



To: Lower Minnesota River Watershed District
City of Bloomington

From: Trish Sieh, P.E., Kimley-Horn and Associates

Date: May 1, 2020

Subject: Project Stargate – Best Buy Warehouse Improvements

Best Buy is planning to reprogram their existing Distribution Center located at 6205 W 111th St in Bloomington, MN. The proposed site improvements will consist of creating additional surface parking areas for pedestrian vehicles as well as providing access to the building to serve the interior reprogramming. Stormwater infiltration basins will also be added to account for the new impervious area.

EXISTING DRAINAGE CONDITIONS:

The project site currently consists of a ±581,000 sf Best Buy Distribution Center/Warehouse building and associated truck and standard vehicle parking. The majority of the north and west sides of the site are captured by on-site catch basins and routed north to W 111th Street. The east half and south sides of the site are routed to existing NURP ponds on the NE corner and SW corner of the site, respectively, before discharging into the public storm network in W 111th Street. The site is approximately 80% impervious in the existing condition with green space around the perimeter of the building and site.

Based on the Web Soil Survey, the site consists primarily of sandy loams with Hydrologic Soil Group ratings of A. The Minnesota Stormwater Manual suggests a design infiltration rate of 0.80 in/hr for these soil types. Infiltration is considered a viable option for this site.

DEVELOPED SITE DRAINAGE CONDITIONS

The proposed site will keep the existing building and majority of existing parking areas. Two new small parking lots will be constructed on the north and west sides of the building for visitor parking. Truck parking in the southwest portion of the site will be converted to vehicular parking with the addition of landscape islands and restriping. New pedestrian access walks will also be added to connect the new parking lots and public sidewalk to the building. The added impervious area is approximately 24,632 sf. Portions of the parking areas on the south and east sides of the site that are currently dedicated to truck parking will be converted to greenspace to offset the added impervious area. The added pervious area is approximately 27,307 sf. The proposed reconstruction will follow all City of Bloomington and Lower Minnesota Watershed District stormwater requirements.

Surface drainage will primarily follow the patterns as noted in the existing conditions. The new parking lots on the north and west sides building will sheet flow to infiltration basins just west side of the new pavement before discharging into the existing site storm network. The remaining reconstructed areas will be routed to one of the NURP ponds on the NE and SW corners of the site, following existing site drainage patterns. All of the proposed runoff will eventually be directed to the public storm sewer in W 111th St as in the existing condition. The two new parking areas will create approximately 17,147 sf of new impervious area.

WATER QUALITY SUMMARY

The City of Bloomington surface water management plan and Lower Minnesota Watershed District require that the site must capture and retain a volume equivalent of 1.1" of runoff from the new impervious area. The total new impervious area on site routed to BMP 1 and BMP 2 is 17,147 sf, which requires 1,571 cf of volume retention. The proposed surface basins provide 1,589 cf of surface storage. The remaining 7,485 sf of new impervious area will be routed to existing NURP ponds on site, which have been sized for the existing impervious area. The proposed site has a net loss of impervious area routed to these existing ponds and will therefore accommodate the runoff volume resulting from the reconstructed impervious area. See table below.

Table 1 below summarizes the retention required and provided.

TABLE 1: RUNOFF RATE SUMMARY RUNOFF

Location	New Impervious Area (sf)	Retention Volume Required (cf)	Retention Volume Provided (cf)
North Parking Lot (BMP 1)	7,440	682	689
West Parking Lot (BMP 2)	9,707	889	900
South/East Sidewalk (Ex. NURP Ponds)	7,485	686	931

The new impervious area shall be treated to at least 60% TP removal and 90% TSS removal. The proposed infiltration basins and existing NURP Ponds will treat 100% of TSS and TP routed to them. The proposed infiltration basins capture and treat approximately 70% of the site's new impervious area with the remaining 30% being routed to the existing NURP Ponds on the NE and SW corners of the site. Pretreatment will be provided in the form of rain guardian turrets prior to entering the proposed infiltration basins. The proposed site is decreasing the total impervious area from existing conditions and drainage patterns are being maintained. Proposed surface water discharge rates for the site will be reduced from existing conditions.

Please feel free to contact me at (651) 643-0470 if you have any questions.

Sincerely,



Trish Sieh, P.E., KIMLEY-HORN AND ASSOCIATES, INC

Custom Soil Resource Report for **Hennepin County, Minnesota**



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.

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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

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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

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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.

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Soil Map




Soil Map may not be valid at this scale.

Map Scale: 1:5,010 if printed on A landscape (11" x 8.5") sheet.
0 50 100 200 300 Meters
0 200 400 800 1200 Feet
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: Hennepin County, Minnesota
 Survey Area Data: Version 15, Sep 16, 2019

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

Date(s) aerial images were photographed: Jul 1, 2013—Sep 13, 2016

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
L3A	Rasset sandy loam, 0 to 2 percent slopes	6.6	5.1%
L3B	Rasset sandy loam, 2 to 6 percent slopes	44.6	34.3%
L4C	Crowfork loamy sand, 6 to 12 percent slopes	0.6	0.5%
L4D	Crowfork loamy sand, 12 to 18 percent slopes	3.2	2.5%
L6A	Biscay clay loam, 0 to 2 percent slopes	4.4	3.4%
L31A	Medo, Dassel, and Biscay soils, ponded, 0 to 1 percent slopes	2.9	2.2%
L46A	Tomall loam, 0 to 2 percent slopes	24.0	18.5%
L47B	Eden Prairie sandy loam, 2 to 6 percent slopes	26.4	20.3%
L47C	Eden Prairie sandy loam, 6 to 12 percent slopes	17.2	13.2%
M-W	Water, miscellaneous	0.0	0.0%
U4A	Urban land-Udipsamments (cut and fill land) complex, 0 to 2 percent slopes	0.1	0.1%
Totals for Area of Interest		130.1	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

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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

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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.

Hennepin County, Minnesota

L3A—Rasset sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: h4zb
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 124 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Rasset and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rasset

Setting

Landform: Stream terraces, outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Outwash

Typical profile

Ap,A - 0 to 15 inches: sandy loam
Bt - 15 to 28 inches: sandy loam
2BC - 28 to 36 inches: loamy sand
2C - 36 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 20 percent
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: Sandy Upland Savannas (R103XY019MN)
Forage suitability group: Sloping Upland, Acid (G103XS006MN)
Hydric soil rating: No

Minor Components

Malardi

Percent of map unit: 8 percent
Landform: Stream terraces, outwash plains
Down-slope shape: Linear

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Across-slope shape: Linear

Hydric soil rating: No

Eden prairie

Percent of map unit: 2 percent

Landform: Outwash plains, stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

L3B—Rasset sandy loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: h4z9

Mean annual precipitation: 23 to 35 inches

Mean annual air temperature: 43 to 50 degrees F

Frost-free period: 124 to 200 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Rasset and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rasset

Setting

Landform: Hills on outwash plains, hills on stream terraces

Landform position (two-dimensional): Backslope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Outwash

Typical profile

Ap,A - 0 to 15 inches: sandy loam

Bt - 15 to 28 inches: sandy loam

2BC - 28 to 36 inches: loamy sand

2C - 36 to 80 inches: sand

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 20 percent

Available water storage in profile: Moderate (about 6.1 inches)

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Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: Sandy Upland Savannas (R103XY019MN)
Forage suitability group: Sloping Upland, Acid (G103XS006MN)
Hydric soil rating: No

Minor Components

Malardi

Percent of map unit: 15 percent
Landform: Hills on stream terraces, hills on outwash plains
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Eden prairie

Percent of map unit: 5 percent
Landform: Hills on outwash plains, hills on stream terraces
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

L4C—Crowfork loamy sand, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: h4yz
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 124 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Crowfork and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Crowfork

Setting

Landform: Hills on stream terraces, hills on outwash plains
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Outwash

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Typical profile

Ap - 0 to 11 inches: loamy sand
E - 11 to 20 inches: loamy fine sand
E&Bt - 20 to 76 inches: loamy sand
C - 76 to 80 inches: sand

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: Sandy Upland Savannas (R103XY019MN)
Forage suitability group: Sandy (G103XS022MN)
Hydric soil rating: No

Minor Components

Eden prairie

Percent of map unit: 10 percent
Landform: Swales on stream terraces, swales on outwash plains
Landform position (two-dimensional): Footslope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

L4D—Crowfork loamy sand, 12 to 18 percent slopes

Map Unit Setting

National map unit symbol: h4yy
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 124 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Crowfork

Setting

Landform: Hills on stream terraces, hills on outwash plains
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Outwash

Typical profile

Ap - 0 to 11 inches: loamy sand
E - 11 to 20 inches: loamy fine sand
E&Bt - 20 to 76 inches: loamy sand
C - 76 to 80 inches: sand

Properties and qualities

Slope: 12 to 18 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: Sandy Upland Savannas (R103XY019MN)
Forage suitability group: Sandy (G103XS022MN)
Hydric soil rating: No

Minor Components

Eden prairie

Percent of map unit: 15 percent
Landform: Swales on stream terraces, swales on outwash plains
Landform position (two-dimensional): Footslope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

L6A—Biscay clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2tsjc
Elevation: 690 to 1,840 feet

Custom Soil Resource Report

Mean annual precipitation: 24 to 37 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 140 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Biscay

Setting

Landform: Terraces, outwash plains
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-loamy glaciofluvial deposits over sandy and gravelly outwash

Typical profile

Ap - 0 to 8 inches: clay loam
A - 8 to 20 inches: clay loam
Bg - 20 to 35 inches: sandy clay loam
2Cg - 35 to 79 inches: gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 0 to 8 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: Sandy Wet Prairies (R103XY007MN)
Forage suitability group: Level Swale, Neutral (G103XS001MN)
Hydric soil rating: Yes

Minor Components

Biscay, depressional

Percent of map unit: 10 percent
Landform: Depressions on outwash plains
Landform position (three-dimensional): Talf
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Ecological site: Depressional Marsh (R103XY015MN)

Custom Soil Resource Report

Hydric soil rating: Yes

Mayer

Percent of map unit: 3 percent

Landform: Terraces, outwash plains

Landform position (three-dimensional): Tread, talf

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Calcareous Upland Prairies (R103XY002MN)

Hydric soil rating: Yes

Okoboji

Percent of map unit: 2 percent

Landform: Depressions

Down-slope shape: Concave

Across-slope shape: Concave

Ecological site: Depressional Marsh (R103XY015MN)

Hydric soil rating: Yes

L31A—Medo, Dassel, and Biscay soils, ponded, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: h4x3

Mean annual precipitation: 23 to 35 inches

Mean annual air temperature: 43 to 50 degrees F

Frost-free period: 124 to 200 days

Farmland classification: Not prime farmland

Map Unit Composition

Biscay, ponded, and similar soils: 30 percent

Medo, ponded, and similar soils: 30 percent

Dassel, ponded, and similar soils: 30 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Biscay, Ponded

Setting

Landform: Marshes on outwash plains

Down-slope shape: Concave

Across-slope shape: Concave

Parent material: Outwash

Typical profile

A1,AB - 0 to 24 inches: loam

Bg - 24 to 29 inches: loam

2BCg,2Cg - 29 to 60 inches: stratified gravelly coarse sand to loamy sand

Properties and qualities

Slope: 0 to 1 percent

Depth to restrictive feature: More than 80 inches

Custom Soil Resource Report

Natural drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 30 percent
Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: B/D
Ecological site: Depressional Marsh (R103XY015MN)
Forage suitability group: Not Suited (G103XS024MN)
Hydric soil rating: Yes

Description of Medo, Ponded

Setting

Landform: Marshes on outwash plains
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Organic material over outwash

Typical profile

Oa - 0 to 20 inches: muck
2A - 20 to 34 inches: loam
2AC,2Cg - 34 to 60 inches: sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Very high (about 12.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: A/D
Ecological site: Organic Marsh (R103XY016MN)
Forage suitability group: Not Suited (G103XS024MN)
Hydric soil rating: Yes

Description of Dassel, Ponded

Setting

Landform: Marshes on outwash plains
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Outwash

Custom Soil Resource Report

Typical profile

A1,A3 - 0 to 23 inches: fine sandy loam
Bg - 23 to 31 inches: stratified loamy fine sand to fine sandy loam
2Cg - 31 to 60 inches: stratified coarse sand to loamy sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: A/D
Ecological site: Depressional Marsh (R103XY015MN)
Forage suitability group: Not Suited (G103XS024MN)
Hydric soil rating: Yes

Minor Components

Houghton, ponded

Percent of map unit: 5 percent
Landform: Marshes on outwash plains
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Muskego, ponded

Percent of map unit: 5 percent
Landform: Marshes on outwash plains
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

L46A—Tomall loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: h661
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 124 to 200 days

Custom Soil Resource Report

Farmland classification: All areas are prime farmland

Map Unit Composition

Tomall and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tomall

Setting

Landform: Stream terraces, outwash plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Colluvium over outwash

Typical profile

Ap,A,AB - 0 to 33 inches: loam

Bw - 33 to 42 inches: sandy loam

2Bw - 42 to 47 inches: loamy coarse sand

2C - 47 to 80 inches: gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)

Depth to water table: About 48 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 5 percent

Gypsum, maximum in profile: 1 percent

Available water storage in profile: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2s

Hydrologic Soil Group: B

Ecological site: Sandy Upland Prairies (R103XY003MN)

Forage suitability group: Sloping Upland, Neutral (G103XS002MN)

Hydric soil rating: No

Minor Components

Malardi

Percent of map unit: 10 percent

Landform: Stream terraces, outwash plains

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Rasset

Percent of map unit: 10 percent

Landform: Outwash plains, stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

L47B—Eden Prairie sandy loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: h667
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 124 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Eden prairie and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Eden Prairie

Setting

Landform: Hills on outwash plains, hills on stream terraces
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Outwash

Typical profile

Ap - 0 to 10 inches: sandy loam
Bt - 10 to 16 inches: sandy loam
2Bt - 16 to 26 inches: loamy sand
2Bw,2C1,2C2 - 26 to 80 inches: sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: Sandy Upland Savannas (R103XY019MN)
Forage suitability group: Sandy (G103XS022MN)
Hydric soil rating: No

Minor Components

Rasset

Percent of map unit: 10 percent
Landform: Stream terraces, outwash plains
Landform position (two-dimensional): Footslope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Malardi

Percent of map unit: 10 percent
Landform: Hills on outwash plains, hills on stream terraces
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

L47C—Eden Prairie sandy loam, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: gk8m
Mean annual precipitation: 23 to 35 inches
Mean annual air temperature: 43 to 50 degrees F
Frost-free period: 124 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Eden prairie and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Eden Prairie

Setting

Landform: Hills on outwash plains, hills on stream terraces
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Outwash

Typical profile

Ap - 0 to 10 inches: sandy loam
Bt - 10 to 16 inches: sandy loam
2Bt - 16 to 26 inches: loamy sand
2Bw,2C1,2C2 - 26 to 80 inches: sand

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches

Custom Soil Resource Report

Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: Sandy Upland Savannas (R103XY019MN)
Forage suitability group: Sandy (G103XS022MN)
Hydric soil rating: No

Minor Components

Malardi

Percent of map unit: 10 percent
Landform: Hills on stream terraces, hills on outwash plains
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hawick

Percent of map unit: 10 percent
Landform: Hills on outwash plains, hills on stream terraces
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Rasset

Percent of map unit: 10 percent
Landform: Outwash plains, stream terraces
Landform position (two-dimensional): Footslope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

M-W—Water, miscellaneous

Map Unit Setting

National map unit symbol: h4xr
Elevation: 660 to 1,640 feet
Mean annual precipitation: 27 to 33 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 135 to 160 days

Custom Soil Resource Report

Farmland classification: Not prime farmland

Map Unit Composition

Water, miscellaneous: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

U4A—Urban land-Udipsamments (cut and fill land) complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: glwk

Mean annual precipitation: 23 to 35 inches

Mean annual air temperature: 43 to 50 degrees F

Frost-free period: 155 to 200 days

Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 70 percent

Udipsamments, cut and fill land, and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Stream terraces, outwash plains

Description of Udipsamments, Cut And Fill Land

Setting

Landform: Stream terraces, outwash plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Variable sandy material

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Somewhat excessively drained

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

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