75% Grass cover, Good, HSG C |
| 0.150 | 98 | Unconnected roofs, HSG C |
| 0.240 | 89 | Weighted Average |
| 0.090 | | 37.50% Pervious Area |
| 0.150 | | 62.50% Impervious Area |
| 0.150 | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

## Summary for Subcatchment W: West

Runoff = 1.00 cfs @ 12.13 hrs, Volume= 0.046 af, Depth= 2.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

| Area (ac) | CN | Description |
|---|---|---|
| 0.100 | 74 | >75% Grass cover, Good, HSG C |
| 0.090 | 98 | Unconnected roofs, HSG C |
| 0.190 | 85 | Weighted Average |
| 0.100 | | 52.63% Pervious Area |
| 0.090 | | 47.37% Impervious Area |
| 0.090 | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

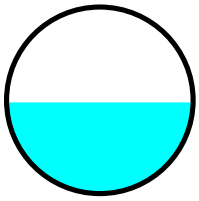
## Summary for Reach 1R: Pipe 4

Inflow Area = 0.460 ac, 95.65% Impervious, Inflow Depth = 4.12" for 10-yr event
Inflow = 3.04 cfs @ 12.13 hrs, Volume= 0.158 af
Outflow = 3.02 cfs @ 12.14 hrs, Volume= 0.158 af, Atten= 1%, Lag= 0.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.05 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.41 fps, Avg. Travel Time= 2.1 min

Peak Storage= 107 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.61'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 6.26 cfs

15.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 180.0' Slope= 0.0056 '/'
Inlet Invert= 1,242.00', Outlet Invert= 1,241.00'



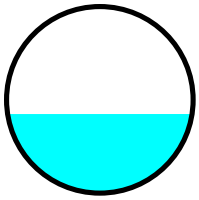
## Summary for Reach 2R: Pipe 1

Inflow Area = 0.930 ac, 79.57% Impervious, Inflow Depth = 2.33" for 10-yr event
Inflow = 4.46 cfs @ 12.18 hrs, Volume= 0.180 af
Outflow = 4.46 cfs @ 12.18 hrs, Volume= 0.180 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.99 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.66 fps, Avg. Travel Time= 0.1 min

Peak Storage= 10 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 11.88 cfs

15.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 20.0' Slope= 0.0200 '/'
Inlet Invert= 1,238.30', Outlet Invert= 1,237.90'



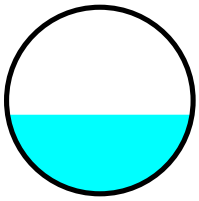
## Summary for Reach 3R: Pipe 2

Inflow Area = 0.930 ac, 79.57% Impervious, Inflow Depth = 2.33" for 10-yr event
Inflow = 4.46 cfs @ 12.18 hrs, Volume= 0.180 af
Outflow = 4.46 cfs @ 12.18 hrs, Volume= 0.180 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.99 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.66 fps, Avg. Travel Time= 0.4 min

Peak Storage= 29 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 11.88 cfs

15.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 58.0' Slope= 0.0200 '/'
Inlet Invert= 1,239.46', Outlet Invert= 1,238.30'



## Summary for Pond basin: basin

Inflow Area = 0.930 ac, 79.57% Impervious, Inflow Depth = 3.69" for 10-yr event
Inflow = 5.73 cfs @ 12.13 hrs, Volume= 0.286 af
Outflow = 4.48 cfs @ 12.18 hrs, Volume= 0.251 af, Atten= 22%, Lag= 2.7 min
Discarded = 0.03 cfs @ 12.18 hrs, Volume= 0.071 af
Primary = 4.46 cfs @ 12.18 hrs, Volume= 0.180 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 1,242.81' @ 12.18 hrs Surf.Area= 3,242 sf Storage= 4,496 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 248.8 min ( 1,016.0 - 767.3 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 1,241.00' | 8,851 cf | **Custom Stage Data (Conic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|
| 1,241.00 | 1,800 | 0 | 0 | 1,800 |
| 1,242.00 | 2,556 | 2,167 | 2,167 | 2,574 |
| 1,243.00 | 3,420 | 2,978 | 5,145 | 3,459 |
| 1,244.00 | 4,000 | 3,706 | 8,851 | 4,078 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 1,240.26' | **15.0" Round Culvert**<br>L= 40.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,240.26' / 1,239.46' S= 0.0200 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf |
| #2 | Secondary | 1,243.25' | **10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64 |
| #3 | Discarded | 1,241.00' | **0.300 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 1,232.00' |
| #4 | Device 1 | 1,242.40' | **R-4342 grate Special & User-Defined**<br>Head (feet) 0.00 0.10 0.30 0.50 0.70 1.00 1.60 2.00 2.50<br>Disch. (cfs) 0.000 0.600 3.300 5.500 8.100 9.600 12.200 13.600 15.200 |

**Discarded OutFlow** Max=0.03 cfs @ 12.18 hrs HW=1,242.80' (Free Discharge)
↑—**3=Exfiltration** ( Controls 0.03 cfs)

**Primary OutFlow** Max=4.45 cfs @ 12.18 hrs HW=1,242.80' TW=1,239.99' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 4.45 cfs of 8.19 cfs potential flow)
↑—**4=R-4342 grate Special & User-Defined** (Custom Controls 4.45 cfs)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=1,241.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Summary for Link 1L: Total Proposed

Inflow Area = 1.580 ac, 64.56% Impervious, Inflow Depth = 2.51" for 10-yr event
Inflow = 7.31 cfs @ 12.15 hrs, Volume= 0.330 af
Primary = 7.31 cfs @ 12.15 hrs, Volume= 0.330 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

## Summary for Link 4L: Ex CB

Inflow Area = 0.930 ac, 79.57% Impervious, Inflow Depth = 2.33" for 10-yr event
Inflow = 4.46 cfs @ 12.18 hrs, Volume= 0.180 af
Primary = 4.46 cfs @ 12.18 hrs, Volume= 0.180 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment B-N: Basin - north portion** Runoff Area=0.470 ac 63.83% Impervious Runoff Depth=6.50"
Tc=6.0 min CN=89 Runoff=5.18 cfs 0.255 af

**Subcatchment B-S: Basin - south portion** Runoff Area=0.460 ac 95.65% Impervious Runoff Depth=7.45"
Tc=6.0 min CN=97 Runoff=5.35 cfs 0.286 af

**Subcatchment E: East** Runoff Area=0.220 ac 18.18% Impervious Runoff Depth=4.99"
Tc=6.0 min UI Adjusted CN=76 Runoff=2.00 cfs 0.091 af

**Subcatchment EX: Existing** Runoff Area=1.580 ac 6.33% Impervious Runoff Depth=5.45"
Tc=6.0 min CN=80 Runoff=15.42 cfs 0.717 af

**Subcatchment S: South** Runoff Area=0.240 ac 62.50% Impervious Runoff Depth=6.50"
Tc=6.0 min CN=89 Runoff=2.64 cfs 0.130 af

**Subcatchment W: West** Runoff Area=0.190 ac 47.37% Impervious Runoff Depth=6.03"
Tc=6.0 min CN=85 Runoff=2.00 cfs 0.095 af

**Reach 1R: Pipe 4** Avg. Flow Depth=0.89' Max Vel=5.72 fps Inflow=5.35 cfs 0.286 af
15.0" Round Pipe n=0.010 L=180.0' S=0.0056 '/' Capacity=6.26 cfs Outflow=5.32 cfs 0.286 af

**Reach 2R: Pipe 1** Avg. Flow Depth=0.77' Max Vel=10.47 fps Inflow=8.29 cfs 0.431 af
15.0" Round Pipe n=0.010 L=20.0' S=0.0200 '/' Capacity=11.88 cfs Outflow=8.29 cfs 0.431 af

**Reach 3R: Pipe 2** Avg. Flow Depth=0.77' Max Vel=10.47 fps Inflow=8.29 cfs 0.431 af
15.0" Round Pipe n=0.010 L=58.0' S=0.0200 '/' Capacity=11.88 cfs Outflow=8.29 cfs 0.431 af

**Pond basin: basin** Peak Elev=1,243.14' Storage=5,623 cf Inflow=10.49 cfs 0.540 af
Discarded=0.03 cfs 0.074 af Primary=8.29 cfs 0.431 af Secondary=0.00 cfs 0.000 af Outflow=8.32 cfs 0.505 af

**Link 1L: Total Proposed** Inflow=14.50 cfs 0.748 af
Primary=14.50 cfs 0.748 af

**Link 4L: Ex CB** Inflow=8.29 cfs 0.431 af
Primary=8.29 cfs 0.431 af

**Total Runoff Area = 3.160 ac Runoff Volume = 1.574 af Average Runoff Depth = 5.98"**
**64.56% Pervious = 2.040 ac 35.44% Impervious = 1.120 ac**

## Summary for Subcatchment B-N: Basin - north portion

Runoff = 5.18 cfs @ 12.13 hrs, Volume= 0.255 af, Depth= 6.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Rainfall=7.81"

| Area (ac) | CN | Description |
|---|---|---|
| 0.300 | 98 | Paved parking, HSG C |
| 0.170 | 74 | >75% Grass cover, Good, HSG C |
| 0.470 | 89 | Weighted Average |
| 0.170 | | 36.17% Pervious Area |
| 0.300 | | 63.83% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

## Summary for Subcatchment B-S: Basin - south portion

Runoff = 5.35 cfs @ 12.13 hrs, Volume= 0.286 af, Depth= 7.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Rainfall=7.81"

| Area (ac) | CN | Description |
|---|---|---|
| 0.440 | 98 | Paved parking, HSG C |
| 0.020 | 74 | >75% Grass cover, Good, HSG C |
| 0.460 | 97 | Weighted Average |
| 0.020 | | 4.35% Pervious Area |
| 0.440 | | 95.65% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, Direct - Minimum** |

## Summary for Subcatchment E: East

Runoff = 2.00 cfs @ 12.13 hrs, Volume= 0.091 af, Depth= 4.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Rainfall=7.81"

| Area (ac) | CN | Adj | Description |
|---|---|---|---|
| 0.180 | 74 | | >75% Grass cover, Good, HSG C |
| 0.040 | 98 | | Unconnected roofs, HSG C |
| 0.220 | 78 | 76 | Weighted Average, UI Adjusted |
| 0.180 | | | 81.82% Pervious Area |
| 0.040 | | | 18.18% Impervious Area |
| 0.040 | | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

## Summary for Subcatchment EX: Existing

Runoff = 15.42 cfs @ 12.13 hrs, Volume= 0.717 af, Depth= 5.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Rainfall=7.81"

| Area (ac) | CN | Description |
|---|---|---|
| 1.480 | 79 | 50-75% Grass cover, Fair, HSG C |
| 0.100 | 98 | Unconnected roofs, HSG C |
| 1.580 | 80 | Weighted Average |
| 1.480 | | 93.67% Pervious Area |
| 0.100 | | 6.33% Impervious Area |
| 0.100 | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

## Summary for Subcatchment S: South

Runoff = 2.64 cfs @ 12.13 hrs, Volume= 0.130 af, Depth= 6.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Rainfall=7.81"

| Area (ac) | CN | Description |
|---|---|---|
| 0.090 | 74 | >75% Grass cover, Good, HSG C |
| 0.150 | 98 | Unconnected roofs, HSG C |
| 0.240 | 89 | Weighted Average |
| 0.090 | | 37.50% Pervious Area |
| 0.150 | | 62.50% Impervious Area |
| 0.150 | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

## Summary for Subcatchment W: West

Runoff = 2.00 cfs @ 12.13 hrs, Volume= 0.095 af, Depth= 6.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Rainfall=7.81"

| Area (ac) | CN | Description |
|---|---|---|
| 0.100 | 74 | >75% Grass cover, Good, HSG C |
| 0.090 | 98 | Unconnected roofs, HSG C |
| 0.190 | 85 | Weighted Average |
| 0.100 | | 52.63% Pervious Area |
| 0.090 | | 47.37% Impervious Area |
| 0.090 | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

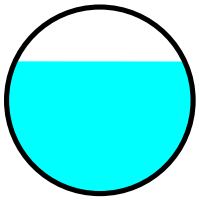
## Summary for Reach 1R: Pipe 4

Inflow Area = 0.460 ac, 95.65% Impervious, Inflow Depth = 7.45" for 100-yr event
Inflow = 5.35 cfs @ 12.13 hrs, Volume= 0.286 af
Outflow = 5.32 cfs @ 12.14 hrs, Volume= 0.286 af, Atten= 1%, Lag= 0.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.72 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.67 fps, Avg. Travel Time= 1.8 min

Peak Storage= 167 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.89'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 6.26 cfs

15.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 180.0' Slope= 0.0056 '/'
Inlet Invert= 1,242.00', Outlet Invert= 1,241.00'



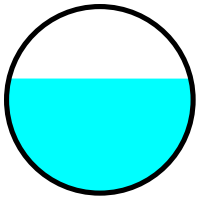
## Summary for Reach 2R: Pipe 1

Inflow Area = 0.930 ac, 79.57% Impervious, Inflow Depth = 5.56" for 100-yr event
Inflow = 8.29 cfs @ 12.18 hrs, Volume= 0.431 af
Outflow = 8.29 cfs @ 12.18 hrs, Volume= 0.431 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.47 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.32 fps, Avg. Travel Time= 0.1 min

Peak Storage= 16 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.77'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 11.88 cfs

15.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 20.0' Slope= 0.0200 '/'
Inlet Invert= 1,238.30', Outlet Invert= 1,237.90'



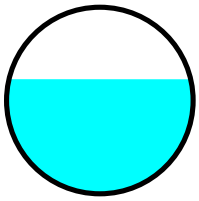
## Summary for Reach 3R: Pipe 2

Inflow Area = 0.930 ac, 79.57% Impervious, Inflow Depth = 5.56" for 100-yr event
Inflow = 8.29 cfs @ 12.18 hrs, Volume= 0.431 af
Outflow = 8.29 cfs @ 12.18 hrs, Volume= 0.431 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.47 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.32 fps, Avg. Travel Time= 0.3 min

Peak Storage= 46 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.77'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 11.88 cfs

15.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 58.0' Slope= 0.0200 '/'
Inlet Invert= 1,239.46', Outlet Invert= 1,238.30'



## Summary for Pond basin: basin

Inflow Area = 0.930 ac, 79.57% Impervious, Inflow Depth = 6.97" for 100-yr event
Inflow = 10.49 cfs @ 12.13 hrs, Volume= 0.540 af
Outflow = 8.32 cfs @ 12.18 hrs, Volume= 0.505 af, Atten= 21%, Lag= 2.6 min
Discarded = 0.03 cfs @ 12.18 hrs, Volume= 0.074 af
Primary = 8.29 cfs @ 12.18 hrs, Volume= 0.431 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 1,243.14' @ 12.18 hrs Surf.Area= 3,498 sf Storage= 5,623 cf

Plug-Flow detention time= 169.4 min calculated for 0.505 af (93% of inflow)
Center-of-Mass det. time= 138.2 min ( 895.2 - 757.0 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 1,241.00' | 8,851 cf | **Custom Stage Data (Conic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|
| 1,241.00 | 1,800 | 0 | 0 | 1,800 |
| 1,242.00 | 2,556 | 2,167 | 2,167 | 2,574 |
| 1,243.00 | 3,420 | 2,978 | 5,145 | 3,459 |
| 1,244.00 | 4,000 | 3,706 | 8,851 | 4,078 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 1,240.26' | **15.0" Round Culvert**<br>L= 40.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,240.26' / 1,239.46' S= 0.0200 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf |
| #2 | Secondary | 1,243.25' | **10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64 |
| #3 | Discarded | 1,241.00' | **0.300 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 1,232.00' |
| #4 | Device 1 | 1,242.40' | **R-4342 grate Special & User-Defined**<br>Head (feet) 0.00 0.10 0.30 0.50 0.70 1.00 1.60 2.00 2.50<br>Disch. (cfs) 0.000 0.600 3.300 5.500 8.100 9.600 12.200 13.600 15.200 |

**Discarded OutFlow** Max=0.03 cfs @ 12.18 hrs HW=1,243.14' (Free Discharge)
└**3=Exfiltration** ( Controls 0.03 cfs)

**Primary OutFlow** Max=8.29 cfs @ 12.18 hrs HW=1,243.14' TW=1,240.23' (Dynamic Tailwater)
└**1=Culvert** (Passes 8.29 cfs of 8.87 cfs potential flow)
└**4=R-4342 grate Special & User-Defined** (Custom Controls 8.29 cfs)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=1,241.00' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Summary for Link 1L: Total Proposed

Inflow Area = 1.580 ac, 64.56% Impervious, Inflow Depth = 5.68" for 100-yr event
Inflow = 14.50 cfs @ 12.15 hrs, Volume= 0.748 af
Primary = 14.50 cfs @ 12.15 hrs, Volume= 0.748 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

## Summary for Link 4L: Ex CB

Inflow Area = 0.930 ac, 79.57% Impervious, Inflow Depth = 5.56" for 100-yr event
Inflow = 8.29 cfs @ 12.18 hrs, Volume= 0.431 af
Primary = 8.29 cfs @ 12.18 hrs, Volume= 0.431 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment B-N: Basin - north portion** Runoff Area=0.470 ac 63.83% Impervious Runoff Depth=11.23"
Tc=6.0 min CN=89 Runoff=8.64 cfs 0.440 af

**Subcatchment B-S: Basin - south portion** Runoff Area=0.460 ac 95.65% Impervious Runoff Depth=12.24"
Tc=6.0 min CN=97 Runoff=8.66 cfs 0.469 af

**Subcatchment E: East** Runoff Area=0.220 ac 18.18% Impervious Runoff Depth=9.47"
Tc=6.0 min UI Adjusted CN=76 Runoff=3.66 cfs 0.174 af

**Subcatchment EX: Existing** Runoff Area=1.580 ac 6.33% Impervious Runoff Depth=10.03"
Tc=6.0 min CN=80 Runoff=27.33 cfs 1.320 af

**Subcatchment S: South** Runoff Area=0.240 ac 62.50% Impervious Runoff Depth=11.23"
Tc=6.0 min CN=89 Runoff=4.41 cfs 0.225 af

**Subcatchment W: West** Runoff Area=0.190 ac 47.37% Impervious Runoff Depth=10.70"
Tc=6.0 min CN=85 Runoff=3.41 cfs 0.169 af

**Reach 1R: Pipe 4** Avg. Flow Depth=1.25' Max Vel=5.81 fps Inflow=8.66 cfs 0.469 af
15.0" Round Pipe n=0.010 L=180.0' S=0.0056 '/' Capacity=6.26 cfs Outflow=6.78 cfs 0.469 af

**Reach 2R: Pipe 1** Avg. Flow Depth=0.85' Max Vel=10.77 fps Inflow=9.57 cfs 0.764 af
15.0" Round Pipe n=0.010 L=20.0' S=0.0200 '/' Capacity=11.88 cfs Outflow=9.57 cfs 0.764 af

**Reach 3R: Pipe 2** Avg. Flow Depth=0.85' Max Vel=10.77 fps Inflow=9.57 cfs 0.764 af
15.0" Round Pipe n=0.010 L=58.0' S=0.0200 '/' Capacity=11.88 cfs Outflow=9.57 cfs 0.764 af

**Pond basin: basin** Peak Elev=1,243.51' Storage=6,950 cf Inflow=14.89 cfs 0.909 af
Discarded=0.03 cfs 0.077 af Primary=9.57 cfs 0.764 af Secondary=3.26 cfs 0.033 af Outflow=12.86 cfs 0.873 af

**Link 1L: Total Proposed** Inflow=23.22 cfs 1.364 af
Primary=23.22 cfs 1.364 af

**Link 4L: Ex CB** Inflow=12.83 cfs 0.797 af
Primary=12.83 cfs 0.797 af

**Total Runoff Area = 3.160 ac Runoff Volume = 2.797 af Average Runoff Depth = 10.62"**
**64.56% Pervious = 2.040 ac 35.44% Impervious = 1.120 ac**

## Summary for Subcatchment B-N: Basin - north portion

Runoff = 8.64 cfs @ 12.13 hrs, Volume= 0.440 af, Depth=11.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 1000-yr Rainfall=12.60"

| Area (ac) | CN | Description |
|---|---|---|
| 0.300 | 98 | Paved parking, HSG C |
| 0.170 | 74 | >75% Grass cover, Good, HSG C |
| 0.470 | 89 | Weighted Average |
| 0.170 | | 36.17% Pervious Area |
| 0.300 | | 63.83% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

## Summary for Subcatchment B-S: Basin - south portion

Runoff = 8.66 cfs @ 12.13 hrs, Volume= 0.469 af, Depth=12.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 1000-yr Rainfall=12.60"

| Area (ac) | CN | Description |
|---|---|---|
| 0.440 | 98 | Paved parking, HSG C |
| 0.020 | 74 | >75% Grass cover, Good, HSG C |
| 0.460 | 97 | Weighted Average |
| 0.020 | | 4.35% Pervious Area |
| 0.440 | | 95.65% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, Direct - Minimum** |

## Summary for Subcatchment E: East

Runoff = 3.66 cfs @ 12.13 hrs, Volume= 0.174 af, Depth= 9.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 1000-yr Rainfall=12.60"

| Area (ac) | CN | Adj | Description |
|---|---|---|---|
| 0.180 | 74 | | >75% Grass cover, Good, HSG C |
| 0.040 | 98 | | Unconnected roofs, HSG C |
| 0.220 | 78 | 76 | Weighted Average, UI Adjusted |
| 0.180 | | | 81.82% Pervious Area |
| 0.040 | | | 18.18% Impervious Area |
| 0.040 | | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

## Summary for Subcatchment EX: Existing

Runoff = 27.33 cfs @ 12.13 hrs, Volume= 1.320 af, Depth=10.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 1000-yr Rainfall=12.60"

| Area (ac) | CN | Description |
|---|---|---|
| 1.480 | 79 | 50-75% Grass cover, Fair, HSG C |
| 0.100 | 98 | Unconnected roofs, HSG C |
| 1.580 | 80 | Weighted Average |
| 1.480 | | 93.67% Pervious Area |
| 0.100 | | 6.33% Impervious Area |
| 0.100 | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

## Summary for Subcatchment S: South

Runoff = 4.41 cfs @ 12.13 hrs, Volume= 0.225 af, Depth=11.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 1000-yr Rainfall=12.60"

| Area (ac) | CN | Description |
|---|---|---|
| 0.090 | 74 | >75% Grass cover, Good, HSG C |
| 0.150 | 98 | Unconnected roofs, HSG C |
| 0.240 | 89 | Weighted Average |
| 0.090 | | 37.50% Pervious Area |
| 0.150 | | 62.50% Impervious Area |
| 0.150 | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

## Summary for Subcatchment W: West

Runoff = 3.41 cfs @ 12.13 hrs, Volume= 0.169 af, Depth=10.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 1000-yr Rainfall=12.60"

| Area (ac) | CN | Description |
|---|---|---|
| 0.100 | 74 | >75% Grass cover, Good, HSG C |
| 0.090 | 98 | Unconnected roofs, HSG C |
| 0.190 | 85 | Weighted Average |
| 0.100 | | 52.63% Pervious Area |
| 0.090 | | 47.37% Impervious Area |
| 0.090 | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry, direct** |

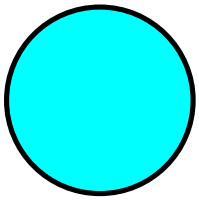
## Summary for Reach 1R: Pipe 4

Inflow Area = 0.460 ac, 95.65% Impervious, Inflow Depth = 12.24" for 1000-yr event
Inflow = 8.66 cfs @ 12.13 hrs, Volume= 0.469 af
Outflow = 6.78 cfs @ 12.26 hrs, Volume= 0.469 af, Atten= 22%, Lag= 7.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.81 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.92 fps, Avg. Travel Time= 1.6 min

Peak Storage= 221 cf @ 12.09 hrs
Average Depth at Peak Storage= 1.25'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 6.26 cfs

15.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 180.0' Slope= 0.0056 '/'
Inlet Invert= 1,242.00', Outlet Invert= 1,241.00'



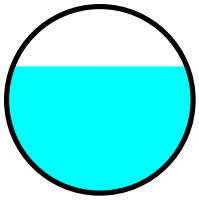
## Summary for Reach 2R: Pipe 1

Inflow Area = 0.930 ac, 79.57% Impervious, Inflow Depth = 9.86" for 1000-yr event
Inflow = 9.57 cfs @ 12.18 hrs, Volume= 0.764 af
Outflow = 9.57 cfs @ 12.18 hrs, Volume= 0.764 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.77 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.00 fps, Avg. Travel Time= 0.1 min

Peak Storage= 18 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.85'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 11.88 cfs

15.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 20.0' Slope= 0.0200 '/'
Inlet Invert= 1,238.30', Outlet Invert= 1,237.90'



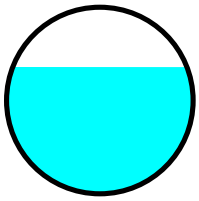
## Summary for Reach 3R: Pipe 2

Inflow Area = 0.930 ac, 79.57% Impervious, Inflow Depth = 9.86" for 1000-yr event
Inflow = 9.57 cfs @ 12.18 hrs, Volume= 0.764 af
Outflow = 9.57 cfs @ 12.18 hrs, Volume= 0.764 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.77 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.00 fps, Avg. Travel Time= 0.2 min

Peak Storage= 52 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.85'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 11.88 cfs

15.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 58.0' Slope= 0.0200 '/'
Inlet Invert= 1,239.46', Outlet Invert= 1,238.30'



## Summary for Pond basin: basin

Inflow Area = 0.930 ac, 79.57% Impervious, Inflow Depth = 11.73" for 1000-yr event
Inflow = 14.89 cfs @ 12.13 hrs, Volume= 0.909 af
Outflow = 12.86 cfs @ 12.18 hrs, Volume= 0.873 af, Atten= 14%, Lag= 2.8 min
Discarded = 0.03 cfs @ 12.18 hrs, Volume= 0.077 af
Primary = 9.57 cfs @ 12.18 hrs, Volume= 0.764 af
Secondary = 3.26 cfs @ 12.18 hrs, Volume= 0.033 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 1,243.51' @ 12.18 hrs Surf.Area= 3,708 sf Storage= 6,950 cf

Plug-Flow detention time= 111.8 min calculated for 0.873 af (96% of inflow)
Center-of-Mass det. time= 91.2 min ( 840.8 - 749.7 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 1,241.00' | 8,851 cf | **Custom Stage Data (Conic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|
| 1,241.00 | 1,800 | 0 | 0 | 1,800 |
| 1,242.00 | 2,556 | 2,167 | 2,167 | 2,574 |
| 1,243.00 | 3,420 | 2,978 | 5,145 | 3,459 |
| 1,244.00 | 4,000 | 3,706 | 8,851 | 4,078 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 1,240.26' | **15.0" Round Culvert**<br>L= 40.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,240.26' / 1,239.46' S= 0.0200 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf |
| #2 | Secondary | 1,243.25' | **10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64 |
| #3 | Discarded | 1,241.00' | **0.300 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 1,232.00' |
| #4 | Device 1 | 1,242.40' | **R-4342 grate Special & User-Defined**<br>Head (feet) 0.00 0.10 0.30 0.50 0.70 1.00 1.60 2.00 2.50<br>Disch. (cfs) 0.000 0.600 3.300 5.500 8.100 9.600 12.200 13.600 15.200 |

**Discarded OutFlow** Max=0.03 cfs @ 12.18 hrs HW=1,243.51' (Free Discharge)
└**3=Exfiltration** ( Controls 0.03 cfs)

**Primary OutFlow** Max=9.57 cfs @ 12.18 hrs HW=1,243.51' TW=1,240.31' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 9.57 cfs @ 7.80 fps)
└**4=R-4342 grate Special & User-Defined** (Passes 9.57 cfs of 10.06 cfs potential flow)

**Secondary OutFlow** Max=3.25 cfs @ 12.18 hrs HW=1,243.51' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 3.25 cfs @ 1.27 fps)

## Summary for Link 1L: Total Proposed

Inflow Area = 1.580 ac, 64.56% Impervious, Inflow Depth = 10.36" for 1000-yr event
Inflow = 23.22 cfs @ 12.15 hrs, Volume= 1.364 af
Primary = 23.22 cfs @ 12.15 hrs, Volume= 1.364 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

## Summary for Link 4L: Ex CB

Inflow Area = 0.930 ac, 79.57% Impervious, Inflow Depth = 10.28" for 1000-yr event
Inflow = 12.83 cfs @ 12.18 hrs, Volume= 0.797 af
Primary = 12.83 cfs @ 12.18 hrs, Volume= 0.797 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

# Neenah R-4342 Head-Q Table

| Head (ft) | Capacity (cfs) |
|---|---|
| 0 | 0 |
| 0.1 | 0.6 |
| 0.2 | 1.8 |
| 0.3 | 3.3 |
| 0.4 | 4.4 |
| 0.5 | 5.5 |
| 0.6 | 7.5 |
| 0.7 | 8.1 |
| 0.8 | 8.6 |
| 0.9 | 9.1 |
| 1 | 9.6 |
| 1.2 | 10.5 |
| 1.4 | 11.4 |
| 1.6 | 12.2 |
| 1.8 | 12.8 |
| 2 | 13.6 |
| 2.5 | 15.2 |
| 3 | 16.7 |