HASTINGS PLANNING COMMISSION
A G E N D A

Monday April 3, 2023

1. **Call to Order/Roll Call** (Regular meeting starts at 7:00 p.m.)
2. **Pledge of Allegiance**
3. **Approval / additions / deletions to agenda**
4. **Approval of Minutes** March 6, 2023 Draft Meeting Minutes of the Planning Commission *
5. **Informative Items:** Barry County Master Plan Barry County Master Plan - Google Drive

   Council Workshop on Monday April 10th at 6:00 PM to hear information from Barry County Central Dispatch Director Stephanie Lehman regarding locating a 300' communications tower in the City of Hastings.

6. **Public Hearings:**

   A. Public hearing to review and consider an amendment to Section 90-1 to add Food Truck and Food Truck Park, Sections 90-462, 90-472, and 90-552 to add Food Truck and Food Truck Park as permitted uses and add Division 90-IX-8 Food Truck and Food Truck Parks, Sections 90-914 and 90-915 to Article 90-IX Supplementary District Regulations. *

7. **New Business:**

   A. Consider setting a public hearing for the May 1, 2023 meeting for a text amendment to Section 90-883 (4) regarding the maximum driveway width at the property line. *
   B. Consider setting a public hearing for the May 1, 2023 meeting for site plan review and special use permit consideration for the location of a 300' communications tower at 1037 East State Street by Barry County Central Dispatch.
   C. Review revised storm water runoff information. *
   D. Review annual Capital Improvements Program (CIP). *

8. **Old Business:**

   A. Receive JPA / JPC Update.
   B. Consider Planning Commission 2023 General Work Task List. *
   C. Report Regarding Tracking and Terms and Conditions Imposed by the Planning Commission. *
   D. Discuss Planning Consultant memo regarding tractor, trailer, and RV parking text. *

9. **Open Public Discussion and Comments**
10. **Staff Comments**
11. **Commissioner Comments**
12. **Adjourn**

*Indicates attachment

CITY OF HASTINGS
DRAFT PLANNING COMMISSION MEETING MINUTES
March 6, 2023

Call to Order

The meeting was called to order at 7:00 p.m. by Chairperson Hatfield with the following Commissioners present: Jordan Brehm, Lois Bowers, Chelsey Foster, David Hatfield, Nichole Lyke, Tom Maurer, Jacquie McLean, Sarah Moyer-Cale, and Dave Tossava. Absent: None.

Also present: Community Development Director Dan King and Planning Consultant Rebecca Harvey.

Approval of the Agenda

It was MOVED by Bowers and SECONDED by Maurer to approve the agenda as presented. All members present voting yes, motion carried.

Approval of the Minutes

It was MOVED by Bowers and SECONDED by Brehm that the proposed minutes of the meeting of February 6, 2023 be approved. All members present voting yes; motion carried.

Informative Items

King provided information about training for the Planning Commission and notified the commission about an upcoming economic development visioning session and streetscape open house for merchants.

Public Hearing:

None.

New Business:

None.

Old Business

JPA/JPC Update

Moyer-Cale reported that the JPA has not recently met. The JPC met to hold a hearing and recommend approval of modifications to ordinance text regarding childcare facilities.

Work Task List

King noted that #16 (adult day care homes, family homes, etc) had been added to the list.

Tracking Terms and Conditions

King noted the approvals related to the car wash plan had been added.

Mobile Food Truck Ordinance Text

Harvey presented the updated draft text for a food truck zoning ordinance that included changes discussed at the previous meeting. Discussion was held regarding who should hold the license and if a secondary, regulatory ordinance was needed to require food truck registration. Text clarifications were suggested that Harvey said she would use to modify the draft ordinance text. It was decided that the commission would plan to submit food truck registration suggestions to the City Council for their consideration along with the recommended draft text when it was ready. It was MOVED by Brehm and SECONDED by Foster to hold a public hearing on the revised draft text for a food truck ordinance on April 3rd. All members present voting yes; motion carried.

Trailer, Tractor, RV Parking Text

Harvey provided an overview of the memo regarding a strategy for updating the various zoning ordinances related to parking of trailers and recreational vehicles. It was the consensus of the commission to move forward with the approach to text

modifications as presented.

No public comment was received.	Public Comment
Moyer-Cale noted the upcoming economic development visioning session and encouraged members to attend.	Staff Comments
It was noted that Foster, Bowers, and McLean would not be present at the April commission meeting.	Commission Comments
It was MOVED by Tossava and SUPPORTED by Brehm to adjourn the meeting. All members present voting yes, motion carried. Meeting adjourned at 8:20 p.m.	Adjournment

Respectfully submitted,

Sarah Moyer-Cale,
Secretary

City of Hastings

NOTICE OF PUBLIC HEARING ON ORDINANCE NO. TBD

The Planning Commission will hold a Public Hearing for the purpose of hearing written and/or oral comments from the public concerning an amendment to Section 90-1 of the Hastings Municipal Code to add Food Truck and Food Truck Park, Sections 90-462, 90-472, and 90-552 to add Food Truck and Food Truck Parks as permitted uses, and Article 90-IX, Division 90-IX-8 Food Truck and Food Truck Parks, Sections 90-914 and 90-915. The public hearing will be held at **7:00 PM** on **Monday April 3, 2023** in the Council Chambers, second floor of City Hall, 201 East State Street, Hastings, MI 49058. Please check the City of Hastings website at www.hastingsmi.org or contact City Hall for details.

All interested citizens are encouraged to attend and to submit comments.

Please contact Dan King, Community Development Director, at dking@hastingsmi.org or 269-945-2468 if you have questions or comments regarding this public hearing.

A copy of this information is available for public inspection from 9:00 AM to 4:00 PM Monday through Friday at the Office of the City Clerk, 201 East State Street, Hastings, MI 49058.

The City will provide necessary reasonable aids and services upon five days notice to Hastings City Clerk (telephone number 269-945-2468) or TDD call relay services 1-800-649-3777.

Christopher R. Bever
City Clerk

Please publish in the March 16, 2023 edition of the Hastings Banner.

Received by _____ on _____
as representative of the Hastings Banner.

FOOD TRUCKS/FOOD TRUCK PARKS

Sec 90-1 Definitions

- *Food Truck* means a motorized or non-motorized vehicle designed as a complete and transportable unit and used as a mobile business to sell food and/or beverages from a stationary location during serving hours. Food trucks exclude structures installed with a permanent foundation, tent-walled structures, and mobile food trucks which distribute food and/or beverages as driven throughout a community (e.g., mobile ice cream truck).

Food Truck

Food Truck

- *Food Truck Park* means three (3) or more food trucks that congregate at an established private property location to offer food and/or beverages for sale to the public as the principal use of the land.

Food Truck Park

Food Truck Park

Section 90-462 Permitted Uses (O Office District)

Add: (p) Food Trucks/Food Truck Parks as regulated by Division 90-IX-8.

Section 90-472 Permitted Uses (B-1 Central Business District)

Add: (v) Food Trucks/Food Truck Parks as regulated by Division 90-IX-8.

Section 90-552 Permitted Uses (D-1 Industrial District)

Add: (q) Food Trucks/Food Truck Parks as regulated by Division 90-IX-8.

SUMMARY OF PROPOSED FOOD TRUCK/FOOD TRUCK PARK DISTRICTS			
ZONING DISTRICT	ORDINANCE SECTION	USE	P=PERMITTED S=SPECIAL LAND USE
O	Section 90-462 (p)	Food Trucks/Food Truck Parks	P*
B-1	Section 90-472 (v)	Food Trucks/Food Truck Parks	P*
B-2		Food Trucks/Food Truck Parks	P*
B-3		Food Trucks/Food Truck Parks	P*
B-4		Food Trucks/Food Truck Parks	P*
B-6		Food Trucks/Food Truck Parks	P*
D-1	Section 90-552 (q)	Food Trucks/Food Truck Parks	P*
D-2		Food Trucks/Food Truck Parks	P*
***As regulated by section 90-915**			

ARTICLE 90-IX SUPPLEMENTARY DISTRICT REGULATIONS

DIVISION 90-IX-8 FOOD TRUCKS/FOOD TRUCK PARKS

Sec 90-914 Scope

(a) *Public property*. A food truck located on public property is not regulated by this ordinance.

(b) *Private property*. A food truck located on private property shall only be allowed as regulated by Article 90-VI – District Regulations and shall be subject to the standards and approval process of Section 90-915 – Standards.

Sec 90-915 Standards

(a) *Location*. A food truck may be located and operate on property with or without a principal use/building.

(b) *District regulations*. Lot area, lot width, setbacks and any other dimensional requirement of the zoning district shall apply.

(c) *Parking*.

1. A food truck located/operating on property with a principal use/building shall not serve to reduce on-site parking for the principal use/building in violation of parking requirements.

2. A food truck located on property without a principal use/building and food truck parks shall be adequately served by on-site and/or off-site parking facilities.

(d) *Separation*. A food truck shall not be located within 150 feet of a permanent business with a food license during the permanent business's hours of operation.

(e) *Traffic.* A food truck shall be located and operate in such a manner so as not to interfere with pedestrian or vehicular traffic.

(f) *Noise.* The use of amplifiers, banners, loud music and other attention gathering devices in conjunction with the operation of a food truck shall be prohibited.

(g) *Lighting*. The use of flashing or blinking lights or strobe lights in conjunction with the operation of a food truck is prohibited. All exterior lights over 60 watts shall contain opaque, hood shields to direct the illumination downward.

(h) *Refuse.* A food truck provider shall provide appropriate waste receptacles at the site of the food truck and keep the area in which it operates clean, sightly, and free of trash.

(i) *Local ordinances*. A food truck shall comply with the city's nuisance ordinance, sign ordinance and all other city ordinances.

(j) *Other regulations*. A food truck shall comply with all applicable federal, state, and county regulations.

(k) *Approval*. A food truck/food truck park shall be subject to the following approval process:

1. No food truck/food truck park shall locate or operate on private property until a temporary zoning permit has been approved by the city.

2. Application for a temporary zoning permit shall be made through the city clerk/treasurer and shall be accompanied by a plot plan, which shall show parking and outdoor seating proposed to serve the food truck/food truck park, and demonstrate compliance with the standards of this section.

    a. Application for a temporary zoning permit for a food truck may be for a single location or to rotate between multiple locations.

    b. Application for a food truck/food truck park shall be accompanied by written consent of the property owner(s) of the private property(ies) under consideration.

3. The zoning administrator shall review the application and plot plan for a single food truck to be located on one (1) property or multiple properties for compliance with the standards of this section. Based on these standards, the zoning administrator shall approve, deny or approve with conditions the temporary zoning permit.

4. The planning commission shall review the application and plot plan for a food truck park for compliance with the standards of this section. Based on these standards, the planning commission shall approve, deny or approve with conditions the temporary zoning permit.

5. The temporary zoning permit shall state the approved time periods of location/operation of the food truck/food truck park.

6. A temporary zoning permit for a food truck/food truck park shall be valid for one calendar year.

7. A temporary zoning permit may be transferred to a new food truck proposed to replace the food truck previously designated. The new food truck shall be subject to the standards of this section and the conditions of the transferred temporary zoning permit.

8. An amendment of a temporary zoning permit is required if there are proposed modifications to the approved plot plan or conditions of the temporary zoning permit.

9. A temporary zoning permit may be revoked by the zoning administrator upon evidence of a failure to comply with the standards of this section and/or the conditions of the temporary zoning permit.

City of Hastings

COUNTY OF BARRY, STATE OF MICHIGAN

ORDINANCE NO. TBD

AN ORDINANCE TO AMEND CHAPTER 90 OF THE HASTINGS CODE OF 1970, AS AMENDED, BY ADDING THE FOLLOWING: ARTICLE 90 - I, SECTION 90-1 DEFINITIONS, FOOD TRUCK AND FOOD TRUCK PARK AND ADDING SECTION 90-462 (P), SECTION 90-472 (V), AND SECTION 90-552 (Q), AND ADDING DIVISION 90-IX-8 FOOD TRUCK/FOOD TRUCK PARK, SECTIONS 90-914 AND 90-915 TO ARTICLE 90-IX SUPPLEMENTARY SUPPLEMENTARY DISTRICT REGULATIONS

THE CITY OF HASTINGS ORDAINS:

SECTION I.

Section 90-1 is hereby amended to Chapter 90, Article 90 – I to add Food Truck and Food Truck Park to definitions and adding Sections 90-462 (p), 90-472 (v), and 90-552 (q), and adding Division 90-IX-8 Food Truck/Food Truck Park to Article 90-IX Supplementary District Regulations: Text additions in **BOLD**

Sec 90-1 Definitions

Food Truck

1. **Food Truck means a motorized or non-motorized vehicle designed as a complete and transportable unit and used as a mobile business to sell food and/or beverages from a stationary location during serving hours. Food trucks exclude structures installed with a permanent foundation, tent-walled structures, and mobile food trucks which distribute food and/or beverages as driven throughout a community (e.g., mobile ice cream truck).**

2. **Food Truck Park means three (3) or more food trucks that congregate at an established private property location to offer food and/or beverages for sale to the public as the principal use of the land.**

Sec 90-462 Permitted Uses (O Office District)

p. Food Truck/Food Truck Park as regulated by Division 90-IX-8.

Sec 90-472 Permitted Uses (B-1 Central Business District)

v. Food Truck/Food Truck Park as regulated by Division 90-IX-8.

Sec 90-552 Permitted Uses Permitted Uses (D-1 Industrial District)

q. Food Truck/Food Truck Park as regulated by Division 90-IX-8.

Division 90-IX-8 Food Truck/Food Truck Park

Sec 90-914 Scope

a. Public property. A food truck located on public property is not regulated by this ordinance.

b. Private property. A food truck located on private property shall only be allowed as regulated by Article 90-VI – District Regulations and shall be subject to the standards and approval process of Section 90-915 – Standards.

Sec 90-915 Standards

a. Location. A food truck may be located and operate on property with or without a principal use/building.

b. District regulations. Lot area, lot width, setbacks and any other dimensional requirement of the zoning district shall apply.

c. Parking

1. A food truck located/operating on property with a principal use/building shall not serve to reduce on-site parking for the principal use/building in violation of parking requirements.

2. A food truck located on property without a principal use/building and food truck parks shall be adequately served by on-site and/or off-site parking facilities.

d. Separation. A food truck shall not be located within 150 feet of a permanent business with a food license during the permanent business's hours of operation.

e. Traffic. A food truck shall be located and operate in such a manner so as not to interfere with pedestrian or vehicular traffic.

f. Noise. The use of amplifiers, banners, loud music, and other attention gathering devices in conjunction with the operation of a food truck shall be prohibited.

g. Lighting. The use of flashing or blinking lights or strobe lights in conjunction with the operation of a food truck is prohibited. All exterior lights over 60 watts shall contain opaque, hood shields to direct the illumination downward.

h. Refuse. A food truck provider shall provide appropriate waste receptacles at the site of the food truck and keep the area in which it operates clean, sightly, and free of trash.

i. Local ordinances. A food truck shall comply with the city's nuisance ordinance, sign ordinance and all other city ordinances.

j. Other regulations. A food truck shall comply with all applicable federal, state, and county regulations.

k. Approval. A food truck/food truck park shall be subject to the following approval process:

1. No food truck/food truck park shall locate or operate on private property until a zoning permit has been approved by the city.

2. Application for a zoning permit shall be made through the city clerk/treasurer and shall be accompanied by a plot plan, which shall show parking and outdoor seating proposed to serve the food truck/food truck park and demonstrate compliance with the standards of this section.

a. Application for a zoning permit for a food truck may be for a single location or to rotate between multiple locations.

b. Application for a food truck/food truck park shall be accompanied by written consent of the property owner(s) of the private property(ies) under consideration.

3. The zoning administrator shall review the application and plot plan for a single food truck to be located on one (1) property or multiple properties for compliance with the standards of this section. Based on these standards, the zoning administrator shall approve, deny, or approve with conditions the zoning permit.

4. The planning commission shall review the application and plot plan for a food truck park for compliance with the standards of this section. Based on these standards, the planning commission shall approve, deny, or approve with conditions the zoning permit.

5. **The zoning permit shall state the approved time periods of location/operation of the food truck/food truck park.**

6. **A zoning permit for a food truck/food truck park shall be valid for one calendar year.**

7. **A zoning permit may be transferred to a new food truck proposed to replace the food truck previously designated. The new food truck shall be subject to the standards of this section and the conditions of the transferred zoning permit.**

8. **An amendment of a zoning permit is required if there are proposed modifications to the approved plot plan or conditions of the temporary zoning permit.**

9. **A zoning permit may be revoked by the zoning administrator upon evidence of a failure to comply with the standards of this section and/or the conditions of the temporary zoning permit.**

SECTION II.

If any article, section, subsection, sentence, clause, phrase, or portion of this ordinance is, for any reason, held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed a separate, distinct, and independent provision, and such holding shall not affect the validity of the remaining portions of this ordinance.

SECTION III.

This ordinance shall become effective upon its adoption and publication as provided by City Charter.

Moved by , with support by , that Ordinance No. TBD be adopted as read.

YEAS:
NAYS:
ABSENT:

CITY OF HASTINGS

Adoption Date:
Effective Date:
First Reading:
Second Reading:

By: Christopher R. Bever
Hastings City Clerk

CERTIFICATE

The undersigned, being the duly qualified and acting Clerk of the City of Hastings, Michigan, does hereby certify that the foregoing is a true and complete copy of an Ordinance adopted by the City Council of the City of Hastings, at a regular meeting of the City Council on the day of 2023, at which meeting a quorum was present and remained throughout, and that the original of said Ordinance is on file in the records of the City of Hastings. I further certify that the meeting was conducted, and public notice was given pursuant to and in compliance with Act No. 267, Public Acts of Michigan of 1976, as amended, and that minutes were kept and will be or have been made available as required thereby.

Dated:

_____

Christopher R. Bever
City Clerk

Sec 90-883 Driveways

a) *General requirements*. All driveways, including tapers and approaches, shall be located within the limits of the side lot lines extended to the centerline of the roadway except for shared driveways as permitted by this section.

b) *Residential driveways.*

1.

a) A lot or parcel containing a single-family dwelling shall have only one driveway. Two driveways may be permitted for a circle drive on the lot or parcel, but only if the lot or parcel has 80 feet or more of frontage on the street.

b) One additional driveway may be allowed for every 70 feet of frontage that is in excess of 100 feet of lot frontage.

2. Driveways serving a lot containing a single-family or two-family dwelling shall be a minimum of 45 feet from a driveway on another lot as measured between the centerline of each driveway. The zoning administrator may permit driveways closer together if it can be demonstrated that there is some feature peculiar to the lot or street or the location of an existing driveway prevents or makes it difficult to comply with the 45-feet spacing requirement.

3. Dwellings constructed after the effective date of the ordinance from which this section was derived shall be served by a driveway paved with asphalt or concrete that shall connect the garage or parking space with the street.

4. The maximum width of a driveway serving a single-family or two-family dwelling shall be a minimum of 12 feet and a maximum of 20 feet as measured at the property line.

5.

a) For lots containing single-family and two-family dwellings where the dwelling is more than 150 feet from the edge of the street, the fire chief shall review the driveway and make recommendations to require, to the extent possible, that the driveway be constructed so the dwelling can be provided adequate fire protection.

b) For driveways that cross a ditch, natural drainage course or other body of water, the fire chief shall approve the crossing to ensure it is capable of accommodating emergency vehicles.

(Ord. No. 301, § 3(3.48), 2-10-97)

Planning Commission Agenda Item Memorandum

To: The Planning Commission

From: Travis J. Tate, P.E., Director of Public Services

Subject: New Stormwater Standards for the City of Hastings

Meeting Date: April 3, 2023

Recommended Action:

Approve recommending to the City Council to adopt new Stormwater Standards, Procedures and Design Criteria for Stormwater Management. These standards were prepared by Claire E. Schwarts, P.E., of Fishbeck. She is a well renowned expert in the West Michigan and has worked for several counties, and municipalities developing stormwater standards.

Background Information:

The City's current standards were adopted in 2000, making them 23 years old. The standards are fine for detention ponds, but they lack modern stormwater Best Management Practices(BMPs). There are many types of stormwater management including: Sediment forbays, infiltration trenches, rain gardens, bioswales, water quality swales, water quality devices, vegetative filter strips, ect. Those mentioned among others are not identified or encouraged to use in the current standards or guidelines.

The new standards give developers and engineers a better expectation on how to approach stormwater management. It allows for site specific flexibility, by utilizing various BMP's for pre-treatment, water quality, channel protection, and flood control. The standards require the designers to takes into account soil type, groundwater depth and other site parameters in order to best fit stormwater management for the site project. Adopting these standards will save time for developer's engineers and the Director of Public Services to design and review, respectively. Lastly, implementation of the new standards will protect an important resource for the city, the Thornapple River, Fall Creek and Butler Creek.

Attachments:

- *New Stormwater Standards, April 2023*
- *Detention Basin Design Criteria for The City of Hastings, 2000*

CITY OF HASTINGS, MICHIGAN

STORMWATER STANDARDS

Procedures and Design Criteria for
Stormwater Management

City of Hastings
Department of Public Services
201 E State Street
Hastings, MI 49058

April 2023

Published By:

City of Hastings
201 E State Street
Hastings, MI 49058
269.945.6006
https://hastingsmi.org

Prepared By:

Fishbeck, Inc.
1515 Arboretum Drive SE
Grand Rapids, MI 49546
616.575.3824
Project No. 230203

Table of Contents

Table of Contents

List of Tables

List of Figures

Table of Contents

List of Abbreviations

Acronyms

ASTM	American Society for Testing and Materials
BMP	Best Management Practice
CN	Curve Number
EGLE	Michigan Department of Environment, Great Lakes and Energy (formerly Department of Environmental Quality (DEQ) prior to April 7, 2019).
EPA	United States Environmental Protection Agency
HSG	Hydrologic Soil Group
MCL	Michigan Compiled Laws
MDOT	Michigan Department of Transportation
NAICS	North American Industry Classification System
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
NRCS	Natural Resources Conservation Service
PA	Public Acts of Michigan
RRD	Remediation and Redevelopment Division
SEMCOG	Southeast Michigan Council of Governments
TR-55	Technical Release 55
USDA	United States Department of Agriculture
USGS	United States Geological Survey

List of Units

ft (’)	feet
in (”)	inches
cfs	cubic feet per second
H:V	horizontal to vertical
in/hr	inches per hour

I. PURPOSE

The City of Hastings (City) maintains a storm sewer infrastructure that serves a majority of its 5.29 square mile jurisdictional area. As the City continues to grow and redevelop, stormwater drainage systems will be necessary to provide for public safety, convenience, and the protection of property. The future of the City's surface water and groundwater resources also depends to a great extent on the management of storm water runoff. The City takes an active role in protecting these resources through effective stormwater management planning and practices.

It is the purpose of these published Stormwater Standards to meet the following objectives in the City:

1. Ensure stormwater drainage systems are adequate to address stormwater management needs within a proposed development, and protect the drainage, property, and water rights of landowners outside of the proposed development.
2. Reduce flood damage due to development.
3. Minimize degradation of watercourses due to development.
4. Prevent an increase in nonpoint source pollution.
5. Encourage water recharge into the ground where favorable conditions exist.

II. AUTHORITY

A. State law and Code of City Ordinances

Under the Home Rule City Act, PA 279 of 1909 (MCL 117.1 et seq), the City Commission has the power to enact, amend and repeal all ordinances that may be necessary or proper for carrying out the powers conferred and the duties imposed upon the City by the charter and by the laws of the State.

The Code of City Ordinances, Chapter 46 Land Division and Chapter 90 Zoning, establish the site plan review procedure under the Land Division Act, PA 288 of 1967 (MCL 560.101 et seq.); Condominium Act, PA 59 of 1978 (MCL 559.101 et seq.) and local regulation of condominiums (MCL 559.241); the Mobile Home Commission Act, PA 96 of 1987 (MCL 125.2301 et seq.); and the Michigan Zoning Enabling Act, PA 110 of 2006 (MCL 125.3101 et seq.), including Planned Unit Development (MCL 125.3503 et seq.); as amended.

B. Provisions for Requirements in Addition to Minimum Standards

This manual provides minimum stormwater standards to be complied with by Developers and in no way limit the authority of the City to adopt or publish and enforce higher standards as a condition of approval of the final plat or site plan. The City reserves the right to determine site specific requirements other than those herein, based upon review of the plans. Any deviations from these Stormwater Standards shall be subject to approval by the City.

If any part of these Stormwater Standards is found to be invalid, such invalidity shall not affect the remaining portions of the standards which can be given effect without the invalid portion, and to this end the rules are declared to be severable.

III. APPLICABILITY

A. Review Required

These Stormwater Standards apply to all private and public development and redevelopment projects within the City that:

1. Require planning commission or staff approval under Chapter 46 Land Division; and Chapter 90 Zoning, Article 90-IV Site Plan Review of the City Code of Ordinances;
2. Will alter stormwater drainage characteristics of the site.

These standards also apply to City-owned facilities and City public works projects, including road projects.

B. Exemptions

The following development activities are exempt from stormwater review:

1. Land and lot divisions (under Article 46-III City Code of Ordinances).
2. Construction, addition, extension or modification to an individual single or two-family residential dwelling.
3. Relocation of an existing driveway.
4. Non-motorized improvements (sidewalk, pathway) within public rights-of-way that disturb less than 5,445 square feet or 1/8 acre.

C. Redevelopment

Redevelopment and additions requiring stormwater review shall comply with the current standards for the redeveloped or newly constructed portion of the site, except that the City reserves the right to require the entire site be brought up to the current standards.

The last land use prior to the redevelopment shall be the condition of the site prior to vacancy. The City reserves the right to define the last land use for the redevelopment site as the interim vacant condition.

IV. FEES

The fees for stormwater permit review under the provisions of these Stormwater Standards are set forth in City Resolution 2020-09 to Revise Fees for Various Services, or a subsequent resolution when fees are updated by City Council.

V. ADOPTION AND REVISION

The City Council has adopted these Stormwater Standards at the April 10, 2023 City Council meeting. The effective date of these standards is April 10, 2023. Revisions to the standards or fees will be subject to review and approval by City Council.

I. SUMMARY

The following stormwater management requirements shall apply to all new and redevelopments in the City of Hastings requiring stormwater review.

Design Process

The stormwater site design process, summarized in the steps below, shall be followed to minimize negative impacts from development that could be avoided through proper planning.

1. Protection. The design process shall begin by identifying and prioritizing environmentally sensitive areas located on the site and laying out the site to maximize protection of the sensitive areas.
2. Drainage Plan. The drainage plan shall meet the stated drainage and discharge requirements both internal and external to the site. An adequate outlet must always be identified downstream of the development to receive the post-development discharge.
3. Source Controls. Source controls reduce the volume of runoff generated onsite. Non-structural BMPs shall be maximized to protect sensitive areas and reduce the size of runoff controls.
4. Runoff Controls. Runoff controls are typically needed to manage the additional post-development stormwater runoff. Structural BMPs shall be sized to meet the minimum stormwater standards summarized in **Table 1**, or higher standards if required.
5. BMP Design. BMPs must be selected and designed in accordance with the calculation methodology and minimum design criteria provided in this manual. A list of common BMPs and their treatment ability is given in **Table 2**.
6. Soils Investigation. Test pits or soil borings are required for most structural BMPs to determine soil classification, depth to groundwater and the presence of other site constraints. Field permeability testing is not generally required, but may be requested for questionable soils or conducted to allow the use of a higher design infiltration rate.
7. Groundwater. The highest known groundwater elevation and extent of mounding from infiltration BMPs shall be determined to ensure no adverse impacts internal and external to the site.
8. Operation and Maintenance. BMPs must be designed to allow for operation and maintenance, demonstrated in the review submittals. Specific requirements are included on individual BMP design criteria sheets. A maintenance agreement with the City is not required at this time.

Table 1 – Minimum Required Stormwater Standards

Standard/Where Required	Criteria
Water Quality "first flush" All sites.	Treat the runoff generated from 1 inch of rain over the project site.
Channel Protection Surface water discharge.	Retain the runoff volume increase between pre-development and post-development conditions for the 2-year, 24-hour storm, where site conditions are conducive to infiltration. Where site conditions preclude infiltration the City may require extended detention of the 2-year runoff volume increase with a drawdown time of 48 hours.
Flood Control All sites; unless exception is allowed.	Collection and Conveyance: Design storm sewers and swales for the 10-year storm, and open channels for the 25-year storm. Detention and Retention: Store runoff from the 25-year storm with a maximum release rate of 0.13 cfs per acre. Overflow Routes for Extreme Flood: Identify overflow routes and the extent of high water levels for the 100-year flood to ensure no adverse impacts to structures offsite or internal to the site. Where overland flow routes do not exist: 1. Protect buildings with redundant storm sewer system sized for the 100-year storm; and 2. Increase size of detention and retention basins to store two (2) times the flood control volume.
Pretreatment	Pretreatment volume equal to 15% of water quality volume.
Hotspot Industrial and commercial land uses in **Table 3;** Part 201 and Part 213 sites (Brownfields).	Isolate transfer and storage areas to minimize need for treatment. Pretreatment BMP with impermeable barrier above groundwater and provisions for the capture of oil, grease, and sediments. Minimum spill containment volume: 400 gallons.

Table 2 – Stormwater BMP Matrix

Stormwater BMP	Treatment			
	Requires Pretreatment	TSS Removal Efficiency	Provides Pretreatment	Provides Spill Containment
Non-Structural BMPs				
Protect Sensitive Areas				
Native Revegetation				
Stormwater Disconnect				
Structural BMPs – Conveyance and Storage				
Storm Sewer				✓
Culvert or Bridge				
Open Channel				
Detention Basin	✓			
Retention Basin	✓			
Structural BMPs – Treatment and Small Site				
Sediment Forebay			✓	
Spill Containment Cell			✓	✓
Infiltration Practices	✓			
Constructed Filter	✓		✓	
Bioretention/Rain Garden	✓			
Planter Box			✓	
Pervious Pavement				
Vegetated Roof			✓	
Capture Reuse	✓			✓
Water Quality Device			✓	✓
Water Quality Swale			✓	✓
Bioswale			✓	
Vegetated Swale			✓	
Vegetated Filter Strip			✓	
Level Spreader			✓	

✓ = Yes

TSS Removal Efficiency is not used at this time.

II. DRAINAGE PLAN

Drainage Patterns

Proposed drainage for the development shall conform to existing watershed boundaries, natural drainage patterns within the site, or any established county drainage districts.

Staged Development

Each phase shall be self-sufficient from the standpoint of drainage.

Location of Stormwater Management Facilities

Stormwater management facilities (detention and retention basins) within a development planned to have multiple lot owners shall be located on dedicated outlots, or have separate easements granted to the entity responsible for operation and maintenance of the stormwater management system.

Parking lots, roadways, and walkways shall not be flooded for use as stormwater detention.

Offsite Stormwater

Surface water flows from offsite land shall be routed around the development's onsite stormwater system whenever possible. An onsite detention basin shall not be used to pass this flow through the site. If water from offsite is directed through a private onsite detention basin, the basin must be sized to include the existing offsite area under current land use.

Stormwater Discharge

The rate, volume, concentration, or constitution of stormwater discharged from a site for the specified design storms shall not create adverse impacts to downstream property owners and watercourses. To that end, the following stormwater discharge requirements must be met for all sites:

1. Post-development discharge shall not exceed the capacity of existing infrastructure or the existing discharge rate from the site. An adequate outlet must always be identified downstream of the development to receive the post-development discharge.
2. Post-development discharge shall not cause adverse impact to offsite property due to concentrated runoff or ponded water of greater height, area, and duration.
3. Discharge shall not cause downstream erosion or sedimentation.
4. Discharge to groundwater shall not cause groundwater mounding sufficient to adversely impact structures or adjacent property.
5. Post-development discharge shall not cause impairments by the contribution of pollutants to surface water or groundwater.
6. For a downstream drainage system that is inadequate to handle any increase to the existing design discharge from the site development, it is the Developer's responsibility to:
    a. Stabilize or upsize the existing conveyance system, or establish a county drain to provide the needed design level of flood protection.
    b. Obtain flooding easements for increases in water levels determined to cause an adverse impact.
    c. Provide additional onsite stormwater controls.

It is the Developer's obligation to meet these requirements. Should a stormwater system, as built, fail to comply, it is the Developer's responsibility to have constructed at their expense, any necessary additional and/or alternative stormwater management facilities, subject to City review and approval.

III. STANDARDS

A. Water Quality

Where Required

Treatment of the water quality volume is required for all sites to capture and treat the "first flush" of stormwater runoff that typically carries with it the highest concentration of pollutants.[1]

Standard

Capture and treatment of the runoff from the 90% annual nonexceedance storm is required for the project site. This storm is approximately equivalent to 1 inch of rain (0.90 inch for Michigan Climatic Zone 9 per EGLE memo "90 Percent Annual Nonexceedance Storms" dated March 24, 2006).

Runoff is calculated from the disturbed portion of the site including both pervious and impervious surfaces. Natural areas left undisturbed and BMPs that provide water quality treatment need not be included in the calculations.

Treatment BMPs

Treatment can be provided through one of the following methods:

1. Settling (Permanent Pool or Detention)
2. Filtration
3. Infiltration
4. Absorption
5. Chemical/Mechanical Treatment

Permanent Pool. The volume of a permanent pool incorporated into a stormwater BMP and sized at 2.5 times the water quality volume.[2] This is the volume below the ordinary static water level (also known as dead storage).

Detention. The storage volume provided by detention of stormwater.

Filtration. The volume of stormwater runoff routed through a BMP that provides filtration (i.e. an underdrained BMP). In the case of a vegetated filter strip or vegetated swale, the filtering area must meet minimum standards for slope, length, drainage area and vegetative cover.

Infiltration. The volume of stormwater runoff infiltrated into the ground through a stormwater BMP.

Absorption and Chemical/Mechanical Treatment. The volume of stormwater runoff routed through a water quality device, or natural or engineered system.

[1] Stenstrom, Michael K. and Kayhanian, Masoud (2005). *First Flush Phenomenon Characterization*. California Department of Transportation, Sacramento, California.

[2] Barrett, Michael (2005). *BMP Performance Comparisons: Examples from the International Stormwater BMP Database*, Center for Research in Water Resources, PRC#119, University of Texas, 2005 Water Environment Federation.

B. Channel Protection

Where Required

Channel protection is required for surface water discharges.

Standard

Retain the runoff volume increase between pre-development and post-development conditions for the 2-year, 24-hour storm, where site conditions are conducive to infiltration.

Pre-development is defined as the last land use prior to the planned new development or redevelopment.

Retention can be provided through infiltration or reuse.

Note: Volume control for channel protection is required to mitigate increases in runoff rates and volumes for the more frequent (bankfull) rainfall events that have the greatest influence on shaping stream channels. An increase in runoff volume can expose channels to critical erosive velocities for a longer duration, causing accelerated channel adjustments to occur.

Extended Detention

Where site constraints limit infiltration, extended detention of the 2-year volume increase may be required for larger sites, where minimum orifice requirements can be met.

Extended detention is defined as holding the stormwater runoff volume and releasing it gradually so the maximum storage volume will drawdown (drain) in 48 hours.

Note: The intent is to release stormwater runoff in such a gradual manner that critical erosive velocities during the bankfull event will seldom be exceeded in downstream channels.

Site constraints that limit the use of infiltration may include:

1. Poorly draining soils (<0.24 inches per hour; typically hydrologic soil groups C and D).
2. Bedrock.
3. High groundwater, or the potential of mounded groundwater to impair other uses.
4. Well head protection areas.
5. Stormwater hot spots.
6. Part 201 and Part 213 sites, and areas of soil or groundwater contamination.

C. Flood Control

Where Required
Flood control is required for all sites.

Standard
Detention or retention of the 25-year storm with a maximum release rate of no greater than 0.13 cfs per acre is required.

A pipe outlet (detention) shall be provided whenever possible.

An alternate maximum release rate may be allowed under certain conditions, including, but not limited to:

1. City Storm Sewer. Redevelopment sites discharging to a municipal storm sewer where the municipality has determined the sewer has adequate capacity for the existing peak runoff rate from the site. Detention need only be provided for any increase in impervious area.
2. Grandfathered Detention Sites. A site expansion with a previously approved discharge rate higher than the current standard may be "grandfathered in" and need only provide the additional storage volume for any increase in impervious area over that previously approved.
3. Direct Discharge. Direct discharges to waterbodies or watercourses where the Developer demonstrates that the receiving waters possess capacity to convey the post-development discharge safely and with no negative downstream impacts due to increased flow rates, water levels or velocities. In addition, the peak flow of the receiving waters cannot be increased by the proposed development (i.e. there is a sufficient difference in the timing of the two hydrographs).
4. Floodplain. When the site is located adjacent to or within a floodplain, excavation of new floodplain in lieu of standard stormwater detention may be required. The excavated volume shall be equal to the standard detention basin storage volume. Only the volume above the 2-year and below the 100-year floodplain elevation can be counted to meet the volume requirement.

Overflow Routes for Extreme Flood
Overflow routes and the extent of high water levels for the 100-year flood shall be identified for the site and for downstream areas between the site and the nearest acceptable floodway or outlet. Provisions shall be made to ensure no adverse impacts offsite or internal to the site.

Acceptable overflow routes are defined as available flow paths that do not flood structures including buildings, parking garages and the like. Where acceptable overflow routes do not exist:

1. Buildings shall be protected from flooding by two separate enclosed drainage systems, a primary and a redundant system, each independently protecting the building from flooding during the 100-year storm. Runoff shall be directed to the inlets of the primary system for up to a 10-year storm, to minimize the accumulation of debris over the redundant inlets; and
2. Detention and retention basins shall be increased in size to store two (2) times the flood control volume.

Note: The intent of the extreme flood criteria is to prevent flood damage from large but infrequent storm events by identifying and/or designing overland flow paths that are clear of structures and have grades below the lowest openings of structures. Overflow routes may include floodplains along open channels, overbank areas along vegetated swales, curb jumps in drives and parking lots, and other flow paths flood waters will take to reach an outlet, whether overland or underground.

D. Pretreatment

Where Required

Pretreatment is required prior to discharging stormwater runoff to the following structural BMPs to preserve the longevity and function of the BMP:

1. Detention basin
2. Retention basin
3. Infiltration practices
4. Constructed filter
5. Bioretention/rain garden
6. Capture reuse

Treatment BMPs

Pretreatment provides for the removal of courser sediments, trash, debris and other pollutants. Methods of pretreatment include:

1. Sediment Forebay (including other BMPs that hold and filter this volume)
2. Water Quality Device
3. Vegetated swale
4. Vegetated filter strip

Standard

Sediment Forebay

A minimum pretreatment volume equivalent to 15% of the water quality volume is required for sediment forebays using gravity.

Note: This is a conservative approximation of results given by the Hazen equation for sediment basin sizing using a 50% settling efficiency for a 50-micron particle (silt) at a maximum 4-foot settling depth with a 1-year peak inflow at a rainfall intensity of 1 inch per hour, consistent with recommendations in the *Low Impact Development Manual for Michigan* (SEMCOG, 2008).

Note: For properly sized pretreatment BMPs, the entire contributing drainage area must be used to calculate the water quality volume if the disturbed portion is only a small percentage of the area.

Water Quality Device

Configured to trap sediment, oils and floatables in an integral unit.

Vegetated Swale

Minimum length shall be 20 feet with a minimum 1-foot-high check dam and wedge storage sized as a sediment forebay.

Vegetated Filter Strip

Minimum sheet flow length shall be 10 feet at a maximum slope of 2% with an impervious approach length no greater than 3.5 times the filter strip length, up to a maximum approach length of 75 feet.

Minimum sheet flow length shall be 15 feet for slopes between 2% and 6% with an impervious approach length no greater than 3 times the filter strip length, up to a maximum approach length of 75 feet.

Note: Vegetated filter strip sizing for pretreatment from Design of Stormwater Filtering Systems (Center for Watershed Protection, 1996).

E. Hot Spots

Where Required

Sites considered to be stormwater hot spots are identified in **Table 2**. These include activities with a high potential to cause contamination, and sites that have existing contamination. More specifically:

1. Commercial, industrial, institutional, municipal or transportation-related operations (i.e. high risk operations) involving the production, transfer, storage, and/or use of hazardous materials in quantities that pose a high risk to surface and groundwater quality as defined in Part 5 Rules: Spillage of Oil and Polluting Materials, Water Resources Protection (Part 31, Act 451, PA 1994).
2. "Brownfield" sites with soil or groundwater contamination under Part 201 Environmental Remediation and Part 213 Leaking Underground Storage Tanks (Act 451, PA 1994).

Standard

Pretreatment volume with a minimum of 400 gallons required for spill containment from hot spot land use activities.

Note: The minimum spill containment volume provides a reasonable capture size (e.g. a small fuel truck can have a hauling capacity of 500 to 1,000 gallons) that can be accommodated with a 6-foot diameter water quality device.

Pretreatment BMPs must have an impermeable barrier between the treated material and the groundwater and have provisions for the capture of oil, grease, and sediments.

Treatment BMPs

Specific stormwater management strategies for hotspots include the following:

1. Isolate transfer and storage areas from permeable surfaces and reduce exposure to stormwater.
2. Identify opportunities for use of infiltration BMPs in other areas of the site.
3. Where storage and transfer areas exposed to stormwater cannot be avoided:
   a. Infiltration of runoff from pavement surfaces is discouraged in favor of a surface water discharge.
   b. Pervious pavements that infiltrate into the groundwater are not permitted because they do not allow for any pretreatment or spill containment.
   c. Perforated pipes for infiltration are not permitted due to the difficulty in isolating an accidental spill.
   d. A standard catchbasin and outlet pipe with a downturned end is not permitted because the area of the permanent pool is insufficient to prevent the captured low-density fluids from becoming entrained in the water when surface inflow enters the structure.

Evaluation Procedure

High-risk Operations

Sites meeting the classifications in **Table 3** must be evaluated to see if operations classify the site as a stormwater hotspot when it is not clear from the descriptions in the table. Evaluation is based on six categories of operations using the EPA form "Hotspot Site Investigation" as a guide:

1. Vehicle Operations
2. Outdoor Materials
3. Waste Management
4. Physical Plant Maintenance
5. Turf and Landscaping
6. Stormwater Infrastructure

The site is considered a stormwater hotspot unless scoring indicates "not a hotspot."

Brownfield Sites

Brownfield sites must be evaluated before an infiltration approach can be approved so as not to exacerbate existing conditions. The following steps must be followed for sites with known contamination:

1. Include a qualified environmental consultant on the design team.
2. Show areas of known contamination on the site map.
3. Specify on the drawings how contractor is to address any contamination which may be found during construction.
4. The site evaluation process must follow the document entitled *Implementing Stormwater Infiltration Practices at Vacant Parcels and Brownfield Sites* (EPA, 2013).
5. Submit supporting documentation of the site evaluation process with the stormwater review package.
6. Contact EGLE Remediation and Redevelopment Division (RRD) staff for consultation as necessary.

Table 3 – Stormwater Hot Spots

2017 North American Industry Classification System (NAICS)	
31 – 33	Manufacturing.
44 – 45	Retail Trade (441 Motor Vehicle and Parts Dealers, 444 Building Material and Garden Equipment and Supplies Dealers, 447 Gasoline Stations, 454 Non-store Retailers (e.g. fuel dealers)).
48 – 49	Transportation and Warehousing.
71	Arts, Entertainment, and Recreation (79393 Marinas).
81	Other Services (8111 Automotive Repair and Maintenance, 8113 Commercial and Industrial Machinery and Equipment Repair and Maintenance, 8123 Dry Cleaning and Laundry Services, 8129 Other Personal Services (e.g. photofinishing laboratory)).
42, 56	Salvage Yards (423930 Recyclable Material Merchant Wholesalers) and Recycling Facilities (562 Waste Management and Remediation Services).
	Brownfield Sites classified under Part 201 Environmental Remediation and Part 213 Leaking Underground Storage Tanks (Act 451, PA 1994) of the Michigan compiled laws.
	Areas with the potential for contaminating public water supply intakes.
	Other land uses and activities where petroleum products, chemicals or other polluting materials have a high probability of polluting surface or groundwater due to quantity of use, storage or waste products generated, as determined by the City.
Many of these sites will also be regulated under the EPA NPDES Industrial Stormwater Program. A detailed list of NAICS industries can be found at: https://www.census.gov/naics/	

I. SOILS INVESTIGATION

A. Qualifications

Soils investigation by a qualified geotechnical consultant is required for BMPs that rely on infiltration. The geotechnical consultant shall be a professional engineer, soil scientist, or professional geologist.

B. Feasibility Evaluation

An initial feasibility evaluation shall be conducted to screen proposed BMP sites. The evaluation involves review of the following resources:

1. County Soil Survey prepared by the NRCS and USDA Hydrologic Soil Group (HSG) classifications.
2. Existing soil borings, wells, or geotechnical report on the site.
3. Onsite septic percolation testing.
4. Cyclical groundwater levels http://waterdata.usgs.gov/mi/nwis/gw

C. Test Pit/Soil Boring Requirements

A test pit (excavated trench) or soil boring shall be used for geotechnical investigation. Test pits may typically be selected for shallower investigations in locations where groundwater is sufficiently low.

The minimum number of test pits or soil borings shall be determined from **Table 4**. The City reserves the right to request additional test pits or soil borings based on local conditions and initial findings (e.g. large variability in soil type, high groundwater table).

Table 4 – Minimum Number of Soil Tests Required

Type of BMP	Test Pit/Soil Boring	Depth of Test Pit/ Soil Boring	Field Permeability Test
Retention basin Infiltration bed Pervious pavement	1 per 5,000 square feet of bottom area; 1 minimum	10 feet below proposed bottom	1 per change in soil class; 1 minimum
Infiltration trench Bioswale	1 per 500 to 1,000 linear feet of BMP; 1 minimum	5 feet below proposed bottom	1 per change in soil class; 1 minimum
Dry well Leaching basin Bioretention/Rain garden Planter box	1 minimum	5 feet below proposed bottom	1 per change in soil class; 1 minimum
Detention basin	1 per 10,000 square feet of bottom area; 1 minimum	5 feet below proposed bottom	No

Excavate a test pit or soil boring in the location of the proposed BMP. The following conditions shall be noted and described, referenced from a top-of-ground elevation:

1. Depth to groundwater recorded during initial digging or drilling, and again upon completion of the excavation.
2. Depth to bedrock or hardpan.
3. Depth and thickness of each soil horizon including the presence of mottling.
4. Unified Soil Classification System for all soil horizons. USDA soil texture classification when required.

Test pit and soil boring logs shall include the date(s) data was collected and the location referenced to a site plan.

D. Highest Known Groundwater Elevation

The highest known groundwater elevation shall be determined by adjusting the measured groundwater elevation using indicators such as soil mottling and regional water level data. It should also take into consideration local conditions that may be temporarily altering water levels at the time of measurement. Such conditions could include, but not be limited to: dewatering, irrigation well or large quantity withdrawals in the area, or areas of groundwater infiltration (such as a nearby retention basin).

E. Field Permeability Testing

Field permeability testing is generally not required, but may be performed to determine a design infiltration rate. The City reserves the right to request that field permeability testing be performed.

Acceptable field tests include:

1. Infiltration Rate of Soils in Field Using Double-Ring Infiltrometers (ASTM D3385).
2. Modified double-ring infiltration testing, using smaller diameter metal or plastic casings, where bore hole is required to reach design depth. The "Methodology for Double-Ring Infiltrometer Field Test" outlined on page 440 in Appendix E of the *Low Impact Development Manual for Michigan* (SEMCOG, 2008) shall be followed for each test.

Laboratory tests are not allowed.

The minimum number of field permeability tests shall be determined from **Table 4**. The City reserves the right to request additional field permeability tests be performed.

Tests shall be conducted in the location of the proposed BMP at the proposed bottom elevation. An alternate testing depth may be allowed if material is identical and groundwater is not an issue.

Tests shall not be conducted in the rain or within 24 hours of significant rainfall events (>0.5 inch) or when the ground is frozen.

Test reports shall include the date(s) data was collected and the location referenced to a site plan.

F. Design Infiltration Rates

The procedure used to determine a design infiltration rate is summarized in **Table 5**. The resulting design infiltration rate shall be the limiting value of the underlying soil or top dressing.

Table 5 – Determination of a Design Infiltration Rate

Description	Value	Maximum Design Infiltration Rate
Underlying soil Field permeability testing conducted No testing	 Test value divided by 2 Table 6	 10 in/hr 3.6 in/hr
Top dressing Sand/compost/topsoil mix Topsoil	Table 6 1.63 in/hr 0.50 in/hr	3.6 in/hr

The infiltration rate determined from field permeability testing shall be divided by 2 to calculate the design infiltration rate, up to a maximum design infiltration rate of 10 inches per hour.

Where field permeability testing is not performed, the design infiltration rates provided in **Table 6** shall be used to calculate the storage volume and minimum infiltration area of the BMP necessary to drain in the allotted drawdown time.

Table 6 – Design Infiltration Rates by USDA Soil Texture Class

Soil Texture Class	Effective Water Capacity[1] (inches per inch)	Design Infiltration Rate[2] (inches per hour)	HSG
Gravel	0.40	3.60	A
Sand	0.35	3.60	A
Loamy Sand	0.31	1.63	A
Sandy Loam	0.25	0.50	A
(Medium) Loam	0.19	0.24	B
Silty Loam / (Silt)	0.17	0.13	B
Sandy Clay Loam	0.14	0.11	C
Clay Loam	0.14	0.03	D
Silty Clay Loam	0.11	0.04	D
Sandy Clay	0.09	0.04	D
Silty Clay	0.09	0.07	D
Clay	0.08	0.07	D

[1]Source: Maryland Department of Environment (2000). *Maryland Stormwater Design Manual*, Appendix D.13, Table D.13.1 (Rawls, Brakensiek and Saxton, 1982).

[2]Source: Wisconsin Department of Natural Resources (2004). *Site Evaluation for Stormwater Infiltration (1002)*, Table 2 (Rawls, 1998). *Note*: Values are reduced by approximately a factor of 2 from those given in Table D.13.1.

Table 6 provides design values of the infiltration rate and effective water capacity (void ratio) for soils based on their textural classification. Soil textural classes correspond to the USDA Soil Textural Triangle shown in **Figure 1**.

Note: Infiltration is the process by which water on the ground surface enters the soil. Infiltration rate is a measure of the rate at which soil is able to absorb rainfall or irrigation in inches per hour. The rate decreases as the soil becomes saturated. The design infiltration rate assumes saturated conditions and closely approximates the hydraulic conductivity (typically given in feet per day) of the near-surface soil.

Note: The effective water capacity of a soil is the fraction of the void spaces available for water storage measured in inches per inch.

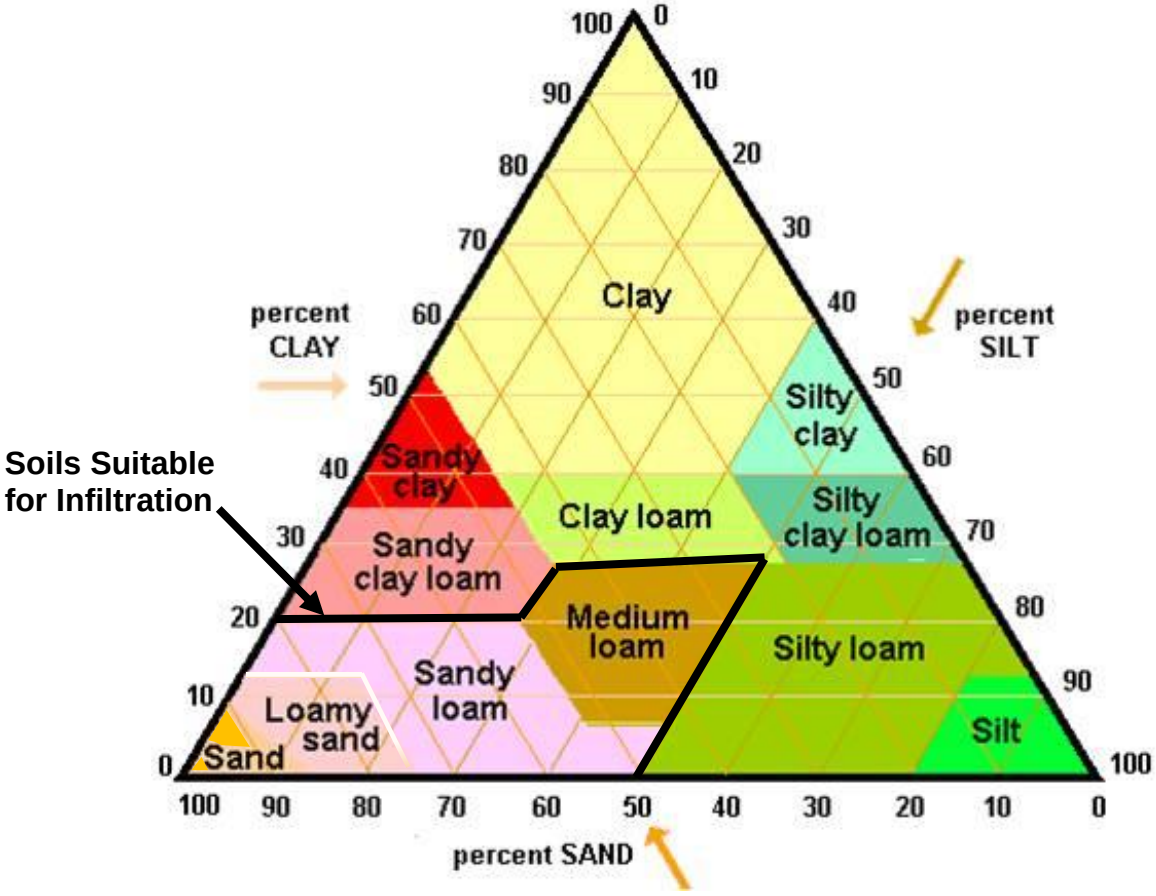
G. Minimum Allowable Infiltration Rate

Soil textures with design infiltration rates less than 0.24 inches per hour are deemed not suitable for infiltration BMPs.

Soils with design infiltration rates between 0.24 and 0.50 inches per hour may be used if suitable supplemental measures are included in the design. Supplemental measures may include subsoil amendment, underdrain placed at the top of the storage bed layer, or placement of wick drains.

The design infiltration rate of the underlying soil must be no less than 3.6 inches per hour for infiltration BMPs designed for flood control.

Figure 1 – USDA Soil Textural Triangle



II. CALCULATION METHODOLOGY

The Rational Method and the NRCS Runoff Curve Number Method (Curve Number Method) are typically used to calculate peak discharges and volumes of stormwater runoff to design stormwater conveyance and storage systems.

The Curve Number Method is presently the only acceptable method to calculate the channel protection volume.

The Small Storm Hydrology Method is used to calculate runoff volumes from the smaller rainfall amounts used for water quality treatment.

A. Calculating Runoff

1. Rational Method

The Rational Method may be used to calculate stormwater runoff volumes and peak discharges to size conveyance and storage systems for contributing drainage areas of 40 acres or less. The peak runoff rate is given by the equation:

$$Q = CIA \tag{3.1}$$

where:

Q = peak runoff rate (cubic feet per second).
C = weighted runoff coefficient of the drainage area.
I = average rainfall intensity for a storm with a duration equal to the time of-concentration of the drainage area (inches per hour). Use rainfall amounts from **Table 11** and divide by the duration in hours to obtain the average rainfall intensity (I).
A = drainage area (acres).

Runoff coefficients shall be selected from **Table 7**. Use 10-year coefficients to calculate peak discharges. Lawns and Open reflect average slopes (2% to 7%). Subtract 0.05 for flat slopes (0% to 2%). Add 0.05 for steep slopes (over 7%).[3]

Table 7 – Rational Method Runoff Coefficients (10- to 100-year rainfall frequencies)

Character of Surface	Return Period (years)		
	10[1]	25[2]	100[2]
Asphalt and Concrete Pavement/Roofs	0.95	0.97	0.98
Brick Pavement and Gravel Surface	0.85	0.88	0.91
Lawns and Open (HSG A)	0.10	0.17	0.20
Lawns and Open (HSG B)	0.15	0.27	0.38
Lawns and Open (HSG C)	0.20	0.45	0.55
Lawns and Open (HSG D)	0.30	0.57	0.67
Water	1.00	1.00	1.00

[1]The 10-year runoff coefficients are consistent with American Society of Civil Engineers and the Water Pollution Control Federation (1969). *Design and Construction of Sanitary and Storm Sewers*.

[2]The 25- and 100-year runoff coefficients are back-calculated to match 24-hour runoff volumes by the Curve Number Method and result in comparable storage volumes for detention and retention basins.

[3] C.T. Hann, B.J. Barfield, J.C. Hayes (1994). *Design Hydrology & Sedimentology for Small Catchments*.

Time-of-concentration for the Rational Method is the sum of overland flow and channel flow. A minimum of 15 minutes shall be used.

Overland flow time may be calculated using the following formula:

$$t_o = \left(\frac{2Ln}{3\sqrt{s}} \right)^{0.4673} \quad (3.2)$$

where:

t_o = time of overland flow (minutes)

L = length (feet); the distance from the extremity of the subcatchment area in a direction parallel to the slope until a defined channel is reached. Overland flow will become channel flow within 1,200 feet in almost all cases.

n = surface retardants coefficient from **Table 8**

s = slope (feet per foot); the difference in elevation between the extremity of the subcatchment area and the point in question divided by the horizontal distance

Table 8 – Surface Retardants Coefficients

Type of Surface	Coefficient (n)
Smooth impervious surface	0.02
Smooth bare packed soil	0.10
Poor grass, cultivated row crops, or moderately rough bare surface	0.20
Pasture or average grass	0.40
Deciduous timberland	0.60
Conifer timberland, deciduous timberland with deep forest litter, or dense grass	0.80
Source: Formula, coefficients and empirical observations from W.S. Kerby, J.M. Asce. Servis, Van Doren & Hazard Engineers, Topeka, Kansas. "Time of Concentration for Overland Flow" ENGINEER'S NOTEBOOK.	

Channel flow shall be calculated using Manning's equation arranged as:

$$V = \frac{An}{1.49R^{\frac{2}{3}}S^{\frac{1}{2}}} \quad (3.3)$$

where:

V = velocity (feet per second)

A = wetted area (square feet)

n = Manning's roughness coefficient from **Table 12**

R = hydraulic radius (feet)

S = slope (feet per foot)

The time-of-concentration is then:

$$Tc = t_o + \frac{L_c}{60V} \quad (3.4)$$

where:

Tc = time-of-concentration (minutes)

t_o = time of overland flow (minutes)

L_c = length of channelized flow (feet)

V = velocity of channelized flow (feet per second)

60 = factor to convert seconds to minutes

2. Curve Number Method

The Runoff Curve Number Method developed by the NRCS may be used to calculate stormwater runoff volumes and peak discharges to size conveyance and storage systems. This method must be used when it is necessary to calculate runoff volumes for channel protection. The formulas are as follows:

$$Qv = \frac{(P - 0.2S)^2}{(P + 0.8S)} \tag{3.5}$$

where:

Q_v = surface runoff (inches). *Note*: Qv=0 if P ≤ 0.2S

P = rainfall (inches)

S = potential maximum retention after runoff begins (inches)

and where:

$$S = \frac{1000}{CN} - 10 \tag{3.6}$$

Surface runoff (Qv) is calculated separately for each land use and soil type combination. Total runoff volume can then be calculated by the formula:

$$Vt = (\sum_i Q_{vi} A_i) \times 3630 \tag{3.7}$$

where:

Vt = total runoff volume of the design storm (cubic feet)

Qv = surface runoff for the i^{th} land use (inches)

A = contributing area associated with the i^{th} land use (acres)

3630 = factor to convert acre-inches to cubic feet

Curve Number (CN) values are taken from NRCS TR-55, and provided in **Table 9**.

Peak Discharge

The EGLE procedure outlined in *"Computing Flood Discharges for Small Ungaged Watersheds"* by Richard Sorrell, or computer software such as NRCS WinTR-55 may be used to calculate peak stormwater runoff rates.

A Michigan Unit Hydrograph is used in the EGLE small ungaged watershed spreadsheet and can be input into WinTR-55. The ordinates for the Michigan Unit Hydrograph for TR-55 are: [0.0, 0.5, 1.0, 0.8, 0.6, 0.4, 0.2 and 0.0].

Note: Using the standard NRCS unit hydrograph will overestimate peak runoff rates by 30 to 50 percent or more.

Table 9 – Curve Numbers (CNs) from TR-55

Land Use Description		Curve Number[1]			
	Hydrologic Condition[2]	Hydrologic Soil Group			
Cover Type		A	B	C	D
Cultivated land	Good	64	75	82	85
Pasture or range land	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow		30	58	71	78
Orchard or tree farm[3]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30[4]	55	70	77
Open spaces (grass cover)[5]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Paved parking lot, roof, driveway		98	98	98	98
Gravel[6]		88	93	94	95
Bare Soil		77	86	91	94
Water[7]		100	100	100	100

Source: U.S. Department of Agriculture Soil Conservation Service (1986). *Urban Hydrology for Small Watersheds*, *Technical Release No. 55*.

[1]Antecedent moisture condition II and initial abstract (I_a) = 0.2S

[2]Poor Condition: pasture or open space with less than 50% ground cover or heavily grazed with no mulch; woods - forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.

Fair Condition: pasture or open space with 50% to 75% grass cover and not heavily grazed; woods are grazed but not burned, and some forest litter covers the soil.

Good Condition: cultivated land (row crops, straight row) with conservation treatment (crop residue cover), also small grain; pasture or open space with 75% or more ground cover and lightly or only occasionally grazed; woods are protected from grazing, and litter and brush adequately cover the soil.

[3]CN's shown were computed for areas with 50% woods and 50% pasture (grass) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

[4]Actual curve number is less than 30; use CN = 30 for runoff computations.

[5]CN's shown are equivalent to those of pasture.

[6]Surface only; not including right-of-way.

[7]Water added.

Time-of-concentration for the Runoff Curve Number Method shall be calculated using NRCS TR-55 methodology as outlined below. A minimum of 0.1 hour (6 minutes) shall be used.

The flow path is split into three sections – sheet flow, shallow concentrated flow, and open channel flow. The travel time is computed for each flow regime. The time-of-concentration is then the sum of the travel times:

$$Tc = t_1 + t_2 + t_3 \tag{3.8}$$

(1) For sheet flow the travel time (t_1) in hours is given as:

$$t_1 = \frac{0.007(nL)^{0.8}}{P_2^{0.5} s^{0.4}} \tag{3.9}$$

where:
n = Manning's roughness coefficient from TR-55 Table 3-1
L = flow length (feet)
P_2 = 2-year, 24-hour precipitation depth (inches) from **Table 11**
s = slope (feet/foot)

(2) Shallow concentrated flow velocities are calculated for paved and unpaved surfaces. The velocities are given as:

$$v = \begin{cases} 16.1345 s^{0.5} & Unpaved \\ 20.3282 s^{0.5} & Paved \end{cases} \tag{3.10}$$

where:
s = slope (feet/foot)
v = velocity (feet per second)

The flow length (feet) is then divided by the velocity (feet per second) and a conversion factor of 3600 to obtain travel time (t_2) in hours:

$$t_2 = \frac{L}{3600\, v} \tag{3.11}$$

(3) Open channel flow uses Manning's equation to calculate the velocity based on slope, flow area, and wetted perimeter (refer to Equation 3.3). The flow length (feet) is then divided by the velocity (feet per second) to obtain travel time (t_3) in hours (refer to Equation 3.11).

<u>BMP Residence Time</u>

BMP residence time shall be calculated as the storage volume divided by the 10-year peak inflow rate.

3. Small Storm Hydrology Method

The Small Storm Hydrology Method is used to calculate the water quality treatment volume. The method was developed to estimate the runoff volume from urban land uses for relatively small storm events where the Rational and NRCS Methods prove less accurate. Water quality volume is calculated by the formula:

$$Vwq = ARv(1)(3630) \quad (3.12)$$

where:

Vwq = minimum required water quality volume (cubic feet)
A = area (acres); the developed portion of the site, both impervious and pervious, not receiving treatment with a non-structural BMP
Rv = area-weighted volumetric runoff coefficient from **Table 10**
1 = 90% non-exceedance storm rainfall amount (inches)
3630 = factor to convert acre-inches to cubic feet

Note: The Volumetric Runoff Coefficients (Rv) provided in **Table 10** are similar to the Rational runoff coefficient, but are exclusive to the rainfall amount (1-inch).

Table 10 – Runoff Coefficients for Small Storm Hydrology Method

Rainfall Amount (inches)	Volumetric Runoff Coefficient, Rv					
	Directly Connected Impervious Area			Disturbed Pervious Area		
	Flat Roofs/ Unpaved	Pitched Roofs	Paved	Sandy Soils (HSG A)	Silty Soils (HSG B)	Clayey Soils (HSG C&D)
1.0	0.815	0.965	0.980	0.035	0.120	0.2015

Source: Adapted from SEMCOG (2008). *Low Impact Development Manual for Michigan*, Table 9.3. (R. Pitt (2003). *The Source Loading and Management Model (WinSLAMM): Introduction and Basic Uses)*.

The area-weighted volumetric runoff coefficient, Rv, is calculated as:

$$Rv = \frac{A_1 Rv_1 + A_2 Rv_2 + \cdots A_n Rv_n}{\mathrm{A}} \quad (3.13)$$

where:

Rv_n = runoff coefficient for sub-area n
A_n = area of sub-area n (acres)
A = sum of the areas of all sub-areas (acres)

B. Rainfall

The rainfall duration-frequency table provided in **Table 11** shall be used with the Rational Method to determine rainfall intensity for rainfall duration equal to the time-of-concentration. Divide the rainfall amount by the duration in hours to obtain the rainfall intensity.

The 24-hour rainfall amounts provided in **Table 11** shall be used with the Runoff Curve Number Method.

An MSE4 rainfall distribution shall be used when a unit hydrograph approach is used (e.g. WinTR-55 computer program).

Table 11 – Rainfall Amounts (inches)

Duration	1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
24-hr	2.22	2.52	3.08	3.59	4.39	5.08	5.83
12-hr	1.92	2.19	2.70	3.17	3.92	4.57	5.28
6-hr	1.61	1.89	2.40	2.87	3.57	4.17	4.82
3-hr	1.37	1.63	2.09	2.50	3.11	3.62	4.16
2-hr	1.25	1.48	1.89	2.25	2.78	3.22	3.69
1-hr	1.02	1.21	1.53	1.81	2.23	2.57	2.93
30-min	0.80	0.94	1.17	1.38	1.67	1.91	2.17
15-min	0.56	0.65	0.81	0.95	1.15	1.32	1.49
10-min	0.46	0.53	0.66	0.78	0.95	1.08	1.22
5-min	0.31	0.36	0.45	0.53	0.65	0.74	0.83

Source: NOAA (2013). *Atlas 14, Precipitation-Frequency Atlas of the United States, Volume 8, Version 2.0*. Rainfall amounts from: HASTINGS. Station ID 20-3661.

C. Calculating Storage Volumes and Release Rates

1. Water Quality

Treatment of the runoff generated from 1 inch of rain (the 90% annual nonexceedance storm) over the disturbed portion of the site is required. Water quality volume is calculated using the Small Storm Hydrology Method.

A 1-year frequency rainfall may be used with the time-of-concentration of the contributing drainage area to calculate the peak flow rate for sizing diversion structures and treatment BMPs.

Note: A 1-inch, 1-hour rainfall has approximately a 1-year frequency of occurrence. The use of a constant rainfall frequency allows for reasonable sizing of infrastructure for drainage areas with times-of-concentration less than 1 hour, since 1-inch of rain over these shorter durations results in high intensities and rainfall frequencies on the order of those used for flood control.

2. Pretreatment

Pretreatment volume may be included in the total water quality volume, and is calculated as:

$$Vpt = 0.15(Vwq) \tag{3.14}$$

where:
Vpt = minimum required pretreatment volume (cubic feet)
Vwq = water quality volume (cubic feet)

3. Channel Protection

a. Retention

Channel protection consists of retaining onsite the net increase in runoff volume between pre-development and post-development conditions for a 2-year, 24-hour storm using the Runoff Curve Number Method. Channel protection volume is calculated with the following equation:

$$Vcp = Vt_{post} - Vt_{pre} \tag{3.15}$$

where:
Vcp = minimum required channel protection volume (cubic feet)
Vt_{post} = total runoff volume for 2-year storm, post-development conditions
Vt_{pre} = total runoff volume for 2-year storm, pre-development conditions

EGLE provides a NPS Storm Water Runoff Calculator and Instructions to assist in computing channel protection volume.

b. Extended Detention

The storage volume of an extended detention basin shall be sized for that part of the 2-year runoff volume increase not met by retention, with a maximum release rate that results in a 48-hour drawdown time. The maximum release rate is computed with the following equation:

$$Q_{ED} = (Vcp - Vret)/(24 * 3600) \quad (3.16)$$

where:

Q_{ED} = maximum extended detention release rate (cubic feet per second)
Vcp = total channel protection volume required (cubic feet)
Vret = channel protection volume met by retention (cubic feet)
*24*3600* = half of the drawdown time of outflow hydrograph (seconds)

4. Flood Control

a. Detention

Detention of the 25-year rainfall event with a maximum allowable release rate of 0.13 cfs per acre is required, unless an exception is allowed.

The storage volume of any upstream retentive BMPs may be subtracted from the required flood control storage volume of the detention basin.

(1) Rational Method for Detention

If the Rational Method is used, the required storage volume shall be calculated by the "Modified Chicago" Method.

The calculated storage volume shall be multiplied by 1.25 to obtain the required storage volume.

Note: This adjustment is necessary since the Modified Chicago Method tends to underestimate the storage volume when compared to pond routing, because it uses a constant maximum outflow. This is particularly evident for short times-of-concentrations (15 to 30 minutes)[4].

(2) Curve Number Method for Detention

If the Curve Number Method is used, the required storage volume shall be calculated by the formula:

$$V_{fc} = 0.75\left(\frac{(Qp-Qout)}{Qp}Vt\right) \quad (3.17)$$

where:

V_{fc} = minimum required storage volume for flood control (cubic feet)
0.75 = adjustment factor to approximate results obtained by routing
Qp = peak runoff rate (cubic feet per second)
Qout = maximum allowable peak discharge (cubic feet per second)
Vt = total runoff volume for 25-year, 24-hour storm (cubic feet)

[4] Stahre, Peter and Urbonas, Ben (1990). Stormwater Detention For Drainage, Water Quality and CSO Management, pp. 268 274.

b. Retention

Retention basins shall be sized for the 25-year rainfall event.

The storage volume of any upstream retentive BMPs may be subtracted from the required flood control storage volume of the retention basin.

(1) Rational Method for Retention

If the Rational Method is used, the required storage volume shall be calculated by the "Modified Chicago" Method.

The calculated storage volume shall be multiplied by 1.12 to obtain the required storage volume.

Note: This adjustment is necessary to match routing results.

The discharge or exfiltration rate into the soil from the retention basin shall be calculated as:

$$Qout = Ai/(12 \times 3600) \quad (3.18)$$

where:

Q_{out} = discharge rate (cubic feet per second)
A = infiltration area (square feet)
i = design infiltration rate (inches per hour) from **Table 5**
12 = factor to convert inches to feet
3600 = factor to convert hours to seconds

(2) Curve Number Method for Retention

If the Curve Number Method is used, the required storage volume shall be calculated by the formula:

$$V_{fc} = Rs \times Vt \quad (3.19)$$

where:

V_{fc} = minimum required storage volume for flood control (cubic feet)
Rs = storage volume ratio coefficient
Vt = total runoff volume for 25-year, 24-hour storm (cubic feet)

The storage volume ratio coefficient (Rs) is the ratio of required storage volume to total runoff volume. Values of Rs as a function of design high water depth are given in the table below. Linear interpolation may be used for design infiltration rates (i) between those shown in the table.

i [in/hr]	Rs			
	6-ft	5-ft	4-ft	3-ft
0.50	--	--	--	0.80
1.00	0.80	0.77	0.74	0.70
1.36	0.75	0.72	0.69	0.65
2.00	0.70	0.67	0.64	0.60
3.60	0.62	0.59	0.57	0.53
6.00	0.55	0.53	0.50	0.47
10.00	0.50	0.47	0.44	0.40

-- drawdown time exceeds 72 hours

Note: The storage volume ratio coefficients were determined by formulating a curve to the results of routing multiple runoff scenarios for a range of design infiltration rates. The coefficient is dependent on design high water depth (as an indicator of drawdown time).

5. Retentive BMPs Sized for Channel Protection or Water Quality

The BMP volume (Vbmp) credited towards meeting the channel protection or water quality volume is the storage volume of the BMP plus the volume infiltrated by the BMP during the infiltration period.

The required storage volume (Vs) shall be calculated by subtracting the volume infiltrated during the infiltration period (Vi) from the runoff volume (Vr) by the formula:

$$Vs = Vr - Vi \tag{3.20}$$

The infiltrating volume is calculated as:

$$Vi = \frac{6iA}{12} \tag{3.21}$$

where:

Vi = volume infiltrated (cubic feet)
6 = infiltration period (hours); time when the bed is receiving runoff and is capable of infiltrating at the design rate, conservatively estimated as 6 hours
i = design infiltration rate (inches per hour)
A = infiltration area (square feet)
12 = factor to convert inches to feet

Note: This method is recommended in the *Low Impact Development Manual for Michigan* (SEMCOG, 2008) as a straightforward way to approximate and credit the infiltrating volume to meet the treatment standards. It should be noted that the 6-hour assumption tends to underestimate BMP storage volume for high infiltration rates and overestimate BMP storage volume for low infiltration rates as compared to routing. This approximation is acceptable because only the storage volume provided by an upstream retentive BMP is allowed to be subtracted from the required flood control volume.

D. Groundwater Mounding

A spreadsheet developed by the USGS is recommended to calculate the extent of groundwater mounding beneath infiltration BMPs. The USGS Scientific Investigations Report 2010–5102 *"Simulation of Groundwater Mounding Beneath Hypothetical Stormwater Infiltration Basins,"* may be used with the accompanying spreadsheet, which solves the Hantush (1967) equation to predict the extent of groundwater mounding based on user-specified site conditions. Other finite-difference groundwater flow models such as USGS MODFLOW are also acceptable.

E. Computing Tools

Hydrologic and hydraulic calculations can be performed using a variety of customized spreadsheets and computer software. Results of computer models that use detailed routing methods to optimize storage volumes may be needed for more complex situations. Accompanying design calculations may include hand calculations or spreadsheets using the formulas specified in this manual, and computer models with submittal of clear and complete input and output.

I. BEST MANAGEMENT PRACTICES

A Best Management Practice (BMP) is defined as a structural or non-structural practice or technique that mitigates the adverse impacts caused by land development on water quality and/or water quantity.

Non-structural BMPs consist of protection measures that reduce the volume of stormwater runoff from the site.

Structural BMPs are constructed measures that convey, store and treat stormwater in a site-specific location and help manage stormwater runoff. Structural BMPs are further categorized as those used primarily for conveyance and flood storage, and those used primarily for treatment and/or for small sites.

BMPs shall be designed in accordance with the design criteria in this manual. BMPs proposed for use that are not included in this manual will be evaluated on an individual basis. Further information and examples are provided in the BMP Fact Sheets in Chapter 6 and Chapter 7 of the *Low Impact Development Manual for Michigan* (SEMCOG, 2008).

Note: Design criteria for BMPs used primarily for soil erosion and sedimentation control and channel stabilization (i.e. riprap, in stream structures, natural channel design), and technical specifications for construction are beyond the scope of this manual.

II. NON-STRUCTURAL BEST MANAGEMENT PRACTICES

Design criteria is provided for the following BMPs:

- Protect Sensitive Areas
- Native Revegetation
- Stormwater Disconnect

Protect Sensitive Areas

1. Summary

Description:	Identify, map and prioritize environmentally sensitive areas on the site to be preserved and protected.
Application:	Plats; Condominiums; More difficult to implement as development density increases.
Pretreatment Required:	No.
Maintenance Plan:	No.
Calculation Credits:	Remove protected sensitive areas from stormwater management calculations; or select an appropriate existing land use if necessary to include the area for sizing of conveyance systems. For small sites, individual trees can receive a credit of 800 square feet per tree, counted as woods in "good" condition.[1]
Volume Reduction:	Exempt from channel protection criteria.
Rate Reduction:	Longer time-of-concentration; lower CN; may be exempt from flood control criteria.
Water Quality:	Exempt from water quality criteria.

[1]Source: SEMCOG (2008). *Low Impact Development Manual for Michigan.*

2. Criteria

This BMP includes identification and protection of environmentally sensitive areas on the development property. For the purpose of these Stormwater Standards, sensitive areas include:

1. Waterbodies (lakes and ponds)
2. Rivers and streams
3. Floodplains (and flood prone areas)
4. Riparian buffers
5. Wetlands
6. Woodlands
7. Sand dunes
8. Natural flow pathways
9. Soils and topography (erodible, steep, karst)
10. Susceptible groundwater supplies
11. Susceptible surface drinking water intakes
12. Threatened and endangered species habitat

a. Sensitive areas are determined on a site-specific basis by survey, delineation, aerial photographs, or maps. Natural resources in sensitive areas may be regulated by federal, state, or local laws.

b. Identify all sensitive areas on the site plan and prioritize areas to be protected. A good faith effort to maximize protection must be demonstrated and acreages provided.

c. Sensitive areas to be protected must have a regulatory or other legal mechanism to ensure protection and preservation with uses consistent with stormwater management objectives (e.g. statute; ordinance; designation of separate out lots or set-asides with language in the master deed, restrictive covenants or bylaws; easement; conservation easement).

d. Identify sensitive areas and areas to be protected on the construction drawings.

e. Sensitive areas to be protected must have the limits delineated/flagged/fenced in the field during construction. Visible permanent boundary markers may be required to minimize encroachment. Notes to this effect must be included on the construction drawings.

f. Natural flow pathways: Ensure adequacy of flow pathways for post-development flows.

g. Soils and topography: Minimize soil disturbance and soil compaction on site.

h. Riparian buffers: Identify municipal ordinance requirements. In the absence of a local ordinance, standards for riparian buffers shall consist of:

   (1) Trees, shrubs and herbaceous vegetation that is maintained in a condition that effectively filters stormwater runoff.

   (2) Minimum 25-foot width (Zone 1). Variable widths may be allowed where a consistent minimum width would result in a hardship loss of buildable area, with the goal of maintaining an overall equivalent buffer area.

i. Floodplains: Demonstrate that any activity proposed within a 100-year floodplain will not diminish the flood storage capacity. Compensatory storage will be required at a minimum ratio of one-to-one (1:1) for all lost floodplain storage.

   (1) The compensating cut must be available during a flood event.
   (2) Water must be able to move freely from stream to storage.
   (3) Excavation must be adjacent to the floodplain.
   (4) Flood storage must be between the 2-year flood elevation and the 100-year flood elevation.
   (5) Compensating storage shall not be provided through channel widening.

Native Revegetation

1. Summary

Description:	Restoration of disturbed pervious areas with deeper-rooted native plants or trees in lieu of conventional turf grass to reduce runoff volume.
Application:	All development types; Limitations where rapid establishment of dense turf grass is needed to prevent erosion in concentrated flow situations.
Pretreatment Required:	No. This BMP can provide pretreatment.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	Assign a CN reflecting a meadow or woods. For small sites, individual trees can receive a credit of 200 square feet per tree, counted as woods in "good" condition.[1]
Rate Reduction:	By virtue of lower CN.
Water Quality:	Exempt from water quality criteria.

[1]Source: SEMCOG (2008). *Low Impact Development Manual for Michigan*.

2. Criteria

a. Identify native revegetation areas on the construction drawings.

b. Native revegetation areas must be protected by having the limits delineated/flagged/fenced in the field during construction. Notes to this effect must be included on construction drawings.

c. Native vegetation shall be selected from the *Low Impact Development Manual for Michigan* (SEMCOG, 2008), Appendix C.

d. Riparian Buffers: As specified in "Protect Sensitive Areas."

e. Areas receiving credit must be located on the development property.

Stormwater Disconnect

1. Summary

<table>
<tr><td>Description:</td><td>Minimize runoff volume by disconnecting impervious areas from the stormwater conveyance system.</td></tr>
<tr><td>Application:</td><td>Rooftops; Driveways; Walkways; Patio areas; Minor roads.</td></tr>
<tr><td>Pretreatment Required:</td><td>No.</td></tr>
<tr><td>Maintenance Plan:</td><td>No.</td></tr>
<tr><td>Calculation Credits:</td><td></td></tr>
<tr><td>Volume Reduction:</td><td>Weight impervious CN with pervious CN for open spaces in “good” condition.

The following weighted CNs can be assigned to the disconnected impervious area. They assume a pervious area twice the size of the impervious area.
<table>
<tr><td>A</td><td>B</td><td>C</td><td>D</td></tr>
<tr><td>59</td><td>73</td><td>82</td><td>86</td></tr>
</table></td></tr>
<tr><td>Rate Reduction:</td><td>By virtue of weighted CN.</td></tr>
<tr><td>Water Quality:</td><td>Exempt from water quality criteria.</td></tr>
</table>

2. Criteria

a. Stormwater from rooftops and other impervious areas is considered disconnected if it is routed to a stabilized vegetated area or an onsite depression storage area that meets the following criteria:

(1) Pervious area is <u>not</u> a structural BMP that must be designed to treat the runoff from the impervious surface.

(2) Impervious area must be limited to 1,000 square feet per discharge point.

(3) Roof downspouts and curb cuts must be at least 10 feet away from the nearest connected impervious surface to discourage “re-connections.”

(4) Disconnection in less permeable soils (HSGs C and D) may require the use of dry wells, french drains, or other temporary storage device to compensate for poor infiltration capability if ponding of water for extended period of time becomes problematic.

(5) For disconnects to stabilized vegetated areas:
   (a.) Size of disconnect area shall be twice the size of the contributing impervious area.
   (b.) Length of disconnect area must be at least the length of the flow path of the contributing impervious area (maximum 75 feet).
   (c.) Slope of disconnect area must be no greater than 5%.

(6) Disconnection must ensure no basement seepage.

b. Identify disconnect areas on the construction drawings.

III. STRUCTURAL BEST MANAGEMENT PRACTICES

Design criteria is provided for the following BMPs:

Conveyance and Storage

- Storm Sewer
- Culvert or Bridge
- Open Channel
- Detention Basin
- Retention Basin

Treatment and Small Site

- Sediment Forebay
- Spill Containment Cell
- Infiltration Practices
- Constructed Filter
- Bioretention/Rain Garden
- Planter Box
- Pervious Pavement
- Vegetated Roof
- Capture Reuse
- Water Quality Device
- Water Quality Swale
- Bioswale
- Vegetated Swale
- Vegetated Filter Strip
- Level Spreader

Storm Sewer

1. Summary

Description:	Provides stormwater conveyance in an enclosed system.
Application:	Urban areas; Where above-ground conveyance is not desirable.
Types:	Pipe (solid wall, perforated).
Pretreatment Required:	No. This BMP can provide spill containment.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	Solid wall pipe: None. Perforated pipe (with slope): None.
Rate Reduction:	None.
Water Quality:	Count volume routed through catch basin.

2. Design Requirements

a. Sizing and Configuration

(1) Storm sewer shall be designed to convey the 10-year peak discharge.

(2) A dual or redundant storm sewer may be required to convey the 100-year peak discharge if acceptable overland flow routes do not exist.

(3) Design velocities, capacities, and friction losses shall be based on Manning's equation:

$$Q = \frac{1.49 A R^{\frac{2}{3}} S^{\frac{1}{2}}}{n} \quad (4.1)$$

where:

Q = discharge (cubic feet per second)
A = wetted area (square feet)
R = hydraulic radius (feet)
S = slope (feet per foot)
n = Manning's roughness coefficient

(4) Manning's coefficients for closed conduit are included in **Table 12**.

(5) Acceptable slopes for circular pipe ("n" = 0.013) are included in **Table 13**. Minimum and maximum grade for other Manning's n values must be calculated based on allowable minimum and maximum velocities (V).

(6) As a general rule, the storm sewer system shall be designed without surcharging. Where this is not possible, surcharging may be allowed to 1 foot below the top of casting. However, minor losses must be considered in hydraulic grade line calculations.

(7) Storm sewer pipe shall have a minimum diameter of 12 inches. Smaller pipe may be approved for private systems.

(8) The minimum depth of cover shall be 24 inches from grade to the top of pipe.

(9) Restricted conveyance systems designed to create backflow into stormwater storage facilities are not permitted. A storm sewer line shall not be used as both an inlet and outlet line to a stormwater storage facility.

Table 12 – Manning's Roughness Coefficients

Conduit	Coefficients
Closed Conduits	
Asbestos-Cement Pipe	0.011 to 0.015
Brick	0.013 to 0.017
Cast Iron Pipe (Cement-lined and seal-coated)	0.011 to 0.015
Concrete (Monolithic)	
Smooth forms	0.012 to 0.014
Rough forms	0.015 to 0.017
Concrete Pipe	0.011 to 0.015
Corrugated-Metal Pipe (1/2-inch corrugated)	0.022 to 0.026
Paved invert	0.018 to 0.022
Spun asphalt-lined	0.011 to 0.015
Plastic Pipe (Smooth)	0.011 to 0.015
Vitrified Clay Pipes	0.011 to 0.015
Liner channels	0.013 to 0.017
Open Channels	
Lined Channels	
Asphalt	0.013 to 0.017
Brick	0.012 to 0.018
Concrete	0.011 to 0.020
Rubble or riprap	0.020 to 0.035
Vegetal	0.030 to 0.040
Excavated or Dredged	
Earth, straight and uniform	0.020 to 0.030
Earth, winding, fairly uniform	0.025 to 0.040
Rock	0.030 to 0.045
Unmaintained	0.050 to 0.140
Natural Channels (streams, top width at flood state <100 feet)	
Fairly regular section	0.030 to 0.070
Irregular section with pools	0.040 to 0.100
Source: American Society of Civil Engineers and the Water Pollution Control Federation (1969). *Design and Construction of Sanitary and Storm Sewers*.	

Table 13 – Minimum and Maximum Slopes for Storm Sewers

Pipe Size (inches)	Minimum % of Grade (Velocity = 2.5 feet per second)	Maximum % of Grade (Velocity = 12 feet per second)
12	0.32	7.00
15	0.24	5.20
18	0.20	4.07
21	0.16	3.32
24	0.14	2.78
27	0.12	2.37
30	0.10	2.06
36	0.08	1.62
42	0.06	1.32
48	0.06	1.10
54	0.04	0.94
60	0.04	0.82
66	0.04	0.72
Manning's "n" = 0.013		

b. End Treatment

(1) Outlet pipes shall require energy dissipation. Riprap protection or equivalent erosion control measures shall be used where the velocity exceeds 4 feet per second, up to maximum allowable design velocity of 8 feet per second.
(2) Outlets into open channels or grassed swales shall enter at an angle of 90 degrees or less with the direction of flow.

c. Manholes and Catch Basins

(1) Manhole spacing shall not exceed 400 feet for sewers less than 42 inches in diameter and 600 feet for larger sewers.
(2) Manholes shall be placed at all changes in pipe direction, slope, pipe size, all inlet connection locations, and at the upper end of the storm sewer.
(3) Where possible, pipe inverts at junctions shall be designed to minimize junction losses (match 0.8 points of pipe diameters).
(4) Minimum inside diameter of all manholes, catch basins, and inlet structures shall be 48 inches, except that a 24-inch diameter structure may be allowed with a single 12-inch outlet pipe.
(5) All structures receiving direct surface water runoff shall have a sump not less than 24 inches deep.
(6) Catch basins shall be placed at low points of streets and yards. Spacing and/or number of inlet structures required to accommodate the design flows in streets, private drives, and parking areas shall be provided based on inlet capacity with no ponding occurring during a 10-year storm, and the following additional stipulations:
(a.) No more than 300 feet of pavement surface drainage will be allowed. No more than 200 feet of surface drainage will be allowed for grades exceeding 4%.
(b.) Consideration shall be given to pedestrian crossings when siting catch basins in intersections. Catch basins shall be placed upstream of pedestrian crossings when practical.
(c.) No more than 150 feet of street drainage will be allowed to flow around a corner.
(d.) No flow will be allowed across a public street intersection.

d. Sump Discharge

(1) Sump discharge outlets for individual lots shall be a catch basin (minimum 4-foot diameter) with lead (6-inch minimum diameter); manufactured tees; or cored and booted lead.

e. Rear and Side Yard Drainage

(1) Lots provided with rear and side yard drainage shall have an underdrain.
(2) Minimum diameter of yard catch basin shall be 2 feet.
(3) Minimum pipe diameter and slope by drainage area:

Drainage Area (acre)	Minimum Pipe Diameter (inches)	Slope
≤ 0.5 acre	6	0.5%
≥ 0.5 acre; ≤ 1 acre	8	0.3%
> 1 acre	mainline storm sewer	Table 13

f. Materials

(1) All materials must comply with the authority having jurisdiction over the storm sewer system.
(2) Storm sewer pipe within the influence of a public road shall be reinforced concrete pipe. All other storm sewer pipe shall be reinforced concrete or smooth interior wall polyethylene in accordance with MDOT Standard Specifications. Other materials shall be subject to approval.
(3) Pipe joints shall be designed to prevent excessive infiltration or exfiltration.
(4) Manholes and catch basins shall be in accordance with MDOT Standard Specifications.

Culvert or Bridge

1. Summary

Description:	Provides stormwater conveyance through a crossing structure.
Application:	Where crossing of open channels, wetlands, waterbodies, and grassed swales is required. Culverts can also provide equalization and outlet control.
Types:	Pipe Culvert; Box Culvert; Bridge.
Pretreatment Required:	No.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	None.
Rate Reduction:	None.
Water Quality:	None.

2. Design Requirements

a. Sizing and Configuration

(1) Bridges shall be designed to provide a 4.3-foot minimum underclearance at normal flow for canoe traffic on navigable waterways, and a 2-foot minimum freeboard to the underside (low chord) of the bridge for a 100-year flood where conditions allow.
(2) Footings shall extend at least 4 feet below the bottom of the channel.
(3) Culverts serving a drainage area of less than 2 square miles shall be designed for the 25-year peak discharge in the developed watershed with a maximum outlet velocity of 8 feet per second. A maximum of 1 foot of inlet submergence may be permitted if this does not backup water out of the easement.
(4) The effect of the 100-year storm shall be reviewed to ensure no adverse increase in water elevation off of the development property or flooding of structures within the development.
(5) Sizing of culverts and bridges shall be performed using the Bernouli equation and include consideration of inlet and outlet control, entrance and exit losses, and tailwater condition. Published culvert nomographs and other computer software may be used.
(6) Minimum diameter of a drive culvert shall be 12 inches.
(7) Minimum diameter of a road crossing culvert shall be 18 inches or equivalent pipe arch.

b. End Treatment

(1) Headwalls, wingwalls, and all other end treatments shall be designed to ensure the stability of the surrounding soil. MDOT or manufacturer's designs may be used.
(2) Riprap protection or equivalent erosion control measures shall be used where the velocity exceeds 4 feet per second, up to maximum allowable design velocity of 8 feet per second.

c. Materials

(1) All materials must comply with the authority having jurisdiction over the roadway.
(2) Culverts may be reinforced concrete pipe, corrugated steel pipe, or pipe arch in accordance with MDOT Standard Specifications. Smooth interior wall polyethylene may also be allowed.

Open Channel

1. Summary

Description:	Stormwater conveyance in an excavated channel.
Application:	Larger drainage areas with concentrated runoff.
Types:	Channel; Ditch.
Pretreatment Required:	No.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	None.
Rate Reduction:	None.
Water Quality:	None.

2. Design Requirements

a. Sizing and Configuration

(1) The open channel shall be designed to convey the 25-year peak discharge.

(2) Open channel design velocity, capacity, and friction loss shall be based on Manning's equation:

$$Q = \frac{1.49 A R^{\frac{2}{3}} S^{\frac{1}{2}}}{n} \quad (4.1)$$

where:

Q = discharge (cubic feet per second)
A = wetted area (square feet)
R = hydraulic radius (feet)
S = slope (feet per foot)
n = Manning's roughness coefficient

(3) Manning's coefficients shall be determined from **Table 12**. A minimum Manning's coefficient of 0.035 shall be used for open channels, unless special treatment is given to the bottom and sides (riprap, paving, mown sod, etc.).

(4) Minimum bottom width shall be 2 feet.

(5) Minimum longitudinal slope shall be 0.10%.

(6) Side slopes shall be no steeper than 2:1 (horizontal to vertical).

(7) The minimum velocity for open channels during the design event shall be 1.5 feet per second.

(8) The maximum velocity shall be 4 feet per second. Riprap protection or equivalent shall be used where the velocity exceeds 4 feet per second, up to maximum allowable design velocity of 8 feet per second.

b. Connections and Crossings

(1) Outlets into the open channel shall enter at an angle of 90 degrees or less with the direction of flow.

(2) A minimum clearance of 5 feet is required between open channel inverts and underground utilities unless special provisions are approved.

Detention Basin

1. Summary

Description:	Provides stormwater storage and slow release through a pipe outlet.
Application:	Practical for a wide range of applications including large sites.
Types:	Dry Basin; Underground Vault; Extended Detention Basin[1]; Wet Pond; Constructed Wetland.
Pretreatment Required:	Yes, if needed to facilitate maintenance, or preserve intended aesthetics of basin.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	None.
Rate Reduction:	Calculated release rate.
Water Quality:	Count volume routed through BMP.

[1] *Extended detention basins, by their nature, will typically develop the characteristics of a wetland.*

2. Sizing Calculations

a. Detention basins shall be sized for flood control.

b. Calculate the allowable release rate and required storage volume. Refer to Part 3 section "Calculating Storage Volumes and Release Rates, Flood Control, Detention" for calculation methods and credit allowed from upstream retentive BMPs.

c. Extended detention volume for water quality and/or channel protection may be included in the flood control volume if it comprises no more than 30% of the flood control volume. Any extended detention volume above that is additive.

d. If retention storage is provided below the orifice within the detention basin, only the storage volume and infiltration area below the orifice may be counted as the retentive BMP.

e. Detention basins without an acceptable surface water overflow route shall be designed for 2 times the required flood control volume.

3. Design Requirements

a. Siting

(1) Soil borings are required. Refer to Part 3 section "Soils Investigation."

(a.) A minimum of 2 feet is required between the bottom of dry detention basins and the highest known groundwater elevation.

(b.) Wet ponds and constructed wetlands shall be constructed in clay soils or have a reliable supply of baseflow or groundwater to support a permanent pool. Wet ponds and constructed wetlands proposed in sandy soils above the groundwater table shall have a clay or synthetic liner to minimize infiltration.

(c.) A constructed wetland must have a minimum contributing drainage area of 10 acres (5 acres for a pocket wetland).

(2) Setbacks shall be as follows:
(a.) Public and private sidewalk/non-motorized pathway: 5 feet
(b.) Adjacent property line: 10 feet
(c.) Building foundation: 30 feet
(d.) Private well: 50 feet
(e.) Public well: 200 feet from Type I or Type IIa wells, 75 feet from Type IIb or Type III wells (Safe Drinking Water Act, Act 399, PA 1976)
(f.) Septic system drainfield: 100 feet
(g.) Airport: Per Federal Aviation Administration guidelines (wet pond; constructed wetland)

b. Configuration

(1) General
(a.) Distances of flow paths between inlets and outlets shall be maximized. A minimum basin length-to-width ratio of 2 to 1 is required.
(b.) If site constraints preclude placing pipes at opposite ends of the basin or meeting the length-to-width ratio, baffles (berms) may be used to lengthen the flow path.
(c.) Where steeper side slopes than those specified are unavoidable, safety railing, fencing, or other access barriers may be approved.

(2) Dry Basin
(a.) The design high water depth should generally not exceed 10 feet above the bottom of the basin.
(b.) Side slopes shall not be steeper than 3:1 (H:V). Where basins are to be maintained as a mown lawn, side slopes shall be no steeper than 4:1 (H:V) to facilitate mowing.
(c.) The bottom of dry detention basins shall be graded to provide positive flow to the pipe outlet. A minimum longitudinal bottom slope of 1% shall be provided. Cross slopes shall be 2% minimum. If continuous flow is anticipated, a low-flow channel shall be provided, with necessary crossings, and sloped to eliminate standing water. If site grades prohibit achieving these minimum slopes, the use of an underdrain with flatter slopes may be approved.

(3) Wet Pond
(a.) At a minimum, the volume of the permanent pool for wet ponds shall be 2.5 times the water quality volume to account for reduced settling efficiency due to turbulence caused by wind.
(b.) Wet ponds shall generally be wedge-shaped with inflow at the narrow end to prevent short-circuiting and stagnation. However, other shapes meeting the design intent may be approved.
(c.) Permanent pools shall have a minimum depth of 3 feet across the deepest part of the basin to discourage aquatic plant infill and provide open water.
(d.) The design high water depth should generally not exceed 10 feet above the permanent pool elevation.
(e.) Side slopes shall not be steeper than 3:1 (H:V). Where basins are to be maintained as a mown lawn to the water's edge, side slopes shall be no steeper than 4:1 (H:V) to facilitate mowing.
(f.) A minimum 8-foot wide safety bench shall be constructed on the slopes of wet ponds with a permanent pool 3 feet or deeper. The safety bench shall have a maximum slope of 6:1 (H:V) and extend a minimum of 8 inches below the permanent pool level and a minimum of 8 inches above the permanent pool level.
(g.) Warning signs prohibiting swimming and skating shall be posted for wet ponds.

(4) Constructed Wetland

(a.) The emergent vegetation zone shall comprise 60 to 65% of the total surface area. Half shall be high marsh with a normal water depth of 6 inches or less, and half shall be low marsh with a normal water depth between 6 and 18 inches.

(b.) The open water zone shall comprise 35% to 40% of the total surface area with a normal water depth of between 18 inches and 6 feet.

(c.) At a minimum, the volume of the permanent pool for the open water zone shall be 2.5 times the water quality volume to account for reduced settling efficiency due to turbulence caused by wind.

(d.) The design high water surface elevation shall not exceed the normal water surface elevation by more than 4 feet.

(e.) Side slopes shall be 4:1 to 5:1 (H:V) wherever possible. Side slopes shall not be steeper than 3:1 (H:V).

(f.) A minimum 8-foot wide safety bench shall be constructed on the slopes of constructed wetlands with a permanent pool 3 feet or deeper. The safety bench shall have a maximum slope of 6:1 (H:V) and extend a minimum of 8 inches below the permanent pool level and a minimum of 8 inches above the permanent pool level.

(g.) A micro pool shall be located at the outlet of the stormwater wetland to protect the low flow pipe from clogging and prevent sediment resuspension. The micro pool shall be 3 to 6 feet deep and have a minimum surface area equivalent to the forebay.

(h.) A pocket wetland shall consist of a forebay and micropool with safety benches.

c. Inlet Design

(1) Inlet pipes shall not be fully submerged at normal pool elevations.

(2) Inlet pipes shall require energy dissipation. Riprap protection or equivalent erosion control measures shall be used where the velocity exceeds 4 feet per second up to maximum allowable design velocity of 8 feet per second.

(3) Pretreatment shall be provided in a sediment forebay, spill containment cell, or water quality swale. For small sites, a water quality device may be used prior to the basin. Pretreatment for overland sheet flow entering the basin can be provided through a vegetated filter strip.

(4) When spill containment is required, all pipes contributing runoff from the high-risk area must enter the pretreatment BMP.

d. Outlet Design

(1) The outlet shall consist of a multi-stage outlet and include a low flow outlet, a primary overflow (typically provided through the top of a grated riser pipe), and a secondary emergency overflow spillway.

(2) Staged low flow outlet: When required, the lowest stage openings shall be sized for the water quality and/or channel protection volume. The flood control opening shall be placed at the water quality and/or channel protection high water level and sized so that the cumulative discharge from all openings is limited to the allowable design discharge at the design high water level.

(3) Low Flow Outlet

(a.) The low flow outlet shall be designed using the orifice equation, rearranged to solve for area:

$$A = \frac{Q}{c\sqrt{2gH}} \tag{4.2}$$

where:

A = required area (square feet)
Q = required outflow (cubic feet per second)
c = orifice coefficient (approximately 0.6)
2g = 2 times the gravitation constant (g = 32.2 feet per second squared)
H = height of design high water level above center of orifice outlet (feet)

(b.) Other types of outlet devices shall have full design calculations provided for review.

(c.) The outlet shall be designed to prevent clogging and be accessible for maintenance. The largest single orifice diameter shall be used in lieu of multiple smaller holes.

(d.) The minimum inlet and outlet pipe diameter from the control structure shall be 12 inches.

(e.) The minimum pipe or hole diameter cored through a weir wall shall be 6 inches. Smaller openings shall be provided using an orifice plate, drilled end cap, or reducer. The minimum orifice diameter shall be 2 inches.

(f.) Protection against clogging.

i. Openings 6 inches and larger: Sump; AND exterior pipe end grate set on an angle, consisting of parallel longitudinal bars spaced 4-inches on center for 12- through 30-inch pipe diameters, and 6-inches on center for pipe diameters 36 inch and larger.

ii. Openings less than 6 inches: Sump; AND exterior pipe end grate; AND baffle and/or screening around orifice plate. Screening shall have a surface area at least 10 times larger than the orifice area and openings equal to half the width of the orifice.

iii. A gravel filter over minimum 4-inch underdrain or around a perforated riser may be used in lieu of an open exterior pipe. If a gravel filter is used for a perforated riser, it shall consist of 3-inch washed stone placed around the riser with 1-inch washed stone covering the larger stone.

(g.) Orifices used to maintain a permanent pool shall be designed to withdraw water a minimum of 2 feet below the normal water surface.

(4) Primary Overflow

(a.) All detention basins must have a primary overflow at the design high water level.

(b.) The primary overflow and downstream pipe shall be designed to convey the 10-year undetained peak inflow at the maximum design high water level. Exceptions may be made where it is not practical to meet the 10-year criteria. The crest of the secondary emergency spillway shall be set at the maximum design high water level, but no less than 0.5 foot above the primary overflow.

(c.) Hoods and trash racks shall be placed on riser pipes. Grate openings shall be a maximum of 3 inches on center. A vertical flow area must be provided where leaves and debris are prone to clog a horizontally seated grate.

(d.) Riser pipes shall have a minimum diameter of 24 inches. Riser pipes greater than 4 feet in height shall be a minimum of 48 inches in diameter.

(e.) Riser pipes shall be constructed of reinforced concrete or corrugated metal and be set in a concrete base designed to prevent buoyancy. Plastic is not acceptable as a material unless riser is buried, due to lack of durability.

(f.) The riser must be placed near or within the embankment to provide for maintenance access.
(g.) When possible, a drain for completely dewatering the detention basin shall be installed for maintenance purposes.
(h.) Pipes placed through embankments shall have anti-seep collars.
(i.) Outlet pipes shall require energy dissipation. Riprap protection or equivalent erosion control measures shall be used where the velocity exceeds 4 feet per second up to maximum allowable design velocity of 8 feet per second.

(5) Secondary Emergency Spillway

(a.) All detention basins must have a provision for an emergency spillway through the berm.

(b.) The spillway shall be designed for the 10-year undetained peak inflow with a maximum flow depth of 1 foot. The spillway shall be sized using the weir equation:

Rectangular weir: $$Q = CLH^{\frac{3}{2}} \quad (4.3)$$

Trapezoidal weir: $$Q = 0.75CmH^{2.5} + CLH^{\frac{3}{2}} \quad (4.4)$$

Triangular weir: $$Q = 0.75CmH^{2.5} \quad (4.5)$$

where:
Q = discharge (cubic feet per second)
C = coefficient of discharge (varies from 2.6 to 3.3)
m = horizontal component of side slope
L = length of spillway crest (feet)
H = total head measured above spillway crest (feet)

(c.) Freeboard.
i. Primary overflow provided: The top of berm elevation shall be equal to or greater than the design flow depth, and in no case shall the spillway depth be less than 0.5 foot.
ii. No primary overflow: The top of berm elevation shall be a minimum of 0.5 foot above the design flow depth, and in no case shall the spillway depth be less than 1 foot.
iii. Additional freeboard may be required based on risk.

(d.) Overflow spillways shall be protected with concrete, riprap, or a permanent erosion control blanket to prevent erosion of the structure. Protection shall extend across the entire spillway up to the top of berm, starting on the basin side a minimum of 3 feet below the crest and extending down the spillway to an apron a minimum of 6 feet beyond the toe of the spillway.

e. Access

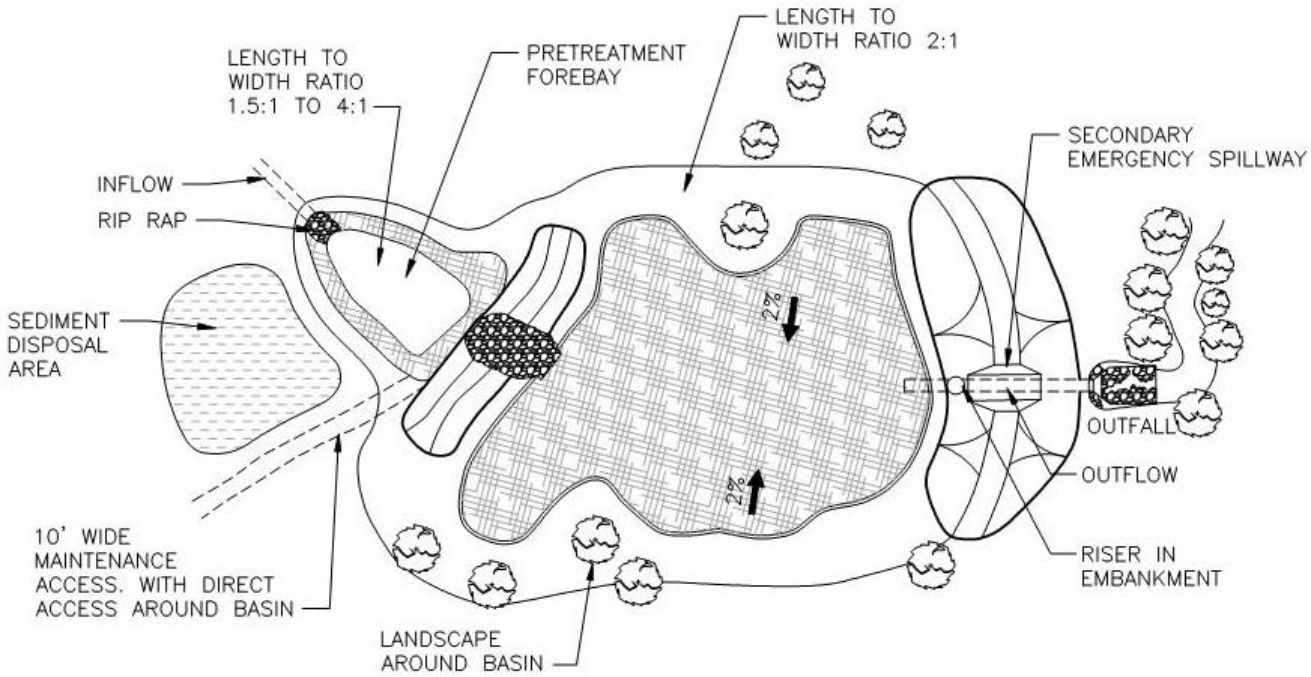
(1) Outlet control structures shall be placed near or within the embankment to facilitate maintenance access.

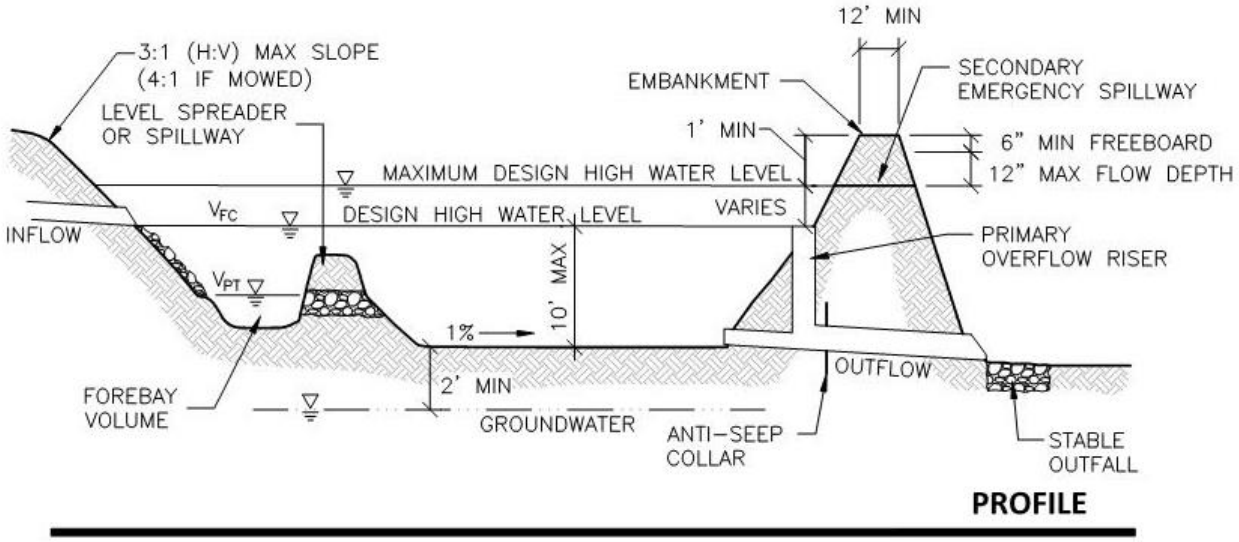
(2) Berm top width shall be a minimum of 4 feet, or 12 feet where vehicle access is required for maintenance.

(3) A minimum 10-foot wide maintenance access route from a public or private right-of-way shall be provided to the basin. The access way (including side slopes on trapezoidal and triangular spillways) shall have a vertical grade of no greater than 20% (5:1 H:V slope) and shall be stabilized to withstand the passage of heavy equipment. Direct access to the forebay, control structures and the outlet shall be provided.

4. Design Schematics

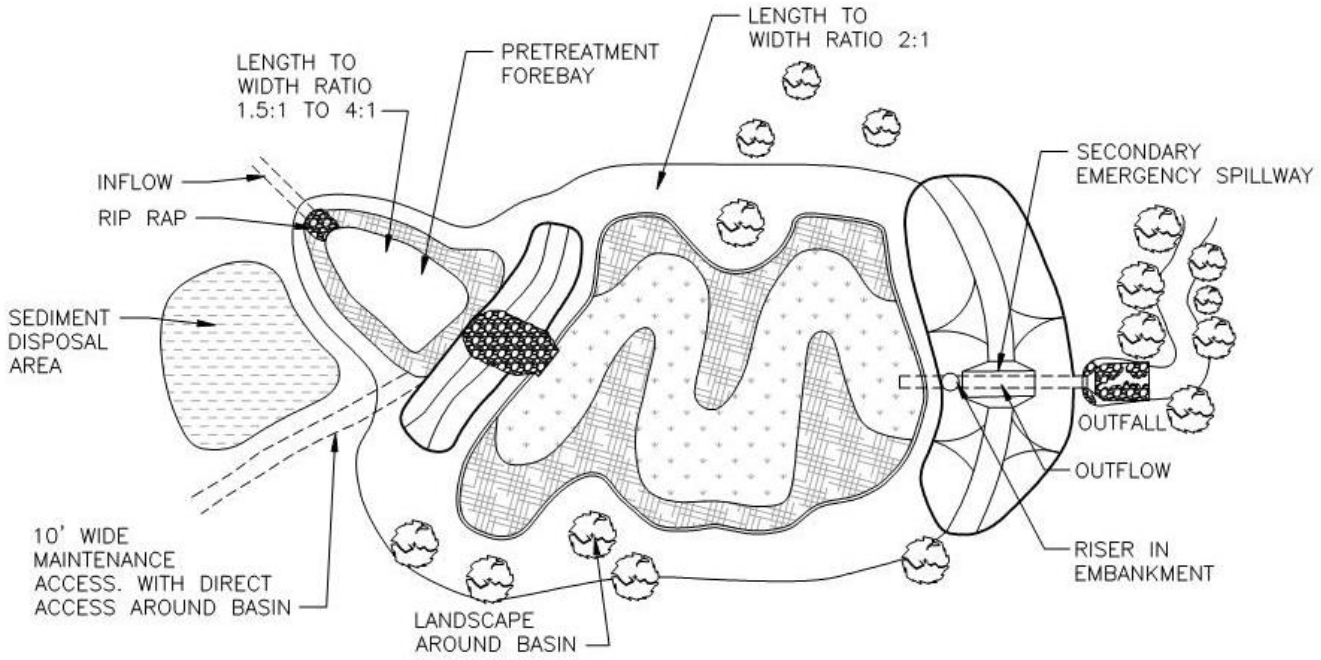
DRY DETENTION BASIN



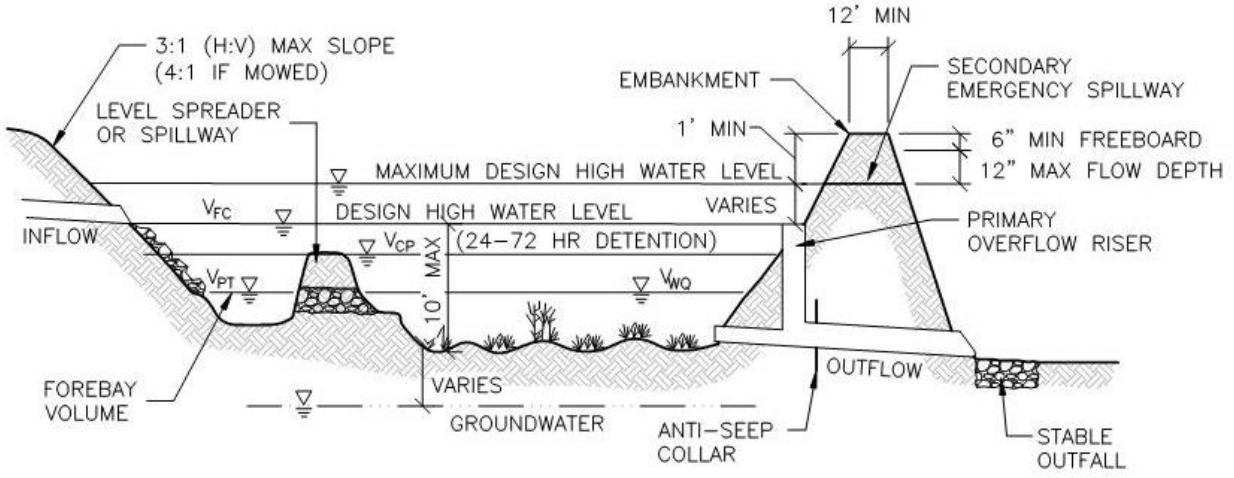


FINAL OUTLET CONFIGURATION MUST BE DESIGNED TO PREVENT CLOGGING

EXTENDED DETENTION BASIN



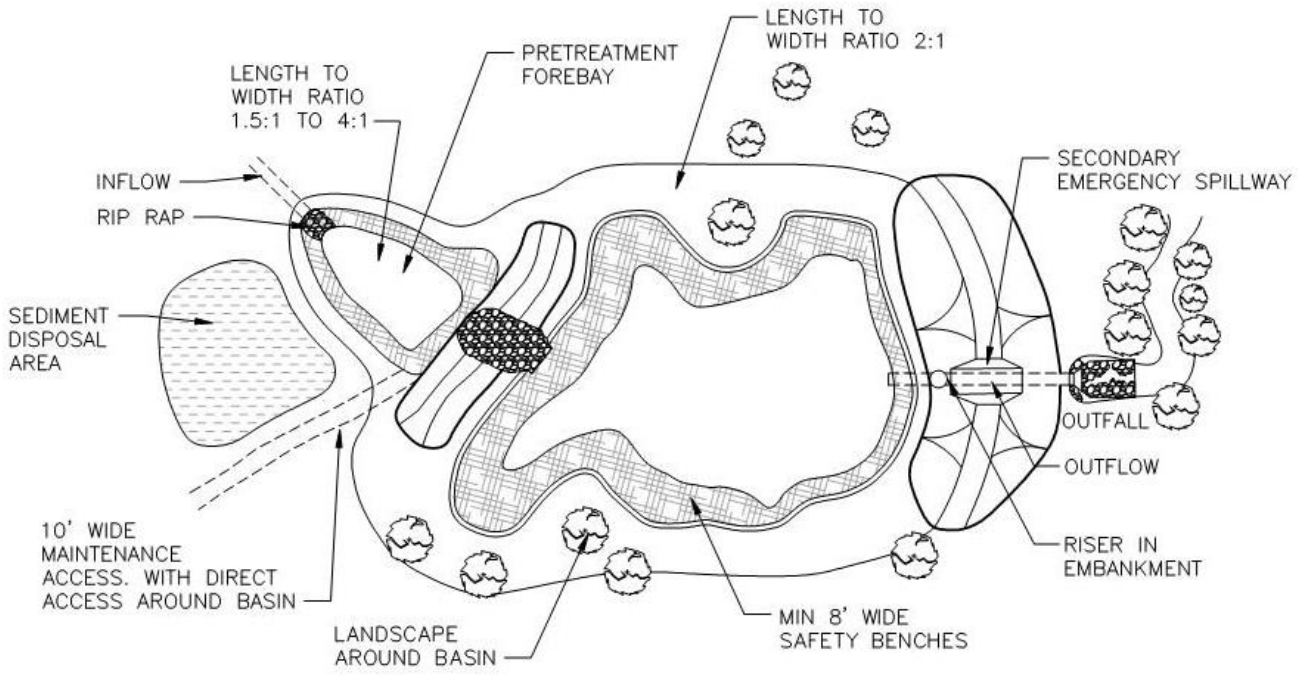
PLAN VIEW

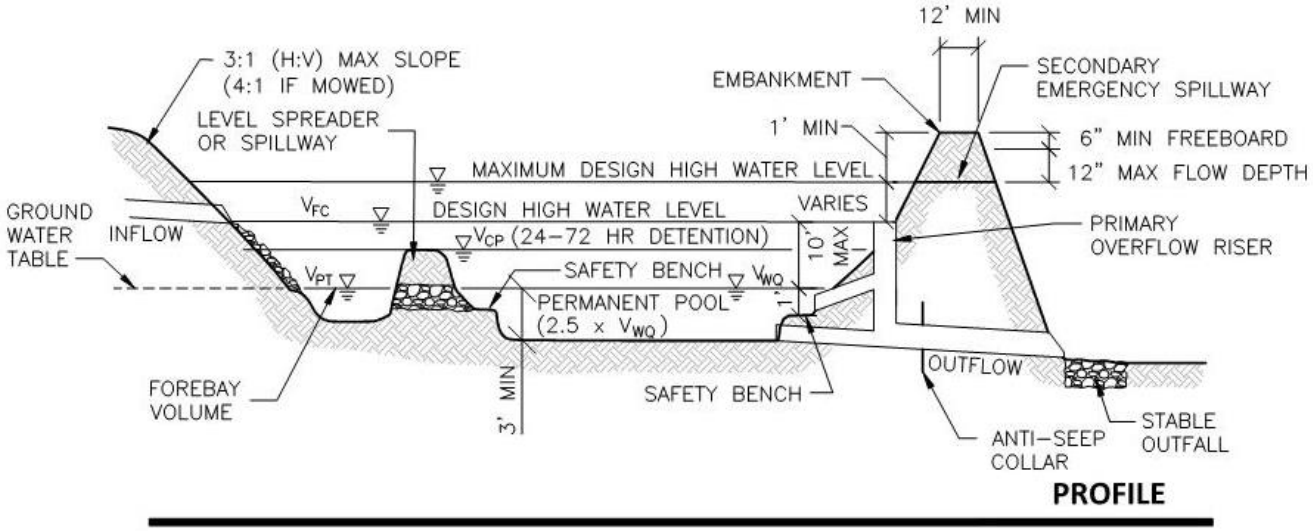


PROFILE

FINAL OUTLET CONFIGURATION MUST BE DESIGNED TO PREVENT CLOGGING

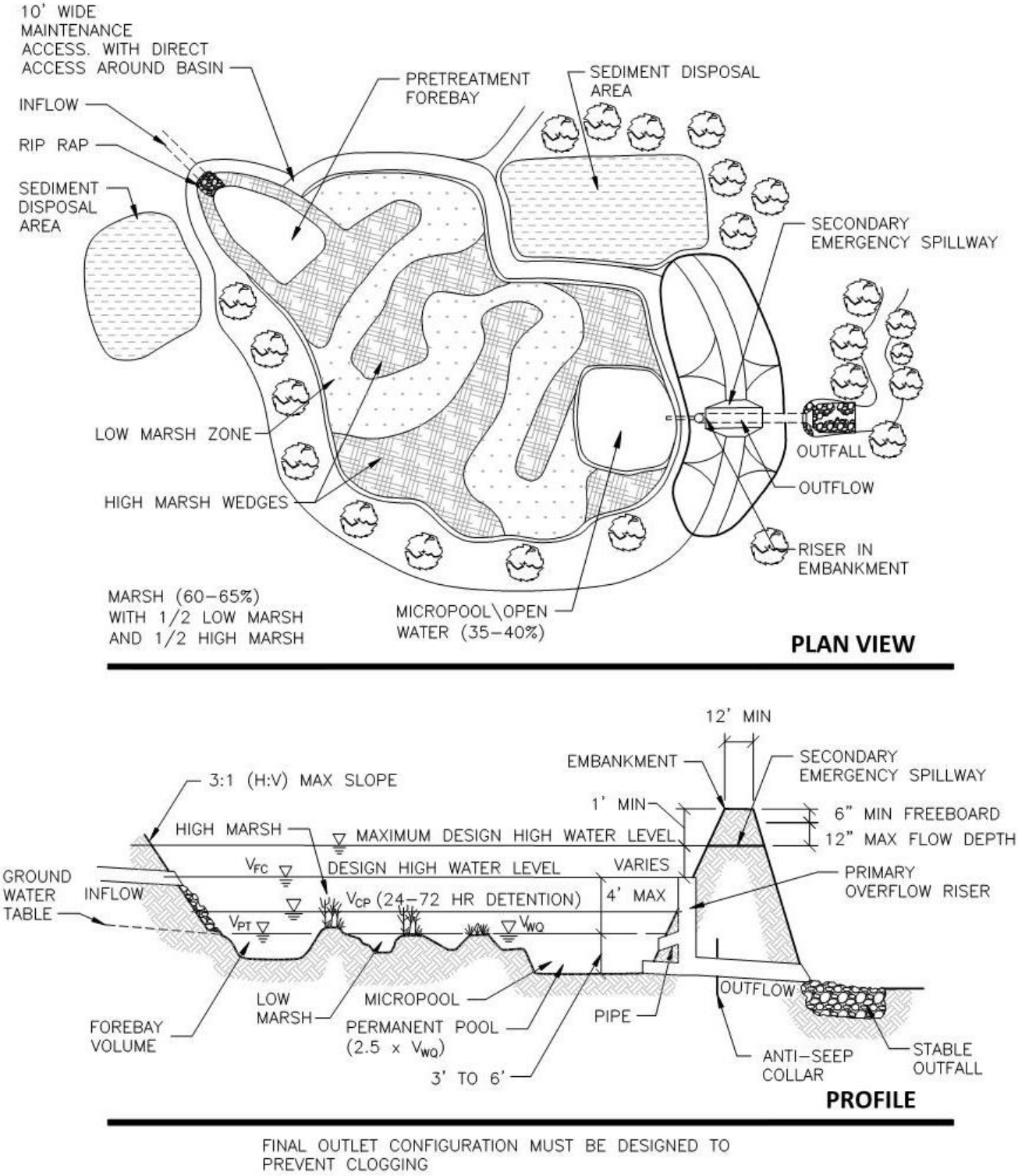
WET DETENTION BASIN (WET POND)





FINAL OUTLET CONFIGURATION MUST BE DESIGNED TO PREVENT CLOGGING

CONSTRUCTED WETLAND



FINAL OUTLET CONFIGURATION MUST BE DESIGNED TO PREVENT CLOGGING

Retention Basin

1. Summary

Description:	Provides stormwater storage without a pipe outlet, relying instead on infiltration into the ground.
Application:	Practical in sandy soils. Not recommended for regional use.
Types:	Dry Basin; Wet Pond.
Pretreatment Required:	Yes.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	Count volume stored and infiltrated.
Rate Reduction:	Designed for flood control: 100%.
Water Quality:	Count volume stored and infiltrated.

2. Sizing Calculations

a. Retention basins shall be sized for flood control.

b. Calculate the required storage volume. Refer to Part 3 section "Calculating Storage Volumes and Release Rates, Flood Control, Retention" for calculation methods and credit allowed from upstream retentive BMPs.

c. Water quality and channel protection volumes may be included in the flood control volume.

d. Calculate the minimum infiltration area required to drain the required storage volume in the specified drawdown time using the design infiltration rate. Refer to Part 3 section "Design Infiltration Rates" to determine the design infiltration rate.

$$A = \frac{12Vs}{i(t_d)} \tag{4.6}$$

where:

A = minimum infiltration area (square feet)
Vs = storage volume (cubic feet)
i = design infiltration rate (inches per hour)
t_d = maximum allowable drawdown time (hours)
12 factor to convert inches to feet

e. Drawdown time shall be no more than 72 hours.

f. The infiltration area shall be defined as the bottom of the basin, or the horizontal projection of the side slopes up to half of the design water depth above a permanent pool.

g. When possible, retention basins must have a primary overflow at the design high water level.

h. Retention basins without an acceptable surface water overflow route shall be designed for 2 times the required flood control volume.

i. Regional retention basins are strongly discouraged. If accepted for use, a regional retention basin shall be sized for the 100-year flood control volume and require spill containment, forebays sized for the full water quality volume, and may require other measures to reduce the potential for groundwater contamination and protect the infiltration capacity of the BMP.

3. Design Requirements

a. Siting

(1) Soil borings are required. Refer to Part 3 section "Soils Investigation."

(a.) A minimum of 3 feet is required between the bottom of dry retention basins and the highest known groundwater elevation.

(2) Setbacks shall be as follows:
(a.) Public and private sidewalk/non-motorized pathway: 5 feet
(b.) Adjacent property line: 10 feet
(c.) Building foundation: 30 feet
(d.) Private well: 50 feet
(e.) Public well: 200 feet from Type I or Type IIa wells, 75 feet from Type IIb or Type III wells (Safe Drinking Water Act, Act 399, PA 1976)
(f.) Septic system drainfield: 100 feet
(g.) Airports: Per Federal Aviation Administration guidelines (wet pond)

(3) Groundwater mounding calculations may be required to ensure no adverse impacts to adjacent structures.

b. Configuration

(1) General

(a.) Where steeper side slopes than those specified are unavoidable, safety railing, fencing or other access barriers may be approved.

(2) Dry Basin

(a.) The design high water depth should generally not exceed 6 feet above the basin bottom.
(b.) Side slopes shall not be steeper than 3:1 (H:V). Where basins are to be maintained as a mown lawn, side slopes shall be no steeper than 4:1 (H:V) to facilitate mowing.
(c.) The bottom of dry retention basins shall generally be flat to encourage uniform ponding and infiltration.

(3) Wet Pond (no surface water outlet)

(a.) The design high water depth should generally not exceed 7 feet above the permanent pool elevation.
(b.) Where excavation and reshaping of the retention area is necessary, side slopes shall not be steeper than 3:1 (H:V). Where basins are to be maintained as a mown lawn to the water's edge, side slopes shall be no steeper than 4:1 (H:V) to facilitate mowing.
(c.) A minimum 8-foot wide safety bench shall be constructed on the slopes of wet ponds with a permanent pool 3 feet or deeper. The safety bench shall have a maximum slope of 6:1 (H:V) and extend a minimum of 8 inches below the permanent pool level and a minimum of 8 inches above the permanent pool level.
(d.) Warning signs prohibiting swimming and skating shall be posted for wet ponds.

c. Inlet Design

(1) Inlet pipes shall not be fully submerged at normal pool elevations.

(2) Inlet pipes shall require energy dissipation. Riprap protection or equivalent erosion control measures shall be used where the velocity exceeds 4 feet per second, up to maximum allowable design velocity of 8 feet per second.

(3) Pretreatment is required for each inlet and shall be provided in a sediment forebay, spill containment cell, or water quality swale. For small sites, a water quality device may be used prior to the basin. Pretreatment for overland sheet flow entering the basin can be provided through a vegetated filter strip.

(4) When spill containment is required, all pipes contributing runoff from the high-risk area must enter the pretreatment BMP.

d. Overflow

(1) Primary Overflow

(a.) The primary overflow and downstream pipe shall be designed to convey the 10-year peak inflow at the maximum design high water level. The crest of the secondary emergency spillway shall be set at the maximum design high water level, but no less than 0.5 foot above the primary overflow.

(b.) Hoods and trash racks shall be placed on riser pipes. Grate openings shall be a maximum of 3 inches on center. A vertical flow area must be provided where leaves and debris are prone to clog a horizontally seated grate.

(c.) Riser pipes shall have a minimum diameter of 24 inches. Riser pipes greater than 4 feet in height shall be a minimum of 48 inches in diameter.

(d.) Riser pipes shall be constructed of reinforced concrete or corrugated metal and be set in a concrete base designed to prevent buoyancy. Plastic is not acceptable as a material unless riser is buried, due to lack of durability.

(e.) When possible, a drain for completely dewatering the retention basin shall be installed for maintenance purposes.

(f.) Pipes placed through embankments shall have anti-seep collars.

(g.) Outlet pipes shall require energy dissipation. Riprap protection or equivalent erosion control measures shall be used where the velocity exceeds 4 feet per second up to maximum allowable design velocity of 8 feet per second.

(2) Secondary Emergency Spillway

(a.) All retention basins must have a provision for an emergency spillway through the berm.

(b.) The spillway shall be designed for the 10-year peak inflow with a maximum flow depth of 1 foot. The spillway shall be sized using the weir equation:

Rectangular weir: $$Q = CLH^{\frac{3}{2}} \quad (4.3)$$

Trapezoidal weir: $$Q = 0.75CmH^{2.5} + CLH^{\frac{3}{2}} \quad (4.4)$$

Triangular weir: $$Q = 0.75CmH^{2.5} \quad (4.5)$$

where:

Q = discharge (cubic feet per second)
C = coefficient of discharge (varies from 2.6 to 3.3)
m = horizontal component of side slope
L = length of spillway crest (feet)
H = total head measured above spillway crest (feet)

(c.) Freeboard.
   i. Primary overflow provided: The top of berm elevation shall be equal to or greater than the design flow depth, and in no case shall the spillway depth be less than 0.5 foot.
   ii. No primary overflow: The top of berm elevation shall be a minimum of 0.5 foot above the design flow depth, and in no case shall the spillway depth be less than 1 foot.
   iii. Additional freeboard may be required based on risk.

(d.) Overflow spillways shall be protected with concrete, riprap, or a permanent erosion control blanket to prevent erosion of the structure. Protection shall extend across the entire spillway up to the top of berm, starting on the basin side a minimum of 3 feet below the crest and extending down the spillway to an apron a minimum of 6 feet beyond the toe of the spillway.

e. Access

(1) Berm top width shall be a minimum of 4 feet, or 12 feet where vehicle access is required.

(2) A minimum 10-foot wide maintenance access route from a public or private right-of-way shall be provided to the basin. The access way (including side slopes on trapezoidal and triangular spillways) shall have a vertical grade of no greater than 20% (5:1 H:V slope) and shall be stabilized to withstand the passage of heavy equipment. Direct access to the forebay, control structures and the outlet shall be provided.

f. Finishing and Top Dressing

(1) Care must be taken during the excavation and finishing process to make sure that soil compaction does not occur.

(2) The bottom of dry retention basins shall be scarified or deep tilled to a depth of 6 to 12 inches after final grading has been established.

(3) Top Dressing for basin bottom and side slopes:

(a.) A permeable blend of sand, compost and/or topsoil with a pH between 5.5 and 7.5.
   i. 3-inches of compost tilled into the top 6-inches of native permeable soil (equivalent to a 9-inch homogenous mixture of 70% sand; 30% compost); or
   ii. 4-inches of topsoil tilled into the top 6-inches of native permeable soil (equivalent to a 10-inch homogenous mixture with maximum 20% silts, 4% clay, and 80% to 92% sand).

(b.) Topsoil shall be sandy loam, loamy sand or loam per USDA Soil Textural Triangle with 20% to 50% fines by volume (silt and clay with <10% clay), and 2% to 8% organic matter by dry weight.

(c.) Placement of a topsoil layer without tilling is generally not allowed due to the diminished infiltration rates observed.

(d.) A bare sand bottom is not allowed, as it provides no cation exchange capacity or vegetative uptake for pollutant removal.

g. Supplemental Measures

(1) Supplemental measures may be required to ensure that a retention basin drains sufficiently as the soil becomes less permeable with use. The need for supplemental measures may be based on a number of indicators including:

(a.) Underlying soils with a design infiltration rate less than 3.6 inches per hour.

(b.) High probability for sedimentation (particularly fines).

(c.) Larger regional basin where there is less control over contributing area runoff.

(d.) Probability of groundwater rising higher than minimum isolation distance.

(2) Supplemental measures may include:

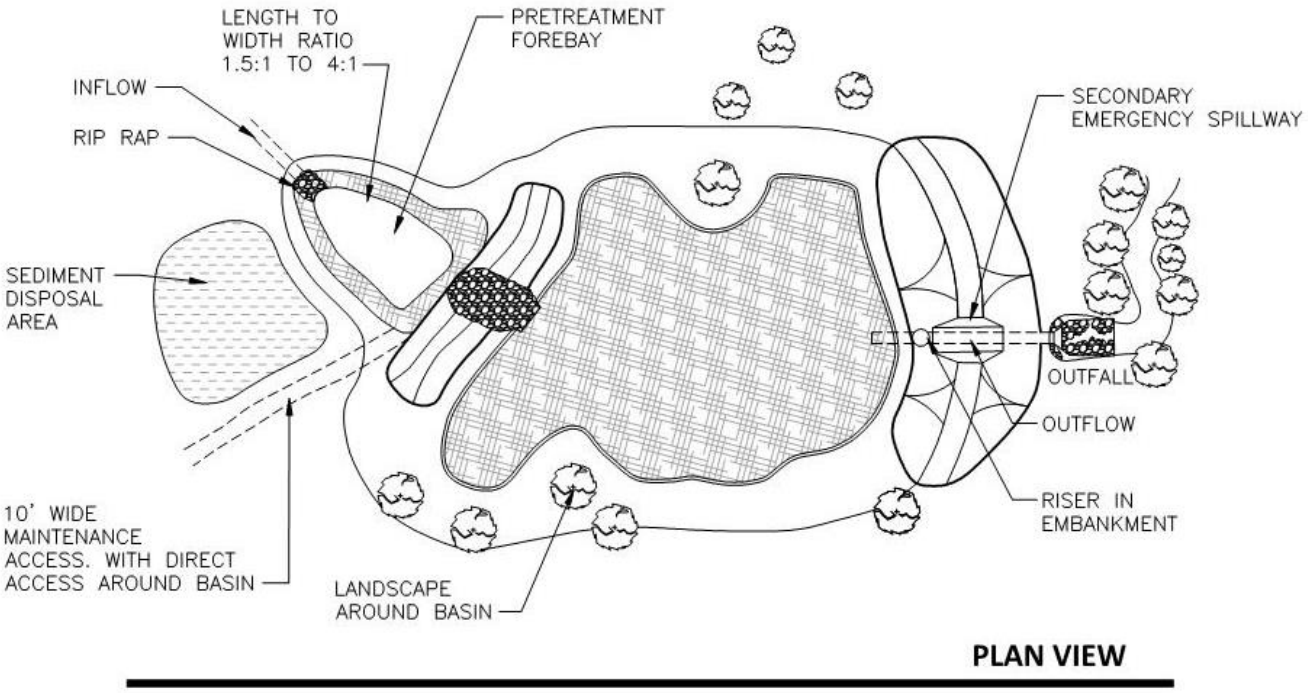
(a.) Leaching basins, infiltration trench, or wick drains placed in the bottom of the basin.

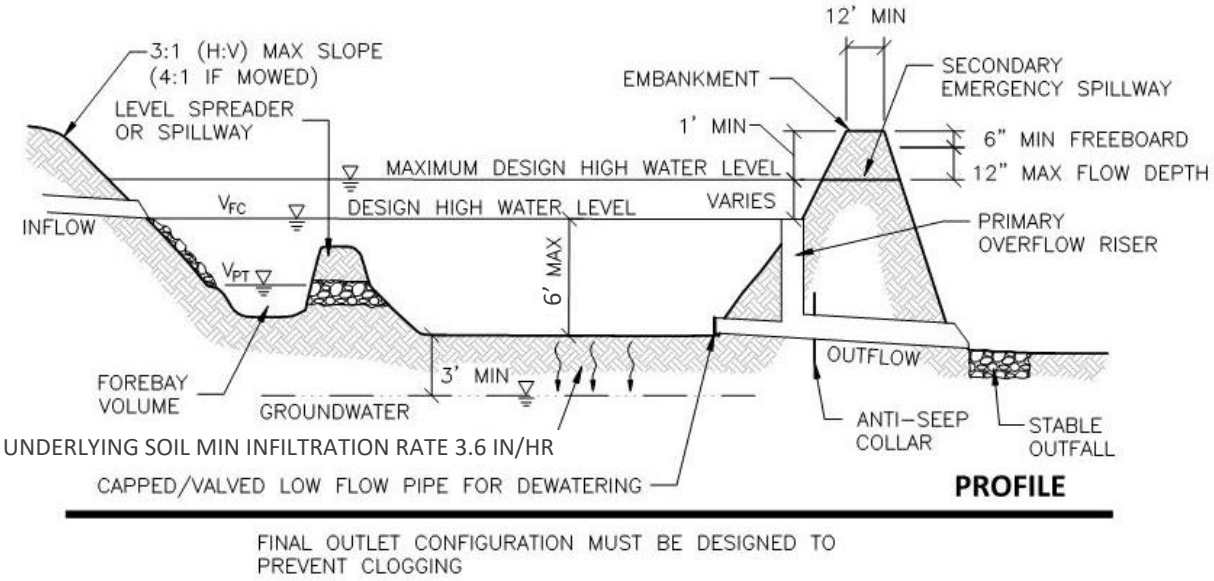
(b.) Valved outlet to drain basin.

(c.) Conversion to a wet basin with sufficient storage volume provided above the permanent pool.

4. Design Schematics

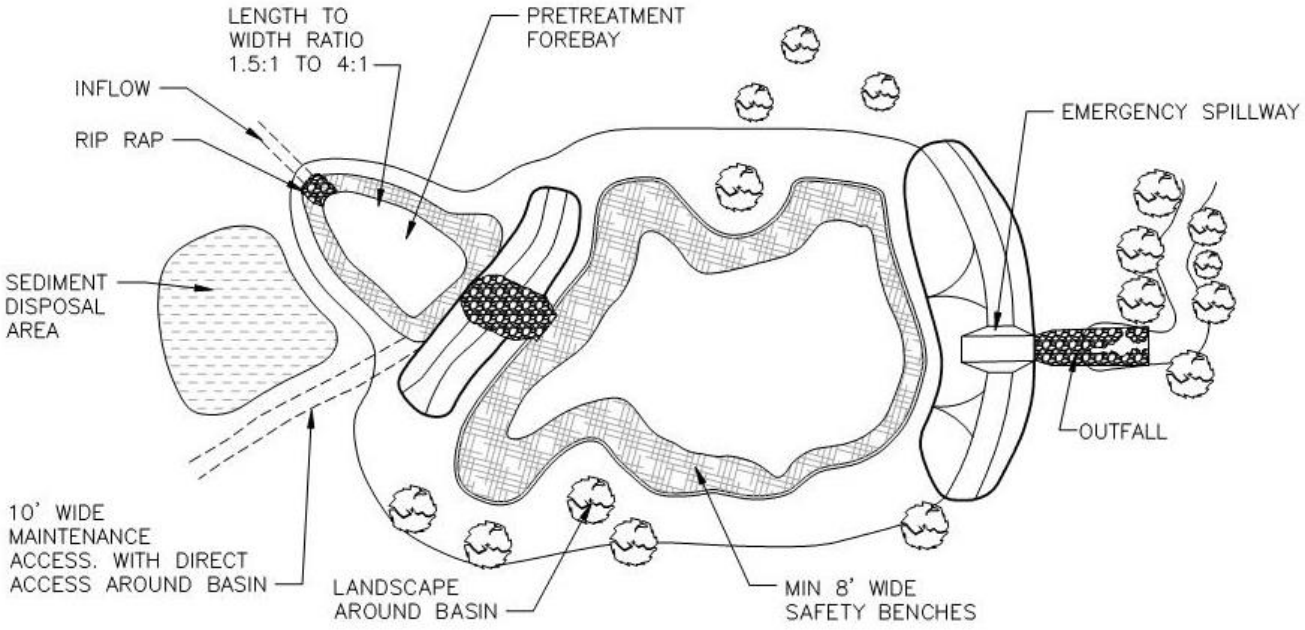
DRY RETENTION BASIN



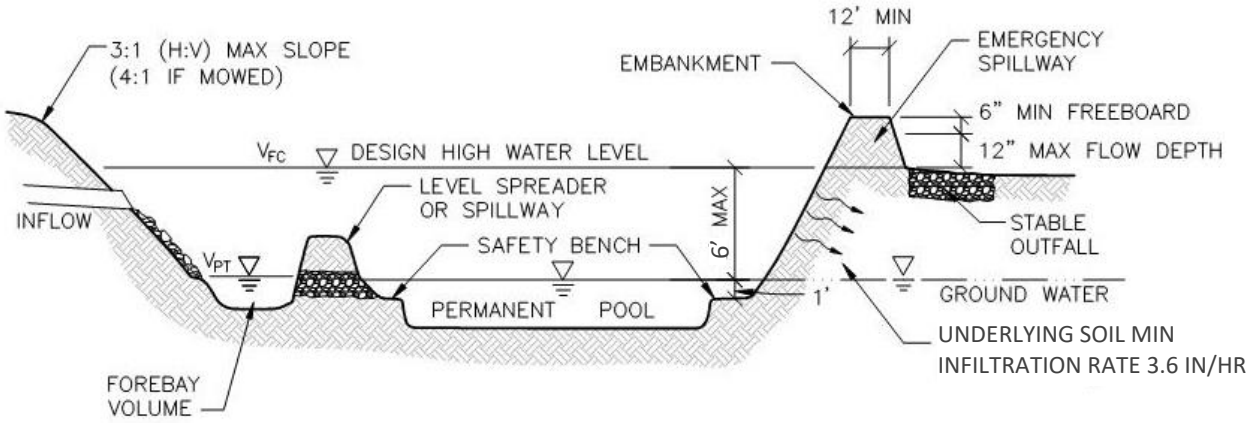


FINAL OUTLET CONFIGURATION MUST BE DESIGNED TO PREVENT CLOGGING

WET RETENTION BASIN



PLAN VIEW



PROFILE

Sediment Forebay

1. Summary

Description:	Stormwater pretreatment practice.
Application:	Typically used with a detention or retention basin.
Types:	Wet basin; Dry basin; Level spreader.
Pretreatment Required:	No. This BMP can provide pretreatment.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	None.
Rate Reduction:	None.
Water Quality:	Count volume routed through BMP.

2. Sizing Calculations

a. Sediment forebays shall be sized for pretreatment. Refer to Part 3 section "Calculating Storage Volumes and Release Rates, Pretreatment."

b. The pretreatment volume is the volume of the forebay to the elevation of the level spreader or overflow spillway including any permanent pool.

3. Design Requirements

a. Siting

(1) Where more than one inlet pipe is required, the calculated forebay volume shall be pro-rated by flow contribution of each inlet.

b. Configuration

(1) The sediment forebay shall be a separate sump, which can be formed by grading.

(2) The minimum sump depth shall be 2 feet, and in any case no less than 1 foot.

(3) The forebay must be wider than it is deep. The minimum surface area shall be 25% of the pretreatment volume (this results in a maximum depth of 4 feet).

(4) The length-to-width ratio shall be a minimum of 1.5:1 and a maximum of 4:1 to allow for adequate hydraulic length yet minimize scour velocities.

(5) The top-of-berm elevation between the forebay and the basin shall be a minimum of 1 foot below the outer berm elevation.

(6) The overflow spillway shall be sized using Equations 4.24 through 4.26 and designed to prevent erosion.

4. Design Schematics

a. See "Detention Basin" and "Retention Basin" BMPs.

Spill Containment Cell

1. Summary

Description:	Lined stormwater pretreatment practice.
Application:	Typically used with a detention or retention basin.
Types:	Wet cell.
Pretreatment Required:	No. This BMP can provide pretreatment and spill containment.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	None.
Rate Reduction:	None.
Water Quality:	Count volume routed through BMP.

2. Sizing Calculations

a. Spill containment cells shall be sized for pretreatment. Refer to Part 3 section "Calculating Storage Volumes and Release Rates, Pretreatment".

b. The pretreatment volume is the volume of the spill containment cell to the elevation of the level spreader or overflow spillway including any permanent pool.

c. The spill containment volume is the storage volume between the normal water level and the entrance of the outlet pipe. The minimum spill containment volume shall be provided to capture a slug pollutant load from an accidental spill of toxic materials.

3. Design Requirements

a. Siting

(1) All inlets shall enter the spill containment cell unless the inlet collects stormwater exclusively from non-hotspot areas (i.e. office parking, courtyard, roof.)

b. Configuration

(1) The spill containment cell must be wider than it is deep. The minimum surface area shall be 25% of the pretreatment volume (this results in a maximum depth of 4 feet).

(2) The length-to-width ratio shall be a minimum of 1.5:1, and a maximum of 4:1 to allow for adequate hydraulic length yet minimize scour velocities.

(3) The top-of-berm elevation between the spill containment cell and the basin shall be a minimum of 1 foot below the outer berm elevation.

(4) Side slopes shall not be steeper than 3:1 (H:V). Where basins are to be maintained as a mown lawn, side slopes shall be no steeper than 4:1 (H:V) to facilitate mowing.

(5) Minimum depth of the permanent pool shall be 3 feet.

(6) Unless protected by fencing, a minimum 4-foot wide safety bench shall be constructed around the permanent pool. The safety bench shall have a maximum slope of 6:1 (H:V) and extend a minimum of 4 inches below the permanent pool level and a minimum of 4 inches above the permanent pool level.

c. Outlet Design

(1) The outlet structure from the spill containment cell shall be designed to draw water from the central portion of the water column within the cell to trap floatables and contain sediments. The inlet of the transfer pipe shall be located a minimum of 1 foot below the normal water level, and a minimum of 1 foot above the bottom of the spill containment cell or manhole sump.

(2) The transfer pipe(s) between the spill containment cell and the basin shall be sized for the peak inflow from a 10-year rainfall event.

(3) Minimum pipe diameter shall be 12 inches.

d. Emergency Overflow

(1) The crest of the level spreader or overflow spillway from the spill containment cell shall be set at the elevation of the calculated 10-year hydraulic head.

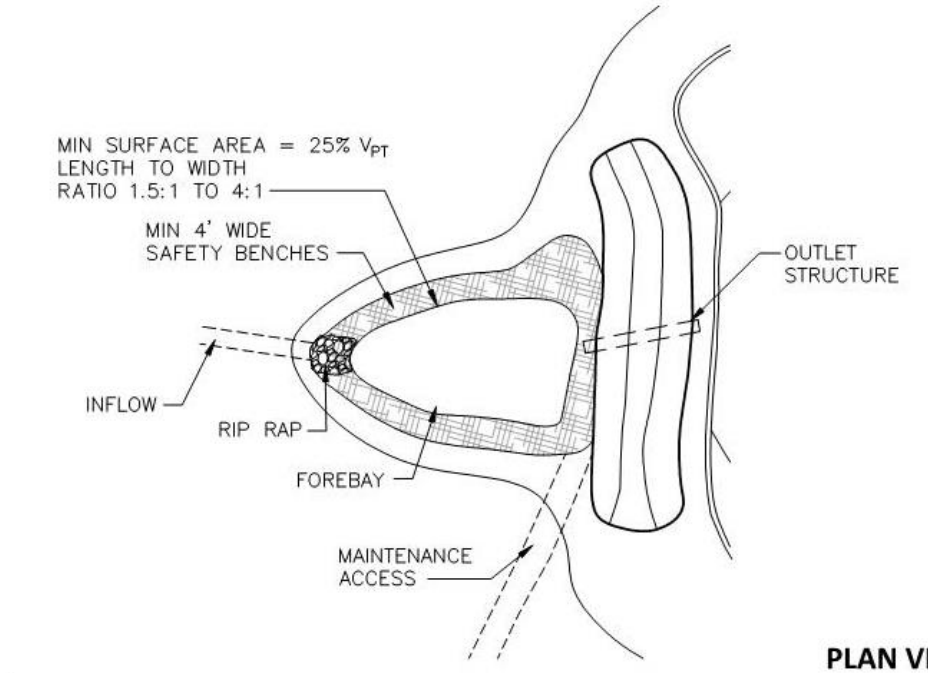
(2) The overflow spillway from the spill containment cell shall be sized using Equations 4.24 through 4.26 and designed to prevent erosion.

e. Materials

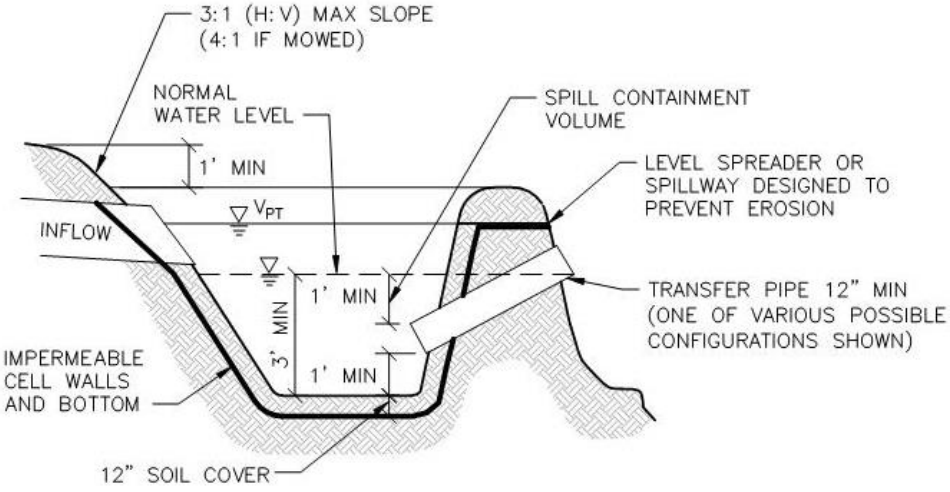
(1) The spill containment cell shall be lined with impermeable materials extending up to the design high water elevation. A minimum 18-inch-thick clay layer, or an impermeable liner protected with a minimum 12 inches of soil cover are acceptable alternatives. Maximum allowable permeability shall be 1×10^{-7} centimeters per second as determined by the geotechnical consultant for clay placement, or manufacturer's certificate for liner products.

4. Design Schematics

SPILL CONTAINMENT CELL



PLAN VIEW



NOTE:
SPILL CONTAINMENT CELL SHALL BE CONSTRUCTED IN PLACE OF THE FOREBAY WHERE REQUIRED

PROFILE

Infiltration Practices

1. Summary

Description:	Stormwater treatment and storage without a pipe outlet, relying instead on infiltration into the ground.
Application:	Practices are typically applicable to small sites and drainage areas in sandy soils.
Types:	Dry Well; Leaching Basin; Infiltration Trench; Infiltration Bed; Infiltration Berm.
Pretreatment Required:	Yes.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	Count volume stored and infiltrated.
Rate Reduction:	Designed for flood control: 100%. Designed for channel protection and/or water quality: Adjust time-of-concentration by dividing storage volume by 10-year peak flow rate.
Water Quality:	Count volume stored and infiltrated.

2. Sizing Calculations

a. Infiltration practices may be sized for water quality, channel protection, or flood control.

b. Calculate the required water quality or channel protection volume. Refer to Part 3 section "Calculating Storage Volumes and Release Rates."

c. Calculate the required storage volume. Refer to Part 3 section "Calculating Storage Volumes and Release Rates, Flood Control, Retention" and "Retentive BMPs."

d. Calculate the minimum infiltration area required to drain the required storage volume in the specified drawdown time using the design infiltration rate. Refer to Part 3 section "Design Infiltration Rates" to determine the design infiltration rate.

$$A = \frac{12Vs}{i(t_d)} \tag{4.6}$$

where:
A = minimum infiltration area (square feet)
Vs = storage volume (cubic feet)
i = design infiltration rate (inches per hour)
t_d = maximum allowable drawdown time (hours)
12 = factor to convert inches to feet

e. Total drawdown time shall be no more than 72 hours. Depth of surface ponding shall be no more than 2 feet and drain within 24 hours.

f. Infiltration area shall be defined as:
   (1) Dry Well/Leaching Basin: Bottom of stone and ½ the height of the sides below the outlet elevation; omit bottom area when groundwater is less than 3 feet from the bottom.
   (2) Infiltration Trench: Bottom area of the trench.
   (3) Infiltration Bed: Bottom area of the bed.
   (4) Infiltration Berm: Ponding area (length of berm x average width of ponding behind berm).

g. Calculate the storage volume of the BMP:

   (1) Dry wells, infiltration trenches, infiltration beds:
   Subsurface Storage Volume (cubic feet) = Length (feet) x Width (feet) x Depth (feet) x Void Ratio of Material

   Where perforated pipe is used, the formula is modified:

   Subsurface Storage Volume (cubic feet) = Volume of Pipe (cubic feet) + [Length (feet) x Width (feet) x Depth (feet) – Volume of Pipe (cubic feet)] x Void Ratio of Material

   (2) Leaching basins:
   Storage Volume (cubic feet) = Πr^2 (square feet) x Depth (feet)

   where:
   r = radius of leaching basin (feet)
   Π = *pi* (approximately 3.14)

   Volume of storage in stone envelope around leaching basin may also be counted.

   (3) Infiltration berm:
   Surface Storage Volume (cubic feet) = Average Ponding Area (square feet) x Design High Water Depth (feet)

3. Design Requirements

a. Siting

   (1) Soil borings are required. Refer to Part 3 section "Soils Investigation."
   (a.) A minimum of 3 feet is required between the bottom of infiltration practices and the highest known groundwater elevation.

   (b.) Void ratio for the imported material shall be based on the USDA soil textural class and effective water capacity in **Table 6**. A maximum design value of 0.40 shall be used for the void ratio of stone.

   (2) Setbacks shall be as follows:
   (a.) Adjacent property line: 10 feet
   (b.) Building foundation: 10 feet
   (c.) Private well: 50 feet
   (d.) Public well: 200 feet from Type I or Type IIa wells, 75 feet from Type IIb or Type III wells (Safe Drinking Water Act, Act 399, PA 1976)
   (e.) Septic system drainfield: 50 feet

   (3) Infiltration practices shall be located outside of the drip line of adjacent trees to avoid root intrusion.

b. Configuration

(1) General

(a.) A combination of surface and subsurface storage may be used to provide the required storage volume.

(2) Dry wells, infiltration trenches and infiltration beds

(a.) Infiltration trench width : 2-foot minimum to 6-foot maximum.

(b.) Coarse aggregates shall be uniformly graded, washed and wrapped in a non-woven geotextile to provide separation between the aggregate and the surrounding soil and prevent fines from clogging the infiltration surface.

(c.) An observation well shall be provided for each dry well, at each end of an infiltration trench, and at each corner of an infiltration bed with intermediate center wells added so as not to exceed maximum distance of 50 feet between wells.

(d.) Perforated pipes laid flat may be used to distribute runoff over the bottom of infiltration trenches and infiltration beds.

(e.) Cleanouts shall be provided at pipe ends.

(f.) Care must be taken during the excavation and finishing process to make sure that soil compaction does not occur.

(3) Leaching Basins

(a.) Leaching basins shall have a minimum diameter of 4 feet and meet the layout requirements for catchbasins (refer to “Storm Sewer”).

(b.) Leaching basins shall have an open bottom and perforations around the circumference of the structure at no greater than 12-inch intervals horizontally and vertically the entire depth of the sump.

(c.) Bedding and backfill shall consist of clean stone with nonwoven geotextile fabric placed along the walls of the trench and wrapped around the stone and the basin.

(4) Infiltration Berms

(a.) Infiltration berms shall be constructed along (parallel to) contours at a constant level elevation.

(b.) Maximum berm height shall be 2 feet to prevent excessive ponding behind berm.

(c.) Berm top width shall be a minimum of 2 feet.

(d.) Side slopes shall not be steeper than 4:1 (H:V) to facilitate mowing and ensure stable side slopes.

(e.) Well compacted cohesive soil shall be used to construct the berm.

(f.) The berm shall be well vegetated to prevent erosion if overtopped.

c. Inlet Design

(1) Pretreatment is required for each inlet and for overland flow entering the infiltration practice. Exceptions may be allowed for small, paved drainage areas contributing directly to a leaching basin.

d. Emergency Overflow

(1) All infiltration practices must have a provision for overflow at the high water level.

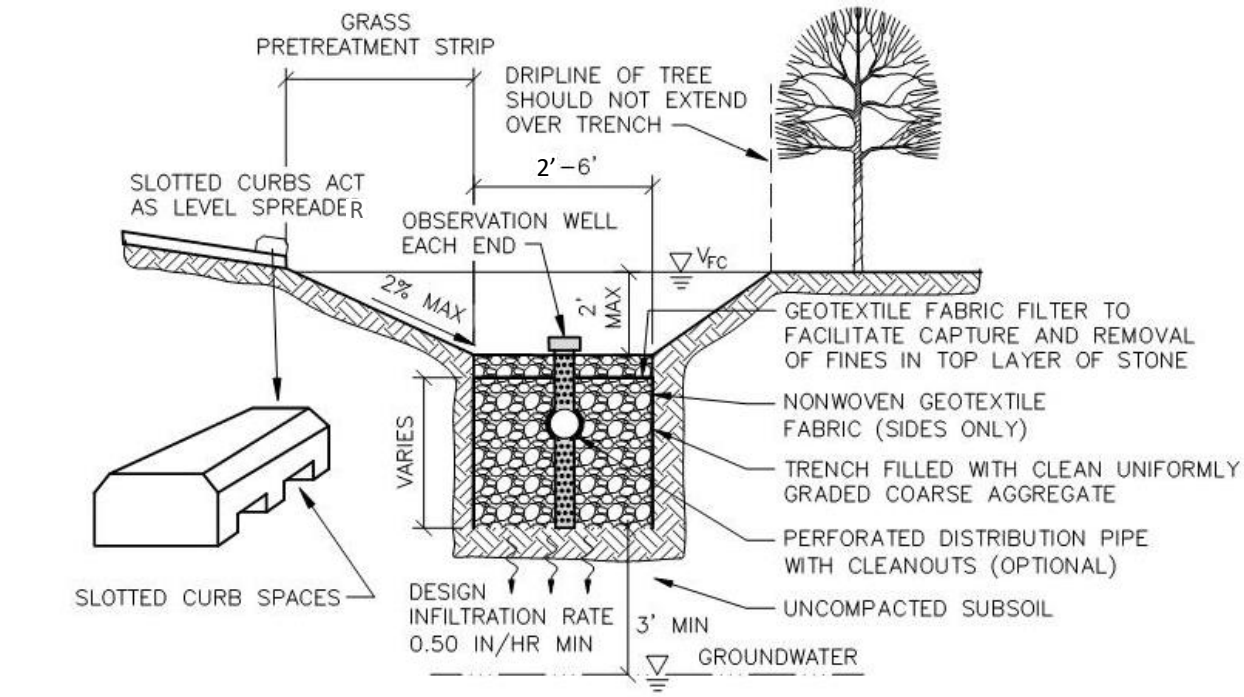
(2) Infiltration practices without an acceptable surface water overflow route shall be designed for 2 times the required flood control volume.

e. Access

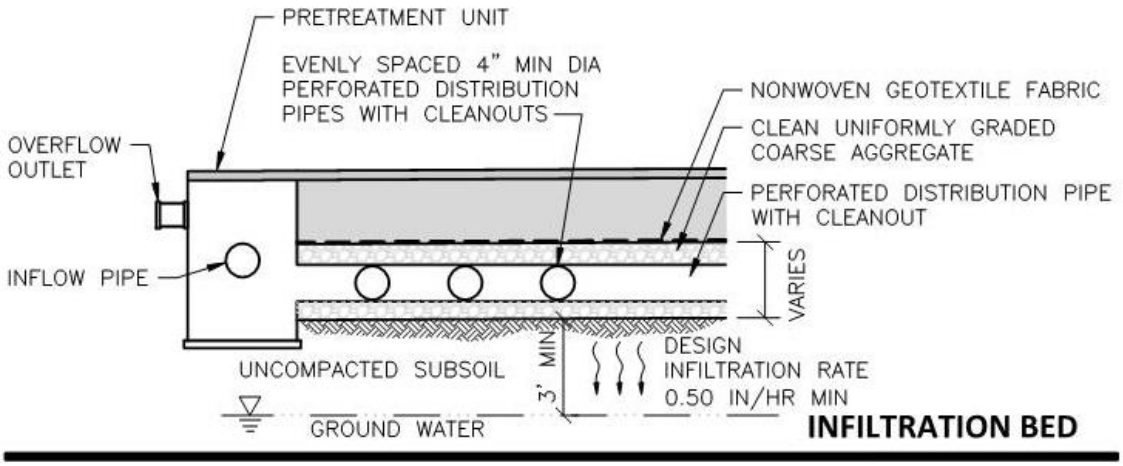
(1) Inspection and maintenance access to the infiltration practice shall be provided.

4. Design Schematics

INFILTRATION PRACTICES

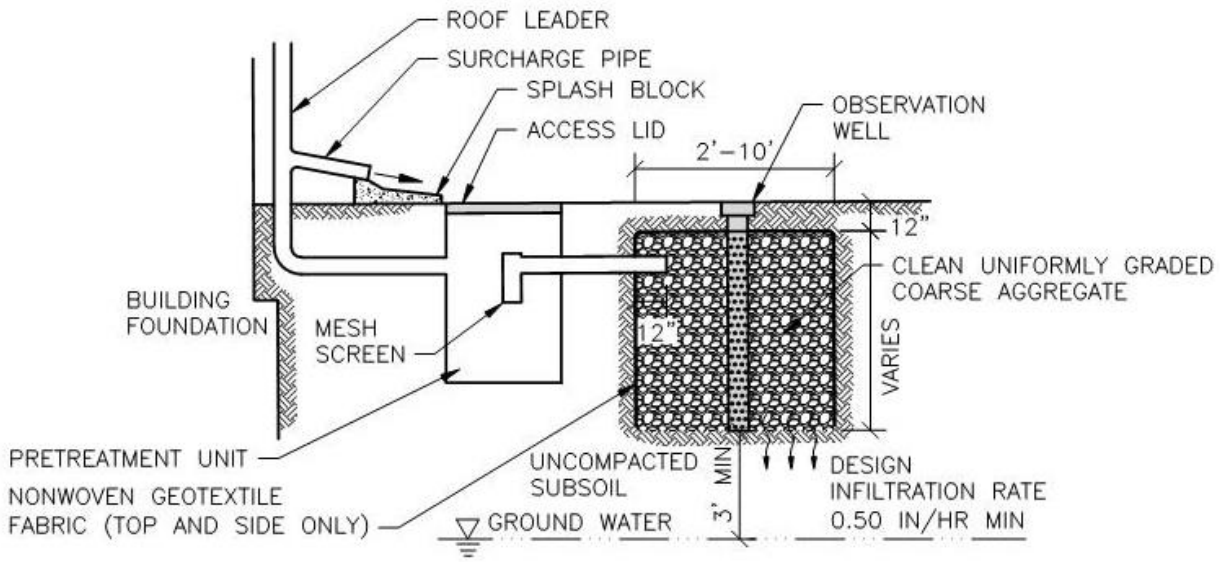


INFILTRATION TRENCH

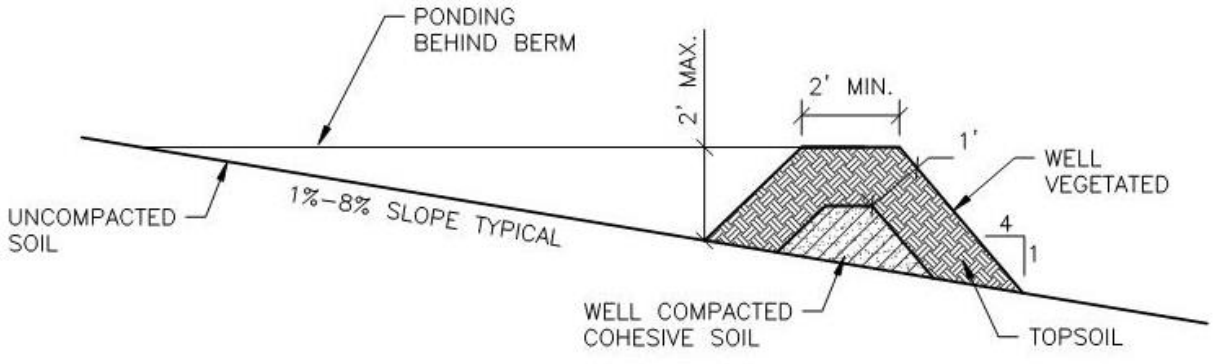


INFILTRATION BED

INFILTRATION PRACTICES



DRY WELL



INFILTRATION BERM

Constructed Filter

1. Summary

Description:	Provides stormwater treatment and storage with a pipe outlet (underdrain).
Application:	Areas with high heavy metal pollutant loads. May be used on small sites to provide extended detention.
Types:	Sand; Gravel; Sand/compost mix; Other media. Dry; Static water level within filter media.
Pretreatment Required:	Yes. This BMP can also provide pretreatment.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	None.
Rate Reduction:	Adjust time-of-concentration by dividing storage volume by 10-year peak flow rate.
Water Quality:	Count volume routed through filter.

2. Sizing Calculations

a. Constructed filters shall be sized for water quality or pretreatment.

b. Calculate the required water quality or pretreatment volume. Refer to Part 3 section "Calculating Storage Volumes and Release Rates."

c. The design volume of the BMP is the storage volume of the voids and underdrain within the filter media including any temporary surface storage volume to the elevation of the overflow.

d. Calculate the minimum filter surface area required to drain the design volume in the specified drawdown time using hydraulic conductivity of filter media:

$$A = \frac{V(d_f)}{K(t_d)(h_f+d_f)} \quad (4.7)$$

where:

A = minimum surface area of filter (square feet)
V = design runoff volume (cubic feet)
d_f = depth of filter media (1.5-foot minimum to 3-foot maximum)
K = hydraulic conductivity (feet per day)
t_d = maximum allowable drawdown time (days)
h_f = average head; typically ½ of the maximum head on filter media (feet)

e. Total drawdown time shall be no more than 72 hours. Maximum depth of surface ponding above the filter bed shall be 24 inches and drain within 24 hours.

f. An orifice may be used at the downstream end of the underdrain to provide extended detention as long as drawdown times are met.

g. Calculate the storage volume of the BMP:

Surface Storage Volume (cubic feet) = Bed Area (square feet) x Design High Water Depth (feet)

Subsurface Storage Volume (cubic feet) = Volume of Pipe (cubic feet) + [Length (feet) x Width (feet) x Depth (feet) – Volume of Pipe (cubic feet)] x Void Ratio of Material

h. Design values for hydraulic conductivity of the filter media shall be as specified in **Table 14**. Values for other types of filter media will be reviewed for use on an individual basis.

Table 14 –Hydraulic Conductivities for Filter Media

Filter Media	Hydraulic Conductivity, K (feet per day)
Gravel	14[1]
Compost (loose)	8.7[2]
Coarse Sand	3.5[2]
Peat	2[2]
Topsoil (< 10% clay)	1.3[3]

[1] Adapted from William E. Sanford, et. al. (1995). *Hydraulic Conductivity of Gravel and Sand as Substrates in Rock-reed Filters,* Table 3 (using lowest initial conductivity for sand and gravel (0.25 cm/s) and correction factors from Source 2 (p. 5-18)).

[2] Center for Watershed Protection (1996). *Design of Stormwater Filtering Systems.*

[3] D. Carpenter and L. Hallam (2007). An *Investigation of Rain Garden Planting Mixtures and the Implications for Design.*

A composite value of hydraulic conductivity for mixture combinations shall be calculated as: K = (%xK1 + %xK2 +%xK3)/100

3. Design Requirements

a. Siting

(1) Soil borings are required. Refer to Part 3 section "Soils Investigation."

(a.) A minimum of 2 foot is required between the bottom of the constructed filter and the highest known groundwater elevation.

b. Configuration

(1) Filter media shall have a minimum depth of 18 inches and a maximum depth of 36 inches.

(2) Stone bedding shall consist of at least 2 inches under the pipe and 4 inches above the pipe. An aggregate window extending to the filter surface may also be provided as a factor-of-safety.

(3) A 4-inch minimum diameter underdrain shall be provided in the gravel layer with lateral spacing at 10 feet, and in any case no more than 25 feet.

(4) All underground pipes shall have cleanouts accessible from the surface.

(5) Pipes shall be sloped to prevent siltation.

(6) Constructed filters located in areas of existing soil contamination shall be lined to prevent infiltration.

c. Inlet Design

(1) A level spreader, distribution pipes or other flow dispersion measure shall be used for energy dissipation and to uniformly distribute the flow.

(2) Pretreatment is required for each inlet and for overland flow entering the constructed filter.

d. Emergency Overflow

(1) All constructed filters must be designed so that larger storms may safely overflow or bypass the filter. Flow splitters, multi-stage chambers or other devices may be used.

(2) Sufficient space must be provided between the top of the filtering bed and the overflow to allow the maximum design head to be stored for filtration.

e. Materials

(1) Stone bedding shall consist of clean, uniformly graded coarse aggregate (MDOT coarse or open-graded aggregate).

(2) A woven geotextile fabric, or an additional 2 inches of gravel choker course shall be placed between the filter media layer(s) and the stone layer.

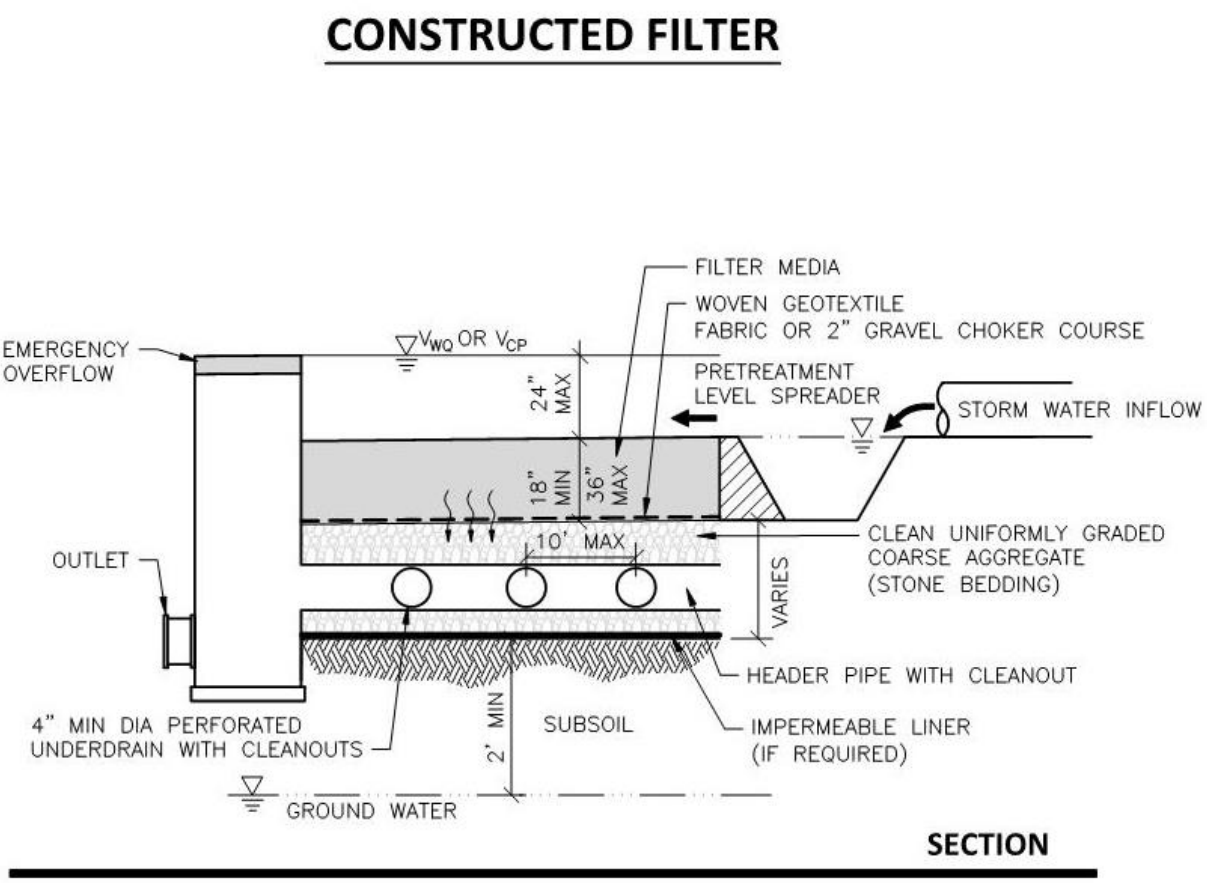
(3) When used, impermeable liner shall have a maximum permeability of 1×10^{-7} centimeters per second certified by the manufacturer.

f. Access

(1) Inspection and maintenance access to the constructed filter shall be provided.

(2) For underground vault heights greater than 4 feet, ladder access shall be provided.

4. Design Schematics



Bioretention/Rain Garden

1. Summary

Description:	Incorporates amended soil and provides stormwater storage, treatment and uptake with or without a pipe outlet.
Application:	Small sites and drainage areas.
Types:	Bioretention: Natural-looking herbaceous. Rain garden: Landscaped and manicured. Retentive; Underdrain at top of storage layer; Underdrain at bottom of storage layer; Lined.
Pretreatment Required:	Yes.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	Retentive: Count volume stored and infiltrated. Underdrained: Count volume stored and infiltrated between bottom of BMP and invert of underdrain.
Rate Reduction:	Adjust time-of-concentration by dividing storage volume by 10-year peak flow rate.
Water Quality:	Count volume stored and infiltrated, or routed through filter.

2. Sizing Calculations

a. Bioretention/rain gardens shall be sized for water quality or channel protection, and may be sized for flood control in small drainage areas.

b. Minimum surface area (loading ratio) shall be 5:1 contributing impervious area to BMP surface area, with a maximum impervious area of 1 acre (43,560 square feet) per bioretention cell.

c. Calculate the required water quality or channel protection volume. Refer to Part 3 section “Calculating Storage Volumes and Release Rates.”

d. For underdrained BMP, follow sizing criteria for “Constructed Filter.”

e. For retentive BMP, calculate the required storage volume. Refer to Part 3 section “Calculating Storage Volumes and Release Rates, Flood Control, Retention” and “Retentive BMPs.”

f. Calculate the minimum infiltration area required to drain the storage volume in the specified drawdown time using the design infiltration rate. Refer to Part 3 section “Design Infiltration Rates” to determine the design infiltration rate. The bottom area of the BMP shall be used as the infiltration area.

$$A = \frac{12Vs}{i(t_d)} \tag{4.6}$$

where:

A = minimum infiltration area (square feet)
Vs = storage volume (cubic feet)
i = design infiltration rate (inches per hour)
t_d = maximum allowable drawdown time (hours)
12 = factor to convert inches to feet

g. Total drawdown time shall be no more than 72 hours. Depth of surface ponding shall be no more than 12 inches and drain within 12 hours. Surface ponding depth may be increased up to 24 inches for bioretention areas and drain within 24 hours.

h. Calculate the storage volume of the BMP:

Average Bed Area (square feet) = [Area at Design High Water Depth (square feet) + Bottom Area (square feet)] / 2

Surface Storage Volume (cubic feet) = Average Bed Area (square feet) x Design High Water Depth (feet)

Subsurface Storage Volume (cubic feet) = Length (feet) x Width (feet) x Depth (feet) x Void Ratio of Material

Note: Count subsurface storage volume only if permeability of media is greater than permeability of subsoil.

Total Storage Volume (cubic feet) = Surface Storage Volume (cubic feet) + Subsurface Storage Volume (cubic feet)

3. Design Requirements

a. Siting

(1) Soil borings are required. Refer to Part 3 section "Soils Investigation."
(a.) A minimum of 3 feet is required between the bottom of bioretention/rain gardens capable of infiltration and the highest known groundwater elevation.
(b.) A minimum of 2 feet is required between the bottom of lined or underdrained bioretention/rain gardens and the highest known groundwater elevation.
(c.) An underdrain shall be provided for design infiltration rates of the underlying native soil less than 0.50 inches per hour, or if bioretention/rain garden will be lined.
(d.) Void ratio for the amended soil material shall be based on the USDA soil textural class and effective water capacity in **Table 6**. A maximum design value of 0.30 shall be used for the void ratio of the amended soil material. A maximum design value of 0.40 shall be used for the void ratio of stone.

(2) Setbacks shall be as follows:
(a.) Adjacent property line: 10 feet
(b.) Building foundation: 10 feet
(c.) Private well: 50 feet
(d.) Public well: 200 feet from Type I or Type IIa wells, 75 feet from Type IIb or Type III wells (Safe Drinking Water Act, Act 399, PA 1976)
(e.) Septic system drainfield: 50 feet

b. Configuration

(1) General
(a.) The bottom shall be flat to encourage uniform ponding and infiltration.
(b.) Minimum bottom width shall be 3 feet.
(c.) Bioretention/rain gardens located in areas with steep slopes shall be terraced to minimize earth disturbance and maximize infiltration area.
(d.) Care must be taken during the excavation and finishing process to make sure that soil compaction does not occur.

(e.) Bioretention/rain gardens located in areas of existing soil contamination shall be lined to prevent infiltration.
(f.) Underdrains shall have a 4-inch minimum pipe diameter.
(g.) All underground pipes shall have cleanouts accessible from the surface.
(h.) Pipes shall be sloped to prevent siltation.
(i.) Side slopes shall not be steeper than 3:1 (H:V), unless landscape retaining walls are used.
(j.) An observation well shall be provided for each bioretention/rain garden without a bottom underdrain.

(2) Rain garden
(a.) A landscape plan shall be provided.

c. Inlet Design

(1) Inlet pipes shall require energy dissipation. Riprap protection or equivalent erosion control measures shall be used where the velocity exceeds 4 feet per second up to a maximum allowable design velocity of 8 feet per second.

(2) Pretreatment is required for each inlet and for overland flow entering the bioretention/ rain garden.

d. Emergency Overflow

(1) All bioretention/rain gardens must have a provision for overflow at the high water level.

e. Materials

(1) Amended soil material shall consist of 18 to 48 inches of the following materials, evenly mixed: Compost: minimum 20%; Sand: 20-80%; Topsoil: maximum 30%.
(a.) Alternative mix designs with ratios outside of the limits provided will be considered with justification.
(b.) The soil mix shall have a pH between 5.5 and 7.5.

(2) Topsoil shall be sandy loam, loamy sand or loam per USDA Soil Textural Triangle with 20% to 50% fines by volume (silt and clay with <10% clay), and 2% to 8% organic matter by dry weight.

(3) Stone shall consist of clean, uniformly graded coarse aggregate.

(4) A woven geotextile fabric shall be placed between the amended soil and the stone, when a stone layer is used.

(5) When used, impermeable liner shall have a maximum permeability of 1 x 10-7 centimeters per second certified by the manufacturer.

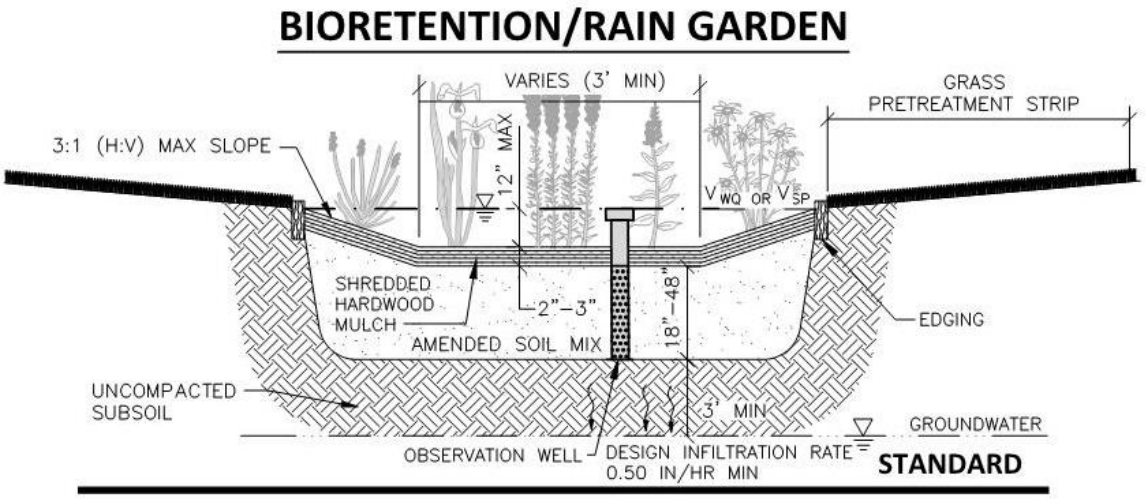
(6) Plant selection shall consider exposure and tolerance to salt, sediment and pollutants, and the design depth of surface storage. Native species are encouraged.
(a.) Bioretention: Plugs and seed.
(b.) Rain gardens: Container stock.

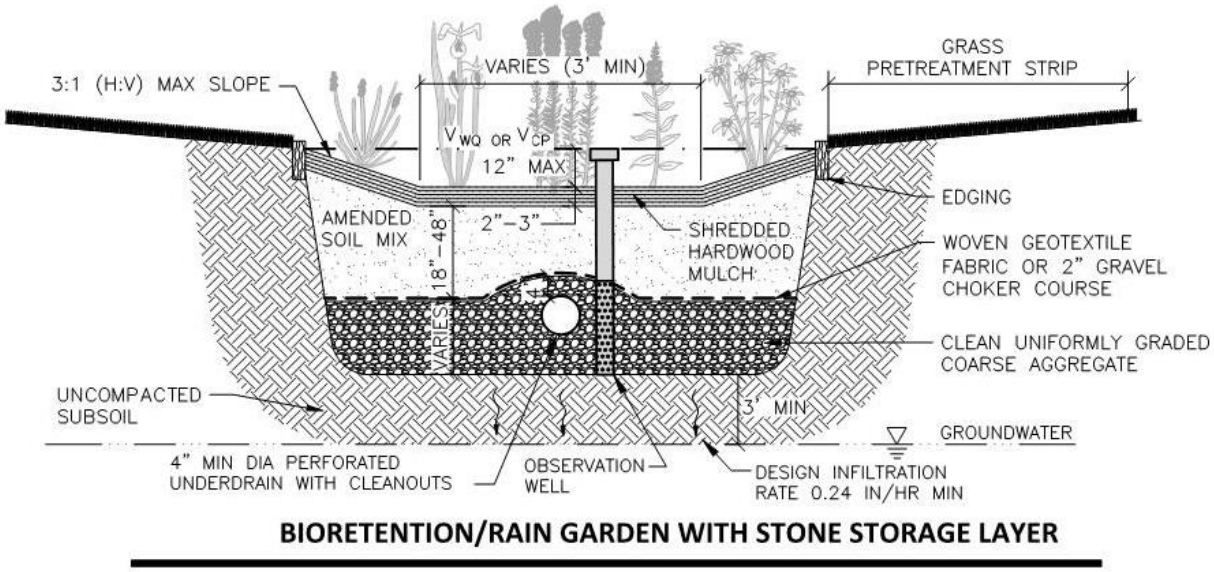
(7) Mulch shall be applied after planting.
(a.) Bioretention: Shredded hardwood mulch, straw mulch or mulch blanket shall be uniformly applied and tacked.
(b.) Rain gardens: Shredded hardwood mulch shall be uniformly applied to a depth of 2 to 3 inches.

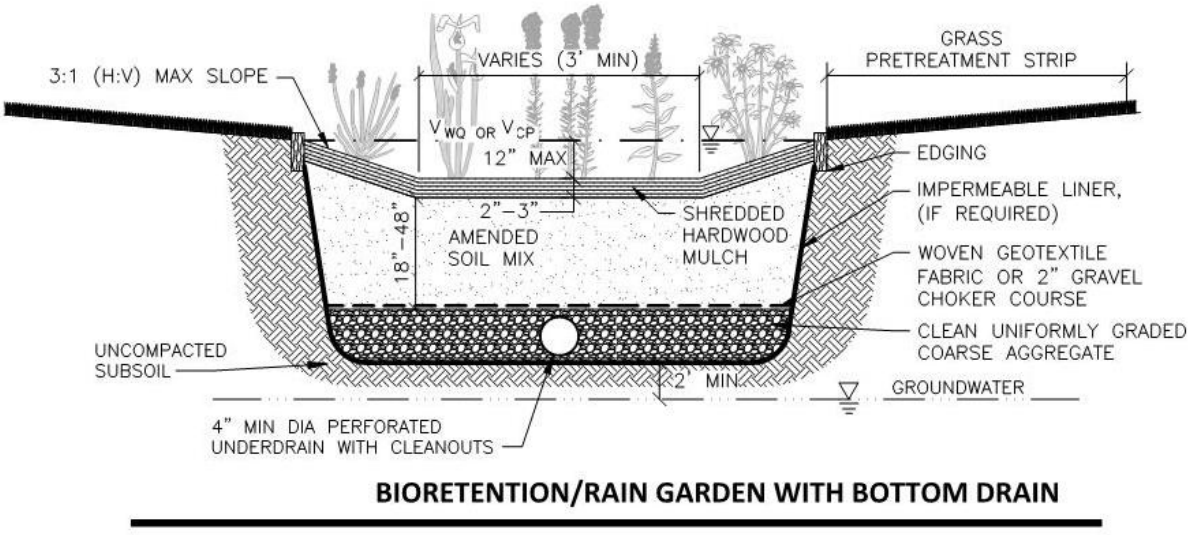
f. Access

(1) Inspection and maintenance access to the bioretention/rain garden shall be provided.

4. Design Schematics







Planter Box

1. Summary

Description:	A type of rain garden.
Application:	Small sites or highly urban areas.
Types:	Retentive; Underdrain at top of storage layer; Underdrain at bottom of storage layer; Lined.
Pretreatment Required:	No. This BMP can provide pretreatment.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	Retentive: Count volume stored and infiltrated. Underdrained: Count volume stored and infiltrated between bottom of BMP and invert of underdrain.
Rate Reduction:	Adjust time-of-concentration by dividing storage volume by 10-year peak flow rate.
Water Quality:	Count volume stored and infiltrated, or routed through filter.

2. Sizing Calculations

a. Planter boxes shall be sized for water quality, pretreatment or channel protection.

b. Minimum surface area (loading ratio) shall be 5:1 contributing impervious area to BMP surface area, with a maximum impervious area of 15,000 square feet per planter box.

c. Calculate the required water quality, pretreatment or channel protection volume. Refer to Part 3 section “Calculating Storage Volumes and Release Rates.”

d. For underdrained BMP, follow sizing criteria for “Constructed Filter.”

e. For retentive BMP, calculate the required storage volume. Refer to Part 3 section “Calculating Storage Volumes and Release Rates, Flood Control, Retentive BMPs.”

f. Calculate the minimum infiltration area required to drain the storage volume in the specified drawdown time using the design infiltration rate. Refer to Part 3 section “Design Infiltration Rates” to determine the design infiltration rate. The bottom area of the BMP shall be used as the infiltration area.

$$A = \frac{12Vs}{i(t_d)} \tag{4.6}$$

where:
A = minimum infiltration area (square feet)
Vs = storage volume (cubic feet)
i = design infiltration rate (inches per hour)
t_d = maximum allowable drawdown time (hours)
12 factor to convert inches to feet

g. Total drawdown time shall be no more than 12 hours. Depth of surface ponding shall be no more than 12 inches and drain within 4 hours.

h. Calculate the storage volume of the BMP:

Surface Storage Volume (cubic feet) = Bed Area (square feet) x Design High Water Depth (feet)

Subsurface Storage Volume (cubic feet) = Length (feet) x Width (feet) x Depth (feet) x Void Ratio of Material

Note: Count subsurface storage volume only if permeability of media is greater than permeability of subsoil.

Total Storage Volume (cubic feet) = Surface Storage Volume (cubic feet) + Subsurface Storage Volume (cubic feet)

3. Design Requirements

a. Siting

(1) Soil borings are required. Refer to Part 3 section "Soils Investigation."

(a.) A minimum of 3 feet is required between the bottom of the planter box and the highest known groundwater elevation.

(b.) A minimum of 2 foot is required between the bottom of a lined or underdrained planter box and the highest known groundwater elevation.

(c.) An underdrain shall be provided for design infiltration rates less than 0.50 inches per hour, or if planter box will be lined.

(d.) Void ratio for the amended soil material shall be based on the USDA soil textural class and effective water capacity in **Table 6**. A maximum design value of 0.30 shall be used for the void ratio of the amended soil material. A maximum design value of 0.40 shall be used for the void ratio of stone.

b. Configuration

(1) A combination of surface and subsurface storage may be used to provide the required storage volume.

(2) Minimum width of planter boxes shall be 30 inches, or 18 inches if flow-through.

(3) Care must be taken during the excavation and finishing process to make sure that soil compaction does not occur.

(4) Planter boxes located in areas of existing soil contamination shall be lined to prevent infiltration.

(5) Underdrains shall have a 4-inch minimum pipe diameter.

(6) All underground pipes shall have cleanouts accessible from the surface.

(7) Pipes shall be sloped to prevent siltation.

(8) A planting plan shall be provided.

c. Inlet Design

(1) Inlet pipes shall require energy dissipation. Riprap protection or equivalent erosion control measures shall be used where the velocity exceeds 4 feet per second, up to a maximum allowable design velocity of 8 feet per second.

d. Emergency Overflow

(1) All planter boxes must have a provision for overflow at the high water level.

e. Materials

(1) Suggested structural elements of planter boxes are stone, concrete, brick or pressure-treated wood.

(2) Amended soil material shall consist of 12 to 36 inches of the following materials, evenly mixed: Compost: minimum 20%; Sand: 20-80% ; Topsoil: maximum 30%.

(a.) Alternative mix designs with ratios outside of the limits provided will be considered with justification.

(b.) The soil mix shall have a pH between 5.5 and 6.5.

(3) Topsoil shall be sandy loam, loamy sand or loam per USDA Soil Textural Triangle with 20% to 50% fines by volume (silt and clay with <10% clay), and 2% to 8% organic matter by dry weight.

(4) Stone bedding shall consist of clean, uniformly graded coarse aggregate.

(5) A woven geotextile fabric shall be placed between the amended soil and the stone.

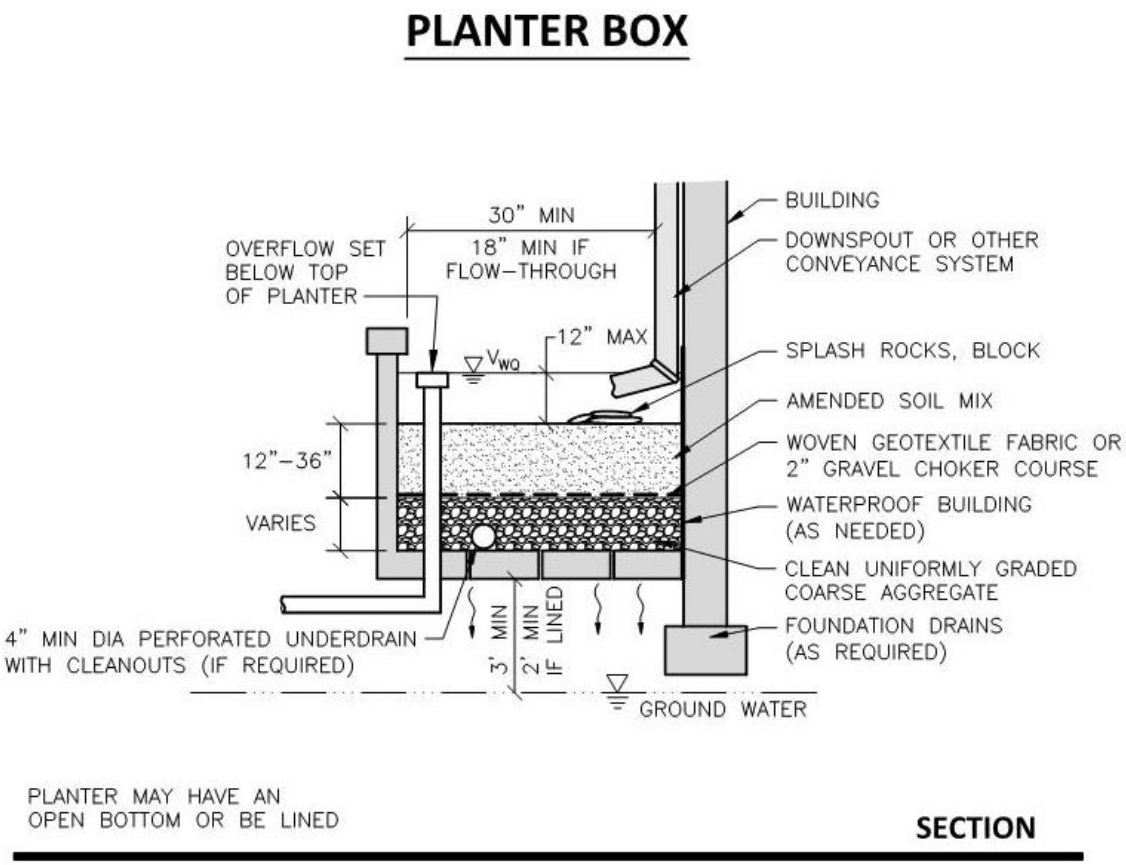
(6) Impermeable liner shall have a maximum permeability of 1 x 10-7 centimeters per second certified by the manufacturer.

(7) Plant selection shall consider exposure and tolerance to salt, sediment and pollutants, and the design depth of surface storage. Native species are encouraged.

(8) Plants shall be container stock.

f. Access. Inspection and maintenance access to the planter box shall be provided.

4. Design Schematics



Pervious Pavement

1. Summary

Description:	Permeable pavement surface with storage layer underneath. Provides stormwater storage and treatment with or without a pipe outlet.
Application:	Parking lots, alleys and roads and drives with low-volume vehicular traffic and minimal turning motions.
Types:	Retentive; Underdrain at top of storage layer; Underdrain at bottom of storage layer; Lined.
Pretreatment Required:	No.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	Retentive: Count volume stored and infiltrated (limited by design rainfall on pavement and roof). Underdrained: Count volume stored and volume infiltrated between bottom of BMP and invert of underdrain (limited by design rainfall on pavement and roof).
Rate Reduction:	Retentive: 100%.
Water Quality:	Count volume stored and infiltrated, or volume filtered.

2. Sizing Calculations

a. Pervious pavement shall be sized for flood control.

b. Calculate the runoff volume from the flood control rainfall event assuming impervious pavement. Refer to Part 3 section "Calculating Runoff."

c. The design volume of the BMP is the storage volume of the voids and underdrain within the stone to the elevation of the overflow.

d. Water quality volume may be included in the flood control volume. Channel protection volume may be included in the flood control volume for retentive BMP (no underdrain).

e. For retentive BMP, the bottom area of the stone shall be used as the infiltration area.

f. Maximum allowable drawdown time shall be 24 hours.

g. Calculate the subsurface storage volume of the BMP:
Subsurface Storage Volume (cubic feet) = Length (feet) x Width (feet) x Depth (feet) x Void Ratio of Material

3. Design Requirements

a. Siting

(1) Soil borings are required. Refer to Part 3 section "Soils Investigation."

(a.) A minimum of 3 feet is required between the bottom of pervious pavement capable of infiltration and the highest known groundwater elevation.

(b.) A minimum of 2 foot is required between the bottom of lined or underdrained pervious pavement and the highest known groundwater elevation.

(c.) An underdrain shall be provided for design infiltration rates less than 0.50 inches per hour, or if stone bed will be lined.

(d.) A maximum design value of 0.40 shall be used for the void ratio of stone.

(2) Runoff from offsite areas shall not be directed onto pervious pavement surface.

b. Configuration

(1) The stone bed shall be flat to encourage uniform ponding and infiltration.

(2) For pervious pavements located in areas with steep slopes, stone beds shall be terraced to maximize infiltration area.

(3) Pervious pavements located in areas of existing soil contamination shall be lined to prevent infiltration.

(4) Underdrains shall have a 4-inch minimum pipe diameter with lateral spacing at 10 feet, and in any case no more than 25 feet.

(5) All underground pipes shall have cleanouts accessible from the surface.

(6) Pipes shall be sloped to prevent siltation.

c. Inlet Design

(1) Pervious pavements shall have a backup method for water to enter the storage bed. Backup drainage may consist of an unpaved 1- to 2-foot wide stone edge or inlets with sediment traps.

d. Emergency Overflow

(1) Stone beds must have a provision for overflow below the level of the pavement surface when an underdrain is not already provided.

e. Materials

(1) Stone bed shall consist of 8 to 36 inches of clean, uniformly graded coarse aggregate.

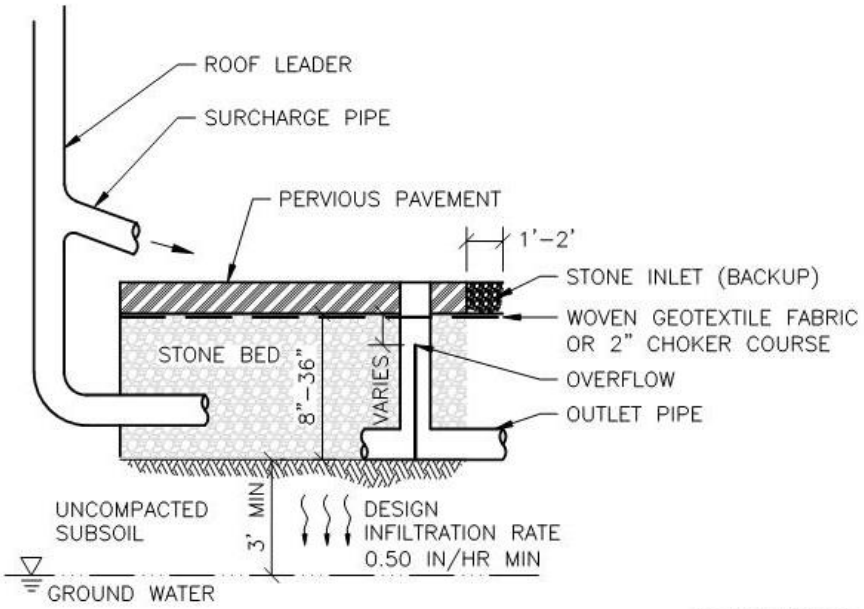
(2) A woven geotextile fabric or 2-inch gravel choker course shall be placed between the pervious pavement and stone bed.

(3) A nonwoven geotextile fabric or liner shall be placed between the stone bed and the subsoil for underdrained pavements.

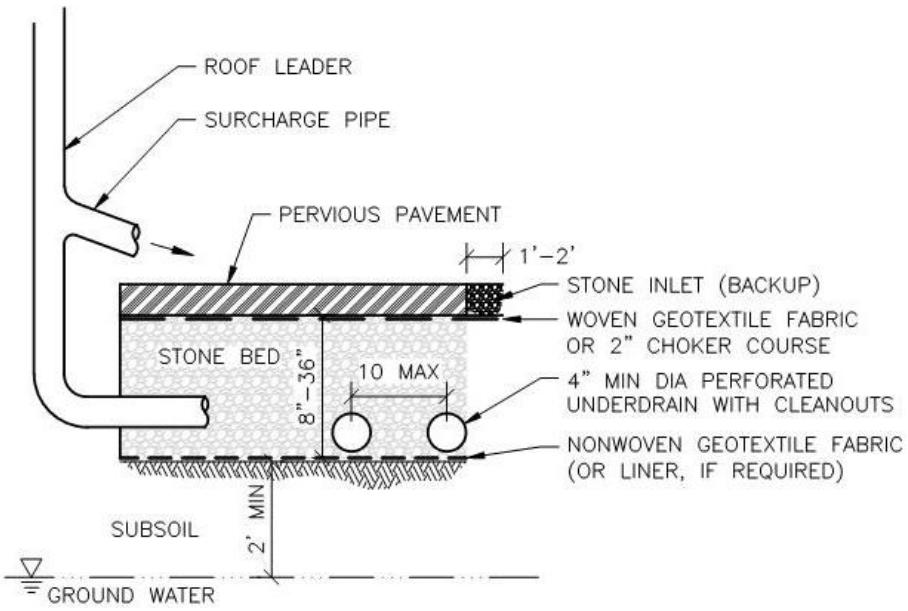
(4) Impermeable liner shall have a maximum permeability of 1×10^{-7} centimeters per second certified by the manufacturer.

4. Design Schematics

PERVIOUS PAVEMENT



STANDARD



PERVIOUS PAVEMENT WITH BOTTOM DRAIN

Vegetated Roof

1. Summary

Description:	Liner, soil media and vegetation placed on roof surface. Provides stormwater storage and treatment with a surface overflow.
Application:	Most practical for flat rooftops.
Types:	Intensive (> 4 inches, wide variety of plants, public use); Extensive (≤ 4 inches, plants are herbs, mosses, succulents and grasses).
Pretreatment Required:	No. This BMP can provide pretreatment.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	Count subsurface storage volume below the overflow (limited by design rainfall on roof).
Rate Reduction:	Adjust time-of-concentration.
Water Quality:	Count subsurface storage volume.

2. Sizing Calculations

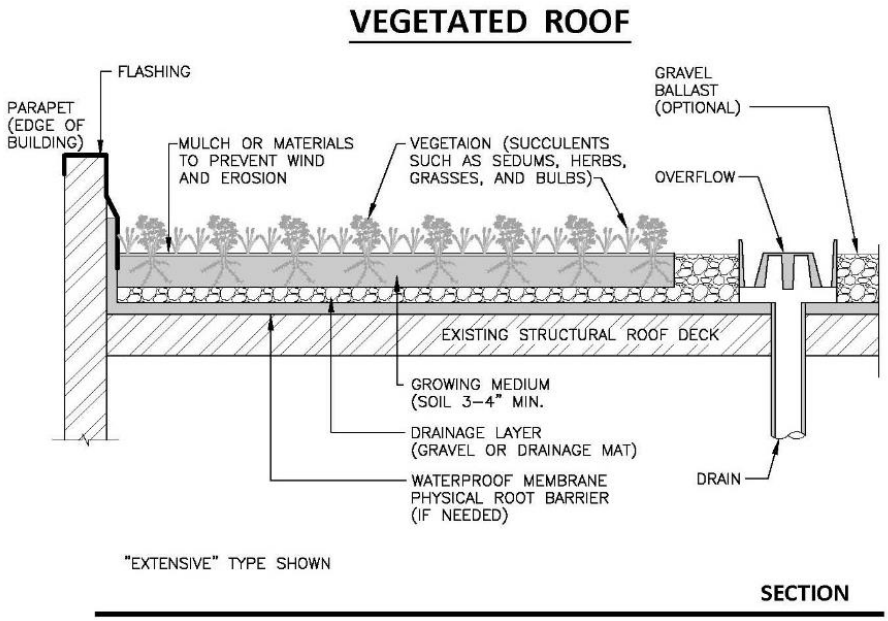
a. Vegetated roofs shall be sized for water quality, pretreatment, or channel protection.
b. The minimum subsurface storage volume shall be equal to the volume from 1-inch of rain falling on the roof area.
c. The subsurface storage volume below the overflow may be counted as retention.
d. Calculate the subsurface storage volume of the BMP:

Subsurface Storage Volume (cubic feet) = Length (feet) x Width (feet) x Depth (feet) x Void Ratio of Material.

3. Design Requirements

a. Configuration: Follow manufacturer's and structural engineer's guidelines.
b. Emergency Overflow: A positive outlet for overflow shall be provided.

4. Design Schematics



Capture Reuse

1. Summary

Description:	Stormwater capture, storage and removal from storm flow by reuse for irrigation or as greywater.
Application:	Most practical for roof runoff. Other collection areas may require pumping for reuse.
Types:	Rain barrels; Cisterns (both above ground and underground); Tanks; Ponds.
Pretreatment Required:	Yes. This BMP can provide spill containment.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	Count storage volume provided.
Rate Reduction:	Adjust time-of-concentration by dividing storage volume by 10-year peak inflow rate.
Water Quality:	Count volume stored.

2. Sizing Calculations

a. Capture reuse may be sized for water quality or channel protection.

b. Determine water use (gallons per day) and add up for each month of the year.

c. Obtain average monthly precipitation (inches) and evapotranspiration (ET) in inches. www.enviroweather.msu.edu

d. Multiply average monthly precipitation by contributing area and area-weighted Small Storm Hydrology Method runoff coefficient (assuming 90% of the storms produce 1 inch of rain or less) to obtain volume of recharge. A modified equation for the Small Storm Hydrology Method is given below:

$$V = PR_v A(3630) \tag{4.8}$$

where:

V = recharge volume (cubic feet)
P = rainfall (inches)
Rv = area-weighted volumetric runoff coefficient (individual runoff coefficients are given in **Table 10**)
A = contributing area (acres)
3630 = factor to convert acre-inches to cubic feet

e. Multiply recharge volume by 7.48 gallons per cubic foot to convert to gallons.

f. Calculate ET for open water surfaces. Multiply average monthly ET (inches) by surface area of pond (square feet) and divide by 12 to calculate the volume of water evaporated in cubic feet. Multiply by 7.48 gallons per cubic foot to convert to gallons.

g. Select trial size container or pond volume.

h. Calculate the water balance. A tabular method may be used similar to that illustrated below.

i. Adjust size of container or pond to balance reuse efficiency and cost.

Volume of Water in Storage at End of Month = Storage Volume at Start of Month + Recharge from Monthly Precipitation – ET – Monthly Water Use

Month	Vstart	+Recharge	-Et	-Use	=Vend*	Lost
1						
2	=Vend1					
Total	--				--	
*Limited by total volume of the selected container or pond. If value is greater than container volume, surplus is lost to overflow. If value is negative, it means that amount must be supplemented.						

3. Design Requirements

a. Siting

(1) Storage units shall be positioned to receive rooftop runoff.

(2) Protect storage units from direct sunlight to minimize algae growth.

(3) Discharge points and storage units shall be clearly marked "Caution: Untreated Rainwater. Do Not Drink."

b. Configuration

(1) If storage units are used to supplement greywater needs, a parallel conveyance system must be installed to separate greywater from other potable water piping systems.

(2) Storage units shall be watertight with a smooth interior surface.

(3) Covers and lids shall have a tight fit to keep out surface water, insects, animals, dust and light.

(4) Observation risers shall be provided for buried storage units.

(5) Pumps and pressure tanks may be used to add pressure (most irrigation systems require at least 15 pounds per square inch).

c. Inlet Design

(1) Screens shall be used to filter debris from runoff flowing into the storage unit.

d. Emergency Overflow

(1) A positive outlet for overflow shall be provided a few inches from the top of the storage unit and sized to safely discharge the peak flow from the 10-year design storm when the storage unit is full.

(2) Above-ground storage units shall have a release mechanism to drain and empty the unit between storm events.

Water Quality Device

1. Summary

Description:	Stormwater treatment provided in a prefabricated unit, also known as a Manufactured Treatment Device (MTD).
Application:	Practical for small sites and drainage areas.
Types:	Oil and grit separator; Hydrodynamic separator; Baffle box.
Pretreatment Required:	No. This BMP can provide pretreatment and spill containment
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	None.
Rate Reduction:	None.
Water Quality:	Count volume routed through BMP.

2. Sizing Calculations

a. Water quality devices shall be sized for water quality and pretreatment.

b. Calculate the design water quality flow rate. Refer to Part 3 section "Calculating Storage Volumes and Release Rates, Water Quality."

c. Select water quality device unit/model based on manufacturer's recommendations.

d. When the device is used to provide spill containment, the minimum spill containment volume shall be provided between the normal water level and the entrance of the outlet pipe to capture a slug pollutant load from an accidental spill of toxic materials.

3. Design Requirements

a. Configuration

(1) The geometry of the water quality device shall promote the trapping of sediment, oils and floatables.

(2) The water quality device shall be designed to prevent surcharging in pipes upstream of the device.

b. Emergency Overflow

(1) A bypass overflow shall be designed to convey the 10-year peak discharge to prevent release of trapped sediments and pollutants.

(2) The outlet from the overflow shall not be submerged under normal conditions.

c. Materials

(1) Catch basin inserts (inlet filters) are not accepted as a post-construction BMP.

Water Quality Swale

1. Summary

Description:	Lined swale designed to provide spill containment.
Application:	Small sites in lieu of a spill containment cell when a permanent pool is not desirable.
Types:	Dry swale.
Pretreatment Required:	No. This BMP can provide pretreatment and spill containment.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	None.
Rate Reduction:	Adjust time-of-concentration by dividing storage volume by 10-year peak flow rate.
Water Quality:	Count volume routed through filter.

2. Sizing Calculations

a. Water quality swales shall be sized for water quality or pretreatment.

b. Calculate the required water quality or pretreatment volume. Refer to Part 3 section "Calculating Storage Volumes and Release Rates."

c. The design volume of the BMP is the storage volume of the voids and underdrain within the filter media including any temporary surface storage volume to the elevation of the overflow, and including any permanent pool within the outlet structure.

d. The spill containment volume provided is the storage volume between the normal water level in the water quality swale and the entrance of the outlet pipe. The minimum spill containment volume shall be provided to capture a slug pollutant load from an accidental spill of toxic materials.

e. Follow sizing criteria for "Constructed Filter."

f. The swale shall be designed to pass the 10-year peak discharge. Refer to "Vegetated Swale" for sizing calculations.

3. Design Requirements

a. Siting

(1) All inlets shall enter the water quality swale unless the inlet collects stormwater exclusively from non-hotspot areas (i.e. office parking, courtyard, roof).

b. Configuration

(1) The bottom of the water quality swale shall be flat to encourage uniform ponding and filtration.
(2) The swale shall have a minimum bottom width of 2 feet and a maximum bottom width of 10 feet.
(3) Side slopes shall be 3:1 (H:V) or flatter.
(4) Sand filter shall have a minimum depth of 18 inches and a maximum depth of 36 inches.
(5) Stone bedding shall consist of at least 2 inches under the pipe and 4 inches above the pipe. An aggregate window extending to the filter surface may also be provided as a factor-of-safety.
(6) Underdrains shall have a 4-inch minimum pipe diameter.
(7) All underground pipes shall have cleanouts accessible from the surface.
(8) Pipes shall be sloped to prevent siltation.

c. Inlet Design

(1) Inlet pipes shall require energy dissipation. Riprap protection or equivalent erosion control measures shall be used where the velocity exceeds 4 feet per second up to a maximum allowable design velocity of 8 feet per second.

d. Outlet Design

(1) The containment structure shall be constructed within a manhole and be designed to draw water from the central portion of the water column within the manhole to trap floatables and contain sediments in a minimum 3-foot sump.

e. Emergency Overflow

(1) A positive outlet for overflow shall be provided.

(2) A catch basin and outlet pipe may be used to convey the 10-year peak discharge. This must be a separate structure or chamber within the containment manhole to prevent the captured low-density fluids from becoming entrained in the water when surface inflow enters the structure.

f. Materials

(1) Top Dressing for bottom and side slopes:

(a.) A permeable blend of sand, compost and/or topsoil with a pH between 5.5 and 7.5.

i. 3-inches of compost tilled into the top 6-inches of native permeable soil (equivalent to a 9-inch homogenous mixture of 70% sand; 30% compost); or

ii. 4-inches of topsoil tilled into the top 6-inches of native permeable soil (equivalent to a 10-inch homogenous mixture with maximum 20% silts, 4% clay, and 80% to 92% sand).

(b.) Topsoil shall be sandy loam, loamy sand or loam per USDA Soil Textural Triangle with 20% to 50% fines by volume (silt and clay with <10% clay), and 2% to 8% organic matter by dry weight.

(c.) Placement of a topsoil layer without tilling is generally not allowed due to the diminished infiltration rates observed.

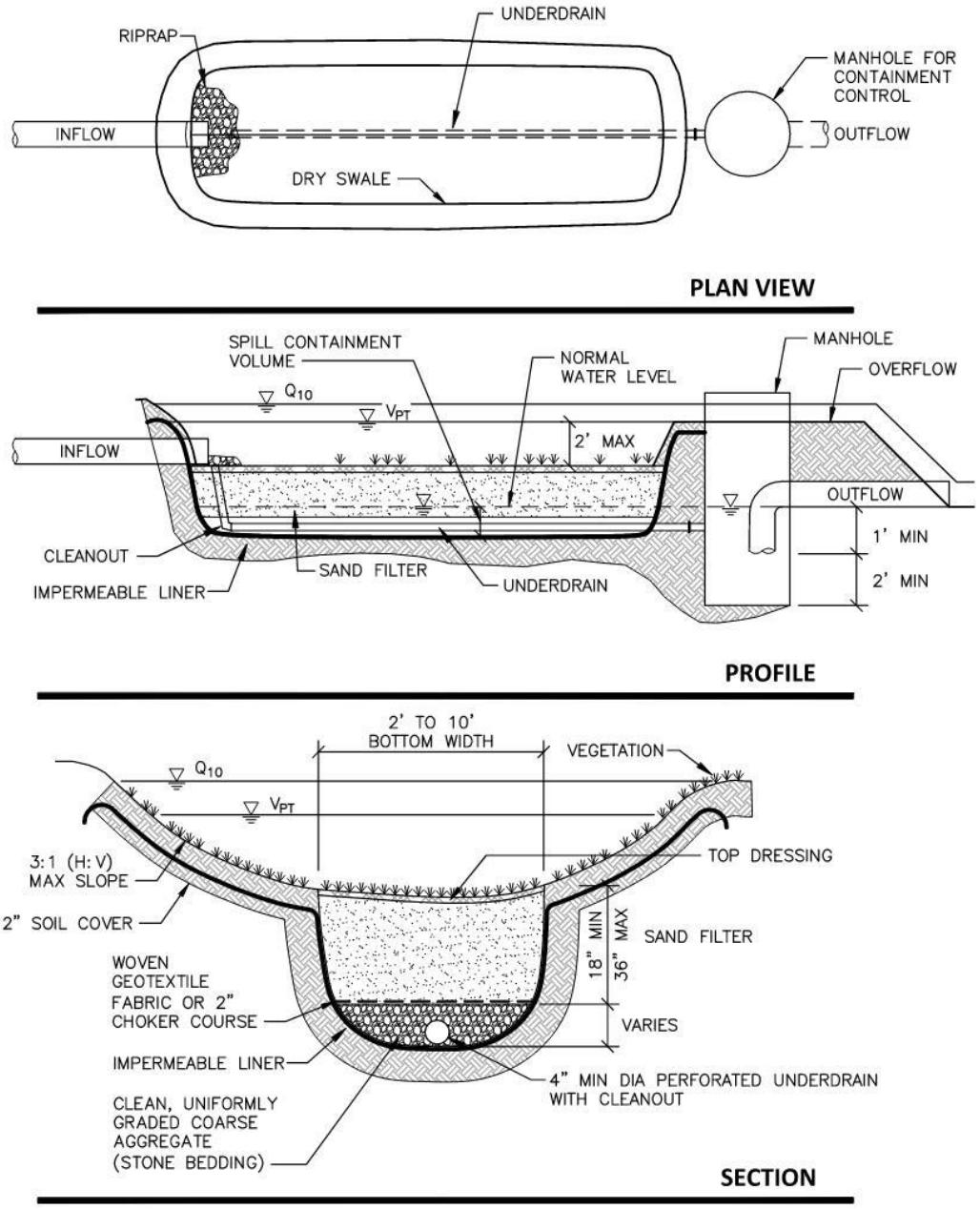
(2) Stone bedding shall consist of clean, uniformly graded coarse aggregate.

(3) A woven geotextile fabric or 2-inch gravel choker course shall be placed between the sand and the stone bedding.

(4) The water quality swale shall be lined with impermeable materials extending up to the design high water elevation. A minimum 18-inch-thick clay layer, or an impermeable liner protected with a minimum 12-inches of soil cover are acceptable alternatives. Maximum allowable permeability shall be 1 x 10-7 centimeters per second as determined by the geotechnical consultant for clay placement, or manufacturer's certificate for liner products.

4. Design Schematics

WATER QUALITY SWALE



Bioswale

1. Summary

Description:	Vegetated swale designed to capture and treat stormwater with native (or imported) soils below the base of the channel.
Application:	Linear projects or areas; Sandy soils.
Types:	Dry swale; Swale with check dams.
Pretreatment Required:	No. This BMP can provide pretreatment.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	Count volume stored and infiltrated.
Rate Reduction:	Adjust time-of-concentration by dividing storage volume by 10-year peak flow rate.
Water Quality:	Count volume stored and infiltrated, or routed through filter.

2. Sizing Calculations

a. Bioswales shall be designed for water quality, pretreatment, or channel protection.

b. Calculate the required water quality, pretreatment or channel protection volume. Refer to Part 3 section "Calculating Storage Volumes and Release Rates."

c. For underdrained BMP, follow sizing criteria for "Constructed Filter."

d. For retentive BMP, calculate the required storage volume. Refer to Part 3 section "Calculating Storage Volumes and Release Rates, Flood Control, Retentive BMPs."

e. Calculate the minimum infiltration area required to drain the required storage volume in the specified drawdown time using the design infiltration rate. Refer to Part 3 section "Design Infiltration Rates" to determine the design infiltration rate. The bottom area of the BMP shall be used as the infiltration area.

$$A = \frac{12Vs}{i(t_d)} \tag{4.6}$$

where:
A = minimum infiltration area (square feet)
Vs = storage volume (cubic feet)
i = design infiltration rate (inches per hour)
t_d = maximum allowable drawdown time (hours)
12 = factor to convert inches to feet

f. Depth of surface ponding shall be no more than 12 inches and drain within 12 hours.

g. The swale shall be designed to pass the 10-year peak discharge. Refer to "Vegetated Swale" for sizing calculations.

h. Calculate the wedge shaped storage volume behind each check dam (if used):

Storage Volume (cubic feet) = 0.5 x Length of Swale Impoundment Area per Check Dam (feet) x Depth of Check Dam (feet) x [Top Width of Check Dam (feet) + Bottom Width of Check Dam (feet)] / 2

3. Design Requirements

a. Configuration

(1) Bioswales shall have a maximum longitudinal slope of 1%.
(2) The swale shall have a minimum bottom width of 2 feet and a maximum bottom width of 10 feet.
(3) Side slopes shall be 3:1 (H:V) or flatter.
(4) Underdrains shall have a 4-inch minimum pipe diameter.
(5) All underground pipes shall have cleanouts accessible from the surface.
(6) Pipes shall be sloped to prevent siltation.

b. Check Dam Design

(1) Check dams may be used along bioswales to encourage ponding and infiltration.
(2) Check dams shall be earthen or other impervious design. Rock check dams are not suitable for infiltration.
(3) Maximum ponding depth behind check dam shall be 24 inches. Minimum check dam height shall be 12 inches.
(4) Minimum top width of check dam shall be 2 feet.
(5) Check dams shall be keyed into the bottom and sides of the swale a minimum of 1-foot on all sides.
(6) The center of the check dam crest must be below the sides of the check dam by a minimum of 12 inches.
(7) The crest of a downstream check dam shall be no lower than the downstream toe of the upstream check dam.
(8) Erosion control measures (i.e. riprap, turf reinforcement mat) shall be used to protect the integrity of the check dam and downstream toe.

c. Inlet Design

(1) Inlet pipes shall require energy dissipation. Riprap protection or equivalent erosion control measures shall be used where the velocity exceeds 4 feet per second up to a maximum allowable design velocity of 8 feet per second.

d. Emergency Overflow

(1) A positive outlet for overflow shall be provided.
(2) A catch basin and outlet pipe may be used to convey the 10-year peak discharge.

e. Materials

(1) Top Dressing for bottom and side slopes:

(a.) A permeable blend of sand, compost and/or topsoil with a pH between 5.5 and 7.5.

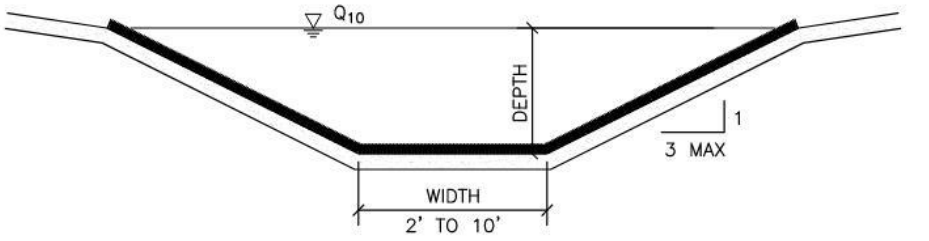
i. 3-inches of compost tilled into the top 6-inches of native permeable soil (equivalent to a 9-inch homogenous mixture of 70% sand; 30% compost); or
ii. 4-inches of topsoil tilled into the top 6-inches of native permeable soil (equivalent to a 10-inch homogenous mixture with maximum 20% silts, 4% clay, and 80% to 92% sand).

(b.) Topsoil shall be sandy loam, loamy sand or loam per USDA Soil Textural Triangle with 20% to 50% fines by volume (silt and clay with <10% clay), and 2% to 8% organic matter by dry weight.

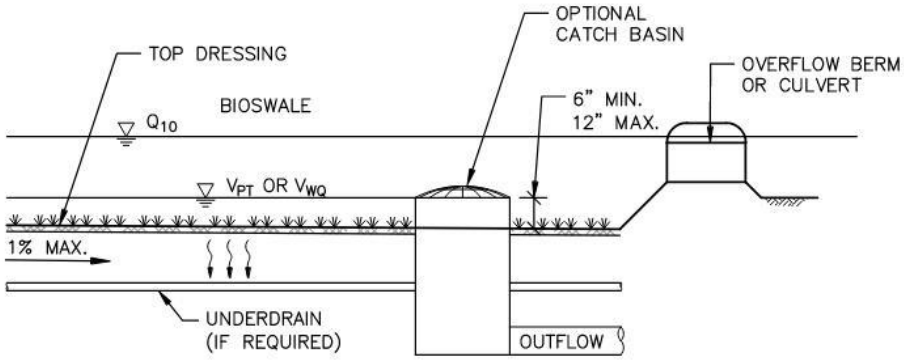
(c.) Placement of a topsoil layer without tilling is generally not allowed due to the diminished infiltration rates observed.

4. Design Schematics

BIOSWALE



SECTION



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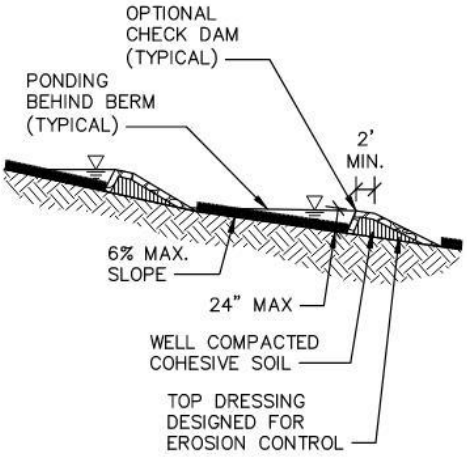
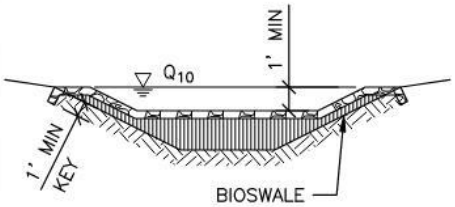


CHECK DAM PROFILE



CHECK DAM DETAIL

Vegetated Swale

1. Summary

Description:	Stormwater conveyance designed to slow and filter stormwater.
Application:	Small drainage areas with concentrated flow; rear and side yard drainage.
Types:	Dry swale; Swale with check dams (no infiltration).
Pretreatment Required:	No. This BMP provides pretreatment.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	None.
Rate Reduction:	Due to longer time-of-concentration for swale.
Water Quality:	Count volume routed through BMP.

2. Sizing Calculations

a. Vegetated swales shall be designed for water quality or pretreatment, and sized to pass the 10-year peak discharge.

b. Calculate 10-year peak flow rate. Refer to Part 3 section "Calculating Runoff."

c. Size swale using Manning's Equation:

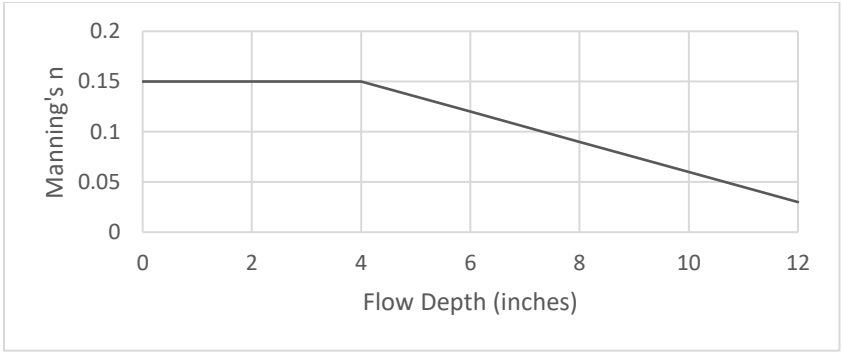
$$Q = \frac{1.49 A R^{\frac{2}{3}} S^{\frac{1}{2}}}{n} \quad (4.1)$$

where:

Q = discharge (cubic feet per second)
A = wetted area (square feet)
R = hydraulic radius (feet)
S = slope (feet per foot)
n = Manning's roughness coefficient

d. Select the higher value of Manning's roughness coefficient from **Table 12** or **Figure 2** below.

Figure 2 – Manning's Roughness Coefficients for Vegetated Swales



Source: SEMCOG (2008). *Low Impact Development Manual for Michigan*, Figure 7.62.

e. Check that flow velocities are within acceptable limits. The minimum velocity for open channels shall be 1.5 feet per second. The maximum velocity shall be 4 feet per second.

f. Calculate the wedge-shaped storage volume behind each check dam (if used):

Storage Volume (cubic feet) = 0.5 x Length of Swale Impoundment Area per Check Dam (feet) x Depth of Check Dam (feet) x [Top Width of Check Dam (feet) + Bottom Width of Check Dam (feet)] / 2

3. Design Requirements

a. Siting

(1) Vegetated swales can be used for drainage areas up to 5 acres. Drainage areas greater than this may require open channels.

b. Configuration

(1) Trapezoidal, with a minimum bottom width of 2 feet and a maximum bottom width of 8 feet.
(2) Side slopes shall be 3:1 (H:V) or flatter.
(3) Longitudinal slope shall be a minimum of 1% and a maximum of 6%. Flatter slopes may be allowed on permeable soils.
(4) Design to meet water quality standard:
  (a.) Maximum design flow depth shall be 6 inches, or approximately equal to the grass height.
  (b.) Minimum length shall be 50 feet for a point discharge at upstream end, and 100 feet for lateral inflow.
(5) Design to meet pretreatment standard:
  (a.) Minimum length shall be 20 feet with a minimum 1-foot high check dam and wedge storage sized as a sediment forebay.

c. Check Dam Design

(1) Check dams may be used for energy dissipation along vegetated swales with longitudinal slopes greater than 3%.
(2) Maximum ponding depth behind check dam shall be 24 inches.
(3) Minimum check dam height shall be 12 inches.
(4) Check dams shall be keyed into the bottom and sides of the swale a minimum of 1-foot on all sides. The height of the key must exceed the 10-year water surface elevation by a minimum of 6 inches on both sides.
(5) The center of the check dam crest must be below the sides of the check dam by a minimum of 12 inches.
(6) The crest of a downstream check dam shall be no lower than the downstream toe of the upstream check dam.

d. Materials

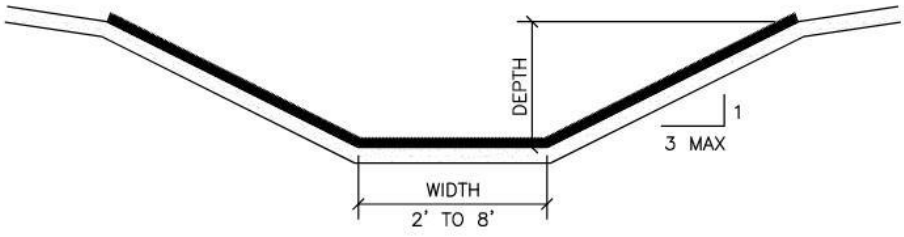
(1) Establishment of vegetation shall follow the guidelines outlined below.

Swale Bottom Treatment	Swale Grade
Seed and Mulch	0.3% to 0.5%
Standard Mulch Blanket	0.5% to 1.5%
High Velocity Mulch Blanket or Sod	1.5% to 3.0%
Turf Reinforcement Mat or Check Dams	3.0% to 6.0%
Specific Design Required	> 6.0%

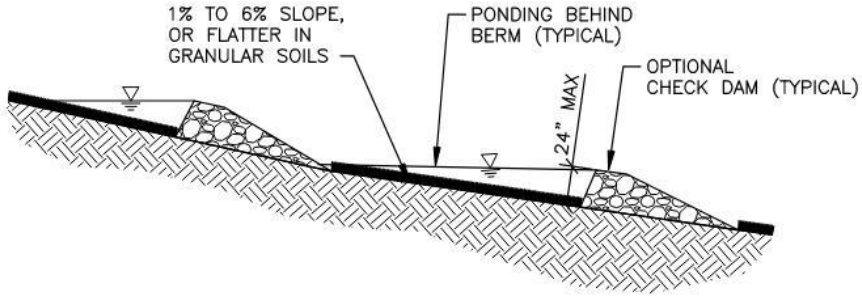
Source: *Michigan Department of Transportation Drainage Manual* (2006).

4. Design Schematics

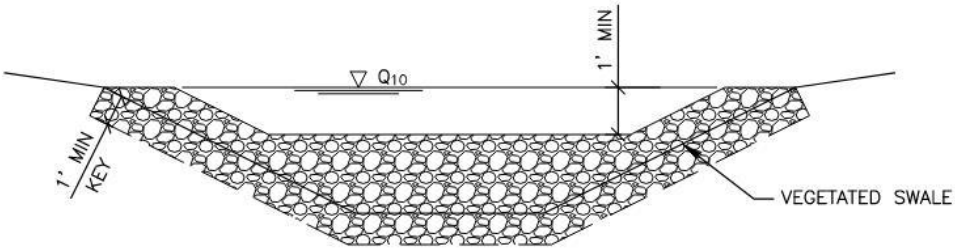
VEGETATED SWALE



SECTION



PROFILE



CHECK DAM DETAIL

Vegetated Filter Strip

1. Summary

Description:	Overland flow path designed to slow and filter stormwater.
Application:	Contributing drainage areas with sheet flow surface runoff.
Types:	Turf grass; other dense herbaceous groundcover vegetation.
Pretreatment Required:	No. This BMP provides pretreatment.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	None.
Rate Reduction:	Adjust time-of-concentration.
Water Quality:	Count volume routed through BMP.

2. Sizing Calculations

a. Vegetated filter strips shall be designed for water quality or pretreatment.

b. Calculate the minimum required filter strip area by the equation:

$$A_{fs} = \frac{A}{6} \tag{4.9}$$

where:

A_{fs} = area of filter strip (square feet)

A = contributing drainage area (square feet)

Note: This equates to a loading ratio of 0.17 from the contributing drainage area (both impervious and pervious surfaces).

c. Calculate minimum required longitudinal length based on slope and type of vegetation using the graphs in **Figures 3a** through **3d**.

3. Design Requirements

a. Siting

(1) Maximum upstream drainage area shall generally be 100 feet impervious or 200 feet pervious upgradient.

b. Configuration

(1) The upstream edge of the filter strip shall be level and at an elevation at least 1 inch below the adjacent pavement.

(2) A level spreader may also be required to evenly distribute flow across filter strip.

(3) Slopes shall range from 1% to 8%, with optimal slopes ranging from 2% to 6%.

(4) The maximum lateral slope shall be 1%.

(5) Berms and curbs may be installed along the sides of the filter strip parallel to the direction of flow to prohibit runoff from laterally bypassing the filter strip.

(6) Design to meet pretreatment standard:

(a.) Minimum sheet flow length shall be 10 feet at a maximum slope of 2% with an impervious approach length no greater than 3.5 times the filter strip length, up to a maximum approach length of 75 feet.

(b.) Minimum sheet flow length shall be 15 feet for slopes between 2% and 6% with an impervious approach length no greater than 3 times the filter strip length, up to a maximum approach length of 75 feet.

Figure 3a – Filter Strip Length (Sandy soils with HSG A)

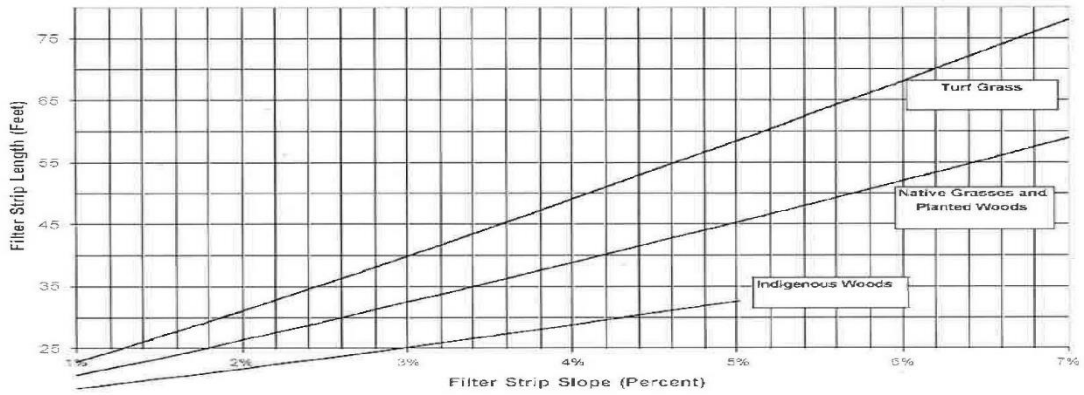


Figure 3b1 – Filter Strip Length (Sandy Loam soils with HSG B)

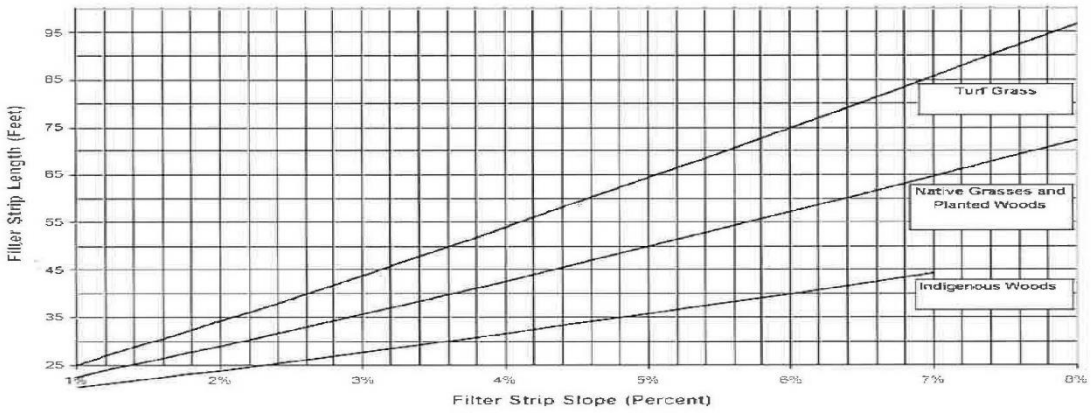
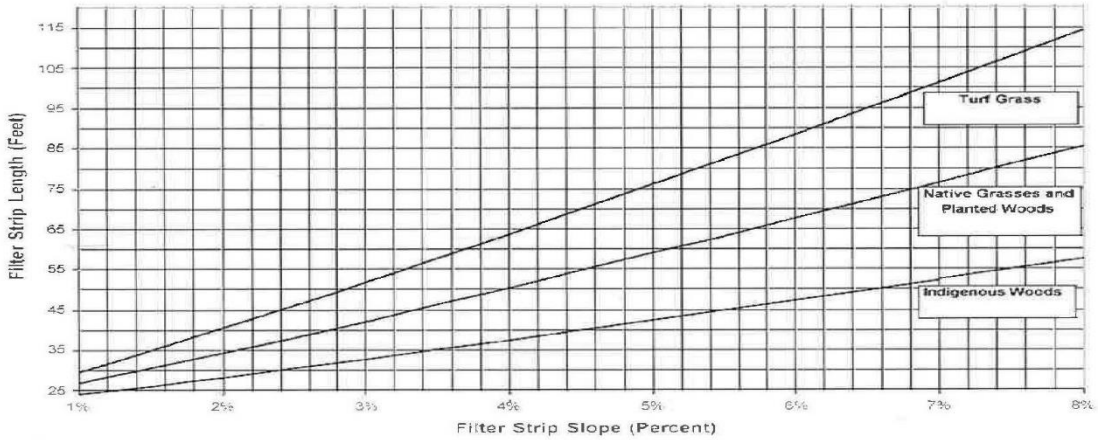


Figure 3b2 – Filter Strip Length (Loam, Silt-Loam soils with HSG B)



Source: SEMCOG (2008), *Low Impact Development Manual for Michigan,* Figures 7.52, 7.53 and 7.54 (New Jersey Stormwater Best Management Practices Manual, 2004)

Figure 3c – Filter Strip Length (Sandy Clay Loam soils with HSG C)

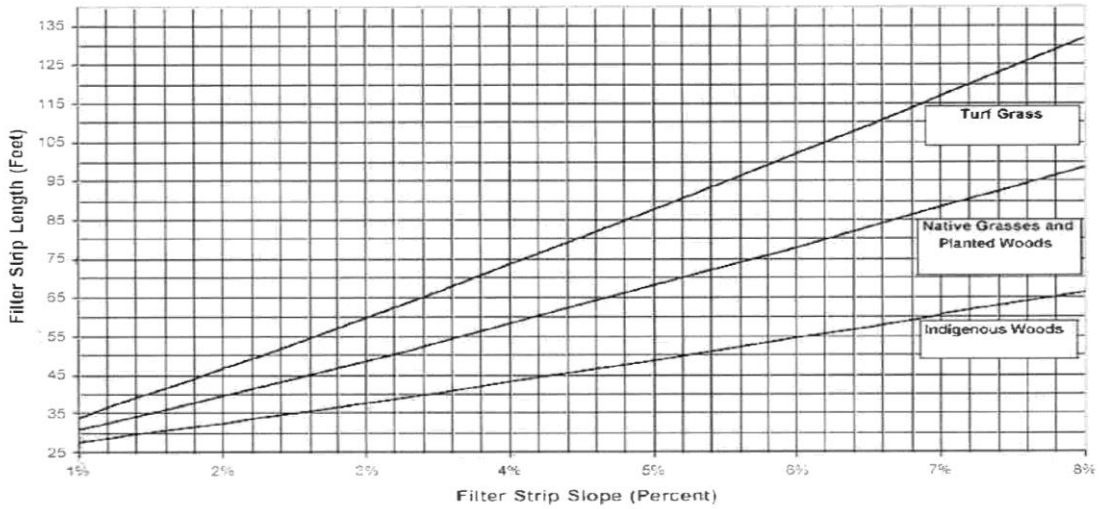
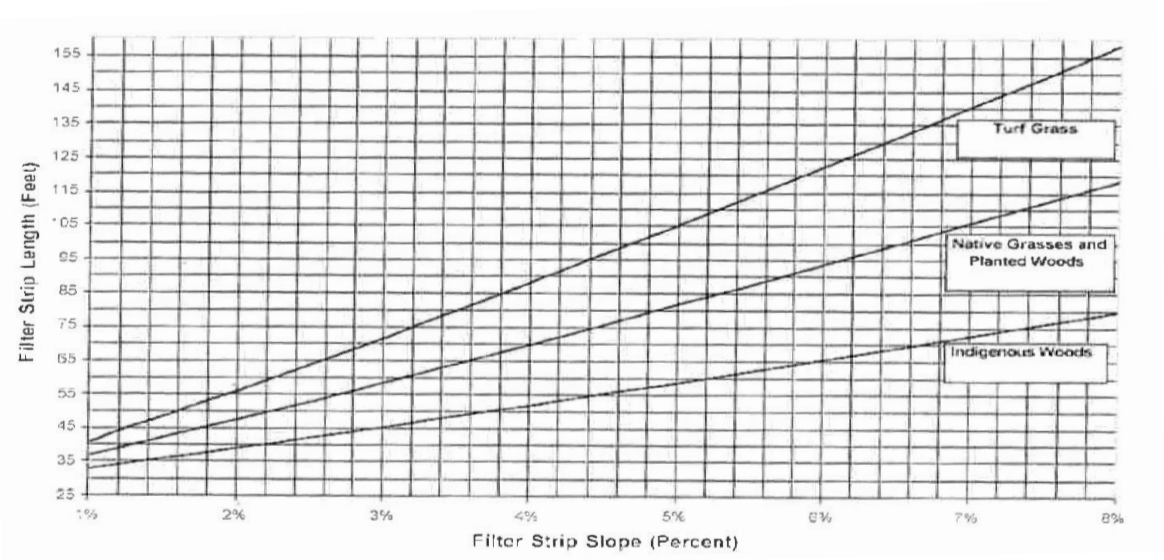


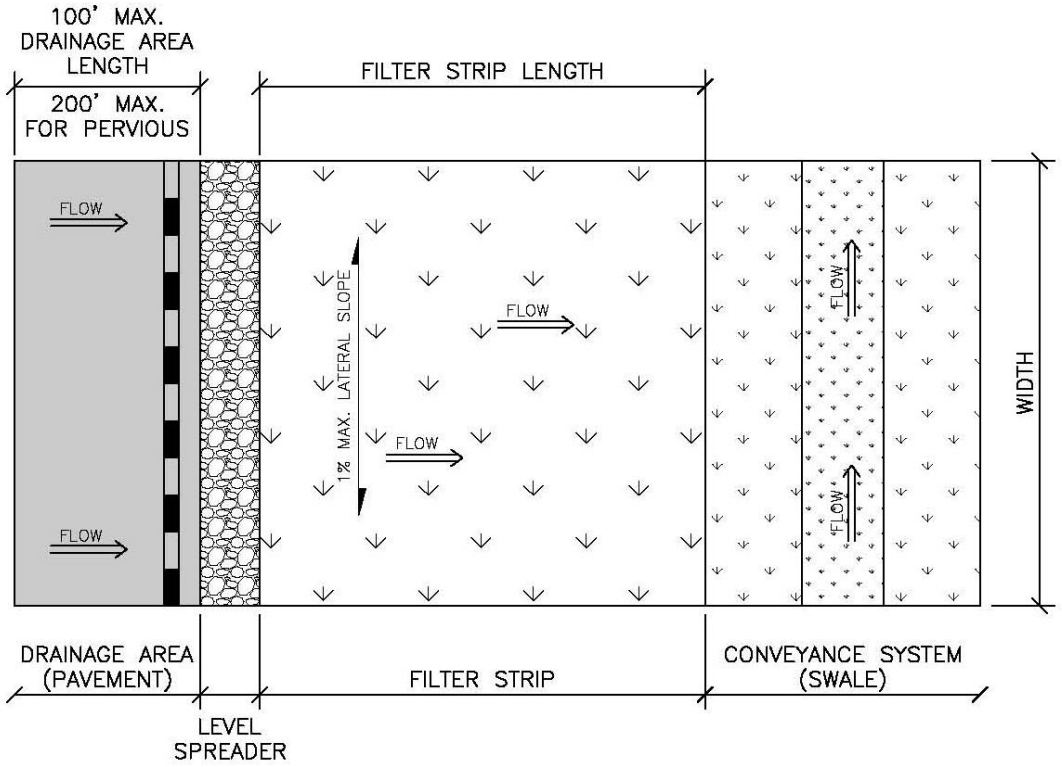
Figure 3d – Filter Strip Length (Clay Loam, Silty Clay, Clay soils with HSG D)



Source: SEMCOG (2008), *Low Impact Development Manual for Michigan,* Figures 7.55 and 7.56
(New Jersey Stormwater Best Management Practices Manual, 2004)

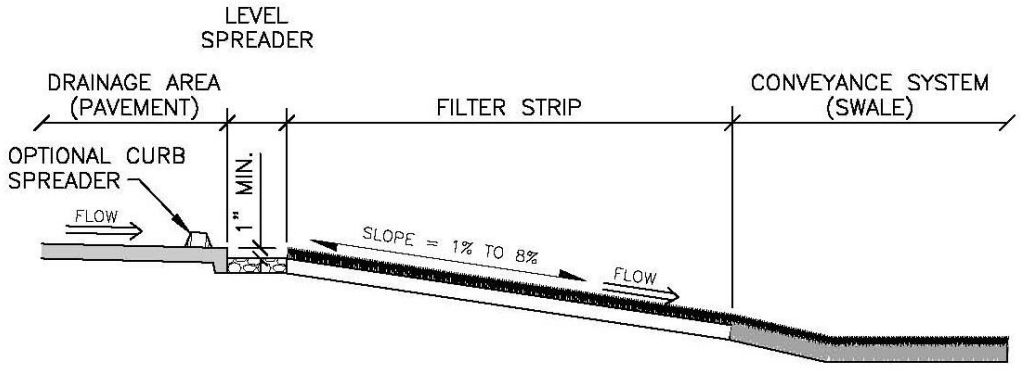
4. Design Schematics

VEGETATED FILTER STRIP



MIN. FILTER STRIP AREA = 1/6 DRAINAGE AREA.

PLAN VIEW



PROFILE

Level Spreader

1. Summary

Description:	Shallow, level berm placed perpendicular to a flow path.
Application:	Used with other BMPs to disperse concentrated stormwater flows.
Types:	Inflow (prior to BMP); Outflow (at outlet of BMP).
Pretreatment Required:	No. This BMP provides pretreatment.
Maintenance Plan:	Yes.
Calculation Credits:	
Volume Reduction:	None.
Rate Reduction:	None.
Water Quality:	None.

2. Sizing Calculations

a. Level spreaders shall be sized to pass the 10-year peak flow.

b. Calculate 10-year peak flow rate. Refer to Part 3 section “Calculating Runoff.”

3. Design Requirements

a. Siting

(1) Slopes below outflow level spreaders should be no greater than 8% in the direction of flow to discourage channelization.

b. Configuration

(1) Construct level spreaders in compacted fill or of other non-erodible material.

(2) Minimum length: 10 feet.

(3) A bypass may be required for higher flows.

c. Material

(1) Level spreaders may be constructed of compacted earth, rock, stone, concrete, treated timber or perforated pipe in stone.

DETENTION BASIN DESIGN CRITERIA FOR THE CITY OF HASTINGS

Introduction

The development of land from agrarian and open space to residential, commercial and industrial land use continues to increase in the City of Hastings. As a result, a policy for storage of storm runoff in on-site detention basins has become essential to assure that increase runoff from this development is adequately controlled. In addition, the initiation of a policy assures that all developers follow the same requirements.

Need for Detention

Detention requirements focus on whether the peak discharge from a development site will increase over pre-development conditions. As such, a review of the stormwater design for all new developments is required, except for the construction of a single family residential building on an existing lot.

On-site detention provides attenuation of peak flows from a storm event. That is, the peak flow discharge from the site is reduced using the detention basin. It is recognized that detaining the flow does not always reduce the peak flow downstream, since the peak flow from a site may already have passed through the downstream area before peak flows from upstream arrive. The City reserves the right to reject any proposal, which would increase peak flows from a new development. Also, the sizing of detention basins must take into account all potential developments within the watershed area upstream of the proposed development. The detention basin for an individual development must be sized to discharge less than the pre-development peak flow for the 2-year event and shall not increase the peak discharge for the 100-year event.

Designing Detention Basins

The stormwater calculations and design for these developments must be prepared based on the guidelines in this report. Design calculation based on the following

guidelines shall be submitted to the City Engineer for his review and approval. The Developer, or his Engineer, shall also provide documentation showing that the existing ground water table shall not be adversely effected by the creation of the detention basin. Documentation shall also show that no flooding of existing structures or off-site property will occur.

A. DETENTION PONDS - GENERAL

1. Detention Storage

Detention storage volume shall be sufficient to store the increased runoff from a pre-development flow to a post-development flow. The requirement for detention volume shall be determined from Table 1. The area of the detention pond must be included as impervious area in any calculations of impervious area.

TABLE 1

STORAGE (AC-FT/AC)

	SOIL INFILTRATION ABILITY		
PERCENT IMPERVIOUS	LOW INFIL (1) (clay or silty soil)	MED INFIL (2) (clayey or silty sand)	HIGH INFIL (3) (gravel or sandy soil)
5%	0.025	0.025	0.025
10%	0.050	0.050	0.050
15%	0.075	0.075	0.066
20%	0.096	0.090	0.074
25%	0.102	0.097	0.081
30%	0.108	0.103	0.088
35%	0.114	0.110	0.095
40%	0.121	0.116	0.102
45%	0.126	0.122	0.110
50%	0.132	0.128	0.117
55%	0.138	0.135	0.124
60%	0.143	0.140	0.131
65%	0.149	0.146	0.138
70%	0.154	0.152	0.145
75%	0.160	0.158	0.151
80%	0.165	0.163	0.158
85%	0.170	0.169	0.165
90%	0.175	0.169	0.165
95%	0.180	0.180	0.179
100%	0.184	0.184	0.184

Notes

(1) Low Infiltration = $i_{initial} \leq 3.0$ in/hr & $i_{ultimate} \leq 0.25$ in/hr

(2) Medium Infiltration = $i_{initial}$ of 4.0 to 5.0 in/hr & $i_{ultimate}$ of 0.25 to 0.35 in/hr
(3) High Infiltration = $i_{initial} \geq 6.0$ in/hr & $i_{ultimate} \geq 0.35$ in/hr

2. Construction Standards

Only one detention pond is allowed per development or original parcel, unless field considerations dictate otherwise. (E.g. the site is divided by ridge line)

Configurations include wet detention basins, dry detention basins, underground storage, (e.g. oversized storm sewer with a restricted outlet), roof top storage, porous pavement, and parking lot with restricted outlet.

It is imperative that during the construction phase, the detention storage facility be constructed first.

Detention storage shall be provided during the construction phase. If the permanent detention facility cannot be built at the start of construction (e.g. roof top storage), then an approved temporary facility shall be constructed and maintained. The detention storage may be phased in proportion to the construction if the construction is to be phased.

Integration of detention storage for the site in question with the drainage from upland areas must satisfy the NO INCREASE IN FLOOD ELEVATION requirement for the developed watershed. Hydrographs for the existing and future conditions shall be determined using the SCS or USEPA SWMM methods.

a. Dry Detention Pond Criteria

Construction Goals

Dry detention basins must be built to minimize operation and maintenance efforts after the basin has been constructed. To insure that the detention basins are designed and built properly, the following general guidelines must be used:

1. The pond must provide load-bearing capability for maintenance vehicles.
2. Adequate under drainage must be provided to allow normal turf maintenance.
3. The pond slopes must be sufficiently gradual to allow accessibility.
4. The channels to and from the basin must have appropriate transitions into and out of the original channel.
5. Impermeable or permeable material may be used in the detention area.

Detention Basins Grades

Banks - 25% maximum allowed anywhere

Bottom Cross Slopes

- grass, 2% minimum
- paved, 1% minimum

Bottom Longitudinal Slope

- grass, 2% minimum
- paved, 0.5% minimum
- permeable crushed stone 0.6% minimum

Low Flow/Extended Release

A low flow channel or subsurface under drain is required when the pond bottom may be subject to non-storm flow from ground water, footing drainage, storm sewer acting as under drain, and sump pump

discharge such that vegetation will not grow across the bottom of the pond.

An infiltration trench, or similar device, shall be used to limit the time of inundation to 24 hours.

Receiving Stream

In general, the receiving stream is to be left in its natural state, except that drain checks or similar erosion control measures may be required if the frequency of the 2-year storm runoff, under present conditions, is materially affected. Normal depth and velocity shall be checked for a distance of 660 feet downstream

Should the existing drainage onto adjacent land consist of sheet runoff, concentrated flows shall be diffused. A level area of reinforced turf sufficient for spreading the flow shall be provided.

b. Wet Detention Pond Area

Construction Goals

Wet detention basins must be built to optimize the filtration and nutrient uptake of marsh type wetland plants. To insure that the detention basin is designed and built properly, the following general guidelines must be used:

1. The pond must be separated from proposed dwellings, such that the design high water line is at least 100 feet from the front building set back line.
2. Adequate access must be provided for the removal of sediment.
3. The pond slopes must be sufficiently gradual to allow accessibility.

4. Baffles may be required to prevent short circuiting the hold time.

Detention Basin Grades

Banks - 25% maximum allowed anywhere.
Near normal waterline - 7% maximum from 10.0" above to 14.0" below.

NOTE: PERMANENT IMPOUNDMENTS OR OPEN PIT PONDS DESIGNED AS SITE AMENITIES HAVE AN INHERENT RISK THAT MUST BE ASSUMED BY THE LANDOWNER. THE LANDOWNER IS THE PARTY RESPONSIBLE FOR POLICING HIS PROPERTY. THESE TYPES OF SITE AMENITIES WILL ONLY BE ALLOWED IF THE CITY IS HELD HARMLESS BY THE LANDOWNER.

Bottom Grades

The bottom may be undulated to better promote the establishment of wetland plants. Pockets or depressions shall be varied in size from 100- sq. ft. to 1,000-sq. ft. and shall not be more than 12 inches deep.

Dikes may be used as baffles to lengthen the flow line through the basin. The height of the dikes shall not exceed 14 of the design depth.

Planting Plan

A landscape plan shall be submitted identifying the wetland plants to be established, the limits of turf maintenance and the placement of

shrubs and bushes between the maintenance and non-maintenance areas.

B. OUTLET DESIGN CRITERIA

Detention pond outlet shall be designed to pass not more than the 2-year pre-development flow using the Rational Method. The outlet also shall not increase the amount of runoff to an adjacent site from the pre-development state.

The Rational Method shall be used only in cases where the tributary area is 40 acres or less. The SWMM model can also be used as an alternative method for calculating the peak discharge rate.

The Rational Method is a standard method for calculating the peak runoff rate for a parcel. The results of its use are very sensitive to the coefficients selected. As a result, the method is best suited for use on small parcels where the additional time that may be required to use another method may not be justified. Larger parcels should utilize more accurate methods.

The Rational Method is based on three assumptions:

1. The peak runoff at any design location is a function of the average rainfall intensity during the time of concentration to that location.
2. The frequency of peak discharge is the same as the frequency of the average rainfall intensity.
3. The Time of Concentration is the time required for the runoff from the most remote part of the drainage area to become established and flow to the point under design.

The Rational Method is an empirical method based on the following equation:

$$Q = C \cdot I \cdot A$$

C - the runoff coefficient, is a constant (dimensionless) which represent the fraction of rainfall which will result in the peak runoff rate from the land into a storm drainage system.

A - the area (acres) of the sub-basin upstream from the point of design, and must include upstream tributary areas not part of the development.

i - is the rainfall intensity (in/hr) of the storm which represents the duration and frequency of rainfall which will create the maximum peak runoff. Typically, the intensity over the time of concentration for the sub-basin will result in the peak flow for a particular period.

The Rational Method formula is an empirical equation where the units are as assigned, and in this case, are not consistent (i.e. acre x in/hr = cfs)..

Procedure for Determining Peak Discharge

1. Delineate and determine the drainage area, (A), in acres, of the watershed upstream of the point of the storm drainage system in question. If the watershed drainage is greater than 40 acres, this method should not be used. The upstream area must be considered completely developed.
2. Identify the primary drainage channel(s) of the sub-basin area.
3. Identify any sub-channel(s) and flow paths flowing into the main channel from available topographical maps. Using the sub-channels and contours divide the drainage area sub-basin into sub-basins.
4. Determine the surface types for the entire drainage area and the respective percentages of each type within the drainage area.
5. Determine the weighted (average) Runoff Coefficient, "ċ", for the drainage area using the following equation:

$\dot{c} = (A_i C_i + A_{i+1} C_{i+1} + ...)/A_T$

Where:

$\dot{c}$ = the weighted Runoff Coefficient

C_I, C_{i+1}, … = the individual Runoff Coefficient for each surface type

A_I, A_{i+1}, … = the individual areas for each surface type

A_T = the total area of the development. (Note: A_T is equal to the sum of the different surface type areas.)

6. Determine the overland time flow, t_o from the following equation:

$t_o = ((2L^n)/(3/5)^{1/2}))^{(0.467)}$

Where:

L - The distance of the overland flow path with the longest overland flow time for that sub-basin. The path follows a direction parallel to the slope of the sub-basin. Several flow times will have to be calculated for various paths to determine which path actually has the maximum flow time.

n - The friction coefficient (Manning's n) can be taken from Table 3.

TABLE 2

Runoff Coefficients

Rational Method

Surface Type	C-Faction
Pavement (concrete)	0.95
Pavement (bituminous)	0.90
Pavement (brick)	0.80
Buildings (roof area)	0.95
Lawns, well drained (sandy soils)	

Up to 2% slope	0.10
2% to 7% slope	0.15
Over 7% slope	0.20
Lawns, poorly drained (clay soils)	
Up to 2% slope	0.15
2% to 7% slope	0.20
Over 7% slope	0.30
Forested	0.12

TABLE 3
Manning's n
Overland Flow

Ground Cover	**Manning's n**
Smooth asphalt or concrete	0.012
Rough asphalt or concrete	0.014
Packed clay	0.03
Light turf	0.2
Dense turf	0.35
Dense shrubbery	0.5

S The slope is the difference in elevation between the extreme edge of the flow path to the point of entry into the defined channel divided by the length of the flow path.

7. Determine the stream (channel) flow time, t_s, if the stream flow is achieved within the sub-basin.

$$T_s = L / V$$

and

$$V = 1.49 \cdot R^{2/3} s^{1/2} / n$$

Where:

L = Channel Length (ft)

V = Velocity (ft/s)

R = Hydraulic Radius (ft)

S = Channel Slope (ft/ft)

N = Composite Manning's n for channel

For an open channel, the hydraulic radius can be approximated as:

R = 0.6 for small streams (less than 100 Ac drained)

R - 1.5 for medium streams (100 Ac to 1 sq. mile)

R = 2.5 for large streams (more than 1 sq. mile)

For flow in a closed conduit (storm sewer) the conduit can be assumed to be flowing full and R = A / P, where A is the flow area and P is the wetted perimeter.

8. Determine the pipe flow time, if any;

$t_p = L / V$

Where L is the pipe length, and V is the average pipe velocity

9. The time of concentration, tc, is the sum of the overland flow time, the stream flow time, and the pipe flow time.

$t_c = t_o + t_s = t_p$

10. The time of concentration indicates the duration of a storm which will cause the maximum peak runoff rate to be reached. Using the 2-year storm and the time of concentration as duration, the average intensity of the storm can be found using Figure 1.

11. The Peak Runoff Rate, Q_{outlet}, is then calculated using:

$Q_{outlet} = C \ I \ A$

Where:

Q_{outlet} = Peak Runoff Rate (cfs)

C = Composite Runoff Coefficient

i = Average Rainfall Intensity (in/hr)

A = Drainage Area (acres)

The outlet release pipe should be sized to adequately pass this flow.

The outlet release pipe size shall be calculated using the orifice equation.

$Q_{outlet} = 0.6 \cdot A_{pipe} \cdot (2\ gh)0.5$

Where:

A_{pipe}= cross-sectional area of pipe

g = 32.2 ft/sec^2

h = depth of water at design volume (difference between water surface and pipe centerline)

If the diameter of the release pipe is determined to be less than 4 inches, then alternate designs to avoid clogging shall be submitted. (e.g. increasing pipe roughness and length, perforated and/or annular opening riser pipe and infiltration)

C. OUTLET STRUCTURE AND EMERGENCY SPILLWAY

Emergency spillways must be constructed of hot rolled plan mix asphalt or concrete with geotextile fabric underneath. The spillway must extend down the back slope of

the dike to form an inlet section and outward from the toe of the fore slope to form an apron with the outfall channel. Where desirable, turf reinforcement with a three-dimensional root mat or geogrids may be used in lieu of paving in non-traffic areas.

All edges of concrete or asphalt paving must be toed in a minimum of 12 inches.

Energy dissipaters designed in accordance with the procedures used in FHWA publication HEC No. 14 shall be provided at all pipe outfalls.

Erosion protection shall be provided for changes in cross-section of the outlet channel and for transition from turbulent to laminar flow.

Emergency Spillway Design

Spillway shall be sized to safely pass the peak runoff from the 10-year storm recurrent interval (10% annual chance) from the total contributing drainage area, as ultimately developed.

Spillway design shall extend from the berm crest to the outfall channel.

Design Equation for Rectangular Weir

$$Q - CLH^{3/2}$$

Where:

C = 3.3 for sharp-crested weir (sheet piling)
C = 3.0 for broad-crested weir (earth berm)
Q = design flow (cubic feet per second)

$Q = C (L-0.2H) H^{32}$ when vertical side walls are present

Where:

H = height of weir

L = opening length of weir

Design Equation for V-notch Weir

$$Q = 1.28\ LH^{3/2}$$

Design Equation for Trapezoidal Weir (normally used with earthen berms)

$$Q = C\ ((a+b)/2 - 0.2H)\ H^{3/2}$$

Where:

C = 3.0 for broad-crested (earth berm)

a = width of weir at design high water elevation

b = width of weir at base

Side slope of opening shall be minimum of IV:3H for grass weirs that will not have equipment, etc., traffic or a minimum of IV:5H for weir that will have equipment, etc., traffic.

D. DETENTION POND DESIGN FOR AREA LARGER THEN 40 ACRES

For areas larger then 40 acres, the SCS Method SWMM or another method approved by the City Engineer should be used. The SCS TR-55 Method is described briefly below.

The Soil Conservation Services Technical Release 55 (TR-55) requires the determination of peak flows primarily based on time of concentration and soil type.

The method is also outlined in *Stormwater Management Guidebook* by MDNR. The Soil Conservation Service TR-55 methodology for determination of peak discharges

is summarized in Chapter 7 of this document. Storage Volume requirements using TR-55 are provided in Chapter 9.

For the City of Hastings, SCS Type 2 distribution curves should be used. In addition, the following is a summary of the rainfall depths for various storm frequencies:

Storm Event	Rainfall Depth (inches)
2- Year, 24 Hour	2.6
10-Year, 24-hour	3.7
25-Year, 24 Hour	4.3
50-Year, 24 Hour	4.75
100-Year, 24 Hour	5.25

Source: *Stormwater Management Guidebook*, MDNR 1992

The storage requirements are based on detaining the 25-year storm event. TR-55 has developed a curve using the ratio of the pre-development and post-development peak outflow to determine the necessary storage. This curve is shown on page 149 of the *Stormwater Management Guidebook.*

An emergency spillway is required for discharge of the 100-year, 24-hour storm event. This spillway should be designed with one half foot of freeboard when detaining the 25 year, 24 hour event. In addition, the spillway should be constructed to resist erosion and should discharge to the downstream channel or a public right-of-way if adequate stormwater conveyance is available to prevent harm or detriment to adjoining properties from flooding. The height of the overflow spillway should be set above the 100-year flood elevation of the stream or conveyance to which it is discharging so that there is no impedance of its operation during a 100-year flood event. In no cases can an overflow be constructed that will, in the opinion of the Director of Public Services, cause a negative impact on downstream properties or hinder the conveyance capacity of the stormwater system downstream from the development.

If the normal flow from a detention basin or excess flow from the overflow spillway discharges on to an adjoining property, the private property developer shall be responsible to furnish to the City evidence of a drainage easement or easements secured from all properties in question from the point of discharge to the nearest public drainage course. The drainage easement(s) shall be prepared by a licensed

attorney and be sealed by a registered engineer and be executed by all property owners. All drainage easements shall run with the land in perpetuity until modified by another drainage easement redirecting the drainage in question.

Implementation Steps

The following pages from the *Stormwater Management Guidebook* by MDNR, 1992 have been included to provide guidance in developing appropriate stormwater detention volumes for new sites. The discharge rate from stormwater detention basins shall be determined using the TR-55 methodology as explained in the following referenced pages.

Determination of Surface Runoff	Page 72-80, 88-97
Storage Volume Determination	Page 148-149

CITY OF HASTINGS

CAPITAL IMPROVEMENT PLAN

March 2023 Edition

Introduction

The City of Hastings public infrastructure includes drinking water supply and delivery systems, wastewater collection and treatment systems, storm drainage systems, and public streets. These systems are aging and certain parts need to be repaired or replaced to keep up with deterioration over time. In addition to the City's mostly linear (right-of-way related) infrastructure, this plan includes capital planning for at least 6 years of all types of public structures and assets including: public parks and recreation, city-owned buildings and parking lots, public works assets, cemeteries, public safety (police and fire), library, and other related city-owned assets.

Waiting until something breaks to make emergency repairs is expensive and often leads to unexpected budget impacts. A more proactive approach can minimize life cycle costs using the following steps:

- Evaluate the condition and capacity of assets to determine the needs.
- Implement a maintenance program for the small needs.
- Implement a Capital Improvement Plan for the big needs.
- Develop financial strategies to fund all planned work before needs become emergencies.

The City of Hastings is actively managing the needs of these systems. The needs have been evaluated and financial strategies have been considered. This Capital Improvement Plan presents the City of Hastings' infrastructure priorities that have been established within a 10-year planning period for streets and utilities, and a 6-year planning period for all other types of public structures and improvements.

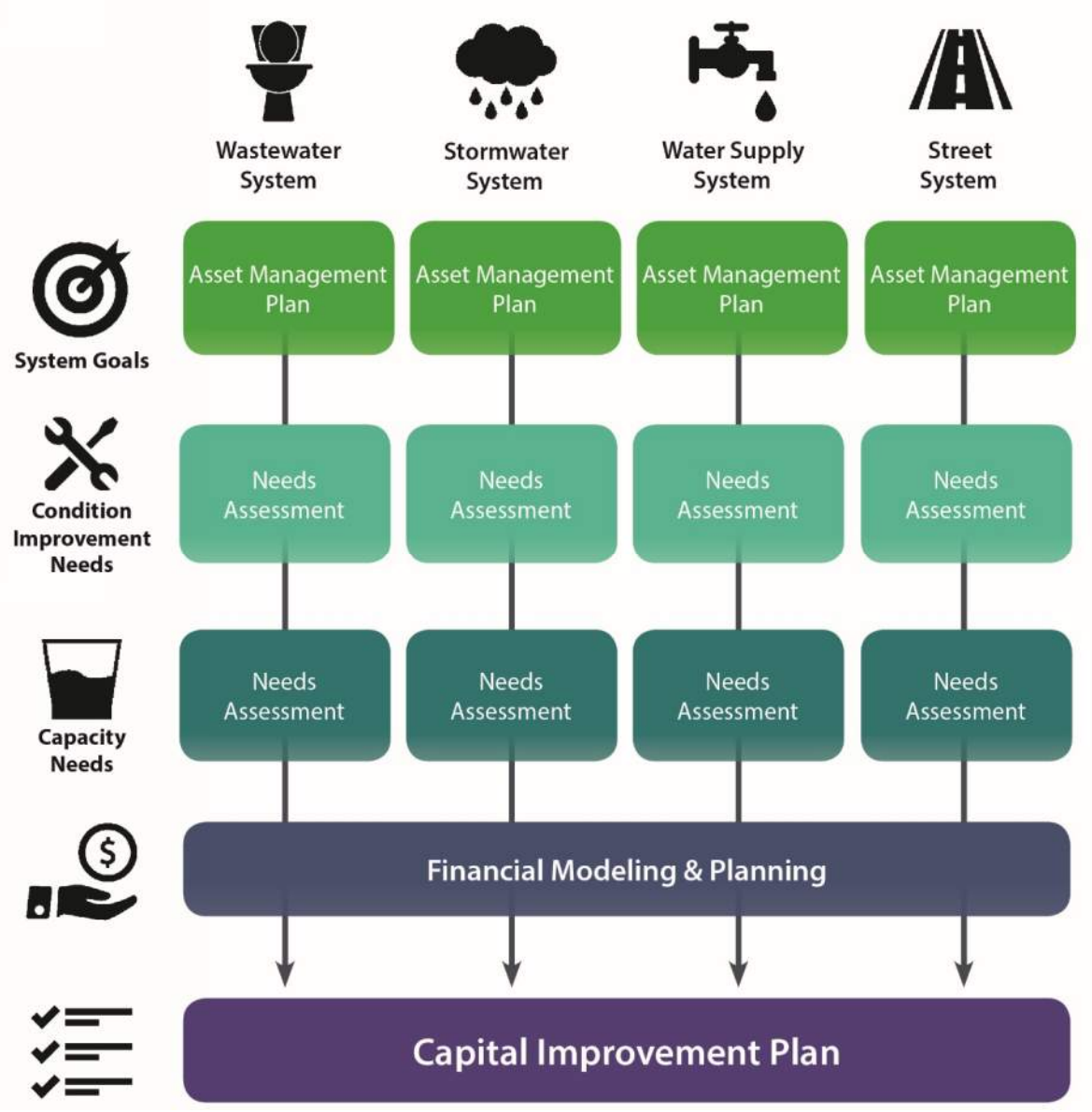
The next step for the City of Hastings is to further develop and refine financial strategies to fund the planned work over the anticipated timeline. This can be done through annual budgeting discussions, leveraging state and federal grant/loan resources, and rate studies. A financial strategy is necessary to fully implement the plan.

Planning Framework

Asset management is programmatic way of managing the needs of the infrastructure. The asset management plan for each system guides the program and establishes goals for the system. By implementing the asset management program, the needs of each system are determined and prioritized. Each system has two kinds of needs: condition improvement needs and capacity needs.

Condition improvements may be needed to repair aging and deteriorated parts of the system.

Capacity may be needed to ensure the infrastructure will meet the needs of the people.



Current Needs Assessments

The City of Hastings has completed the following needs assessments upon which this Capital Improvement plan has been developed:

System	Condition Improvement Needs Assessments	Capacity Improvement Needs Assessments
Wastewater System	Wastewater System Asset Management Plan, HRC Report- 2019 (SAW) 2018 CCTV in GIS & Observation Point Data. P&N CCTV Review Memo- 2022 P&N Lift Station Assessment Memo- 2022	Sewer Flow Study, P&N Report- 2019 (SAW)
Stormwater System	Stormwater System Asset Management Plan, HRC Report- 2019 (SAW) 2018 CCTV in GIS & Observation Point Data. P&N CCTV Review Memo- 2022	
Water Supply System	Water System Asset Management Plan, HRC Report- 2020 (WAMP) Preliminary Distribution System Material Inventory, by City 2020 Water Main Break History (GIS), By City 2022	Water System Reliability Study, P&N Report- 2018
Street System	Pavement Analysis (PASER), ROWE Report- 2021 (GIS) Street Asset Management Plan, P&N Report- 2018 (GIS/PASER)	No Current Traffic Studies (not typical for local streets) 'Bike Hastings' Bike Master, W&W Report- 2016
Parks & Recreation	5-Year Parks and Recreation Master Plan Update, Viridis Design Report- 2019	
All City Departments	Review of Prior Year Capital Improvement Plan Spreadsheet 2022 Project Application Form Request process	

Coordinating the Systems to Minimize Cost

When capital improvements are planned considering both kinds of needs across all infrastructure systems the potential for tearing up good streets to work on underground utilities can be reduced and overall cost can be minimized. This requires financial planning for all infrastructure systems together and a capital improvement plan that is coordinated across all infrastructure systems.

Ongoing Capital Improvement Planning

Capital improvement planning is an ongoing process. Plans are expected to change as new information becomes available and economic conditions change. While the various studies to determine the needs may be updated at differing times, this Capital Improvement Plan is intended to be updated annually to always reflect the current plan moving forward.

CITY OF HASTINGS

BARRY COUNTY, MICHIGAN

2023 CAPITAL IMPROVEMENT PLAN

March 2023

LEGEND

CIP Projects

Year

- 2023
- 2024
- 2025
- 2026
- 2027
- 2028-2032
- 2033+

Sanitary Spot Repairs

Type

- Dig
- Line

Storm Spot Repairs

Type

- Dig
- Line

- Stormwater CIPP Lining
- Sanitary CIPP Lining

Note:

Refer to Implementation Timeline and Future Planning Project lists for additional information. Some projects are not shown on this map.

Feet

500 250 0 500 1,000

Prein&Newhof

2211207

CITY OF HASTINGS
BARRY COUNTY, MICHIGAN

SANITARY SEWER DEFICIENCIES

January 2022

Note:
21.7 miles (46%) of sanitary sewers were televised in 2018 under SAW project. This map is only showing 4 & 5 structural rated pipes. Refer to GIS data for full PACP observation data including specific observations points added to GIS in 2022 as part of the CIP project.

LEGEND

- Lift Station
- Force Main

Sanitary Deficiencies

- 4 (poor)
- 5 (failing)
- Municipal Boundary
- CityBoundary
- Sanitary Capital Projects through 2031

Note:
Refer to Implementation Timeline for additional CIP projects including spot repairs, sewer lining, smoke testing, and additional televising.

500 250 0 500 1,000 Feet

Prein&Newhof
2211207

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CITY OF HASTINGS
BARRY COUNTY, MICHIGAN

STORM SEWER DEFICIENCIES

January 2022

Note:
5.0 miles (12%) of storm sewers were televised in 2018 under SAW project. This map is only showing 4 & 5 structural rated pipes. Refer to GIS data for full PACP observation data including specific observations points added to GIS in 2022 as part of the CIP project.

LEGEND

Stormwater Deficiencies

- 4 (poor)
- 5 (failing)
- CityBoundary
- Storm Capital Projects through 2031

Note:
Refer to Implementation Timeline for additional CIP projects including spot repairs, sewer lining, smoke testing, and additional televising.

500 250 0 500 1,000 Feet

Prein&Newhof

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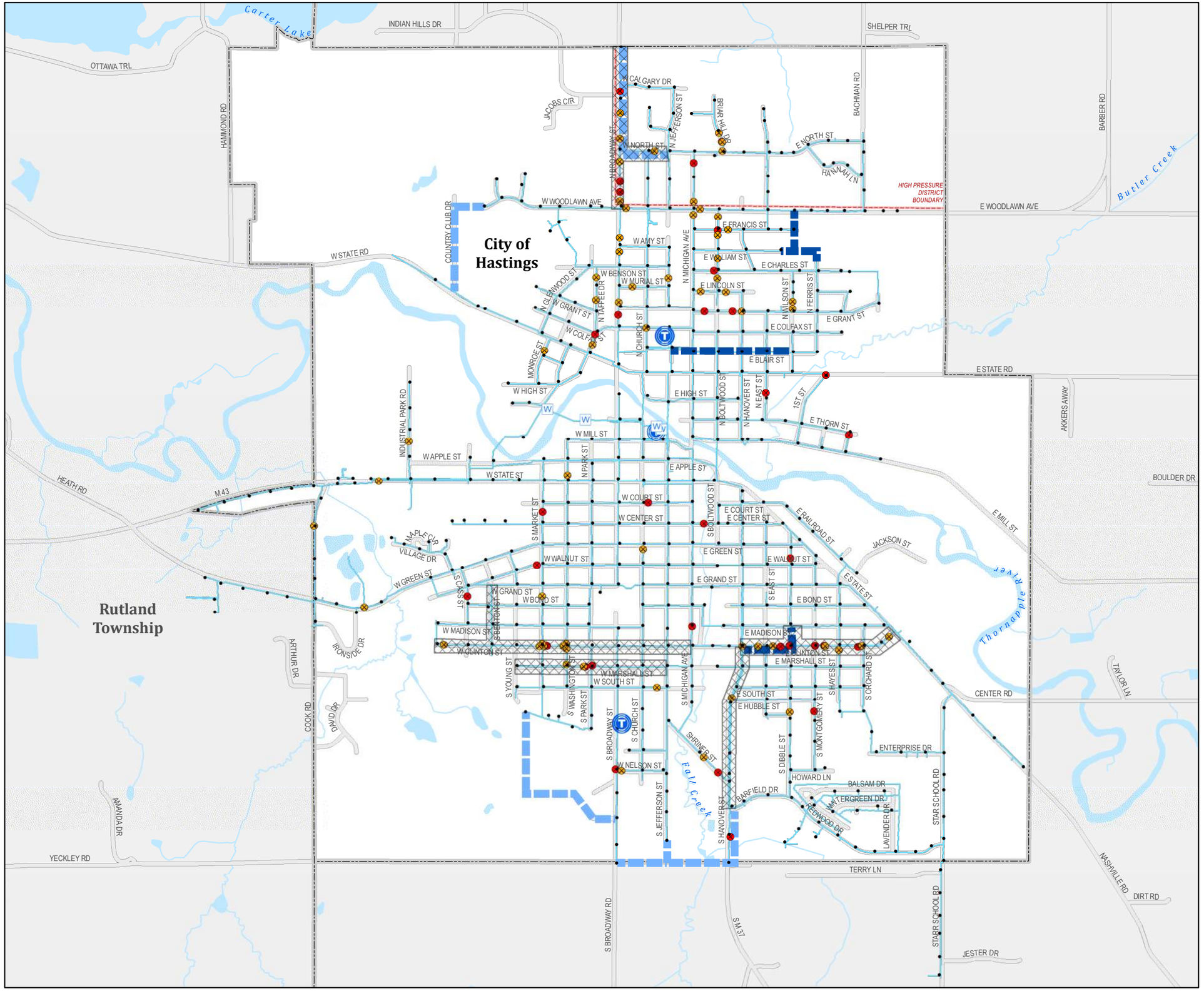
CITY OF HASTINGS
BARRY COUNTY, MICHIGAN

WATER SYSTEM DEFICIENCIES

January 2022



LEGEND

- Production Well
- Hydrant
- Water Main Break (2011-2018)
- Water Main Breaks (2018-2022)
- Storage Tank
- Water Main

2018 Water Reliability Study

- Short-Term (0-5 Years)
- Long-Term (6-20 Years)
- High Pressure District Boundary
- Municipal Boundary
- Water Capital Projects through 2031

Note:
Refer to Implementation Timeline for additional CIP projects including lead service line verification and replacement.

500 250 0 500 1,000 Feet

Prein&Newhof

2211207

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CITY OF HASTINGS
BARRY COUNTY, MICHIGAN

ROAD DEFICIENCIES

January 2022

LEGEND

2021 PASER

- 1 (failing)
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9 (good)
- Municipal Boundary
- Road Capital Projects through 2031

Note:

Refer to Implementation Timeline for additional CIP projects. Many utility CIP projects include full street reconstruction or partial resurfacing.

Feet
500 250 0 500 1,000

Prein&Newhof
2211207

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		2023	2024	2025	2026	2027	2028	Total
General Services								
CH-2	City Hall Parking Lot Lights	26,500						26,500
CH-3	Replace Phone System			45,000				45,000
CH-4	City Hall First Floor Renovation	25,000						25,000
CH-5	Pedestrian Design Improvements	50,000						50,000
DPS-1	Screening of Compost Facility	10,000	10,000	10,000	20,000	10,000		60,000
Total General Services		111,500	10,000	55,000	20,000	10,000	0	206,500
Parks & Recreation								
P-1	Fish Hatchery Restrooms		400,000					400,000
P-2	Fish Hatchery Softball Field		95,000					95,000
P-3	Fish Hatchery Walking Path Reconstruction			45,000				45,000
P-4	Tangle Town Renovation	185,000						185,000
P-5	Tyden Park Pavillion Restoration		20,000					20,000
P-6	Tyden Park Riverwalk Trail		65,000					65,000
P-7	Tyden Park Drive and Parking			75,000				75,000
P-8	Sweezy's Pond Improvements			125,000				125,000
P-9	Non-motorized Trail / McNair St						100,000	100,000
P-10	Bob King Park "tot lot"	60,000						60,000
P-11	River Access Improvements				20,000			20,000
P-12	Hammond Hills Green Restroom Construction				80,000			80,000
P-13	Pickleball at Bob King Park	15,000						15,000
Total Parks & Recreation		260,000	580,000	245,000	100,000	0	100,000	1,285,000
Library								
L-1	Window/HVAC Replacement	1,200,000						1,200,000
Total Library		1,200,000	0	0	0	0	0	1,200,000

		2023	2024	2025	2026	2027	2028	Total
Water/Sewer Department								
WS-1	Well 4 Building Repair		35,000					35,000
WS-2	Chlorine Detector at Water Plant	13,800						13,800
WS-3	Well 3 Upgrade	80,000						80,000
WS-4	Water Plant HVAC Improvements	50,000	50,000					100,000
WS-5	Chlorinator 2 Upgrade		40,000					40,000
WS-6	VFD Programming Upgrade		18,000					18,000
WS-7	Water System Radio Upgrades	19,000					20,000	39,000
WS-8	Water Plant Ground Storage Fill Flow Meter Replacement	10,000						10,000
WS-9	Booster Station Upgrade	16,500						16,500
WS-10	Water Reliability Study		20,000					20,000
WS-11	Construct new elevated storage tank						3,000,000	3,000,000
WS-12	Air Scrubber Media Replacement	14,000						14,000
WS-13	North Primary Clarifier Mechanism Replacement		100,000					100,000
WS-14	Add press to SCADA controls			50,000				50,000
WS-15	Screw Addition to Sludge Press				150,000			150,000
WS-16	Increase Thickener Capacity			300,000				300,000
WS-17	Additional Blower		60,000					60,000
WS-18	Railroad St Lift Station Engineering & Replacement	60,000				524,000		584,000
WS-19	Green/Market St. Sanitary Sewer Replacement (Broadway to Fish Hatchery Park/State St to Green St)		4,772,242					4,772,242
WS-20	Sanitary Sewer Televising Program	47,000		50,000	50,000	52,000	53,000	252,000
WS-21	Marshall St. Water Main Replacement & LSLR Project (Jefferson to West End)			2,122,171				2,122,171
WS-22	Clinton St. (east)/Dibble Water Main Replacement/Transmission Improvements (Hanover/M37 to State St)			3,396,314				3,396,314
WS-23	Clinton St. (west) Water Main & LSL Replacement Project (Michigan to West End), and S Benton St. Sanitary & Storm Sewer Replacement (Clinton to Walnut)			4,163,670				4,163,670
WS-24	Apple Street Sanitary Trunk Sewer Replacement (600' W of Market to Michigan)				2,491,947			2,491,947
WS-25	Lead Service Line Replacements				15,068,000			15,068,000
WS-26	Mill Street Sanitary Replacement (Michigan to Jefferson)				93,143			93,143
WS-27	E. Madison Sanitary Replacement						432,319	432,319
WS-28	Smoke Testing for Sanitary Sewer I&I					61,000		61,000
WS-29	Water Meter Replacement Program	200,000		200,000	200,000			600,000
WS-30	Sanitary Sewer Spot Repairs						78,000	78,000
Total Water/Sewer		510,300	5,095,242	10,282,155	18,053,090	637,000	3,583,319	38,161,106

		2023	2024	2025	2026	2027	2028	Total
Streets								
MS-1	State Rd Resurfacing	274,954						274,954
MS-2	Michigan Ave Bridge Maintenance		50,000					50,000
MS-3	E. Grand Street mill & resurface						700,000	700,000
MS-4	State St Storm Sewer Replacement				400,000			400,000
LS-1	Road Gravel	10,000						10,000
LS-5	Mill St (Michigan to Jefferson)				10,388			10,388
MS-5	Boltwood Storm Sewer Replacement	30,000						30,000
MS-6	E. Grand Street storm sewer replacement						210,000	210,000
MS-7	Green/Market St. (Broadway to Fish Hatchery Park/State St to Green St)		1,351,587					1,351,587
LS-1	Marshall St. (Jefferson to West End)			193,194				193,194
MS-9	Clinton St. (east)/Dibble (Hanover/M37 to State St)			431,846				431,846
MS-10	Clinton St. (west) (Michigan to West End), and S Benton Storm Sewer Replacement (Clinton to Walnut)			267,062				267,062
S-1	Storm Sewer Televising Program	69,000		71,000	73,000	75,000	78,000	366,000
S-2	Storm Sewer Spot Repairs						38,807	38,807
Total Streets		383,954	1,401,587	963,102	483,388	75,000	1,026,807	4,333,838
Cemetery								
RC-2	Riverside Cemetery Reflective Area	100,000						100,000
Total Cemetery		100,000	0	0	0	0	0	100,000
TIF Funds								
DDA-1	Parking Lot 8 Reconstruction	200,000						200,000
DDA-2	State Streetscape Reconstruction	2,800,000						2,800,000
DDA-3	Thornapple Plaza & Spray Plaza Stage Maintenance	15,000						15,000
LDFA-1	Semi-Parking Lot Mill & Reshape	30,000						30,000
LDFA-2	Mill & Resurface Enterprise Drive	150,000						150,000
Total TIF		3,195,000	0	0	0	0	0	3,195,000

		2023	2024	2025	2026	2027	2028	Total
Emergency Services								
PD-3	Patrol Vehicle Replacement (#41)			45,000				45,000
PD-4	Patrol Vehicle Replacement (#43)			45,000				45,000
PD-5	Patrol Vehicle Replacement (#42)				45,000			45,000
PD-6	Patrol Vehicle Replacement (#47)				45,000			45,000
PD-7	Replacement of Police Chief's Vehicle		50,000					50,000
PD-8	Replacement Portable Radios		80,000					80,000
F-2	Replace SCBA (4 units)	27,342						27,342
F-3	Replacement tanks for SCBAs (12 units)	13,500						13,500
F-4	Replacement VHF Radios (4 units)	4,500		4,500				9,000
F-5	Turnout Gear (4 sets)	10,000	10,000	12,500	13,500	13,500		59,500
F-6	800 Radios (2 units)	8,500		9,000				17,500
F-8	New Class A Pumper Truck (half cost)				625,000			625,000
ES-1	Emergency Services Building Construction		12,000,000					12,000,000
Total Emergency		63,842	12,140,000	116,000	728,500	13,500	0	13,061,842
Equipment/Motor Pool								
MP-4	6-Yd Dump Truck Replacement (#130)	210,000						210,000
MP-5	Front End Loader (#220)			265,000				265,000
MP-6	3-Yd 2008 Dump Truck Replacement (#350)	100,000						100,000
MP-7	3-Yd 2008 Dump Truck Replacement (#80)	100,000						100,000
MP-8	1996 Super Duty Bucket Truck Replacement (#290)	205,000						205,000
MP-9	Claw/Tink bucket (#253)	20,000						20,000
MP-31	Claw/Tink bucket (#224)	20,000						20,000
MP-10	John Park Mower Replacement (#300)		55,000					55,000
MP-11	C-7500 2000 GMC Replacement (#120)		185,000					185,000
MP-12	2014 International Dump Truck (#140)		185,000					185,000
MP-13	International Sweeper 2018 (#270)			355,000				355,000
MP-14	Cat Skid Steer 2014 (#430)					135,000		135,000
MP-15	Salt Spreader Replacement 6.9 yds (#62)			20,000				20,000
MP-16	Salt Spreader Replacement 6.9 yds (#92)			20,000				20,000
MP-17	Vactor Truck Replacement (on rotation)				525,000			525,000
MP-18	Pull behind Air Compressor (#160)		20,000					20,000
MP-20	Front End Loader (#250)					325,000		325,000
MP-21	Excavator Replacement (#180)					265,000		265,000
MP-24	Street Supervisor Truck #20 (Rotation schedule)	53,000	54,000	54,500	55,000	55,000		271,500
MP-25	Utility Supervisor Truck #30 (Rotation schedule)	53,000	54,000	54,500	55,000	55,000		271,500
MP-29	Service Truck (#40)	90,000						90,000
Total Equipment/Motor Pool		851,000	553,000	769,000	635,000	835,000	0	3,643,000
	GRAND TOTAL 2023 - 2028							**65,186,286**

Future Planning Projects 10-20 Year - City of Hastings 2023 CIP - rev. 03/06/23

2211207

Water/Sewer/Storm/Streets Projects

2210635

Planned FY [1,2]	Project No.	Project Title
2032	32001	North Boltwood Neighborhood Water Main Replacement
2032	32002	Sanitary Sewer Televising Program (continue through 2034)
2032	32003	Storm Sewer Televising Program (continue through 2034)
2033	33001	Blair Street Water Main Replacement/Transmission Improvements
2033	33002	Francis/William Street Water Main Extension/Loop
2033	33003	Michigan Ave. Sanitary Replacement (Grand to Shriner) include storm/water main
2035	35001	Sanitary Sewer Upsize in Easement (N of Grand, E of Michigan by Fall Creek)
2036	36001	S. Broadway/Jefferson Street Water Main Extension/Loop
2036	36002	S. Hanover Street (M37) Water Main Extension/Loop (Barfield to Jefferson)
2037	37001	Market Street Water Main Extension (S Broadway/Westfield to Market St.)
2037	37002	Smoke Testing (North) Districts 2&3, Sanitary Sewer Inflow & Infiltration Inv.
2038	38001	Country Club Dr. Water Main Extension/Loop (State Rd. to Woodlawn)
2038	38002	E. State Street Sanitary Upsize/Replacement (Railroad to Clinton)
2039	39001	Elevated Water Tank in High Pressure District (EGLE Count Limits)
2039	39002	Inidan Hills/Jacob Circle Watermain Extension (Broadway to W. Woodlawn)
2041		All lead water service lines must be replaced.

Notes:

(1) Unplanned repairs or system demands may necessitate adjustments in priority.

(2) City Fiscal Year is "FY23" is FY23/24 July 1, 2023 to June 30, 2024. Note some costs may overlap engineering/construction over 2 years.


WE TREASURE THE OLD
HASTINGS
MICHIGAN
PROGRESS WITH THE NEW

		Total
General Services		
CH-2	City Hall Parking Lot Lights	26,500
CH-3	Replace Phone System	45,000
CH-4	City Hall First Floor Renovation	25,000
CH-5	Pedestrian Design Improvements	50,000
DPS-1	Screening of Compost Facility	60,000
Total General Services		206,500

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of Parking Lot Lights at City Hall

Project ID #: _____ CIP ID #: CH-2

Department: Administration Anticipated Start Date: 07/2023

Date Prepared: 02/20/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replace the light poles in the parking lot at city hall (5 light poles).

Project Need: Provide a brief explanation of why the project is necessary.

The lights are old and rusting. Opportunity to upgrade to LEDs.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

bid out last year, deemed too expensive to proceed

Does the project share space or overlap with other CIP projects? Please describe.

Streetscape Project adjacent

Project Cost: $ 26,500.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

General Fund

List of Attachments (quotes, photos, etc.):

Photos of existing lightpoles

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replace Phone System

Project ID #: _____ CIP ID #: CH-3

Department: _____ Anticipated Start Date: 01/2025

Date Prepared: 03/06/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replace phones and software for telephonic system for the City.

Project Need: Provide a brief explanation of why the project is necessary.

Our existing phone system is old and limited in its capabilities. Last year, we updated the software to a more modern system and moved to VOIP rather than a direct copper line connection. This improvement allowed our phones to continue to function when Internet Explorer went offline but did not provide service improvement.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 45,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

General Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: City Hall Improvements

Project ID #: _____ CIP ID #: CH-4

Department: multiple Anticipated Start Date: 07/2023

Date Prepared: 02/20/2023

Project Description: Provide a brief physical description of the project. Please be specific.

-modify the current layout to make better use of existing square footage
-improve security & accessibility for people with disabilities
-replace flooring material on first floor and mayor's office

Project Need: Provide a brief explanation of why the project is necessary.

The existing flooring material is well worn. It is not clear to customers and guests where they should go. Without clear direction where guests should go, they sometimes "wander". No accessible restroom on the first floor. It would be difficult to accommodate an employee with disabilities on the first floor. There is a lot of underutilitzed floor space yet the work areas are very small.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

no

Does the project share space or overlap with other CIP projects? Please describe.

no

Project Cost: $ 25,000.00

Please check one of the following for cost basis:

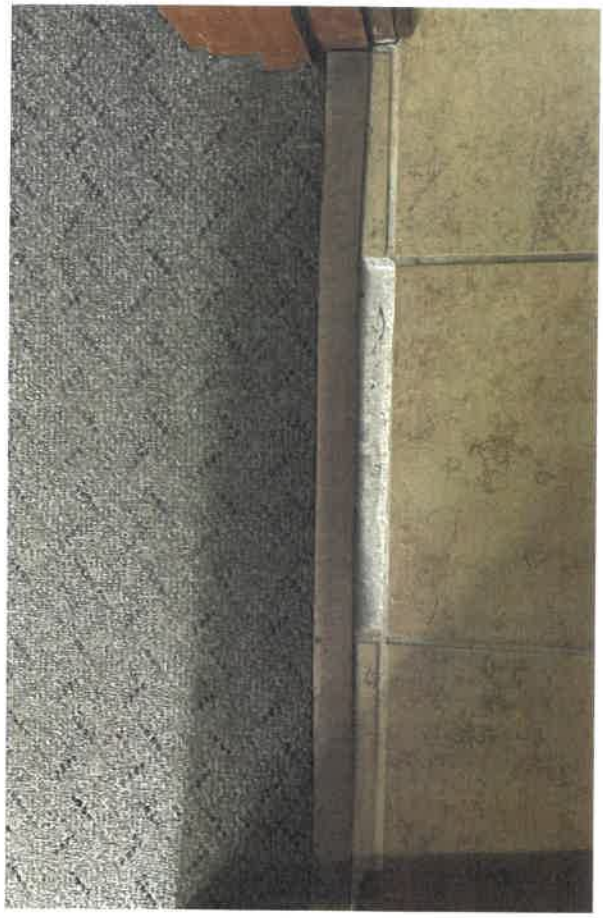
- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

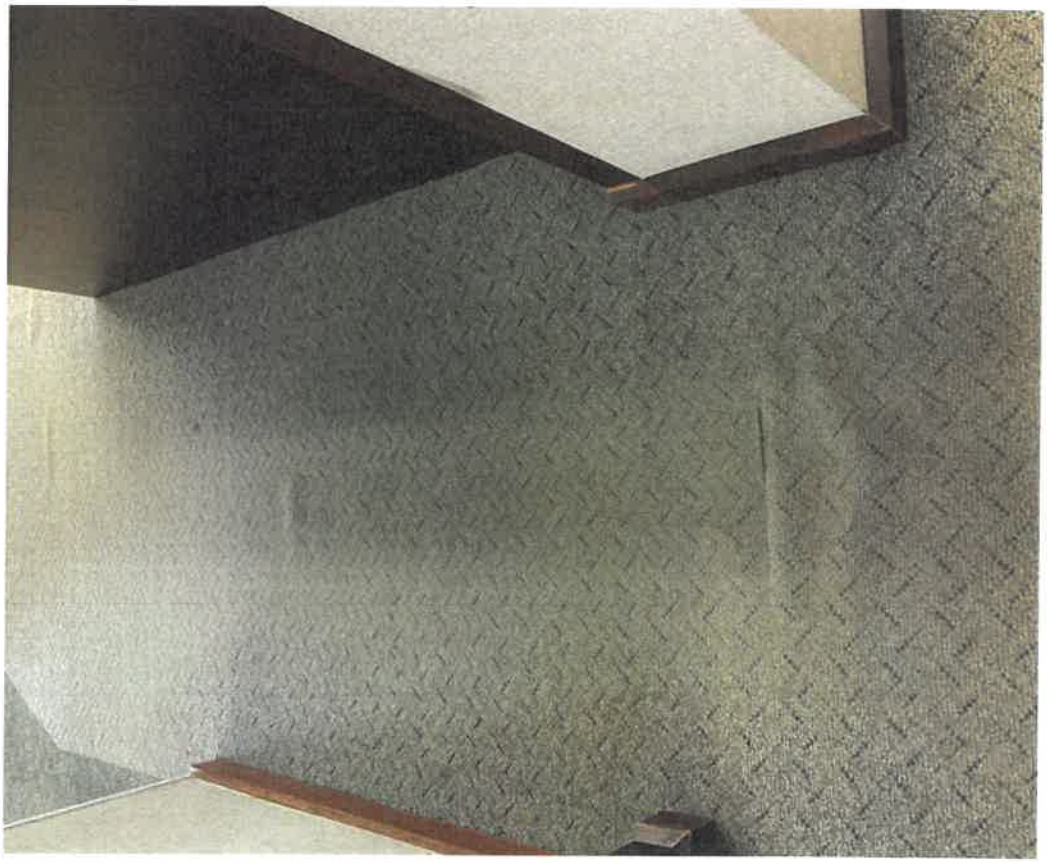
Potential Funding Sources:

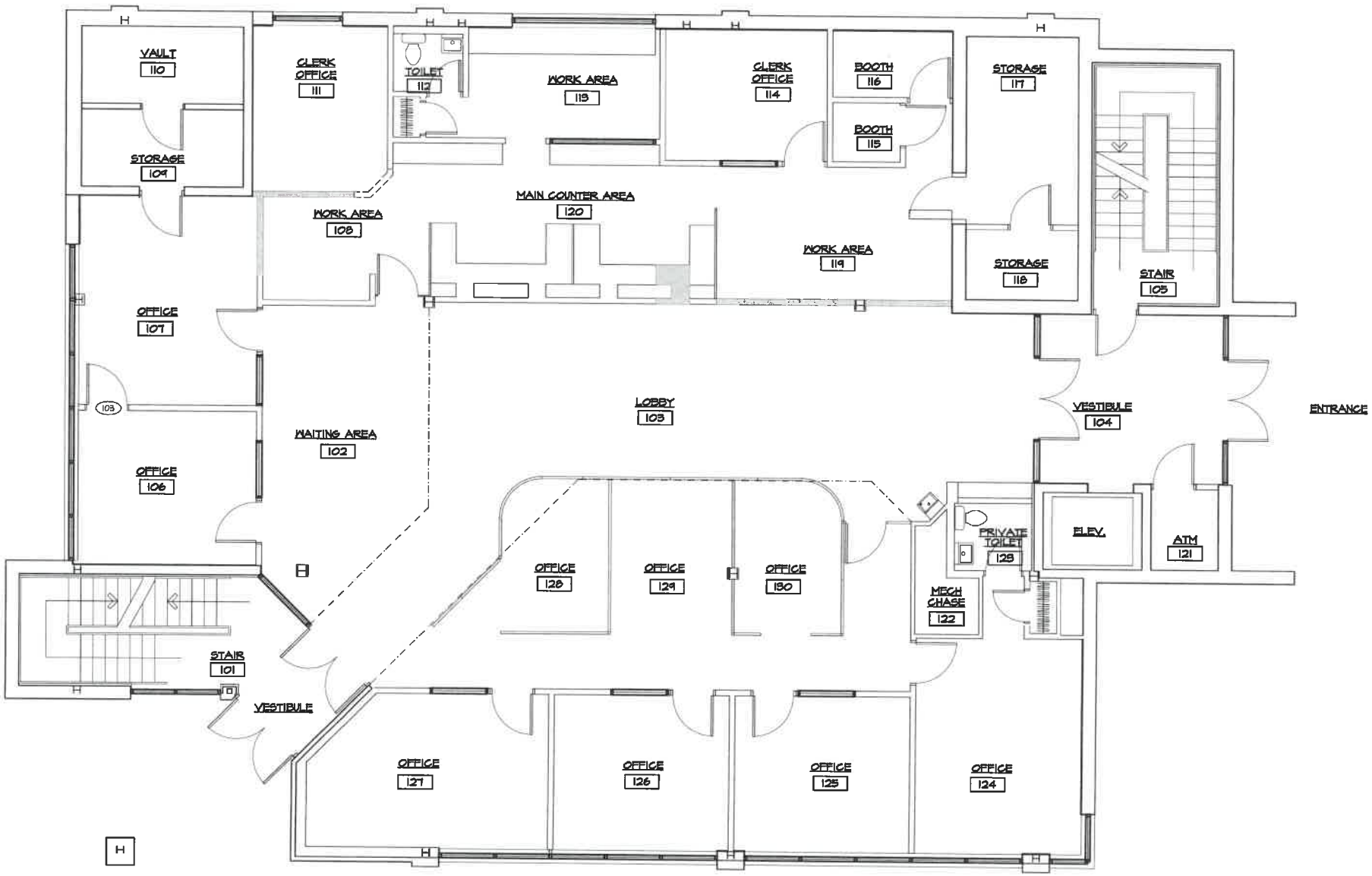
General Fund

List of Attachments (quotes, photos, etc.):

Photos






VAULT
110
CLERK OFFICE
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TOILET
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WORK AREA
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CLERK OFFICE
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BOOTH
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BOOTH
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STORAGE
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STORAGE
109
MAIN COUNTER AREA
120
WORK AREA
108
WORK AREA
119
STORAGE
118
STAIR
105
OFFICE
107
LOBBY
103
VESTIBULE
104
ENTRANCE
103
WAITING AREA
102
OFFICE
106
OFFICE
128
OFFICE
129
OFFICE
130
PRIVATE TOILET
129
ELEV.
ATM
121
MECH CHASE
122
STAIR
101
VESTIBULE
OFFICE
127
OFFICE
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OFFICE
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OFFICE
124

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Pedestrian Design Improvements

Project ID #: _____ CIP ID #: _____

Department: City Manager Anticipated Start Date: 07/2023

Date Prepared: 01/30/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Identify and strategize how pedestrian crossings can be improved. Implement the strategy in cooperation with MDOT or other agencies as determined.

Project Need: Provide a brief explanation of why the project is necessary.

Past walking audit and publically identified areas where crossing safety can be improved (ie Tyden Park/M43 crossing)

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 50,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Major Streets
Local Streets
General Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Compost Screening

Project ID #: _____ CIP ID #: _____

Department: _____ Anticipated Start Date: 07/2023

Date Prepared: 01/16/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Screening of composted natural material into black dirt

Project Need: Provide a brief explanation of why the project is necessary.

We need to screen and partially remove topsoil each year as a condition of our EGLE permit. We are behind in our material screening. Topsoil is approximately $20-$30 per yard and is more cost effective to screen the product than it is to purchase.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 20,000.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

General Fund

List of Attachments (quotes, photos, etc.):

Parks & Recreation		
P-1	Fish Hatchery Restrooms	400,000
P-2	Fish Hatchery Softball Field	95,000
P-3	Fish Hatchery Walking Path Reconstruction	45,000
P-4	Tangle Town Renovation	185,000
P-5	Tyden Park Pavillion Restoration	20,000
P-6	Tyden Park Riverwalk Trail	65,000
P-7	Tyden Park Drive and Parking	75,000
P-8	Sweezy's Pond Improvements	125,000
P-9	Non-motorized Trail / McNair St	100,000
P-10	Bob King Park "tot lot"	60,000
P-11	River Access Improvements	20,000
P-12	Hammond Hills Green Restroom Construction	80,000
P-13	Pickleball at Bob King Park	15,000
Total Parks & Recreation		1,285,000

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Fish Hatchery Restrooms

Project ID #: _____ CIP ID #: P-1

Department: DPS Anticipated Start Date: 07/2024

Date Prepared: 03/02/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replace restrooms at Fish Hatchery Park. The "Upper Restrooms" have a grant application for their replacement. The "lower restrooms" do not and may require additional design to replace because they are affixed to the pavilion.

Project Need: Provide a brief explanation of why the project is necessary.

Restrooms were constructed with a DNR grant in 1985. They are dated and are very difficult to maneuver due to the shape of the building. Accessible restrooms are needed.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Yes - 5 Year Park and Rec Master Plan

Does the project share space or overlap with other CIP projects? Please describe.

No.

Project Cost: $ 400,000.00

Please check one of the following for cost basis:

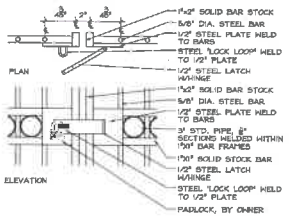
- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

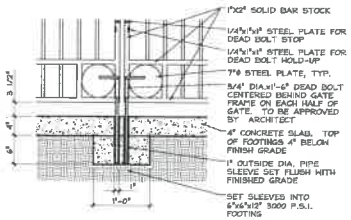
MDNR Natural Resources Trust Fund
General Fund

List of Attachments (quotes, photos, etc.):

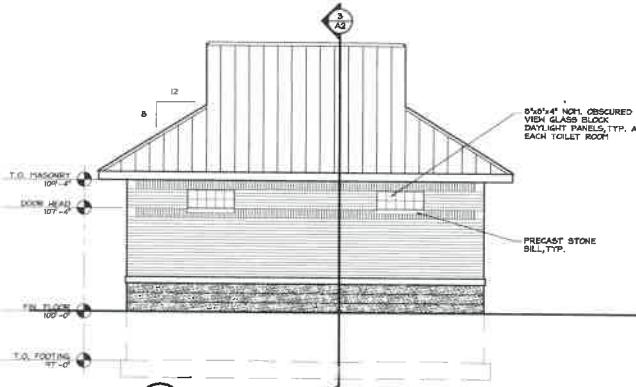
Photos
Possible Floor Plans



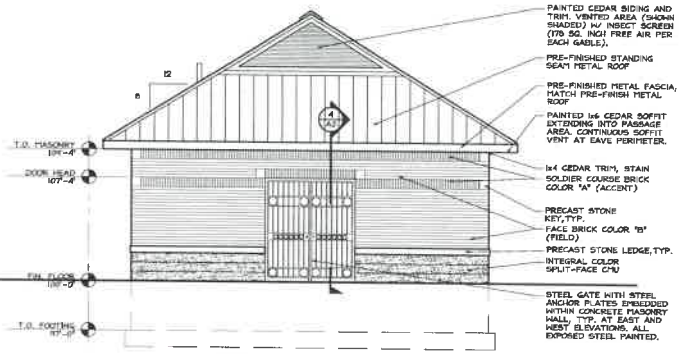
5/A2 LATCH DETAIL
SCALE: 1 1/2" = 1'-0"



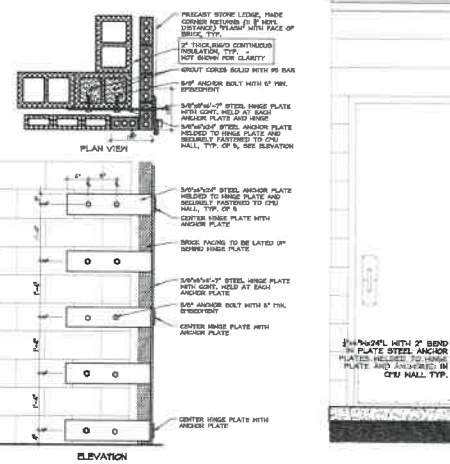
6/A2 DEAD BOLT DETAIL
SCALE: 1" = 1'-0"



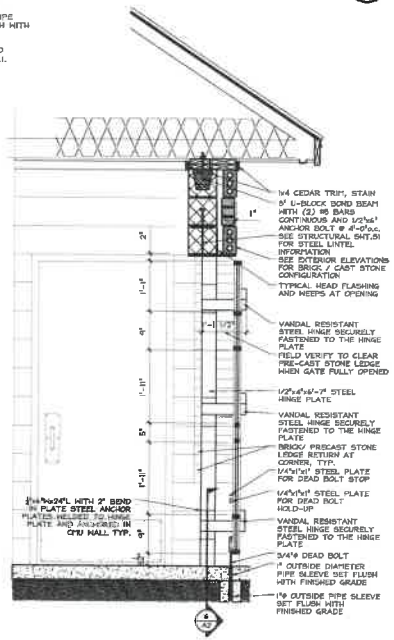
1/A2 NORTH ELEVATION
SCALE: 1/4" = 1'-0"



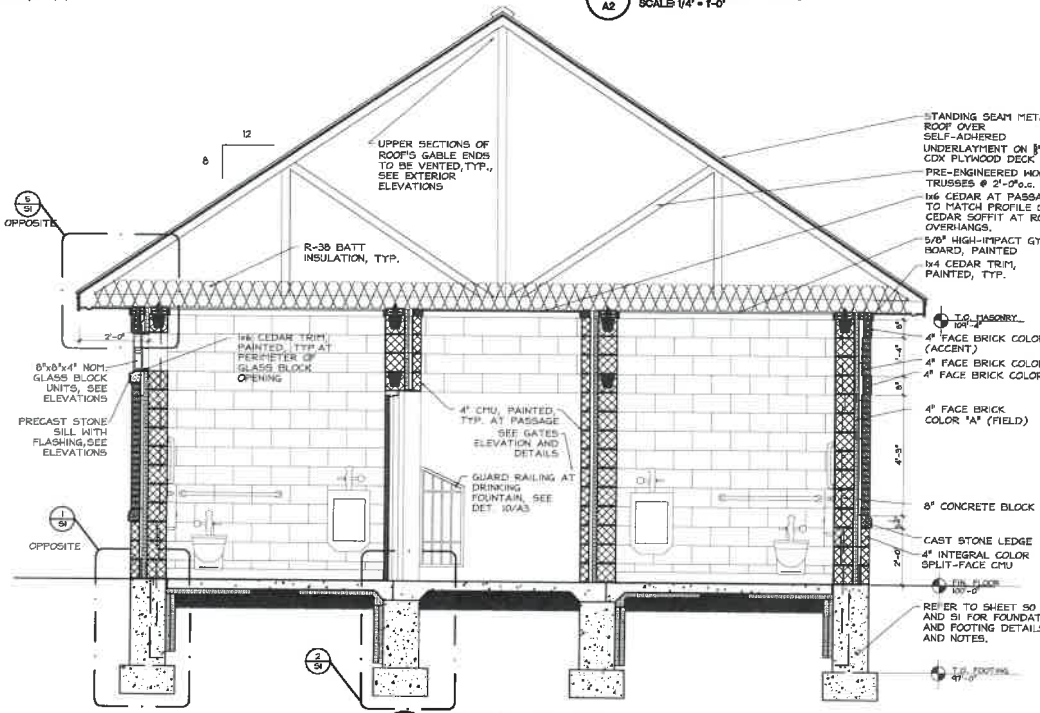
2/A2 EAST ELEVATION
SCALE: 1/4" = 1'-0"



7/A2 GATE ANCHORE PLATES DETAIL
SCALE: 1" = 1'-0"



4/A2 WALL SECTION AT GATE
SCALE: 3/4" = 1'-0"



3/A2 BUILDING SECTION
SCALE: 1/2" = 1'-0"

BEECHWOOD PARK PHASE 1 IMPROVEMENTS
Holland Charter Township, MI

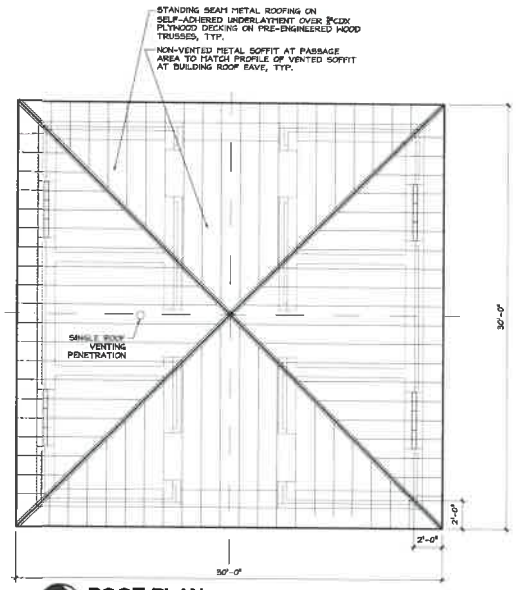
MCSA GROUP, INC.
Landscape Architecture • Park & Recreation Planning • Architecture
Downtown Planning • Interior Design • Sports Facility Planning
828 Greenwood Avenue S.E. • East Grand Rapids, MI 49506
616-451-3545 • FAX: 616-451-1965 • EMAIL:

SCALE: as shown

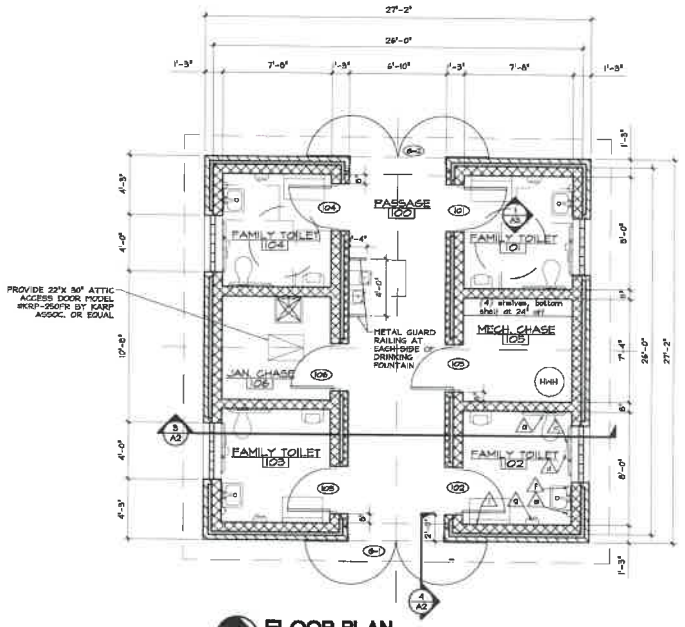
Exterior Elevations, Sections

DATE: 08.30.2021
REVISIONS

PROJECT NO. 2120
SHEET NO. A2



ROOF PLAN
SCALE: 1/4" = 1'-0"



FLOOR PLAN
SCALE: 1/4" = 1'-0"

ROOM FINISH SCHEDULE

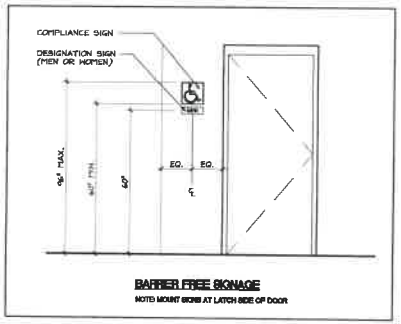
NO.	ROOM	FLOOR	BASE	WALLS	CEILING	HT.	REMARKS
100	PASSAGE - OPEN	CONCRETE	-	CMU, PAINT	4" 1/4 CEDAR, PAINT	9'-4"	PAINT 4" CMU
101	TOILET	EPOXY FLOORING	4"EPOXY COVE	CMU, PAINT	GYP. BD.+, PAINT	9'-6"	-
102	TOILET	EPOXY FLOORING	4"EPOXY COVE	CMU, PAINT	GYP. BD.+, PAINT	9'-6"	
103	TOILET	EPOXY FLOORING	4"EPOXY COVE	CMU, PAINT	GYP. BD.+, PAINT	9'-6"	
104	TOILET	EPOXY FLOORING	4"EPOXY COVE	CMU, PAINT	GYP. BD.+, PAINT	9'-6"	
105	MECHANICAL	SEALED CONC.	4" VINYL BASE	CMU, PAINT	GYP. BD.+, PAINT	9'-6"	
106	JANITORIAL	SEALED CONC.	4"VINYL BASE	CMU, PAINT	GYP. BD.+, PAINT	9'-6"	

NOTES: HIGH-IMPACT GYPSUM BOARD CEILING ATTACHED TO BOTTOM OF TRUSSES

ACCESSORY SCHEDULE

A	**GRAB BARS:** HORIZONTAL BARS: TOP AT 33-36" AFF; VERTICAL BAR: CENTER LINE AT 39-41" AFF FROM BACK WALL & BOTTOM AT 39-41" AFF.	A	**SOAP DISPENSER:** MOUNTING HEIGHT: 40" MAX.
B	**TOILET TISSUE DISPENSER:** MOUNTING HEIGHT = 19" AFF (MIN.) 48" AFF MAX. TO CENTERLINE OF DISPENSER. REAR EDGE OF DISPENSER TO BE 8" IN FRONT OF WATER CLOSET (DISPENSER MUST BE 1 1/2" (MIN.) BELOW THE GRAB BAR)	A	**MIRROR:** 24" WIDE x 36" HIGH MOUNTING HEIGHT: 38" AFF (MAX.)
		A	**HAND DRYER:** MOUNTING HEIGHT: 40" MAX. TO CONTROL
A	**SANITARY NAPKIN DISPOSAL:** MOUNTING HEIGHT = 34" AFF (TO TOP OF UNIT) B.F. MOUNTING HEIGHT = 27" AFF (TO TOP OF UNIT)	A	**BARRIER FREE SIGNAGE:** DESIGNATION SIGN: 60" A.F.F. COMPLIANCE SIGN: 60"-96" A.F.F. SEE DETAIL THIS SHEET
A	**COAT HOOK:** MOUNTING HEIGHT: 54" AFF	A	**BABY CHANGING STATION:** MOUNTING HEIGHT: 34" AFF TO SHELF

NOTE:
INSTALL ALL TOILET FIXTURES AND ACCESSORIES IN ACCORDANCE WITH THE LATEST EDITION OF THE STATE OF MICHIGAN BUILDING CODE (MBC 2012) AND ADOPTED ICC A117.1 - 2009 STANDARDS FOR BARRIER FREE ACCESSIBILITY STANDARDS.

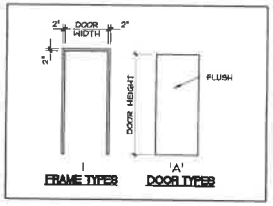


BARRIER FREE SIGNAGE
NOTE: MOUNT SIGNS AT LATCH SIDE OF DOOR

DOOR SCHEDULE

NO.	SIZE	DOOR TYPE	DOOR MAT.	DOOR FINISH	FRAME TYPE	FRAME MAT.	FRAME FINISH	LABEL	HDWE	REMARKS
101	3'-0" X 7'-2" X 1-3/4"	A	H.M.	PAINT	1	H.M.	PAINT	-	1	
102	3'-0" X 7'-2" X 1-3/4"	A	H.M.	PAINT	1	H.M.	PAINT	-	1	
103	3'-0" X 7'-2" X 1-3/4"	A	H.M.	PAINT	1	H.M.	PAINT	-	1	
104	3'-0" X 7'-2" X 1-3/4"	A	H.M.	PAINT	1	H.M.	PAINT	-	1	
105	3'-0" X 7'-2" X 1-3/4"	A	H.M.	PAINT	1	H.M.	PAINT	-	2	
106	3'-0" X 7'-2" X 1-3/4"	A	H.M.	PAINT	1	H.M.	PAINT	-	3	

NOTE: USE HARDWARE SET 3 FOR STEEL GATES



WALL TYPES

EXTERIOR 9" CMU WALL W/AIR BARRIER, 2" RIGID INSULATION, 1" AIR SPACE AND FACE BRICK VENEER (OR 4" CMU AT PASSAGE)

INTERIOR 6" CMU WALL

BEECHWOOD PARK PHASE 1 IMPROVEMENTS
Holland Charter Township, MI

MCSA GROUP, INC.
Landscape Architecture • Park & Recreation Planning • Architecture
Downtown Planning • Interior Design • Sports Facility Planning
120 Ottawa Ave. N.W. • Suite 310 • Grand Rapids, MI 49503
616-451-2048 • FAX: 616-451-1966 • EMAIL: mail@mcsaonline.com

SCALE: as shown

Floor/ Roof Plans, Schedules

DATE: 08.30.2021
REVISIONS:

PROJECT NO. 2120
SHEET NO. A1

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Fish Hatchery Softball Field

Project ID #: _____ CIP ID #: P-2

Department: DPS - Parks Anticipated Start Date: 07/2024

Date Prepared: 01/17/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Update the outfield fencing and backstop. Raise the right and center fields 8-12 inches so that they no longer hold water.

Project Need: Provide a brief explanation of why the project is necessary.

Fencing is dated and the fields are holding water. The softball field was constructed in the mid-1980s.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Yes, 5 Year Park and Rec Master Plan

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 95,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

List of Attachments (quotes, photos, etc.):

D-K FENCE
BATTLE CREEK
965-3991

1227 W. Dickman RD. Battle Creek, MI 49037
PHONE: (269) 965-3991 FAX: (269)965-8627

February 3, 2023

City of Hastings
201 E. State St.
Hastings, MI 49058

Attn: Rob Neil
rneil@hastingsmi.org
269.838.8395

Re: **Fish Hatchery Park Ballfield**

Please consider this a formal quote to provide the materials, labor, and supervision necessary to complete the fence and backstop replacement at Fish Hatchery Park. Please find the items included in this quote, below:

Item	Description	Cost
Chain Link Fences and Gates	• To remove and replace approx. 980 LF of 6' tall, aluminized chain link fence with (2) 12' wide double swing gates. New fence includes new yellow safety top cap. Terminal posts to be 2-1/2" SS40 pipe. Line posts to be 2" SS40 Pipe. Top rail to be 1-5/8" SS20 pipe. Fence fabric to be 9GA. Bottom tension wire to be 7GA steel wire. • To remove (1) backstop. • To install (1) 20'x30'x20' backstop with a finished height of 20' above grade. Backstop to be 20' vertical, with no overhang.	**$85,020.00**

- **To install an additional 10' tall #36 net to the top of the backstop for a finished height of 30', Add: $4,895.00**
- **Turf restoration by others**

Thank you for considering D-K Fence Company for your project. If you have any questions regarding this or future projects, please do not hesitate to contact me.

Regards,

Brent Hartwell
Estimator

MEMBER OF THE AFA American Fence Association

FENCING THE "Wright" WAY

LICENSED INSURED BONDED

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Fish Hatchery Park Walking Path Reconstruction

Project ID #: _____ CIP ID #: P-3

Department: DPS - Parks Anticipated Start Date: 07/2025

Date Prepared: 01/17/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Repave the existing walking path throughout the park.

Project Need: Provide a brief explanation of why the project is necessary.

The walking path is significantly deteriorated in many areas. An upgraded path would improve safety and park accessibility.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Yes, 5 Year Park and Recreation Master Plan

Does the project share space or overlap with other CIP projects? Please describe.

Yes, other park projects planned for Fish Hatchery Park.

Project Cost: $ 45,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

General Fund
Grant funds if combined with other projects

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Tangle Town Rehab or Reconstruction

Project ID #: _____ CIP ID #: P-4

Department: DPS - Parks Anticipated Start Date: 07/2025

Date Prepared: 01/17/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Tangle Town is located within Bob King Park. This project would include significant rehab of the structure or replacement.

Project Need: Provide a brief explanation of why the project is necessary.

Tangle Town is well loved, but is of wood construction and was built in 1997. Most similar structure last approximately 20 years. The structure has become more difficult to maintain and residents complain of splintering wood.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Yes, 5 Year Park & Rec Master Plan

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 185,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

MDNR Recreation Passport Grant
General Fund
Community Donations

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Tyden Park Pavillion Restoration

Project ID #: _____ CIP ID #: P-5

Department: DPS - Parks Anticipated Start Date: 07/2024

Date Prepared: 01/17/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Painting and restroom improvements, stain cedar beams

Project Need: Provide a brief explanation of why the project is necessary.

Minor improvements need to be made to the facility including painting, restroom improvements, and some exterior work.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 20,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

General Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Tyden Park Riverwalk Trail

Project ID #: _____ CIP ID #: P-6

Department: DPS - Parks Anticipated Start Date: 07/2024

Date Prepared: 01/17/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Mill and repave trail around Tyden Park.

Project Need: Provide a brief explanation of why the project is necessary.

The trail has many cracks and raised areas due to tree roots. Paving this trail would improve safety and user access.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Yes, 5 Year Park and Rec Master Plan

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 65,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

General Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Tyden Park Parking Lot and Access Drive

Project ID #: _____ CIP ID #: P-7

Department: DPS - Parks Anticipated Start Date: 07/2025

Date Prepared: 01/17/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Driveway and parking lot at Tyden Park needs to be milled and resurfaced. Parking area may also be somewhat expanded to eliminate vehicles from parking on the lawn.

Project Need: Provide a brief explanation of why the project is necessary.

The drive and parking lot have large cracks and holes. The existing pavement is only 1.5 - 2 inches thick.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Yes, 5 Year Park and Rec Master Plan

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 125,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

General Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Sweezy's Pond Improvement

Project ID #: 11

CIP ID #: P8

Department: DPS

Anticipated Start Date: 08/2025

Date Prepared: 02/17/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Includes wetland study, engineering and construction of open channel outlet to creek north, with a non-motorized bridge

Project Need: Provide a brief explanation of why the project is necessary.

Currently, Sweezy's Pond is neither a pond nor functional wetland. The water is to shallow for a proper freshwater pond and the depth is too deep for a healthy wetland habitat. There are many invasive vegetative species that have inundated the pond that make it have poor aesthetics and out competes natural wetland vegetation for the area.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 150,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

DNR park or wetland grants

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Non-Motorized Trail along Undeveloped McNair Street Right of Way

Project ID #: 4 CIP ID #: P-15

Department: Public Services Anticipated Start Date: 07/2028

Date Prepared: 02/17/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Place an approximately 1,300 feet, 8 foot wide paved trail along an existing street ROW which has no street. The path would be adjacent to an existing farm field that will not be developed. The path would start at Green Street (Across from Pennock Hospital) and go south to Clinton Street. There would also be connector trails off of Walnut Street, and Madison Street. A four foot tall chain link fence would also be needed along the property lines on along the ROW lines.

Project Need: Provide a brief explanation of why the project is necessary.

This trail will help connect Fish Hatchery Park with Sweezy Pond with non-motorized traffic. This will also connect Cook Additions to Fish Hatchery Park, M-37/43, and Downtown. Would help expose trail users to wide open space inside the city limits and not by a busy road.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No.

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 100,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

General Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Bob King Park small children's play area

Project ID #: _____ CIP ID #: P-10

Department: DPS - Parks Anticipated Start Date: 07/2025

Date Prepared: 01/17/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of play area for small children

Project Need: Provide a brief explanation of why the project is necessary.

Current equipment is dated and ending its useful life

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 60,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

General Fund
MDNR Grant

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: River Access Points Improvements

Project ID #: _____ CIP ID #: P11

Department: Parks Anticipated Start Date: 07/2026

Date Prepared: 03/02/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Improve water access at Bliss Park and Tyden Park to make it easier for users to enter/exit the river for recreation purposes.

Project Need: Provide a brief explanation of why the project is necessary.

Many visitors use the water access points

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 20,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

General Fund
Potential grants

List of Attachments (quotes, photos, etc.):

none

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: "Green" toilets at Hammond Hills

Project ID #: _____ CIP ID #: P-12

Department: DPS - Parks Anticipated Start Date: 07/2026

Date Prepared: 01/17/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Addition of "green" toilets or pit toilets at Hammond Hills Park

Project Need: Provide a brief explanation of why the project is necessary.

Currently only a porta-john is used at Hammond Hills. This park is not located in an area where other public restrooms are accessible.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 80,000.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

General Fund
MDNR Rec Passport Grant

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Pickleball/Resurface courts at Bob King Park

Project ID #: _____ CIP ID #: _____

Department: Parks Anticipated Start Date: 07/2023

Date Prepared: 01/30/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Resurface existing tennis courts for use as pickleball and/or tennis courts.

Project Need: Provide a brief explanation of why the project is necessary.

Existing court needs some maintenance. There is a high demand for pickleball in the community.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

no

Does the project share space or overlap with other CIP projects? Please describe.

yes - other projects are in Bob King park. This project could be done together or independently.

Project Cost: $ 15,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

General Fund

List of Attachments (quotes, photos, etc.):

Library		
L-1	Window/HVAC Replacement	1,200,000
Total Library		1,200,000

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Window Replacement Project

Project ID #: _____ CIP ID #: L1

Department: Library Anticipated Start Date: 09/2023

Date Prepared: 02/13/2023

Project Description: Provide a brief physical description of the project. Please be specific.

All 336 windows will be replaced with highly efficient triple pane windows. The whole interior of the building will be painted after the installation. Much of the landscaping around the building will need to be removed to allow access to the windows. It will be replace/repaired after the windows are in place.

As part of the project the HVAC system will be evaluated as to how much of it needs to be

Project Need: Provide a brief explanation of why the project is necessary.

The exterior windows have become foggy/discolored because of a design flaw. They continue to worsen including allowing moisture to condensing on the outer pane inside the windows and run down to the base of the windows. This is not repairable.

Since the drywall and paint will be damaged when the windows are removed, we will need to paint once the windows are in place and the drywall is repaired. The building hasn't been painted

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

The project has been include on the CIP for at least five years.

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 1,200,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Committed fund balance
Family foundation grants
Corporate donations
State grant(s)
Private donations

List of Attachments (quotes, photos, etc.):

Christman construction quote
Painting quote
Landscaping quote
These documents were attached to the Library CIP application for 2022.

Library Window Project, Continued

Project Description:

All 336 windows will be replaced with highly efficient triple pane windows. The whole interior of the building will be painted after the installation. Much of the landscaping around the building will need to be removed to allow access to the windows. It will be replace/repaired after the windows are in place.

As part of the project the HVAC system will be evaluated as to how much of it needs to be replaced to meet the increased demand, since the new windows will not insulate as well as the old ones. The two roof top units will definitely be replaced.

Project Need:

The exterior windows have become foggy/discolored because of a design flaw. They continue to worsen including allowing moisture to condensing on the outer pane inside the windows and run down to the base of the windows. This is not repairable.

Since the drywall and paint will be damaged when the windows are removed, we will need to paint once the windows are in place and the drywall is repaired. The building hasn't been painted in fifteen years. There are a many nicks and dents in the walls, so we want to take this opportunity to paint the whole building, so the color will be the same all over.

The HVAC roof top unites have reached their life expectancy. They break down fairly regularly and need to be replaced. More efficient new units will meet the building's demands for many years to come.

Scapes

4390 W. Hickory Rd.
Hickory Corners, Mi. 49060

Estimate

Date	Estimate #
11/3/2021	411

Name / Address
Hastings City Library 227 E State St. Hastings, MI 49058

Project

Description	Qty	Cost	Total
Landscape Update - Includes installation of (4) Limelite Hydrangea tress, (2) 10' Blue Point Juniper, (11) Dark Pink Knock Out Rose, (12) May Night Salvia, (5) Wine and Roses Weigela, (6) Stella De Oro Daylillies, (10) Pink Creeping Phlox, (2) yards of garden soil, (18) yards of shredded hardwood mulch to uniformly cover previously mulched area, and watering in new plantings. The Hydrangea trees will replace the (4) Crabapple trees. The roses will replace the small evergreen Yews. The Blue Point Junipers will replace the large upright Arborvitae.The Salvia and Daylilies will accent the roses. The Weigela will replace the large Viburnum and small shrubs between the upright Arborvitae, tieing the look together. The Creeping Phlox will add another slow growing, pretty addition in the Spring.		4,830.00	4,830.00

Please sign and return with 50% deposit to schedule work and reserve materials.

Total $4,830.00

Customer Signature _____

H & H Painting Company, Inc.

Commercial – Institutional – Industrial
1738 N. Westnedge Avenue, Kalamazoo, MI 49007-1715
Phone: 269.342.2465 Fax: 269.342.2052
Kalamazoo – Grand Rapids

August 20, 2021

Brian Crissman
The Christman Company

RE: Hastings Public Library
Painting Budget

Dear Brian:

Following is budget pricing for patching and repainting all walls only on the interior of the library.

Paint (1) coat to match existing colors	$24,000.00
Paint (2) coats color change	$37,600.00

I have not figured painting any ceilings, doors, frames or stair steel.

Please contact me with any questions.

Sincerely,

H & H Painting Co., Inc.

Chad Sisco

CHRISTMAN
BUILDING SINCE 1894

HPL HASTINGS PUBLIC LIBRARY

PROJECT COST SUMMARY

Hastings Public Library

Budget Summary

Hastings, MI

Concept

Revision No.: 00

July 19, 2021

Discipline							
		6,432 GSF	$	122.67 /GSF	$	788,999
WC 18 Window Glazing	A.G.M.		$	101.06 /GSF	$	650,000
WC 27 HVAC & Plumbing	B&V Mech		$	21.61 /GSF	$	139,000
Direct Trade Cost Total:		6,432 BGSF	$	122.67 /GSF	$	789,000
CM Construction Contingency:		10.00%			$	78,000
CM Fee:		10.00%			$	78,000
	Subtotal CM Services:	6,432 BGSF	$	24.25 /GSF	$	156,000
CGL Insurance:		0.75%			$	7,088
	Subtotal Insurances:	6,432 BGSF	$	1.10 /GSF	$	7,088
Building Permit & Plan Review Fee's:		LSUM			$	3,000
	Subtotal Permits:	6,432 BGSF	$	0.47 /GSF	$	3,000
Services, Insurance, and Permit Total:		6,432 BGSF	$	25.82 /GSF	$	166,088
Total Construction Estimate:		6,432 BGSF	$	148.49 /GSF	$	955,088

WC Notes

WC 18

Approximately 4,000 SF of high performance (Triple-Glazed) CW system, i.e. "Best"

Approximately (6) new aluminum entrance doors w/ new hardware

Approximately (4) concealed vent windows

Remove / salvage and re-install (11) aluminum sunshades

WC 27

RTU-1 30 ton Rtu - $62,000

RTU-1 15 ton Rtu - $36,000

Boiler replacment - $45,000

Rough cost, would need to make site visit for a more accuret budget number

Water/Sewer Department		
WS-1	Well 4 Building Repair	35,000
WS-2	Chlorine Detector at Water Plant	13,800
WS-3	Well 3 Upgrade	80,000
WS-4	Water Plant HVAC Improvements	100,000
WS-5	Chlorinator 2 Upgrade	40,000
WS-6	VFD Programming Upgrade	18,000
WS-7	Water System Radio Upgrades	39,000
WS-8	Water Plant Ground Storage Fill Flow Meter Replacement	10,000
WS-9	Booster Station Upgrade	16,500
WS-10	Water Reliability Study	20,000
WS-11	Construct new elevated storage tank	3,000,000
WS-12	Air Scrubber Media Replacement	14,000
WS-13	North Primary Clarifier Mechanism Replacement	100,000
WS-14	Add press to SCADA controls	50,000
WS-15	Screw Addition to Sludge Press	150,000
WS-16	Increase Thickener Capacity	300,000
WS-17	Additional Blower	60,000
WS-18	Railroad St Lift Station Engineering & Replacement	584,000
WS-19	Green/Market St. Sanitary Sewer Replacement (Broadway to Fish Hatchery Park/State St to Green St)	4,772,242
WS-20	Sanitary Sewer Televising Program	252,000
WS-21	Marshall St. Water Main Replacement & LSLR Project (Jefferson to West End)	2,122,171
WS-22	Clinton St. (east)/Dibble Water Main Replacement/Transmission Improvements (Hanover/M37 to State St)	3,396,314
WS-23	Clinton St. (west) Water Main & LSL Replacement Project (Michigan to West End), and S Benton St. Sanitary & Storm Sewer Replacement (Clinton to Walnut)	4,163,670
WS-24	Apple Street Sanitary Trunk Sewer Replacement (600' W of Market to Michigan)	2,491,947
WS-25	Lead Service Line Replacements	15,068,000
WS-26	Mill Street Sanitary Replacement (Michigan to Jefferson)	93,143
WS-27	E. Madison Sanitary Replacement	432,319
WS-28	Smoke Testing for Sanitary Sewer I&I	61,000
WS-29	Water Meter Replacement Program	600,000
WS-30	Sanitary Sewer Spot Repairs	78,000
Total Water/Sewer		38,161,106

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Well 4 Building Repair

Project ID #: _____ CIP ID #: WS-1

Department: Water Anticipated Start Date: 07/2024

Date Prepared: 03/06/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Repair the brick and mortar on the exterior of the building.

Project Need: Provide a brief explanation of why the project is necessary.

The bricks and mortar on the outside of this building are crumbling and showing signs of failure.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 35,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Water & Sewer Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Chlorine Detector - WTP Basement

Project ID #: _____ CIP ID #: WS-2

Department: Water Anticipated Start Date: 07/2023

Date Prepared: 03/02/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Install a chlorine detector with remote alarm and readout in the basement of the water plant.

Project Need: Provide a brief explanation of why the project is necessary.

Provide additional safety for employees and service workers that will enter the basement. A gas chlorine line runs across the ceiling. This system would alert staff to any leaks.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 13,800.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Water & Sewer Fund

List of Attachments (quotes, photos, etc.):

Quote

QUOTATION

Quote #: CO- 18005

Date: 9/7/2022

Job No:

RS Technical Services, Inc.

695 Lincoln Lake Ave.
Lowell, Michigan 49331
(616)-897-7041 Fax (616)-897-3015

To: **HASTINGS WTP (Ship to City Hall)**
101 MILL STREET
HASTINGS MI 49058
Attn
Phone: (269) 945-233 Fax: (269) 948-387

Ship To:

Attn:

Shipping Options: ☐ No Partials ☐ Partials FOB SHIPPING POINT

Item#	Qnty	Part Number	SAP	Description	Unit Price	Amount
1	1	W2T11702		BASE,DUAL POINT ACUTEC 35 ; 85-255 VAC	716.49	716.49
2	1	U29361	W2T11692	WALLACE & TIERNAN ACUTEC-35 Chlorine Gas Monitor includes monitor module showing PPM concentration, and remote Chlorine sensor/transmitter	1663.00	1663.00
3	1	8002.14		Gemini Control Panel w/ (2) Gravity Mount Terminator Actuators with 6 ft. Cables. Also Includes (2) wall mount storage brackets, (1) remote emergency shutoff switch (panic button), and (1) Operation & Maintenance Manual.	10355.00	10355.00
4	4	LABOR		INCLUDES: FIELD SERVICE HOURS, TRAVEL TIME, AND MILEAGE	142.00	568.00
5	1	NOTE		Maintenance/Electrician will install and we will start up system	0.00	0.00

Subtotal:	$13,302.49
Estimated Shipping Charges	$100.00
Salestax:	$0.00
Total:	$13,402.49

Net 30 Day Customers: Please email / fax us your purchase order or indicate your PO #, SIGN and email sales@rstechnicalservices.com or fax back to us so we can proceed with your order.

YOUR PURCHASE ORDER NO.: _____

Visa/MC Customers: Please complete the form below, SIGN, and fax back to us so we can proceed with your order.

Name on Card: _____ 3-Digit Security Code: ☐☐☐

Card Number: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ Exp. Date: _____

☐ Visa
☐ Master Card

PLEASE REFERENCE THIS CO NUMBER WHEN PLACING ORDER - MINIMUM ORDER $25.00 - EXCLUDING SHIPPING

This quotation is valid for 30 days and subject to the attached terms and conditions. Thereafter it is subject to change without notice. Quoted pricing an discounts are predicated on receiving a single order for the quantities as listed. Order deviations may result in price or discount changes. All freight is n prepaid and added to invoices. "Destination" customers: add freight charge to any parts price before issuing your purchase order. All returns subject to 25% restocking fee. Credit Card Order minimum is $100.00. Thank you for this opportunity to quote.

The above prices, specifications and conditions are satisfactory and are hereby accepted.

Authorized Signature: _____ Date: _____ Quoted By: Jared Roberts

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Well 3 Upgrade

Project ID #: _____ CIP ID #: WS-3

Department: Water Anticipated Start Date: 07/2023

Date Prepared: 02/07/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Well 3 complete tear down and service. Upgrade to VFD and Install Meter to monitor water usage. upgrade SCADA Controls. We maintain our wells on a 5 year basis. This well needed to be serviced in 2020. We were waiting on EGLE permit approval.

Project Need: Provide a brief explanation of why the project is necessary.

Project is needed to increase design flow capacity of the well from 1000 gpm to 1400 gpm. This will match the flows of our plant high service pumps allowing this well to maintain without the need to call another well online to maintain wet well level. This will also install a meter on the well providing flow monitoring for EGLE. Upgrading the SCADA controls to add functionality of maintaining a consistent wet well level and monitoring temperature of the water and the building.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

This project was approved by council in early 2020.

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 80,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Water Plant HVAC and Mechanical Improvements

Project ID #: 14 CIP ID #: WS-4

Department: DPS Anticipated Start Date: 07/2023

Date Prepared: 02/17/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Develop a list of furnaces, air conditioners, fans, etc. for the building that require replacement.

Project Need: Provide a brief explanation of why the project is necessary.

Many components to the building (non-water operation) are original or old, leading to costly repairs. They need to be replaced with more efficient and modern equipment.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

no.

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 100,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

water sewer fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Chlorinator #2 Upgrade

Project ID #: _____ CIP ID #: WS-5

Department: Water Anticipated Start Date: 07/2024

Date Prepared: 02/07/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Install electric solenoid valve and logic to allow chlorination of well water prior to aeration and allow the feeding of chlorine to resevoir suction line to boost chlorine residuals at the resevoir before pumping to the system.

Project Need: Provide a brief explanation of why the project is necessary.

This will allow us to get a better iron removal and reduce the smell of rotten egg/sulfur (hydrogen sulfide gas). We would also be able to boost chlorine levels from the ground storage resevoir as needed to ensure safe drinking water with effective levels of chlorine.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 40,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: VFD Programming Upgrades

Project ID #: _____ CIP ID #: WS-6

Department: Water Plant Anticipated Start Date: 07/2024

Date Prepared: 02/15/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Create logic to monitor and control the VFD's on each plant pump.

Project Need: Provide a brief explanation of why the project is necessary.

This would allow us to utilize the VFD's to manipulate the pump runs start and stops to improve efficiency and effectiveness of our pumps. Allowing us to designate a specific flow or increase and decrease capacity due to specific needs (fireflows, tank demands, hydrant flushing, water main breaks). Will enable the pumps to not exceed our filter capacity even when demand is increased.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 18,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Radio Upgrades for Water System

Project ID #: _____ CIP ID #: _____

Department: Water Anticipated Start Date: 07/2023

Date Prepared: 02/15/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Upgrade all radios to new Series GE radios (8 units).

Project Need: Provide a brief explanation of why the project is necessary.

Current radios are no longer supported. parts are limited and will become hard to find for replacements.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 19,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replace Water Plant Ground Storage Fill Flow Meter

Project ID #: _____ CIP ID #: _____

Department: _____ Anticipated Start Date: 07/2023

Date Prepared: 02/15/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of non-functioning flow meter.

Project Need: Provide a brief explanation of why the project is necessary.

This meter measures the flow of water into our ground storage reservoir. The meter is no longer functional and needs to be replaced. The meter is used to monitor the water flow between the distribution system and the reservoir to maintain water tower levels and fill the reservoir at the same time. Without this meter, we do not have readings on how much water is put into the ground storage reservoir.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 10,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Booster Station Upgrade

Project ID #: _____ CIP ID #: WS-9

Department: Water Anticipated Start Date: 07/2023

Date Prepared: 03/02/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replace two, low flow pumps with new, HP pumps, VFDs, and programming to maintain a specific pressure and alternate use between the pumps.

Project Need: Provide a brief explanation of why the project is necessary.

Will allow us to maintain pressure instead of each pump cycling on and off constantly. This would improve efficiency and be less pressure on the pumps. The pump has already had to be replaced twice. The VFDs will allow us to maintain more consistent pressure and increase the longevity of the motor.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 16,500.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Water/Sewer Fund

List of Attachments (quotes, photos, etc.):

PEERLESS MIDWEST INC.
An Employee Owned Company

QUOTATION

City of Hastings
Water Department
Attn: Verne Robbins

QUOTE # RWM 2022-0330

DATE March 30, 2022

REFERENCE **Booster Station Small Booster Pump and VFD addition**

Prepare and submit EGLE Act 399 permit to increse pump size and add VFDs plans and specs as required by EGLE.	$350.00
Replacement Pump:	
New pump to replace small booster: Paco (formerly Grundfos) end suction pump Paco cat# 10-20501-130001-1681P, size 2" x 2.5" NPT, BF close coupled end suction pump w/ std. mech seal and 5HP 3/60/230-460V 3500 RPM ODP prem eff motor. Rated 200 gpm @ 52 ft. TDH. Nickel Aluminum impeller for chlorinated water pumping.	$2,777.83
Labor and materials for mechanical to modify piping and pipe in new pump (allowance, not to exceed), megaflanges, pipe spool, pipe nipples, companion flanges.	$3,750.00
VFD additions to small booster pumps:	
For two(2) 5 HP pumps: Supply 5 HP 460 Volt Allen Bradley Powerflex 400 VFDs, line reactors, motor protector breaker, ethernet cards, ethernet switch, cables, etc.	$7,074.00
Labor and programing to remove old equipment, install VFD, startup and test	$2,500.00
Total:	**$16,451.83**

ACCEPTED BY _____

TITLE _____

DATE _____

PEERLESS-MIDWEST. INC.

Bob Masters

Bob Masters, Project Manager

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Water Reliability Study

Project ID #: 12 CIP ID #: WS-10

Department: DPS Anticipated Start Date: 07/2024

Date Prepared: 03/02/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Water Reliability Study to analyze the capacity and condition of the entire water system.

Project Need: Provide a brief explanation of why the project is necessary.

This study is useful for capital planning. It is required by EGLE every five years.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Required by EGLE every five years.

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 20,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Water/Sewer Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: New 200,000 Gallon Elevated Water Storage Tank - North Pressure District

Project ID #: 13

CIP ID #: WS-12

Department: DPS

Anticipated Start Date: 07/2028

Date Prepared: 03/02/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Construction of new elevated storage tank in the north pressure district. The City would need to secure a 1 acre parcel of land, engineering, design, and construction of an approximately 200,000 gallon spheroidal elevated storage tank.

Project Need: Provide a brief explanation of why the project is necessary.

Our booster station is unable to meet all parameters set by the ten state standards. Although this is not a permit requirement at this time, it may be in the future. Potential development in this area could be delayed if the tank is not included in near future plans.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

In progress.

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 3,000,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Water & Sewer Fund
Federal & State Loans

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Air Makeup Media Replacement

Project ID #: _____ CIP ID #: WS-12

Department: Wastewater Anticipated Start Date: 07/2023

Date Prepared: 02/17/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Charcoal media replacement for the air scrubber in the press room.

Project Need: Provide a brief explanation of why the project is necessary.

The charcoal in this unit is old and broken down. The unit was unused for many years and is now repaired and functional. We believe we will get 2 years out of this media. We received a verbal price from the manufacturer on the cost of the charcoal media. We will do the removal and installation ourselves.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 14,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Water/Sewer Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: North Primary Clarifier Mechanism

Project ID #: _____ CIP ID #: WS-13

Department: Wastewater Anticipated Start Date: 01/2024

Date Prepared: 02/16/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replace the outdated mechanism on the north primary tank. The skimmer scrapper and stilling well.

Project Need: Provide a brief explanation of why the project is necessary.

This would update our North Primary tank with a new mechanism that would tie into our SCADA and create more efficiency in settling.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 100,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Water/Sewer Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Add press to SCADA controls and third screw

Project ID #: _____ CIP ID #: WS-14

Department: WWTP Anticipated Start Date: 07/2025

Date Prepared: 03/03/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Addition of SCADA controls for alternate control.

Project Need: Provide a brief explanation of why the project is necessary.

This will provide an alternate control for the sludge press in case of failure of the current PLC failure.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 50,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Water & Sewer Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Third Screw addition to Sludge Press

Project ID #: _____ CIP ID #: WS-15

Department: Wastewater Anticipated Start Date: 07/2026

Date Prepared: 03/03/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Install third screw in press.

Project Need: Provide a brief explanation of why the project is necessary.

This would give us redundancy on our press if we had a failure in one of the two screws. Our press is already designed for a third screw. This will allow us to shut down and pull maintenance on each screw without losing capacity.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 150,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Water & Sewer Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Increase Thickener Capacity

Project ID #: _____ CIP ID #: WS-16

Department: _____ Anticipated Start Date: 07/2025

Date Prepared: 02/16/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replace existing thickener tank with a larger one that has greater capacity.

Project Need: Provide a brief explanation of why the project is necessary.

Our current thickener has less than optimal capacity. The capacity may need to be approximately doubled. The thickener is 80% full at most times; ideally it would be about 50% full. This would improve the functionality of the wastewater treatment process.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 300,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Water & Sewer Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Additional Blower

Project ID #: _____ CIP ID #: WS-17

Department: Wastewater Anticipated Start Date: 01/2024

Date Prepared: 02/16/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Add a positive displacement blower in addition to the existing blowers.

Project Need: Provide a brief explanation of why the project is necessary.

This blower will allow for a reduced blowing speed to better match the current flows at the treatment plant. This will greatly improve efficiency and allow us to have greater system redundancy.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 60,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Water/Sewer Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Railroad Street Lift Station Engineering

Project ID #: _____ CIP ID #: _____

Department: Wastewater Anticipated Start Date: 07/2023

Date Prepared: 03/07/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Engineering review for replacement or railroad st lift station.

Project Need: Provide a brief explanation of why the project is necessary.

Dilapidated lift station has outlived its useful life and needs to be replaced.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

This project was included in previous CIP from Prein and Newhoff for 2027.

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 60,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Water & Sewer Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Green/Market St Sanitary Sewer Replacement & Improvements

Project ID #: _____ CIP ID #: WS19 & MS7

Department: DPS Anticipated Start Date: 08/2024

Date Prepared: 03/08/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of sanitary sewer on Green Street from Broadway to Fish Hatchery Park. Replace lead service lines. Resurface road.

Project Need: Provide a brief explanation of why the project is necessary.

Capacity in the sewer main needs to be increased from 10 inches to 12 inches. Sewer main has numerous defects and high consequence of failure. Adjacent properties have lead service lines that require replacement under EGLE rules. Road surface is deteriorated.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Yes, previous CIPs

Does the project share space or overlap with other CIP projects? Please describe.

Yes - multiple infrastructure improvements to be completed as a part of this project.

Project Cost: $ 6,123,829.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Water/Sewer Funds
SRF Loan
USDA-RD Loan
EDF-B Grant

List of Attachments (quotes, photos, etc.):

Project Summary: Green St. and Market St. Sanitary Sewer Replacement

Project No: 23003

Project Scope:
Primarily sanitary sewer replacement with full storm and street reconstruction. Install 5,000 feet of 12-inch sanitary sewer. Replace 1,000 feet of 8-inch water main in Market Street. Replace 6,000 feet of storm sewer. Full street reconstruct with curb & gutter. Water service line replacements (69 assumed). Rebuild intersection on Green/Market for traffic safety. Review for additional pedestrian mobility and tree impacts.

Need: Replace old clay sanitary sewer with structural failures and infiltration/inflow issues. Insufficient sewer diameter and slope per 2018 flow study. Potential to consolidate parallel sewers on Green Street to improve solids deposition and reduce future system replacement cost. Sanitary failures include cracks, fractures, holes, large roots, exposed aggregate indicating wall corrosion, grease/debris buildup, and velocity/solids deposition. Storm sewer replacement with road reconstruction due to age and condition, but some storm pipes in the project area have not had CCTV inspection. Storm failures found in CCTV'd pipes include utility penetrations, cracks, fractures, and deformed pipe. Replace old cast iron water pipes on Market Street at the end of their useful lifecycle with breaks noted. Water main on Green is assumed in good condition and 1970's ductile iron. All water service lines are assumed to require replacement per State of Michigan requirements. City's 2016 Bike Master Plan recommended 10.5' drive lines with 4' bike lanes with road reconstruction.

Planned Year: 2023

Anticipated Project Costs:

Local Street Fund	$1,313,000
Sanitary Fund	$3,004,000
Water Fund	$1,373,000

Potential Funding Sources:

City Sanitary/Water/Storm/Street Funds. Low interest loans CW/DWSRF or USDA-RD programs. Street grants MDOT Small Urban or TEDF-B programs.

Prein&Newhof

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Sanitary Sewer Televising Program

Project ID #: _____ CIP ID #: WS-20

Department: Sewer Anticipated Start Date: 07/2023

Date Prepared: 03/08/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Televising additional sanitary sewer lines throughout the collection system.

Project Need: Provide a brief explanation of why the project is necessary.

46% sanitary sewer has been televised to date, SAW BRE methodology did not prioritize many failing ROF 4/5 pipe issues, recommend additional review of CCTV results and additional televising on 5 yr or 10 year cycle is recommended by our engineers.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Prior CIP

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 252,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Water & Sewer Fund
Cost to be spread out over a six year period.

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Marshall Street Water Main Replacement (including LSLRs and road improvements)

Project ID #: _____ CIP ID #: WS-21 and LS-1

Department: DPS Anticipated Start Date: 07/2025

Date Prepared: 03/09/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replace 2,500 ft water main and approximately 40 lead service lines. Full street to be reconstructed with 4inch HMA, minimal storm repairs.

Project Need: Provide a brief explanation of why the project is necessary.

History of water main breaks, aging service, lead service lines. Significant road deterioration.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Previous CIP

Does the project share space or overlap with other CIP projects? Please describe.

Yes, as described above

Project Cost: $ 2,316,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Water & Sewer Fund
DWSRF or USDA Loan
Local Streets Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Clinton St. (east)/Dibble Water Main Replacement/Transmission Improvements (Hanover/M37 to State St)

Project ID #: _____ CIP ID #: WS-22 and MS-9

Department: DPS Anticipated Start Date: 07/2025

Date Prepared: 03/09/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Transmission loop per WRS/City, Replace ex. 8" cast 1940's (breaks) with 12" on Clinton, New 12" extension on Dibble (1,200 ft total), reliability, fire flow, approximately 15 lead service lines need replacing. Sanitary sewer - ROF 5 spot repairs or pipe replacement 1940's VC

Project Need: Provide a brief explanation of why the project is necessary.

Improve service and replace aging infrastructure

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Previous CIP

Does the project share space or overlap with other CIP projects? Please describe.

As described above

Project Cost: $ 3,828,160.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Water/Sewer Fund
DWSRF Loan
USDA Loan

List of Attachments (quotes, photos, etc.):

Project Summary: Clinton St. (East)/Dibble Water Main Improvements

Project No: 25002

Project Scope:

Water main extension/replacement with full street reconstruction and sanitary sewer replacement. Install 1,100 feet 12-inch and 3,200 feet 8-inch water main. Extend water main on Dibble from Madison to Clinton. Replace 2,500 feet 8-inch sanitary sewer and 2,800 feet storm sewer. Full street reconstruct with curb & gutter and sidewalk. Water service line replacements (45 assumed).

Need: Replace old cast iron water pipes with insufficient diameter and frequent breaks at the end of their useful lifecycle. Finish a transmission loop partially completed in 2020 as recommended in the 2018 Water System Reliability Study. Increasing pipe diameter will greatly improve available fire flow and system reliability. Existing water mains (8"/6"/4") are undersized and experience frequent breaks. The 1926 clay sanitary sewer is in poor to failing condition with broken pipes, holes, fractures, and cracks. All water service lines are assumed to require replacement per State of Michigan requirements. City's 2016 Bike Master Plan recommended 10' drive lines with 4' bike lanes and an 8' parking lane with road reconstruction. Project to fill gaps in the existing sidewalk network on north side of Clinton.

Planned Year: 2025

Potential Funding Sources:

City Sanitary/Water/Storm/Street Funds. Low interest loans DWSRF or USDA-RD programs. MEDC utility grants. MDOT Small Urban or TEDF-B programs.

Anticipated Project Costs:

Local Street Fund	$432,000
Sanitary Fund	$998,000
Water Fund	$2,221,000

Prein&Newhof

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Clinton St (west) Water Main & LSLR(Michigan to West End) and S Benton Sanitary & Storm Replacement (Clinton to Walnut)

Project ID #: _____ CIP ID #: WS-23 and MS-10

Department: DPS Anticipated Start Date: 07/2025

Date Prepared: 03/09/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replace 4,000 ft main 8"/12" (breaks), and approximately 65 lead service line replacements. Full street reconstruct with 4" HMA/C&G, minimal storm, no sanitary.

Project Need: Provide a brief explanation of why the project is necessary.

Aging infrastructure, numerous water main breaks, deteriorated pavement condition. Lead service lines to be replaced.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Yes, prior CIP

Does the project share space or overlap with other CIP projects? Please describe.

Yes, with projects WS-22 and MS-9

Project Cost: $ 4,431,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Water/Sewer Funds
DW/CWSRF
USDA Loan

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Apple Street Sanitary Truck Sewer Replacement

Project ID #: _____ CIP ID #: WS-24

Department: Sewer Anticipated Start Date: 07/2026

Date Prepared: 03/09/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replace 1950 feet of 15 inch sewer and upsize 850 feet of sewer to 24 inches.

Project Need: Provide a brief explanation of why the project is necessary.

Will improve capacity. Line has multiple fractures and I/I concerns.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Included in Previous CIPs. Applied in 2022 for MEDC funding.

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 2,491,947.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

MEDC infrastructure grant
Water/Sewer Funds

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Lead Service Line Replacements

Project ID #: _____ CIP ID #: WS-25

Department: Water Anticipated Start Date: 07/2026

Date Prepared: 03/08/2023

Project Description: Provide a brief physical description of the project. Please be specific.

System wide lead service line replacements to comply with state standards

Project Need: Provide a brief explanation of why the project is necessary.

Replacement of all lead service lines is required within the next 17 years. The city must average 5% replacement per year.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 15,068,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

DWSRF loan
Water/Sewer Funds

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Mill Street Sanitary Replacement (Michigan to Jefferson)

Project ID #: _____ CIP ID #: WS-26 and LS-5

Department: Sewer Anticipated Start Date: 07/2026

Date Prepared: 03/09/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Probable replacement of 150 ft of sewer main. Large sag was found in the line and a camera couldn't get through. Flow was not blocked in 2018. Additional investigation is needed to fully determine the project scope. Road repairs.

Project Need: Provide a brief explanation of why the project is necessary.

Damage found in the line.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Previous CIP

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 93,143.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Water/Sewer Funds
Local Streets Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: E. Madison Sanitary Replacement

Project ID #: _____ CIP ID #: WS-27

Department: Sewer Anticipated Start Date: 07/2028

Date Prepared: 03/09/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replace 730 ft of sanitary sewer line

Project Need: Provide a brief explanation of why the project is necessary.

Aging infrastructure

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Prior CIP

Does the project share space or overlap with other CIP projects? Please describe.

NO

Project Cost: $ 433,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Water/Sewer Funds

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Smoke Testing for Sanitary Sewer

Project ID #: _____ CIP ID #: WS-28

Department: Sewer Anticipated Start Date: 07/2027

Date Prepared: 03/08/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Smoke testing to detect areas of inflow and infiltration (I&I) into the sewer system.

Project Need: Provide a brief explanation of why the project is necessary.

2018 televising/flow study found I&I issues. Smoke testing the high I&I districts will identify sources of I&I.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Previous CIP

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 61,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Water/Sewer Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Water Meter Replacements

Project ID #: _____ CIP ID #: WS-29

Department: Water Anticipated Start Date: 07/2023

Date Prepared: 03/08/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replace 25% of water meters for four years until all the old meters are replaced.

Project Need: Provide a brief explanation of why the project is necessary.

Meters slow down as they age leading to lower revenue for the water system.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 600,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Water/Sewer Funds
(200K per year)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Sanitary Sewer Spot Repairs

Project ID #: _____ CIP ID #: WS-30

Department: Sewer Anticipated Start Date: 07/2028

Date Prepared: 03/09/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Repair various portions of sewer main throughout the collection system.

Project Need: Provide a brief explanation of why the project is necessary.

Repair of defects found during camera investigations.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Prior CIPs

Does the project share space or overlap with other CIP projects? Please describe.

Unknown.

Project Cost: $ 78,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Water/Sewer Fund

List of Attachments (quotes, photos, etc.):

Streets		
MS-1	State Rd Resurfacing	274,954
MS-2	Michigan Ave Bridge Maintenance	50,000
MS-3	E. Grand Street mill & resurface	700,000
MS-4	State St Storm Sewer Replacement	400,000
LS-1	Road Gravel	10,000
LS-5	Mill St (Michigan to Jefferson)	10,388
MS-5	Boltwood Storm Sewer Replacement	30,000
MS-6	E. Grand Street storm sewer replacement	210,000
MS-7	Green/Market St. (Broadway to Fish Hatchery Park/State St to Green St)	1,351,587
LS-1	Marshall St. (Jefferson to West End)	193,194
MS-9	Clinton St. (east)/Dibble (Hanover/M37 to State St)	431,846
MS-10	Clinton St. (west) (Michigan to West End), and S Benton Storm Sewer Replacement (Clinton to Walnut)	267,062
S-1	Storm Sewer Televising Program	366,000
S-2	Storm Sewer Spot Repairs	38,807
Total Streets		4,333,838

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: State Road Resurface

Project ID #: 3

CIP ID #: MS-1

Department: DPS

Anticipated Start Date: 07/2023

Date Prepared: 02/17/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Mill and Pave 3.5" of HMA from Glenwood to Broadway Avenue. Also replace miscellaneous curb and gutter and paint striping.

Project Need: Provide a brief explanation of why the project is necessary.

Road surface deterioration. High traffic road/main thoroughfare to the City.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Yes - local TIP

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 274,954.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Small Urban Grant ($231,204)
Local match is ($43,750)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Michigan Ave Bridge Maintenance

Project ID #: _____ CIP ID #: _____

Department: DPS Anticipated Start Date: 07/2024

Date Prepared: 03/07/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Sandblasting and repainting of the Michigan Ave bridge

Project Need: Provide a brief explanation of why the project is necessary.

The bridge was constructed and painted in 2011. Paint is starting to flake off and is starting to create small pits that may start to deteriorate the surface if not maintained.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 50,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Major Streets Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: East Grand Street (Hanover to State)

Project ID #: 11

CIP ID #: MS-3

Department: DPS

Anticipated Start Date: 07/2028

Date Prepared: 02/17/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Mill and pave 3.5" of HMA, replace curb and gutter and sidewalk ramps.

Project Need: Provide a brief explanation of why the project is necessary.

Existing roadway is deteriorated. Road experiences relatively high traffic volumes including truck traffic.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Yes, engineering was started but the project was shelved due to expense.

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 700,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Small Urban Grant ($375,000)
Major Streets Fund (remaining balance)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: State Street Storm Replacement (Boltwood to Michigan)

Project ID #: 9

CIP ID #: MS-4

Department: DPS

Anticipated Start Date: 08/2026

Date Prepared: 02/17/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replace existing storm sewer under State Street from Michigan Avenue to Boltwood. Repave section of road over trench and mill and pave 2" over rest of street.

Project Need: Provide a brief explanation of why the project is necessary.

Deterioration of the storm sewer in this area has led to street deformation.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 345,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Major Street Fund
Potential DDA Funds

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Purchase of 22A Road Gravel

Project ID #: _____ CIP ID #: LS-1

Department: DPS Anticipated Start Date: 07/2023

Date Prepared: 01/16/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Purchase of road gravel specifically for dirt roads.

Project Need: Provide a brief explanation of why the project is necessary.

This would allow us to maintain our gravel roads better and would also allow our dust control to poteintally last longer. It also has more of a clay base than the crushed concrete we currently use.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 10,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Local Streets Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Boltwood Storm Sewer Replacement (South of Mill St)

Project ID #: _____ CIP ID #: MS-5

Department: MS-5 Anticipated Start Date: 07/2023

Date Prepared: 03/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replace storm sewer on Boltwood, south of Mill Street.

Project Need: Provide a brief explanation of why the project is necessary.

Known hole in bottom of storm pipe

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Prior CIP

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 30,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Major Streets Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: E. Grand Storm Replacement (Michigan to Hanover)

Project ID #: _____ CIP ID #: MS-6

Department: Major Streets Anticipated Start Date: 07/2028

Date Prepared: 03/07/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of storm sewer under E. Grand between Michigan and Hanover.

Project Need: Provide a brief explanation of why the project is necessary.

Storm sewer deterioration

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

Yes - E. Grand resurface project

Project Cost: $ 210,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Major Street Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Storm Sewer Televising Program

Project ID #: _____ CIP ID #: S-1

Department: DPS Anticipated Start Date: 07/2023

Date Prepared: 03/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Continued storm sewer CCTV and review of results

Project Need: Provide a brief explanation of why the project is necessary.

Only 12% of storm sewer has been televised to date, SAW BRE methodology did not prioritize many failing pipe issues.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Prior CIP

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 366,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Major and Local Streets Funds

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Storm Spot Repairs

Project ID #: _____ CIP ID #: S-2

Department: DPS Anticipated Start Date: 07/2028

Date Prepared: 03/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Spot repair deficiencies found in system during review of cctv results

Project Need: Provide a brief explanation of why the project is necessary.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Prior CIP

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 38,807.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Major and Local Streets

List of Attachments (quotes, photos, etc.):

Cemetery		
RC-2	Riverside Cemetery Reflective Area	100,000
Total Cemetery		100,000

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Riverside Cemetery Reflective Area

Project ID #: _____ CIP ID #: RC-2

Department: Cemetery Administration Anticipated Start Date: 04/2023

Date Prepared: 02/20/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Creation of a designated space within the Riverside Memorial Cemetery that will be for reflection with possible plan for memorial recognition. Potential improvements to include memorial wall, landscaping, memorial pavers, fountain, benches, etc. Access will be provided for people of all abilities.

Project Need: Provide a brief explanation of why the project is necessary.

When the cemetery was acquired in 2014, a reflective space was included in the original plans for updating and improving the cemetery.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Cemetery Master Plan

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 100,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Cemetery millage
Committed fund balance

List of Attachments (quotes, photos, etc.):

none

TIF Funds		
DDA-1	Parking Lot 8 Reconstruction	200,000
DDA-2	State Streetscape Reconstruction	2,800,000
DDA-3	Thornapple Plaza & Spray Plaza Stage Maintenance	15,000
LDFA-1	Semi-Parking Lot Mill & Reshape	30,000
LDFA-2	Mill & Resurface Enterprise Drive	150,000
Total TIF		3,195,000

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Parking Lot 8 Reconstruction

Project ID #: _____ CIP ID #: DDA1

Department: DDA Anticipated Start Date: 07/2023

Date Prepared: 02/20/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Reconstruct Parking lot #8 consisting of +/- 15,000 sqft.

Project Need: Provide a brief explanation of why the project is necessary.

Parking lot 8 was never completed after the purchase of the former Ace Building. The opening of the lofts at 128 increases the need to enhance the parking lot to City zoning standards. A portion of the lot has not ever been paved.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 200,000.00

Please check one of the following for cost basis:

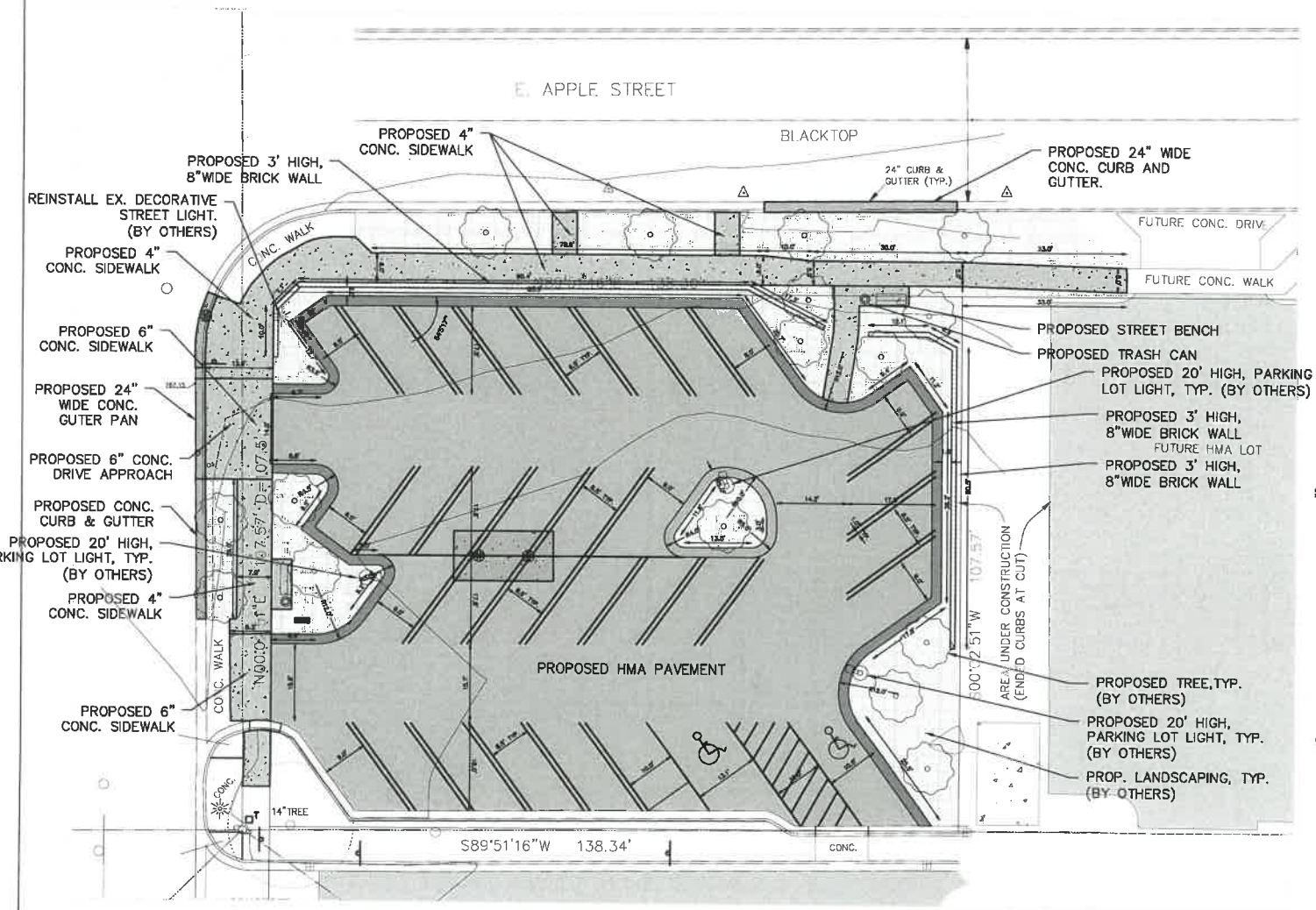
- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

DDA Funds
General Fund

List of Attachments (quotes, photos, etc.):

Plan Set



PROPOSED LOT 8 LAYOUT PLAN

SCALE: 1" = 10'

EXISTING LEGEND

- = IRON STAKE FOUND
- = IRON STAKE SET
- = UTILITY POLE & GUY WIRE
- = SIGN
- = HYDRANT
- = WATERMAIN VALVE
- = CATCH BASIN
- = MANHOLE
- = FENCE LINE
- = OVERHEAD WIRES
- R = RECORDED DIMENSION
- 1' CONTOUR INTERVAL
- = EXISTING TREE LINE

SCALE: 1"=10'

PROPOSED LEGEND

- CONC. CURB & GUTTER
- CONC. SIDEWALK
- HMA PARKING LOT PAVING
- BRICK WALL
- TREE
- LANDSCAPING OR RESTORATION
- BENCH
- TRASH CAN

SITE NOTES:

1. OVERAL AREA = 14,877 SF
2. PROP. IMPERVIOUS AREA = 12,190 SF
   - 2.1. HMA LOT AREA = 11,170 SF
   - 2.2. CURB & GUTTER = 615 SF
   - 2.3. SIDEWALK = 145 SF
   - 2.4. BRICK WALL = 60
3. LANDSCAPE AREA = 2,687 SF
4. PERCENT IMPERVIOUS AREA = 82%
5. PARCEL NO. 55-201-050-20
6. ZONED B-1, CENTRAL BUSINESS DISTRICT
7. PARKING LOT SPACES:
   - 7.1. STANDARD SPACES = 30 EA
   - 7.2. HANDICAP SPACES = 2 EA
   - TOTAL = 32 EA

GENERAL NOTES:

1. THE LANDSCAPING AND PARKING LOT LIGHT WORK WILL BE DONE BY OTHERS FOR A DIFFERENT CONTRACT. COORDINATION AND SCHEDULING WILL BE REQUIRED

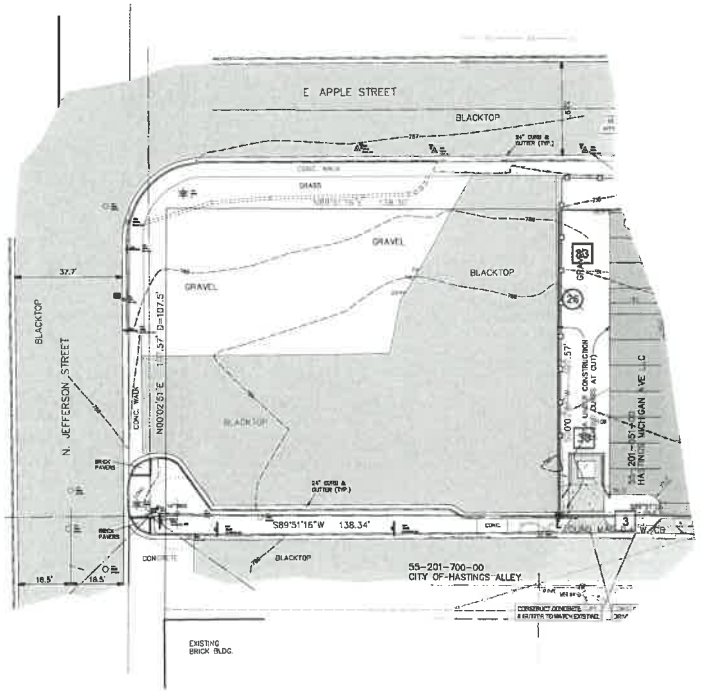
REVISIONS

1	PRELIM-08-17-22
2	BID-09-29-22
3	
4	
5	

PROPOSED PARKING LOT 8 RECONSTRUCTION
125 N. JEFFERSON STREET
CITY OF HASTINGS
201 E. STATE STREET
HASTINGS, MICHIGAN 49058
PROPOSED LAYOUT PLAN

DRAWN BY: TJT 08/22

Sheet No.:
C1



Description per Reynolds survey, No.: 13238 dated Dec. 24 2013:
Part of Lots 438, 439 and 440 of the original Plat of the Village of Hastings, Michigan, according to the recorded plat thereof, being more particularly described as follows: Beginning at the Northwest corner of said Lot 438, said Northwest corner being the intersection of the east line of Jefferson street and the South line of a Railroad Right-of-Way and the North line of said Lots 438, 439 and 440 a distance of 138.30 feet; thence S00°03'40"E 107.50 feet to a point 24.5 North of the South line of said Lot 440; thence S89°45W 138.30 feet to a point on the West line of said Lot 438, which lies N00°03'40"W 24.50 feet from the Southwest corner of said Lot 438; thence N00°03'40"W to the Place of Beginning.

Notes:
Bearings based the Reynolds survey, No.: 13238 dated Dec. 24 2013.

Utility structures visible on the ground surface have been located and shown per actual measurements.

No title work was furnished for this survey. A commitment for title insurance should be obtained in order to determine easements, restrictions and other covenants which may affect the property.

STATE OF MICHIGAN
CAMERON REID LEAR
License No. 6001067178
PROFESSIONAL SURVEYOR

SCALE: 1" = 20'
1' CONTOUR INTERVAL

LEGEND

- o = IRON STAKE FOUND
- • = IRON STAKE SET
- ⊕ = MONUMENT
- ⊗ = UTILITY POLE
- ✲ = LIGHT POLE
- ⊢ = SIGN
- SB = STOP BOX
- ⊞ = CATCH BASIN
- ○ = MANHOLE
- T□ = TELEPHONE BOX
- T△ = BURIED TELEPHONE MARKER
- FENCE LINE
- OVERHEAD WIRES

TOPOGRAPHICAL SURVEY
RE: 125 N. JEFFERSON ST.
FOR: CITY OF HASTINGS
ATTN: TRAVIS TATE, PE
201 E. STATE ST.
HASTINGS, MI 49058
PART OF THE NW 1/4, SECTION 17, T3N, R8W, CITY OF HASTINGS, BARRY COUNTY, MICHIGAN

excel engineering, inc.
planners · engineers · surveyors
5252 Clyde Park, S.W. · Grand Rapids, MI 49509
Phone: (616) 531-3660 www.excelengineering.com

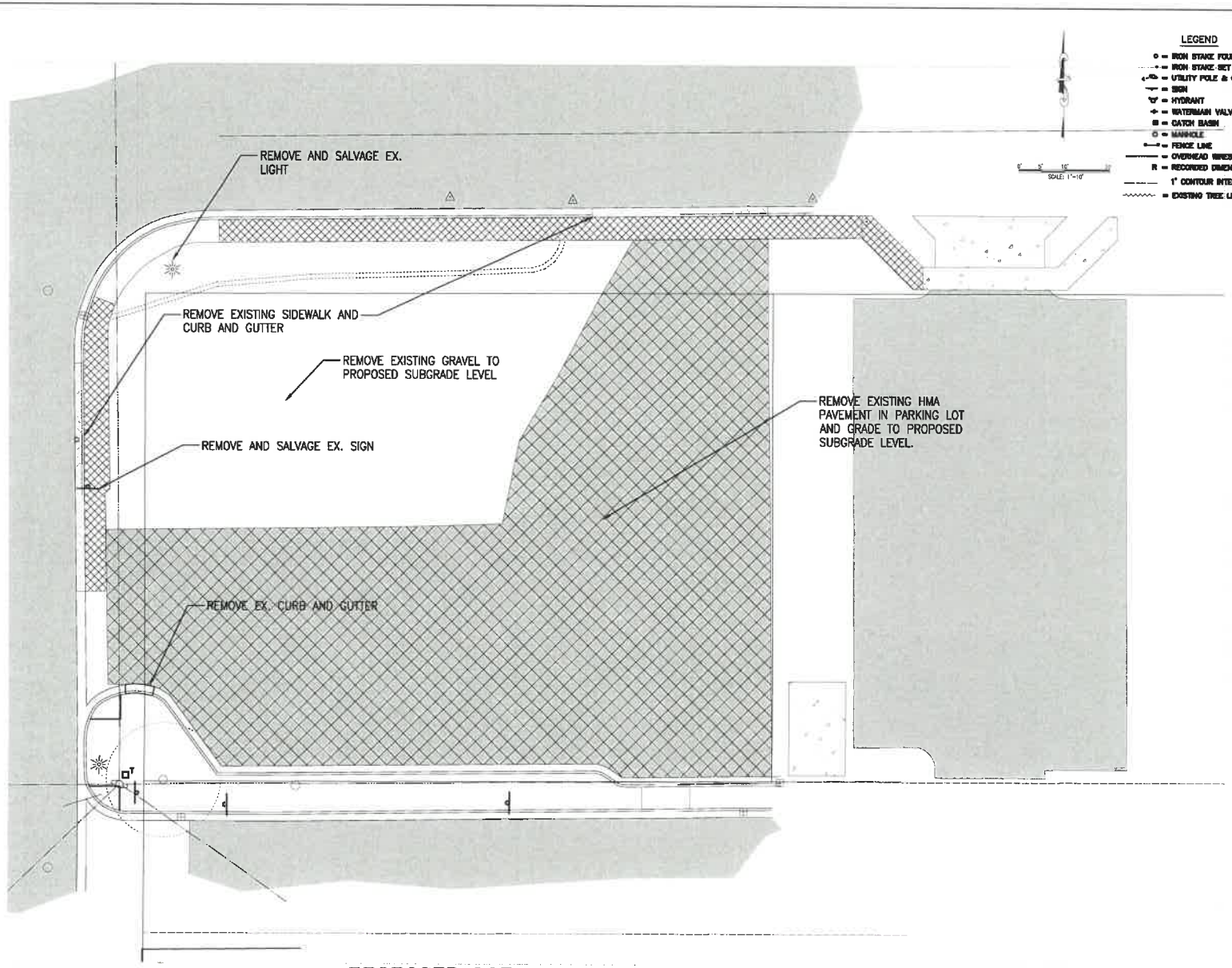
DRAWN BY: BG | PROJ. ENG.: -
APPROVED BY: CL | PROJ. SURV.: CL
FILE NO.: 13238 | DATE: 6/6/2022

SHEET 2 of 5

REVISIONS	
1	PRELIM - 06-17-22
2	BID - 09-29-22
3	
4	
5	

PROPOSED PARKING LOT B RECONSTRUCTION
125 N. JEFFERSON STREET
201 E. STATE STREET
HASTINGS, MICHIGAN 49058
EXISTING CONDITIONS

Sheet No.:
C2



PROPOSED LOT 8 REMOVAL

SCALE: 1" = 10'

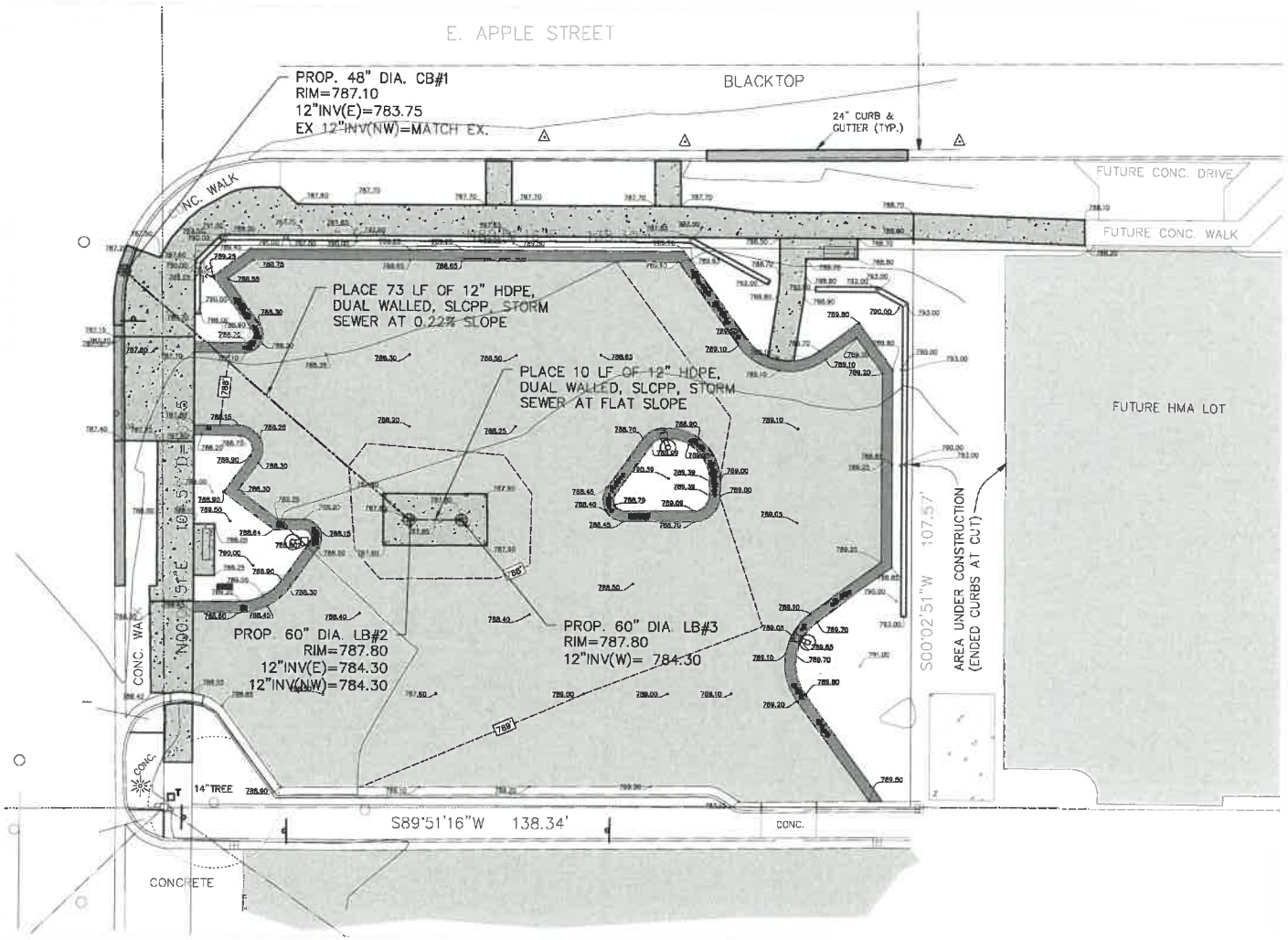
REVISIONS

1	PRELIM 08-17-22
2	BID 09-29-22

PROPOSED PARKING LOT 8 RECONSTRUCTION
125 N. JEFFERSON STREET
CITY OF HASTINGS
201 E. STATE STREET
HASTINGS, MICHIGAN 49058

REMOVAL PLAN

Sheet No.:
C3



PROPOSED LOT 8 GRADING AND STORM SEWER PLAN

SCALE: 1" = 10'

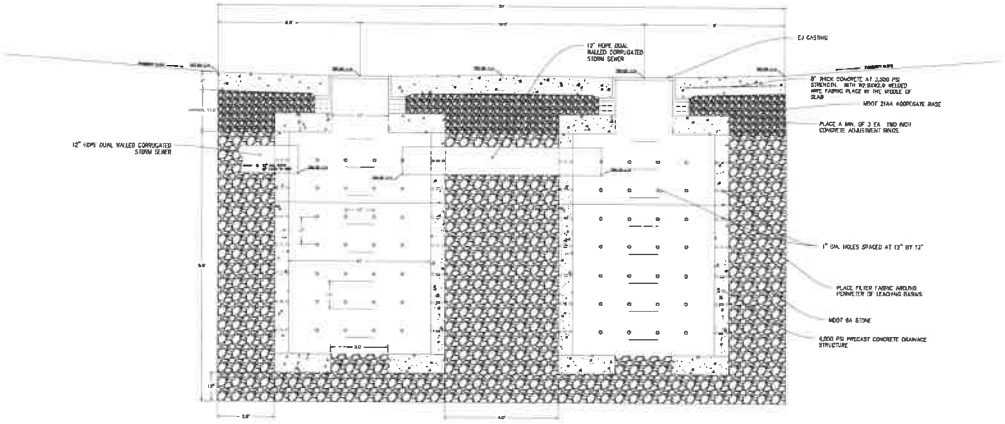
REVISIONS
REV 07-29-22
BID 09-29-22

PROPOSED PARKING LOT 8 RECONSTRUCTION
125 N JEFFERSON STREET
CITY OF HASTINGS
201 E. STATE STREET
HASTINGS, MICHIGAN 49058
PROPOSED GRADING PLAN

Sheet No.
C4

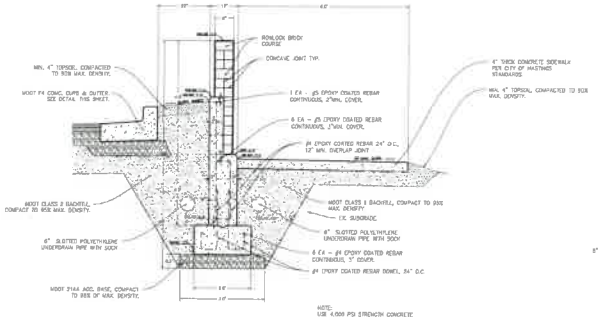
GENERAL NOTES:

1. EXISTING UTILITIES SHOWN ARE FROM RECORD PLANS AND EVIDENCE IN THE FIELD. NO GUARANTEE IS MADE FOR ACCURACY OR THAT THE UTILITIES SHOWN ARE THE ONLY IN THE AREA. CONTRACTOR SHALL VERIFY EXISTING CONDITIONS PRIOR TO CONSTRUCTION. ANY DISCREPANCIES FOUND ARE TO BE BROUGHT TO ENGINEER'S AND DIRECTOR OF PUBLIC SERVICES ATTENTION PRIOR TO COMMENCEMENT OR CONTINUATION OR CONTINUATION OF CONSTRUCTION ACTIVITIES.
2. CONTRACTOR SHALL PERFORM ALL CONSTRUCTION ACTIVITIES IN A MANNER TO MINIMIZE INCONVENIENCE TO ADJACENT BUSINESS AND RESIDENCES.
3. ALL CONSTRUCTION METHODS AND MATERIALS SHALL COMPLY WITH CURRENT CITY OF HASTINGS AND CURRENT MDOT STANDARDS AND SPECIFICATIONS FOR CONSTRUCTION. NO CONSTRUCTION SHALL COMMENCE UNTIL ALL REQUIRED PERMITS HAVE BEEN ISSUED.
4. CONTRACTOR SHALL KEEP ALL FIRE LANES OPEN & ACCESSIBLE DURING CONSTRUCTION AT ALL TIMES.
5. CONSTRUCTION TRAFFIC SHALL BE MINIMIZED ON ANY NEW PAVEMENT. THE CONTRACTOR SHALL REPAIR ANY DAMAGE OR FAILURE CAUSED BY CONSTRUCTION ACTIVITIES, AS WELL AS REPAIR ANY DAMAGE OR FAILURE CAUSED BY CONSTRUCTION ACTIVITIES, AS WELL AS REPAIRING LOAD DAMAGE ON THE EXISTING PAVEMENT SYSTEM TO THE SATISFACTION OF THE ENGINEER AND DIRECTOR OF PUBLIC SERVICES.
6. ALL CONSTRUCTION ACTIVITIES SHALL BE STAKED AND GRADED UNDER THE SUPERVISION OF A LICENSED LAND SURVEYOR.
7. STORM SEWER PIPE SHALL CONFORM TO THE CITY OF HASTINGS STANDARDS, UNLESS APPROVED BY THE DIRECTOR OF PUBLIC SERVICES.
8. A QUALIFIED GEOTECHNICAL ENGINEER SHALL BE CONTRACTED TO MONITOR EARTHWORK & PAVING ACTIVITIES.
9. STORMWATER SHALL BE COLLECTED AND DISCHARGED TO THE CITY OF HASTINGS STORM SEWER SYSTEM.
10. CONTRACTOR SHALL BE REQUIRED TO PROVIDE CLEAN-UP OPERATIONS ALONG & ON ANY ADJACENT PAVED SURFACE WHERE DIRT AND/OR RELATED WORK AS A MINIMUM CLEANUP WILL BE DONE ON A DAILY BASIS.
11. ALL DISTURBED AREAS TO BE SEEDED WITHIN 5 CALENDAR DAYS OF ACHIEVING FINAL GRADE.

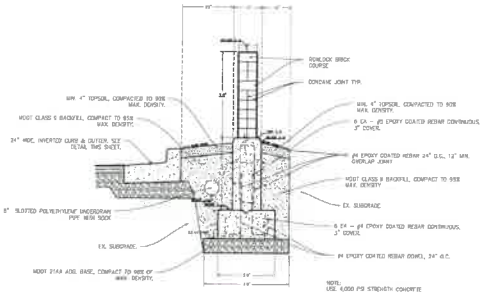


DUAL LEACHING BASING SECTION:
SCALE: 1"=0'-6"

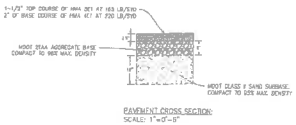
24" INVERTED CURB & GUTTER:
SCALE: 1"=0'-6"



BRICK WALL – CONC. RETAINING WALL- SIDEWALK SECTION:
SCALE: 1"=0'-6"



BRICK WALL – CONC. FOUNDATION WALL SECTION:
SCALE: 1"=0'-6"



PAVEMENT CROSS SECTION:
SCALE: 1"=0'-6"

REVISIONS
REV 07-29-22
BID 09-29-22

PROPOSED PARKING LOT & RECONSTRUCTION
125 N. JEFFERSON STREET
CVS HASTINGS
201 E. STATE STREET
HASTINGS, MICHIGAN 49058
DETAIL SHEET

SHEET No.:
C5

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: State Street Streetscape Reconstruction

Project ID #: _____ CIP ID #: DDA-2

Department: DDA Anticipated Start Date: 03/2023

Date Prepared: 02/20/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Design & Construction for State St streetscape improvements from Broadway to Boltwood. Improvements to include new light poles, mid-block crosswalks, fireplace, sidewalks, seating, landscaping, and similar amenities.

Project Need: Provide a brief explanation of why the project is necessary.

The streetscape was last updated approximately 30 years ago. Approximately half of the trees in the project area have died, sidewalk has heaved, crossings are deteriorated, and a streetlight has blown down in a wind storm. A new streetscape will improve safety and pedestrian oriented infrastructure as well as assist in placemaking and economic development efforts to the core downtown.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Master Plan and past CIPs. Currently in development.

Does the project share space or overlap with other CIP projects? Please describe.

No.

Project Cost: $ 2,800,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

DDA Fund Balance
Bonds

List of Attachments (quotes, photos, etc.):

Cost Estimate
Concept Plans

MCSA GROUP, Inc.
Landscape Architects and Architects
EAST GRAND RAPIDS • MICHIGAN

Landscape Architecture
Park & Recreation Planning
Architecture • Urban Design
Sports Facility Planning

CITY OF HASTINGS

STREETSCAPE IMPROVEMENTS

ORDER OF MAGNITUDE COST ESTIMATE

November 16, 2022

Description	Unit	No. of Units	Price	Extension
GENERAL CONDITIONS				
Mobilization	LS	1	$40,000.00	$40,000.00
Insurance, Permits, and Bonds	LS	1	$12,000.00	$12,000.00
Layout and Staking	LS	1	$15,000.00	$15,000.00
General Conditions (M, O & P@5%)	LS	1	$98,501.00	$98,501.00
SUBTOTAL				**$165,501.00**
REMOVALS/SITE PREPARATION				
Paving Removal	SF	46,034	$3.00	$138,102.00
Light Removal	EA	62	$500.00	$31,000.00
Grading, Soil Erosion, & Sedimentation Control	SY	7,307	$3.30	$24,113.10
SUBTOTAL				**$193,215.10**
PAVING				
Concrete Paving	SF	14,836	$10.00	$148,360.00
Concrete Sculpture Pedestals	EA	4	$450.00	$1,800.00
Colored Concrete	SF	15,640	$15.00	$234,600.00
Exposed Aggregate Paving	SF	5,300	$15.00	$79,500.00
Concrete Curb and Gutter	LF	473	$33.00	$15,609.00
Remove and Replace Planter Curb	LF	559	$33.00	$18,447.00
Brick Pavers	LF	1,015	$45.00	$45,675.00
Colored Concrete Crosswalks	SF	3,940	$15.00	$59,100.00
Truncated Domes	SF	192	$40.00	$7,680.00
Bituminous Patch	LS	1	$20,000.00	$20,000.00
SUBTOTAL				**$630,771.00**

MCSA GROUP, Inc.
Landscape Architects and Architects
EAST GRAND RAPIDS • MICHIGAN

Landscape Architecture
Park & Recreation Planning
Architecture • Urban Design
Sports Facility Planning

Description	Unit	No. of Units	Price	Extension
SITE STRUCTURES/AMENITIES				
2' x 6' Planters (with pedestal, soil and irrigation)	EA	16	$2,235.00	$35,760.00
4' Diameter Planters (with pedestal, soil and irrigation)	EA	50	$3,000.00	$150,000.00
Brick Accent Walls	LF	172	$250.00	$43,000.00
Covered Bench	EA	2	$8,000.00	$16,000.00
Swing Bench	EA	1	$10,000.00	$10,000.00
Repaint/ Replace Trash and Bollards	LS	1	$25,000.00	$25,000.00
Picnic Tables	EA	10	$3,000.00	$30,000.00
Table and Chair Set with Umbrella	EA	14	$1,000.00	$14,000.00
Bike Racks	EA	4	$300.00	$1,200.00
Benches	EA	16	$2,500.00	$40,000.00
Bollards	EA	20	$3,000.00	$60,000.00
Traffic Control Signage	LS	1	$10,000.00	$10,000.00
Outdoor Fireplace	LS	1	$40,000.00	$40,000.00
Shade Structure	EA	1	$25,000.00	$25,000.00
Screen Panels	EA	12	$5,000.00	$60,000.00
SUBTOTAL				**$559,960.00**
SITE UTILITIES				
Tall LED Streetlights	EA	12	$5,000.00	$60,000.00
Short LED Streetlights	EA	27	$4,500.00	$121,500.00
Commercial String Lights	EA	5	$500.00	$2,500.00
Electrical Distribution	LF	3,139	$25.00	$78,475.00
Electrical Connections	LS	1	$30,000.00	$30,000.00
Trench Drain	LF	187	$110.00	$20,570.00
Irrigation System and Connections	LS	1	$75,000.00	$75,000.00
Gasline to Fireplace	LF	95	$30.00	$2,850.00
SUBTOTAL				**$390,895.00**

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Landscape Architecture
Park & Recreation Planning
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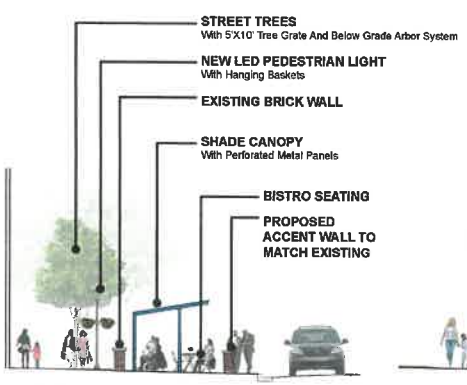
Sports Facility Planning

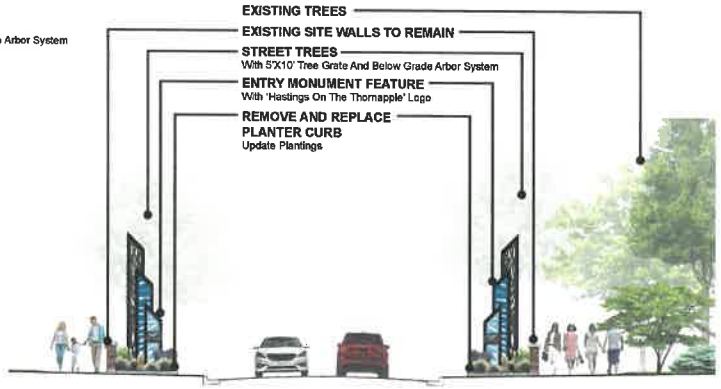
Description	Unit	No. of Units	Price	Extension
LANDSCAPING				
Deciduous Trees	EA	38	$700.00	$26,600.00
Planting Soil for Planters	LS	1	$8,000.00	$8,000.00
SUBTOTAL				**$34,600.00**
SUBTOTAL				**$1,974,942.10**
Design Contongency @ 10%				$197,494.21
Construction Contingency @ 10%				$217,243.63
Professional Fees				$220,000.00
STREETSCAPE TOTAL				**$2,609,679.94**

* Does not include fencing at Resturaunt Area

Evaluations of the Project Budget and Estimates of Construction Cost prepared by MCSA Group, Inc. represents their judgment as design professionals. It is recognized, however, MCSA Group, Inc. has no control over the cost of labor, materials or equipment, nor a contractor's methods of determining bid prices, or over competitive bidding, or market conditions. Accordingly, MCSA Group, Inc. cannot and does not warrant or represent that bids or negotiated prices will not vary from the Project Budget or from any estimate of construction cost or evaluation prepared by MCSA Group, Inc..

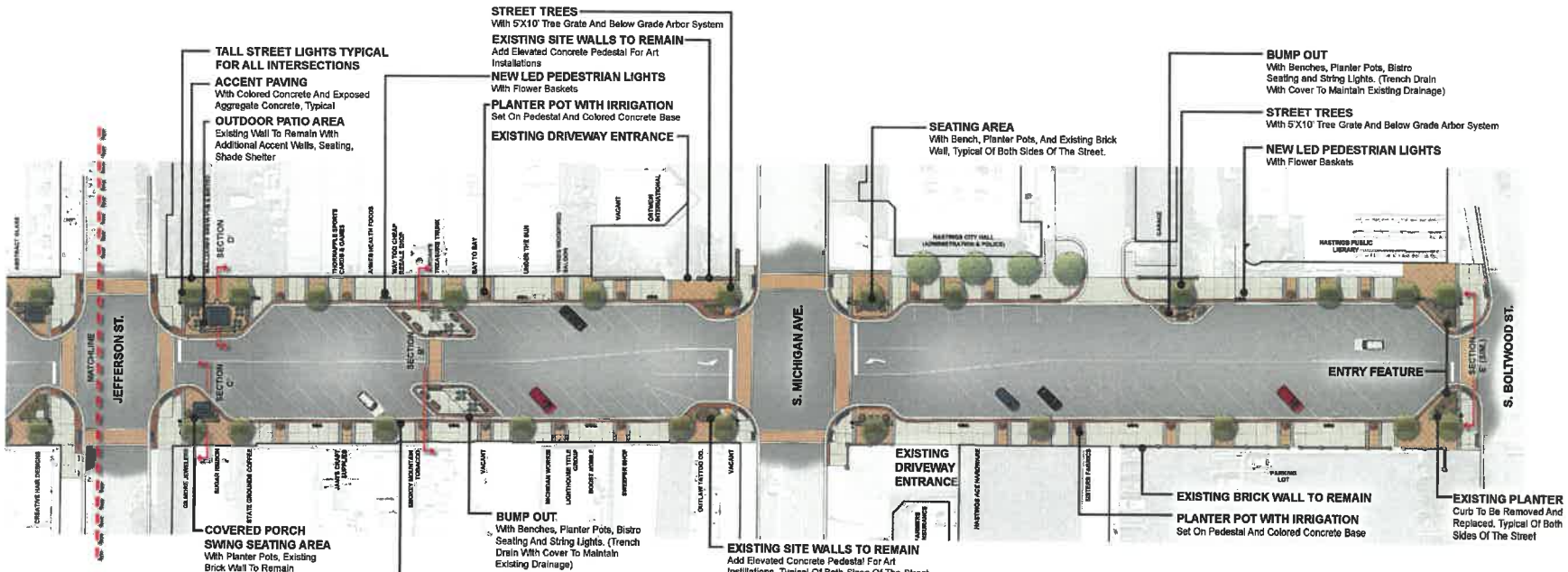


SECTION 'D'



SECTION 'E' - ENTRY FEATURE

ENTRY FEATURE PERSPECTIVE



JEFFERSON ST TO BOLTWOOD ST

MASTER PLAN
STATE STREET - STREETSCAPE
HASTINGS, MICHIGAN

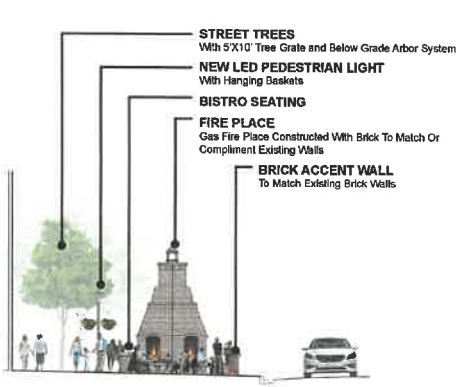
NORTH

SCALE: 1"=20'

DATE
08.22.2022
PROJECT NO.
2142

Affected Parking Spaces
*Loss of six parking spaces per block.

MCSA GROUP, Inc.
Landscape Architects and Architects



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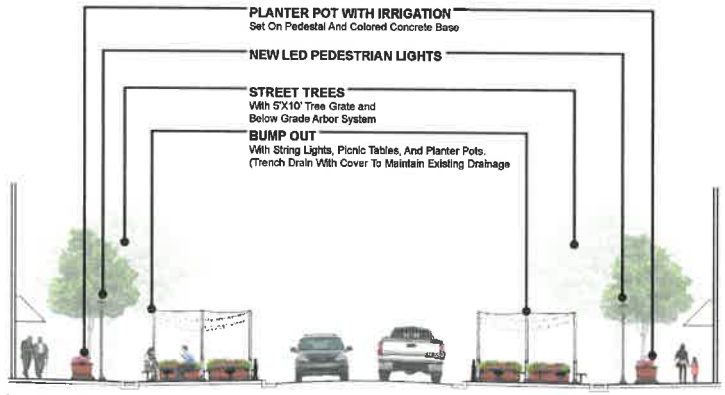

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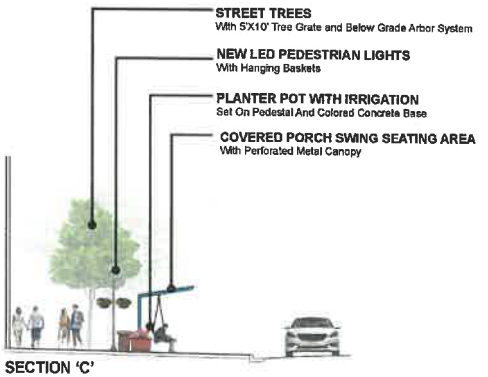
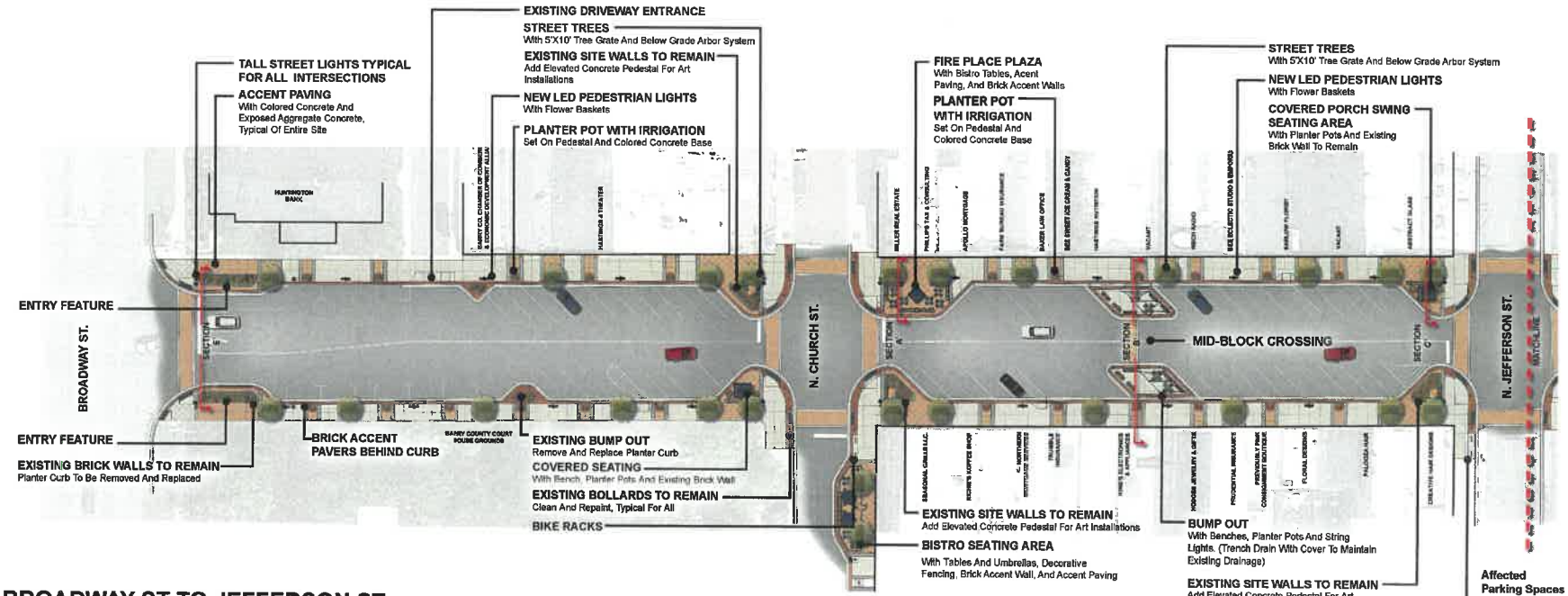


SECTION 'C'



BROADWAY ST TO JEFFERSON ST

MASTER PLAN
STATE STREET - STREETSCAPE
HASTINGS, MICHIGAN

NORTH

SCALE: 1"=20'

DATE -
08.22.2022
PROJECT NO.
2142

MCSA GROUP, Inc.
Landscape Architects and Architects
EAST GRAND RAPIDS - MICHIGAN

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Thornapple & Spray Plaza Stage Maintenance

Project ID #: _____ CIP ID #: DDA-3

Department: DDA Anticipated Start Date: 07/2023

Date Prepared: 03/03/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Clean, prime, and paint both the Thornapple Plaza Stage and Spray Plaza stage structures.

Project Need: Provide a brief explanation of why the project is necessary.

Thornapple Plaza and the Spray Plaza are used for various events throughout the year. The structure is showing some signs of needed maintenance including rust. This project would clean and restore the structure and prevent further deterioration that would be more costly to repair.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

no

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 15,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

DDA funds

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Semi Parking Lot Mill and Reshape

Project ID #: _____ CIP ID #: LDFA-1

Department: LDFA Anticipated Start Date: 07/2023

Date Prepared: 03/02/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Much of the asphalt has deteriorated leaving large areas of gravel. The City is working on transitioning the current zoning code regarding semi parking which could alleviate the need for this lot in the future.

Project Need: Provide a brief explanation of why the project is necessary.

Lot users are complaining that site deterioration is leading to low profile semis "bottoming out" in the parking lot.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 30,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

LDFA Funds

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Enterprise Drive - Mill & Resurface

Project ID #: _____ CIP ID #: LDFA-2

Department: _____ Anticipated Start Date: 07/2023

Date Prepared: 03/02/2023

Project Description: Provide a brief physical description of the project. Please be specific.

4.5 inch mill and resurface Enterprise Drive using funds collected through the LDFA TIF

Project Need: Provide a brief explanation of why the project is necessary.

Current pavement is spalling in highly used areas and cracks have become more extensive. Resurfacing the road will prevent further surface deterioration before more significant improvements are needed.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 150,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

LDFA Funds

List of Attachments (quotes, photos, etc.):

Emergency Services		
PD-3	Patrol Vehicle Replacement (#41)	45,000
PD-4	Patrol Vehicle Replacement (#43)	45,000
PD-5	Patrol Vehicle Replacement (#42)	45,000
PD-6	Patrol Vehicle Replacement (#47)	45,000
PD-7	Replacement of Police Chief's Vehicle	50,000
PD-8	Replacement Portable Radios	80,000
F-2	Replace SCBA (4 units)	27,342
F-3	Replacement tanks for SCBAs (12 units)	13,500
F-4	Replacement VHF Radios (4 units)	9,000
F-5	Turnout Gear (4 sets)	59,500
F-6	800 Radios (2 units)	17,500
F-8	New Class A Pumper Truck (half cost)	625,000
ES-1	Emergency Services Building Construction	12,000,000
Total Emergency		13,061,842

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of Patrol Cars #41 and #43

Project ID #: _____ CIP ID #: PD-3 and PD-4

Department: Police Anticipated Start Date: 07/2025

Date Prepared: 02/06/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Purchase of two new Ford SUV AWD Police Interceptors to replace patrol vehicles number 41 and 43. Includes transfer of all emergency equipment.

Project Need: Provide a brief explanation of why the project is necessary.

To maintain a safe and reliable fleet of patrol vehicles while keeping the cost of maintenance to a minimum.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 90,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

General Fund
Sale of retired vehicle

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of Patrol Cars #42 and #47

Project ID #: _____ CIP ID #: PD-5 and PD-6

Department: Police Anticipated Start Date: 07/2026

Date Prepared: 02/06/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Purchase of two new Ford SUV AWD Police Interceptors to replace patrol vehicle number 42. Includes transfer of all emergency equipment

Project Need: Provide a brief explanation of why the project is necessary.

To maintain a safe and reliable fleet of patrol vehicles while keeping the cost of maintenance to a minimum.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 45,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

General Fund

Sale of retired vehicle

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of Chief's Vehicle

Project ID #: _____ CIP ID #: PD-7

Department: Police Anticipated Start Date: 07/2024

Date Prepared: 02/06/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of existing vehicle (2018 Ford Taurus) with a Ford F150 4x4 extended cab pickup truck. Will include transfer of all emergency lighting and other equipment.

Project Need: Provide a brief explanation of why the project is necessary.

To maintain a safe and reliable fleet of vehicles while keeping the cost of maintenance to a minimum. The purchase of a truck as the chief's vehicle in order to facilitate hauling of items that are not able to be placed in the patrol SUVs. Also to enable hauling items associated with training and events occurring within the City.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Prior CIP

Does the project share space or overlap with other CIP projects? Please describe.

no

Project Cost: $ 50,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

General Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of Portable 700/800 Megahertz Police Radios

Project ID #: _____ CIP ID #: PD-8

Department: Police Anticipated Start Date: 07/2024

Date Prepared: 02/06/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Research and investigation regarding proper and reliable mission critical equipment is a must for all law enforcement officers. Motorola brand radios are at this time, the top of the line and most reliable solution. Research would also include other brand names such as Kenwood, and Viking/Johnson. Project to include exploring the possibility of any state or federal grants potentially reducing overall cost of the purchase.

Project Need: Provide a brief explanation of why the project is necessary.

Police Ban 700/800 mhz Motorola APX 6000 radios currently in use have reached and are past their life expectancy and are currently utilized by our certified officers. The 800 mhz Motorola STX 3000 radios carried by our reserve officers have been discontinued and parts are only available on Ebay or other like sources. The FCC is rapidly making changes and soon they will phase in more 700 mhz bands causing the STX3000 unable to communicate with certain talk groups.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 80,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Currently, General fund with hopes of available grants

Aprox cost per unit is $5,333 each (15 units)

List of Attachments (quotes, photos, etc.):

Brochure

Quote from Chrouch Communications

MOTOROLA SOLUTIONS

APX™ 6000 SINGLE-BAND PORTABLE RADIO

From day one, the single-band APX 6000 P25 portable radio has delivered legendary APX ruggedness and reliability, without compromising on the form factor or features required for routine activities and extreme emergencies. Now, as the ever-increasing needs of public safety personnel grow, we are evolving the APX 6000 to support newer technologies like Wi-Fi®, Adaptive Audio Engine, and Bluetooth® 4.0 wireless technology. These advances help improve the operational efficiency and response time of public safety agencies while enhancing the safety of personnel and communities.

VOICE AND DATA, ALL AT ONCE

Update your radio fleet without interrupting voice communications with secure Wi-Fi. This dramatically improves the speed of configuring new codeplugs, firmware and software features over-the-air via Radio Management*. Agencies can pre-provision up to 20 secure Wi-Fi hotspots so personnel can easily access updates at the facility or in the field.

HEAR AND BE HEARD

The APX 6000 is equipped with a 3-watt speaker, 3 integrated microphones and the Adaptive Audio Engine. This changes the level of noise suppression, microphone gain, windporting and speaker equalization to produce clear and loud audio in any environment.

SEAMLESS ON-SCENE COMMUNICATION

Ensure fast and seamless communication and collaboration across all responders arriving on a scene. Mission Critical Geofence automatically changes a radio's active talkgroup based on its GPS location and an agency-defined virtual barrier. For example, an incident commander can create a geofence around the 3-block radius of a burning building so that all arriving personnel are automatically placed in the same talkgroup.

EMERGENCY FIND ME

Bluetooth 4.0 places a wide range of wireless accessories at your disposal and provides personnel with an added level of security by improving response time in emergencies. With Emergency Find Me, a Bluetooth-enabled beacon signal guides other Bluetooth-enabled APX radios within range to assist the user in distress.

*Radio Management application simplifies APX radio configuration and management by programming up to 16 radios at one time and tracking which radios have been successfully programmed, providing a clear view of the entire radio fleet and a codeplug history for each radio.

SPECIFICATIONS

RF BANDS

- 700/800 MHz, VHF, UHF Range 1 & UHF Range 2
- 9600 Baud Digital APCO P25 Phase 1 FDMA and Phase 2 TDMA Trunking
- 3600 Baud SmartNet®, SmartZone®, SmartZone, Omnilink Trunking
- Digital APCO 25, Conventional, Analog MDC 1200, Quick Call II System Configurations Narrow and Wide Bandwidth Digital Receiver (6.25 kHz Equivalent/25/20/12.5 kHz)[1]

STANDARD FEATURES

- Mission Critical Wireless Bluetooth® 4.0 (LE)[2]
- Emergency Find Me[2]
- ASTRO® 25 Integrated Voice & Data
- Integrated GPS/GLONASS for Outdoor Location Tracking
- Voice Announcements
- ISSI 8000 Roaming
- Radio Profiles
- Dynamic Zone
- Intelligent Lighting
- Single-Key ADP Encryption
- IP68 submersion (2 meters, 2 hours)
- IMPRES 2 Battery (PMNN4485)
- Text Message
- Software Key

PROGRAMMING

- Utilizes Windows 7 & 8 Customer Programming Software (CPS) with Radio Management[3]

ADAPTIVE AUDIO ENGINE (OPTIONAL)

- 3-W Speaker with Adaptive Equalization
- Adaptive Dual-Sided Operation
- Adaptive Noise Suppression Intensity
- Adaptive Gain Control
- Adaptive Windporting

OPTIONAL FEATURES

- Wi-Fi 802.11 b/g/n
- LEX L10 Collaboration
- RFID Volume Knob
- Multi-key for 128 keys and Multi-Algorithm
- Programming Over Project 25 (OTAP)
- Over the Air Rekey (OTAR)
- Digital Tone Signaling
- Mission Critical Geofence
- P25 Authentication
- Man Down Capability
- High Impact Green and Public Safety Yellow Colored Housing Options
- Rugged Option: IP68 (2m/4hr), Mil Std 512.X Delta - T[4]
- Listed by UL to the standards ANSI/TIA 4950-A and CAN/CSA C22.2 NO. 157-92 Classification Rating: Class I, Division 1, Groups C, D; Class II, Division 1, Group E, F, G; Class III, Hazardous (Classified) Locations. ANSI/ISA 12.12.01-2015 and CAN/CSA C22.2 No. 213-15; Class I, Division 2, Groups A, B, C, D; T3C. Tamb = -25° C to +60° C. when used with Motorola Battery: NNTN8921A NNTN8930A 7.4V

1 Per the FCC Narrowbanding rules, new products (APX6000 UHFR1, UHFR2) submitted for FCC certification after January 1, 2011 are restricted from being granted certification at 25 KHz for United States - State & Local Markets only.

2 Compatible with BT 2.1, HSP, PAN, DUN and SPP Profiles found in off-the-shelf Bluetooth accessories and Bluetooth 4.x

3 CPS version R12.00.00 and greater ordered after June 2014 will only support Windows 7 and 8

4 Radios meet industry standards (IPx7) for submersion.

TRANSMITTER - TYPICAL PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	700 MHz 800 MHz	763-776, 793-806 MHz 806-824, 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing		25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Rated RF Output Power Adj[1]		1-3 Watts Max	1-6 Watts Max	1-5 Watts Max	1-5 Watts
Frequency Stability[1] (–30°C to +60°C; +25°C Ref.)		±0.00010 %	±0.00010 %	±0.00010 %	±0.00010 %
Modulation Limiting[1]		±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz	±5 kHz / ±4 kHz / ±2.5 kHz
Emissions (Conducted and Radiated)[1]		-75 dB	-75 dB	-75 dB	-75 dB
Audio Response[1]		+1, -3 dB	+1, -3 dB	+1, -3 dB	+1, -3 dB
FM Hum & Noise	25k 25.5k	-52 dB -47 dB	-55 dB -50 dB	-52 dB -47 dB	-52 dB -46 dB
Audio Distortion[1]	700 MHz 800 MHz	1.00 %	1.00 %	1.00 %	1.00 %

BATTERIES FOR APX 6000

Battery Capacity / Type	Dimensions (HxWxD)	Weight	Battery Part Number	Battery Capacity
Li-Ion IMPRES 2 2550mAh[1]	3.4" x 2.3" x 1.5"	5.0 oz	PMNN4485	2550 mAh
Li-Ion IMPRES 2 3400mAh	3.4" x 2.3" x 1.7"	6.5 oz	PMNN4486	3400 mAh
Li-Ion IMPRES 2 4850mAh	5" x 2.3" x 1.7"	11.0 oz	PMNN4487	4850 mAh
Li-Ion IMPRES 2 5100mAh	5" x 2.3" x 1.7"	11.0 oz	PMNN4494	5100 mAh
Li-Ion IMPRES 2 2650 mAh[2]	3.4" x 2.3" x 1.7"	5.7 oz	NNTN8930	2650 mAh
Li-Ion IMPRES 2 4500mAh[2]	5" x 2.3" x 1.7"	11.0 oz	NNTN8921	4500 mAh

1 The standard shipping battery for the APX6000
2 HAZLOC approved.

RADIO MODELS

	MODEL 1.5	MODEL 2.5	MODEL 3.5
Display	Full bitmap monochromatic LCD top display 1 line text x 8 characters 1 line of icons No menu support Multi-color backlight	Top display plus: Full bitmap color LCD display 4 lines of text x 14 characters 2 lines of icons 1 menu line x 3 menus White backlight	Top display plus: Full bitmap color LCD display 4 lines of text x 14 characters 2 lines of icons 1 menu line x 3 menus White backlight
Keypad	none	Backlit keypad 3 soft keys 4 direction Navigation key Home and Data buttons	Backlit keypad 3 soft keys 4 direction Navigation key 4x3 keypad Home and Data buttons
Channel Capacity[1]	96	1000	1000
FLASHport Memory	64 MB	64 MB	64 MB
700/800 MHz (763-870 MHz)	H98UCD9PW5BN	H98UCF9PW6BN	H98UCH9PW7BN
VHF (136-174 MHz)	H98KGD9PW5BN	H98KGF9PW6BN	H98KGH9PW7BN
UHF Range 1 (380-470 MHz)	H98QDD9PW5BN	H98QDF9PW6BN	H98QDH9PW7BN
UHF Range 2 (450-520 MHz)	H98SDD9PW5BN	H98SDF9PW6BN	H98SDH9PW7BN
Buttons & Switches	Large PTT button ■ Angled On/Off volume control ■ Orange emergency button ■ 16 position top-mounted rotary switch ■ 2-position concentric switch ■ Multi-color backlight ■ 3-position toggle switch ■ 3 programmable side buttons		

Regulatory Information

	FCC ID	Industry Canada
700/800 (764-869 MHz)	AZ489FT7086	109U-89FT7086
VHF (136-174 MHz)	AZ489FT7087	109U-89FT7087
UHF Range 1 (380-470 MHz)	AZ489FT7077	109U-89FT7077
UHF Range 2 (420-520 MHz)	AZ489FT7085	109U-89FT7085

FCC Emissions Designators

FCC Emissions Designators: 11K0F3E, 16K0F3E, 8K10F1D, 8K10F1E, 8K10F1W, 20K0F1E[2]

Power Supply

Power Supply: One rechargeable Li-Ion IMPRES 2 2550mAh battery standard (PMNN4485), with alternate battery options available.

1 Enhancement package available
2 Per the FCC Narrowbanding rules, new products (APX6.CO UHFR1, UHFR2) submitted for FCC certification after January 1, 2011 are restricted from being granted certification at 25 kHz for United States - State & [illegible]

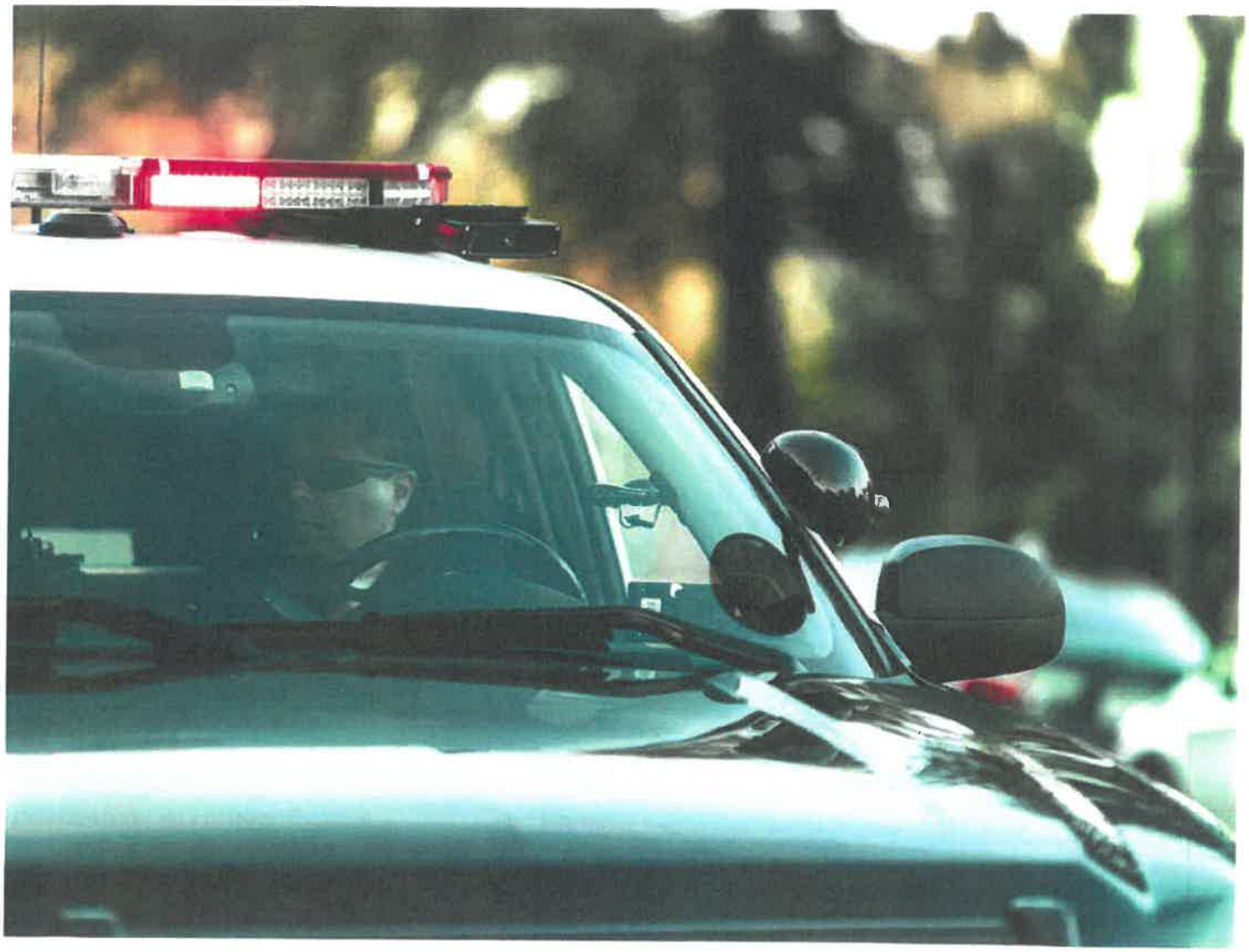
RECEIVER - TYPICAL PERFORMANCE SPECIFICATIONS

		700/800	VHF	UHF Range 1	UHF Range 2
Frequency Range/Bandsplits	700 MHz 800 MHz	763-776 MHz 851-870 MHz	136-174 MHz	380-470 MHz	450-520 MHz
Channel Spacing		25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz	25/20/12.5 kHz
Maximum Frequency Separation		Full Bandsplit	Full Bandsplit	Full Bandsplit	Full Bandsplit
Audio Output Power at Rated[1]		500 mW	500 mW	500 mW	500 mW
Analog Sensitivity[2]	12 dB SINAD	0.25 µV	0.17 µV	0.224 µV	0.203 µV
Digital Sensitivity[3]	1% BER (800 MHz)	0.375 µV	0.243 µV	0.298 µV	0.296 µV
	5% BER	0.24 µV	0.15 µV	0.200 µV	0.204 µV
Selectivity[1]	25 kHz channel	-76 dB	-78 dB	-77 dB	-76 dB
	12.5 kHz channel	-70 dB	-73 dB	-67 dB	-67 dB
Intermodulation		-80.1 dB	-80.2 dB	-80.3 dB	-80.2 dB
Spurious Rejection		-75 dB	-78 dB	-80.5 dB	-80.8 dB
FM Hum and Noise	25 kHz	-54 dB	-54.3 dB	-53.5 dB	-52.5 dB
	12.5 kHz	-79 dB	-50.1 dB	-47.5 dB	-47.3 dB
Audio Distortion at Rated[1]		0.90%	0.90%	0.70%	0.70%

1 Measured in the analog mode per TIA / EIA 603 under nominal conditions
2 Measured conductively in analog mode per TIA / EIA 603 under nominal conditions.
3 Measured conductively in digital mode per TIA / EIA IS 102.CAAA under nominal conditions.

PORTABLE MILITARY STANDARDS 810 C, D, E, F & G

	MIL-STD 810C		MIL-STD 810D		MIL-STD 810E		MIL-STD 810F		MIL-STD 810G	
	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.	Method	Proc./Cat.
Low Pressure	500.1	I	500.2	II	500.3	II	500.4	II	500.5	II
High Temperature	501.1	I, II	501.2	I/A1, II/A1	501.3	I/A1, II/A1	501.4	I/Hot, II/Basic Hot	501.5	I/A1, II/A2
Low Temperature	502.1	I	502.2	I/C3, II/C1	502.3	I/C3, II/C1	502.4	I/C3, II/C1	502.5	I/C3, II/C1
Temperature Shock	503.1	I	503.2	I/A1C3	503.3	I/A1C3	503.4	I	503.5	I/C
Solar Radiation	505.1	II	505.2	I	505.3	I	505.4	I	505.5	I/A1
Rain	506.1	I, II	506.2	I, II	506.3	I, II	506.4	I, III	506.5	I, III
Humidity	507.1	II	507.2	II	507.3	II	507.4	1 Proc	507.5	II/Aggravated
Salt Fog	509.1	I	509.2	I	509.3	I	509.4	1 Proc	509.5	1 Proc
Blowing Dust	510.1	I	510.2	I	510.3	I	510.4	I	510.5	I
Blowing Sand	1 Proc	1 Proc	510.2	II	510.3	II	510.4	II	510.5	II
Immersion	512.1	I	512.2	I	512.3	I	512.4	I	512.5	I
Vibration	514.2	VIII/F, Curve-W	514.3	I/10, II/3	514.4	I/10, II/3	514.5	I/24	514.6	I/24
Shock	516.2	I, III, V	516.3	I, V, VI	516.4	I, V, VI	516.5	I, V, VI	516.6	I, V, VI
Shock (Drop)	516.2	II	516.2	IV	516.4	IV	516.5	IV	516.6	IV



DIMENSIONS OF THE RADIOS WITHOUT BATTERY

Length	5.47 in	139 mm
Width Push-To-Talk button	2.39 in	60.7 mm
Depth Push-To-Talk button	1.40 in	35.6 mm
Width Top	2.98 in	75.7 mm
Depth Top	1.58 in	40.1 mm
Depth Bottom of Battery	1.24 in	31.5 mm
Weight of the radios without battery	10.9 oz	309 g

ENCRYPTION

Supported Encryption Algorithms	ADP, 256-bit AES, DES, DES-XL, DES-OFB, DVP-XL
Encryption Algorithm Capacity	8
Encryption Keys per Radio	Module capable of storing 1024 keys. Programmable for 64 Common Key Reference (CKR) or 16 Physical Identifier (PID)
Encryption Frame Re-sync Interval	P25 CAI 300 mSec
Encryption Keying	Key Loader
Synchronization	XL – Counter Addressing OFB – Output Feedback
Vector Generator	National Institute of Standards and Technology (NIST) approved random number generator
Encryption Type	Digital
Key Storage	Tamper protected volatile or non-volatile memory
Key Erasure	Keyboard command and tamper detection
Standards	FIPS 140-2 Level 3 FIPS 197

GPS/GPS/GNSS SPECIFICATIONS

Constellations	GPS & GLONASS
Tracking Sensitivity	-164 dBm
Accuracy[2]	<5 meters (95%)
Cold Start	<60 seconds (95%)
Hot Start	<5 seconds (95%)
Mode of Operation	Autonomous (Non-Assisted)

RUGGED SPECIFICATIONS

Leakage (submersion)	MIL-STD-810 C, D, E, F and G Method 512.X Procedure I, IP68 (2 meters, 4 hours)

HOUSING COLOR

Black (Standard), Public Safety Yellow, and High Impact Green

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature[1]	-30 °C to +60 °C
Storage Temperature[1]	-50 °C to +85 °C
Humidity Per MIL-STD	ESD IEC 801-2 KV
Water and Dust Intrusion	IP68 (2 meters, 4 hours)

1 Temperatures listed are for radio specifications. Battery storage is recommended at 25 °C, ±5 °C to ensure best performance.
2 Measured conductively with >6 satellites visible at a nominal -130 dBm signal strength. Specs provided are 95th percentile values.

EMISSION DESIGNATORS

LMR:	8K10F1D, 8K10F1E, 8K10F1W, 11K0F3E, 16K0F3E, 20K0F1E
Bluetooth:	852KF1D, 1M17F1D, 1M19F1D, 1M04F1D
WLAN (Wi-Fi):	13M7G1D, 17M0D1D, 18M1D1D

WIRELESS CONNECTIVITY AND SECURITY

Frequency Range/Bandsplits:
Bluetooth: 2402 - 2480 MHz, WLAN (Wi-Fi) 2400 - 2483.5 MHz

WLAN (Wi-Fi) 802.11 b/g/n supports WPA-2, WPA, WEP security protocols; radio can be pre-provisioned with up to 20 SSIDs[1]

Mission Critical Wireless Bluetooth 2.1 uses 96 bit encryption for pairing & 128 bit encryption for voice, signaling and data. The radio BT supports up to 6 data connections and 1 audio connection

Bluetooth 4.0 Low Energy uses 128-bit AES-CCM encryption

1 2400 - 2483.5 MHz

MOTOROLA SOLUTIONS

QUOTE-2036179

02/03/2023

Hastings Police Department
201 East State Street
Hastings, MI 49058

RE: Motorola Quote for 15 APX6000 Portable Radios
Dear Dale Boulter,

Motorola Solutions is pleased to present Hastings Police Department with this quote for quality communications equipment and services. The development of this quote provided us the opportunity to evaluate your requirements and propose a solution to best fulfill your communications needs.

This information is provided to assist you in your evaluation process. Our goal is to provide Hastings Police Department with the best products and services available in the communications industry. Please direct any questions to Kevin Yoder at KevinY@Chrouch.com.

We thank you for the opportunity to provide you with premier communications and look forward to your review and feedback regarding this quote.

Sincerely,

Kevin Yoder
Chrouch Communications, Inc.

Motorola Solutions Manufacturer's Representative

MOTOROLA SOLUTIONS

QUOTE-2036179
15 APX6000 Portable Radios

Billing Address:
Hastings Police Department
201 East State Street
Hastings, MI 49058
US

Quote Date:02/03/2023
Expiration Date:04/04/2023
Quote Created By:
Kevin Yoder
Chrouch Communications, Inc.
KevinY@Chrouch.com
(616) 642-3881

End Customer:
Hastings Police Department
Dale Boulter

Contract: 35115 - STATE OF MICHIGAN, MA# 190000001544

Line #	Item Number	Description	Qty	List Price	Sale Price	Ext. Sale Price
	APX™ 6000 Series	APX6000				
1	H98UCF9PW6BN	APX6000 700/800 MODEL 2.5 PORTABLE	15	$6,506.50	$4,976.38	$74,645.70
1a	QA09006AA	ADD: ADAPTIVE NOISE SUPPRESSION	15			
1b	HA00690AA	ADD: 7Y ESSENTIAL SERVICE HTP	15			
1c	QA01833AH	ADD: EXTREME 1-SIDED NOISE REDUCTION	15			
1d	Q667BB	ADD: ADP ONLY (NON-P25 CAP COMPLIANT) (US ONLY)	15			
1e	QA05570AA	ALT: LI-ION IMPRES 2 IP68 3400 MAH	15			
1f	Q361AR	ADD: P25 9600 BAUD TRUNKING	15			
1g	H38BT	ADD: SMARTZONE OPERATION	15			
1h	Q806BM	ADD: ASTRO DIGITAL CAI OPERATION	15			
2	PMNN4486A	BATT IMPRES 2 LIION R IP67 3400T	15	$188.27	$141.20	$2,118.00

MOTOROLA SOLUTIONS

QUOTE-2036179
15 APX6000 Portable Radios

Line #	Item Number	Description	Qty	List Price	Sale Price	Ext. Sale Price
3	PMMN4099CL	AUDIO ACCESSORY-REMOTE SPEAKER MICROPHONE,IP68 REMOTE SPEAKER MICROPHONE,3.5MM,UL	5	$142.56	$106.92	$534.60
4	NNTN8860A	CHARGER, SINGLE-UNIT, IMPRES 2, 3A, 115VAC, US/NA	15	$169.56	$127.17	$1,907.55

Grand Total $79,205.85(USD)

Notes:

- Customer is responsible for the $250.00 per unit MPSCS activation fee.
- Unless otherwise noted, this quote excludes sales tax or other applicable taxes (such as Goods and Services Tax, sales tax, Value Added Tax and other taxes of a similar nature). Any tax the customer is subject to will be added to invoices.

MOTOROLA SOLUTIONS

Purchase Order Checklist
Marked as PO/ Contract/ Notice to Proceed on Company Letterhead (PO will not be processed without this)
PO Number/ Contract Number
PO Date
Vendor = Motorola Solutions, Inc.
Payment (Billing) Terms/ State Contract Number
Bill-To Name on PO must be equal to the *Legal* Bill-To Name
Bill-To Address
Ship-To Address (If we are shipping to a MR location, it must be documented on PO)
Ultimate Address (If the Ship-To address is the MR location then the Ultimate Destination address must be documented on PO)
PO Amount must be equal to or greater than Order Total
Non-Editable Format (Word/ Excel templates cannot be accepted)
Bill To Contact Name & Phone # and EMAIL for customer accounts payable dept
Ship To Contact Name & Phone #
Tax Exemption Status
Signatures (As required)

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of Self Contained Breathing Apparatus (4 units)

Project ID #: 14 CIP ID #: F-2

Department: Fire Anticipated Start Date: 07/2023

Date Prepared: 01/09/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Purchase of four Self Contained Breathing Apparatus (SCBA). An SCBA delivers breathable compressed air allowing a first responder to safely breathe through the duration of an operation.

Project Need: Provide a brief explanation of why the project is necessary.

Four additional units are needed to fill MIOSHA requirements.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 27,342.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

General Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Tanks for Self Contained Breathing Apparatus (14 tanks)

Project ID #: 15 CIP ID #: F-3

Department: Fire Anticipated Start Date: 07/2023

Date Prepared: 01/09/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Purchase 12 replacement tanks for our SCBA

Project Need: Provide a brief explanation of why the project is necessary.

This will complete the MOSHA requirement for the number of tanks that we need

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 13,500.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

General Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement VHF Radios (4 units)

Project ID #: _____ CIP ID #: F-4

Department: Fire Anticipated Start Date: 01/2023

Date Prepared: 01/09/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Purchase 4 VHF Radios

Project Need: Provide a brief explanation of why the project is necessary.

The VHF radios are used to communicate with Central Dispatch and other departments within the county that we work with. The ones that we currently have are beyond repair.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 4,500.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

General Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Complete Turn Out Gear Sets (4 sets)

Project ID #: _____ CIP ID #: F-5

Department: Fire Anticipated Start Date: 07/2023

Date Prepared: 01/09/2023

Project Description: Provide a brief physical description of the project. Please be specific.

4 COMPLETE SETS OF TURNOUT GEAR FOR NEW MEMBERS

Project Need: Provide a brief explanation of why the project is necessary.

Hopefully we will get some new members for the department if we do we will have to outfit them with gear. Coats and bunkers are 2500 ea and boots are 490 a pair.

Cost estimate is based on last year's purchase plus 10 percent increase.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 10,000.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

General Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: 800 Radios (2 units)

Project ID #: _____ CIP ID #: F-6

Department: Fire Anticipated Start Date: 07/2023

Date Prepared: 01/09/2023

Project Description: Provide a brief physical description of the project. Please be specific.

2, 800 RADIOS

Project Need: Provide a brief explanation of why the project is necessary.

THESE RADIOS ARE USED TO COMMUNICATE WITH OTHER MEMBERS OF THE DEPARTMENT AND ALL TRUCKS.

Based on last year's purchase plus 10 percent increase

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

No

Does the project share space or overlap with other CIP projects? Please describe.

No

Project Cost: $ 8,500.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

General Fund

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement Class A Pumper Truck

Project ID #: _____ CIP ID #: F-8

Department: Fire Anticipated Start Date: 07/2026

Date Prepared: 01/09/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of pumper truck (50%)

Project Need: Provide a brief explanation of why the project is necessary.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 625,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

General Fund
BIRCH

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Emergency Services Building Construction

Project ID #: _____ CIP ID #: ES-1

Department: Fire Anticipated Start Date: 07/2024

Date Prepared: 01/09/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of Fire Barn with Emergency Services Building - Scope TBD

Project Need: Provide a brief explanation of why the project is necessary.

The existing fire barn is in dire need of replacement. The facility is too small and new apparatus are unable to fit in the facility. A new facility is needed to house modern equipment and provide efficient service. The current direction is to construct police facilities in the same structure and share some areas of the building.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 12,000,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

General Fund
USDA Loan

List of Attachments (quotes, photos, etc.):

Equipment/Motor Pool		
MP-4	6-Yd Dump Truck Replacement (#130)	210,000
MP-5	Front End Loader (#220)	265,000
MP-6	3-Yd 2008 Dump Truck Replacement (#350)	100,000
MP-7	3-Yd 2008 Dump Truck Replacement (#80)	100,000
MP-8	1996 Super Duty Bucket Truck Replacement (#290)	205,000
MP-9	Claw/Tink bucket (#253)	20,000
MP-31	Claw/Tink bucket (#224)	20,000
MP-10	John Park Mower Replacement (#300)	55,000
MP-11	C-7500 2000 GMC Replacement (#120)	185,000
MP-12	2014 International Dump Truck (#140)	185,000
MP-13	International Sweeper 2018 (#270)	355,000
MP-14	Cat Skid Steer 2014 (#430)	135,000
MP-15	Salt Spreader Replacement 6.9 yds (#62)	20,000
MP-16	Salt Spreader Replacement 6.9 yds (#92)	20,000
MP-17	Vactor Truck Replacement (on rotation)	525,000
MP-18	Pull behind Air Compressor (#160)	20,000
MP-20	Front End Loader (#250)	325,000
MP-21	Excavator Replacement (#180)	265,000
MP-24	Street Supervisor Truck #20 (Rotation schedule)	271,500
MP-25	Utility Supervisor Truck #30 (Rotation schedule)	271,500
MP-29	Service Truck (#40)	90,000
Total Equipment/Motor Pool		3,643,000

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of 6-yd dump truck #130

Project ID #: _____ CIP ID #: MP-4

Department: DPS - Motor Pool Anticipated Start Date: 07/2023

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of large dump truck

Project Need: Provide a brief explanation of why the project is necessary.

This vehicle is aging and is difficult to find parts for when repairs are needed. This truck is used for leaf pickup, snow removal, and material hauling. This truck will be equipped with a sidewing and underbody plow

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 210,000.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / sealed bid (est 3-10K)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of Front End Loader #220

Project ID #: _____ CIP ID #: MP-5

Department: DPS - Motor Pool Anticipated Start Date: 07/2025

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of 2008 Loader

Project Need: Provide a brief explanation of why the project is necessary.

Front end loader is used for loading material, picking up leaves, snow, and brush.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 265,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ■ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / Sealed Bid for old equipment

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of 2008 3-yd Dump Truck #350

Project ID #: _____ CIP ID #: MP-6

Department: DPS - Motor Pool Anticipated Start Date: 07/2023

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of 3-yd dump truck with 63,000 miles and 16,500 lb capacity.

Project Need: Provide a brief explanation of why the project is necessary.

Current truck is 14 years old and the dump box is rusting through. A new truck would allow a larger hauling capacity (19,500) and additional horsepower which would improve its use to the city. This truck has multiple uses in the field.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 100,000.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / Sealed Bid for current truck

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of 2008 3-yd Dump Truck #80

Project ID #: _____ CIP ID #: MP-7

Department: DPS - Motor Pool Anticipated Start Date: 07/2023

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of 3-yd dump truck

Project Need: Provide a brief explanation of why the project is necessary.

Current truck is 15 years old and the dump box is rusting through. A new truck would allow a larger hauling capacity (19,500) and additional horsepower which would improve its use to the city. This truck has multiple uses in the field.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 100,000.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / Sealed Bid for current truck (est 3-10K)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of 1996 Ford Super Duty Bucket Truck #290

Project ID #: _____ CIP ID #: MP-8

Department: DPS - Motor Pool Anticipated Start Date: 07/2023

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of existing bucket truck.

Project Need: Provide a brief explanation of why the project is necessary.

This truck is used for putting up banners, holiday decorations, tree trimming, changing traffic lights and any other items that require heights greater than that which can be served by a ladder. A new truck would allow us to have a higher reach and to do more tree removals ourselves rather than contracting in some situations.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 205,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / sealed bid for current truck (est 1-5K)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of 2010 930 Claw/Tink Bucket #253

Project ID #: _____ CIP ID #: MP-9

Department: DPS Anticipated Start Date: 07/2023

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Attachment for the front end loader

Project Need: Provide a brief explanation of why the project is necessary.

This attachment is used for spring and fall cleanup and has a lot of wear-and-tear. This attachment should be replaced approximately every 10 years or sooner.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 20,000.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / Sealed Bid (est 1-5K)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of 2010 Claw/Tink Bucket #224

Project ID #: _____ CIP ID #: MP-31

Department: DPS Anticipated Start Date: 07/2023

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Attachment for the front end loader

Project Need: Provide a brief explanation of why the project is necessary.

This attachment is used for spring and fall cleanup and has a lot of wear-and-tear. This attachment should be replaced approximately every 10 years or sooner.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 20,000.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / Sealed Bid (est 1-5K)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of John Park Mower #300

Project ID #: _____ CIP ID #: MP-10

Department: DPS - Motor Pool Anticipated Start Date: 07/2024

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of lawn mower used for roadside mowing

Project Need: Provide a brief explanation of why the project is necessary.

This mower is a 2010 and has approximately 3,000 hours. It is used for mowing roadside and city property that is not contracted out.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 55,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade In / Sealed Bid (est 1-5K)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of 2000 GMC C-7500 #120

Project ID #: _____ CIP ID #: MP-11

Department: DPS - Motor Pool Anticipated Start Date: 07/2024

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of 22 year old large dump truck with 50,000 miles.

Project Need: Provide a brief explanation of why the project is necessary.

The large dump truck is necessary for hauling. A truck with additional horsepower and increased capacity would be beneficial.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 185,000.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / sealed bid (1-5K est)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of 2014 International Dump Truck #140

Project ID #: _____ CIP ID #: MP-12

Department: DPS Anticipated Start Date: 07/2024

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of 10 year old dump truck

Project Need: Provide a brief explanation of why the project is necessary.

This large dump truck is used for hauling sludge from the wastewater plant. The truck operates in a harsh environment and needs to be replaced ever 10 years. Replacement with a truck with greater horsepower and capacity would be beneficial.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 185,000.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / sealed bid (est 5-18K)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of 2018 International Street Sweeper #270

Project ID #: _____ CIP ID #: MP-13

Department: DPS - Motor Pool Anticipated Start Date: 07/2025

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of street sweeper with 1900 hours on both engines, approximately 10,000 miles

Project Need: Provide a brief explanation of why the project is necessary.

The street sweeper is used about 3 days/week during the summer. A sweeper's useful life is approximately five years and then it starts to cost more in parts and looses significant trade in value. Street sweepers keep the roads clean and reduce buildup from occurring in the storm sewers.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 355,000.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / sealed bid (est 60 - 85K)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of Cat Skid Steer #430

Project ID #: _____ CIP ID #: MP-14

Department: DPS - Motor Pool Anticipated Start Date: 07/2027

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of 2014 cat skid steer

Project Need: Provide a brief explanation of why the project is necessary.

This equipment is used for cleaning parking lots in the winter, tree removal, transferring black dirt, and removing sidewalk. It is replaced approximately every 10 years.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 135,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / Sealed Bid (4-15K est)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of 6.9 yd salt spreader #62

Project ID #: _____ CIP ID #: MP-15

Department: DPS - Motor Pool Anticipated Start Date: 07/2025

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of v-box spreader for salt truck.

Project Need: Provide a brief explanation of why the project is necessary.

This box will be approx 11 years old at time of replacement. This equipment is necessary for applying salt to the city streets. It would be advisable to include a liquid system in conjunction with the salt for better application during cold weather. An auger system would be more efficient and consistent in coverage.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 20,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / Sealed Bid (est 1-4K)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of 6.9 yd salt spreader #92

Project ID #: _____ CIP ID #: MP-16

Department: DPS - Motor Pool Anticipated Start Date: 07/2025

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of v-box spreader for salt truck.

Project Need: Provide a brief explanation of why the project is necessary.

This box will be approx 11 years old at time of replacement. This equipment is necessary for applying salt to the city streets. It would be advisable to include a liquid system in conjunction with the salt for better application during cold weather. An auger system would be more efficient and consistent in coverage.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 20,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / Sealed Bid (est 1-4K)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of Vactor Truck #240

Project ID #: _____ CIP ID #: MP-17

Department: DPS - Motor Pool Anticipated Start Date: 07/2026

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of city vactor truck.

Project Need: Provide a brief explanation of why the project is necessary.

The vactor truck is used for sewers, water main repairs, and to service leaks in catch basins. It is one of the most used pieces of equipment in the garage. Vac truck will be approx 7 years old at time of replacement.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 525,000.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund (we are currently saving extra payments to make up the difference between the trade in value and total cost)

Trade in

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of Pull Behind Air Compressor #160

Project ID #: _____ CIP ID #: MP-18

Department: DPS - Motor Pool Anticipated Start Date: 07/2024

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

This air compressor is used for blowout and air hammering

Project Need: Provide a brief explanation of why the project is necessary.

This unit is useful for blowing out valve boxes, service boxes, air hammering of pavement and cleaning lines for winter. This unit will be approx 20 years old at time of replacement.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 20,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ■ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / Sealed Bid

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of Front End Loader #250

Project ID #: _____ CIP ID #: MP-20

Department: DPS - Motor Pool Anticipated Start Date: 07/2027

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of Front End Loader that was purchased in 2015.

Project Need: Provide a brief explanation of why the project is necessary.

Front end loader is used for loading material, picking up leaves, snow, and brush.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 325,000.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / Sealed Bid (est 25 - 45K)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Replacement of Excavator #180

Project ID #: _____ CIP ID #: MP-21

Department: DPS - Motor Pool Anticipated Start Date: 07/2027

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replacement of Excavator

Project Need: Provide a brief explanation of why the project is necessary.

This vehicle is necessary for curb removal, water main breaks, heavy lifting, hydrant replacement, and other purposes within the city. This machine will be about 20 years old at time of proposed replacement.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 265,000.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / Sealed Bid (est 25-45K)

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: DPS Superintendent Vehicle #20

Project ID #: _____ CIP ID #: MP-24

Department: DPS Anticipated Start Date: 07/2023

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Supervisor vehicle for transportation

Project Need: Provide a brief explanation of why the project is necessary.

Vehicle on replacement program (if selected)

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 53,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Vehicle is on replacement program - sale of existing vehicle planned to pay for new vehicle.

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: DPS Superintendent Vehicle #30

Project ID #: _____ CIP ID #: MP-25

Department: DPS Anticipated Start Date: 07/2023

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Supervisor vehicle for transportation

Project Need: Provide a brief explanation of why the project is necessary.

Vehicle on replacement program (if selected)

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 53,000.00

Please check one of the following for cost basis:

- ☐ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ■ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Vehicle is on replacement program - sale of existing vehicle planned to pay for new vehicle.

List of Attachments (quotes, photos, etc.):

City of Hastings – Capital Improvement Plan
Project Application Form

Project Title: Truck 40 Service Truck

Project ID #: _____ CIP ID #: MP-29

Department: WWTP Anticipated Start Date: 07/2023

Date Prepared: 01/10/2023

Project Description: Provide a brief physical description of the project. Please be specific.

Replace 2012 Service Truck 40.

Project Need: Provide a brief explanation of why the project is necessary.

This truck is used in the township and city by the wastewater team for sampling and service. Truck 40 is aging and will begin to cost more in maintenance and upkeep.

Planning: Is the project included in a prior program, plan, or policy? If so, identify the plan here:

Does the project share space or overlap with other CIP projects? Please describe.

Project Cost: $ 90,000.00

Please check one of the following for cost basis:

- ■ Cost of comparable facility/equipment
- ☐ Cost estimate from engineer/architect
- ☐ Rule of thumb indicator/unit cost
- ☐ Preliminary estimate
- ☐ Ballpark "guesstimate"

Potential Funding Sources:

Equipment Fund
Trade in / Sealed Bid (est (6-10K)

List of Attachments (quotes, photos, etc.):

City of Hastings
Planning Commission
Work Tasks for 2023
STATUS REPORT FOR APRIL 2023

1. Continue to work with Hastings Charter Township, Rutland Charter Township and others in regional growth planning and management efforts.

2. Review the Court Street PUD using hypothetical build out scenarios.

3. Consider actions strategies as identified in the Master Plan to accomplish specific desired outcomes within commercial and residential zoning districts.

   - Provide for a wide variety of housing types, sizes, and densities.
   - Maintain existing housing stock and infrastructure.
   - Encourage residential development within areas targeted for growth and investment.
   - Provide for land use options/incentives designed to encourage reuse of vacant buildings and infill development.

4. Consider zoning amendments related to the M-37 Access Management Plan.

5. Monitor plan to construct sidewalks and trail system throughout the City of Hastings.

   - ***Ongoing. City seeking funding where available.***

6. Consider changes to the infrastructure requirements to accommodate denser or more traditional residential development.

7. Consider development of “Complete Streets” ordinance or policy.

8. Consider the following principles to align with Blue Zones Activate Program:

- Offer incentives or expedited approvals for the following Blue Zone principles:
    - Locate new development adjacent to existing infrastructure
    - Create a mixed-use community
    - Build pedestrian amenities (sidewalks, lights, benches, etc) on both side of the streets
    - Provide public facilities for physical activity such as shared-use paths or trails
    - Create bike lanes and bike parking
    - Create opportunities for resident interaction
    - Create mid-block cross walks for traffic calming

9. Review Sec. 90-973 Signs in the B-1, B-2, B-3, B-4, and B-6 districts (as related to portable sidewalk ground signs).

10. Consider development of a Planned Residential District zoning classification to allow for higher density housing through smaller lot sizes and smaller dwelling square footage requirements.

11. Continue path to Redevelopment Ready Communities (RRC) certification by reviewing zoning related codes and procedures.

12. Review Section 90-929 Supplemental Parking Requirement in Residential Zones and other pertinent sections relating to the parking of semi-tractors, semi-trailers, and vehicles with two or more rear axles.

13. Consider Mobile Food Vehicles ordinance for the regulation of food trucks.

14. Review and consider adding text regarding green infrastructure components.

15. Review subdivision text regarding street width.

16. Review text regarding Adult Day Care Homes, Adult Foster Care Family Home, Adult Foster Care Large Group Home, etc.

17. Review Article 90-XII Landscaping Section 90-1010 for permitted trees that are an invasive species.

Site Plan Tracker

Project Name and Address	App and fees paid	Site plan and prints to staff	PC Agenda Date	PC Decision	Conditions for completion	COI
Meadowstone Mobile Home Park 1812 Lavender Drive	1.14.20	1.14.20	2.3.20	Approved	PED X Insulation from roadway Natural feature buffer	
EWB Properties, LLC 400 and 410 W. State Street	2.7.20	2.7.20	3.2.20	Approved	Stormwater runoff compliance	
Hastings Pro Auto Service 229 N. Broadway	10.25.21	10.25.21	3.7.22	Approved	Dumpster enclosure Sidewalk installation Fire Dept. review of traffic circulation	
Meadowtone Mobile Home Park 1812 Lavender Drive	1.13.22	1.13.22	5.2.22	Approved	Refuse disposal enclosure Landscaping Driveway width Elevations to be reviewed for façade Sidewalk installation prior to COI	
EWB 400 W. State Street	7.14.21	7.14.21	6.6.22	Approved	Monument sign on State - Removal Illumination must meet standards	
City of Hastings Parking Lot 8	8.19.22	NA	NA	Administrative	Fencing details Parking space width compliance Canopy tree type compliance	

Site Plan Tracker

Project Name and Address	App and fees paid	Site plan and prints to staff	PC Agenda Date	PC Decision	Conditions for completion	COI
Serenity Village 700 East Woodlawn	9.28.22	9.28.22	11.7.22	Approved	Landscaping Off Street Loading Ped. Access from sidewalk	

MCKENNA

April 3, 2023

Planning Commission
City of Hastings
201 East State Street
Hastings, Michigan 49058

Subject: Tractor, Trailer & RV Parking

Summary of Issues

Parking or Storage of Semi-Tractors/Semi-Trailers

Issue #1

- Section 90-929 prohibits 'the outdoor parking or storage of semi-tractors, semi-trailers, or vehicles with 2 or more rear axles':
    - in all residential areas;
    - on any streets, alleys or public ways within the City, except when actively loading or unloading;
    - and, all other areas except –
        - in connection with construction activity actually occurring on the property;
        - for a period of up to 3 hours for the purpose of loading or unloading;
        - where such vehicles are being offered for sale by a licensed dealership; or
        - where such vehicles are customarily used in connection with the business

- Per Section 90-929, there is currently no zoning district in the City that allows for the 'outdoor parking or storage of semi-tractors, semi-trailers, or vehicles with 2 or more rear axles' as an accessory use or as a principal use.

WEST MICHIGAN
151 South Rose Street
Suite 190
Kalamazoo, Michigan 49007
O 269.382.4443
F 248.596.0930
MCKA.COM

Proposal

- Allow a parking lot for the overnight parking of semi-tractors, semi-trailers, vehicles with 2 or more rear axles, and recreational vehicles on a short-term basis as a principal use.

- Amend the Zoning Ordinance to establish a 'parking lot for the overnight parking of semi-tractors, semi-trailers, vehicles with 2 or more rear axles, and recreational vehicles on a short-term basis' as a special land use within the D-1 and D-2 Industrial Districts, with related parking lot design standards.

Issue #2

- Section 90-929 prohibits 'the outdoor parking or storage of semi-tractors, semi-trailers, or vehicles with 2 or more rear axles' . . and so does not apply to single rear axle trucks.

- Single rear axle trucks can include large trucks such as dump trucks, platform trucks, and tow trucks.

- Per the Code Enforcement Officer, several types of large trucks . . such as a box truck, platform truck, utility truck, and tow truck . . are routinely parked in residential driveways . . often as the work truck of the resident.

    - This is currently allowed by Ordinance.
    - Complaints are not being received regarding this practice.
    - Not currently a widespread occurrence.

Proposal

- Include 'large single axle trucks' in the amendments to the D-1 and D-2 Districts to allow overnight parking lots as a special land use.

Parking or Storage of Recreational Vehicles

Issue #1

- Section 90-1 defines 'recreational vehicle' as 'a vehicular unit not exceeding 36 feet in overall length, eight feet in width, or 12 feet in overall height'. . and includes a camper trailer, travel trailer, truck camper, motor home, boat trailer, horse trailer, utility trailer, and off-road vehicle.

- Section 90-776 allows for the outdoor 'parking' or 'storage' of a recreational vehicle in any zoning district as follows:

    - Side/rear yard
    - 2 ft setback from lot lines
    - Front driveway, or area adjacent to the driveway (perpendicular to the front curb) . . if side/rear yard parking is not feasible . . and cannot extend over the sidewalk or r.o.w.

- Per the Code Enforcement Officer, 1) the 36 ft length standard established by Section 90-1 allows RVs of significant size; 2) Section 90-776 does not limit the number of RVs that can be parked/stored on site; and 3) Section 90-776 does not distinguish between 'parking' and 'storage' raising questions as to duration.

    - Most RV parking is being done in compliance with Section 90-776.
    - Complaints are not being received.
    - However, some areas where lots are smaller are beginning to look like 'storage lots' due to the number, size, and duration of RV parking.

Proposal

- Include RVs in the amendments to the D-1 and D-2 Districts to allow overnight parking lots as a special land use.

Summary Proposal

- The amendment of the D-1 and D-2 Districts so as to allow a parking lot for the overnight parking of semi-tractors, semi-trailers, vehicles with 2 or more rear axles, large single axle trucks and recreational vehicles on a short-term basis as a principal use . . will offer a parking alternative to residents.

- It is assumed that providing an alternative to on-site parking for residents will address some of the practices currently observed by the Code Enforcement Officer.

- One option would be to proceed with the proposed amendment; allow for parking lots to be established; and, then assess whether the parking alternative is resulting in a decrease in on-site parking.

- Additional amendments that could be considered include:
  1. Amend Section 90-929 to also prohibit 'large single axle trucks'.
  2. Amend the definition of 'recreational vehicle' to reduce the maximum metrics allowed for on-site parking/storage.
  3. Amend Section 90-776 to establish a limit on the number of RVs allowed to be parked/stored on-site.
  4. Amend Section 90-776 to clarify the distinction between parking/storage by establishing an allowed duration.

  These amendments require Planning Commission discussion and guidance.

Review Schedule

- ✓ March: Work with the Zoning Administrator and Code Enforcement Officer to understand the frequent parking violations and the perceived 'deficiencies' of Sections 90-776 and 90-929.

- April PC Meeting – summary of issues; outline of proposed amendments

- May PC Meeting – Draft #1 of proposed amendments