Legal Department

American Electric Power
1 Riverside Plaza
Columbus, OH 43215-2373
AEP.com

September 15, 2020

The Honorable Sam
Randazzo, Chairman
Ohio Power Siting Board
180 East Broad Street
Columbus, Ohio 43215-3793

Tanner S. Wolffram
Christen M. Blend
Senior Counsel –
Regulatory Services
(614) 716-2914 (P)
(614) 716-1915 (P)
tswolffram@aep.com
cmblend@aep.com

RE: Proof of Compliance with Condition 2
Case No. 20-0583-EL-BLN
Hayden Transmission Station Expansion Project

Dear Chairman Randazzo:

In satisfaction of Condition (2) of the Staff Report of Investigation for this Project, Ohio Power Company submits this notice and attachment to inform you that the Ohio Environmental Protection Agency National Pollutant Discharge Elimination System-Construction Site Stormwater General Permit has been approved for the above-referenced Project.

If you have questions regarding this information, please do not hesitate to contact me.

Respectfully submitted,

/s/ Tanner S. Wolffram
Christen M. Blend (0086881), Counsel of Record
Tanner S. Wolffram (0097789)
Counsel for Ohio Power Company

Mike DeWine, Governor
Jon Husted, Lt. Governor
Laurie A. Stevenson, Director

Apr 28, 2020

AEP Ohio Transmission Company, Inc.
Aimee Toole
8600 Smiths Mill Road
New Albany, OH 43055

Re: Approval Under Ohio EPA National Pollutant Discharge Elimination System (NPDES) - Construction Site Stormwater General Permit - OHC000005

Dear Applicant,

Your NPDES Notice of Intent (NOI) application is approved for the following facility/site. Please use your Ohio EPA Facility Permit Number in all future correspondence.

Facility Name:	Hayden Station
Facility Location:	7210 Hayden Run Road
City:	Amlin
County:	Franklin
Township:	Washington
Ohio EPA Facility Permit Number:	4GC07303*AG
Permit Effective Date:	Apr 28, 2020

Please read and review the permit carefully. The permit contains requirements and prohibitions with which you must comply. Coverage under this permit will remain in effect until a renewal of the permit is issued by the Ohio EPA.

If more than one operator (defined in the permit) will be engaged at the site, each operator shall seek coverage under the general permit. Additional operator(s) shall submit a Co-Permittee NOI to be covered under this permit. There is no fee associated with the Co-Permittee NOI form.

Please be aware that this letter only authorizes discharges in accordance with the above referenced NPDES CGP. The placement to fill into regulated waters of the state may require a 401 Water Quality Certification and/or Isolated Wetlands Permit from Ohio EPA. Also, a Permit-To-Install (PTI) is required for the construction of sanitary or industrial wastewater collection, conveyance, storage, treatment, or disposal facility; unless a specific exemption by rule exists. Failure to obtain the required permits in advance is a violation of Ohio Revised Code 6111 and potentially subjects you to enforcement and civil penalties.

To view your electronic submissions and permits please Logon in to the Ohio EPA's eBusiness Center at http://ebiz.epa.ohio.gov.

If you need assistance or have questions please call (614) 644-2001 and ask for Construction Site Stormwater General Permit support or visit our website at http://www.epa.ohio.gov.

Sincerely,

Laurie A. Stevenson
Director

Division of Surface Water - Notice of Intent (NOI) For Coverage Under Ohio *Environmental Protection Agency General NPDES Permit*

(Read accompanying instructions carefully before completing this form.)

Submission of this NOI constitutes notice that the party identified in Section I of this form intends to be authorized to discharge into state surface waters under Ohio EPA's NPDES general permit program. Becoming a permittee obligates a discharger to comply with the terms and conditions of the permit. Complete all required information as indicated by the instructions. Do not use correction fluid on this form. Forms transmitted by fax will not be accepted. A check for the proper amount must accompany this form and be made payable to "Treasurer, State of Ohio." (See the fee table in Attachment C of the NOI instructions for the appropriate processing fee.)

I. Applicant Information/Mailing Address

Company (Applicant) Name: AEP Ohio Transmission Company, Inc.

Mailing (Applicant) Address: 8600 Smiths Mill Road

City: New Albany	**State :** OH	**Zip Code:** 43055

Country: USA

Contact Person: Aimee Toole	**Phone:** (614) 933-2060	**Fax:**

Contact E-mail Address: artoole@aep.com

II. Facility/Site Location Information

Facility/Site Name: Hayden Station

Facility Address: 7210 Hayden Run Road

City: Amlin	**State:** OH	**Zip Code:** 43002

County: Franklin	**Township:** Washington

Facility Contact Person: Brandon Morrison	**Phone:** (614) 307-9196	**Fax:**

Facility Contact E-mail Address: bwmorrison@aep.com

Latitude: 40.061017	**Longitude:** -83.193611	**Facility/Map Attachment** location map.pdf

Receiving Stream or MS4: Franklin County MS4, unnamed trib Hayden Run

III. General Permit Information

General Permit Number: OHC000005	**Initial Coverage:** Y **Renewal Coverage:** N
Type of Activity: Construction Site Stormwater General Permit	**SIC Code(s):**
Existing NPDES Facility Permit Number:	**ODNR Coal Mining Application Number:**
If Household Sewage Treatment System, is system for:	**New Home Construction:** / **Replacement of failed existing system:**

Outfall	Design Flow (MGD):	Associated Permit Effluent Table:	Receiving Water :	Latitude	Longitude

Are These Permits Required?	**PTI:** NO	**Individual 401 Water Quality Certification:** NO
Individual NPDES: NO	**Isolated Wetland:** NO	**U.S. Army Corp Nationwide Permit:** NO
Proposed Project Start Date(if applicable): May 04, 2020		**Estimated Completion Date(if applicable):** November 25, 2020
Total Land Disturbance (Acres): 20		**MS4 Drainage Area (Sq. Miles):**

SWP3 Attachment(s): <None>

IV. Payment Information

Check #:	**For Ohio EPA Use Only**
Check Amount:	**Check ID(OFA):**_____ **ORG #:**_____
Date of Check:	**Rev ID:**_____ **DOC #:**_____

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Applicant Name: Aimee Toole	**Title:** Transmission Project Environmental Support Manager

Signature:	Date:
Electronically submitted by p000106	Electronically submitted on 04/27/2020

From: Drozin, Kevin
To: Amy J Toohey
Cc: Aultman, Ian; Zahorchak, Sara
Subject: [EXTERNAL] FW: File Transfer: AEP Hayden Station - SWPPP Report
Date: Friday, May 15, 2020 1:36:41 PM
Attachments: image001.png
image003.png
image004.png
image005.png
image011.png
image012.png
image013.png

Amy, please see below from Jim Ramsey with Franklin County. The County has no comments on the SWPPP document.

-Kevin

Kevin Drozin, PE
ms consultants, inc | engineers, planners
333 Rouser Road
Airport Office Park #4
Second Floor, Coraopolis, Pennsylvania 15108-2773

p: 412-264-8701 Ext. 18154
f: 412-264-2076
e: kdrozin@msconsultants.com
Connect: Facebook | Twitter | LinkedIn | ms Blog

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From: James R. Ramsey, P.E. [mailto:jramsey@franklincountyengineer.org]
Sent: Friday, May 15, 2020 1:23 PM
To: Drozin, Kevin <kdrozin@msconsultants.com>
Cc: Mounika Sajja <msajja@franklincountyengineer.org>; Katherine M. Radtke, E.I. <kradtke@franklincountyengineer.org>
Subject: RE: File Transfer: AEP Hayden Station - SWPPP Report

---

Kevin,

Your submittal was very well done. We have no comments.

Sincerely,
Jim

James R. Ramsey, P.E.
Assistant Highway Design Engineer
970 Dublin Road
Columbus, Ohio 43215
614-525-7469
jramsey@franklincountyengineer.org
www.franklincountyengineer.org

From: Drozin, Kevin [mailto:kdrozin@msconsultants.com]
Sent: Friday, May 15, 2020 11:52 AM
To: James R. Ramsey, P.E. <jramsey@franklincountyengineer.org>
Subject: RE: File Transfer: AEP Hayden Station - SWPPP Report

Hi Jim. Wanted to follow up to see if there were any comments on the AEP Hayden substation plans or reports.

Thanks,
Kevin

Kevin Drozin, PE
ms consultants, inc | engineers, planners
333 Rouser Road
Airport Office Park #4
Second Floor, Coraopolis, Pennsylvania 15108-2773

p: 412-264-8701 Ext. 18154
f: 412-264-2076
e: kdrozin@msconsultants.com
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From: James R. Ramsey, P.E. [mailto:jramsey@franklincountyengineer.org]
Sent: Wednesday, May 6, 2020 9:24 AM
To: Drozin, Kevin <kdrozin@msconsultants.com>
Subject: RE: File Transfer: AEP Hayden Station - SWPPP Report

In review until 5/14

James R. Ramsey, P.E.
Assistant Highway Design Engineer
970 Dublin Road
Columbus, Ohio 43215
614-525-7469
jramsey@franklincountyengineer.org
www.franklincountyengineer.org

From: Drozin, Kevin [mailto:kdrozin@msconsultants.com]
Sent: Tuesday, May 5, 2020 7:33 AM
To: James R. Ramsey, P.E. <jramsey@franklincountyengineer.org>
Cc: Aultman, Ian <iaultman@msconsultants.com>; Zahorchak, Sara <szahorchak@msconsultants.com>
Subject: RE: File Transfer: AEP Hayden Station - SWPPP Report

Good morning Jim.

Hope all is well with you. I wanted to follow up on the AEP Hayden station file transfer shown below. Were you able to download the files you needed for the County's review? Please let me know if you need me to resend anything or provide any additional information.

Thank you,
Kevin

Kevin Drozin, PE
ms consultants, inc | engineers, planners
333 Rouser Road
Airport Office Park #4
Second Floor, Coraopolis, Pennsylvania 15108-2773

p: 412-264-8701 Ext. 18154
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From: Zahorchak, Sara
Sent: Tuesday, May 5, 2020 7:28 AM
To: Drozin, Kevin <kdrozin@msconsultants.com>
Subject: File Transfer: AEP Hayden Station - SWPPP Report - Kevin P. Drozin

A transfer (File Transfer) has arrived on the ms consultants, inc. Info Exchange Site.

Additional links:

Download all associated files
Reply to All

From:	Kevin P. Drozin (ms consultants, inc.)
To:	jramsey@franklincountyengineer.org
CC:	Ian Aultman (ms consultants, inc.); Sara A. Zahorchak (ms consultants, inc.); ajtoohey@aep.com; Joshua C. Martin (ms consultants, inc.); Mike Deskin (American Electric Power); mjpanzitta@aep.com; bwmorrison@aep.com
Subject:	AEP Hayden Station - SWPPP Report
Sent via:	Info Exchange
Expiration Date:	5/22/2020
Remarks:	Jim, good morning. On behalf of American Electric Power, ms consultants would like to submit the AEP Hayden Station SWPPP Report for Franklin County review. Please follow the link provided in this email to download the document. This report includes the Stormwater Management Report and Civil Design Drawings. Please note that AEP is not requesting any new access from the public R/W, nor will the project impact a floodplain. If you have any questions about the report or have any difficulty accessing the file, do not hesitate to call or email. Since we are working from home while the COVID-19 guidelines are in place, you will have to call my cell (216-470-2976). Thank you, Kevin Drozin

Transferred Files

NAME	TYPE	DATE	TIME	SIZE
AEP Hayden - SWPPP Report.pdf	PDF File	04/21/2020	11:09	41,692 KB

HAYDEN STATION PROJECT

7210 Hayden Run Road

Amlin, OH 43002

LAT/LONG: 40.061017 N, -83.193611 W

STORM WATER POLLUTION PREVENTION PLAN (SWP3)

Prepared for:

AEP Ohio Transmission Company, Inc.
8600 Smith's Mill Road
New Albany, OH 43054

Prepared by:

ms Consultants, Inc.
2221 Schrock Road
Columbus, OH 43229

Site Contact: Brandon Morrison
Phone: 614-307-9196
E-mail: bwmorrison@aep.com

REVISION 1, APRIL 2020

Project Start Date: May 2020
Project End Date: October 2020

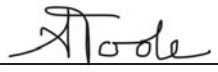
HAYDEN STATION PROJECT

CERTIFICATION

“I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

Name: Aimee Toole

Title: Mngr - Project Environmental Support

Signature: 

Date: 4/27/2020

TABLE OF CONTENTS

APPENDIX 1 – Ohio EPA General Permit No. OHC000005

APPENDIX 2 – Project Location Map, Soil Erosion and Sediment Control Plan, USDA Soils Map, Watershed (HUC-12) Map, and ODNR Rainwater and Land Development Manual Details

APPENDIX 3 – SWP3 Inspection Form and SWP3 Amendments, Grading, and Stabilization Log

APPENDIX 4 – Duty to Inform Contractors and Subcontractors Signature Form

APPENDIX 5 – Storm Water Calculations Report

APPENDIX 6 – Long-term Maintenance Plan

I. Site Description

A. Description of Construction Activity

AEP Ohio Transmission Company, Inc. (AEP) is proposing to conduct construction activities for the Hayden Station Project (Project) located in Amlin, Franklin County, Ohio. The Project consists of adding an approximate 11-acre gravel pad expansion to the existing 6.5-acre site. Construction activities will include grading, gravel placement, and installation of storm water management facilities. The existing station fence will remain in place and access to the Project is provided by the existing drive off Hayden Run Road.

The transmission line extension will include installing 2 new poles along the gravel pad expansion and approximately 1,309 feet of new transmission lines. The pole foundations will be either drilled shaft or embedded.

B. Disturbed Area

Total Area of the Site – 55.3 acres

Total Disturbed Area – 18.62 acres

Table 1: Disturbed Area

County	Township/Village/City	Disturbance Acreage
Franklin (MS4)	Amlin	18.62

C. Impervious Area

The station will result in 11 acres of additional impervious surface. As a result of the change in impervious area, post-construction best management practices (BMPs) are warranted. See Section II.D.5 of this SWP3 for post-construction storm water management requirements.

Table 2: Impervious Area

	Impervious Acreage	% Imperviousness
Existing	6.5	11.75%
New	11	19.89%
Total	17.5	31.64%

D. Storm Water Calculations

Pre- and post-development runoff coefficients have been calculated based on the pre- and post-estimates for impervious surfaces within the existing facility. The proposed expansion does not include the addition of impermeable materials such as concrete, asphalt, or other hard surfaces. A measure of the impervious areas and percent imperviousness created by the construction activity can be found in the water quality calculations included in Appendix 5. The resulting increase in overall impermeability due to the expansion is approximately 19.89%, producing an increase in runoff volume, as indicated in the water quality calculations in Appendix 5. Therefore, this does warrant the need for post-construction best management practices (BMPs).

Total Area of Site:
Pre-development runoff coefficient – 0.49
Post-development runoff coefficient – 0.57*

*For substation construction only, the transmission line construction will not permanently change the runoff coefficient.

E. Existing Soil Data

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey was used to determine soil types within the Project area. A copy of the web-based soil map is included in Appendix 2. Soils in the Project area are shown in Table 3.

Table 3: Soil Types

Map Unit Symbol	Map Unit Description	Drainage Class	Hydric Soil?
Ko	Kokomo silty clay loam, 0 to 2 percent slopes	Very poorly drained	Yes
LeB	Lewisburg-Crosby complex, 2 to 6 percent slopes	Moderately well drained/Somewhat poorly drained	No[1]

[1] Contains hydric inclusions.

F. Prior Land Uses

The Project is located in a rural area west of Columbus, Ohio in Amlin (Brown Township). Prior land use is an existing gravel station with areas of grass and farm crops.

G. On-site Streams and Receiving Streams and Surface Waters

1. On-Site Waterbodies

Table 4: Delineated Wetlands and Ponds

Wetland ID	Cowardin Classification	ORAM Category
Existing Pond	PUBGx	1

2. Receiving Waters

The Project is located in the Upper Scioto Watershed (HUC-12: 050600011204) which ultimately drains to the Scioto River. The receiving streams may include Hayden Run.

H. Implementation Schedule

A construction log will be kept at the Project site to record major dates of grading and stabilization. The general order of construction is provided in Table 5 below and will begin in May 2020 and is estimated to end in October 2020.

Table 5: Implementation Schedule

Task	Date
Identify environmental avoidance areas in the field [i.e. wetlands, 50' stream buffers, other environmental commitments]	May 2020
Mobilize construction equipment	May 2020
Forestry clearing/grubbing to begin	May 2020
Install erosion controls/BMPs - filter sock, timber matting, and temporary construction entrances, as needed	May 2020
Excavate foundations for new poles, install new poles	May 2020
Install sediment basin and begin station excavation and grading	May 2020-October 2020
Install temporary seed and mulch, as needed, during Project activities	May 2020-October 2020
Finish pad construction and final grading	May 2020-October 2020
Grade pole locations to pre-existing conditions	October 2020
Install permanent seed and mulch	October 2020
Remove matting and temporary BMPs	October 2020
Repair/restore all remaining disturbed areas	October 2020
Seed and mulch all remaining disturbed areas	October 2020
Construction demobilization	October 2020
Inspection with AEP and SWP3 contractor	October 2020

I. Subdivided Development Drawing

Not applicable.

J. Dedicated Asphalt and Concrete Plant Discharges

Not applicable.

K. Log of Grading and Stabilization Activities

A log for documenting grading and stabilization activities and amendments to the SWP3 is included in Appendix 3.

L. Site Map

A vicinity of the Project area is included in Appendix 2, along with the Soil Erosion Sediment and Sediment Control Plan and details. The Soil Erosion and Sediment Control Plan shows the

Project boundaries and contours, the limits of construction, and the locations of the erosion and sediment control features.

M. Permit Requirements

The permit requirements can be reviewed in the Ohio EPA General Permit No. OHC000005 which has been included as Appendix 1.

II. Storm Water Pollution Prevention Plan

The SWP3 was developed to meet the objectives in Part II. Non-numeric Effluent Limitations and Part III. Storm Water Pollution Prevention Plan (SWP3) of Ohio EPA General Permit No. OHC000005.

A. SWP3 Availability

This Plan, a copy of the Notice of Intent (NOI), and the Ohio EPA authorization shall be made available on-site immediately upon request of the director or an authorized representative during working hours. Per Ohio EPA, an electronic copy is an acceptable format for on-site availability and review.

B. Amendments

The SWP3 is a living document that will be updated as needed. The SWP3 shall be amended whenever there is a change in design, construction, operation or maintenance, or if the SWP3 proves to be ineffective in controlling pollutants in storm water discharges associated with construction activity. A log for documenting amendments is included in Appendix 3.

AEP Environmental Services shall be notified prior to any significant modifications to the SWP3, such as changes to the access roads, disturbance acreage, culvert installations, etc., to ensure the Project remains in compliance with Ohio EPA General Permit No. OHC000005.

C. Duty to Inform Contractors

All contractors and subcontractors who will be involved in implementation of the SWP3 shall review and understand the conditions and responsibilities of the SWP3 and document their acknowledgement by signing the form included in Appendix 4.

D. Controls

Timing: Temporary erosion and sediment control measures shall be installed prior to earth-disturbing activity. Temporary control measures will not be removed until final site stabilization, in the form of permanent gravel cover or perennial vegetative cover with a density of at least 70%, is achieved.

The locations of the control methods are shown on the Soil Erosion and Sediment Control Plans in Appendix 2. Maintenance and inspections requirements for these controls can be found in Section II.D.6 of this SWP3. The control measures for this Project include the following:

1. Preservation Methods

   Existing natural conditions shall be preserved as much as feasible. Such practices may include: preserving existing vegetation, vegetative buffer strips, and existing soil profile and topsoil; minimizing soil compaction; minimizing disturbance of steep slopes; phasing of construction operations to minimize the amount of disturbed land at any one time; and protective clearing or grubbing practices. For all construction activity adjacent to surface waters of the state, a 50-foot undisturbed natural buffer will be maintained as measured from the ordinary high water mark (OHWM).

2. Erosion, Sediment, and Runoff Controls

   a. *Stabilization and Seeding*

      Disturbed areas will be stabilized as specified in tables 6 and 7 below per the Soil Erosion and Sediment Control Plan and BMP detail sheets in Appendix 2. Mulch shall be applied to all exposed soil that has been seeded in an effort to facilitate seed germination and development.

Table 6: Permanent Stabilization

Area Requiring Permanent Stabilization	Time Frame to Apply Erosion Controls
Any areas that will lie dormant for one year or more.	Within seven calendar days of the most recent disturbance.
Any areas within 50 feet of a surface water of the state and at final grade.	Within two calendar days of reaching final grade.
Other areas at final grade.	Within seven calendar days of reaching final grade within that area.

Table 7: Temporary Stabilization

Area Requiring Temporary Stabilization	Time Frame to Apply Erosion Controls
Any disturbed areas within 50 feet of a surface water of the state and not at final grade.	Within two calendar days of the most recent disturbance if the area will remain idle for more than 14 calendar days.
Any disturbed areas that will be dormant for more than 14 calendar days but less than one year, and not within 50 feet of a surface water of the state.	Within seven calendar days of the most recent disturbance within the area. For residential subdivisions, disturbed areas must be stabilized at least seven days prior to transfer of permit coverage for the individual lot(s).
Disturbed areas that will be idle over winter.	Prior to the onset of winter weather.

   b. *Sediment Barriers and Diversions*

      Filter sock and silt fence will be installed to encompass the entire site at all appropriate locations to filter sediment from site runoff. Orange barrier fencing will be used as needed and to protect wetland areas and 50-foot natural stream buffers. After Project completion, the posts, fencing, and ties shall be removed from the Project site and transported to an appropriate off-site disposal facility.

c. *Wetland and Stream Crossings*

No wetland or stream crossings are proposed for this project.

d. *Temporary Construction Entrances*

Construction entrances consisting of a stabilized pad of aggregate will be installed where construction vehicles leave active construction areas and enter public roadways to reduce the amount of sediment tracked offsite. Temporary construction entrance locations and details are provided in Appendix 2.

e. *Sediment Settling Ponds / Sediment Basins*

Sediment basins shall be implemented prior to grading and within seven calendar days from the start of grubbing. A sediment basin will be implemented for this project and converted into a permanent detention basin upon the completion of the project and the establishment of vegetation. The sediment basin will be equipped with an outlet riser with a Faircloth Skimmer.

3. Surface Water Protection

No direct discharge to surface waters is proposed for this Project. Surface waters will be protected through the erosion and sediment controls outlined in the sections above.

4. Other Controls

a. *Non-sediment Pollutant Controls*

Waste disposal containers shall be provided for proper collection of all waste material including sanitary garbage, petroleum products and any materials to be used onsite (excluding inert waste/materials such as construction debris that would not be expected to contribute pollution to storm water). Containers shall be covered and not leaking. No construction waste materials shall be buried on-site. All waste materials shall be disposed of in the manner specified by local or state regulations or by the manufacturer. No solid or liquid wastes will be discharged in storm water runoff.

b. *Off-site Traffic and Dust Control*

Any paved roads adjacent to the site entrance shall be swept to remove any excess mud, dirt, or rock tracked from the site, as necessary. Dump trucks hauling materials to or from the site shall be covered with a tarpaulin. Dust control shall be observed both on and off the site for the duration of the Project. Dust and sedimentation will be minimized by limiting earth-moving activities, site traffic, and soil and vegetation disturbances throughout the site. Chemical stabilizers and adhesives will not be used unless written permission is received from AEP Environmental Representative. Dust control details can be found in Appendix 2.

c. *Concrete Washouts*

Concrete washouts will be located in upland areas outside of wetlands or flood zones. Under no circumstances will concrete trucks wash out into a drainage channel, storm sewer or surface water.

d. *Wash Water*

Water from vehicle washing, wheel washing, and other wash waters will be treated appropriately prior to discharge to minimize pollutants. Spills and leaks will be prevented and responded to as necessary.

e. *Compliance with Other Requirements*

This SWP3 is consistent with state and/or local waste disposal, sanitary sewer or septic system regulations including provisions prohibiting waste disposal by open burning. Spill response, disposal of suspect contaminated soils and clean-up activities are initiated by calling the AEP Regional Environmental Coordinator (REC).

f. *Trench and Groundwater Control and Dewatering*

Trench dewatering and groundwater control is not likely since this is an overhead line and any necessary trenching will be relatively shallow and short in duration. Dewatering may be needed if surface or subsurface water creates conditions where pole or foundation placement is being prevented or hindered and removing the water has the potential to contribute sediment to surface waters. If dewatering is needed, water shall be pumped directly into a dewatering device such as a tube or bag that has been sized according to the flow rate of the dewatering pump and the predominant sediment size (woven for sand, non-woven for silt and clay). Upon construction completion, accumulated sediment shall be removed from the dewatering device and either placed in an upland part of the site where it shall then be seeded and mulched or shall be removed to an appropriate off-site disposal facility.

g. *Contaminated Sediment*

Contaminated soils are not expected to be encountered on this Project. However, if they should exist within the limits of construction, they will be disposed of properly per direction of the AEP Regional Environmental Coordinator (REC).

5. Post-Construction Storm Water Management Requirements

The proposed station expansion development is more than two acres resulting in the need for post-construction storm water best management practices to treat storm water runoff for pollutants and to reduce adverse impacts to receiving waters per the Ohio EPA General Permit Part III.G.2.e. The post-construction storm water practices shall provide long-term management of runoff quantity and quality to protect the receiving streams' physical, chemical and biological characteristics and maintain the function of the stream.

For this project, a detention basin will provide storm water runoff quantity and quality management. It will be equipped with an outlet structure that regulates the discharge. See Appendix 5 for the Storm Water Calculations Report and Appendix 6 for the Long-Term BMP Maintenance Plan for the proposed BMP's.

]

6. Maintenance and Inspections Requirements

*All temporary and permanent control practices shall be maintained and repaired as needed to ensure continued performance of their intended function. All erosion and sediment control measures shall be inspected:

- Once every seven calendar days; and,
- After any storm event greater than one-half inch of rain per 24-hour period by the end of the next calendar day, excluding weekends and holidays unless work is scheduled.

An inspection report shall be made after each inspection. The SWP3 Inspection Form is included in Appendix 3.

*The Contractor shall select at least two qualified individuals responsible for inspections, maintenance, and repair activities, and filling out the SWP3 Inspection Form and SWP3 Amendments, Grading, and Stabilization Log in Appendix 3. Personnel selected for these responsibilities shall be knowledgeable and experienced in all inspection and maintenance practices necessary for keeping the erosion and sediment controls in good working order.

*If an inspection reveals that a control is in need of repair or maintenance, with the exception of a sediment settling pond, it shall be repaired or maintained within three calendar days of the inspection. Sediment ponds will be repaired or maintained within 10 calendar days of the inspection. If an inspection reveals that a control fails to perform its intended function and that another, more appropriate control is required, the SWP3 shall be amended and the new control shall be installed within 10 calendar days of the inspection. If an inspection reveals a control has been installed inappropriately or incorrectly, the control will be replaced or modified for site conditions.

*When controls are modified, the erosion control drawings associated with the SWP3 will be updated to reflect the modifications, and the changes will be reflected using the SWP3 Amendments, Grading, and Stabilization Log in Appendix 3.

- Silt fence and Filter sock shall be inspected for depth of sediment, tears, and to ensure the anchor posts are firmly in the ground. Silt fence and filter sock shall also be inspected to ensure they are maintained in the appropriate positions per the plans in Appendix 2. Built up sediment shall be removed from the silt fence when it has reached one-half the height of the fence. Built up sediment shall be removed from the filter sock when it has reached one-third the height of the sock.
- Orange barrier fence shall be inspected to ensure the fence is erect and functioning as intended per the plans in Appendix 2.
- Temporary and permanent seeding shall be inspected for bare spots, washouts, and healthy growth. If seed does not germinate in an area on which it was placed, the area will either be re-seeded or an alternate erosion control method will be employed.
- Locations where vehicles and equipment enter or exit the site shall be inspected for evidence of off-site tracking of sediment. Sediment being tracked onto off-site roadways shall be cleaned up promptly.
- Detention basins shall be cleaned out when the site is stabilized to ensure the design elevation is restored.
- Excess concrete should be removed when the washout system reaches 50 percent of the design capacity. Use of the system should be discontinued until appropriate measures can be initiated to clean out the structure. Prefabricated systems should also utilize this criterion unless the manufacturer has alternative specifications.

*The permittee shall maintain the SWP3 Inspection Forms for three years following the submittal of a notice of termination (NOT) form. The Inspection Forms shall be signed in accordance with Part V.G of Ohio EPA General Permit OHC000005.

III. Approved State or Local Plans

The erosion and sediment control plans were prepared in accordance with Ohio EPA Permit No. OHC000005.

IV. Exceptions

There are no exceptions to the erosion and sediment control practices contained in the Ohio EPA General Permit No. OHC000005.

APPENDIX 1

Ohio EPA General Permit No. OHC000005

Issuance Date: April 23, 2018
Effective Date: April 23, 2018
Expiration Date: April 22, 2023

OHIO ENVIRONMENTAL PROTECTION AGENCY

GENERAL PERMIT AUTHORIZATION FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the federal Water Pollution Control Act, as amended (33 U.S.C. Section 1251 et. seq. hereafter referred to as "the Act") and the Ohio Water Pollution Control Act [Ohio Revised Code ("ORC") Chapter 6111], dischargers of storm water from sites where construction activity is being conducted, as defined in Part I.B of this permit, are authorized by the Ohio Environmental Protection Agency, hereafter referred to as "Ohio EPA," to discharge from the outfalls at the sites and to the receiving surface waters of the state identified in their Notice of Intent ("NOI") application form on file with Ohio EPA in accordance with the conditions specified in Parts I through VII of this permit.

It has been determined that a lowering of water quality of various waters of the state associated with granting coverage under this permit is necessary to accommodate important social and economic development in the state of Ohio. In accordance with OAC 3745-1-05, this decision was reached only after examining a series of technical alternatives, reviewing social and economic issues related to the degradation, and considering all public and intergovernmental comments received concerning the proposal.

This permit is conditioned upon payment of applicable fees, submittal of a complete NOI application form, development (and submittal, if applicable) of a complete Storm Water Pollution Prevention Plan (SWP3) and written approval of coverage from the director of Ohio EPA in accordance with Ohio Administrative Code ("OAC") Rule 3745-38-02.

Craig W. Butler
Director

Total Pages: 60

TABLE OF CONTENTS

PART I. COVERAGE UNDER THIS PERMIT

A. Permit Area.

This permit covers the entire State of Ohio. Appendices A and B of this permit contain additional watershed specific requirements for construction activities located partially or fully within the Big Darby Creek Watershed and portions of the Olentangy River Watershed. Projects within portions of the Olentangy River watershed shall seek coverage under this permit following the expiration of OHCO00002 (May 31, 2019).

B. Eligibility.

1. Construction activities covered. Except for storm water discharges identified under Part I.B.2, this permit may cover all new and existing discharges composed entirely of storm water discharges associated with construction activity that enter surface waters of the state or a storm drain leading to surface waters of the state.

   For the purposes of this permit, construction activities include any clearing, grading, excavating, grubbing and/or filling activities that disturb one or more acres. Discharges from trench dewatering are also covered by this permit as long as the dewatering activity is carried out in accordance with the practices outlined in Part III.G.2.g.iv of this permit.

   Construction activities disturbing one or more acres of total land or will disturb less than one acre of land but are part of a larger common plan of development or sale that will ultimately disturb one or more acres of land are eligible for coverage under this permit. The threshold acreage includes the entire area disturbed in the larger common plan of development or sale.

   This permit also authorizes storm water discharges from support activities (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) provided:

   a. The support activity is directly related to a construction site that is required to have NPDES permit coverage for discharges of storm water associated with construction activity;

   b. The support activity is not a commercial operation serving multiple unrelated construction projects and does not operate beyond the completion of the construction activity at the site it supports;

   c. Appropriate controls and measures are identified in a storm water pollution prevention plan (SWP3) covering the discharges from the support activity; and

   d. The support activity is on or contiguous with the property defined in the NOI (offsite borrow pits and soil disposal areas, which serve only one project, do not have to be contiguous with the construction site).

2. Limitations on coverage. The following storm water discharges associated with construction activity are not covered by this permit:

a. Storm water discharges that originate from the site after construction activities have ceased, including any temporary support activity, and the site has achieved final stabilization. Industrial post-construction storm water discharges may need to be covered by an NPDES permit;

b. Storm water discharges associated with construction activity that the director has shown to be or may reasonably expect to be contributing to a violation of a water quality standard; and

c. Storm water discharges authorized by an individual NPDES permit or another NPDES general permit.

3. Waivers. After March 10, 2003, sites whose larger common plan of development or sale have at least one, but less than five acres of land disturbance, which would otherwise require permit coverage for storm water discharges associated with construction activities, may request that the director waive their permit requirement. Entities wishing to request such a waiver must certify in writing that the construction activity meets one of the two waiver conditions:

a. Rainfall Erosivity Waiver. For a construction site to qualify for the rainfall erosivity waiver, the cumulative rainfall erosivity over the project duration must be five or less and the site must be stabilized with a least a 70 percent vegetative cover or other permanent, non-erosive cover. The rainfall erosivity must be calculated according to the method in U.S. EPA Fact Sheet 3.1 Construction Rainfall Erosivity Waiver dated January 2001 and be found at: http://epa.ohio.gov/portals/35/permits/USEPAfact3-1_s.pdf. If it is determined that a construction activity will take place during a time period where the rainfall erosivity factor is less than five, a written waiver certification must be submitted to Ohio EPA at least 21 days before construction activity is scheduled to begin. If the construction activity will extend beyond the dates specified in the waiver certification, the operator must either: (a) recalculate the waiver using the original start date with the new ending date (if the R factor is still less than five, a new waiver certification must be submitted) or (b) submit an NOI application form and fee for coverage under this general permit at least seven days prior to the end of the waiver period; or

b. TMDL (Total Maximum Daily Load) Waiver. Storm water controls are not needed based on a TMDL approved or established by U.S. EPA that addresses the pollutant(s) of concern or, for non-impaired waters that do not require TMDLs, and equivalent analysis that determines allocations for small construction sites for the pollutant(s) of concern or that determines that such allocations are not needed to protect water quality based on consideration of existing in-stream concentrations, expected growth in pollutant contributions from all sources, and a margin of safety. The pollutant(s) of concern include sediment or a parameter that addresses sediment (such as total suspended solids, turbidity or siltation) and any other pollutant that has been identified as a cause of impairment of any water body that will receive a discharge from the construction activity. The operator must certify to the director of Ohio EPA that the construction activity will take place, and storm water discharges will occur, within the drainage area addressed by the TMDL or equivalent analysis. A written waiver certification must be submitted to Ohio EPA at least 21 days before the construction activity is scheduled to begin.

4. Prohibition on non-storm water discharges. All discharges covered by this permit must be composed entirely of storm water with the exception of the following: discharges from firefighting activities; fire hydrant flushings; potable water sources including waterline flushings; irrigation drainage; lawn watering; routine external building washdown which does not use detergents; pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used; air conditioning condensate; springs; uncontaminated ground water from trench or well point dewatering and foundation or footing drains where flows are not contaminated with process materials such as solvents. Dewatering activities must be done in compliance with Part II.C and Part III.G.2.g.iv of this permit. Discharges of material other than storm water or the authorized non-storm water discharges listed above must comply with an individual NPDES permit or an alternative NPDES general permit issued for the discharge.

   Except for flows from firefighting activities, sources of non-storm water listed above that are combined with storm water discharges associated with construction activity must be identified in the SWP3. The SWP3 must identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

5. Spills and unintended releases (Releases in excess of Reportable Quantities). This permit does not relieve the permittee of the reporting requirements of Title 40 of the Code of Federal Regulations ("CFR") Part 117 and 40 CFR Part 302. In the event of a spill or other unintended release, the discharge of hazardous substances in the storm water discharge(s) from a construction site must be minimized in accordance with the applicable storm water pollution prevention plan for the construction activity and in no case, during any 24-hour period, may the discharge(s) contain a hazardous substance equal to or in excess of reportable quantities.

   40 CFR Part 117 sets forth a determination of the reportable quantity for each substance designated as hazardous in 40 CFR Part 116. The regulation applies to quantities of designated substances equal to or greater than the reportable quantities, when discharged to surface waters of the state. 40 CFR Part 302 designates under section 102(a) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, those substances in the statutes referred to in section 101(14), identifies reportable quantities for these substances and sets forth the notification requirements for releases of these substances. This regulation also sets forth reportable quantities for hazardous substances designated under section 311(b)(2)(A) of the Clean Water Act (CWA).

C. Requiring an individual NPDES permit or an alternative NPDES general permit.

1. The director may require an alternative permit. The director may require any operator eligible for this permit to apply for and obtain either an individual NPDES permit or coverage under an alternative NPDES general permit in accordance with OAC Rule 3745-38-02. Any interested person may petition the director to take action under this paragraph.

The director will send written notification that an alternative NPDES permit is required. This notice shall include a brief statement of the reasons for this decision, an application form and a statement setting a deadline for the operator to file the application. If an operator fails to submit an application in a timely manner as required by the director under this paragraph, then coverage, if in effect, under this permit is automatically terminated at the end of the day specified for application submittal.

2. Operators may request an individual NPDES permit. Any owner or operator eligible for this permit may request to be excluded from the coverage of this permit by applying for an individual permit. The owner or operator shall submit an individual application with reasons supporting the request to the director in accordance with the requirements of 40 CFR 122.26. If the reasons adequately support the request, the director shall grant it by issuing an individual NPDES permit.

3. When an individual NPDES permit is issued to an owner or operator otherwise subject to this permit or the owner or operator is approved for coverage under an alternative NPDES general permit, the applicability of this permit to the individual NPDES permittee is automatically terminated on the effective date of the individual permit or the date of approval for coverage under the alternative general permit, whichever the case may be.

D. Permit requirements when portions of a site are sold

If an operator obtains a permit for a development, and then the operator (permittee) sells off lots or parcels within that development, permit coverage must be continued on those lots until a Notice of Termination (NOT) in accordance with Part IV.B is submitted. For developments which require the use of centralized sediment and erosion controls (i.e., controls that address storm water runoff from one or more lots) for which the current permittee intends to terminate responsibilities under this permit for a lot after sale of the lot to a new owner and such termination will either prevent or impair the implementation of the controls and therefore jeopardize compliance with the terms and conditions of this permit, the permittee will be required to maintain responsibility for the implementation of those controls. For developments where this is not the case, it is the permittee's responsibility to temporarily stabilize all lots sold to individual lot owners unless an exception is approved in accordance with Part III.G.4. In cases where permit responsibilities for individual lot(s) will be terminated after sale of the lot, the permittee shall inform the individual lot owner of the obligations under this permit and ensure that the Individual Lot NOI application is submitted to Ohio EPA.

E. Authorization

1. Obtaining authorization to discharge. Operators that discharge storm water associated with construction activity must submit an NOI application form and Storm Water Pollution Prevention Plan (SWP3) if located within the Big Darby Creek watershed or portions of the Olentangy watershed in accordance with the requirements of Part I.F of this permit to obtain authorization to discharge under this general permit. As required under OAC Rule 3745-38-06(E), the director, in response to the NOI submission, will notify the applicant in writing that he/she has or has not been granted general permit coverage to discharge storm water associated with construction activity under the terms and conditions of this permit or that the applicant must apply for an individual NPDES permit or coverage under an alternate general NPDES permit as described in Part I.C.1.

2. No release from other requirements. No condition of this permit shall release the permittee from any responsibility or requirements under other environmental statutes or regulations. Other permit requirements commonly associated with construction activities include, but are not limited to, section 401 water quality certifications, isolated wetland permits, permits to install sanitary sewers or other devices that discharge or convey polluted water, permits to install drinking water lines, single lot sanitary system permits and disturbance of land which was used to operate a solid or hazardous waste facility (i.e., coverage under this NPDES general permit does not satisfy the requirements of OAC Rule 3745-27-13 or ORC Section 3734.02(H)). The issuance of this permit is subject to resolution of an antidegradation review. This permit does not relieve the permittee of other responsibilities associated with construction activities such as contacting the Ohio Department of Natural Resources, Division of Water, to ensure proper well installation and abandonment of wells.

F. Notice of Intent Requirements

1. Deadlines for notification.

   a. Initial coverage: Operators who intend to obtain initial coverage for a storm water discharge associated with construction activity under this general permit must submit a complete and accurate NOI application form, a completed Storm Water Pollution Prevention Plan (SWP3) for projects within the Big Darby Creek and portions of the Olentangy river watersheds and appropriate fee at least 21 days (or 45 days in the Big Darby Creek watershed and portions of the Olentangy watershed) prior to the commencement of construction activity. If more than one operator, as defined in Part VII of this general permit, will be engaged at a site, each operator shall seek coverage under this general permit prior to engaging in construction activities. Coverage under this permit is not effective until an approval letter granting coverage from the director of Ohio EPA is received by the applicant. Where one operator has already submitted an NOI prior to other operator(s) being identified, the additional operator shall request modification of coverage to become a co-permittee. In such instances, the co-permittees shall be covered under the same facility permit number. No additional permit fee is required.

   b. Individual lot transfer of coverage: Operators must each submit an individual lot notice of intent (Individual Lot NOI) application form (no fee required) to Ohio EPA at least seven days prior to the date that they intend to accept responsibility for permit requirements for their portion of the original permitted development from the previous permittee. Transfer of permit coverage is not granted until an approval letter from the director of Ohio EPA is received by the applicant.

2. Failure to notify. Operators who fail to notify the director of their intent to be covered and who discharge pollutants to surface waters of the state without an NPDES permit are in violation of ORC Chapter 6111. In such instances, Ohio EPA may bring an enforcement action for any discharges of storm water associated with construction activity.

3. How to submit an NOI. Operators seeking coverage under this permit must submit a complete and accurate Notice of Intent (NOI) application using Ohio EPA's electronic application form which is available through the Ohio EPA eBusiness Center at: **https://ebiz.epa.ohio.gov/**. Submission through the Ohio EPA eBusiness Center will

require establishing an Ohio EPA eBusiness Center account and obtaining a unique Personal Identification Number (PIN) for final submission of the NOI. Existing eBusiness Center account holders can access the NOI form through their existing account and submit using their existing PIN. Please see the following link for guidance: **http://epa.ohio.gov/dsw/ebs.aspx#170669803-streams-guidance**. Alternatively, if you are unable to access the NOI form through the agency eBusiness Center due to a demonstrated hardship, the NOI may be submitted on a paper NOI form provided by Ohio EPA. NOI information shall be typed on the form. Please contact Ohio EPA, Division of Surface Water at (614) 644-2001 if you wish to receive a paper NOI form.

4. Additional notification. NOIs and SWP3s are considered public documents and shall be made available to the public in accordance with Part III.C.2. The permittee shall make NOIs and SWP3s available upon request of the director of Ohio EPA, local agencies approving sediment and erosion control plans, grading plans or storm water management plans, local governmental officials, or operators of municipal separate storm sewer systems (MS4s) receiving drainage from the permitted site. Each operator that discharges to an NPDES permitted MS4 shall provide a copy of its Ohio EPA NOI submission to the MS4 in accordance with the MS4's requirements, if applicable.

5. Re-notification. Existing permittees having coverage under the previous generations of this general permit shall have continuing coverage under OHC000005 with the submittal of a timely renewal application. Within 180 days from the effective date of this permit, existing permittees shall submit the completed renewal application expressing their intent for continued coverage. In accordance with Ohio Administrative Code (OAC) 3745-38-02(E)(2)(a)(i), a renewal application fee will only apply to existing permittees having general permit coverage for 5 or more years as of the effective date of this general permit. Permit coverage will be terminated if Ohio EPA does not receive the renewal application within this 180-day period.

Part II. NON-NUMERIC EFFLUENT LIMITATIONS

You shall comply with the following non-numeric effluent limitations for discharges from your site and/or from construction support activities. Part III of this permit contains the specific design criteria to meet the objectives of the following non-numeric effluent limitations. You shall develop and implement the SWP3 in accordance with Part III of this permit to satisfy these non-numeric effluent limitations.

A. Erosion and Sediment Controls. You shall design, install and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants. At a minimum, such controls shall be designed, installed and maintained to:

1. Control storm water volume and velocity within the site to minimize soil and stream erosion;

2. Control storm water discharges, including both peak flowrates and total storm water volume, to minimize erosion at outlets and to minimize downstream channel and streambank erosion;

3. Minimize the amount of soil exposed during construction activity;

4. Minimize the disturbance of steep slopes;

5. Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls shall address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting storm water runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site;

6. If feasible, provide and maintain a 50-foot undisturbed natural buffer around surface waters of the state, direct storm water to vegetated areas to increase sediment removal and maximize storm water infiltration. If it is infeasible to provide and maintain an undisturbed 50-foot natural buffer, you shall comply with the stabilization requirements found in Part II.B for areas within 50 feet of a surface water; and

7. Minimize soil compaction and, unless infeasible, preserve topsoil.

B. Soil Stabilization. Stabilization of disturbed areas shall, at a minimum, be initiated in accordance with the time frames specified in the following tables.

Table 1: Permanent Stabilization

Area requiring permanent stabilization	Time frame to apply erosion controls
Any areas that will lie dormant for one year or more	Within seven days of the most recent disturbance
Any areas within 50 feet of a surface water of the state and at final grade	Within two days of reaching final grade
Other areas at final grade	Within seven days of reaching final grade within that area

Table 2: Temporary Stabilization

Area requiring temporary stabilization	Time frame to apply erosion controls
Any disturbed areas within 50 feet of a surface water of the state and not at final grade	Within two days of the most recent disturbance if the area will remain idle for more than 14 days
Any disturbed areas that will be dormant for more than 14 days but less than one year, and not within 50 feet of a surface water of the state	Within seven days of the most recent disturbance within the area For residential subdivisions, disturbed areas must be stabilized at least seven days prior to transfer of permit coverage for the individual lot(s).
Disturbed areas that will be idle over winter	Prior to the onset of winter weather

Where vegetative stabilization techniques may cause structural instability or are otherwise unobtainable, alternative stabilization techniques must be employed. Permanent and temporary stabilization are defined in Part VII.

C. **Dewatering.** Discharges from dewatering activities, including discharges from dewatering of trenches and excavations, are prohibited unless managed by appropriate controls.

D. **Pollution Prevention Measures.** Design, install, implement and maintain effective pollution prevention measures to minimize the discharge of pollutants. At a minimum, such measures must be designed, installed, implemented and maintained to:

1. Minimize the discharge of pollutants from equipment and vehicle washing, wheel washwater, and other washwaters. Washwaters shall be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;

2. Minimize the exposure of construction materials, products, and wastes; landscape materials, fertilizers, pesticides, and herbicides; detergents, sanitary waste and other materials present on the site to precipitation and to storm water; and

3. Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures.

E. **Prohibited Discharges.** The following discharges are prohibited:

1. Wastewater from washout of concrete, unless managed by an appropriate control;

2. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;

3. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and

4. Soaps or solvents used in vehicle and equipment washing or all other waste water streams which could be subject to an individual NPDES permit (Part III.G.2.g).

F. **Surface Outlets**. When discharging from sediment basins utilize outlet structures that withdraw water from the surface, unless infeasible. (Note: Ohio EPA believes that the circumstances in which it is infeasible to design outlet structures in this manner are rare. Exceptions may include time periods with extended cold weather during winter months. If you have determined that it is infeasible to meet this requirement, you shall provide documentation in your SWP3 to support your determination.)

G. **Post-Construction Storm Water Management Controls**. So that receiving stream's physical, chemical and biological characteristics are protected, and stream functions are maintained, post-construction storm water practices shall provide long-term management of runoff quality and quantity.

PART III. STORM WATER POLLUTION PREVENTION PLAN (SWP3)

A. Storm Water Pollution Prevention Plans.

A SWP3 shall be developed for each site covered by this permit. For a multi-phase construction project, a separate NOI shall be submitted when a separate SWP3 will be prepared for

subsequent phases. SWP3s shall be prepared in accordance with sound engineering and/or conservation practices by a professional experienced in the design and implementation of standard erosion and sediment controls and storm water management practices addressing all phases of construction. The SWP3 shall clearly identify all activities which are required to be authorized under Section 401 and subject to an antidegradation review. The SWP3 shall identify potential sources of pollution which may reasonably be expected to affect the quality of storm water discharges associated with construction activities. The SWP3 shall be a comprehensive, stand-alone document, which is not complete unless it contains the information required by Part III.G of this permit. In addition, the SWP3 shall describe and ensure the implementation of best management practices (BMPs) that reduce the pollutants and impact of storm water discharges during construction and pollutants associated with the post-construction land use to ensure compliance with ORC Section 6111.04, OAC Chapter 3745-1 and the terms and conditions of this permit.

B. Timing.

An acceptable SWP3 shall be completed and submitted to the applicable regulated MS4 entity (for projects constructed entirely within a regulated MS4 area) prior to the timely submittal of an NOI. Projects within the Big Darby Creek and portions of the Olentangy watersheds must submit a SWP3 with the NOI. The SWP3 shall be updated in accordance with Part III.D. Submission of a SWP3 does not constitute review and approval on the part of Ohio EPA. Upon request and good cause shown, the director may waive the requirement to have a SWP3 completed at the time of NOI submission. If a waiver has been granted, the SWP3 must be completed prior to the initiation of construction activities. The SWP3 must be implemented upon initiation of construction activities.

In order to continue coverage from the previous generations of this permit, the permittee shall review and update the SWP3 to ensure that this permit's requirements are addressed within 180 days after the effective date of this permit. If it is infeasible for you to comply with a specific requirement in this permit because (1) the provision was not part of the permit you were previously covered under, and (2) because you are prevented from compliance due to the nature or location of earth disturbances that commenced prior to the effective date of this permit, you shall include documentation within your SWP3 of the reasons why it is infeasible for you to meet the specific requirement.

Examples of OHC000005 permit conditions that would be infeasible for permittees renewing coverage to comply with include:

- OHC000005 post-construction requirements, for projects that obtained NPDES construction storm water coverage and started construction activities prior to the effective date of this permit;

- OHC000005 post-construction requirements, for multi-phase development projects with an existing regional post-construction BMP issued under previous NPDES post-construction requirements. This only applies to construction sites authorized under Ohio EPA's Construction Storm Water Permits issued after April 20, 2003;

- OHC000005 post-construction requirements, for renewing or initial coverage and you have a SWP3 approved locally and you will start construction within 180 days of the effective date of this permit;

- Sediment settling pond design requirements, if the general permit coverage was obtained prior to April 21, 2013 and the sediment settling pond has been installed; or

- Case-by-case situations approved by the Director.

C. SWP3 Signature and Review.

1. Plan Signature and Retention On-Site. The SWP3 shall include the certification in Part V.H, be signed in accordance with Part V.G., and be retained on site during working hours.

2. Plan Availability

   a. On-site: The plan shall be made available immediately upon request of the director or his authorized representative and MS4 operators or their authorized representative during working hours. A copy of the NOI and letter granting permit coverage under this general permit also shall be made available at the site.

   b. By written request: The permittee must provide the most recent copy of the SWP3 within 7 days upon written request by any of the following:

      i. The director or the director's authorized representative;

      ii. A local agency approving sediment and erosion plans, grading plans or storm water management plans; or

      iii. In the case of a storm water discharge associated with construction activity which discharges through a municipal separate storm sewer system with an NPDES permit, to the operator of the system.

   c. To the public: All NOIs, general permit approval for coverage letters, and SWP3s are considered reports that shall be available to the public in accordance with the Ohio Public Records law. The permittee shall make documents available to the public upon request or provide a copy at public expense, at cost, in a timely manner. However, the permittee may claim to Ohio EPA any portion of an SWP3 as confidential in accordance with Ohio law.

3. Plan Revision. The director or authorized representative may notify the permittee at any time that the SWP3 does not meet one or more of the minimum requirements of this part. Within 10 days after such notification from the director or authorized representative (or as otherwise provided in the notification), the permittee shall make the required changes to the SWP3 and shall submit to Ohio EPA the revised SWP3 or a written certification that the requested changes have been made.

D. Amendments.

The permittee shall amend the SWP3 whenever there is a change in design, construction, operation or maintenance, which has a significant effect on the potential for the discharge of pollutants to surface waters of the state or if the SWP3 proves to be ineffective in achieving the

general objectives of controlling pollutants in storm water discharges associated with construction activity. Amendments to the SWP3 may be reviewed by Ohio EPA in the same manner as Part III.C.

E. Duty to inform contractors and subcontractors.

The permittee shall inform all contractors and subcontractors not otherwise defined as "operators" in Part VII of this general permit who will be involved in the implementation of the SWP3 of the terms and conditions of this general permit. The permittee shall maintain a written document containing the signatures of all contractors and subcontractors involved in the implementation of the SWP3 as proof acknowledging that they reviewed and understand the conditions and responsibilities of the SWP3. The written document shall be created, and signatures shall be obtained prior to commencement of earth disturbing activity on the construction site.

F. Total Maximum Daily Load (TMDL) allocations.

If a TMDL is approved for any waterbody into which the permittee's site discharges and requires specific BMPs for construction sites, the director may require the permittee to revise his/her SWP3. Specific conditions have been provided in Appendix A (for the Big Darby Creek Watershed) and Appendix B (for portions of the Olentangy river watershed).

G. SWP3 Requirements.

Operations that discharge storm water from construction activities are subject to the following requirements and the SWP3 shall include the following items:

1. Site description. Each SWP3 shall provide:

    a. A description of the nature and type of the construction activity (e.g., low density residential, shopping mall, highway, etc.);

    b. Total area of the site and the area of the site that is expected to be disturbed (i.e., grubbing, clearing, excavation, filling or grading, including off-site borrow areas);

    c. A measure of the impervious area and percent imperviousness created by the construction activity (existing, new and total impervious area after construction);

    d. Storm water calculations, including the volumetric runoff coefficients for both the pre-construction and post- construction site conditions, and resulting water quality volume; design details for post-construction storm water facilities and pretreatment practices such as contributing drainage areas, capacities, elevations, outlet details and drain times shall be included in the SWP3; and if applicable, explanation of the use of existing post-construction facilities. Ohio EPA recommends the use of data sheets (see Ohio's Rainwater and Land Development manual and Ohio EPA resources for examples);

    e. Existing data describing the soil and, if available, the quality of any discharge from the site;

f. A description of prior land uses at the site;

g. A description of the condition of any on-site streams (e.g. prior channelization, bed instability or headcuts, channels on public maintenance, or natural channels);

h. An implementation schedule which describes the sequence of major construction operations (i.e., designation of vegetative preservation areas, grubbing, excavating, grading, utilities, infrastructure installation and others) and the implementation of erosion, sediment and storm water management practices or facilities to be employed during each operation of the sequence;

i. The name and/or location of the immediate receiving stream or surface water(s) and the first subsequent named receiving water(s) and the areal extent and description of wetlands or other special aquatic sites at or near the site which will be disturbed, or which will receive discharges from disturbed areas of the project. For discharges to an MS4, the point of discharge to the MS4 and the location where the MS4 ultimately discharges to a stream or surface water of the state shall be indicated;

j. For subdivided developments, a detail drawing of individual parcels with their erosion, sediment or storm water control practices and/or a typical individual lot showing standard individual lot erosion and sediment control practices.

   A typical individual lot drawing does not remove the responsibility to designate specific erosion and sediment control practices in the SWP3 for critical areas such as steep slopes, stream banks, drainage ways and riparian zones;

k. Location and description of any storm water discharges associated with dedicated asphalt and dedicated concrete plants covered by this permit and the best management practices to address pollutants in these storm water discharges;

l. A cover page or title identifying the name and location of the site, the name and contact information of all construction site operators, the name and contact information for the person responsible for authorizing and amending the SWP3, preparation date, and the estimated dates that construction will start and be complete;

m. A log documenting grading and stabilization activities as well as amendments to the SWP3, which occur after construction activities commence; and

n. Site map showing:

   i. Limits of earth-disturbing activity of the site including associated off-site borrow or spoil areas that are not addressed by a separate NOI and associated SWP3;

   ii. Soils types for all areas of the site, including locations of unstable or highly erodible and/or known contaminated soils;

iii. Existing and proposed contours. A delineation of drainage watersheds expected during and after major grading activities as well as the size of each drainage watershed, in acres;

iv. The location of any delineated boundary for required riparian setbacks;

v. Conservation easements or areas designated as open space, preserved vegetation or otherwise protected from earth disturbing activities. A description of any associated temporary or permanent fencing or signage;

vi. Surface water locations including springs, wetlands, streams, lakes, water wells, etc., on or within 200 feet of the site, including the boundaries of wetlands or stream channels and first subsequent named receiving water(s) the permittee intends to fill or relocate for which the permittee is seeking approval from the Army Corps of Engineers and/or Ohio EPA;

vii. Existing and planned locations of buildings, roads, parking facilities and utilities;

viii. The location of all erosion and sediment control practices, including the location of areas likely to require temporary stabilization during site development;

ix. Sediment traps and basins noting their sediment storage and dewatering (detention) volume and contributing drainage area. Ohio EPA recommends the use of data sheets (see Ohio EPA's Rainwater and Land Development manual and website for examples) to provide data for all sediment traps and basins noting important inputs to design and resulting parameters such as their contributing drainage area, disturbed area, detention volume, sediment storage volume, practice surface area, dewatering time, outlet type and dimensions;

x. The location of permanent storm water management practices (new and existing) including pretreatment practices to be used to control pollutants in storm water after construction operations have been completed along with the location of existing and planned drainage features including catch basins, culverts, ditches, swales, surface inlets and outlet structures;

xi. Areas designated for the storage or disposal of solid, sanitary and toxic wastes, including dumpster areas, areas designated for cement truck washout, and vehicle fueling;

xii. The location of designated construction entrances where the vehicles will access the construction site; and

xiii. The location of any areas of proposed floodplain fill, floodplain excavation, stream restoration or known temporary or permanent stream crossings.

2. Controls. In accordance with Part II.A, the SWP3 shall contain a description of the controls appropriate for each construction operation covered by this permit and the operator(s) shall implement such controls. The SWP3 shall clearly describe for each major construction activity identified in Part III.G.1.h: (a) appropriate control measures and the general timing (or sequence) during the construction process that the measures will be implemented; and (b) which contractor is responsible for implementation (e.g., contractor A will clear land and install perimeter controls and contractor B will maintain perimeter controls until final stabilization). The SWP3 shall identify the subcontractors engaged in activities that could impact storm water runoff. The SWP3 shall contain signatures from all of the identified subcontractors indicating that they have been informed and understand their roles and responsibilities in complying with the SWP3. Ohio EPA recommends that the primary site operator review the SWP3 with the primary contractor prior to commencement of construction activities and keep a SWP3 training log to demonstrate that this review has occurred.

   Ohio EPA recommends that the erosion, sediment, and storm water management practices used to satisfy the conditions of this permit should meet the standards and specifications in the most current edition of Ohio's Rainwater and Land Development (see definitions) manual or other standards acceptable to Ohio EPA. The controls shall include the following minimum components:

   a. Preservation Methods. The SWP3 shall make use of practices which preserve the existing natural condition as much as feasible. Such practices may include: preserving existing vegetation, vegetative buffer strips, and existing soil profile and topsoil; phasing of construction operations to minimize the amount of disturbed land at any one time; and designation of tree preservation areas or other protective clearing or grubbing practices. For all construction activities immediately adjacent to surface waters of the state, the permittee shall comply with the buffer non-numeric effluent limitation in Part II.A.6, as measured from the ordinary high water mark of the surface water.

   b. Erosion Control Practices. The SWP3 shall make use of erosion controls that provide cover over disturbed soils unless an exception is approved in accordance with Part III.G.4. A description of control practices designed to re-establish vegetation or suitable cover on disturbed areas after grading shall be included in the SWP3. The SWP3 shall provide specifications for stabilization of all disturbed areas of the site and provide guidance as to which method of stabilization will be employed for any time of the year. Such practices may include: temporary seeding, permanent seeding, mulching, matting, sod stabilization, vegetative buffer strips, phasing of construction operations, use of construction entrances and the use of alternative ground cover.

      i. **Stabilization.** Disturbed areas shall be stabilized in accordance with Table 1 (Permanent Stabilization) and Table 2 (Temporary Stabilization) in Part II.B of this permit.

      ii. **Permanent stabilization of conveyance channels**. Operators shall undertake special measures to stabilize channels and outfalls and prevent erosive flows. Measures may include seeding, dormant seeding (as defined in the most current edition of the Rainwater and Land

Development manual), mulching, erosion control matting, sodding, riprap, natural channel design with bioengineering techniques or rock check dams.

c. Runoff Control Practices. The SWP3 shall incorporate measures which control the flow of runoff from disturbed areas so as to prevent erosion from occurring. Such practices may include rock check dams, pipe slope drains, diversions to direct flow away from exposed soils and protective grading practices. These practices shall divert runoff away from disturbed areas and steep slopes where practicable. Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel to provide non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected.

d. Sediment Control Practices. The plan shall include a description of structural practices that shall store runoff allowing sediments to settle and/or divert flows away from exposed soils or otherwise limit runoff from exposed areas. Structural practices shall be used to control erosion and trap sediment from a site remaining disturbed for more than 14 days. Such practices may include, among others: sediment settling ponds, sediment barriers, earth diversion dikes or channels which direct runoff to a sediment settling pond and storm drain inlet protection. All sediment control practices must be capable of ponding runoff in order to be considered functional. Earth diversion dikes or channels alone are not considered a sediment control practice unless those are used in conjunction with a sediment settling pond.

The SWP3 shall contain detail drawings for all structural practices.

i. **Timing.** Sediment control structures shall be functional throughout the course of earth disturbing activity. Sediment basins and perimeter sediment barriers shall be implemented prior to grading and within seven days from the start of grubbing. They shall continue to function until the upslope development area is stabilized with permanent cover. As construction progresses and the topography is altered, appropriate controls shall be constructed, or existing controls altered to address the changing drainage patterns.

ii. **Sediment settling ponds.** A sediment settling pond is required for any one of the following conditions:

- Concentrated or collected storm water runoff (e.g., storm sewer or ditch);
- Runoff from drainage areas, which exceed the design capacity of silt fence or other sediment barriers; or
- Runoff from drainage areas that exceed the design capacity of inlet protection.

The permittee may request approval from Ohio EPA to use alternative controls if the permittee can demonstrate the alternative controls are equivalent in effectiveness to a sediment settling pond.

In accordance with Part II.F, if feasible, sediment settling ponds shall be dewatered at the pond surface using a skimmer or equivalent device. The sediment settling pond volume consists of both a dewatering zone and a sediment storage zone. The volume of the dewatering zone shall be a minimum of 1800 cubic feet (ft^3) per acre of drainage (67 yd^3/acre) with a minimum 48-hour drain time. The volume of the sediment storage zone shall be calculated by one of the following methods:

Method 1: The volume of the sediment storage zone shall be 1000 ft^3 per disturbed acre within the watershed of the basin. OR

Method 2: The volume of the sediment storage zone shall be the volume necessary to store the sediment as calculated with RUSLE or a similar generally accepted erosion prediction model.

Accumulated sediment shall be removed from the sediment storage zone once it exceeds 50 percent of the minimum required sediment storage design capacity and prior to the conversion to the post-construction practice unless suitable storage is demonstrated based upon over-design. When determining the total contributing drainage area, off-site areas and areas which remain undisturbed by construction activity shall be included unless runoff from these areas is diverted away from the sediment settling pond and is not co-mingled with sediment-laden runoff. The depth of the dewatering zone shall be less than or equal to five feet. The configuration between inlets and the outlet of the basin shall provide at least two units of length for each one unit of width (≥ 2:1 length:width ratio); however, a length to width ratio of 4:1 is recommended. When designing sediment settling ponds, the permittee shall consider public safety, especially as it relates to children, as a design factor for the sediment basin and alternative sediment controls shall be used where site limitations would preclude a safe design. Combining multiple sediment and erosion control measures in order to maximize pollutant removal is encouraged.

iii. **Sediment Barriers and Diversions.** Sheet flow runoff from denuded areas shall be intercepted by sediment barriers or diversions to protect adjacent properties and water resources from sediment transported via sheet flow. Where intended to provide sediment control, silt fence shall be placed on a level contour downslope of the disturbed area. For most applications, standard silt fence may be substituted with a 12-inch diameter sediment barrier. The relationship between the maximum drainage area to sediment barrier for a particular slope range is shown in the following table:

Table 3 Sediment Barrier Maximum Drainage Area Based on Slope

Maximum drainage area (in acres) to 100 linear feet of sediment barrier	Range of slope for a particular drainage area (in percent)
0.5	< 2%
0.25	≥ 2% but < 20%
0.125	≥ 20% but < 50%

Placing sediment barriers in a parallel series does not extend the size of the drainage area. Storm water diversion practices shall be used to keep runoff away from disturbed areas and steep slopes where practicable. Diversion practices, which include swales, dikes or berms, may receive storm water runoff from areas up to 10 acres.

iv. **Inlet Protection.** Other erosion and sediment control practices shall minimize sediment laden water entering active storm drain systems. All inlets receiving runoff from drainage areas of one or more acres will require a sediment settling pond.

v. **Surface Waters of the State Protection.** If construction activities disturb areas adjacent to surface waters of the state, structural practices shall be designed and implemented on site to protect all adjacent surface waters of the state from the impacts of sediment runoff. No structural sediment controls (e.g., the installation of silt fence or a sediment settling pond) shall be used in a surface water of the state. For all construction activities immediately adjacent to surface waters of the state, the permittee shall comply with the buffer non-numeric effluent limitation in Part II.A.6, as measured from the ordinary high water mark of the surface water. Where impacts within this buffer area are unavoidable, due to the nature of the construction (e.g., stream crossings for roads or utilities), the project shall be designed such that the number of stream crossings and the width of the disturbance within the buffer area are minimized.

vi. **Modifying Controls**. If periodic inspections or other information indicates a control has been used inappropriately or incorrectly, the permittee shall replace or modify the control for site conditions.

e. Post-Construction Storm Water Management Requirements. So that receiving stream's physical, chemical and biological characteristics are protected, and stream functions are maintained, post-construction storm water practices shall provide long-term management of runoff quality and quantity. To meet the post-construction requirements of this permit, the SWP3 shall contain a description of the post-construction BMPs that will be installed during construction for the site and the rationale for their selection. The rationale shall address the anticipated impacts on the channel and floodplain morphology, hydrology, and water quality. Post-construction BMPs cannot be installed within a surface water of the state (e.g., wetland or stream) unless it is authorized by a CWA 401 water quality certification, CWA 404 permit, or Ohio EPA non-jurisdictional wetland/stream program approval. Note: local jurisdictions may have more stringent post-construction requirements.

Detail drawings and maintenance plans shall be provided for all post-construction BMPs in the SWP3. Maintenance plans shall be provided by the permittee to the post-construction operator of the site (including homeowner associations) upon completion of construction activities (prior to termination of permit coverage). Maintenance plans shall ensure that pollutants collected within structural post-construction practices are disposed of in accordance with local, state, and federal regulations. To ensure that storm water management systems function as

designed and constructed, the post-construction operation and maintenance plan shall be a stand-alone document which contains: (1) a designated entity for storm water inspection and maintenance responsibilities; (2) the routine and non-routine maintenance tasks to be undertaken; (3) a schedule for inspection and maintenance; (4) any necessary legally binding maintenance easements and agreements; (5) construction drawings or excerpts showing the plan view, profile and details of the outlet(s); (6) a map showing all access and maintenance easements; and (7) for table 4a/4b practices, provide relevant elevations and associated volumes that dictate when removal of accumulated sediments must occur. Permittees are responsible for assuring all post-construction practices meet plan specifications and intended post-construction conditions have been met (e.g., sediment removed from, and sediment storage restored to, permanent pools, sediment control outlets removed and replaced with permanent post-construction discharge structures, and all slopes and drainageways permanently stabilized), but are not responsible under this permit for operation and maintenance of post-construction practices once coverage under this permit is terminated.

Post-construction storm water BMPs that discharge pollutants from point sources once construction is completed may in themselves need authorization under a separate NPDES permit (one example is storm water discharges from regulated industrial sites).

Construction activities that do not include the installation of any impervious surface (e.g., park lands), abandoned mine land reclamation activities regulated by the Ohio Department of Natural Resources, stream and wetland restoration activities, and wetland mitigation activities are not required to comply with the conditions of Part III.G.2.e of this permit. Linear construction projects (e.g., pipeline or utility line installation) which do not result in the installation of additional impervious surface are not required to comply with the conditions of Part III.G.2.e of this permit. However, linear construction projects shall be designed to minimize the number of stream crossings and the width of disturbance, and to achieve final stabilization of the disturbed area as defined in Part VII.M.1.

For all construction activities that will disturb two or more acres of land or will disturb less than two acres that are part of a larger common plan of development or sale which will disturb two or more acres of land, the post construction BMP(s) chosen shall be able to manage storm water runoff for protection of stream channels, stream stability, and water quality. The BMP(s) chosen must be compatible with site and soil conditions. Structural post-construction storm water treatment practices shall be incorporated into the permanent drainage system for the site. The BMP(s) chosen must be sized to treat the water quality volume (WQ_v) and ensure compliance with Ohio's Water Quality Standards in OAC Chapter 3745-1. The WQ_v shall be equivalent to the volume of runoff from a 0.90-inch rainfall and shall be determined using the following equations:

$$WQ_v = Rv * P * A / 12 \quad \text{(Equation 1)}$$

where:
WQ_v = water quality volume in acre-feet
Rv = the volumetric runoff coefficient calculated using equation 2
P = 0.90 inch precipitation depth
A = area draining into the BMP in acres

$$Rv = 0.05 + 0.9i \quad \text{(Equation 2)}$$

where i = fraction of post-construction impervious surface

An additional volume equal to 20 percent of the WQ_v shall be incorporated into the BMP for sediment storage. Ohio EPA recommends BMPs be designed according to the methodology described in the most current edition of the Rainwater and Land Development manual or in another design manual acceptable for use by Ohio EPA.

The BMPs listed in Tables 4a and 4b below are considered standard BMPs approved for general use. However, communities with a regulated MS4 may limit the use of some of these BMPs. BMPs shall be designed such that the drain time is long enough to provide treatment but short enough to provide storage for successive rainfall events and avoid the creation of nuisance conditions. The outlet structure for the post-construction BMP shall not discharge more than the first half of the WQv in less than one-third of the drain time. The WQv is the volume of storm water runoff that must be detained by a post-construction practice as specified by the most recent edition of the Rainwater and Land Development manual.

Post-construction practices shall be sized to treat 100% of the WQv associated with their contributing drainage area. If there is an existing post-construction BMP that treats runoff from the disturbed area and the BMP meets the post-construction requirements of this permit, no additional post-construction BMP will be required. A regional storm water BMP may be used to meet the post-construction requirement if: (1) the BMP meets the design requirements for treating the WQv; and (2) a legal agreement is established through which the regional BMP owner or operator agrees to provide this service in the long term. Design information for such facilities such as contributing drainage areas, capacities, elevations, outlet details and drain times shall be included in the SWP3.

Table 4a Extended Detention Post-Construction Practices with Minimum Drain Times

Extended Detention Practices	Minimum Drain Time of WQv
Wet Extended Detention Basin[1,2]	24 hours
Constructed Extended Detention Wetland[1,2]	24 hours
Dry Extended Detention Basin[1,3]	48 hours
Permeable Pavement – Extended Detention[1]	24 hours
Underground Storage – Extended Detention[1,4]	24 hours
Sand & Other Media Filtration - Extended Detention[1, 5]	24 hours

Notes:

1. The outlet structure shall not discharge more than the first half of the WQv in less than one-third of the drain time.
2. Provide a permanent pool with a minimum volume equal to the WQv and an extended detention volume above the permanent pool equal to 1.0 x WQv.
3. Dry basins must include a forebay and a micropool each sized at a minimum of 0.1 x WQv and a protected outlet, or include acceptable pretreatment and a protected outlet.
4. Underground storage must have pretreatment for removal of suspended sediments included in the design and documented in the SWP3. This pretreatment shall concentrate sediment in a location where it can be readily removed. For non-infiltrating, underground extended detention systems, pretreatment shall be 50% effective at capturing total suspended solids according to the testing protocol established in the Alternative Post-Construction BMP Testing Protocol.
5. The WQv ponding area shall completely empty between 24 and 72 hours.

Table 4b Infiltration Post-Construction Practices with Maximum Drain Times

Infiltration Practices	Maximum Drain Time of WQv
Bioretention Area/Cell[1,2]	24 hours
Infiltration Basin[2]	24 hours
Infiltration Trench[3]	48 hours
Permeable Pavement – Infiltration[3]	48 hours
Underground Storage – Infiltration[3,4]	48 hours

Notes:
1. Bioretention soil media shall have a permeability of approximately 1 – 4 in/hr. Meeting the soil media specifications in the Rainwater and Land Development manual is considered compliant with this requirement. Bioretention cells must have underdrains unless in-situ conditions allow for the WQv (surface ponding) plus the bioretention soil (to a depth of 24 inches) to drain completely within 48 hours.
2. Infiltrating practices with the WQv stored aboveground (bioretention, infiltration basin) shall fully drain the WQv within 24 hours to minimize nuisance effects of standing water and to promote vigorous communities of appropriate vegetation.
3. Subsurface practices designed to fully infiltrate the WQv (infiltration trench, permeable pavement with infiltration, underground storage with infiltration) shall empty within 48 hours to recover storage for subsequent storm events.
4. Underground storage systems with infiltration must have adequate pretreatment of suspended sediments included in the design and documented in the SWP3 in order to minimize clogging of the infiltrating surface. Pretreatment shall concentrate sediment in a location where it can be readily removed. Examples include media filters situated upstream of the storage or other suitable alternative approved by Ohio EPA. For infiltrating underground systems, pretreatment shall be 80% effective at capturing total suspended solids according to the testing protocol established in the Alternative Post-Construction BMP Testing Protocol.

Small Construction Activities. For all construction activities authorized under this permit which result in a disturbance less than 2 acres, a post-construction practice shall be used to treat storm water runoff for pollutants and to reduce adverse impacts on receiving waters. The applicant must provide a justification in the SWP3 why the use of table 4a and 4b practices are not feasible. The justification must address limiting factors which would prohibit the project going forward should table 4a and 4b practices be required. Please note that additional practices selected will require approval from the regulated MS4. The use of green infrastructure BMPs such as runoff reducing practices is also encouraged.

Transportation Projects. The construction of new roads and roadway improvement projects by public entities (i.e., the state, counties, townships, cities, or villages) may implement post-construction BMPs in compliance with the current version (as of the effective date of this permit) of the Ohio Department of Transportation's "Location and Design Manual, Volume Two Drainage Design" that has been accepted by Ohio EPA as an alternative to the conditions of this permit.

Offsite Mitigation of Post-Construction. Ohio EPA may authorize the offsite mitigation of the post-construction requirements of Part III.G.2.e of this permit on a case by case basis provided the permittee clearly demonstrates the BMPs listed in Tables 4a and 4b are not feasible and the following criteria are met: (1) a maintenance agreement or policy is established to ensure operations and treatment long-term; (2) the offsite location discharges to the same HUC-12 watershed unit; and (3) the mitigation ratio of the WQv is 1.5 to 1 or the WQv at the point of retrofit, whichever is greater. Requests for offsite mitigation must be received prior to receipt of the NOI application.

Previously Developed Areas - Ohio EPA encourages the redevelopment of previously graded, paved or built upon sites through a reduction of the WQv treatment requirement. For a previously developed area, one or a combination of the following two conditions shall be met:

- A 20 percent net reduction of the site's volumetric runoff coefficient through impervious area reduction with soil restoration or replacing impervious roof area with green roof area (for these purposes green roofs shall be considered pervious surface) or
- Treatment of 20 percent of the WQv for the previously developed area using a practice meeting Table 4a/4b criteria.

Where there is a combination of redeveloped areas and new development, a weighted approached shall be used with the following equation:

$$WQv = P * A * [(Rv_1*0.2) + (Rv_2 - Rv_1)] / 12 \qquad \text{(Equation 3)}$$

where

P = 0.90 inches
A = area draining into the BMP in acres
Rv_1 = volumetric runoff coefficient for existing conditions (current site impervious area)
Rv_2 = volumetric runoff coefficient for proposed conditions (post-construction site impervious area)

Post-construction practices shall be located to treat impervious areas most likely to generate the highest pollutant load, such as parking lots or roadways, rather than areas predicted to be cleaner such as rooftops.

Runoff Reduction Practices. The size of structural post-construction practices used to capture and treat the WQv can be reduced by incorporating runoff

reducing practices into the design of the site's drainage system. The approach to calculate and document runoff reduction is detailed in the Rainwater and Land Development Manual. BMP-specific runoff reduction volumes are set by specifications in the Rainwater and Land Development Manual for the following practices:

- Impervious surface disconnection
- Rainwater harvesting
- Bioretention
- Infiltration basin
- Infiltration trench
- Permeable pavement with infiltration
- Underground storage with infiltration
- Grass swale
- Sheet flow to filter strip
- Sheet flow to conservation area

A runoff reduction approach may be used to meet the groundwater recharge requirements in the Big Darby Creek Watershed. The runoff reduction practices used for groundwater recharge may be used to reduce the WQv requirement, see appendix A for details on groundwater recharge requirements.

In order to promote the implementation of green infrastructure, the Director may consider the use of runoff reducing practices to demonstrate compliance with Part III.G.2.e of this permit for areas of the site not draining into a common drainage system of the site, e.g., sheet flow from perimeter areas such as the rear yards of residential lots, low density development scenarios, or where the permittee can demonstrate that the intent of pollutant removal and stream protection, as required in Part III.G.2.e of this permit is being addressed through non-structural post-construction BMPs based upon review and approval by Ohio EPA.

Use of Alternative Post-Construction BMPs. This permit does not preclude the use of innovative or experimental post-construction storm water management technologies. Alternative post-construction BMPs shall previously have been tested to confirm storm water treatment efficacy equivalent to those BMPs listed in Tables 4a and 4b using the protocol described in this section. BMP testing may include laboratory testing, field testing, or both.

Permittees shall request approval from Ohio EPA to use alternative post-construction BMPs on a case-by-case basis. To use an alternative post-construction BMP, the permittee must demonstrate that use of a BMP listed in Tables 4a and 4b is not feasible and the proposed alternative post-construction BMP meets the minimum treatment criteria as described in this section. The permittee shall submit an application to Ohio EPA for any proposed alternative post-construction BMP. Where the development project is located within a regulated municipal separate storm sewer system (MS4) community, the use of an alternative practice requires pre-approval by the MS4 before submittal of the

Ohio EPA permit application. Ohio EPA requires that approvals for alternative post-construction BMPs are finalized before permittees submit an NOI for permit coverage.

In addition to meeting sediment removal criteria, the discharge rate from the proposed alternative practice shall be reduced to prevent stream bed erosion and protect the physical and biological stream integrity unless there will be negligible hydrological impact to the receiving surface water of the state. Discharge rate is considered to have a negligible impact if the permittee can demonstrate that one of the following three conditions exist:

i. The entire WQv is recharged to groundwater;
ii. The larger common plan of development or sale will create less than one acre of impervious surface;
iii. The storm water drainage system of the development discharges directly into a large river with drainage area equal to 100 square miles or larger upstream of the development site or to a lake where the development area is less than 5 percent of the watershed area, unless a TMDL has identified water quality problems into the receiving surface waters of the state.

If the conditions above that minimize the potential for hydrological impact to the receiving surface water of the state do not exist, then the alternative post-construction BMP must prevent stream erosion by reducing the flow rate from the WQ_V. In such cases, discharge of the WQ_V must be controlled. A second storm water BMP that provides extended detention of the WQv may be needed to meet the post-construction criteria.

Alternative Post-Construction BMP Testing Protocol. For laboratory testing, the alternative BMP shall be tested using sediment with a specific gravity of 2.65, a particle size distribution closely matching the distribution shown in Table 5, and total suspended sediment (TSS) concentrations within 10% of 200 mg/L (180 mg/L – 220 mg/L TSS). For an alternative BMP to be acceptable, the test results must demonstrate that the minimum treatment rate is 80% TSS removal at the design flow rate for the tested BMP.

Table 5 Particle Size Distribution for Testing Alternative Post-Construction BMPs

Particle Size (microns)	Percent Finer (%)
1,000	100
500	95
250	90
150	75
100	60
75	50
50	45
20	35
8	20
5	10
2	5

- For field testing, the alternative BMP shall be tested using storm water runoff

from the field, not altered by adding aggregate or subjecting to unusually high sediment loads such as those from unstabilized construction disturbance. The storm water runoff used for field testing shall be representative of runoff from the proposed installation site for the alternative BMP after all construction activities have ceased and the ground has been stabilized. The influent and effluent TSS concentrations of storm water runoff must be collected in the field. For an alternative BMP to be acceptable, the test results must demonstrate the minimum treatment rate is 80% TSS removal for influent concentrations equal to or greater than 100 mg/L TSS. If the influent concentration to the proposed alternative BMP is less than 100 mg/L TSS in the field, then the BMP must achieve an average effluent concentration less than or equal to 20 mg/L TSS.

- Testing of alternative post-construction BMPs shall be performed or overseen by a qualified independent, third-party testing organization;

- Testing shall demonstrate the maximum flow rate at which the alternative post-construction BMP can achieve the necessary treatment efficacy, including consideration for the potential of sediment resuspension;

- Testing shall demonstrate the maximum volume of sediment and floatables that can be collected in the alternative post-construction BMP before pollutants must be removed to maintain 80% treatment efficacy;

- Testing shall indicate the recommended maintenance frequency and maintenance protocol to ensure ongoing performance of the alternative post-construction BMP.

The alternative post-construction BMP testing protocol described in this section is similar to testing requirements specified by the New Jersey Department of Environmental Protection (NJDEP) for storm water Manufactured Treatment Devices (MTD) and therefore testing results certified by NJDEP shall be accepted by Ohio EPA. For examples of BMPs that have been tested using New Jersey Department of Environmental Protection's procedures, see the website: www.njstormwater.org.

Another nationally recognized storm water product testing procedure is the Technology Assessment Protocol – Ecology (TAPE) administered by the State of Washington, Department of Ecology. The TAPE testing procedure describes testing to achieve 80% TSS removal using a sediment mix with a particle size distribution with approximately 75% of the mass of the aggregate with particle diameters less than 45 microns. Overall, this particle size distribution is finer than the distribution in Table 5. Therefore, if TAPE testing results are available for a proposed alternative post-construction BMP, those results shall be accepted by Ohio EPA. The State of Washington, Department of Ecology website is https://ecology.wa.gov/.

Alternative BMPs that utilize treatment processes such as filtering or centrifugal separation, rather than a detention and settling volume, must be designed to ensure treatment of 90 percent of the average annual runoff

volume. For the design of these BMPs, the water quality flow rate (WQF) considered equivalent to the Water Quality Volume (WQv) shall be determined utilizing the Rational Method (Equation 4) with an intensity (i) appropriate for the water quality precipitation event. This intensity shall be calculated using the table given in Appendix C.

$$WQF = C * i * A \qquad \text{(Equation 4)}$$

Where

WQF = water quality flow rate in cubic feet per second (cfs)
C = rational method runoff coefficient
i = intensity (in/hr)
A = area draining to the BMP (acres)

Alternative post-construction BMPs may include, but are not limited to: vegetated swales, vegetated filter strips, hydrodynamic separators, high-flow media filters, cartridge filters, membrane filters, subsurface flow wetlands, multi-chamber treatment trains, road shoulder media filter drains, wetland channels, rain barrels, green roofs, and rain gardens. The Director may also consider non-structural post-construction approaches.

f. Surface Water Protection. If the project site contains any streams, rivers, lakes, wetlands or other surface waters, certain construction activities at the site may be regulated under the CWA and/or state isolated wetland permit requirements. Sections 404 and 401 of the Act regulate the discharge of dredged or fill material into surface waters and the impacts of such activities on water quality, respectively. Construction activities in surface waters which may be subject to CWA regulation and/or state isolated wetland permit requirements include, but are not limited to: sewer line crossings, grading, backfilling or culverting streams, filling wetlands, road and utility line construction, bridge installation and installation of flow control structures. If the project contains streams, rivers, lakes or wetlands or possible wetlands, the permittee shall contact the appropriate U.S. Army Corps of Engineers District Office. (CAUTION: Any area of seasonally wet hydric soil is a potential wetland - please consult the Soil Survey and list of hydric soils for your County, available at your county's Soil and Water Conservation District. If you have any questions about Section 401 water quality certification, please contact the Ohio Environmental Protection Agency, Section 401 Coordinator.)

U.S. Army Corps of Engineers (Section 404 regulation):

- Huntington, WV District (304) 399-5210 (Muskingum River, Hocking River, Scioto River, Little Miami River, and Great Miami River Basins)
- Buffalo, NY District (716) 879-4330 (Lake Erie Basin)
- Pittsburgh, PA District (412) 395-7155 (Mahoning River Basin)
- Louisville, KY District (502) 315-6686 (Ohio River)

Ohio EPA 401/404 and non-jurisdictional stream/wetland coordinator can be contacted at (614) 644-2001 (all of Ohio)

Concentrated storm water runoff from BMPs to natural wetlands shall be converted to diffuse flow before the runoff enters the wetlands. The flow should be released such that no erosion occurs downslope. Level spreaders may need to be placed in series, particularly on steep sloped sites, to ensure non-erosive velocities. Other structural BMPs may be used between storm water features and natural wetlands, in order to protect the natural hydrology, hydroperiod, and wetland flora. If the applicant proposes to discharge to natural wetlands, a hydrologic analysis shall be performed. The applicant shall attempt to match the pre-development hydroperiods and hydrodynamics that support the wetland. The applicant shall assess whether their construction activity will adversely impact the hydrologic flora and fauna of the wetland. Practices such as vegetative buffers, infiltration basins, conservation of forest cover, and the preservation of intermittent streams, depressions, and drainage corridors may be used to maintain wetland hydrology.

g. Other controls.

i. **Non-Sediment Pollutant Controls.** In accordance with Part II.E, no solid (other than sediment) or liquid waste, including building materials, shall be discharged in storm water runoff. The permittee must implement all necessary BMPs to prevent the discharge of non-sediment pollutants to the drainage system of the site or surface waters of the state or an MS4. Under no circumstance shall wastewater from the washout of concrete trucks, stucco, paint, form release oils, curing compounds, and other construction materials be discharged directly into a drainage channel, storm sewer or surface waters of the state. Also, no pollutants from vehicle fuel, oils, or other vehicle fluids can be discharged to surface waters of the state. No exposure of storm water to waste materials is recommended. The SWP3 must include methods to minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, and sanitary waste to precipitation, storm water runoff, and snow melt. In accordance with Part II.D.3, the SWP3 shall include measures to prevent and respond to chemical spills and leaks. You may also reference the existence of other plans (i.e., Spill Prevention Control and Countermeasure (SPCC) plans, spill control programs, Safety Response Plans, etc.) provided that such plan addresses conditions of this permit condition and a copy of such plan is maintained on site.

ii. **Off-site traffic.** Off-site vehicle tracking of sediments and dust generation shall be minimized. In accordance with Part II.D.1, the SWP3 shall include methods to minimize the discharge of pollutants from equipment and vehicle washing, wheel washwater, and other washwaters. No detergents may be used to wash vehicles. Washwaters shall be treated in a sediment basin or alternative control that provides equivalent treatment prior to discharge.

iii. **Compliance with other requirements.** The SWP3 shall be consistent with applicable State and/or local waste disposal, sanitary sewer or septic system regulations, including provisions prohibiting waste disposal by

open burning and shall provide for the proper disposal of contaminated soils to the extent these are located within the permitted area.

iv. **Trench and ground water control**. In accordance with Part II.C, there shall be no turbid discharges to surface waters of the state resulting from dewatering activities. If trench or ground water contains sediment, it shall pass through a sediment settling pond or other equally effective sediment control device, prior to being discharged from the construction site. Alternatively, sediment may be removed by settling in place or by dewatering into a sump pit, filter bag or comparable practice. Ground water which does not contain sediment or other pollutants is not required to be treated prior to discharge. However, care must be taken when discharging ground water to ensure that it does not become pollutant-laden by traversing over disturbed soils or other pollutant sources.

v. **Contaminated Sediment.** Where construction activities are to occur on sites with contamination from previous activities, operators shall be aware that concentrations of materials that meet other criteria (is not considered a Hazardous Waste, meeting VAP standards, etc.) may still result in storm water discharges in excess of Ohio Water Quality Standards. Such discharges are not authorized by this permit. Appropriate BMPs include, but are not limited to:

- The use of berms, trenches, and pits to collect contaminated runoff and prevent discharges;
- Pumping runoff into a sanitary sewer (with prior approval of the sanitary sewer operator) or into a container for transport to an appropriate treatment/disposal facility; and
- Covering areas of contamination with tarps or other methods that prevent storm water from coming into contact with the material.

Operators should consult with Ohio EPA Division of Surface Water prior to seeking permit coverage.

h. Maintenance. All temporary and permanent control practices shall be maintained and repaired as needed to ensure continued performance of their intended function. All sediment control practices must be maintained in a functional condition until all up-slope areas they control are permanently stabilized. The SWP3 shall be designed to minimize maintenance requirements. The applicant shall provide a description of maintenance procedures needed to ensure the continued performance of control practices.

i. Inspections. The permittee shall assign “qualified inspection personnel” to conduct inspections to ensure that the control practices are functional and to evaluate whether the SWP3 is adequate and properly implemented in accordance with the schedule proposed in Part III.G.1.h of this permit or whether additional control measures are required. At a minimum, procedures in a SWP3 shall provide that all controls on the site are inspected:

- after any storm event greater than one-half inch of rain per 24-hour period by the end of the next calendar day, excluding weekends and holidays unless work is scheduled; and
- once every seven calendar days.

The inspection frequency may be reduced to at least once every month for dormant sites if:

- the entire site is temporarily stabilized or
- runoff is unlikely due to weather conditions for extended periods of time (e.g., site is covered with snow, ice, or the ground is frozen).

The beginning and ending dates of any reduced inspection frequency shall be documented in the SWP3.
Once a definable area has achieved final stabilization, the area may be marked on the SWP3 and no further inspection requirements shall apply to that portion of the site.

Following each inspection, a checklist must be completed and signed by the qualified inspection personnel representative. At a minimum, the inspection report shall include:

i. the inspection date;
ii. names, titles, and qualifications of personnel making the inspection;
iii. weather information for the period since the last inspection (or since commencement of construction activity if the first inspection) including a best estimate of the beginning of each storm event, duration of each storm event, approximate amount of rainfall for each storm event (in inches), and whether any discharges occurred;
iv. weather information and a description of any discharges occurring at the time of the inspection;
v. location(s) of discharges of sediment or other pollutants from the site;
vi. location(s) of BMPs that need to be maintained;
vii. location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location;
viii. location(s) where additional BMPs are needed that did not exist at the time of inspection; and
ix. corrective action required including any changes to the SWP3 necessary and implementation dates.

Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of or the potential for pollutants entering the drainage system. Erosion and sediment control measures identified in the SWP3 shall be observed to ensure that those are operating correctly. Discharge locations shall be inspected to ascertain whether erosion and sediment control measures are effective in preventing significant impacts to the receiving waters. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site vehicle tracking.

The permittee shall maintain for three years following the submittal of a notice of termination form, a record summarizing the results of the inspection, names(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the SWP3 and a certification as to whether the facility is in compliance with the SWP3 and the permit and identify any incidents of non-compliance. The record and certification shall be signed in accordance with Part V.G. of this permit.

i. **When practices require repair or maintenance.** If the inspection reveals that a control practice is in need of repair or maintenance, with the exception of a sediment settling pond, it shall be repaired or maintained within 3 days of the inspection. Sediment settling ponds shall be repaired or maintained within 10 days of the inspection.

ii. **When practices fail to provide their intended function.** If the inspection reveals that a control practice fails to perform its intended function and that another, more appropriate control practice is required, the SWP3 shall be amended and the new control practice shall be installed within 10 days of the inspection.

iii. **When practices depicted on the SWP3 are not installed.** If the inspection reveals that a control practice has not been implemented in accordance with the schedule contained in Part III.G.1.h of this permit, the control practice shall be implemented within 10 days from the date of the inspection. If the inspection reveals that the planned control practice is not needed, the record shall contain a statement of explanation as to why the control practice is not needed.

3. Approved State or local plans. All dischargers regulated under this general permit must comply, except those exempted under state law, with the lawful requirements of municipalities, counties and other local agencies regarding discharges of storm water from construction activities. All erosion and sediment control plans and storm water management plans approved by local officials shall be retained with the SWP3 prepared in accordance with this permit. Applicable requirements for erosion and sediment control and storm water management approved by local officials are, upon submittal of a NOI form, incorporated by reference and enforceable under this permit even if they are not specifically included in an SWP3 required under this permit. When the project is located within the jurisdiction of a regulated municipal separate storm sewer system (MS4), the permittee shall certify that the SWP3 complies with the requirements of the storm water management program of the MS4 operator.

4. Exceptions. If specific site conditions prohibit the implementation of any of the erosion and sediment control practices contained in this permit or site-specific conditions are such that implementation of any erosion and sediment control practices contained in this permit will result in no environmental benefit, then the permittee shall provide justification for rejecting each practice based on site conditions. Exceptions from implementing the erosion and sediment control standards contained in this permit will be approved or denied on a case-by-case basis.

The permittee may request approval from Ohio EPA to use alternative methods to satisfy conditions in this permit if the permittee can demonstrate that the alternative methods are sufficient to protect the overall integrity of receiving streams and the watershed. Alternative methods will be approved or denied on a case-by-case basis.

PART IV. NOTICE OF TERMINATION REQUIREMENTS

A. Failure to notify.

The terms and conditions of this permit shall remain in effect until a signed Notice of Termination (NOT) form is submitted. Failure to submit an NOT constitutes a violation of this permit and may affect the ability of the permittee to obtain general permit coverage in the future.

B. When to submit an NOT.

1. Permittees wishing to terminate coverage under this permit shall submit an NOT form in accordance with Part V.G. of this permit. Compliance with this permit is required until an NOT form is submitted. The permittee's authorization to discharge under this permit terminates at midnight of the day the NOT form is submitted. Prior to submitting the NOT form, the permittee shall conduct a site inspection in accordance with Part III.G.2.i of this permit and have a maintenance plan in place to ensure all post-construction BMPs will be maintained in perpetuity.

2. All permittees shall submit an NOT form within 45 days of completing all permit requirements. Enforcement actions may be taken if a permittee submits an NOT form without meeting one or more of the following conditions:

    a. Final stabilization (see definition in Part VII) has been achieved on all portions of the site for which the permittee is responsible (including, if applicable, returning agricultural land to its pre-construction agricultural use);

    b. Another operator(s) has assumed control over all areas of the site that have not been finally stabilized;

    c. A maintenance plan is in place to ensure all post construction BMPs are adequately maintained in the long-term;

    d. For non-residential developments, all elements of the storm water pollution prevention plan have been completed, the disturbed soil at the identified facility have been stabilized and temporary erosion and sediment control measures have been removed at the appropriate time, or all storm water discharges associated with construction activity from the identified facility that are authorized by the above referenced NPDES general permit have otherwise been eliminated. (i)For residential developments only, temporary stabilization has been completed and the lot, which includes a home, has been transferred to the homeowner; (ii) final stabilization has been completed and the lot, which does not include a home, has been transferred to the property owner; (iii) no stabilization has been implemented on a lot, which includes a home, and the lot has been transferred to the homeowner; or

e. An exception has been granted under Part III.G.4.

C. How to submit an NOT.

To terminate permit coverage, the permitee shall submit a complete and accurate Notice of Termination (NOT) form using Ohio EPA's electronic application form which is available through the Ohio EPA eBusiness Center at: https://ebiz.epa.ohio.gov/. Submission through the Ohio EPA eBusiness Center will require establishing an Ohio EPA eBusiness Center account and obtaining a unique Personal Identification Number (PIN) for final submission of the NOT. Existing eBusiness Center account holders can access the NOT form through their existing account and submit using their existing PIN. Please see the following link for guidance: **http://epa.ohio.gov/dsw/ebs.aspx#170669803-streams-guidance**. Alternatively, if you are unable to access the NOT form through the agency eBusiness Center due to a demonstrated hardship, the NOT may be submitted on paper NOT forms provided by Ohio EPA. NOT information shall be typed on the form. Please contact Ohio EPA, Division of Surface Water at (614) 644-2001 if you wish to receive a paper NOT form.

PART V. STANDARD PERMIT CONDITIONS.

A. Duty to comply.

The permittee shall comply with all conditions of this permit. Any permit noncompliance constitutes a violation of ORC Chapter 6111 and is grounds for enforcement action.

Ohio law imposes penalties and fines for persons who knowingly make false statements or knowingly swear or affirm the truth of a false statement previously made.

B. Continuation of an expired general permit.

An expired general permit continues in force and effect until a new general permit is issued.

C. Need to halt or reduce activity not a defense.

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to mitigate.

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Duty to provide information.

The permittee shall furnish to the director, within 10 days of written request, any information which the director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee

shall also furnish to the director upon request copies of records required to be kept by this permit.

F. Other information.

When the permittee becomes aware that he or she failed to submit any relevant facts or submitted incorrect information in the NOI, SWP3, NOT or in any other report to the director, he or she shall promptly submit such facts or information.

G. Signatory requirements.

All NOIs, NOTs, SWP3s, reports, certifications or information either submitted to the director or that this permit requires to be maintained by the permittee, shall be signed.

1. These items shall be signed as follows:

    a. For a corporation: By a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

        i. A president, secretary, treasurer or vice-president of the corporation in charge of a principal business function or any other person who performs similar policy or decision-making functions for the corporation; or

        ii. The manager of one or more manufacturing, production or operating facilities, provided, the manager is authorized to make management decisions that govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

    b. For a partnership or sole proprietorship: By a general partner or the proprietor, respectively; or

    c. For a municipality, State, Federal or other public agency: By either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes (1) the chief executive officer of the agency or (2) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of U.S. EPA).

2. All reports required by the permits and other information requested by the director shall be signed by a person described in Part V.G.1 of this permit or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Part V.G.1 of this permit and submitted to the director;

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of manager, operator of a well or well field, superintendent, position of equivalent responsibility or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and

c. The written authorization is submitted to the director.

3. Changes to authorization. If an authorization under Part V.G.2 of this permit is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part V.G.2 of this permit must be submitted to the director prior to or together with any reports, information or applications to be signed by an authorized representative.

H. Certification.

Any person signing documents under this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

I. Oil and hazardous substance liability.

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities or penalties to which the permittee is or may be subject under section 311 of the CWA or 40 CFR Part 112. 40 CFR Part 112 establishes procedures, methods and equipment and other requirements for equipment to prevent the discharge of oil from non-transportation-related onshore and offshore facilities into or upon the navigable surface waters of the state or adjoining shorelines.

J. Property rights.

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

K. Severability.

The provisions of this permit are severable and if any provision of this permit or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

L. Transfers.

Ohio NPDES general permit coverage is transferable. Ohio EPA must be notified in writing sixty days prior to any proposed transfer of coverage under an Ohio NPDES general permit. The transferee must inform Ohio EPA it will assume the responsibilities of the original permittee transferor.

M. Environmental laws.

No condition of this permit shall release the permittee from any responsibility or requirements under other environmental statutes or regulations.

N. Proper operation and maintenance.

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the requirements of SWP3s. Proper operation and maintenance requires the operation of backup or auxiliary facilities or similar systems, installed by a permittee only when necessary to achieve compliance with the conditions of the permit.

O. Inspection and entry.

The permittee shall allow the director or an authorized representative of Ohio EPA, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment); and

4. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

P. Duty to Reapply.

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit.

Q. Permit Actions.

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

R. Bypass.

The provisions of 40 CFR Section 122.41(m), relating to "Bypass," are specifically incorporated herein by reference in their entirety. For definition of "Bypass," see Part VII.C.

S. Upset.

The provisions of 40 CFR Section 122.41(n), relating to "Upset," are specifically incorporated herein by reference in their entirety. For definition of "Upset," see Part VII.GG.

T. Monitoring and Records.

The provisions of 40 CFR Section 122.41(j), relating to "Monitoring and Records," are specifically incorporated herein by reference in their entirety.

U. Reporting Requirements.

The provisions of 40 CFR Section 122.41(l), relating to "Reporting Requirements," are specifically incorporated herein by reference in their entirety.

PART VI. REOPENER CLAUSE

If there is evidence indicating potential or realized impacts on water quality due to any storm water discharge associated with construction activity covered by this permit, the permittee of such discharge may be required to obtain coverage under an individual permit or an alternative general permit in accordance with Part I.C of this permit or the permit may be modified to include different limitations and/or requirements.

Permit modification or revocation will be conducted according to ORC Chapter 6111.

PART VII. DEFINITIONS

A. "Act" means Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483, Pub. L. 97-117 and Pub. L. 100-4, 33 U.S.C. 1251 et. seq.

B. "Bankfull channel" means a channel flowing at channel capacity and conveying the bankfull discharge. Delineated by the highest water level that has been maintained for a sufficient period of time to leave evidence on the landscape, such as the point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial or

the point at which the clearly scoured substrate of the stream ends and terrestrial vegetation begins.

C. "Bankfull discharge" means the streamflow that fills the main channel and just begins to spill onto the floodplain; it is the discharge most effective at moving sediment and forming the channel.

D. "Best management practices (BMPs)" means schedules of activities, prohibitions of practices, maintenance procedures and other management practices (both structural and non-structural) to prevent or reduce the pollution of surface waters of the state. BMP's also include treatment requirements, operating procedures and practices to control plant and/or construction site runoff, spillage or leaks, sludge or waste disposal or drainage from raw material storage.

E. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

F. "Channelized stream" means the definition set forth in Section 6111.01 (M) of the ORC.

G. "Commencement of construction" means the initial disturbance of soils associated with clearing, grubbing, grading, placement of fill, or excavating activities or other construction activities.

H. "Concentrated storm water runoff" means any storm water runoff which flows through a drainage pipe, ditch, diversion or other discrete conveyance channel.

I. "Director" means the director of the Ohio Environmental Protection Agency.

J. "Discharge" means the addition of any pollutant to the surface waters of the state from a point source.

K. "Disturbance" means any clearing, grading, excavating, filling, or other alteration of land surface where natural or man-made cover is destroyed in a manner that exposes the underlying soils.

L. "Drainage watershed" means for purposes of this permit the total contributing drainage area to a BMP, i.e., the "watershed" directed to the practice. This would also include any off-site drainage.

M. "Final stabilization" means that either:

1. All soil disturbing activities at the site are complete and a uniform perennial vegetative cover (e.g., evenly distributed, without large bare areas) with a density of at least 70 percent cover for the area has been established on all unpaved areas and areas not covered by permanent structures or equivalent stabilization measures (such as the use of mulches, rip-rap, gabions or geotextiles) have been employed. In addition, all temporary erosion and sediment control practices are removed and disposed of and all trapped sediment is permanently stabilized to prevent further erosion; or

2. For individual lots in residential construction by either:

   a. The homebuilder completing final stabilization as specified above or

   b. The homebuilder establishing temporary stabilization including perimeter controls for an individual lot prior to occupation of the home by the homeowner and informing the homeowner of the need for and benefits of, final stabilization. (Homeowners typically have an incentive to put in the landscaping functionally equivalent to final stabilization as quick as possible to keep mud out of their homes and off sidewalks and driveways.); or

3. For construction projects on land used for agricultural purposes (e.g., pipelines across crop or range land), final stabilization may be accomplished by returning the disturbed land to its pre-construction agricultural use. Areas disturbed that were previously used for agricultural activities, such as buffer strips immediately adjacent to surface waters of the state and which are not being returned to their pre-construction agricultural use, must meet the final stabilization criteria in (1) or (2) above.

N. "General contractor" – for the purposes of this permit, the primary individual or company solely accountable to perform a contract. The general contractor typically supervises activities, coordinates the use of subcontractors, and is authorized to direct workers at a site to carry out activities required by the permit.

O. "Individual lot NOI" means a Notice of Intent for an individual lot to be covered by this permit (see Part I of this permit).

P. "Larger common plan of development or sale"- means a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one plan.

Q. "MS4" means municipal separate storm sewer system which means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels or storm drains) that are:

1. Owned or operated by the federal government, state, municipality, township, county, district(s) or other public body (created by or pursuant to state or federal law) including special district under state law such as a sewer district, flood control district or drainage districts or similar entity or a designated and approved management agency under section 208 of the act that discharges into surface waters of the state; and
2. Designed or used for collecting or conveying solely storm water,
3. Which is not a combined sewer and
4. Which is not a part of a publicly owned treatment works.

R. "National Pollutant Discharge Elimination System (NPDES)" means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits and enforcing pretreatment requirements, under sections 307, 402, 318 and 405 of the CWA. The term includes an "approved program."

S. "Natural channel design" means an engineering technique that uses knowledge of the natural process of a stream to create a stable stream that will maintain its form and function over time.

T. "NOI" means notice of intent to be covered by this permit.

U. "NOT" means notice of termination.

V. "Operator" means any party associated with a construction project that meets either of the following two criteria:

1. The party has day-to-day operational control of all activities at a project which are necessary to ensure compliance with a SWP3 for the site and all permit conditions including the ability to authorize modifications to the SWP3, construction plans and site specification to ensure compliance with the General Permit, or

2. Property owner meets the definition of operator should the party which has day to day operational control require additional authorization from the owner for modifications to the SWP3, construction plans, and/or site specification to ensure compliance with the permit or refuses to accept all responsibilities as listed above (Part VII.V.1).

Subcontractors generally are not considered operators for the purposes of this permit. As set forth in Part I.F.1, there can be more than one operator at a site and under these circumstances, the operators shall be co-permittees.

W. "Ordinary high water mark" means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

X. "Owner or operator" means the owner or operator of any "facility or activity" subject to regulation under the NPDES program.

Y. "Permanent stabilization" means the establishment of permanent vegetation, decorative landscape mulching, matting, sod, rip rap and landscaping techniques to provide permanent erosion control on areas where construction operations are complete or where no further disturbance is expected for at least one year.

Z. "Percent imperviousness" means the impervious area created divided by the total area of the project site.

AA. "Point source" means any discernible, confined and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or the floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.

BB. "Qualified inspection personnel" means a person knowledgeable in the principles and practice of erosion and sediment controls, who possesses the skills to assess all conditions at the construction site that could impact storm water quality and to assess the effectiveness of any sediment and erosion control measures selected to control the quality of storm water discharges from the construction activity.

CC. "Rainwater and Land Development" is a manual describing construction and post-construction best management practices and associated specifications. A copy of the manual may be obtained by contacting the Ohio Department of Natural Resources, Division of Soil & Water Conservation.

DD. "Riparian area" means the transition area between flowing water and terrestrial (land) ecosystems composed of trees, shrubs and surrounding vegetation which serve to stabilize erodible soil, improve both surface and ground water quality, increase stream shading and enhance wildlife habitat.

EE. "Runoff coefficient" means the fraction of total rainfall that will appear at the conveyance as runoff.

FF. "Sediment settling pond" means a sediment trap, sediment basin or permanent basin that has been temporarily modified for sediment control, as described in the latest edition of the Rainwater and Land Development manual.

GG. "State isolated wetland permit requirements" means the requirements set forth in Sections 6111.02 through 6111.029 of the ORC.

HH. "Storm water" means storm water runoff, snow melt and surface runoff and drainage.

II. "Steep slopes" means slopes that are 15 percent or greater in grade. Where a local government or industry technical manual has defined what is to be considered a "steep slope," this permit's definition automatically adopts that definition.

JJ. "Stream edge" means the ordinary high water mark.

KK. "Subcontractor" – for the purposes of this permit, an individual or company that takes a portion of a contract from the general contractor or from another subcontractor.

LL. "Surface waters of the state" or "water bodies" means all streams, lakes, reservoirs, ponds, marshes, wetlands or other waterways which are situated wholly or partially within the boundaries of the state, except those private waters which do not combine or effect a junction with natural surface or underground waters. Waters defined as sewerage systems, treatment works or disposal systems in Section 6111.01 of the ORC are not included.

MM. "SWP3" means storm water pollution prevention plan.

NN. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment

facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

OO. "Temporary stabilization" means the establishment of temporary vegetation, mulching, geotextiles, sod, preservation of existing vegetation and other techniques capable of quickly establishing cover over disturbed areas to provide erosion control between construction operations.

PP. "Water Quality Volume (WQ_v)" means the volume of storm water runoff which must be captured and treated prior to discharge from the developed site after construction is complete.

Appendix A
Big Darby Creek Watershed

CONTENTS OF THIS APPENDIX

A.1 Permit Area.

This appendix to Permit OHC00005 applies to the entire Big Darby Creek Watershed located within the State of Ohio. Please see Attachment A for permit area boundaries.

A.2 TMDL Conditions.

This general permit requires control measures/BMPs for construction sites that reflect recommendations set forth in the U.S. EPA approved Big Darby Creek TMDL.

A.3 Sediment Settling Ponds and Sampling

Sediment settling ponds additional conditions. The sediment settling pond shall be sized to provide a minimum sediment storage volume of 134 cubic yards of effective sediment storage per acre of drainage and maintain a target discharge performance standard of 45 mg/l Total Suspended Solids (TSS) up to a 0.75-inch rainfall event within a 24-hour period. Unless infeasible, sediment settling ponds must be dewatered at the pond surface using a skimmer or equivalent device. The depth of the sediment settling pond must be less than or equal to five feet. Sediment must be removed from the sediment settling pond when the design capacity has been reduced by 40 percent (This is typically reached when sediment occupies one-half of the basin depth).

Silt Fence and Diversions. For sites five or more acres in size, the use of sediment barriers as a primary sediment control is prohibited. Centralized sediment basins shall be used for sites 5 or more acres in size. Diversions shall direct all storm water runoff from the disturbed areas to the impoundment intended for sediment control. The sediment basins and associated diversions shall be implemented prior to the major earth disturbing activity.

The permittee shall sample in accordance with sampling procedures outlined in 40 CFR 136. Sampling shall occur as follows:

i. Occur at the outfall of each sediment settling pond associated with the site. Each associated outfall shall be identified by a three-digit number (001, 002, etc.);

ii. The applicable rainfall event for sampling to occur shall be a rainfall event of 0.25-inch to a 0.75-inch rainfall event to occur within a 24-hour period. Grab sampling shall be initiated at a site within 14 days, or the first applicable rainfall event thereafter, once upslope disturbance of each sampling location is initiated and shall continue on a quarterly basis. Quarterly periods shall be represented as January - March, April - June, July - September and October - December. Sampling results shall be retained on site and available for inspection.

If any sample is greater than the performance standard of 45 mg/l TSS, the permittee shall modify the SWP3 and install/implement new control practice(s) within 10 days to ensure the TSS performance standard is maintained. Within 3 days of improvement(s), or the first applicable rainfall event thereafter, the permittee shall resample to ensure SWP3 modifications maintain the TSS performance standard target.

For each sample taken, the permittee shall record the following information:

- the outfall and date of sampling;
- the person(s) who performed the sampling;
- the date the analyses were performed on those samples;
- the person(s) who performed the analyses;
- the analytical techniques or methods used; and
- the results of all analyses.

Both quarterly and sampling results following a discharge target exceedance shall be retained on site and available for inspection.

A.4 Riparian Setback Requirements.

The SWP3 shall clearly delineate the boundary of required stream setback distances. No construction activity shall occur, without appropriate mitigation, within the delineated setback boundary except activities associated with restoration or recovery of natural floodplain and channel form characteristics as described in Attachment B, storm water conveyances from permanent treatment practices and approvable utility crossings. Such conveyances must be designed to minimize the width of disturbance. If intrusion within the delineated setback boundary is necessary to accomplish the purposes of a project, then mitigation shall be required in accordance with Appendix A.5 of this permit. Streams requiring protection under this section are defined as perennial, intermittent or ephemeral streams with a defined bed, bank or channel. National Resources Conservation Service (NRCS) soil survey maps should be used as one reference and the presence of a stream requiring protection should also be confirmed in the field. Any required setback distances shall be clearly displayed in the field prior to any construction related activity.

Riparian setbacks distance shall be delineated based upon one of the following two methods:

i. The setback distance shall be sized as the greater of the following:

1. The regulatory 100-year floodplain based on FEMA mapping;

2. A minimum of 100 feet from the top of the streambank on each side; or

3. A distance calculated using the following equation:

$$W = 133DA^{0.43} \qquad \text{(Equation 1, Appendix A)}$$

where:
DA = drainage area (mi^2)
W = total width of riparian setback (ft)

W shall be centered over the meander pattern of the stream such that a line representing the setback width would evenly intersect equal elevation lines on either side of the stream.

If the DA remains relatively constant throughout the stretch of interest, then the DA of the downstream edge of the stretch should be used. Where there is a significant increase in the DA from the upstream edge to The downstream edge of the area of interest, the setback width shall increase accordingly.

ii. **Stream Restoration with 100 feet (each side) Riparian Setback**. Each stream segment within the proposed site boundaries can be assessed in accordance with Attachment B, Part 1. In the event the stream segment is classified as a "Previously Modified Low Gradient Headwater Stream", the permittee has the option to restore the stream segment in accordance with Attachment B and include a 100-foot water quality setback distance from the top of the streambank on each side. In the event the stream segment exceeds the minimum criteria in Attachment B to be classified as a "Previously Modified Low Gradient Headwater Stream," this Appendix A, Attachment B may be considered on a case-by-case basis.

No structural sediment controls (e.g., the installation of sediment barriers or a sediment settling pond) or structural post-construction controls shall be used in a surface water of the State or the delineated setback corridor.

Previously developed projects (as defined in Part III.G.2.e.) located within the delineated setback boundary are exempt from Riparian Setback Mitigation (A.5) provided the proposed project does not further intrude into the delineated setback boundary.

Linear transportation projects which are caused solely by correcting safety related issues, mandates of modern design requirements and/or resulting from other mitigation activities are exempt from Riparian Setback Mitigation (Appendix A, A.5) if less than one acre of total new right-of-way is associated with the project.

A.5 Riparian Setback Mitigation.

The mitigation required for intrusion into the riparian setback shall be determined by the horizontal distance the intrusion is from the stream. Up to three zones will be used in determining the required mitigation. Zone 1 extends from 0 to 25 feet from the stream edge. Zone 2 extends from 25 to 100 feet from the stream edge, and Zone 3 extends from 100 feet to the outer edge of the setback corridor. Intrusion into these zones will require the following mitigation within the same Watershed Assessment Unit (12-digit HUC scale):

i. Four times the total area disturbed in the stream and within Zone 1 of the site being developed shall be mitigated within Zone 1 of the mitigation location.

ii. Three times the area disturbed within Zone 2 of the site being developed shall be mitigated within Zones 1 and/or 2 of the mitigation location.

iii. Two times the area disturbed within Zone 3 of the site being developed shall be mitigated within any zone of the mitigation location.

In lieu of mitigation ratios found within in this section, linear transportation projects which result in total new right-of-way greater than one acre and less than two acres, which are caused solely by correcting safety related issues, mandates of modern design requirements and/or resulting from other mitigation activities, shall provide Riparian Setback Mitigation at a ratio of 1.5 to 1.

All mitigation shall, at a minimum, include conserved or restored setback zone and should be designed to maximize the ecological function of the mitigation. Including mitigation at the stream edge along with associated setback areas is one way to maximize ecological function. Mitigation shall be protected in perpetuity by binding conservation easements or environmental covenants which must be recorded within 6 months of receiving permit authorization. Granting of binding conservation easements or environmental covenants protected in perpetuity for land outside of disturbed area but within a required riparian setback counts towards required mitigation.

Mitigation may also be satisfied by approved pooled mitigation areas and in-lieu fee sponsored mitigation areas. Mitigation resulting from State or Federal environmental regulations may be adjusted in recognition of these requirements.

A.6 Groundwater Recharge Requirements.

The SWP3 shall ensure that the overall site post-development groundwater recharge equals or exceeds the pre-development groundwater recharge. The SWP3 shall describe the conservation development strategies, BMPs and other practices deemed necessary by the permittee to maintain or improve pre-development rates of groundwater recharge. Pre-development and post-development groundwater recharge shall be calculated using the following equation:

i. $Vre_x = A_x * Dre_x / 12$ (Equation 2, Appendix A)

where:
X = represents a land use and hydrologic soil group pair
Vre_x = volume of total annual recharge from land use-soil group X (in acre-ft)
Dre_x = depth of total annual recharge associated with land use-soil group X from Tables 1 or 2 (in inches)
A_x = area of land use-soil group X (in acres)

Table A-1 values should be used for land where the underlying geology indicates a potential for downward migration of groundwater. Table A-1 values represent the combined total groundwater recharge potential including groundwater contribution to stream baseflow and to the underlying bedrock aquifer. The potential for downward migration can be determined from a comparison of the potentiometric maps for the glacial and bedrock aquifers. Use Table A-2 when this potential is unlikely to exist. Detailed potentiometric maps for the Franklin county portion of the Darby watershed, and coarse potentiometric maps for the Darby watershed outside of Franklin County and hydrologic soil group data are available at: http://www.epa.state.oh.us/dsw/permits/GP_ConstructionSiteStormWater_Darby.aspx.

Table A-1 (Appendix A) Annual Average Expected Total Groundwater Recharge[3]

Land Use	Density (DU[1]/acre)	% Impervious	Recharge (inches) by Hydrologic Soil Group2			
			A	B	C	D
Woods / Forest	-	-	17.0	16.6	15.6	14.6
Brush	-	-	17.0	16.6	15.6	14.6
Meadow	-	-	17.0	16.5	15.4	14.4
Managed Wood	-	-	16.9	16.0	14.7	13.4
Pasture	-	-	16.5	15.9	14.4	13.0
Row Crop	-	-	15.8	14.2	11.9	8.1
Urban Grasses	-	-	15.7	15.7	14.2	12.7
Low Density Residential	0.5	12%	15.7	15.7	14.2	12.7
Low Density Residential	1	20%	14.8	14.8	13.7	12.2
Medium Density Residential	2	25%	11.5	11.5	11.5	11.5
Medium Density Residential	3	30%	11.2	11.2	11.2	11.2
Medium Density Residential	4	38%	9.6	9.6	9.6	9.6
High Density Residential	≥5	65%	7.3	7.3	7.3	7.3
Commercial & Road Right-of-Way[4]	-	90%	4.3	4.3	4.3	4.3

[1] DU = Dwelling Units
[2] Hydrologic soil group designations of A/D, B/D, and C/D should be considered as D soils for this application.
[3] These values apply when recharge of the aquifer is expected; recharge to the bedrock aquifer can be expected when the potentiometric head of the glacial aquifer is greater than the bedrock aquifer.
[4] The 4.3 infiltration value may only be used for an area as a whole (includes impervious and pervious areas) which includes a minimum of 10 percent pervious area. If all land uses (pervious and impervious) are tabulated separately, then impervious areas have 0 inches of recharge.

Table A-2 (Appendix A) Annual Average Expected Baseflow Recharge[3]

Land Use	Density (DU[1]/acre)	% Impervious	Recharge (inches) by Hydrologic Soil Group2			
			A	B	C	D
Woods / Forest	-	-	11.8	11.4	10.7	9.9
Brush	-	-	11.7	11.4	10.7	9..9
Meadow	-	-	11.8	11.3	10.6	9.8
Managed Wood	-	-	11.7	11.0	10.0	9.1
Pasture	-	-	11.3	11.0	9.9	8.9
Row Crop	-	-	11.1	10.1	9.0	6.2
Urban Grasses	-	-	11.2	11.2	10.3	9.3
Low Density Residential	0.5	12%	11.2	11.2	10.3	9.3
Low Density Residential	1	20%	9.5	9.5	9.0	8.6
Medium Density Residential	2	25%	7.8	7.8	7.8	7.8
Medium Density Residential	3	30%	7.6	7.6	7.6	7.6
Medium Density Residential	4	38%	6.5	6.5	6.5	6.5
High Density Residential	≥5	65%	5.0	5.0	5.0	5.0
Commercial & Road Right-of-Way[4]	-	90%	2.9	2.9	2.9	2.9

[1] DU = Dwelling Units
[2] Hydrologic soil group designations of A/D, B/D, and C/D should be considered as D soils for this application.
[3] These values apply when no recharge of the aquifer is expected.
[4] The 2.9 infiltration value may only be used for an area as a whole (includes impervious and pervious areas) which includes a minimum of 10 percent pervious area. If all land uses (pervious and impervious) are tabulated separately, then impervious areas have 0 inches of recharge.

Table A-3 (Appendix A) Land Use Definitions

Land Use	Definition
Woods / Forest	Areas dominated by trees. Woods are protected from grazing and litter and brush adequately cover the soil.
Brush	Brush, weeds, grass mixture where brush is the major element and more than 75% of the ground is covered.
Meadow	Continuous grass, protected from grazing, generally mowed for hay.
Managed Wood	Orchards, tree farms, and other areas planted or maintained for the production of fruits, nuts, berries, or ornamentals.
Pasture	Pasture, grassland, or range where at least 50% of the ground is covered and the area is not heavily grazed.
Row Crop	Areas used to produce crops, such as corn, soybeans, vegetables, tobacco, and cotton.
Urban Grasses	Vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Examples include parks, lawns, golf courses, airport grasses, and industrial site grasses.
Residential	Areas with a mixture of constructed materials and vegetation; the average % imperviousness and number of dwelling units per acre to determine the appropriate density is specified.
Commercial	Includes infrastructure (e.g. roads, railroads, etc.) and all highly developed areas not classified as High Intensity Residential.

ii. The pre-development ground water recharge volume shall be calculated by determining the area of each land use-soil type pairing on the site of interest. The recharge associated with each such pairing multiplied by the area will give the pre-development volume of total groundwater

recharge. The same shall be done for the post-development land use-soil type pairings.

Any activity that is expected to produce storm water runoff with elevated concentrations of carcinogens, hydrocarbons, metals, or toxics is prohibited from infiltrating untreated storm water from the area affected by the activity. The groundwater recharge mitigation requirement for areas affected by such activities must be met by methods which do not present a risk of groundwater contamination. The following land uses and activities are typically deemed storm water hotspots:

Vehicle salvage yards and recycling facilities

- vehicle service and maintenance facilities (i.e. truck stops, gas stations)
- fleet storage areas (i.e. bus, truck)
- industrial sites subject to industrial storm water permitting requirements
- bulk terminals
- marinas
- facilities that generate or store hazardous materials
- other land uses and activities as designated by individual review

The following land uses and activities are not normally considered hotspots:

- residential streets and rural highways
- residential development
- institutional development
- commercial and office developments
- non-industrial rooftops
- pervious areas, except golf courses and nurseries

The applicant may use structural BMPs within drinking water source protection areas for community public water systems only to the extent that the structural BMP(s) does not cause contaminants in the recharge waters to impact the ground water quality at levels that would cause an exceedance of the drinking water Maximum Contaminant Levels (OAC Section 3745-81 and 3745-82). To obtain a map of drinking water source protection areas for community public water systems contact Ohio EPA's Division of Drinking and Ground Waters at (614) 644-2752.

Linear transportation projects which are caused solely by correcting safety related issues, mandates of modern design requirements and/or resulting from other mitigation activities are exempt from Groundwater Recharge Mitigation (Appendix B, A.7) if less than one acre of total new right-of-way is associated with the project.

Protection of open space (infiltration areas) shall be by binding conservation easements that identify a third-party management agency, such as a homeowners' association/condominium association, political jurisdiction or third-party land trust.

A.7 Groundwater Recharge Mitigation.

If the post-development recharge volume is less than the pre-development recharge volume, then mitigation will be required. Two options are available for most applications:

i. The preferred method is to convert additional land to land use with higher recharge potential. The difference in groundwater recharge between the existing and converted land use recharge is the amount which can be used as recharge credit. Off-site Groundwater Recharge Mitigation shall occur within the same Watershed Assessment Unit (12-digit HUC scale) as the permitted site and preferably up-gradient and within a 2-mile radius.

Mitigation shall be protected in perpetuity by binding conservation easements or environmental covenants which must be recorded within 6 months of receiving permit authorization. Granting of binding conservation easements or environmental covenants protected in perpetuity for land outside of the disturbed area, but within a required riparian setback counts towards required mitigation.

Mitigation may also be satisfied by approved pooled mitigation areas and in-lieu fee sponsored mitigation areas.

ii. On-site structural and non-structural practices may also be used to achieve groundwater mitigation requirements by retaining and infiltrating on-site a minimum volume of storm water runoff based on the area and hydrologic soil groups of disturbed soils. If these infiltrating practices are incorporated upstream of the water quality volume treatment practice, the volume of groundwater being infiltrated may be subtracted from the water quality volume for the purpose of meeting post-construction requirements. The on-site retention requirement is determined by the following formula:

$$V_{retention} = A_{HSG\text{-}A}*0.90 \text{ in} + A_{HSG\text{-}B}*0.75 \text{ in} + A_{HSG\text{-}C}*0.50 \text{ in} + A_{HSG\text{-}D}*0.25 \text{ in}$$

(Equation 3, Appendix A)

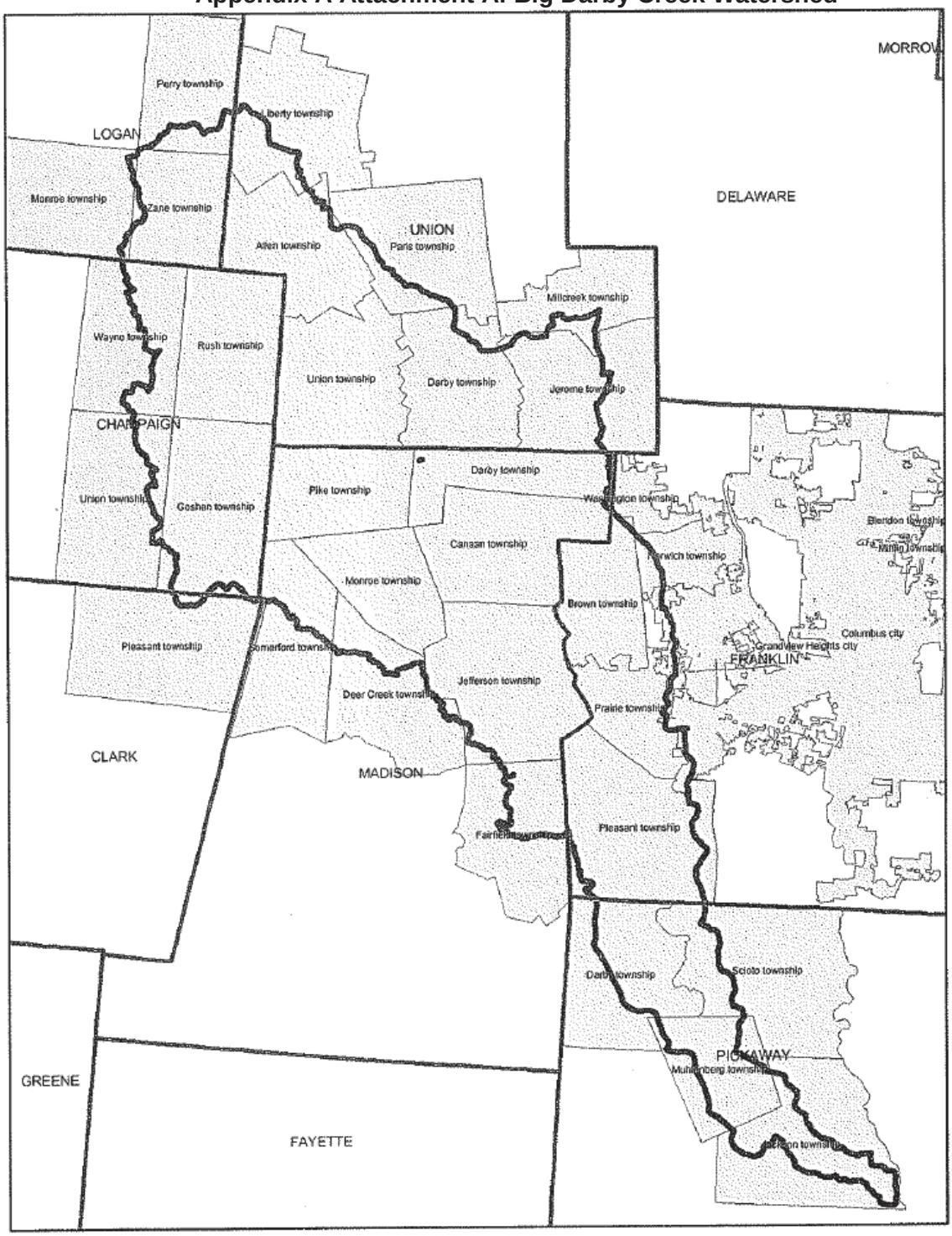
Where,
$V_{retention}$ = volume of runoff retained onsite using an approved infiltration practice
$A_{HSG\text{-}x}$ = area of each hydrologic soil group within the disturbed area

Table A-4: Hydrologic Soil Groups and On-site Retention Depth per Acre

Hydrologic Soil Group	HSG A	HSG B	HSG C	HSG D
Retention Depth (inches)	0.90	0.75	0.50	0.25

Retention volume ($V_{retention}$) provided by selected practices shall be determined using the runoff reduction method criteria as outlined in Part III.G.2.e, Ohio EPA's Runoff Reduction spreadsheet and supporting documentation in the Rainwater and Land Development manual. Hydrologic soil group (HSG) areas are to be determined by using the current version of SURRGO or Web Soil Survey soils information.

Appendix A Attachment A: Big Darby Creek Watershed



A more detailed map can be viewed at:
http://www.epa.state.oh.us/dsw/permits/GP_ConstructionSiteStormWater_Darby.aspx

Appendix A Attachment B

Part 1 Stream Assessment

This assessment will determine if a stream is considered a previously channelized, low-gradient headwater stream (a drainage ditch) which would be applicable for stream restoration in lieu of protecting a setback as per Appendix A. A.4.i and ii.

In the event the assessment of the stream, meets all the criteria listed below, restoration (provided 401/404 permits are authorized) as depicted in Part 2 of this attachment, may be a means of reducing the setback distance required by A.4.i. (Appendix A).

Previously Channelized Low-Gradient Headwater Streams (drainage ditches) shall for the purposes of this permit be defined as having all of the following characteristics:

- Less than 10 square miles of drainage area
- Low gradient and low stream power such that despite their straightened and entrenched condition incision (down-cutting) is not evident
- Entrenched, entrenchment ratio < 2.2
- Straight, sinuosity of the bankfull channel < 1.02

Part 2 Restoration

Restoration shall be accomplished by any natural channel design approach that will lead to a self-maintaining reach able to provide both local habitat and watershed services (e.g. self-purification and valley floodwater storage).

a. Construction of a floodplain, channel and habitat via natural channel design;
b. Floodplain excavation necessary to promote interaction between stream and floodplain;
c. Include a water quality setback of 100 feet from top of the streambank on each side.

The primary target regardless of design approach shall be the frequently flooded width, which shall be maximized, at 10 times the channel's self-forming width. Five times the self-forming channel width may still be acceptable particularly on portions of the site if greater widths are achieved elsewhere.

Appendix B
Olentangy River Watershed

CONTENTS OF THIS APPENDIX

B.1 Permit Area.

This appendix to Permit OHC00005 applies to specific portions of the Olentangy River Watershed located within the State of Ohio. The permit area includes the following 12-digit Hydrologic Unit Codes (HUC-12) within the Olentangy River Watershed:

12-Digit Hydrologic Unit Codes

12-Digit Hydrologic Unit Codes (HUC)	Narrative Description of Sub-Watershed
05060001 09 01	Shaw Creek
05060001 09 02	Headwaters Whetstone Creek
05060001 09 03	Claypool Run-Whetstone Creek
05060001 10 07	Delaware Run-Olentangy River
05060001 11 01	Deep Run-Olentangy River
05060001 11 02 (Only portion as depicted in Attachment A)	Rush Run-Olentangy River

Please see Attachment A (Appendix B) for permit area boundaries. An electronic version of Attachment A can be viewed at
http://epa.ohio.gov/dsw/permits/GP_ConstructionSiteStormWater_Olentangy.aspx

B.2 TMDL Conditions.

This general permit requires control measures/BMPs for construction sites that reflect recommendations set forth in the U.S. EPA approved Olentangy TMDL.

B.3 Riparian Setback Requirements.

The permittee shall comply with the riparian setback requirements of this permit or alternative riparian setback requirements established by a regulated MS4 and approved by Ohio EPA. The SWP3 shall clearly delineate the boundary of required stream setback distances. The stream setback shall consist of a streamside buffer and an outer buffer. No construction activity shall occur, without appropriate mitigation, within the streamside buffer except activities associated with storm water conveyances from permanent treatment practices, approvable utility crossings and restoration or recovery of floodplain and channel form characteristics as described in Attachment B. Storm water conveyances must be designed to minimize the width of disturbance.

Construction activities requiring mitigation for intrusions within the outer buffer for the Olentangy River mainstem and perennial streams are described in Appendix B.4.

If intrusion within the delineated setback boundary is necessary to accomplish the purposes of a project, then mitigation shall be required in accordance with Appendix B.3. of this permit. Streams requiring protection under this section have a defined bed and bank or channel and are defined as follows:

- The Olentangy River mainstem;
- Perennial streams have continuous flow on either the surface of the stream bed or under the surface of the stream bed;
- Intermittent streams flow for extended periods of time seasonally of a typical climate year; and
- Ephemeral streams are normally dry and only flow during and after precipitation runoff (episodic flow).

National Resources Conservation Service (NRCS) soil survey maps should be used as one reference and the presence of a stream requiring protection should also be confirmed in the field. Any required setback distances shall be clearly displayed in the field prior to any construction related activity.

Riparian setbacks shall be delineated based upon one of the following two methods:

i. The required setback distances shall vary with stream type as follows:

a. The setback distances associated with the mainstem of the Olentangy River shall consist of:

(1) A streamside buffer width of 100 feet as measured horizontally from the ordinary high water mark per side; and

(2) An outer buffer width sized to the regulatory 100-year floodplain based on FEMA mapping. No impervious surfaces shall be constructed without appropriate mitigation and moderate to substantial fill activities with no impervious surface may require appropriate mitigation pending an individual approval by Ohio EPA.

b. The setback distance associated with perennial streams, other than the Olentangy mainstem, shall consist of:

(1) A streamside buffer width of 80 feet per side measured horizontally from the ordinary high water mark; and

(2) An outer buffer width sized to the regulatory 100-year floodplain based on FEMA mapping. In the event the regulatory 100-year floodplain is not established, the outer buffer width shall be calculated using the following equation and measured horizontally from the ordinary high water mark. No impervious surfaces, structure, fill, or activity that would impair the floodplain or stream stabilizing ability of the outer buffer shall occur without appropriate mitigation:

$W = 143DA^{0.41}$ (Equation 1 Appendix B)

where:
DA = drainage area (mi^2)
W = total width of riparian setback (ft)

W shall be centered over the meander pattern of the stream such that a line representing the setback width would evenly intersect equal elevation lines on either side of the stream.

If the DA remains relatively constant throughout the stretch of interest, then the DA of the downstream edge of the stretch should be used. Where there is a significant increase in the DA from the upstream edge to the downstream edge of the area of interest, the setback width shall increase accordingly.

c. The setback distance associated with intermittent streams and ephemeral streams shall be a streamside buffer width of 30 feet per side measured horizontally from the centerline of the stream. No outer buffer is required for intermittent and ephemeral streams.

ii. Stream Restoration with 100 feet (each side) Riparian Setback. Each stream segment within the proposed site boundaries can be assessed in accordance with Attachment B. In the event the stream segment is classified as a "Previously Modified Low Gradient Headwater Stream", the permittee has the option to restore the stream segment in accordance with Attachment B and include a 100 feet water quality setback distance from the top of the streambank on each side. In the event the stream segment exceeds the minimum criteria in Attachment B to be classified as a "Previously Modified Low Gradient Headwater Stream", this may be considered on a case-by-case basis.

No structural sediment controls (e.g., the installation of sediment barriers or a sediment settling pond) or structural post-construction controls shall be used in a stream or the streamside buffer. Activities and controls that would not impair the floodplain or stream stabilizing ability of the outer buffer can be considered.

Redevelopment projects (i.e., developments on previously developed property) located within the delineated setback boundary is exempt from Riparian Setback Mitigation (B.3) provided the proposed project does not further intrude the delineated setback boundary.

B.4 Riparian Setback Mitigation.

The mitigation required for intrusion into the riparian setback of the **Olentangy River mainstem or perennial streams** shall be determined by the horizontal distance the intrusion is from the stream. Up to three zones will be used in determining the required mitigation. Zone 1 extends from 0 to 30 feet from the stream edge. Zone 2 extends

from 30 feet to the outer edge of the streamside buffer. Zone 3 extends from the outer edge of the streamside buffer to the outer edge of the outer buffer. Intrusion into these zones will require the following mitigation within the same Watershed Assessment Unit (12-digit HUC scale). Alternative mitigation, within the permit area, may be considered on a case-by-case basis:

1. Four (4) times the total area disturbed in the stream within Zone 1 of the site being developed shall be mitigated; or, two (2) times the total area disturbed in the stream within Zone 1 shall be mitigated within the watershed of the immediate receiving stream, and the entire required setback of the site shall be protected by binding conservation easements or environmental covenants.

2. Three (3) times the area disturbed within Zone 2 of the site being developed shall be mitigated within Zones 1 and/or 2 of the mitigation location; or, one and one-half (1.5) times the total area disturbed within Zone 2 shall be mitigated within the watershed of the immediate receiving stream, and the entire required setback of the site shall be protected in perpetuity by binding conservation easements or environmental covenants.

3. Two (2) times the area to be mitigated within Zone 3 of the site being developed shall be mitigated within any Zone of the mitigation location; or, one (1) times the total area to be mitigated within any zone shall be mitigated within the watershed of the immediate receiving stream, and the entire required setback of the site shall be protected in perpetuity by binding conservation easements or environmental covenants.

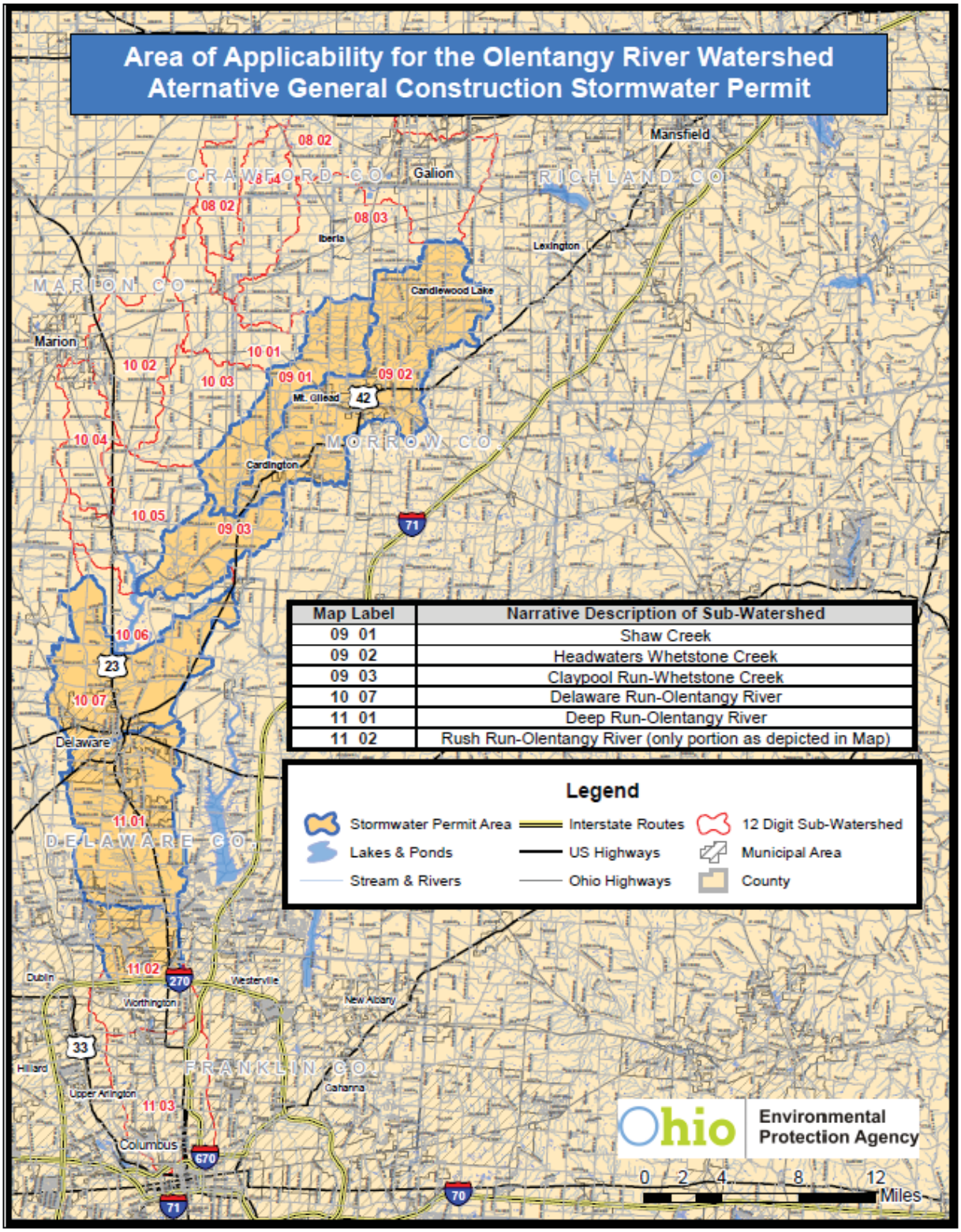
The mitigation required for intrusion into the riparian setback of an **intermittent stream** shall be four (4) times the total area disturbed within the riparian setback of the site being developed shall be mitigated; or two (2) times the total area disturbed within the riparian setback shall be mitigated within the watershed of the immediate receiving stream, and the entire required setback of the site shall be protected in perpetuity by binding conservation easements or environmental covenants.

The mitigation required for intrusion into the streamside buffer of an **ephemeral stream** shall be two (2) times the total area disturbed within the riparian setback of the site being developed shall be mitigated; or one (1) times the total area disturbed within the riparian setback shall be mitigated within the watershed of the immediate receiving stream, and the entire required setback of the site shall be protected in perpetuity by binding conservation easements or environmental covenants.

All mitigation shall, at a minimum, include conserved or restored setback zone, and should be designed to maximize the ecological function of the mitigation. Including mitigation at the stream edge along with associated setback areas is one way to maximize ecological function. Mitigation shall be protected in perpetuity by binding conservation easements or environmental covenants which must be recorded within 6 months of permit authorization. Granting of binding conservation easements or environmental covenants protected for land outside of disturbed area, but within a required riparian setback counts towards required mitigation.

Mitigation may also be satisfied by approved pooled mitigation areas and in-lieu fee sponsored mitigation areas. Mitigation resulting from State or Federal environmental regulations may be adjusted in recognition of these requirements.

Appendix B Attachment A Applicable Portions of the Olentangy Watershed



A more detailed map can be viewed at:
http://epa.ohio.gov/dsw/permits/GP_ConstructionSiteStormWater_Olentangy.aspx

Appendix B Attachment B

Part 1 Stream Assessment

This assessment will determine if a stream is considered a previously channelized, low-gradient headwater stream (a drainage ditch) which would be applicable for stream restoration in lieu of protecting an outer 'no build' setback as per Appendix B B.2i. and ii.

In the event the assessment of the stream meets all the criteria listed below, restoration as depicted in Part 2 of this attachment or natural channel design could be performed, provided 401/404 permits are authorized, and may be a means of reducing the setback distance required by B.2.i. (Appendix B).

Previously Modified, Low-Gradient Headwater Streams shall, for the purposes of this permit, be defined as having all of the following characteristics:

- Less than 10 square miles of drainage area;
- Low gradient and low stream power such that incision (down-cutting) is not evident;
- Entrenched such that the ratio of the frequently flooded width to the bankfull width is less than 2.2; and
- Straight with little or no sinuosity present such that the ratio of the bankfull channel length to the straight-line distance between two points is less than 1.02.

Part 2 Restoration

Restoration shall be accomplished by any natural channel design approach that will lead to a self-maintaining reach able to provide both local habitat and watershed services (e.g. self-purification and valley floodwater storage).

a. Construction of a floodplain, channel and habitat via natural channel design;
b. Floodplain excavation necessary to promote interaction between stream and floodplain;
c. Include a water quality setback of 100 feet from top of the streambank on each side.

The primary target shall be a frequently flooded width of 10 times the channel's self-forming width. Five times the self-forming channel width may be acceptable if sufficient elements of natural channel design are included in the restoration project.

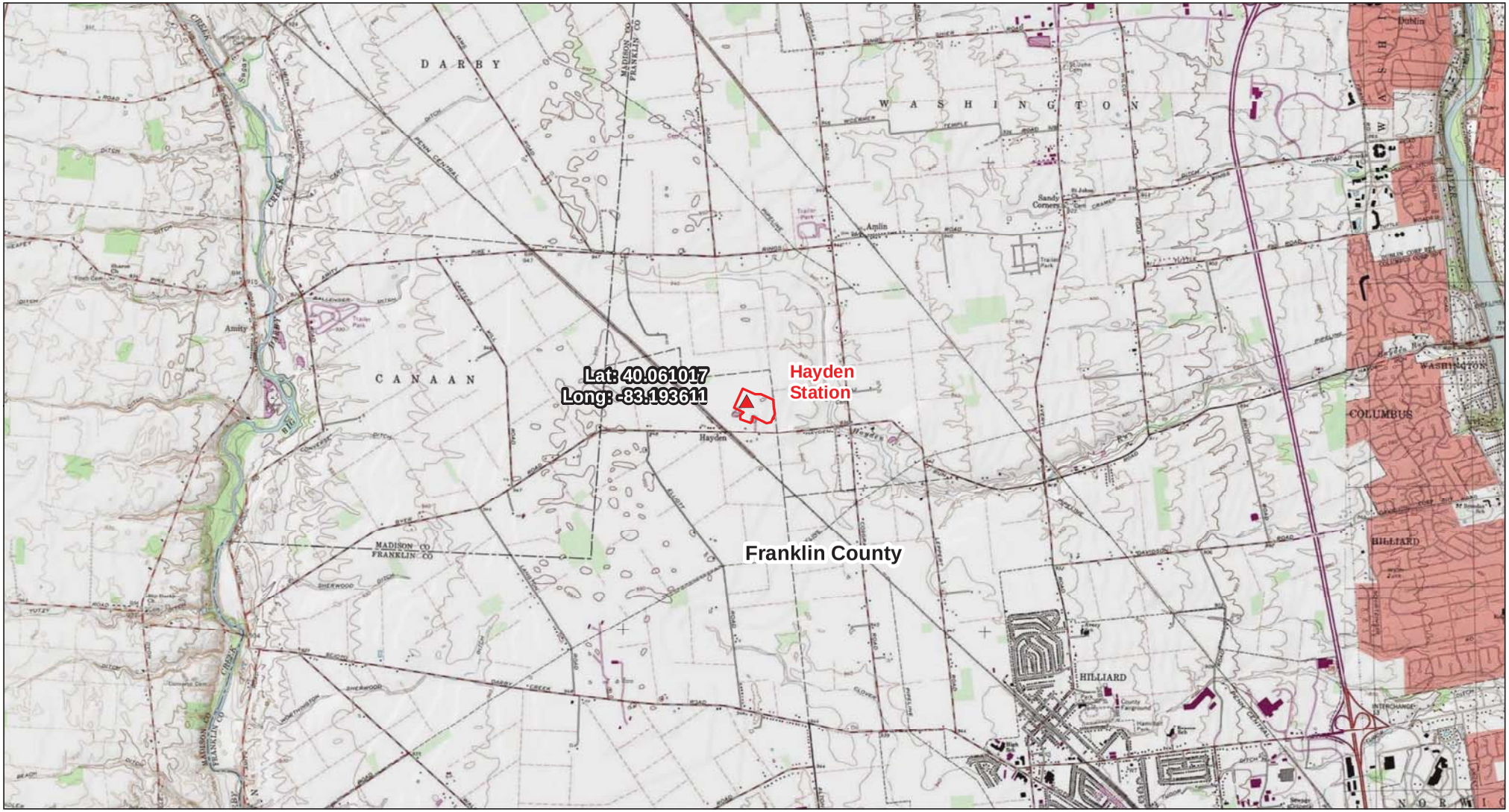
Appendix C Rainfall Intensity for Calculation of Water Quality Flow (WQF)

DURATION t_c (minutes)	WATER QUALITY INTENSITY [i_{wq}] (inches/hour)	DURATION t_c (minutes)	WATER QUALITY INTENSITY [i_{wq}] (inches/hour)
5	2.37	33	0.95
6	2.26	34	0.93
7	2.15	35	0.92
8	2.04	36	0.90
9	1.94	37	0.88
10	1.85	38	0.86
11	1.76	39	0.85
12	1.68	40	0.83
13	1.62	41	0.82
14	1.56	42	0.80
15	1.51	43	0.78
16	1.46	44	0.77
17	1.41	45	0.76
18	1.37	46	0.75
19	1.33	47	0.74
20	1.29	48	0.73
21	1.26	49	0.72
22	1.22	50	0.71
23	1.19	51	0.69
24	1.16	52	0.68
25	1.13	53	0.67
26	1.10	54	0.66
27	1.07	55	0.66
28	1.05	56	0.65
29	1.03	57	0.64
30	1.01	58	0.64
31	0.99	59	0.63
32	0.97	60	0.62

Note: For t_c < 5 minutes, use i = 2.37 in/hr; for t_c > 60 minutes, use i = 0.62 in/hr. For all other t_c, use the appropriate value from this table.

APPENDIX 2

Project Location Map, Soil Erosion and Sediment Control Plan, USDA Soils Map, Watershed (HUC-12) Map, and ODNR Rainwater and Land Development Manual Details



- Existing Station
- Proposed Hayden Station Property Limits

N
W E
S

1 " = 3,000 '

0 1,500 3,000

Feet

PROJECT LOCATION MAP

The State of Ohio
Franklin County
Brown Township

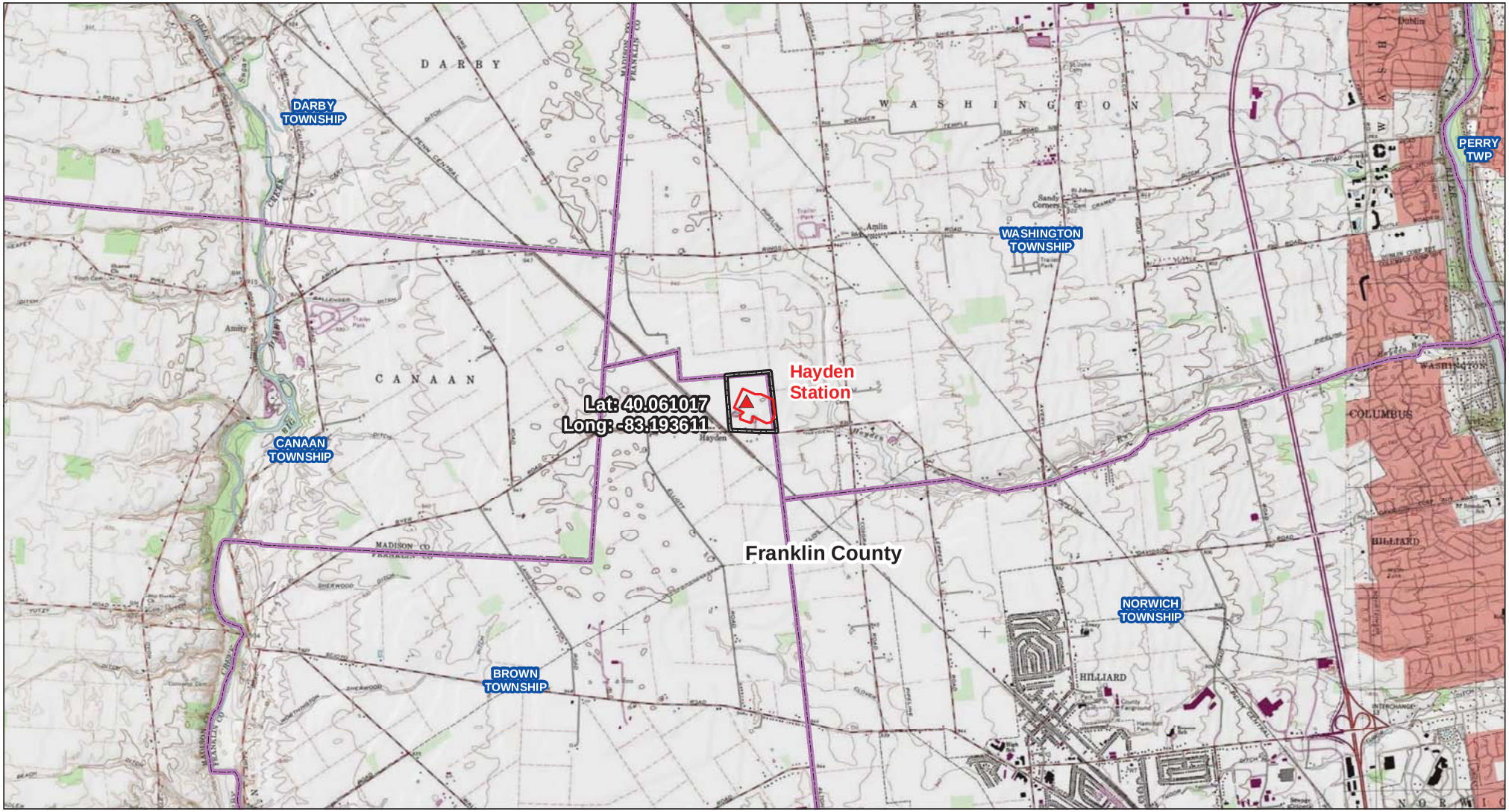
NAD 1983 State Plane Ohio South FIPS 3401 Feet
Foot US
Lambert Conformal Conic
North American 1983

Date: 4/17/2020 Author: RMP

Hayden Station Project
Station Expansion
Erosion and Sediment
Control Plan

AMERICAN ELECTRIC POWER
BOUNDLESS ENERGY

ms consultants, inc.
engineers, architects, planners



- Existing Station
- Proposed Hayden Station Property Limits
- Soil E&S Control Plan Page Index
- Township Boundary

N
W E
S

1 " = 3,000 '

0 1,500 3,000

Feet

INDEX MAP

The State of Ohio
Franklin County
Brown Township

NAD 1983 State Plane Ohio South FIPS 3401 Feet
Foot US
Lambert Conformal Conic
North American 1983

Date: 4/17/2020 Author: RMP

Hayden Station Project
Station Expansion
Erosion and Sediment Control Plan

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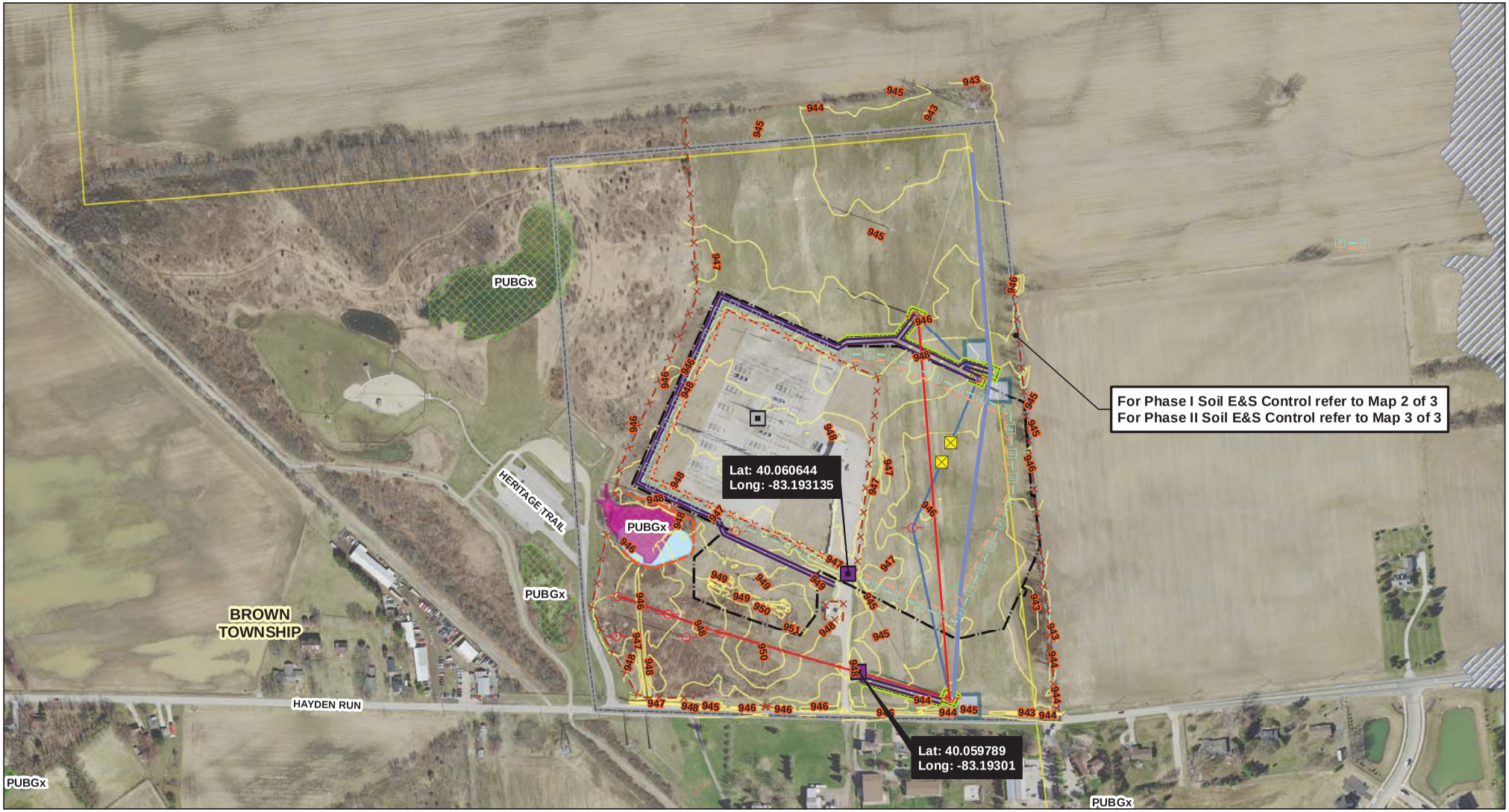

- Existing Station
- Pad Construction Limits
- Delineated Wetland
- Wetlands (NWI)
- Pond (NHD)
- Floodplain 100yr (DFIRM)
- Existing Fence
- Proposed Fence
- Secondary Fence
- Barrier Fence
- Filter Sock
- Timber Matting
- Proposed 140kV Transmission Line
- Existing 345kV Transmission Line
- 15' Timber Matting Access Road
- Temporary Transmission Line
- Pull Pad
- Proposed Poles
- Existing Poles
- Temporary Pole
- Hayden bay
- Soil E&S Control Plan Page Index
- Contour (1')
- Township Boundary

N
W E
S

1 " = 300 '

0 100 200

Feet

MAP 1 of 3

The State of Ohio
Franklin County
Brown Township

NAD 1983 State Plane Ohio South FIPS 3401 Feet
Foot US
Lambert Conformal Conic
North American 1983

Date: 4/17/2020 Author: RMP

Hayden Station Project
Station Expansion
Erosion and Sediment
Control Plan

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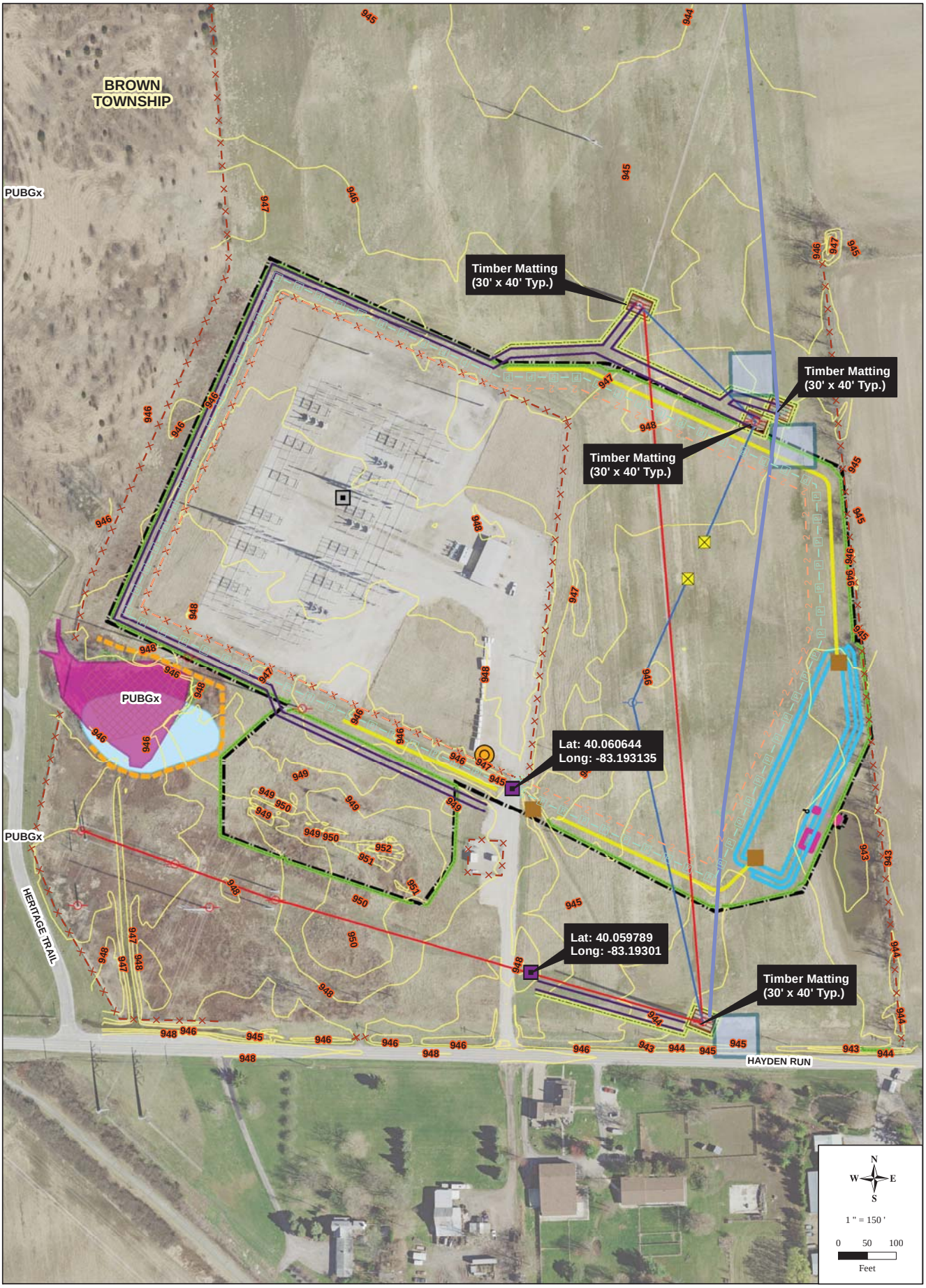

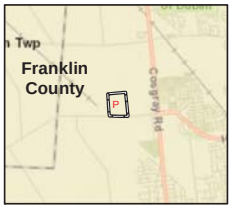

- Existing Station
- Construction Entrance
- Existing Poles
- Proposed Poles
- Temporary Pole
- Hayden bay
- Rock Outlet Protection
- Concrete Washout
- Barrier Fence
- Silt Fence
- Filter Sock
- Proposed 140kV Transmission Line
- Existing 345kV Transmission Line
- Timber Matting
- Outlet Rise with Faircloth Skimmer
- Channel Center
- Sediment Basin
- Outlet Structure
- Outlet Pipe for Pond
- Contour (1')
- Existing Fence
- Proposed Fence
- Secondary Fence
- Temporary Transmission Line
- Pull Pad
- Pad Construction Limits
- Delineated Wetland
- Wetlands (NWI)
- Pond (NHD)
- Floodplain 100yr (DFIRM)
- 15' Timber Matting Access Road

MAP 2 of 3

The State of Ohio
Franklin County
Brown Township

NAD 1983 State Plane Ohio South FIPS 3401 Feet
Foot US
Lambert Conformal Conic
North American 1983

Date: 4/17/2020 Author: RMP

Hayden Station Project
Station Expansion
Erosion and Sediment
Control Plan

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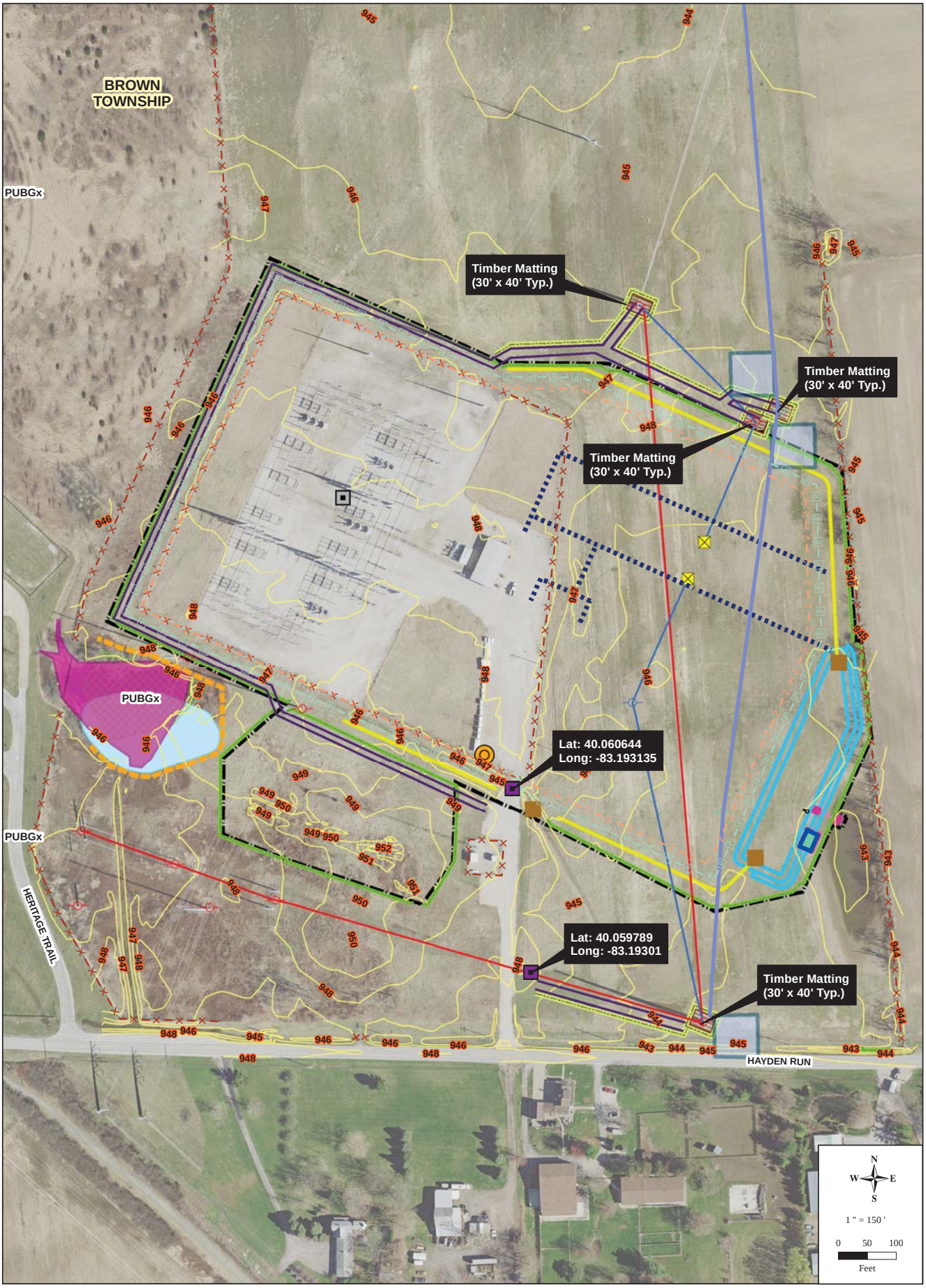

- Existing Station
- Construction Entrance
- Existing Poles
- Proposed Poles
- Temporary Pole
- Hayden bay
- Rock Outlet Protection
- Concrete Washout
- Barrier Fence
- Silt Fence
- Filter Sock
- Proposed 140kV Transmission Line
- Existing 345kV Transmission Line
- Timber Matting
- Outlet Rise with Faircloth Skimmer
- Channel Center
- Sediment Basin
- Outlet Structure
- Outlet Pipe for Pond
- Contour (1')
- Underdrain
- Emergency Spillway
- Existing Fence
- Proposed Fence
- Secondary Fence
- Temporary Transmission Line
- Pull Pad
- Pad Construction Limits
- Delineated Wetland
- Wetlands (NWI)
- Pond (NHD)
- Floodplain 100yr (DFIRM)
- 15' Timber Matting Access Road

MAP 3 of 3

The State of Ohio
Franklin County
Brown Township

NAD 1983 State Plane Ohio South FIPS 3401 Feet
Foot US
Lambert Conformal Conic
North American 1983

Date: 4/17/2020 Author: RMP

Hayden Station Project
Station Expansion
Erosion and Sediment
Control Plan

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- Existing Station
- Construction Limits
- Soil Unit
- Subwatershed Boundary (HUC-12)

N
W E
S

1 " = 400 '

0 200 400

Feet

Soils and Watershed Map

The State of Ohio
Franklin County
Brown Township

NAD 1983 State Plane Ohio South FIPS 3401 Feet
Foot US
Lambert Conformal Conic
North American 1983

Date: 4/17/2020 Author: RMP

Hayden Station Project
Station Expansion
Erosion and Sediment
Control Plan

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BMP Detail Sheets

Concrete Washout, Timber Matting, Grassed Swale, Rigid Lip Level Spreader, Rock Lined Channel, Rock Outlet Protection, Sediment Basins, Filter Sock, Silt Fence, Construction Entrance, Dust Control, Mulching, Permanent Seeding, Temporary Rolled Erosion Control Product, Temporary Seeding, Topsoiling, Additional Construction Site Pollution Controls

Concrete Washout

Concrete washout *areas are designated locations within a construction site that are either a prefabricated unit or a designed measure that is constructed to contain concrete washout. Concrete washout systems are typically used to contain washout water when chutes and hoppers are rinsed following delivery.*

Purpose

Concrete washout systems are implemented to reduce the discharge of pollutants that are associated with concrete washout waste through consolidation of solids and retention of liquids. Uncured concrete and associated liquids are highly alkaline which may leach into the soil and contaminate ground water or discharge to a waterbody or wetland which can elevate the pH and be harmful to aquatic life. Performing concrete washout in designated areas and into specifically designed systems reduces the impact concrete washout will have on the environment.

Specifications

Site Management

- Complete construction/installation of the system and have washout locations operational prior to concrete delivery.
- Do not wash out concrete trucks or equipment into storm drains, wetlands, streams, rivers, creeks, ditches, or streets.
- Never wash out into a storm sewer drainage system. These systems are typically connected to a natural conveyance system.
- Where necessary, provide stable ingress and egress (see **Temporary Construction Ingress/Egress Pad** on page 17).
- It is recommended that washout systems be restricted to washing concrete from mixer and pump trucks and not used to dispose of excess concrete or

residual loads due to potential to exceed the design capacity of the washout system. Small amounts of excess or residual concrete (not washout water) may be disposed of in areas that will not result in flow to an area that is to be protected.

- Install systems at strategic locations that are convenient and in close proximity to work areas and in sufficient number to accommodate the demand for disposal.
- Install signage identifying the location of concrete washout systems.

Location

- Locate concrete washout systems at least 50 feet from any creeks, wetlands, ditches, karst features, or storm drains/manmade conveyance systems.
- To the extent practical, locate concrete washout systems in relatively flat areas that have established vegetative cover and do not receive runoff from adjacent land areas.
- Locate in areas that provide easy access for concrete trucks and other construction equipment.
- Locate away from other construction traffic to reduce the potential for damage to the system.

General Design Considerations

- The structure or system shall be designed to contain the anticipated washout water associated with construction activities.
- The system shall be designed, to the extent practical, to eliminate runoff from entering the washout system.
- Runoff from a rainstorm or snowmelt should not carry wastes away from the washout location.
- Washout will not impact future land uses (i.e., open spaces, landscaped areas, home sites, parks).
- Washout systems/containment measures may also be utilized on smaller individual building sites. The design and size of the system can be adjusted to accommodate the expected capacity.

Prefabricated Washout Systems/Containers

- Self-contained sturdy containment systems that are delivered to a site and located at strategic locations for concrete disposal.

- These systems are manufactured to resist damage from construction equipment and protect against leaks or spills.
- Manufacturer or supplier provides the containers. The project site manager maintains the system or the supplier provides complete service that includes maintenance and disposal.
- Units are often available with or without ramps. Units with ramps lend themselves to accommodate pump trucks.
- Maintain according to the manufacturer's recommendations.

Designed and Installed Units

These units are designed and installed on site. They tend to be less reliable than prefabricated systems and are often prone to failure. Concrete washout systems can be constructed above or below grade. It is not uncommon to have a system that is partly below grade with an additional containment structure above grade.

- Washout systems shall utilize a pit or bermed area designed and maintained at a capacity to contain all liquid and concrete waste generated by washout operations.
- The volume of the system must also be designed to contain runoff that drains to the system and rainfall that enters the system for a two-year frequency, 24-hour storm event.

■ Below Grade System

- ♦ A washout system installed below grade should be a minimum of ten feet wide by ten feet long, but sized to contain all liquid and waste that is expected to be generated between scheduled cleanout periods. The size of the pit may be limited by the size of polyethylene available. The polyethylene lining should be of adequate size to extend over the entire excavation.
- ♦ Include a minimum 12-inch freeboard to reasonably ensure that the structure will not overtop during a rain event.
- ♦ Line the pit with ten millimeter polyethylene lining to control seepage.
- ♦ The bottom of excavated pit should be above the seasonal high water table.

■ Above Grade System

- ♦ A system designed and built above grade should be a minimum of ten feet wide by ten feet long, but sized to contain all liquid and waste that is expected to be generated between scheduled cleanout periods. The size of the containment system may be limited by the size of

polyethylene available. The polyethylene lining should be of adequate size to extend over the berm or containment system.

- The system design may utilize an earthen berm, straw bales, sandbags, or other acceptable barriers that will maintain its shape and integrity and support the polyethylene lining.
- Include a minimum four-inch freeboard as part of the design.

Washout Procedures

- Do not leave excess mud in the chutes or hopper after the pour. Every effort should be made to empty the chutes and hopper at the pour. The less material left in the chutes and hopper, the quicker and easier the cleanout. Small amounts of excess concrete (not washout water) may be disposed of in areas that will not result in flow to an area that is to be protected.
- At the washout location, scrape as much material from the chutes as possible before washing them. Use non-water cleaning methods to minimize the chance for waste to flow off site.
- Remove as much mud as possible when washing out.
- Stop washing out in an area if you observe water running off the designated area or if the containment system is leaking or overflowing and ineffective.
- Do not back flush equipment at the project site. Back flushing should be restricted to the plant as it generates large volumes of waste that more than likely will exceed the capacity of most washout systems. If an emergency arises, back flush should only be performed with the permission of an on-site manager for the project.
- Do not use additives with wash water. Do not use solvents or acids that may be used at the target plant.

Materials

- Minimum of ten millimeter polyethylene sheeting that is free of holes, tears, and other defects. The sheeting selected should be of an appropriate size to fit the washout system without seams or overlap of the lining **(designed and installed systems)**.
- Signage.
- Orange safety fencing or equivalent.
- Straw bales, sandbags (bags should be ultraviolet-stabilized geotextile fabric), soil material, or other appropriate materials that can be used to construct a containment system **(above grade systems)**.

- Metal pins or staples at a minimum of six inches in length, sandbags, or alternative fastener to secure polyethylene lining to the containment system.
- Non-collapsing and non-water holding cover for use during rain events (optional).

Installation

Prefabricated Washout Systems/Containers

- Install and locate according to the manufacturer's recommendations.

Designed and Installed Systems

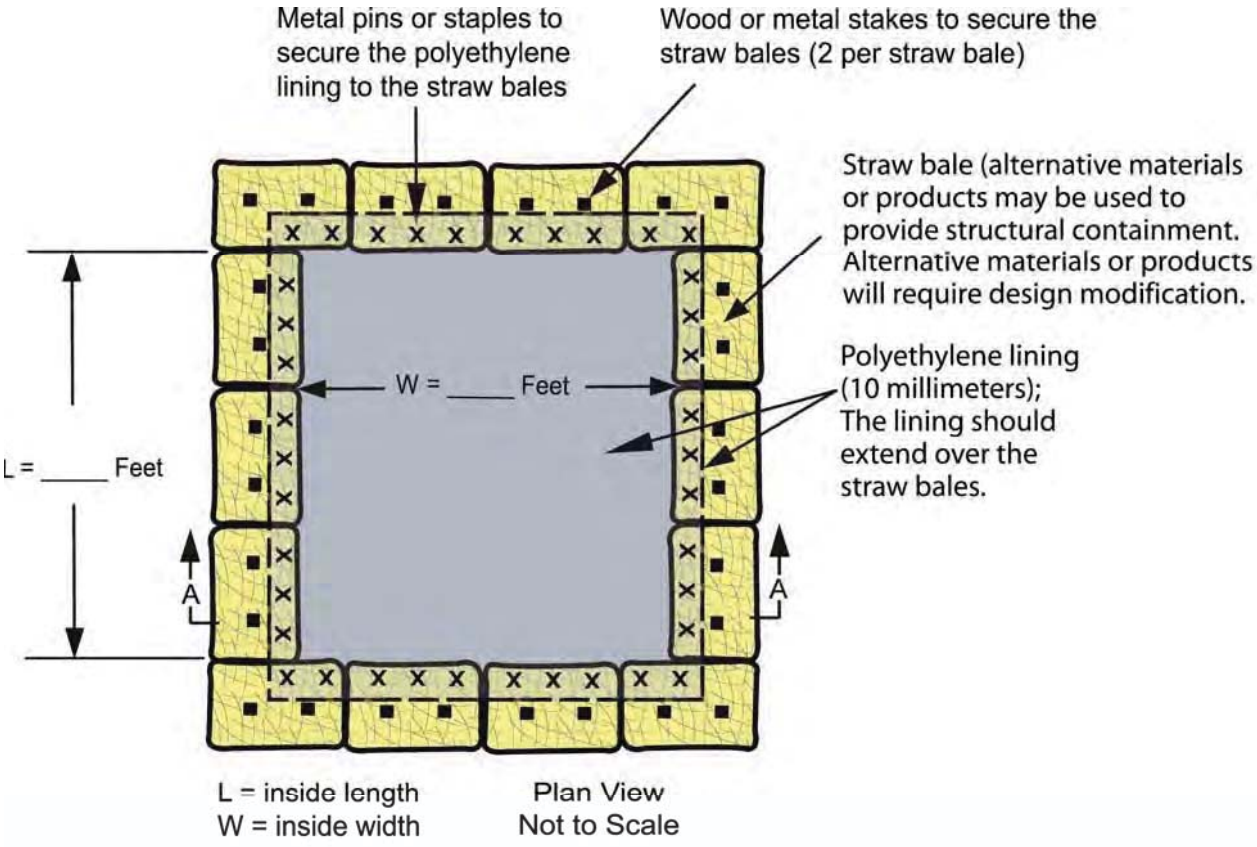
- Utilize and follow the design in the storm water pollution prevention plan to install the system.
- Dependent upon the type of system, either excavate the pit or install the containment system.
- A base shall be constructed and prepared that is free of rocks and other debris that may cause tears or punctures in the polyethylene lining.
- Install the polyethylene lining. For excavated systems, the lining should extend over the entire excavation. The lining for bermed systems should be installed over the pooling area with enough material to extend the lining over the berm or containment system. The lining should be secured with pins, staples, or other fasteners.
- Place flags, safety fencing, or equivalent to provide a barrier to construction equipment and other traffic.
- Place a non-collapsing, non-water holding cover over the washout facility prior to a predicted rainfall event to prevent accumulation of water and possible overflow of the system (optional).
- Install signage that identifies concrete washout areas.
- Post signs directing contractors and suppliers to designated locations.
- Where necessary, provide stable ingress and egress (see **Temporary Construction Ingress/Egress Pad** on page 17) or alternative approach pad for concrete washout systems.

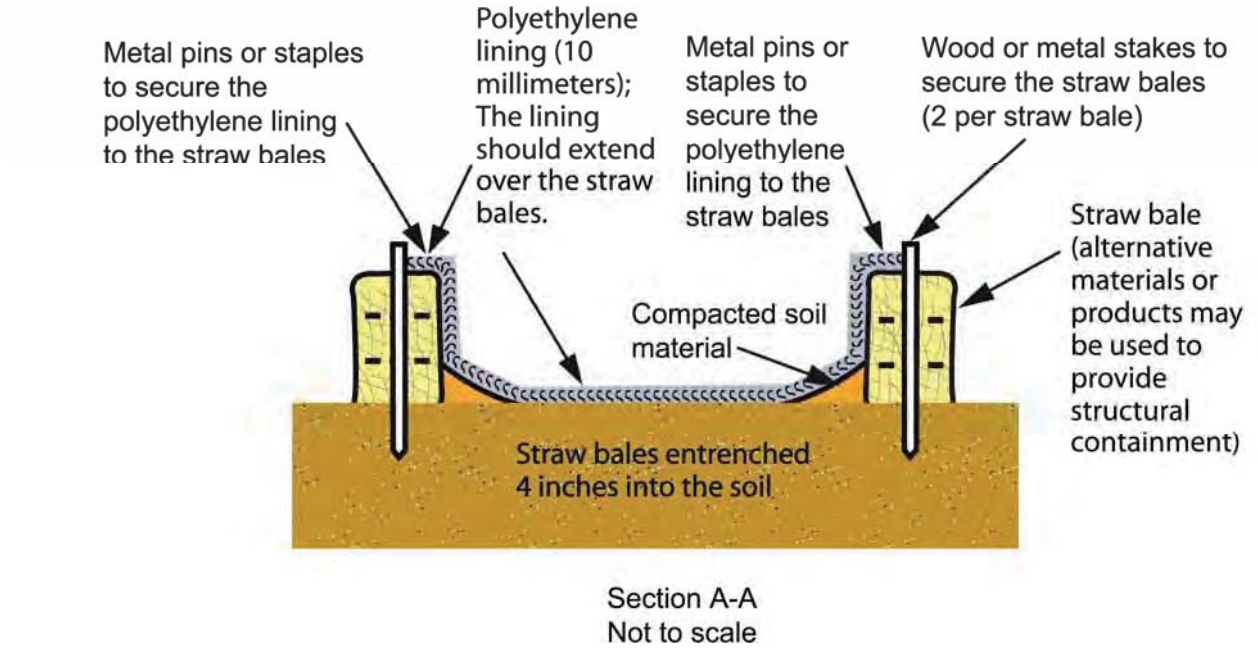
Maintenance

- Inspect daily and after each storm event.
- Inspect the integrity of the overall structure including, where applicable, the containment system.
- Inspect the system for leaks, spills, and tracking of soil by equipment.
- Inspect the polyethylene lining for failure, including tears and punctures.
- Once concrete wastes harden, remove and dispose of the material.
- Excess concrete should be removed when the washout system reaches 50 percent of the design capacity. Use of the system should be discontinued until appropriate measures can be initiated to clean the structure. Prefabricated systems should also utilize this criterion, unless the manufacturer has alternate specifications.
- Upon removal of the solids, inspect the structure. Repair the structure as needed or construct a new system.
- Dispose of all concrete in a legal manner. Reuse the material on site, recycle, or haul the material to an approved construction/demolition landfill site. Recycling of material is encouraged. The waste material can be used for multiple applications including but not limited to roadbeds and building. The availability for recycling should be checked locally.
- The plastic liner should be replaced after every cleaning; the removal of material will usually damage the lining.
- The concrete washout system should be repaired or enlarged as necessary to maintain capacity for concrete waste.
- Concrete washout systems are designed to promote evaporation. However, if the liquids do not evaporate and the system is near capacity it may be necessary to vacuum or remove the liquids and dispose of them in an acceptable method. Disposal may be allowed at the local sanitary sewer authority provided their National Pollutant Discharge Elimination System permits allow for acceptance of this material. Another option would be to utilize a secondary containment system or basin for further dewatering.
- Prefabricated units are often pumped and the company supplying the unit provides this service.
- Inspect construction activities on a regular basis to ensure suppliers, contractors, and others are utilizing designated washout areas. If concrete waste is being disposed of improperly, identify the violators and take appropriate action.

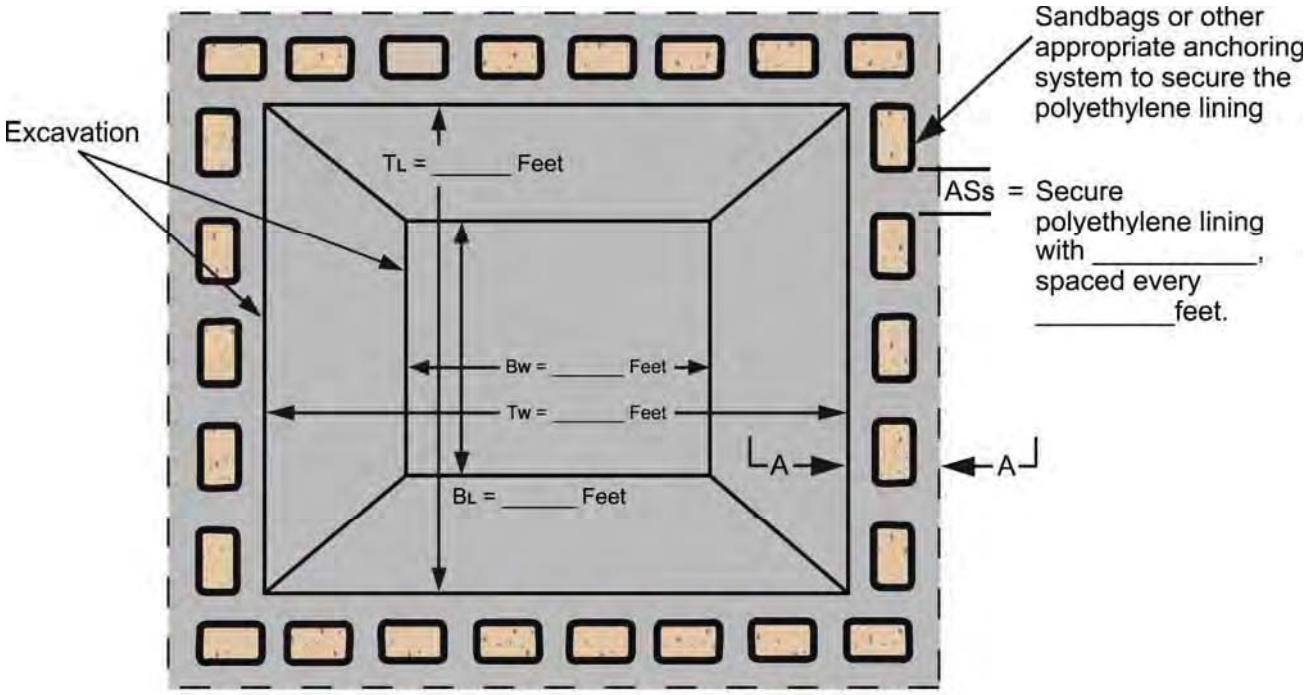
- When concrete washout systems are no longer required, the concrete washout systems shall be closed. Dispose of all hardened concrete and other materials used to construct the system.
- Holes, depressions and other land disturbances associated with the system should be backfilled, graded, and stabilized.

Concrete Washout (Above Grade System) Worksheet



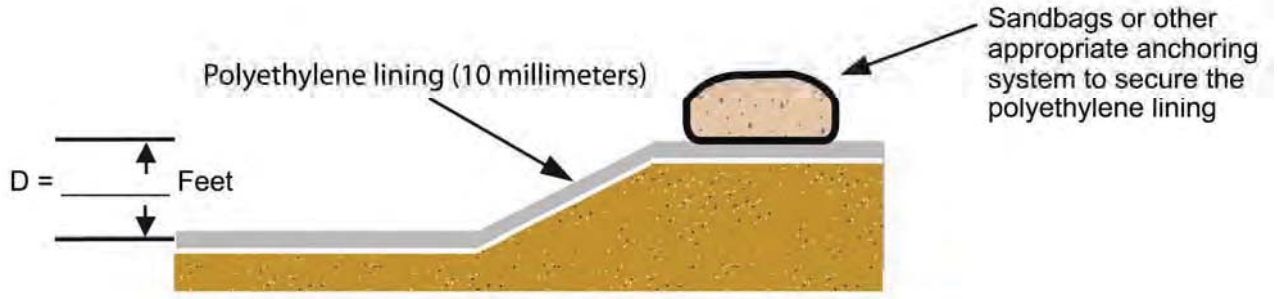


Concrete Washout (Below Grade System) Worksheet



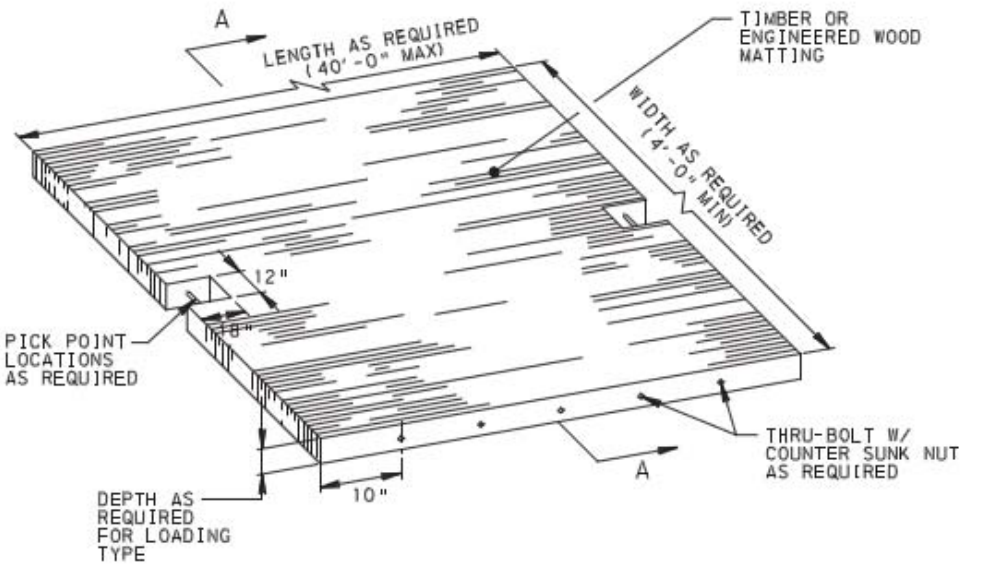
TL = Top Length of Excavation
BL = Bottom Length of Excavation
Tw = Top Width of Excavation
Bw = Bottom Width of Excavation
ASs = Anchoring System type and spacing

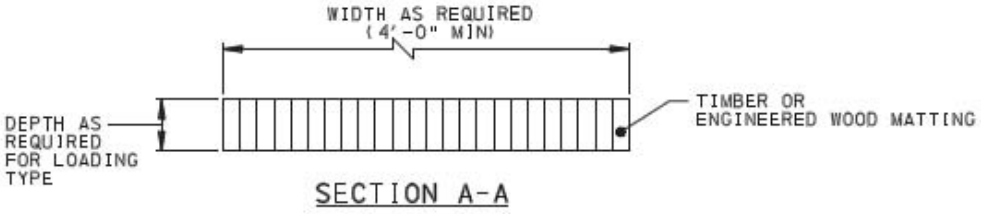
Plan View
Not to Scale



Section A-A
Not to Scale

Timber Matting





SECTION A-A

WETLAND MATTING

NTS

Description

This work is for furnishing, placing, maintaining and removing timber matting to protect the existing wetland soils, as indicated or directed.

Applications

Used for access where the ground surface is unstable due to shallow, standing water, saturated soils, or other substrates not suitable for heavy vehicles.

Material

- Matting – Timber, Engineered laminated wood or an approved material.
  - Supply matting that is capable of supporting heavy equipment, a maximum load of 120,000 lbs.
  - Matting must retain a minimum deflection distance of 4-0” inches under loading.

Construction

- General. Install the matting to the manufacturer’s specifications. Complete the installation prior to the start of construction. Do not allow any vehicles and/or equipment to exceed the limits of the matting.
- Maintenance. Maintain the matting for the duration of the project. Inspect the matting daily. Replace and/or install additional matting as required or directed.
- Removal. Remove matting when access to the existing wetland area is not required. Do not allow any vehicles and/or equipment to come into contact with the existing wetland soils.

Limitations

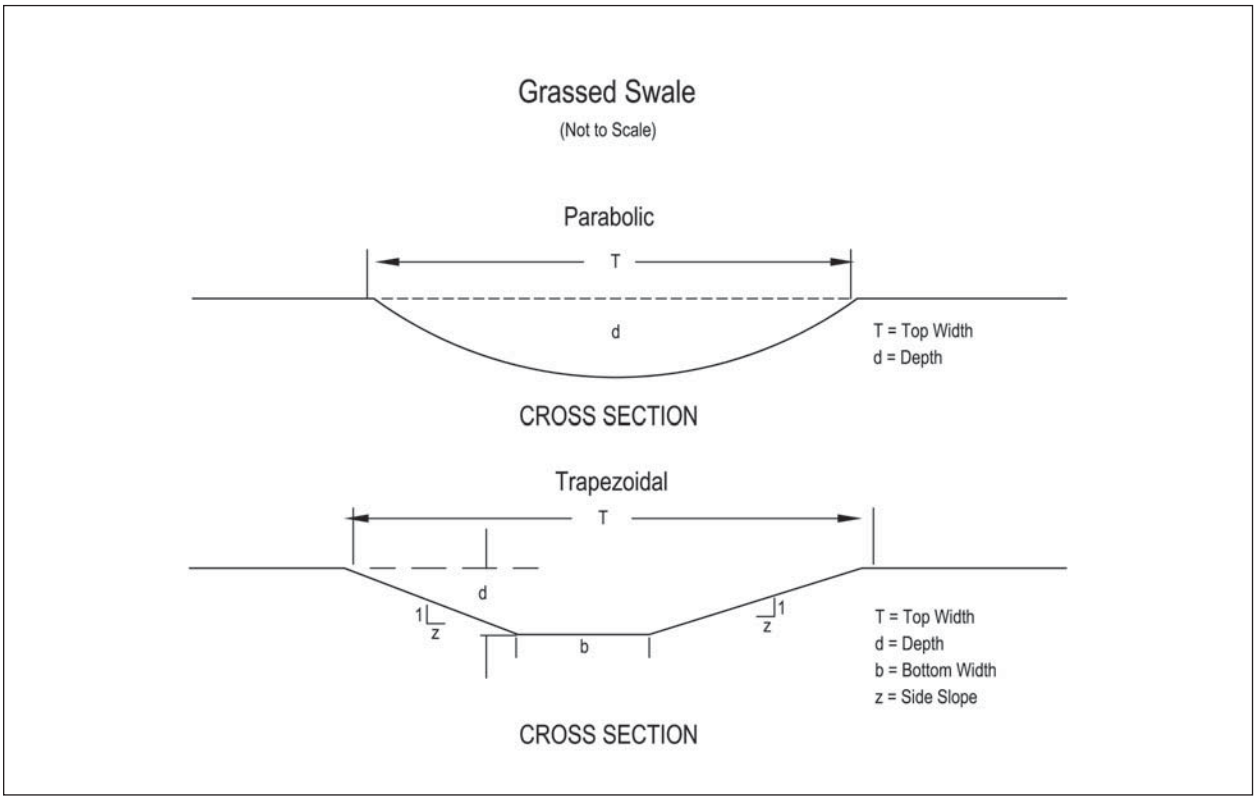
- Only for temporary use. Generally mats should be removed within 60 days.
- May float away in high water conditions.
- Need to be installed with heavy machinery
- Equipment operators should remain cautious so as not to drive or slip off the side of the mats

How to Use

- Should be removed by “backing” out of the site, removing mats one at a time and regrading soils to pre-existing contours while taking care not to compact soils
- Should be cleaned after use to remove any invasive plant species and seed stock. Cleaning methods may include but are not limited to shaking or dropping mats in a controlled manner with a piece of machinery to knock off attached soil and debris, spraying with water or air, and sweeping.

Specifications
for

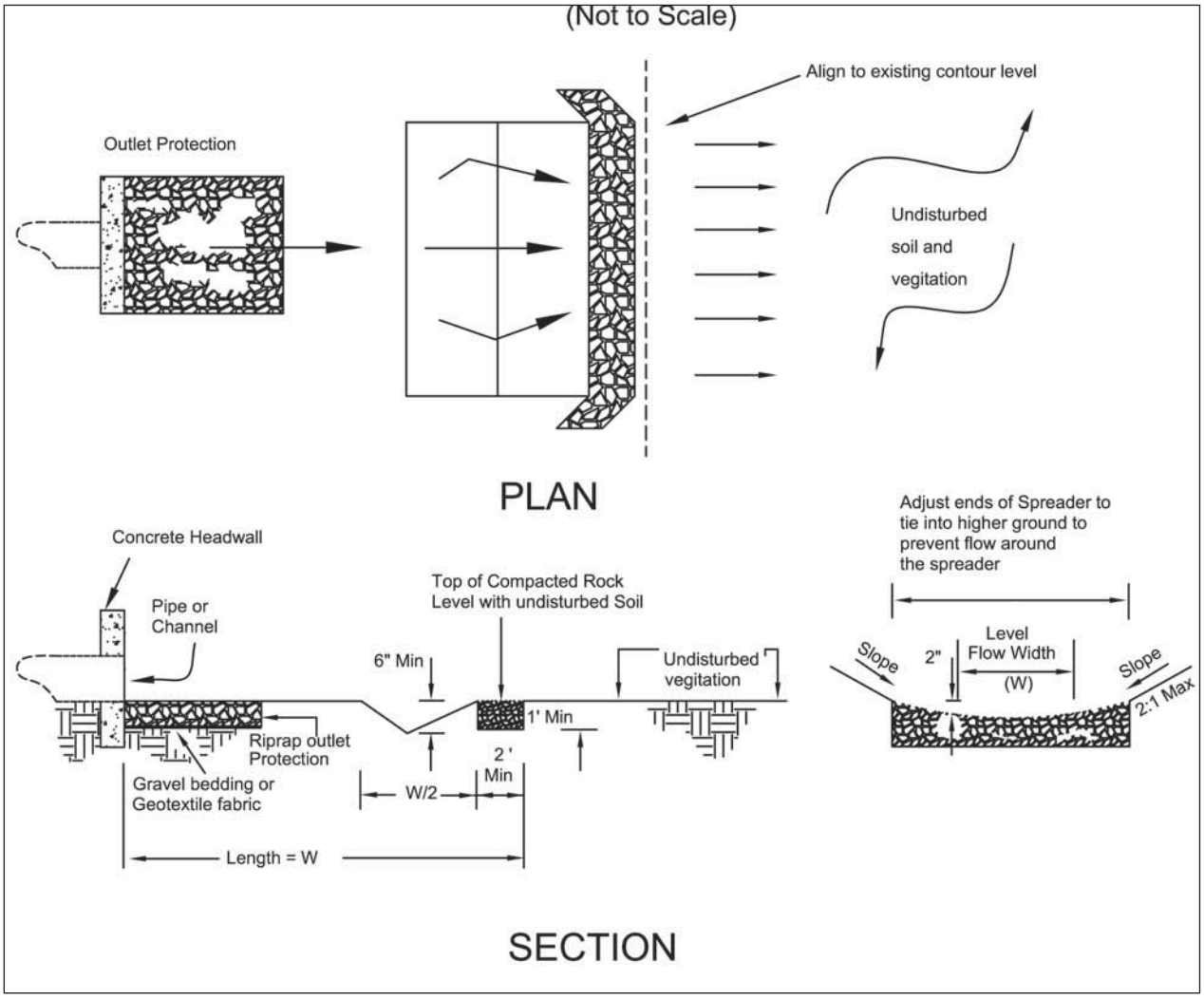
Grassed Swale



1. All trees, brush, stumps, and other unsuitable material shall be removed from the site.
2. The channel shall be excavated and shaped to the proper grade and cross section.
3. Fill material used in the construction of the channel shall be well compacted in uniform layers not exceeding 9 inches using the wheel treads or tracks of the construction equipment to prevent unequal settlement.
4. Excess earth shall be graded or disposed of so that it will not restrict flow to the channel or interfere with its functioning.
5. Stabilization shall be done according to the appropriate specifications for permanent seeding, vegetative practices, sodding and matting.
6. Construction shall be sequenced so that newly constructed channels are stabilized prior to becoming operational. To aid in the establishment of vegetation, surface water may be prevented from entering the newly constructed channel through the establishment period.
7. Gullies that may form in the channel or other erosion damage that occurs before the grass lining becomes established shall be repaired without delay.

Specifications
for

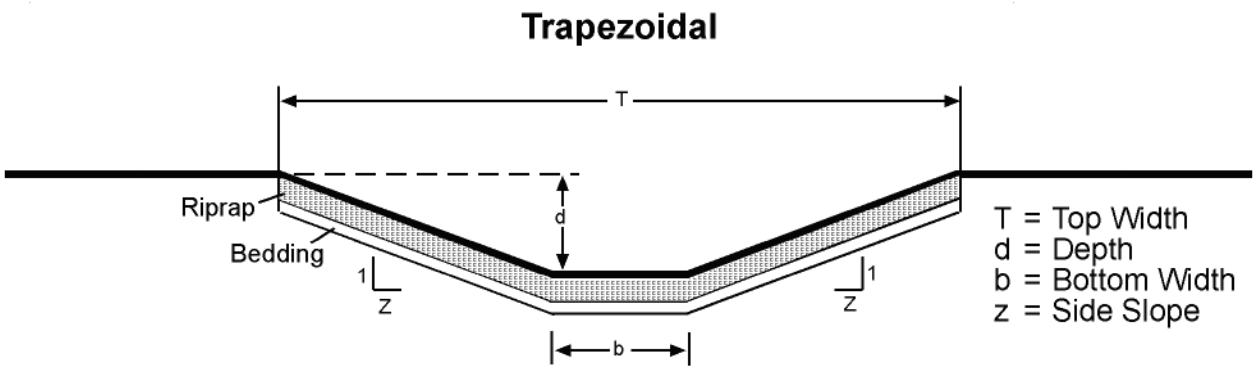
Rigid Lip Level Spreader



1. Construct level spreader on a level grade to ensure uniform spreading of storm runoff.
2. Level spreaders must be constructed on undisturbed soil, NOT on fill.
3. The level spreader must outlet to erosion-resistant areas with established existing vegetation.
4. Rock shall be ODOT Type D where 50% of the material by weight is larger than 6 inches, and 85% of the material by weight is larger than 3 inches but less than 12 inches.
5. Rock in level spreader shall be compacted with at least two passes of heavy machinery to prevent further settling. Spread gravel or soil over top of the placed riprap surface to fill the voids and interlock the riprap together.
6. Fertilizing, seeding, and mulching shall conform to the recommendations in the applicable vegetative specification.

Specifications
for

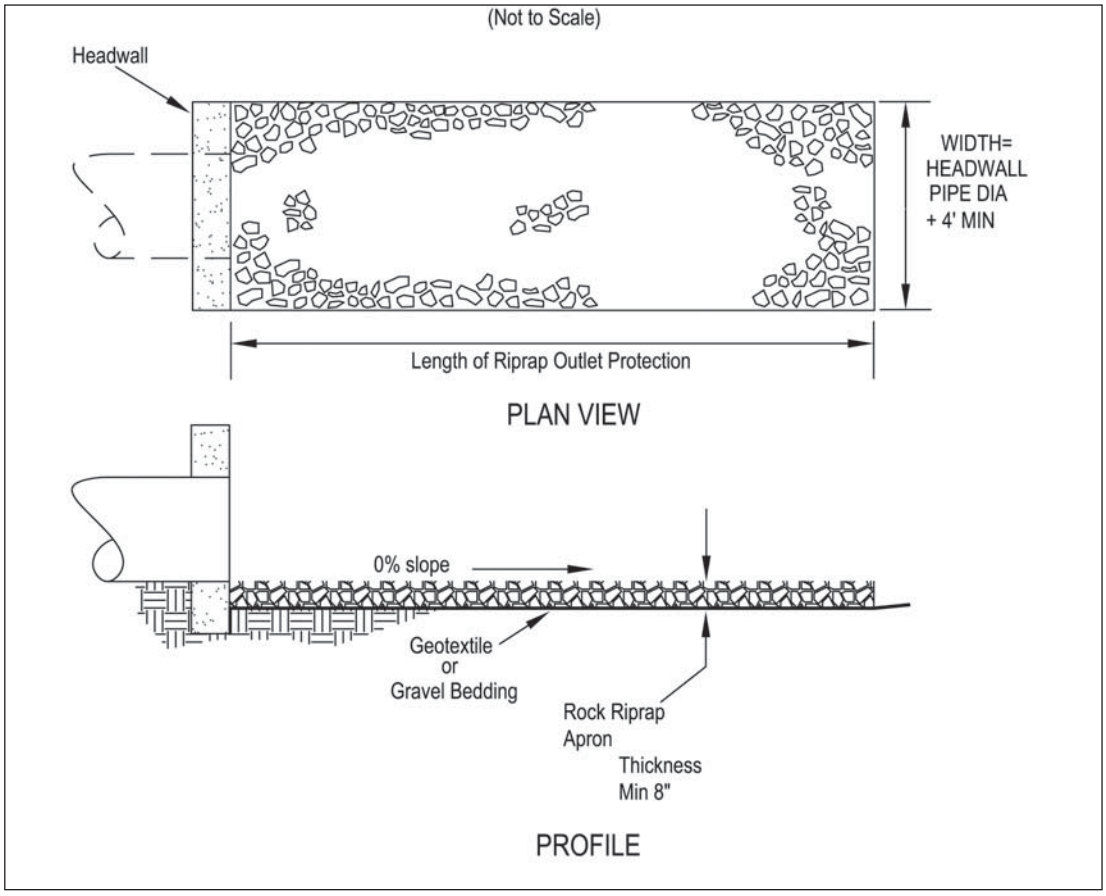
Rock Lined Channel



1. Subgrade for the filter and riprap shall be prepared to the required lines and grades as shown on the plan. The subgrade shall be cleared of all trees, stumps, roots, sod, loose rock, or other material.
2. Riprap shall conform to the grading limits as shown on the plan.
3. No abrupt deviations from the design grade or horizontal alignment shall be permitted.
4. Geotextile shall be securely anchored according to manufacturers recommendations.
5. Geotextile shall be laid with the long dimension parallel to the direction of flow and shall be laid loosely but without wrinkles and creases. Where joints are necessary, strips shall be placed to provide a 12-in. minimum overlap, with the upstream strip overlapping the downstream strip.
6. Gravel bedding shall be ODOT No. 67's or 57's unless shown differently on the drawings.
7. Riprap may be placed by equipment but shall be placed in a manner to prevent slippage or damage to the geotextile.
8. Riprap shall be placed by a method that does not cause segregation of sizes. Extensive pushing with a dozer causes segregation and shall be avoided by delivering riprap near its final location within the channel.
9. Construction shall be sequenced so that riprap channel protection is placed and functional without delays when the channel becomes operational.
10. All disturbed areas will be vegetated as soon as practical.

Specifications
for

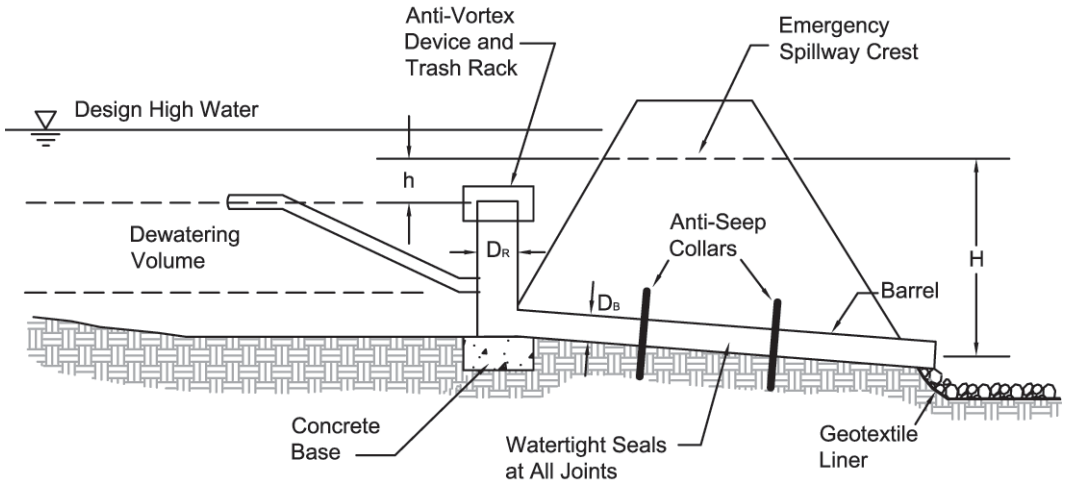
Rock Outlet Protection



1. Subgrade for the filter or bedding and riprap shall be prepared to the required lines and grades as shown on the plan. The subgrade shall be cleared of all trees, stumps, roots, sod, loose rock, or other material.
2. Riprap shall conform to the grading limits as shown on the plan.
3. Geotextile shall be securely anchored according to manufacturers' recommendations.
4. Geotextile shall be laid with the long dimension parallel to the direction of flow and shall be laid loosely but without wrinkles and creases. Where joints are necessary, strips shall be placed to provide a 12-in. minimum overlap, with the upstream strip overlapping the downstream strip.
5. Gravel bedding shall be ODOT No. 67's or 57's unless shown differently on the drawings.
6. Riprap may be placed by equipment but shall be placed in a manner to prevent slippage or damage to the geotextile.
7. Riprap shall be placed by a method that does not cause segregation of sizes. Extensive pushing with a dozer causes segregation and shall be avoided by delivering riprap near its final location within the channel.
8. Construction shall be sequenced so that outlet protection is placed and functional when the storm drain, culvert, or open channel above it becomes operational.
9. All disturbed areas will be vegetated as soon as practical.

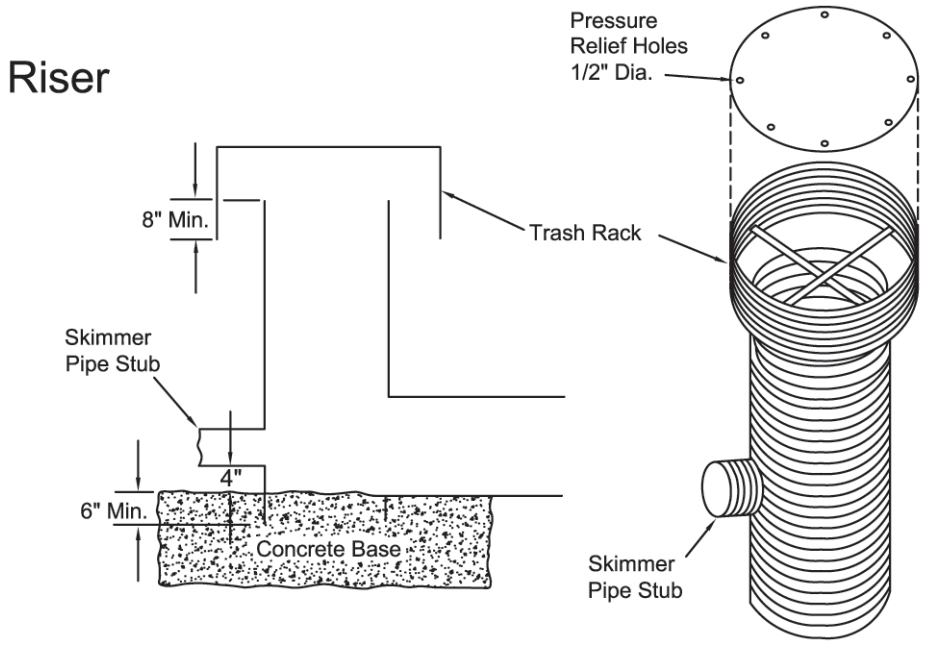
Specifications
for

Sediment Basins



H = Head on Pipe through Embankment
h = Head above Riser Crest
D_B = Diameter of Barrel Pipe
D_R = Diameter of Riser

PROFILE
(Not to Scale)



SECTION
(Not to Scale)

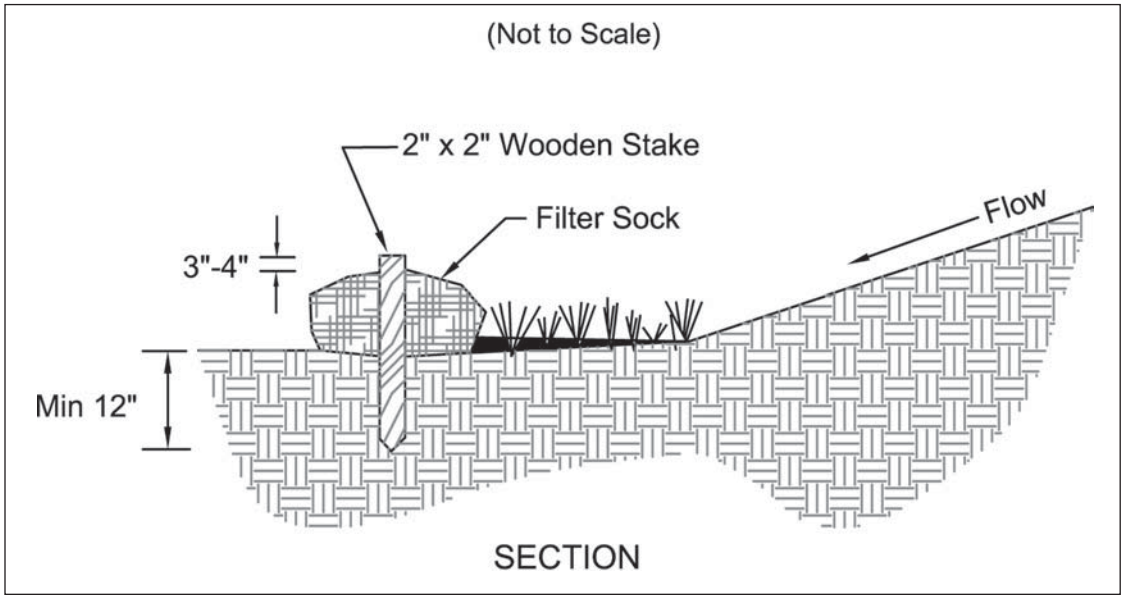
Specifications
for

Sediment Basins

1. Sediment basins shall be constructed and operational before upslope land disturbance begins.
2. Site Preparation -The area under the embankment shall be cleared, grubbed, and stripped of any vegetation and root mat. The pool area shall be cleared as needed to facilitate sediment cleanout. Gullies and sharp breaks shall be sloped to no steeper than 1:1. The surface of the foundation area will be thoroughly scarified before placement of the embankment material.
3. Cut-Off Trench -The cutoff trench shall be excavated along the centerline of the embankment. The minimum depth shall be 3 ft. unless specified deeper on the plans or as a result of site conditions. The minimum bottom width shall be 4 ft., but wide enough to permit operation of compaction equipment. The trench shall be kept free of standing water during backfill operations.
4. Embankment -The fill material shall be free of all sod, roots, frozen soil, stones over 6 in. in diameter, and other objectionable material. The placing and spreading of the fill material shall be started at the lowest point of the foundation and the fill shall be brought up in approximately 6 in. horizontal layers or of such thickness that the required compaction can be obtained with the equipment used. Construction equipment shall be operated over each layer in a way that will result in the required compaction. Special equipment shall be used when the required compaction cannot be obtained without it. The moisture content of fill material shall be such that the required degree of compaction can be obtained with the equipment used.
5. Pipe Spillway -The pipe conduit barrel shall be placed on a firm foundation to the lines and grades shown on the plans. Connections between the riser and barrel, the antiseep collars and barrel and all pipe joints shall be watertight. Selected backfill material shall be placed around the conduit in layers and each layer shall be compacted to at least the same density as the adjacent embankment. All compaction within 2 ft. of the pipe spillway will be accomplished with hand-operated tamping equipment.
6. Riser Pipe Base -The riser pipe shall be set a minimum of 6 in. in the concrete base.
7. Trash Racks -The top of the riser shall be fitted with trash racks firmly fastened to the riser pipe.
8. Emergency Spillway - The emergency spillway shall be cut in undisturbed ground. Accurate construction of the spillway elevation and width is critical and shall be within a tolerance of 0.2 ft.
9. Seed and Mulch -The sediment basin shall be stabilized immediately following its construction. In no case shall the embankment or emergency spillway remain bare for more than 7 days.
10. Sediment Cleanout -Sediment shall be removed and the sediment basin restored to its original dimensions when the sediment has filled one-half the pond's original depth or as indicated on the plans. Sediment removed from the basin shall be placed so that it will not erode.
11. Final removal - Sediment basins shall be removed after the upstream drainage area is stabilized or as indicated in the plans. Dewatering and removal shall NOT cause sediment to be discharged. The sediment basin site and sediment removed from the basin shall be stabilized.

Specifications
for

Filter Sock



1. Materials – Compost used for filter socks shall be weed, pathogen and insect free and free of any refuse, contaminants or other materials toxic to plant growth. They shall be derived from a well-decomposed source of organic matter and consist of a particles ranging from 3/8" to 2".
2. Filter Socks shall be 3 or 5 mil continuous, tubular, HDPE 3/8" knitted mesh netting material, filled with compost passing the above specifications for compost products.

INSTALLATION:

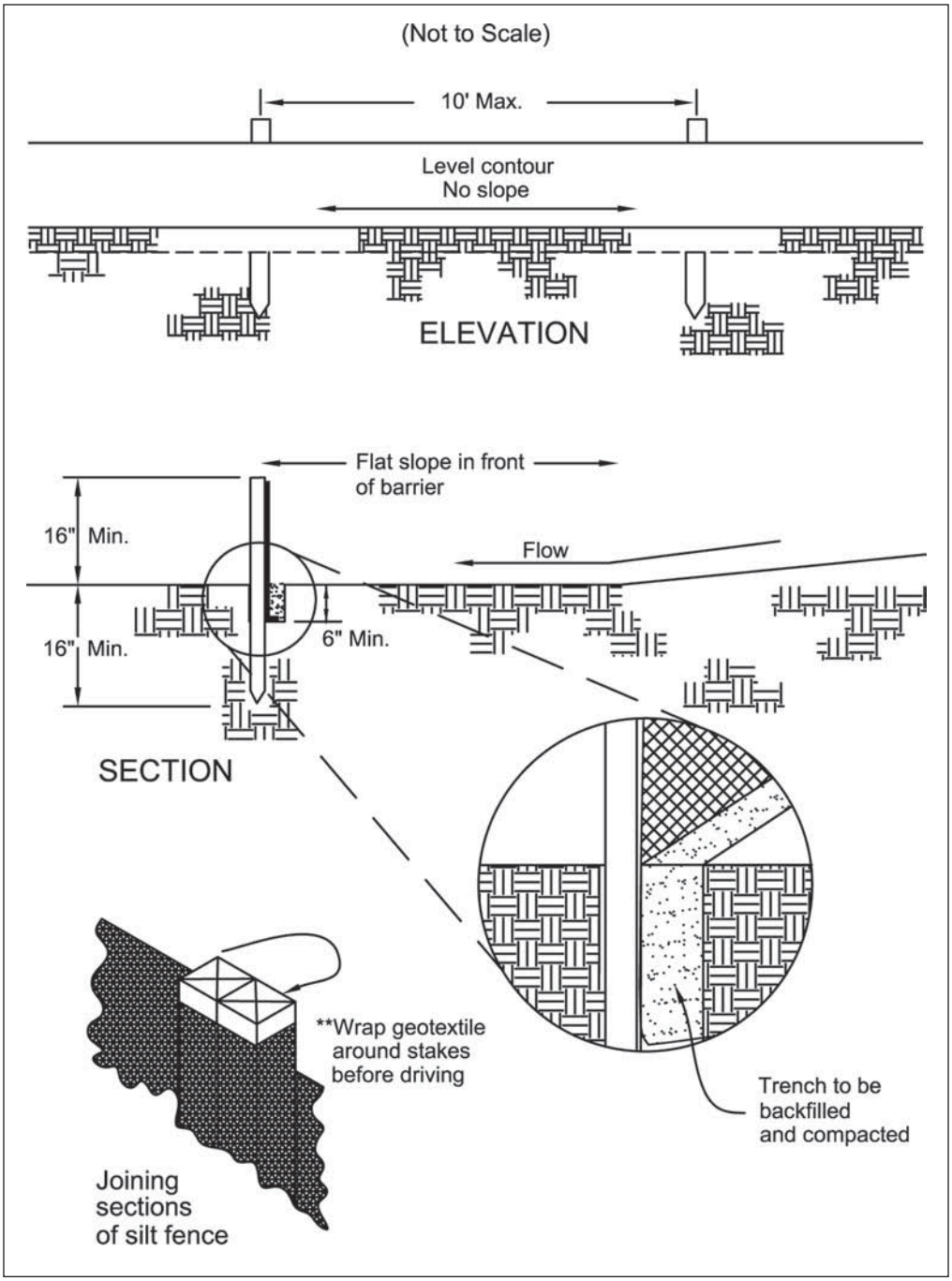
3. Filter socks will be placed on a level line across slopes, generally parallel to the base of the slope or other affected area. On slopes approaching 2:1, additional socks shall be provided at the top and as needed mid-slope.
4. Filter socks intended to be left as a permanent filter or part of the natural landscape, shall be seeded at the time of installation for establishment of permanent vegetation.
5. Filter Socks are not to be used in concentrated flow situations or in runoff channels.

MAINTENANCE:

6. Routinely inspect filter socks after each significant rain, maintaining filter socks in a functional condition at all times.
7. Remove sediments collected at the base of the filter socks when they reach 1/3 of the exposed height of the practice.
8. Where the filter sock deteriorates or fails, it will be repaired or replaced with a more effective alternative.
9. Removal – Filter socks will be dispersed on site when no longer required in such as way as to facilitate and not obstruct seedings.

Specifications
for

Silt Fence



Specifications
for

Silt Fence

1. Silt fence shall be constructed before upslope land disturbance begins.
2. All silt fence shall be placed as close to the contour as possible so that water will not concentrate at low points in the fence and so that small swales or depressions that may carry small concentrated flows to the silt fence are dissipated along its length.
3. Ends of the silt fences shall be brought upslope slightly so that water ponded by the silt fence will be prevented from flowing around the ends.
4. Silt fence shall be placed on the flattest area available.
5. Where possible, vegetation shall be preserved for 5 feet (or as much as possible) upslope from the silt fence. If vegetation is removed, it shall be reestablished within 7 days from the installation of the silt fence.
6. The height of the silt fence shall be a minimum of 16 inches above the original ground surface.
7. The silt fence shall be placed in an excavated or sliced trench cut a minimum of 6 inches deep. The trench shall be made with a trencher, cable laying machine, slicing machine, or other suitable device that will ensure an adequately uniform trench depth.
8. The silt fence shall be placed with the stakes on the downslope side of the geotextile. A minimum of 8 inches of geotextile must be below the ground surface. Excess material shall lay on the bottom of the 6-inch deep trench. The trench shall be backfilled and compacted on both sides of the fabric.
9. Seams between sections of silt fence shall be spliced together only at a support post with a minimum 6-in. overlap prior to driving into the ground, (see details).
10. Maintenance—Silt fence shall allow runoff to pass only as diffuse flow through the geotextile. If runoff overtops the silt fence, flows under the fabric or around the fence ends, or in any other way allows a concentrated flow discharge, one of the following shall be performed, as appropriate: 1) the layout of the silt fence shall be changed, 2) accumulated sediment shall be removed, or 3) other practices shall be installed.

    Sediment deposits shall be routinely removed when the deposit reaches approximately one-half of the height of the silt fence.

    Silt fences shall be inspected after each rainfall and at least daily during a prolonged rainfall. The location of existing silt fence shall be reviewed daily to ensure its proper location and effectiveness. If damaged, the silt fence shall be repaired immediately.

Criteria for silt fence materials

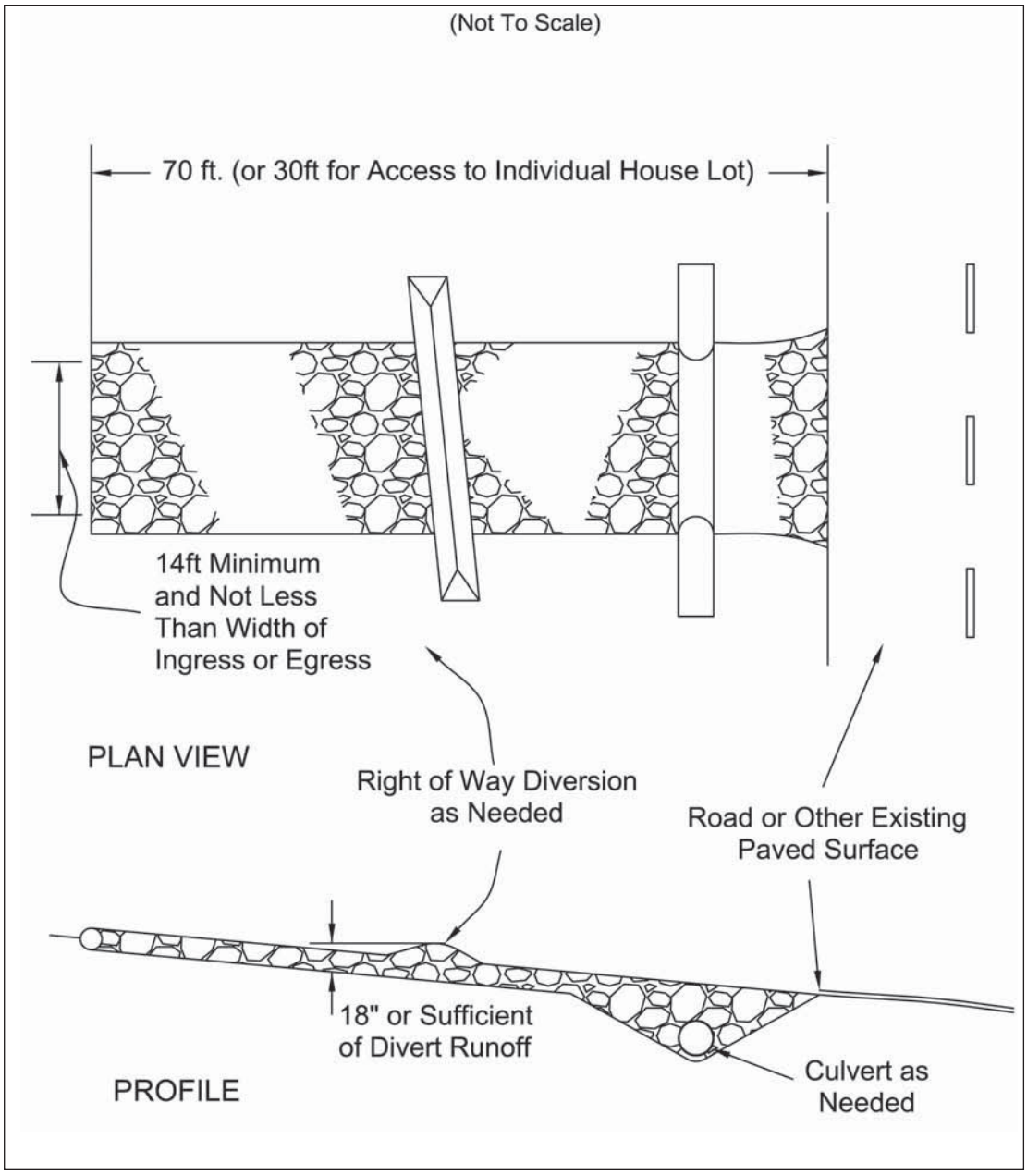
1. Fence post – The length shall be a minimum of 32 inches. Wood posts will be 2-by-2-in. nominal dimensioned hardwood of sound quality. They shall be free of knots, splits and other visible imperfections, that will weaken the posts. The maximum spacing between posts shall be 10 ft. Posts shall be driven a minimum 16 inches into the ground, where possible. If not possible, the posts shall be adequately secured to prevent overturning of the fence due to sediment/water loading.
2. Silt fence fabric – See chart below.

Table 6.3.2 Minimum criteria for Silt Fence Fabric (ODOT, 2002)

FABRIC PROPERTIES	VALUES	TEST METHOD
Minimum Tensile Strength	120 lbs. (535 N)	ASTM D 4632
Maximum Elongation at 60 lbs	50%	ASTM D 4632
Minimum Puncture Strength	50 lbs (220 N)	ASTM D 4833
Minimum Tear Strength	40 lbs (180 N)	ASTM D 4533
Apparent Opening Size	≤ 0.84 mm	ASTM D 4751
Minimum Permittivity	1X10-2 sec.-1	ASTM D 4491
UV Exposure Strength Retention	70%	ASTM G 4355

Specifications
for

Construction Entrance



Specifications
for

Construction Entrance

1. Stone Size—ODOT # 2 (1.5-2.5 inch) stone shall be used, or recycled concrete equivalent.
2. Length—The Construction entrance shall be as long as required to stabilize high traffic areas but not less than 70 ft. (exception: apply 30 ft. minimum to single residence lots).
3. Thickness -The stone layer shall be at least 6 inches thick for light duty entrances or at least 10 inches for heavy duty use.
4. Width -The entrance shall be at least 14 feet wide, but not less than the full width at points where ingress or egress occurs.
5. Geotextile -A geotextile shall be laid over the entire area prior to placing stone. It shall be composed of strong rot-proof polymeric fibers and meet the following specifications:

Figure 7.4.1

Geotextile Specification for Construction Entrance	
Minimum Tensile Strength	200 lbs.
Minimum Puncture Strength	80 psi.
Minimum Tear Strength	50 lbs.
Minimum Burst Strength	320 psi.
Minimum Elongation	20%
Equivalent Opening Size	EOS < 0.6 mm.
Permittivity	1×10-3 cm/sec.

6. Timing—The construction entrance shall be installed as soon as is practicable before major grading activities.
7. Culvert -A pipe or culvert shall be constructed under the entrance if needed to prevent surface water from flowing across the entrance or to prevent runoff from being directed out onto paved surfaces.
8. Water Bar -A water bar shall be constructed as part of the construction entrance if needed to prevent surface runoff from flowing the length of the construction entrance and out onto paved surfaces.
9. Maintenance -Top dressing of additional stone shall be applied as conditions demand. Mud spilled, dropped, washed or tracked onto public roads, or any surface where runoff is not checked by sediment controls, shall be removed immediately. Removal shall be accomplished by scraping or sweeping.
10. Construction entrances shall not be relied upon to remove mud from vehicles and prevent off-site tracking. Vehicles that enter and leave the construction-site shall be restricted from muddy areas.
11. Removal—the entrance shall remain in place until the disturbed area is stabilized or replaced with a permanent roadway or entrance.

Specifications
for

Dust Control

1. Vegetative Cover and/mulch – Apply temporary or permanent seeding and mulch to areas that will remain idle for over 21 days. Saving existing trees and large shrubs will also reduce soil and air movement across disturbed areas. See Temporary Seeding; Permanent Seeding; Mulching Practices; and Tree and Natural Area Protection practices.
2. Watering – Spray site with water until the surface is wet before and during grading and repeat as needed, especially on haul roads and other heavy traffic routes. Watering shall be done at a rate that prevents dust but does not cause soil erosion. Wetting agents shall be utilized according to manufacturers instructions.
3. Spray-On Adhesives – Apply adhesive according to the following table or manufacturers' instructions.

Table 7.5.1 Adhesives for Dust Control

Adhesive	Water Dilution (Adhesive: Water)	Nozzle Type	Application Rate Gal./Ac.
Latex Emulsion	12.5:1	Fine	235
Resin in Water Acrylic Emulsion (No-traffic)	4:1	Fine	300
Acrylic Emulsion (No-traffic)	7:1	Coarse	450
Acrylic Emulsion (Traffic)	3.5:1	Coarse	350

4. Stone – Graded roadways and other suitable areas will be stabilized using crushed stone or coarse gravel as soon as practicable after reaching an interim or final grade. Crushed stone or coarse gravel can be used as a permanent cover to provide control of soil emissions.
5. Barriers – Existing windbreak vegetation shall be marked and preserved. Snow fencing or other suitable barrier may be placed perpendicular to prevailing air currents at intervals of about 15 times the barrier height to control air currents and blowing soil.
6. Calcium Chloride - This chemical may be applied by mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage. Application rates should be strictly in accordance with suppliers' specified rates.
7. Operation and Maintenance - When Temporary Dust Control measures are used; repetitive treatment should be applied as needed to accomplish
control.

   Street Cleaning - Paved areas that have accumulated sediment from construction should be cleaned daily, or as needed, utilizing a street sweeper or bucket -type endloader or scraper.

Specifications
for

Mulching

1. Mulch and other appropriate vegetative practices shall be applied to disturbed areas within 7 days of grading if the area is to remain dormant (undisturbed) for more than 21 days or on areas and portions of the site which can be brought to final grade.
2. Mulch shall consist of one of the following:

- Straw - Straw shall be unrotted small grain straw applied at the rate of 2 tons/ac. or 90 lb./1,000 sq. ft. (two to three bales). The straw mulch shall be spread uniformly by hand or mechanically so the soil surface is covered. For uniform distribution of hand-spread mulch, divide area into approximately 1,000 sq.ft. sections and place two 45-lb. bales of straw in each section.
- Hydroseeders - Wood cellulose fiber should be used at 2,000 lb./ac. or 46 lb./1,000 sq. ft.
- Other - Acceptable mulches include mulch mattings and rolled erosion control products applied according to manufacturer's recommendations or wood mulch/chips applied at 10-20 tons/ac.

3. Mulch Anchoring - Mulch shall be anchored immediately to minimize loss by wind or runoff. The following are acceptable methods for anchoring mulch.

- Mechanical - Use a disk, crimper, or similar type tool set straight to punch or anchor the mulch material into the soil. Straw mechanically anchored shall not be finely chopped but be left generally longer than 6 inches.
- Mulch Nettings - Use according to the manufacturer's recommendations, following all placement and anchoring requirements. Use in areas of water concentration and steep slopes to hold mulch in place.
- Synthetic Binders - For straw mulch, synthetic binders such as Acrylic DLR (Agri-Tac), DCA-70, Petroset, Terra Tack or equal may be used at rates recommended by the manufacturer. All applications of Sythetic Binders must be conducted in such a manner where there is no contact with waters of the state.
- Wood Cellulose Fiber - Wood cellulose fiber may be used for anchoring straw. The fiber binder shall be applied at a net dry weight of 750 lb./acre. The wood cellulose fiber shall be mixed with water and the mixture shall contain a maximum of 50 lb./100 gal. of wood cellulose fiber.

Specifications
for

Permanent Seeding

Site Preparation

1. Subsoiler, plow, or other implement shall be used to reduce soil compaction and allow maximum infiltration. (Maximizing infiltration will help control both runoff rate and water quality.) Subsoiling should be done when the soil moisture is low enough to allow the soil to crack or fracture. Subsoiling shall not be done on slip-prone areas where soil preparation should be limited to what is necessary for establishing vegetation.
2. The site shall be graded as needed to permit the use of conventional equipment for seedbed preparation and seeding.
3. Topsoil shall be applied where needed to establish vegetation.

Seedbed Preparation

1. Lime—Agricultural ground limestone shall be applied to acid soil as recommended by a soil test. In lieu of a soil test, lime shall be applied at the rate of 100 pounds per 1,000-sq. ft. or 2 tons per acre.
2. Fertilizer—Fertilizer shall be applied as recommended by a soil test. In place of a soil test, fertilizer shall be applied at a rate of 25 pounds per 1,000-sq. ft. or 1000 pounds per acre of a 10-10-10 or 12-12-12 analyses.
3. The lime and fertilizer shall be worked into the soil with a disk harrow, spring-tooth harrow, or other suitable field implement to a depth of 3 inches. On sloping land, the soil shall be worked on the contour.

Seeding Dates and Soil Conditions

Seeding should be done March 1 to May 31 or August 1 to September 30. If seeding occurs outside of the above-specified dates, additional mulch and irrigation may be required to ensure a minimum of 80% germination. Tillage for seedbed preparation should be done when the soil is dry enough to crumble and not form ribbons when compressed by hand. For winter seeding, see the following section on dormant seeding.

Dormant Seedings

1. Seedings should not be made from October 1 through November 20. During this period, the seeds are likely to germinate but probably will not be able to survive the winter.
2. The following methods may be used for “Dormant Seeding”:

- From October 1 through November 20, prepare the seedbed, add the required amounts of lime and fertilizer, then mulch and anchor. After November 20, and before March 15, broadcast the selected seed mixture. Increase the seeding rates by 50% for this type of seeding.
- From November 20 through March 15, when soil conditions permit, prepare the seedbed, lime and fertilize, apply the selected seed mixture, mulch and anchor. Increase the seeding rates by 50% for this type of seeding.
- Apply seed uniformly with a cyclone seeder, drill, cultipacker seeder, or hydro-seeder (slurry may include seed and fertilizer) on a firm, moist seedbed.
- Where feasible, except when a cultipacker type seeder is used, the seedbed should be firmed following seeding operations with a cultipacker, roller, or light drag. On sloping land, seeding operations should be on the contour where feasible.

Mulching

1. Mulch material shall be applied immediately after seeding. Dormant seeding shall be mulched. 100% of the ground surface shall be covered with an approved material.
2. Materials

- Straw—If straw is used it shall be unrotted small-grain straw applied at the rate of 2 tons per acre or 90 pounds (two to three bales) per 1,000-sq. ft. The mulch shall be spread uniformly by hand or mechanically applied so the soil surface is covered. For uniform distribution of hand-spread mulch, divide area into approximately 1,000-sq.-ft. sections and spread two 45-lb. bales of straw in each section.
- Hydroseeders—If wood cellulose fiber is used, it shall be applied at 2,000 lb./ac. or 46 lb./1,000 sq. ft.
- Other—Other acceptable mulches include rolled erosion control mattings or blankets applied according to manufacturer’s recommendations or wood chips applied at 6 tons per acre.

3. Straw and Mulch Anchoring Methods

Straw mulch shall be anchored immediately to minimize loss by wind or water.

- Mechanical—A disk, crimper, or similar type tool shall be set straight to punch or anchor the mulch material into the soil. Straw mechanically anchored shall not be finely chopped but, generally, be left longer than 6 inches.
- Mulch Netting—Netting shall be used according to the manufacturer's recommendations. Netting may be necessary to hold mulch in place in areas of concentrated runoff and on critical slopes.
- Asphalt Emulsion—Asphalt shall be applied as recommended by the manufacture or at the rate of 160 gallons per acre.
- Synthetic Binders—Synthetic binders such as Acrylic DLR (Agri-Tac), DCA-70, Petroset, Terra Tack or equivalent may be used at rates specified by the manufacturer.
- Wood Cellulose Fiber—Wood cellulose fiber shall be applied at a net dry weight of 750 pounds per acre. The wood cellulose fiber shall be mixed with water with the mixture containing a maximum of 50 pounds cellulose per 100 gallons of water.

Irrigation

Permanent seeding shall include irrigation to establish vegetation during dry weather or on adverse site conditions, which require adequate moisture for seed germination and plant growth.

Irrigation rates shall be monitored to prevent erosion and damage to seeded areas from excessive runoff.

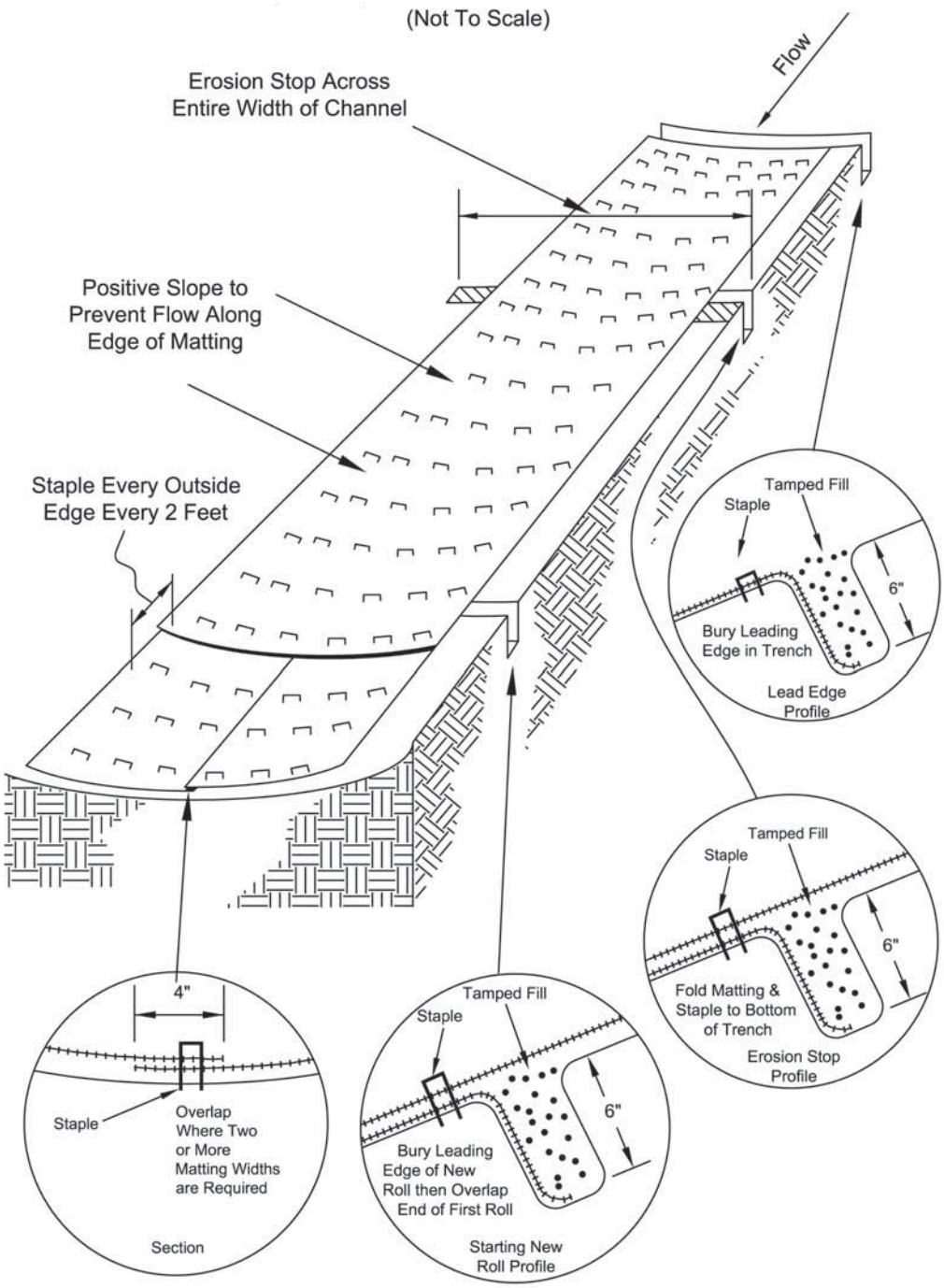
Table 7.10.2 Permanent Seeding

Seed Mix	Seeding Rate		Notes:
	Lbs./acre	Lbs./1,000 Sq. Feet	
General Use			
Creeping Red Fescue Domestic Ryegrass Kentucky Bluegrass	20-40 10-20 20-40	1⁄2-1 1⁄4-1⁄2 1⁄2-1	For close mowing & for waterways with <2.0 ft/sec velocity
Tall Fescue	40-50	1-1 1⁄4	
Turf-type (dwarf) Fescue	90	2 1⁄4	
Steep Banks or Cut Slopes			
Tall Fescue	40-50	1-1 1⁄4	
Crown Vetch Tall Fescue	10-20 20-30	1⁄4-1⁄2 1⁄2-3⁄4	Do not seed later than August
Flat Pea Tall Fescue	20-25 20-30	1⁄2-3⁄4 1⁄2-3⁄4	Do not seed later than August
Road Ditches and Swales			
Tall Fescue	40-50	1-11⁄4	
Turf-type (Dwarf) Fescue Kentucky Bluegrass	90 5	2 1⁄4 0.1	
Lawns			
Kentucky Bluegrass Perennial Ryegrass	100-120	2 2	
Kentucky Bluegrass Creeping Red Fescue	100-120	2 1-1/2	For shaded areas

Note: Other approved seed species may be substituted.

Specifications
for

Temporary Rolled Erosion Control Product



Specifications
for

Temporary Rolled Erosion Control Product

1. Channel/Slope Soil Preparation Grade and compact area of installation, preparing seedbed by loosening 2”-3” of topsoil above final grade. Incorporate amendments such as lime and fertilizer into soil. Remove all rocks, clods, vegetation or other debris so that installed RECP will have direct contact with the soil surface.
2. Channel/Slope Seeding Apply seed to soil surface prior to installation. All check slots, anchor trenches, and other disturbed areas must be reseeded. Refer to the Permanent Seeding specification for seeding recommendations.

Slope Installation

3. Excavate top and bottom trenches (12”x6”). Intermittent erosion check slots (6”x6”) may be required based on slope length. Excavate top anchor trench 2’ x 3’ over crest of the slope.
4. If intermittent erosion check slots are required, install RECP in 6”x6” slot at a maximum of 30’ centers or the mid point of the slope. RECP should be stapled into trench on 12” centers.
5. Install RECP in top anchor trench, anchor on 12” spacings, backfill and compact soil.
6. Unroll RECP down slope with adjacent rolls overlapped a minimum of 3”. Anchor the seam every 18”. Lay the RECP loose to maintain direct soil contact, do not pull taught.
7. Overlap roll ends a minimum of 12” with upslope RECP on top for a shingle effect. Begin all new rolls in an erosion check slot if required, double anchor across roll every 12”.
8. Install RECP in bottom anchor trench (12”x6”), anchor every 12”. Place all other staples throughout slope at 1 to 2.5 per square yard dependant on slope. Refer to manufacturer’s anchor guide.

Channel Installation

9. Excavate initial anchor trench (12”x6”) across the lower end of the project area.
10. Excavate intermittent check slots (6”x6”) across the channel at 30’ intervals along the channel.
11. Excavate longitudinal channel anchor slots (4”x4”) along both sides of the channel to bury the edges. Whenever possible extend the RECP 2’-3’ above the crest of channel side slopes.
12. Install RECP in initial anchor trench (downstream) anchor every 12”, backfill and compact soil.
13. Roll out RECP beginning in the center of the channel toward the intermittent check slot. Do not pull taught. Unroll adjacent rolls upstream with a 3” minimum overlap (anchor every 18”) and up each channel side slope.
14. At top of channel side slopes install RECP in the longitudinal anchor slots, anchor every 18”.
15. Install RECP in intermittent check slots. Lay into trench and secure with anchors every 12”, backfill with soil and compact.
16. Overlap roll ends a minimum of 12” with upstream RECP on top for a shingling effect. Begin all new rolls in an intermittent check slot, double anchored every 12”.
17. Install upstream end in a terminal anchor trench (12”x6”); anchor every 12”, backfill and compact.
18. Complete anchoring throughout channel at 2.5 per square yard using suitable ground anchoring devices (U shaped wire staples, metal geotextile pins, plastic stakes, and triangular wooden stakes). Anchors should be of sufficient length to resist pullout. Longer anchors may be required in loose sandy or gravelly soils.

Specifications
for

Temporary Seeding

Table 7.8.1 Temporary Seeding Species Selection

Seeding Dates	Species	Lb./1000 ft2	Lb/Acre
March 1 to August 15	Oats Tall Fescue Annual Ryegrass	3 1 1	128 (4 Bushel) 40 40
	Perennial Ryegrass Tall Fescue Annual Ryegrass	1 1 1	40 40 40
	Annual Ryegrass Perennial Ryegrass Creeping Red Fescue Kentucky Bluegrass	1.25 3.25 0.4 0.4	55 142 17 17
	Oats Tall Fescue Annual Ryegrass	3 1 1	128 (3 bushel) 40 40
August 16th to November	Rye Tall Fescue Annual Ryegrass	3 1 1	112 (2 bushel) 40 40
	Wheat Tall Fescue Annual Ryegrass	3 1 1	120 (2 bushel) 40 40
	Perennial Rye Tall Fescue Annual Ryegrass	1 1 1	40 40 40
	Annual Ryegrass Perennial Ryegrass Creeping Red Fescue Kentucky Bluegrass	1.25 3.25 0.4 0.4	40 40 40
November 1 to Feb. 29	Use mulch only or dormant seeding		

Note: Other approved species may be substituted.

1. Structural erosion and sediment control practices such as diversions and sediment traps shall be installed and stabilized with temporary seeding prior to grading the rest of the construction site.
2. Temporary seed shall be applied between construction operations on soil that will not be graded or reworked for 21 days or greater. These idle areas shall be seeded within 7 days after grading.
3. The seedbed should be pulverized and loose to ensure the success of establishing vegetation. Temporary seeding should not be postponed if ideal seedbed preparation is not possible.
4. Soil Amendments—Temporary vegetation seeding rates shall establish adequate stands of vegetation, which may require the use of soil amendments. Base rates for lime and fertilizer shall be used.
5. Seeding Method—Seed shall be applied uniformly with a cyclone spreader, drill, cultipacker seeder, or hydroseeder. When feasible, seed that has been broadcast shall be covered by raking or dragging and then lightly tamped into place using a roller or cultipacker. If hydroseeding is used, the seed and fertilizer will be mixed on-site and the seeding shall be done immediately and without interruption.

Specifications
for

Temporary Seeding

Mulching Temporary Seeding

1. Applications of temporary seeding shall include mulch, which shall be applied during or immediately after seeding. Seedings made during optimum seeding dates on favorable, very flat soil conditions may not need mulch to achieve adequate stabilization.

2. Materials:

- Straw—If straw is used, it shall be unrotted small-grain straw applied at a rate of 2 tons per acre or 90 lbs./ 1,000 sq. ft. (2-3 bales)
- Hydroseeders—If wood cellulose fiber is used, it shall be used at 2000 lbs./ ac. or 46 lb./ 1,000-sq.-ft.
- Other—Other acceptable mulches include mulch mattings applied according to manufacturer's recommendations or wood chips applied at 6 ton/ ac.

3. Straw Mulch shall be anchored immediately to minimize loss by wind or water. Anchoring methods:

- Mechanical—A disk, crimper, or similar type tool shall be set straight to punch or anchor the mulch material into the soil. Straw mechanically anchored shall not be finely chopped but left to a length of approximately 6 inches.
- Mulch Netting—Netting shall be used according to the manufacturers recommendations. Netting may be necessary to hold mulch in place in areas of concentrated runoff and on critical slopes.
- Synthetic Binders—Synthetic binders such as Acrylic DLR (Agri-Tac), DCA-70, Petroset, Terra Track or equivalent may be used at rates recommended by the manufacturer.
- Wood-Cellulose Fiber—Wood-cellulose fiber binder shall be applied at a net dry wt. of 750 lb./ac. The wood-cellulose fiber shall be mixed with water and the mixture shall contain a maximum of 50 lb. / 100 gal.

Specifications
for

Topsoiling

Salvaging and Stockpiling

1. Determine the depth and suitability of topsoil at the site. (For help, contact your local SWCD office to obtain a county soil survey report).
2. Prior to stripping topsoil, install appropriate downslope erosion and sedimentation controls such as sediment traps and basins.
3. Remove the soil material no deeper than what the county soil survey describes as “surface soil” (ie. A or Ap horizon).
4. Construct stockpiles in accessible locations that do not interfere with natural drainage. Install appropriate sediment controls to trap sediment such as silt fence immediately adjacent to the stockpile or sediment traps or basins downstream of the stockpile. Stockpile side slopes shall not exceed a ratio of 2:1.
5. If topsoil is stored for more than 21days, it should be temporary seeded, or covered with a tarp.

Spreading the Topsoil

1. Prior to applying topsoil, the topsoil should be pulverized.
2. To ensure bonding, grade the subsoil and roughen the top 3-4 in. by disking.
3. Do not apply when site is wet, muddy, or frozen, because it makes spreading difficult, causes compaction problems, and inhibits bonding with subsoil.
4. Apply topsoil evenly to a depth of at least 4 inches and compact slightly to improve contact with subsoil.
5. After speading, grade and stabilize with seeding or appropriate vegetation.

Specifications
for

Additional Construction Site Pollution Controls

1. Construction personnel, including subcontractors who may use or handle hazardous or toxic materials, shall be made aware of the following general guidelines regarding disposal and handling of hazardous and construction wastes:
    - Prevent spills
    - Use products up
    - Follow label directions for disposal
    - Remove lids from empty bottles and cans when disposing in trash
    - Recycle wastes whenever possible
    - Don't pour into waterways, storm drains or onto the ground
    - Don't pour down the sink, floor drain or septic tanks
    - Don't bury chemicals or containers
    - Don't burn chemicals or containers
    - Don't mix chemicals together
2. **Containers shall be provided for the proper collection of all waste material including construction debris, trash, petroleum products and any hazardous materials used on-site.** Containers shall be covered and not leaking. All waste material shall be disposed of at facilities approved for that material. Construction Demolition and Debris (CD&D) waste must be disposed of at an Ohio EPA approved CD&D landfill.
3. **No construction related waste materials are to be buried on-site.** By exception, clean fill (bricks, hardened concrete, soil) may be utilized in a way which does not encroach upon natural wetlands, streams or floodplains or result in the contamination of waters of the state.
4. **Handling Construction Chemicals.** Mixing, pumping, transferring or other handling of construction chemicals such as fertilizer, lime, asphalt, concrete drying compounds, and all other potentially hazardous materials shall be performed in an area away from any watercourse, ditch or storm drain.
5. **Equipment Fueling and Maintenance,** oil changing, etc., shall be performed away from watercourses, ditches or storm drains, in an area designated for that purpose. The designated area shall be equipped for recycling oil and catching spills. Secondary containment shall be provided for all fuel oil storage tanks. These areas must be inspected every seven days and within 24 hrs. of a 0.5 inch or greater rain event to ensure there are no exposed materials which would contaminate storm water. Site operators must be aware that Spill Prevention Control and Countermeasures (SPCC) requirements may apply. An SPCC plan is required for sites with one single above ground tank of 660

gallons or more, accumulative above ground storage of 1330 gallons or more, or 42,000 gallons of underground storage. Contaminated soils must be disposed of in accordance with Item 8.

6. **Concrete Wash Water** shall not be allowed to flow to streams, ditches, storm drains, or any other water conveyance. A sump or pit with no potential for discharge shall be constructed if needed to contain concrete wash water. Field tile or other subsurface drainage structures within 10 ft. of the sump shall be cut and plugged. For small projects, truck chutes may be rinsed away from any water conveyances.

7. **Spill Reporting Requirements:** Spills on pavement shall be absorbed with sawdust or kitty litter and disposed of with the trash at a licensed sanitary landfill. Hazardous or industrial wastes such as most solvents, gasoline, oil-based paints, and cement curing compounds require special handling. Spills shall be reported to Ohio EPA (1-800-282-9378). Spills of 25 gallons or more of petroleum products shall be reported to Ohio EPA, the local fire department, and the Local Emergency Planning Committee within 30 min. of the discovery of the release. All spills which contact waters of the state must be reported to Ohio EPA.

8. **Contaminated Soils.** If substances such as oil, diesel fuel, hydraulic fluid, antifreeze, etc. are spilled, leaked, or released onto the soil, the soil should be dug up and disposed of at licensed sanitary landfill or other approved petroleum contaminated soil remediation facility. (not a construction/demolition debris landfill). Note that storm water run off associated with contaminated soils are not be authorized under Ohio EPA's General Storm Water Permit associated with Construction Activities.

9. **Open Burning.** No materials containing rubber, grease, asphalt, or petroleum products, such as tires, autoparts, plastics or plastic coated wire may be burned (OAC 3745-19). Open burning is not allowed in restricted areas, which are defined as: 1) within corporation limits; 2) within 1000 feet outside a municipal corporation having a population of 1000 to 10,000; and 3) a one mile zone outside of a corporation of 10, 000 or more. Outside of restricted areas, no open burning is allowed within a 1000 feet of an inhabited building on another property. Open burning is permissible in a restricted area for: heating tar, welding, smudge pots and similar occupational needs, and heating for warmth or outdoor barbeques. Outside of restricted areas, open burning is permissible for landscape or land-clearing wastes (plant material, with prior written permission from Ohio EPA), and agricultural wastes, excluding buildings.

10. **Dust Control or dust suppressants** shall be used to prevent nuisance conditions, in accordance with the manufacturer's specifications and in a manner, which prevent a discharge to waters of the state. Sufficient distance must be provided between applications and nearby bridges, catch basins, and other waterways. Application (excluding water) may not occur when rain is imminent as noted in the short term forecast. Used oil may not be applied for dust control.

11. **Other Air Permitting Requirements:** Certain activities associated with construction will require air permits including but not limited to: mobile concrete batch plants, mobile asphalt plants, concrete crushers, large generators, etc. These activities will require specific Ohio EPA Air Permits for installation and operation. Operators must seek authorization from the corresponding district of Ohio EPA. For demolition of all

commercial sites, a Notification for Restoration and Demolition must be submitted to Ohio EPA to determine if asbestos corrective actions are required.

12. **Process Waste Water/Leachate Management.** Ohio EPA's Construction General Permit only allows the discharge of storm water and does not include other waste streams/discharges such as vehicle and/or equipment washing, on-site septic leachate concrete wash outs, which are considered process wastewaters. All process wastewaters must be collected and properly disposed at an approved disposal facility. In the event, leachate or septage is discharged; it must be isolated for collection and proper disposal and corrective actions taken to eliminate the source of waste water.

13. **A Permit To Install (PTI)** is required prior to the construction of all centralized sanitary systems, including sewer extensions, and sewerage systems (except those serving one, two, and three family dwellings) and potable water lines. Plans must be submitted and approved by Ohio EPA. Issuance of an Ohio EPA Construction General Storm Water Permit does not authorize the installation of any sewerage system where Ohio EPA has not approved a PTI.

APPENDIX 3

SWP3 Inspection Forms and SWP3 Amendments, Grading, and Stabilization Log

AEP OHIO TRANSMISSION COMPANY, INC.
HAYDEN STATION PROJECT
STORM WATER POLLUTION PREVENTION PLAN (SWP3) INSPECTION FORM

Date: _____ Inspector's Name/Title: _____

Inspector's Company: _____

Inspector Qualified in accordance with Part VII.BB of Permit: ☐ Yes ☐ No (Document Qualifications in Appendix 3 of SWP3)

Inspection Type: ☐ Weekly (once every seven calendar days)

☐ Storm Event (0.5 inch or greater) Date: _____ Amount: _____ Duration: _____

Rain Event(s) Since Last Inspection:

Date: _____ Amount: _____ Duration: _____	Date: _____ Amount: _____ Duration: _____
Date: _____ Amount: _____ Duration: _____	Date: _____ Amount: _____ Duration: _____

Did any discharges occur during these events? ☐ No ☐ Yes, Location: _____

Current Weather: ☐ Clear ☐ Cloudy ☐ Fog ☐ Rain ☐ Snow ☐ Sleet ☐ High Winds ☐ Other: _____ Temp: _____

Current Discharges: ☐ No ☐ Yes, Location: _____

Evidence of Sediment/Pollutants Leaving the Site? ☐ No ☐ Yes, Location: _____

Has Seeding Taken Place? ☐ No ☐ Yes, Location/Seed tag photo included: _____

Erosion and Sediment Control Features / BMPs Inspected:

☐ Silt Fence / Filter Sock (Mark which one applies)

Location(s) (Structure # (STR#)): _____

Properly anchored/installed: ☐ Yes ☐ No Repairs Needed: ☐ Yes ☐ No

Sediment Removal Required (Sediment one-half height for fence & one-third height for sock): ☐ Yes ☐ No

Action Required/Taken/Location(s): _____

_____

☐ Orange Barrier Fence

Location(s) (Wetland / Access Road / STR#): _____

Properly anchored/installed: ☐ Yes ☐ No Repairs Needed: ☐ Yes ☐ No

Action Required/Taken/Location(s): _____

_____

☐ Construction Entrance

Location(s) (Reference intersection of road and nearest STR#): _____

Entrance Stabilized: ☐ Yes ☐ No Evidence of mud tracked on roadway: ☐ Yes ☐ No

Action Required/Taken/Location(s): _____

_____

☐ Material Storage Areas (Including waste containers, fuel areas)

Material Storage Areas located on site and shown on the SWP3: ☐ Yes ☐ No

Materials properly contained and labeled: ☐ Yes ☐ No Evidence of spills or releases: ☐ Yes ☐ No

Action Required/Taken/Location(s): _____

_____

☐ Concrete Washouts

Location(s) (Access Road / STR#): _____

Properly installed and located at least 50 feet from wetlands/streams/ditches/storm drains: ☐ Yes ☐ No

Replacement needed (concrete reaches 50 percent of the system): ☐ Yes ☐ No

Action Required/Taken/Location(s): _____

_____

Comments / Additional Control Measures Recommended: _____

_____

_____

If BMP modifications are made, you must update the SWP3 drawings and document changes on the SWP3 amendment log.

Inspector's Signature: _____ Date: _____

AEP OHIO TRANSMISSION COMPANY, INC.
HAYDEN STATION PROJECT

STORM WATER POLLUTION PREVENTION PLAN
AMENDMENTS, GRADING, AND STABILIZATION LOG

Date: _____ Inspector's Name/Title: _____

Location and Description of Grading and Stabilization Activities

_____

_____

_____

_____

Amendments to SWP3:

_____

_____

_____

Date: _____ Inspector's Name/Title: _____

Location and Description of Grading and Stabilization Activities

_____

_____

_____

_____

Amendments to SWP3:

_____

_____

_____

Date: _____ Inspector's Name/Title: _____

Location and Description of Grading and Stabilization Activities

_____

_____

_____

_____

Amendments to SWP3:

_____

_____

_____

AEP OHIO TRANSMISSION COMPANY, INC. HAYDEN STATION PROJECT

SUMMARY SWP3 INSPECTION RECORDS – FOR TCRs

I have completed a review of the SWP3 inspections completed on the project for the period of _____ to _____.

The following major observations were made relating to the implementation of the SWP3 and review of the inspection log.

Inspector Qualifications:

☐ The inspections were performed by "qualified inspection personnel" knowledgeable in the principles of erosion and sediment control and skilled in assessing the effectiveness of control measures.

☐ The inspections were NOT performed by "qualified inspection personnel" knowledgeable in the principles of erosion and sediment control and skilled in assessing the effectiveness of control measures.

☐ Corrective Measures were taken on _____ to provide "qualified inspection personnel" at the site.

Permit Compliance Observations:

☐ The project was in compliance with the SWP3 and permit during the review period.

☐ The project was NOT in compliance with the SWP3 and permit during the review period as noted below:

☐ Non-compliance issues included:

_____
_____
_____
_____
_____
_____
_____
_____

☐ Corrective Measures were taken on _____ to correct the above non-compliance issues.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____

Title: _____

Signature: _____

Date: _____

APPENDIX 4

Duty to Inform Contractors and Subcontractors Signature Form

AEP OHIO TRANSMISSION COMPANY, INC. HAYDEN STATION PROJECT

DUTY TO INFORM CONTRACTORS AND SUBCONTRACTORS SIGNATURE FORM

By signing below, I acknowledge that I have been informed of the terms and conditions of the Ohio Environmental Protection Agency's General NPDES Permit for Storm Water Associated with Construction Activity, and have reviewed and understand the conditions and responsibilities of the Storm Water Pollution Prevention Plan for the AEP Ohio Transmission Company, Inc. Hayden Station Project. I understand that Inspectors shall meet the qualifications outlined in Part VII.BB. of Ohio EPA Permit No.: OHC000005.

Printed Name	Company	Signature	Date

APPENDIX 5

Storm Water Calculations Report

STORMWATER MANAGEMENT PLAN

AMERICAN ELECTRIC POWER HAYDEN SUBSTATION
7210 HAYDEN RUN ROAD
AMLIN, OH 43002

PREPARED FOR

PREPARED BY

ms consultants, inc.
engineers, architects, planners
2221 Schrock Road
Columbus, Ohio 43229-1547
p 614.898.7100
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February 2020

Table of Contents

Appendices

Project Summary

American Electric Power (AEP) is proposing to expand an existing substation for electrical generation services.

The subject parcel is located in Amlin, Franklin County, Ohio, at 7210 Hayden Run Road. The parcel is 55.3 acres, consisting of the current substation, driveway, and farm land. Adjacent land use in the project area is agricultural, commercial, and residential. There is a public park to the west of the subject property, and a mixture of houses and businesses on the southern side of Hayden Run Road. A Project Location Map is provided in ***Appendix A.***

The project is located in the FEMA Flood Zone X (Area of Minimal Flood Hazard). The FIRMette condensed map of the FEMA floodplain maps (FIRM 39049C0130K, Eff. June 17, 2008; and FIRM 39049C0137K, Eff. June 17, 2008) is included in ***Appendix B***.

The proposed work includes the expansion of the existing substation for proposed electrical facilities and an extended detention basin for stormwater management. The detention basin has been sized for water quality and quantity requirements, and will discharge through an outlet control structure and into a level spreader to the east of the site. Additionally, two proposed poles and approximately 1,309 feet of transmission line will be constructed.

Stormwater Analysis

Hydrologic calculations were performed using SCS methodology (TR-55), in accordance with Franklin County regulations, and implemented through Bentley's PondPack computation software. A theoretical Point of Interest, or Point of Analysis, was used as the basis for determining the release rate off-site from all proposed work within the project limits.

Time of Concentration (Tc)

Existing on-site runoff discharges to the roadside swale on the north side of Hayden Run Road, which drains east towards Hayden Run, and eventually to the Scioto River.

Runoff from the proposed construction area will sheet flow across the gravel pad, be captured by erosion-resistant channels, and conveyed to the proposed detention basin.

The pre-development time of concentration (Tc) for the site was determined to be 42.3 minutes based on existing site conditions. The proposed construction decreases the Tc to 5.9 minutes. Runoff from the construction area which will not be captured by the detention basin was assumed to have a Tc of 5.1 minutes in both pre- and post-development conditions. The Tc calculations are included in ***Appendix C***.

Weighted Curve Number

The Soil Survey for Franklin County, Ohio, developed by the United States Department of Agriculture Soil Conservation Service, was referenced to determine the predominant soil types at the project site. Two (2) soil types were identified within the project limits and have been listed in the table below. The Custom Soil Resource Report for Franklin County, Ohio, which includes a soils map, can be found in ***Appendix D***.

Soil Types for the AEP Hayden Substation

Symbol	Description	Slope	Hydrologic Soil Group	Hydric Rating
Ko	Kokomo silty clay loam	0% - 2%	C/D	Yes
LeB	Lewisburg-Crosby complex	2% - 6%	D	No

The land cover curve numbers used for the TR-55 runoff analysis are as follows:

Cover Type	Hydrologic Soil Type	Curve Number
Open Space (Good)	D	80
Open Space (Fair)	D	84
Cultivated Land, w/o Conservative Treatment	D	91
Gravel	D	91

The weighted curve number for the existing site conditions was determined to be 88 based on 5.51 acres of fair condition open space, 7.87 acres of cultivated land, and 0.68 acres of gravel.

A weighted curve number was also calculated for the proposed site conditions within the construction limits. The weighted curve number for the proposed site conditions was determined to be 89 based on 2.41 acres of proposed good condition open space and 11.64 acres of gravel.

The calculations for pre- and post-development runoff-coefficients are included in ***Appendix C***.

Rainfall Depths

The rainfall depths were obtained from the Franklin County Stormwater Drainage Manual, Section 2, Table 2-3. A copy of the rainfall data table can be found in ***Appendix C***.

Detention Requirements

The development was designed to meet the Ohio Department of Natural Resources (ODNR) drainage standards for critical storm and the Ohio Environmental Protection Agency (OEPA) for water quality and water quantity. The critical storm was determined to be the 1-year storm based on the requirements of the Franklin County Drainage Manual; therefore, the detention system was designed to reduce the post-development runoff rate of all storms equal to and more frequent than the 10-year to that of the pre-development runoff rate of the same frequency. Storm events greater, or less frequent, than the 10-year storm were designed to discharge at rates less than the pre-construction conditions of the 10-year storm event. Calculations supporting the pond design can be found in ***Appendix C***.

1-year Pre-Development	1.32 ac-ft
1-year Post-Development	1.40 ac-ft
% Increase in Volume	5.91%
Critical Storm	1-yr

Drainage Area Captured by the Detention Basin:

Storm Event (yr)	Pre-Development Discharge (cfs)	Allowable Release Rate (cfs)	Post-Development Discharge (cfs)	Pond Storage Volume (ac-ft)	Ponding Elev (ft)
1	7.74	5.88	0.22	0.694	943.99
2	10.08	7.94	0.45	0.880	944.28
5	13.45	11.03	1.88	0.968	944.41
10	16.24	13.73	3.94	1.098	944.60
25	20.14	13.67	7.47	1.324	944.92
50	23.37	13.67	10.49	1.525	945.19
100	26.76	13.67	13.55	1.731	945.47

Drainage Area Uncaptured by the Detention Basin:

Storm Event (yr)	Pre-Development Discharge (cfs)	Post-Development Discharge (cfs)
1	7.10	8.96
2	9.64	11.78
5	13.43	15.85
10	16.71	19.22
25	21.38	23.95
50	25.29	27.87
100	29.41	31.98

Drainage Design

The proposed design for the new station requires the installation of vegetated and rock-lined channels and a detention basin to mitigate runoff from the site. Two vegetated channels run along the southern side and a rock lined channel runs along the northeastern corner of the gravel pad to capture runoff from the gravel area and convey the runoff to the detention basin. A 6" underdrain was placed in the location of the plastibeton trench to drain the trench and its utilities. The underdrain will discharge into the channel to the east of the station pad. A level spreader was placed at the outlet point of the detention basin to dissipate the concentrated flow back into sheet flow. The dissipated flow at the tail end of the outlet pipe drains to the roadside swale along Hayden Run Road and eventually into Hayden Run to the east of the site. The calculations for the channels are included in ***Appendix C***.

Water Quality

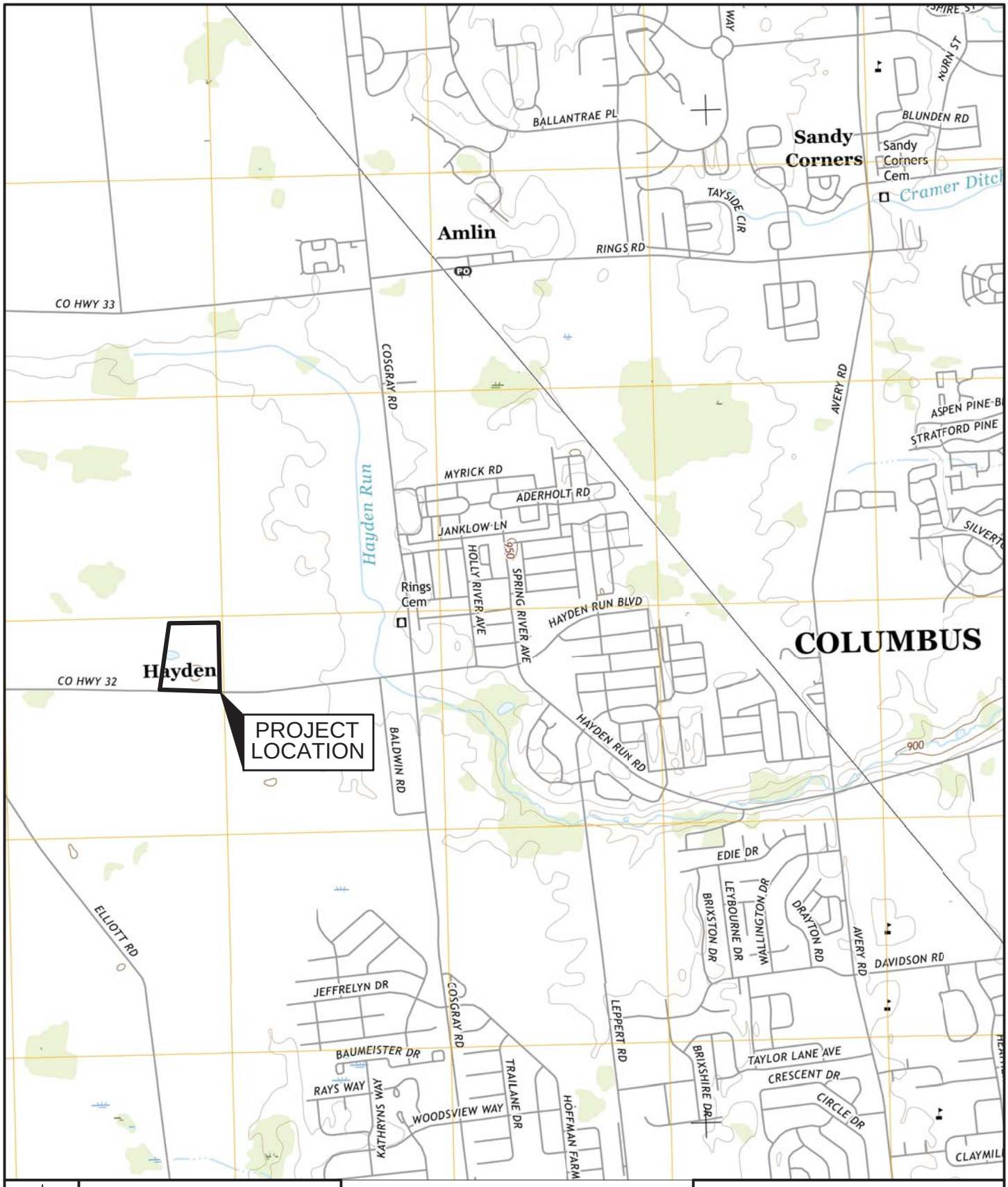
On-site water quality requirements are being met through the proposed detention basin. The required water quality volume, per OEPA requirements, is 27,709 cubic feet. This water quality volume will be captured in the basin and released over a period of 51.5 hours through a 3.5"-diameter low-flow orifice on the outlet control structure. Calculations for the water quality volume can be found in ***Appendix C***.

Summary

As indicated above and shown by the attached calculations, the detention basin calculations are in compliance with the ODNR- Rainwater and Land Development Manual, the Franklin County Drainage Manual, and the OEPA-General Permit OHC000005.

APPENDIX A

Project Location Map



REFERENCE:
USGS 7.5' QUADRANGLE
HILLIARD, OHIO

SCALE:
1" = 2,000'

FIGURE 1
PROJECT VICINITY MAP
AMERICAN ELECTRIC POWER
HAYDEN SUBSTATION

APPENDIX B

FEMA FIRMette

National Flood Hazard Layer FIRMette

FEMA

40°3'55.99"N

83°11'54.50"W

83°11'17.04"W

40°3'28.45"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/6/2019 at 8:32:47 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX C

Stormwater Calculations

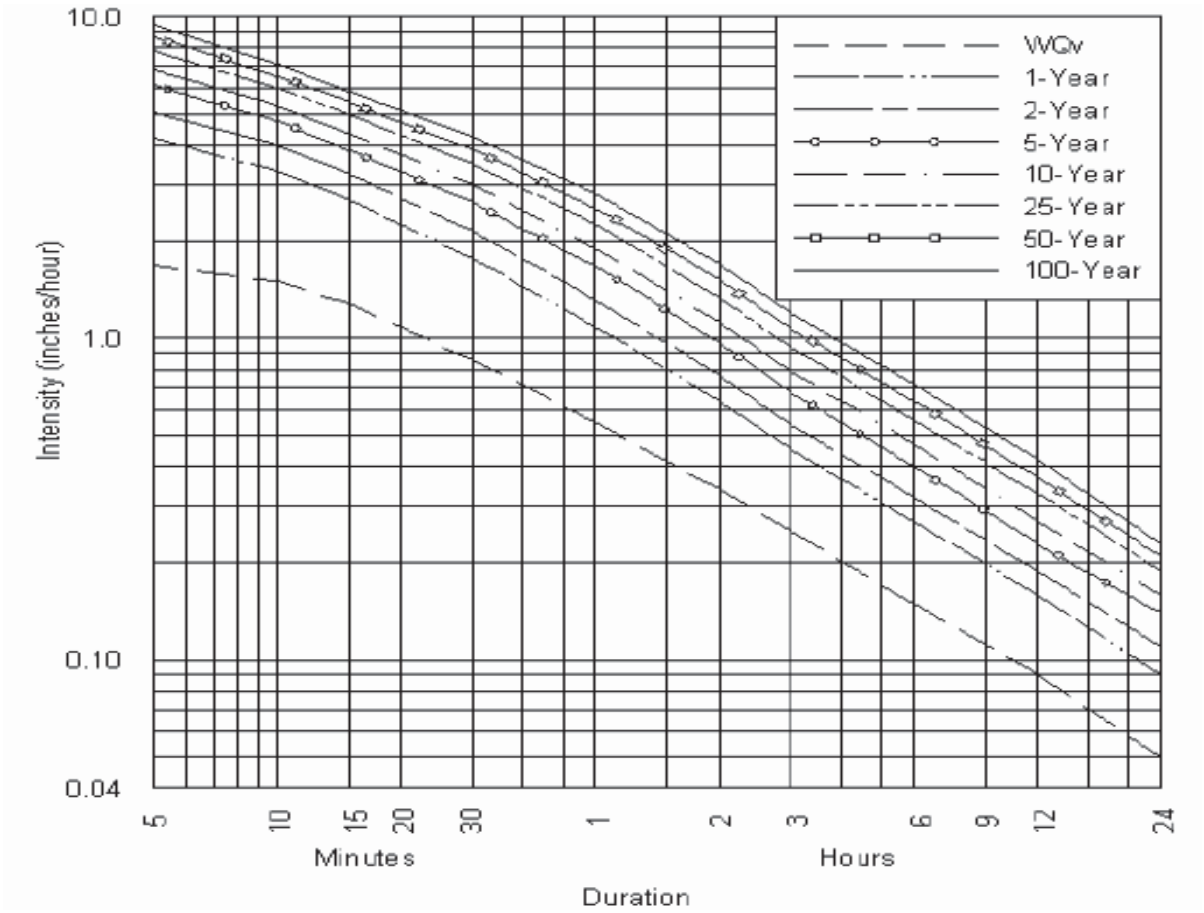
2.2.2 Hydrologic Components

2.2.2.1 Rainfall

Rainfall intensity-duration-frequency (IDF) curves for Central Ohio[3] (**Figure 2-1**) shall be used in conjunction with the appropriate hydrologic method and/or model defined in Sections 2.2.3 and 2.2.4 to determine design runoff volumes and intensities. In general, these curves shall be used directly where the rational formula is appropriate to calculate runoff, or shall be used to develop a design rainfall hyetograph for runoff calculations using hydrograph methods. Design rainfall hyetographs shall be developed using the 24-hour rainfall volume from Figure 2-1, distributed over a 24-hour period with the SCS Type II distribution (**Table 2-3**). The 24-hour Type II rainfall distribution represents design rainfall intensities over a time of concentration range typical of a small urban watershed, coupled with wet antecedent conditions at the time of peak rainfall intensity.

Figure 2-1

Intensity Duration Frequency (IDF) Curves
Ohio (39.972 N, 83.01 W, 744 Feet)



[3] Huff and Angel, *Rainfall Frequency Atlas of the Midwest*, 1992.

Table 2-3

Type II SCS Design Storm Hyetograph

Hour	Type II Mass Curve	Type II Delta Rain	Type II 24-Hour Rainfall Distribution (In) Frequency: / Duration: / Depth (in):	100yr 24 hr 5.63	50yr 24 hr 5.02	25yr 24 hr 4.44	10yr 24 hr 3.74	5yr 24 hr 3.24	2yr 24hr 2.63	1yr 24 hr 2.20
0:00	0			0.000	0.000	0.000	0.000	0.000	0.000	0.000
0:15	0.002	0.002		0.011	0.010	0.009	0.007	0.006	0.005	0.004
0:30	0.005	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
0:45	0.008	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
1:00	0.0108	0.0028		0.016	0.014	0.012	0.010	0.009	0.007	0.006
1:15	0.014	0.0032		0.018	0.016	0.014	0.012	0.010	0.008	0.007
1:30	0.017	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
1:45	0.02	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
2:00	0.023	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
2:15	0.026	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
2:30	0.029	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
2:45	0.032	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
3:00	0.0347	0.0027		0.015	0.014	0.012	0.010	0.009	0.007	0.006
3:15	0.038	0.0033		0.019	0.017	0.015	0.012	0.011	0.009	0.007
3:30	0.041	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
3:45	0.044	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
4:00	0.0483	0.0043		0.024	0.022	0.019	0.016	0.014	0.011	0.009
4:15	0.052	0.0037		0.021	0.019	0.016	0.014	0.012	0.010	0.008
4:30	0.056	0.004		0.023	0.020	0.018	0.015	0.013	0.011	0.009
4:45	0.06	0.004		0.023	0.020	0.018	0.015	0.013	0.011	0.009
5:00	0.064	0.004		0.023	0.020	0.018	0.015	0.013	0.011	0.009
5:15	0.068	0.004		0.023	0.020	0.018	0.015	0.013	0.011	0.009
5:30	0.072	0.004		0.023	0.020	0.018	0.015	0.013	0.011	0.009
5:45	0.076	0.004		0.023	0.020	0.018	0.015	0.013	0.011	0.009
6:00	0.0797	0.0037		0.021	0.019	0.016	0.014	0.012	0.010	0.008
6:15	0.085	0.0053		0.030	0.027	0.024	0.020	0.017	0.014	0.012
6:20	0.09	0.005		0.028	0.025	0.022	0.019	0.016	0.013	0.011
6:30	0.095	0.005		0.028	0.025	0.022	0.019	0.016	0.013	0.011
7:00	0.1	0.005		0.028	0.025	0.022	0.019	0.016	0.013	0.011
7:15	0.105	0.005		0.028	0.025	0.022	0.019	0.016	0.013	0.011
7:30	0.11	0.005		0.028	0.025	0.022	0.019	0.016	0.013	0.011
7:45	0.115	0.005		0.028	0.025	0.022	0.019	0.016	0.013	0.011
8:00	0.1203	0.0053		0.030	0.027	0.024	0.020	0.017	0.014	0.012
8:15	0.126	0.0057		0.032	0.029	0.025	0.021	0.018	0.015	0.013
8:30	0.113	0.007		0.039	0.035	0.031	0.026	0.023	0.018	0.015
8:45	0.14	0.007		0.039	0.035	0.031	0.026	0.023	0.018	0.015
9:00	0.1467	0.0067		0.038	0.034	0.030	0.025	0.022	0.018	0.015
9:15	0.155	0.0083		0.047	0.042	0.037	0.031	0.027	0.022	0.018
9:30	0.163	0.008		0.045	0.040	0.036	0.030	0.026	0.021	0.018
9:45	0.172	0.009		0.051	0.045	0.040	0.034	0.029	0.024	0.020
10:00	0.1808	0.0088		0.050	0.044	0.039	0.033	0.029	0.023	0.019
10:15	0.191	0.0102		0.057	0.051	0.045	0.038	0.033	0.027	0.022
10:30	0.203	0.012		0.068	0.060	0.053	0.045	0.039	0.032	0.026
10:45	0.218	0.015		0.084	0.075	0.067	0.056	0.049	0.039	0.033
11:00	0.236	0.018		0.101	0.090	0.080	0.067	0.058	0.047	0.040
11:15	0.257	0.021		0.118	0.105	0.093	0.079	0.068	0.055	0.046
11:30	0.283	0.026		0.146	0.131	0.115	0.097	0.084	0.068	0.057
11:45	0.387	0.104		0.586	0.522	0.462	0.389	0.337	0.274	0.229

Table 2-3 (Continued)
Type II SCS Design Storm Hyetograph

Hour	Type II Mass Curve	Delta Rain	Frequency: Duration: Depth (in):	100yr 24 hr 5.63	50yr 24 hr 5.02	25yr 24 hr 4.44	10yr 24 hr 3.74	5yr 24 hr 3.24	2yr 24hr 2.63	1yr 24 hr 2.20
12:00	0.6632	0.2762		1.555	1.387	1.226	1.033	0.895	0.726	0.608
12:15	0.707	0.0438		0.247	0.220	0.194	0.164	0.142	0.115	0.096
12:30	0.735	0.028		0.158	0.141	0.124	0.1058	0.091	0.074	0.062
12:45	0.758	0.023		0.129	0.115	0.102	0.086	0.075	0.060	0.051
13:00	0.776	0.018		0.101	0.090	0.080	0.067	0.058	0.047	0.040
13:15	0.791	0.015		0.084	0.075	0.067	0.056	0.049	0.039	0.033
13:30	0.804	0.013		0.073	0.065	0.058	0.049	0.042	0.034	0.029
13:45	0.815	0.007		0.062	0.055	0.049	0.041	0.036	0.029	0.024
14:00	0.825	0.01		0.056	0.050	0.044	0.037	0.032	0.026	0.022
14:15	0.834	0.009		0.051	0.045	0.040	0.034	0.029	0.024	0.020
14:30	0.842	0.008		0.045	0.040	0.036	0.030	0.026	0.021	0.018
14:45	0.849	0.007		0.039	0.035	0.031	0.026	0.023	0.018	0.015
15:00	0.825	0.01		0.039	0.035	0.031	0.026	0.023	0.018	0.015
15:15	0.834	0.009		0.039	0.035	0.031	0.026	0.023	0.018	0.015
15:30	0.869	0.006		0.034	0.030	0.027	0.022	0.019	0.016	0.013
15:45	0.875	0.005		0.034	0.030	0.027	0.022	0.019	0.016	0.013
16:00	0.881	0.006		0.034	0.030	0.027	0.022	0.019	0.016	0.013
16:15	0.887	0.006		0.034	0.030	0.027	0.022	0.019	0.016	0.013
16:30	0.893	0.006		0.034	0.030	0.027	0.022	0.019	0.016	0.013
16:45	0.898	0.005		0.028	0.025	0.022	0.019	0.016	0.013	0.011
17:00	0.903	0.005		0.028	0.025	0.022	0.019	0.016	0.013	0.011
17:15	0.908	0.005		0.028	0.025	0.022	0.019	0.016	0.013	0.011
17:30	0.913	0.005		0.028	0.025	0.022	0.019	0.016	0.013	0.011
17:45	0.918	0.005		0.028	0.025	0.022	0.019	0.016	0.013	0.011
18:00	0.922	0.004		0.023	0.020	0.018	0.015	0.013	0.011	0.009
18:15	0.926	0.004		0.023	0.020	0.018	0.015	0.013	0.011	0.009
18:30	0.93	0.004		0.023	0.020	0.018	0.015	0.013	0.011	0.009
18:45	0.934	0.004		0.023	0.020	0.018	0.015	0.013	0.011	0.009
19:00	0.938	0.004		0.023	0.020	0.018	0.015	0.013	0.011	0.009
19:15	0.942	0.004		0.023	0.020	0.018	0.015	0.013	0.011	0.009
19:30	0.946	0.004		0.023	0.020	0.018	0.015	0.013	0.011	0.009
19:45	0.95	0.004		0.023	0.020	0.018	0.015	0.013	0.011	0.009
20:00	0.953	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
20:15	0.956	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
20:30	0.959	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
20:45	0.962	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
21:00	0.9653	0.0033		0.019	0.017	0.015	0.012	0.011	0.009	0.007
21:15	0.968	0.0027		0.015	0.014	0.012	0.010	0.009	0.007	0.006
21:30	0.971	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
21:45	0.974	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
22:00	0.977	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
22:15	0.98	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
22:30	0.983	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
22:45	0.986	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
23:00	0.9892	0.0032		0.018	0.016	0.014	0.012	0.010	0.008	0.007
23:15	0.992	0.0028		0.016	0.014	0.012	0.010	0.009	0.007	0.006
23:30	0.995	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
23:45	0.998	0.003		0.017	0.015	0.013	0.011	0.010	0.008	0.007
0:00	1	0.002		0.011	0.010	0.009	0.007	0.006	0.005	0.004

Drainage Design - Flow Rate

Project Name: AEP Hayden Substation
Project Number: 66-46005-90
Date: 1/10/2020
Designed By: KPD

Franklin County Rainfall Intensity

Storm Event	**in/hr**
10-year/5-min	6.80

	sq.ft.	A.C.	C		
Channel C - (North to Pond)					
Impervious	212,904	4.89	0.94		
Grass	0	0.00	0.50		
Cultivated Soil	0	0.00	0.75		
Total	212,904	4.89	0.94	31.24	Q-10yr/5-min
Channel B - (South to Pond)					
Impervious	107,245	2.46	0.85		
Grass	0	0.00	0.35		
Cultivated Soil	0	0.00	0.50		
Total	107,245	2.46	0.85	14.23	Q-10yr/5-min
Channel A					
Impervious	123,450	2.83	0.85		
Grass	30,862	0.71	0.35		
Cultivated Soil	0	0.00	0.50		
Total	154,312	3.54	0.75	18.07	Q-10yr/5-min

Project: AEP - Hayden Substation By: KPD
Project No.: 66-46005-90 Date: 1/10/2020

Open Channel Hydraulics

WHERE:

ϕ_{50} = 50% PASSING DIAMETER FOR SPECIFIED ROCK LINING
n = MANNING'S COEFFICIENT OF ROUGNESS = $(d^{1/6}/(21.6*LOG10(d/\phi_{50})+14.0)$
S = CHANNEL SLOPE
Z = CHANNEL SIDE SLOPE (Z:1)
B = CHANNEL BOTTOM WIDTH
d = FLOW DEPTH
A = FLOW AREA
WP = WETTED PERIMETER
W = WIDTH OF FREE WATER SURFACE

r_h = HYDRAULIC RADIUS
y_h = HYDRAULIC DEPTH (OR MEAN DEPTH OF FLOW) = A / W
Q_M = MANNING'S FLOW
Q_{design} = DESIGN FLOW
v = MANNING'S VELOCITY
S_C = CRITICAL SLOPE = $(14.56*n^2*y_h) / (r_h^{4/3})$
F = FREEBOARD
D = DESIGN CHANNEL DEPTH (MINIMUM)
τ_d = SHEAR STRESS @ FLOW DEPTH d
τ_a = MAX. ALLOWABLE SHEAR STRESS

ROCK TYPE	v max (FPS)
A	12.0
B	10.0
C	8.0
D	6.0

CHANNEL NAME	ROCK TYPE	ϕ_{50} (FT)	n	S (FT/FT)	Z (Z:1)	B (FT)	d (FT)	A (FT^2)	WP (FT)	W (FT)	r_h (FT)	y_h (FT)	Q_M (CFS)	Q_{design} (CFS)	v (FPS)	S_C (FT/FT)	$0.7*S_C$ (FT/FT)	$1.3*S_C$ (FT/FT)	STABLE ?	F (FT)	D (FT)
Channel C - (North to Pond)	C	1.00	0.040	0.003	3	4	1.396	11.43	12.829	12.376	0.891	0.9236	21.5347	31.24	1.88	0.0251	0.0176	0.0326	YES	0.5000	1.896

DESIGN SHEAR STRESS METHOD:
n = 0.04 for Rock Channel Protection - Large Channels
per the Franklin County Stormwater Drainage Manual

n	S (FT/FT)	d (FT)	τ_d (LB/FT^2)	τ_a (LB/FT^2)	LINING OKAY?
0.0400	0.003	1.3960	0.261	4.00	YES

Area was decreased by 3.6 SF to account for water flowing through the rock (4' bottom width, 27" placement depth, 40% voids). Q_M modified as a result.

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ECMDS v7.0

CHANNEL ANALYSIS

> > > Channel A

Name	Channel A
Discharge	18.07
Peak Flow Period	0.083
Channel Slope	0.004
Channel Bottom Width	4
Left Side Slope	3
Right Side Slope	3
Low Flow Liner	
Retardence Class	C 6-12 in
Vegetation Type	Bunch Type
Vegetation Density	Good 75-95%
Soil Type	Silt Loam (SM)

SC150

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissable Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC150 Unvegetated	Straight	18.07 cfs	1.48 ft/s	1.45 ft	0.06	1.6 lbs/ft2	0.36 lbs/ft2	4.41	STABLE	E
Underlying Substrate	Straight	18.07 cfs	1.48 ft/s	1.45 ft	0.06	1.17 lbs/ft2	0.23 lbs/ft2	5.1	STABLE	E

Unreinforced Vegetation

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissable Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Unreinforced Vegetation	Straight	18.07 cfs	1.48 ft/s	1.45 ft	0.06	4 lbs/ft2	0.36 lbs/ft2	11.02	STABLE	--
Underlying Substrate	Straight	18.07 cfs	1.48 ft/s	1.45 ft	0.06	4.73 lbs/ft2	0.23 lbs/ft2	20.54	STABLE	--

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CHANNEL ANALYSIS

> > > Channel B

Name	Channel B
Discharge	14.23
Peak Flow Period	0.083
Channel Slope	0.005
Channel Bottom Width	2
Left Side Slope	3
Right Side Slope	3
Low Flow Liner	
Retardence Class	C 6-12 in
Vegetation Type	Bunch Type
Vegetation Density	Good 75-95%
Soil Type	Silt Loam (SM)

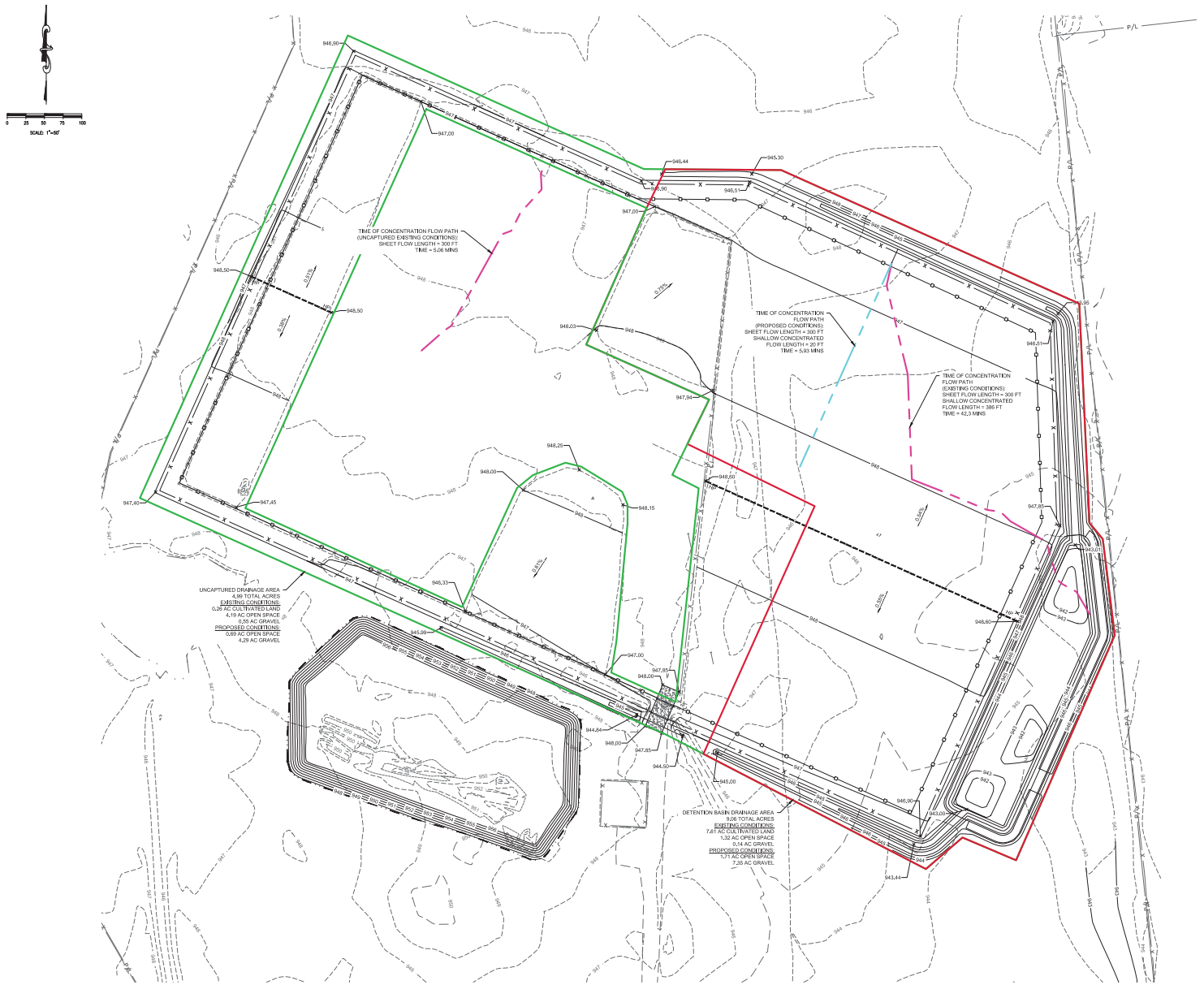
SC150

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissable Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC150 Unvegetated	Straight	14.23 cfs	1.54 ft/s	1.45 ft	0.06	1.6 lbs/ft2	0.45 lbs/ft2	3.53	STABLE	E
Underlying Substrate	Straight	14.23 cfs	1.54 ft/s	1.45 ft	0.06	1.17 lbs/ft2	0.26 lbs/ft2	4.56	STABLE	E

Unreinforced Vegetation

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissable Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Unreinforced Vegetation	Straight	14.23 cfs	1.54 ft/s	1.45 ft	0.06	4 lbs/ft2	0.45 lbs/ft2	8.84	STABLE	--
Underlying Substrate	Straight	14.23 cfs	1.54 ft/s	1.45 ft	0.06	4.73 lbs/ft2	0.26 lbs/ft2	18.36	STABLE	--

DWG. NO. DA-1



ANALYSIS AREA BREAKDOWN

	EXISTING CONDITIONS		PROPOSED CONDITIONS	
	COVER	ACRES	COVER	ACRES
DETENTION BASIN DRAINAGE AREA	CULTIVATED LAND	7.61	OPEN SPACE	1.71
	OPEN SPACE	1.32	GRAVEL	7.35
	GRAVEL	0.13		
	TOTAL	9.06	TOTAL	9.06
UNCAPTURED DRAINAGE AREA	CULTIVATED LAND	0.26	OPEN SPACE	0.70
	OPEN SPACE	4.19	GRAVEL	4.29
	GRAVEL	0.54		
	TOTAL	4.99	TOTAL	4.99

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OLD DWG #: STD DWG #:

AMERICAN ELECTRIC POWER
HAYDEN STATION
COLUMBUS — OHIO
345kV / 138kV / 13kV
DRAINAGE AREAS

SCALE: AS SHOWN	DR: ILK	ENG: IA	CH: IA
	WO#: 428.990.04	APPD:	DATE:
1 RIVERSIDE PLAZA COLUMBUS, OH 43215	DWG. NO.: DA-1	REV: 0	

N:\0256546005 AEP Transmission\90 Hayden\Docs\Calc\Stormwater\Hayden Drainage Areas Plan.dwg, 2/27/2020 8:02 AM, zahorchak, sara

ASP C (22 X 48)

Time of Concentration Pre-Developed

Project Name: ***AEP - Hayden Substation***
Project Number: 66-46005-90
Date: 1/6/2020
Designed By: SAZ

Sheet Flow

		Existing	Source
Coefficient of Runoff	n	0.17	*TR-55 - Cultivated Soils >20% cover*
Distance (ft)	L	300	*CAD*
2-year/24-hour rainfall (inches)	P	2.63	*Franklin County Stormwater Drainage Manual*
Overland Slope (percent)	s	1.08%	*CAD*
		Solve	
Time of Overland Flow (mins)	to	**36.86**	

$$to = \frac{0.007(nL)^{0.8}}{(P2)^{0.5}(S)^{0.4}}$$

Shallow Concentrated Flow

		Existing	Source
Flow Length (ft)	L	386	*CAD*
Slope (percent)	s	0.54%	*CAD*
Velocity (fps)	V	1.18	*Paved (Coef = 20.3282);*
		Solve	***Unpaved (Coef = 16.1435)***
Time of Shallow Concentrated Flow (mins)	ts	**5.43**	

$$ts = \frac{L}{60\,V}$$

Channel Flow

		Existing	Source
Cross Sectional Flow Area (sf)	A	0.50	*Channel section assumption*
Wetted perimeter (ft)	Wp	0.50	*Channel section assumption*
Hydraulic radius (ft)	r	0.50	*Channel section assumption*
Channel slope (ft/ft)	S	0.50%	*CAD*
Manning's roughness coefficient	n	0.045	
Velocity (ft/s)	V	1.47	
Flow length (ft)	L	0	*CAD*
		Solve	
Time of Shallow Concentrated Flow (mins)	tc	**0.00**	

Time of Concentration

$$Tc = to + ts + tc$$

Tc =	**42.29**	mins
	0.705	hours

Time of Concentration Post-Development

Project Name: ***AEP - Hayden Substation***
Project Number: 66-46005-90
Date: 1/6/2020
Designed By: SAZ

Sheet Flow

		Proposed	Source
Coefficient of Runoff	n	0.011	*TR-55 - Smooth surface (gravel)*
Distance (ft)	L	300	*CAD*
2-year/24-hour rainfall (inches)	P	2.63	*Franklin County Stormwater Drainage Manual*
Overland Slope (percent)	s	0.48%	*CAD*
		Solve	
Time of Overland Flow (mins)	to	5.71	

$$to = \frac{0.007(nL)^{0.8}}{(P2)^{0.5}(S)^{0.4}}$$

Shallow Concentrated Flow

		Proposed	Source
Flow Length	L	20	*CAD*
Slope (percent)	s	0.55%	*CAD*
Velocity (fps)	V	1.51	*Paved (Coef = 20.3282);*
		Solve	***Unpaved (Coef = 16.1435)***
Time of Shallow Concentrated Flow (mins)	ts	0.22	

$$ts = \frac{L}{60\,V}$$

Channel Flow

		Proposed	Source
Cross Sectional Flow Area (sf)	A	0.50	*Channel section assumption*
Wetted perimeter (ft)	Wp	0.50	*Channel section assumption*
Hydraulic radius (ft)	r	0.50	*Channel section assumption*
Channel slope (ft/ft)	S	0.50%	*CAD*
Manning's roughness coefficient	n	0.040	
Velocity (ft/s)	V	1.66	
Flow length (ft)	L	0	*CAD*
		Solve	
Time of Shallow Concentrated Flow (mins)	tc	0.00	

Time of Concentration

$$Tc = to + ts + tc$$

Tc =	5.93	mins
	0.10	hours

Time of Concentration Pre-Developed (Uncaptured)

Project Name: ***AEP - Hayden Substation***
Project Number: 66-46005-90
Date: 1/6/2020
Designed By: SAZ

Sheet Flow

		Existing	Source
Coefficient of Runoff	n	0.011	*TR-55 - Smooth surface (gravel)*
Distance (ft)	L	300	*CAD*
2-year/24-hour rainfall (inches)	P	2.63	*Franklin County Stormwater Drainage Manual*
Overland Slope (percent)	s	0.65%	*CAD*
		Solve	
Time of Overland Flow (mins)	to	5.06	

$$to = \frac{0.007(nL)^{0.8}}{(P2)^{0.5}(S)^{0.4}}$$

Shallow Concentrated Flow

		Existing	Source
Flow Length (ft)	L	0	*CAD*
Slope (percent)	s	0.50%	*CAD*
Velocity (fps)	V	1.14	*Paved (Coef = 20.3282);*
		Solve	***Unpaved (Coef = 16.1435)***
Time of Shallow Concentrated Flow (mins)	ts	0.00	

$$ts = \frac{L}{60\,V}$$

Channel Flow

		Existing	Source
Cross Sectional Flow Area (sf)	A	0.50	*Channel section assumption*
Wetted perimeter (ft)	Wp	0.50	*Channel section assumption*
Hydraulic radius (ft)	r	0.50	*Channel section assumption*
Channel slope (ft/ft)	S	0.50%	*CAD*
Manning's roughness coefficient	n	0.045	
Velocity (ft/s)	V	1.47	
Flow length (ft)	L	0	*CAD*
		Solve	
Time of Shallow Concentrated Flow (mins)	tc	0.00	

Time of Concentration

$$Tc = to + ts + tc$$

Tc =	5.06	mins
	0.084	hours

Job Description: **AEP - Hayden Substation**
Job No: 66-46005-90
Computed By: SAZ
Date: 1/8/2020
Checked By: KPD
Date: 1/14/2020

POST CONSTRUCTION STORMWATER MANAGEMENT SUMMARY

Franklin County Drainage Manual Rainfall Data						
Return Period (yr)	*2-yr*	*5-yr*	*10-yr*	*25-yr*	*50-yr*	*100-yr*
24-hr Depth (in)	2.63	3.24	3.74	4.44	5.02	5.63

Project Peak Runoff Volume Mitigation Summary			
	Controlled		**Uncontrolled**
Pre-Development			
Project Drainage Area (ac)	9.06		4.99
Curve Number (CN)	90		85
Impervious Area (ac) - Including Gravel	0.14		0.55
Post-Development			
Project Drainage Area (ac)	9.06		4.99
Curve Number (CN)	See Below		See Below
Impervious Area (ac) - Including Gravel	7.35		4.29
Increase in Impervious Area (ac)	7.21		3.74

Project Peak Runoff Rate Mitigation Summary			
Pre-Development			
POI Drainage Area (ac)	9.06		4.99
Curve Number (CN)	90		85
Time of Concentration, T_c (min.)	42.30		5.06
Post-Development			
POI Drainage Area (ac)	9.06		4.99
Curve Number (CN) to BMPs	89		89
Time of Concentration, T_c,to BMPs (mins)	5.93		5.06

	Storm Frequency	**Controlled**	**Remarks**	
Pre-project Peak Runoff Rate to POI (cfs)	1-yr	7.74	1-yr pre - uncapt	7.10
Required Post-project Peak Runoff Rate to POI (cfs)		5.88		N/A
Post-project Peak Runoff Rate to POI (cfs) - No Control		16.25		8.96
Post-project Peak Runoff Rate to POI (cfs) - w/ Control		0.22		8.96
Net Change to Peak Runoff Rate to POI (cfs)		-7.52		1.86
Pre-project Peak Runoff Rate to POI (cfs)	2-yr	10.08	2-yr pre - uncapt	9.64
Required Post-project Peak Runoff Rate to POI (cfs)		7.94		N/A
Post-project Peak Runoff Rate to POI (cfs) - No Control		21.18		11.78
Post-project Peak Runoff Rate to POI (cfs) - w/ Control		0.45		11.78
Net Change to Peak Runoff Rate to POI (cfs)		-9.63		2.14
Pre-project Peak Runoff Rate to POI (cfs)	5-yr	13.45	5-yr pre - uncapt	13.43
Required Post-project Peak Runoff Rate to POI (cfs)		11.03		N/A
Post-project Peak Runoff Rate to POI (cfs) - No Control		28.29		15.85
Post-project Peak Runoff Rate to POI (cfs) - w/ Control		1.88		15.85
Net Change to Peak Runoff Rate to POI (cfs)		-11.57		2.42
Pre-project Peak Runoff Rate to POI (cfs)	10-yr	16.24	10-yr pre - uncapt	16.71
Required Post-project Peak Runoff Rate to POI (cfs)		13.73		N/A
Post-project Peak Runoff Rate to POI (cfs) - No Control		34.14		19.22
Post-project Peak Runoff Rate to POI (cfs) - w/ Control		3.94		19.22
Net Change to Peak Runoff Rate to POI (cfs)		-12.30		2.51
Pre-project Peak Runoff Rate to POI (cfs)	25-yr	20.14	10-yr pre - uncapt	21.38
Required Post-project Peak Runoff Rate to POI (cfs)		13.67		N/A
Post-project Peak Runoff Rate to POI (cfs) - No Control		42.34		23.95
Post-project Peak Runoff Rate to POI (cfs) - w/ Control		7.47		23.95
Net Change to Peak Runoff Rate to POI (cfs)		-12.67		2.57
Pre-project Peak Runoff Rate to POI (cfs)	50-yr	23.37	10-yr pre - uncapt	25.29
Required Post-project Peak Runoff Rate to POI (cfs)		13.66		N/A
Post-project Peak Runoff Rate to POI (cfs) - No Control		49.12		27.87
Post-project Peak Runoff Rate to POI (cfs) - w/ Control		10.49		27.87
Net Change to Peak Runoff Rate to POI (cfs)		-12.88		2.58
Pre-project Peak Runoff Rate to POI (cfs)	100-yr	26.76	10-yr pre - uncapt	29.41
Required Post-project Peak Runoff Rate to POI (cfs)		13.67		N/A
Post-project Peak Runoff Rate to POI (cfs) - No Control		56.22		31.98
Post-project Peak Runoff Rate to POI (cfs) - w/ Control		13.55		31.98
Net Change to Peak Runoff Rate to POI (cfs)		-13.21		2.57

Change in Runoff Volume for 1-Year Precipitation Event

PROJECT: AEP - Hayden Substation
Grading Limits: 14.05 acres
1-Year Rainfall: 2.20 in

Total Site Area (Grading Limits): 14.05 acres

Existing Conditions: Grading Limits

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN
Cultivated Land, w/o Conservation Treatment	A	0	0.00	72
	B	0	0.00	81
	C	0	0.00	88
	D	342,612	7.87	91
Open Space - Fair Condition	A	0	0.00	49
	B	0	0.00	69
	C	0	0.00	79
	D	240,098	5.51	84
Gravel	A	0	0.00	76
	B	0	0.00	85
	C	0	0.00	89
	D	29,385	0.68	91
Impervious	-	0	0.00	98
TOTAL:		612,095	14.05	88

Developed Conditions: Grading Limits

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN
Open Space - Good Condition	A	0	0.00	39
	B	0	0.00	61
	C	0	0.00	74
	D	105,058	2.41	80
Gravel	A	0	0.00	76
	B	0	0.00	85
	C	0	0.00	89
	D	507,037	11.64	91
Impervious Area	-	0	0.00	98
TOTAL		612,095	14.05	89

From PondPack:

Pre-Development Stormwater Runoff Volume (1-year Storm) = 1.320 ac-ft
57,499 ft^3

Post-Development Stormwater Runoff Volume (1-year Storm) = 1.398 ac-ft
60,897 ft^3

% Volume Increase = 5.91%

Critical Storm = 1-year

PondPack Routing Input

PROJECT: AEP - Hayden Substation
Drainage Area: 14.05 acres

Existing Conditions: Basin Drainage Area

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN
Cultivated Land, w/o Conservation Treatment	A	0	0.00	72
	B	0	0.00	81
	C	0	0.00	88
	D	331,332	7.61	91
Open Space - Fair Condition	A	0	0.00	49
	B	0	0.00	69
	C	0	0.00	79
	D	57,658	1.32	84
Gravel	A	0	0.00	76
	B	0	0.00	85
	C	0	0.00	89
	D	5,778	0.14	91
Impervious	-	0	0.00	98
TOTAL:		394,768	9.06	90

Existing Conditions: Uncaptured

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN
Cultivated Land, w/o Conservation Treatment	A	0	0.00	72
	B	0	0.00	81
	C	0	0.00	88
	D	11,281	0.26	91
Open Space - Fair Condition	A	0	0.00	49
	B	0	0.00	69
	C	0	0.00	79
	D	182,440	4.19	84
Gravel	A	0	0.00	76
	B	0	0.00	85
	C	0	0.00	89
	D	23,607	0.55	91
Impervious	-	0	0.00	98
TOTAL:		217,328	4.99	85

Developed Conditions: Basin Drainage Area

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN
Open Space - Good Condition	A	0	0.00	39
	B	0	0.00	61
	C	0	0.00	74
	D	74,619	1.71	80
Gravel	A	0	0.00	76
	B	0	0.00	85
	C	0	0.00	89
	D	320,149	7.35	91
TOTAL		394,768	9.06	89

PondPack Routing Input

PROJECT: AEP - Hayden Substation
Drainage Area: 14.05 acres

Developed Conditions: Uncaptured

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN
Open Space - Good Condition	A	0	0.00	39
	B	0	0.00	61
	C	0	0.00	74
	D	30,439	0.69	80
Gravel	A	0	0.00	76
	B	0	0.00	85
	C	0	0.00	89
	D	186,889	4.29	91
TOTAL		217,328	4.99	89

From PondPack:

Estimated Storage = 1.354 ac-ft 100-yr Post to 10-yr Pre
Estimated Storage = 58,980.24 cf

WATER QUALITY VOLUME CALCULATIONS- Drainage Area into Pond
Project Name: AEP - Hayden Substation
Project Number: 66-46005-90
Date: 1/8/2020

WQ_v = Rv * P * A / 12

Rv = 0.05 + 0.9i

i = fraction of post-construction impervious surface

P = 0.90 inch precipitation depth
A = Area draining into the BMP in acres

i =	0.811			
Rv =	0.780			
P =	0.9			
A =	9.06			
WQ_v =	0.53	ac-feet	23,090	ft^3
WQ_v + 20% =	**0.64**	ac-feet	27,709	ft^3

WQv Drawdown - Orifice #1				
PIPE DIA.	3.5	in	0.29	ft
total PIPE A	9.62	in^2	0.07	ft^2
C	0.60			
INV.	943.25			
WQv Drawdown - Orifice #2				
PIPE DIA.	0	in	0.00	ft
total PIPE A	0.00	in^2	0.00	ft^2
C	0.60			
INV.	943.25			
WQv Drawdown - Orifice #3				
PIPE DIA.	0	in	0.00	ft
total PIPE A	0.00	in^2	0.00	ft^2
C	0.60			
INV.	943.25			

STAGE	Q1 (CFS)	Q2 (CFS)	Q3 (CFS)	Q (CFS)	Q AVG (CFS)	INC VOL (CFT)	DRAW DOWN (HR)
943.25	0	0	0	0			
					0.15	27,709	51.5
944.26	0.299	0.000	0.000	0.30			

Per Franklin County Drainage Manual - Extended Dry Detention Basin - 48 hours

Stormwater Management Basin

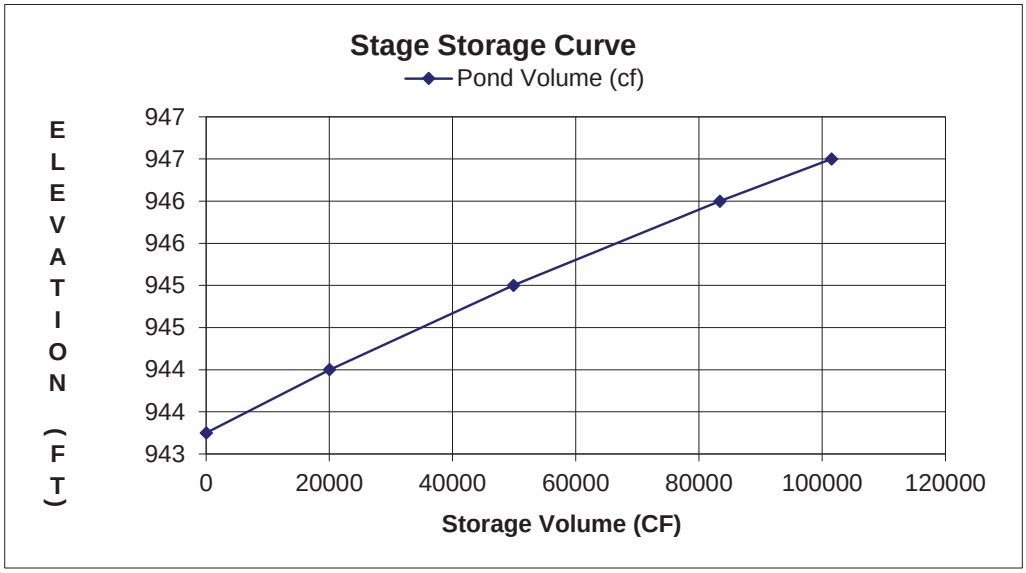
PROJECT NAME: AEP - Hayden Substation

LOCATION: Amlin, Franklin County, Ohio

PREPARED BY: SAZ DATE: 1/8/2020

CHECKED BY: KPD DATE: 1/14/2020

WATER SURFACE ELEVATION (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ. FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET)	
				INCREMENTAL	TOTAL
943.25	25,402.0				0.00
		26,719.0	0.75	20,039.3	
944.00	28,036.0				20,039.25
		29,836.5	1.00	29,836.5	
945.00	31,637.0				49,875.75
		33,487.0	1.00	33,487.0	
946.00	35,337.0				83,362.75
		36,281.0	0.50	18,140.5	
946.50	37,225.0				101,503.25



WQv	Required WQv Elevation
27,709 cf	944.26

Stormwater Management Basin

PROJECT NAME:	AEP - Hayden Substation		
LOCATION:	Amlin, Franklin County, Ohio		
PREPARED BY:	KPD	DATE:	1/14/2020
CHECKED BY:	SAZ	DATE:	1/20/2020

WQv	**27,709 cf**
20% WQv	**5,542 cf**
Forebay/Micropool Volumes (Min.)	**1,847 cf**

North Forebay

WATER SURFACE ELEVATION (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ. FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET) INCREMENTAL	STORAGE VOLUME (CUBIC FEET) TOTAL
942.00	1,052.0				0.00
		1,913.5	1.00	1,913.5	
943.00	2,775.0				1,913.50

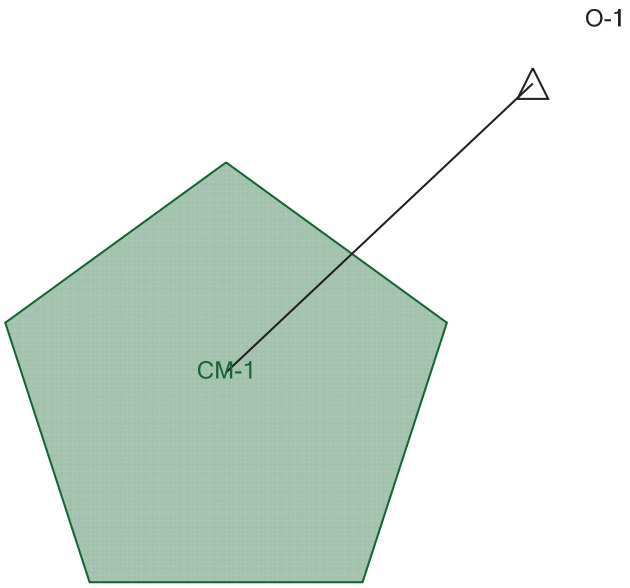
South Forebay

WATER SURFACE ELEVATION (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ. FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET) INCREMENTAL	STORAGE VOLUME (CUBIC FEET) TOTAL
942.00	1,376.0				0.00
		2,620.5	1.00	2,620.5	
943.00	3,865.0				2,620.50

North Forebay

WATER SURFACE ELEVATION (FEET)	AREA (SQ. FT.)	AVERAGE AREA (SQ. FT.)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET) INCREMENTAL	STORAGE VOLUME (CUBIC FEET) TOTAL
942.00	1,115.0				0.00
		1,960.5	1.00	1,960.5	
943.00	2,806.0				1,960.50

Scenario: Pre-Development 1-year



Scenario: Post-Development 1-year

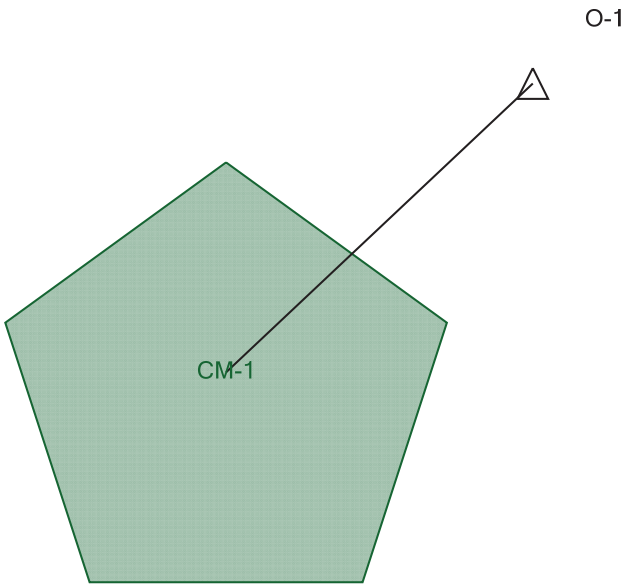


Table of Contents

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
CM-1	Pre-Development 1-year	1	1.320	11.900	23.86
CM-1	Post-Development 1-year	1	1.398	11.900	25.36

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
O-1	Pre-Development 1-year	1	1.320	11.900	23.86
O-1	Post-Development 1-year	1	1.398	11.900	25.36

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Post-Development 1-year

Return Event: 1 years
Storm Event: 1-year

Time-Depth Curve: 1-year	
Label	1-year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	1 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.0	0.0	0.0	0.0
2.000	0.0	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.1	0.1
4.500	0.1	0.1	0.1	0.1	0.1
5.000	0.1	0.1	0.1	0.1	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.2
6.500	0.2	0.2	0.2	0.2	0.2
7.000	0.2	0.2	0.2	0.2	0.2
7.500	0.2	0.2	0.2	0.3	0.3
8.000	0.3	0.3	0.3	0.3	0.3
8.500	0.3	0.3	0.3	0.3	0.3
9.000	0.3	0.3	0.3	0.3	0.4
9.500	0.4	0.4	0.4	0.4	0.4
10.000	0.4	0.4	0.4	0.4	0.4
10.500	0.4	0.5	0.5	0.5	0.5
11.000	0.5	0.5	0.6	0.6	0.6
11.500	0.6	0.7	0.8	0.9	1.2
12.000	1.5	1.5	1.5	1.6	1.6
12.500	1.6	1.6	1.7	1.7	1.7
13.000	1.7	1.7	1.7	1.7	1.7
13.500	1.8	1.8	1.8	1.8	1.8
14.000	1.8	1.8	1.8	1.8	1.8
14.500	1.8	1.9	1.9	1.9	1.9
15.000	1.9	1.9	1.9	1.9	1.9
15.500	1.9	1.9	1.9	1.9	1.9
16.000	1.9	1.9	1.9	2.0	2.0
16.500	2.0	2.0	2.0	2.0	2.0
17.000	2.0	2.0	2.0	2.0	2.0

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Post-Development 1-year

Return Event: 1 years
Storm Event: 1-year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	2.0	2.0	2.0	2.0	2.0
18.000	2.0	2.0	2.0	2.0	2.0
18.500	2.0	2.0	2.1	2.1	2.1
19.000	2.1	2.1	2.1	2.1	2.1
19.500	2.1	2.1	2.1	2.1	2.1
20.000	2.1	2.1	2.1	2.1	2.1
20.500	2.1	2.1	2.1	2.1	2.1
21.000	2.1	2.1	2.1	2.1	2.1
21.500	2.1	2.1	2.1	2.1	2.1
22.000	2.1	2.2	2.2	2.2	2.2
22.500	2.2	2.2	2.2	2.2	2.2
23.000	2.2	2.2	2.2	2.2	2.2
23.500	2.2	2.2	2.2	2.2	2.2
24.000	2.2	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Pre-Development 1-year

Return Event: 1 years
Storm Event: 1-year

Time-Depth Curve: 1-year	
Label	1-year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	1 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.0	0.0	0.0	0.0
2.000	0.0	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.1	0.1
4.500	0.1	0.1	0.1	0.1	0.1
5.000	0.1	0.1	0.1	0.1	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.2
6.500	0.2	0.2	0.2	0.2	0.2
7.000	0.2	0.2	0.2	0.2	0.2
7.500	0.2	0.2	0.2	0.3	0.3
8.000	0.3	0.3	0.3	0.3	0.3
8.500	0.3	0.3	0.3	0.3	0.3
9.000	0.3	0.3	0.3	0.3	0.4
9.500	0.4	0.4	0.4	0.4	0.4
10.000	0.4	0.4	0.4	0.4	0.4
10.500	0.4	0.5	0.5	0.5	0.5
11.000	0.5	0.5	0.6	0.6	0.6
11.500	0.6	0.7	0.8	0.9	1.2
12.000	1.5	1.5	1.5	1.6	1.6
12.500	1.6	1.6	1.7	1.7	1.7
13.000	1.7	1.7	1.7	1.7	1.7
13.500	1.8	1.8	1.8	1.8	1.8
14.000	1.8	1.8	1.8	1.8	1.8
14.500	1.8	1.9	1.9	1.9	1.9
15.000	1.9	1.9	1.9	1.9	1.9
15.500	1.9	1.9	1.9	1.9	1.9
16.000	1.9	1.9	1.9	2.0	2.0
16.500	2.0	2.0	2.0	2.0	2.0
17.000	2.0	2.0	2.0	2.0	2.0

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Pre-Development 1-year

Return Event: 1 years
Storm Event: 1-year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	2.0	2.0	2.0	2.0	2.0
18.000	2.0	2.0	2.0	2.0	2.0
18.500	2.0	2.0	2.1	2.1	2.1
19.000	2.1	2.1	2.1	2.1	2.1
19.500	2.1	2.1	2.1	2.1	2.1
20.000	2.1	2.1	2.1	2.1	2.1
20.500	2.1	2.1	2.1	2.1	2.1
21.000	2.1	2.1	2.1	2.1	2.1
21.500	2.1	2.1	2.1	2.1	2.1
22.000	2.1	2.2	2.2	2.2	2.2
22.500	2.2	2.2	2.2	2.2	2.2
23.000	2.2	2.2	2.2	2.2	2.2
23.500	2.2	2.2	2.2	2.2	2.2
24.000	2.2	(N/A)	(N/A)	(N/A)	(N/A)

Storm Event	1-year
Return Event	1 years
Duration	24.000 hours
Depth	2.2 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	14.050 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	11.922 hours
Flow (Peak, Computed)	26.52 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.900 hours
Flow (Peak Interpolated Output)	25.36 ft³/s

Drainage Area	
SCS CN (Composite)	89.000
Area (User Defined)	14.050 acres
Maximum Retention (Pervious)	1.2 in
Maximum Retention (Pervious, 20 percent)	0.2 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.2 in
Runoff Volume (Pervious)	1.400 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1.398 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	191.03 ft³/s

Subsection: Unit Hydrograph Summary
Label: CM-1
Scenario: Post-Development 1-year

Return Event: 1 years
Storm Event: 1-year

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Storm Event	1-year
Return Event	1 years
Duration	24.000 hours
Depth	2.2 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	14.050 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	11.922 hours
Flow (Peak, Computed)	25.03 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.900 hours
Flow (Peak Interpolated Output)	23.86 ft³/s

Drainage Area	
SCS CN (Composite)	88.000
Area (User Defined)	14.050 acres
Maximum Retention (Pervious)	1.4 in
Maximum Retention (Pervious, 20 percent)	0.3 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.1 in
Runoff Volume (Pervious)	1.322 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1.320 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	191.03 ft³/s

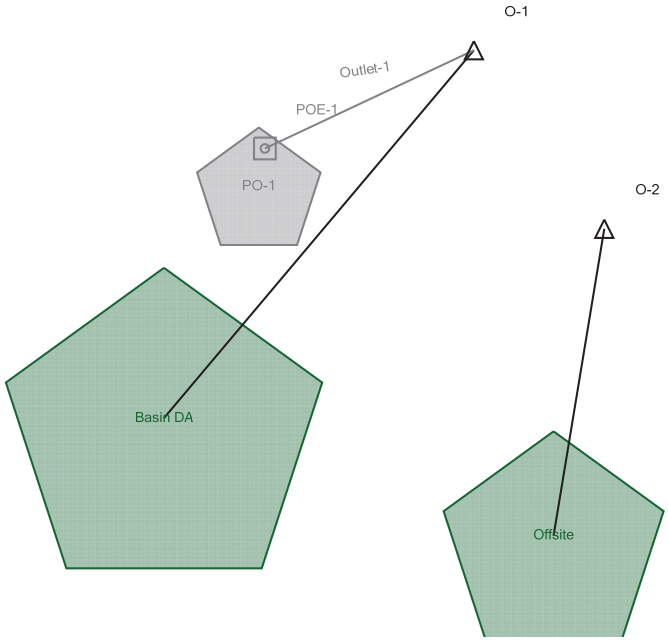
Subsection: Unit Hydrograph Summary
Label: CM-1
Scenario: Pre-Development 1-year

Return Event: 1 years
Storm Event: 1-year

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Index

Scenario: Pre-Development 1-year



Scenario: Post-Development 1-year

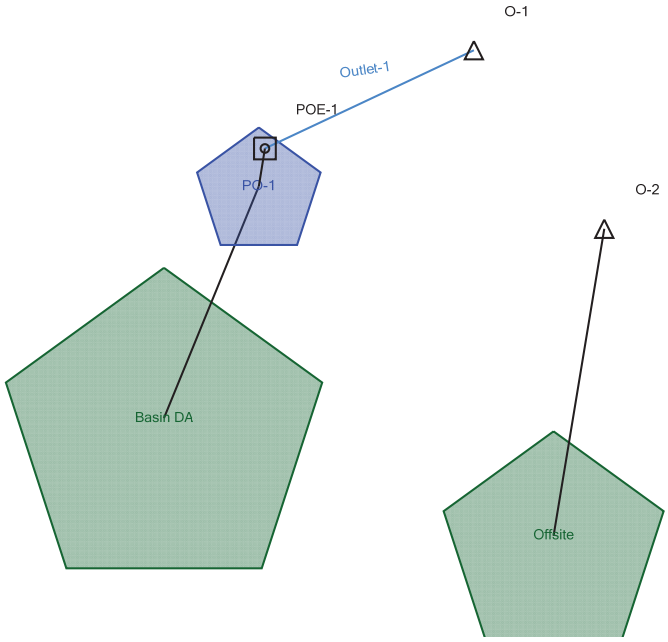


Table of Contents

Table of Contents

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Basin DA	Pre-Development 1-year	1	0.947	12.300	7.74
Basin DA	Post-Development 1-year	1	0.902	11.950	16.25
Basin DA	Pre-Development 2 year	2	1.232	12.300	10.08
Basin DA	Post-Development 2 year	2	1.183	11.950	21.18
Basin DA	Pre-Development 5-year	5	1.651	12.300	13.45
Basin DA	Post-Development 5-year	5	1.597	11.950	28.29
Basin DA	Pre-Development 10--year	10	2.001	12.300	16.24
Basin DA	Post-Development 10--year	10	1.945	11.950	34.14
Basin DA	Pre-Development 25-year	25	2.500	12.300	20.14
Basin DA	Post-Development 25-year	25	2.442	11.950	42.34
Basin DA	Pre-Development 50-year	50	2.918	12.300	23.37
Basin DA	Post-Development 50-year	50	2.859	11.950	49.12
Basin DA	Pre-Development 100-year	100	3.360	12.300	26.76
Basin DA	Post-Development 100-year	100	3.301	11.950	56.22
Offsite	Pre-Development 1-year	1	0.392	11.950	7.10
Offsite	Post-Development 1-year	1	0.497	11.900	8.96
Offsite	Pre-Development 2 year	2	0.533	11.950	9.64
Offsite	Post-Development 2 year	2	0.652	11.900	11.78
Offsite	Pre-Development 5-year	5	0.744	11.900	13.43
Offsite	Post-Development 5-year	5	0.880	11.900	15.85
Offsite	Pre-Development 10--year	10	0.925	11.900	16.71
Offsite	Post-Development 10--year	10	1.072	11.900	19.22
Offsite	Pre-Development 25-year	25	1.186	11.900	21.38
Offsite	Post-Development 25-year	25	1.345	11.900	23.95

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
Offsite	Pre-Development 50-year	50	1.407	11.900	25.29
Offsite	Post-Development 50-year	50	1.575	11.900	27.87
Offsite	Pre-Development 100-year	100	1.643	11.900	29.41
Offsite	Post-Development 100-year	100	1.819	11.900	31.98

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
O-1	Pre-Development 1-year	1	0.947	12.300	7.74
O-1	Post-Development 1-year	1	0.212	19.950	0.22
O-1	Pre-Development 2 year	2	1.232	12.300	10.08
O-1	Post-Development 2 year	2	0.320	16.500	0.45
O-1	Pre-Development 5-year	5	1.651	12.300	13.45
O-1	Post-Development 5-year	5	0.726	12.850	1.88
O-1	Pre-Development 10-year	10	2.001	12.300	16.24
O-1	Post-Development 10--year	10	1.070	12.400	3.94
O-1	Pre-Development 25-year	25	2.500	12.300	20.14
O-1	Post-Development 25-year	25	1.562	12.200	7.47
O-1	Pre-Development 50-year	50	2.918	12.300	23.37
O-1	Post-Development 50-year	50	1.975	12.150	10.49
O-1	Pre-Development 100-year	100	3.360	12.300	26.76
O-1	Post-Development 100-year	100	2.414	12.150	13.56
O-2	Pre-Development 1-year	1	0.392	11.950	7.10
O-2	Post-Development 1-year	1	0.497	11.900	8.96
O-2	Pre-Development 2 year	2	0.533	11.950	9.64

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)
O-2	Post-Development 2 year	2	0.652	11.900	11.78
O-2	Pre-Development 5-year	5	0.744	11.900	13.43
O-2	Post-Development 5-year	5	0.880	11.900	15.85
O-2	Pre-Development 10--year	10	0.925	11.900	16.71
O-2	Post-Development 10--year	10	1.072	11.900	19.22
O-2	Pre-Development 25-year	25	1.186	11.900	21.38
O-2	Post-Development 25-year	25	1.345	11.900	23.95
O-2	Pre-Development 50-year	50	1.407	11.900	25.29
O-2	Post-Development 50-year	50	1.575	11.900	27.87
O-2	Pre-Development 100-year	100	1.643	11.900	29.41
O-2	Post-Development 100-year	100	1.819	11.900	31.98

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
PO-1 (IN)	Post-Development 1-year	1	0.902	11.950	16.25	(N/A)	(N/A)
PO-1 (OUT)	Post-Development 1-year	1	0.212	19.950	0.22	943.99	0.694
PO-1 (IN)	Post-Development 2 year	2	1.183	11.950	21.18	(N/A)	(N/A)
PO-1 (OUT)	Post-Development 2 year	2	0.320	16.500	0.45	944.28	0.880
PO-1 (IN)	Post-Development 5-year	5	1.597	11.950	28.29	(N/A)	(N/A)
PO-1 (OUT)	Post-Development 5-year	5	0.726	12.850	1.88	944.41	0.968

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
PO-1 (IN)	Post-Development 10--year	10	1.945	11.950	34.14	(N/A)	(N/A)
PO-1 (OUT)	Post-Development 10--year	10	1.070	12.400	3.94	944.60	1.098
PO-1 (IN)	Post-Development 25-year	25	2.442	11.950	42.34	(N/A)	(N/A)
PO-1 (OUT)	Post-Development 25-year	25	1.562	12.200	7.47	944.92	1.324
PO-1 (IN)	Post-Development 50-year	50	2.859	11.950	49.12	(N/A)	(N/A)
PO-1 (OUT)	Post-Development 50-year	50	1.975	12.150	10.49	945.19	1.525
PO-1 (IN)	Post-Development 100-year	100	3.301	11.950	56.22	(N/A)	(N/A)
PO-1 (OUT)	Post-Development 100-year	100	2.414	12.150	13.56	945.47	1.731

Time-Depth Curve: 100-year	
Label	100-year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.1
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.2
2.500	0.2	0.2	0.2	0.2	0.2
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.3	0.3
4.000	0.3	0.3	0.3	0.3	0.3
4.500	0.3	0.3	0.3	0.3	0.3
5.000	0.4	0.4	0.4	0.4	0.4
5.500	0.4	0.4	0.4	0.4	0.4
6.000	0.5	0.5	0.5	0.5	0.5
6.500	0.5	0.5	0.5	0.5	0.5
7.000	0.6	0.6	0.6	0.6	0.6
7.500	0.6	0.6	0.6	0.7	0.7
8.000	0.7	0.7	0.7	0.7	0.7
8.500	0.7	0.8	0.8	0.8	0.8
9.000	0.8	0.8	0.9	0.9	0.9
9.500	0.9	0.9	1.0	1.0	1.0
10.000	1.0	1.0	1.1	1.1	1.1
10.500	1.1	1.2	1.2	1.2	1.3
11.000	1.3	1.4	1.4	1.5	1.5
11.500	1.6	1.7	2.0	2.4	3.2
12.000	3.7	3.8	3.9	4.0	4.1
12.500	4.1	4.2	4.2	4.3	4.3
13.000	4.3	4.4	4.4	4.4	4.5
13.500	4.5	4.5	4.5	4.6	4.6
14.000	4.6	4.6	4.7	4.7	4.7
14.500	4.7	4.7	4.8	4.8	4.8
15.000	4.8	4.8	4.8	4.9	4.9
15.500	4.9	4.9	4.9	4.9	4.9
16.000	5.0	5.0	5.0	5.0	5.0
16.500	5.0	5.0	5.0	5.1	5.1
17.000	5.1	5.1	5.1	5.1	5.1

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Post-Development 100-year

Return Event: 100 years
Storm Event: 100-year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	5.1	5.1	5.2	5.2	5.2
18.000	5.2	5.2	5.2	5.2	5.2
18.500	5.2	5.2	5.3	5.3	5.3
19.000	5.3	5.3	5.3	5.3	5.3
19.500	5.3	5.3	5.3	5.3	5.4
20.000	5.4	5.4	5.4	5.4	5.4
20.500	5.4	5.4	5.4	5.4	5.4
21.000	5.4	5.4	5.4	5.5	5.5
21.500	5.5	5.5	5.5	5.5	5.5
22.000	5.5	5.5	5.5	5.5	5.5
22.500	5.5	5.5	5.5	5.6	5.6
23.000	5.6	5.6	5.6	5.6	5.6
23.500	5.6	5.6	5.6	5.6	5.6
24.000	5.6	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Pre-Development 100-year

Return Event: 100 years
Storm Event: 100-year

Time-Depth Curve: 100-year	
Label	100-year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.1
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.2
2.500	0.2	0.2	0.2	0.2	0.2
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.3	0.3
4.000	0.3	0.3	0.3	0.3	0.3
4.500	0.3	0.3	0.3	0.3	0.3
5.000	0.4	0.4	0.4	0.4	0.4
5.500	0.4	0.4	0.4	0.4	0.4
6.000	0.5	0.5	0.5	0.5	0.5
6.500	0.5	0.5	0.5	0.5	0.5
7.000	0.6	0.6	0.6	0.6	0.6
7.500	0.6	0.6	0.6	0.7	0.7
8.000	0.7	0.7	0.7	0.7	0.7
8.500	0.7	0.8	0.8	0.8	0.8
9.000	0.8	0.8	0.9	0.9	0.9
9.500	0.9	0.9	1.0	1.0	1.0
10.000	1.0	1.0	1.1	1.1	1.1
10.500	1.1	1.2	1.2	1.2	1.3
11.000	1.3	1.4	1.4	1.5	1.5
11.500	1.6	1.7	2.0	2.4	3.2
12.000	3.7	3.8	3.9	4.0	4.1
12.500	4.1	4.2	4.2	4.3	4.3
13.000	4.3	4.4	4.4	4.4	4.5
13.500	4.5	4.5	4.5	4.6	4.6
14.000	4.6	4.6	4.7	4.7	4.7
14.500	4.7	4.7	4.8	4.8	4.8
15.000	4.8	4.8	4.8	4.9	4.9
15.500	4.9	4.9	4.9	4.9	4.9
16.000	5.0	5.0	5.0	5.0	5.0
16.500	5.0	5.0	5.0	5.1	5.1
17.000	5.1	5.1	5.1	5.1	5.1

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Pre-Development 100-year

Return Event: 100 years
Storm Event: 100-year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	5.1	5.1	5.2	5.2	5.2
18.000	5.2	5.2	5.2	5.2	5.2
18.500	5.2	5.2	5.3	5.3	5.3
19.000	5.3	5.3	5.3	5.3	5.3
19.500	5.3	5.3	5.3	5.3	5.4
20.000	5.4	5.4	5.4	5.4	5.4
20.500	5.4	5.4	5.4	5.4	5.4
21.000	5.4	5.4	5.4	5.5	5.5
21.500	5.5	5.5	5.5	5.5	5.5
22.000	5.5	5.5	5.5	5.5	5.5
22.500	5.5	5.5	5.5	5.6	5.6
23.000	5.6	5.6	5.6	5.6	5.6
23.500	5.6	5.6	5.6	5.6	5.6
24.000	5.6	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Post-Development 10--year

Return Event: 10 years
Storm Event: 10-year

Time-Depth Curve: 10-year	
Label	10-year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.3	0.3
5.500	0.3	0.3	0.3	0.3	0.3
6.000	0.3	0.3	0.3	0.3	0.3
6.500	0.3	0.3	0.3	0.4	0.4
7.000	0.4	0.4	0.4	0.4	0.4
7.500	0.4	0.4	0.4	0.4	0.4
8.000	0.4	0.5	0.5	0.5	0.5
8.500	0.5	0.5	0.5	0.5	0.5
9.000	0.5	0.6	0.6	0.6	0.6
9.500	0.6	0.6	0.6	0.6	0.7
10.000	0.7	0.7	0.7	0.7	0.7
10.500	0.8	0.8	0.8	0.8	0.9
11.000	0.9	0.9	0.9	1.0	1.0
11.500	1.1	1.1	1.3	1.6	2.1
12.000	2.5	2.6	2.6	2.7	2.7
12.500	2.7	2.8	2.8	2.8	2.9
13.000	2.9	2.9	2.9	3.0	3.0
13.500	3.0	3.0	3.0	3.0	3.1
14.000	3.1	3.1	3.1	3.1	3.1
14.500	3.1	3.1	3.2	3.2	3.2
15.000	3.2	3.2	3.2	3.2	3.2
15.500	3.2	3.3	3.3	3.3	3.3
16.000	3.3	3.3	3.3	3.3	3.3
16.500	3.3	3.3	3.3	3.4	3.4
17.000	3.4	3.4	3.4	3.4	3.4

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Post-Development 10--year

Return Event: 10 years
Storm Event: 10-year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	3.4	3.4	3.4	3.4	3.4
18.000	3.4	3.5	3.5	3.5	3.5
18.500	3.5	3.5	3.5	3.5	3.5
19.000	3.5	3.5	3.5	3.5	3.5
19.500	3.5	3.5	3.5	3.6	3.6
20.000	3.6	3.6	3.6	3.6	3.6
20.500	3.6	3.6	3.6	3.6	3.6
21.000	3.6	3.6	3.6	3.6	3.6
21.500	3.6	3.6	3.6	3.6	3.6
22.000	3.7	3.7	3.7	3.7	3.7
22.500	3.7	3.7	3.7	3.7	3.7
23.000	3.7	3.7	3.7	3.7	3.7
23.500	3.7	3.7	3.7	3.7	3.7
24.000	3.7	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Pre-Development 10--year

Return Event: 10 years
Storm Event: 10-year

Time-Depth Curve: 10-year	
Label	10-year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.3	0.3
5.500	0.3	0.3	0.3	0.3	0.3
6.000	0.3	0.3	0.3	0.3	0.3
6.500	0.3	0.3	0.3	0.4	0.4
7.000	0.4	0.4	0.4	0.4	0.4
7.500	0.4	0.4	0.4	0.4	0.4
8.000	0.4	0.5	0.5	0.5	0.5
8.500	0.5	0.5	0.5	0.5	0.5
9.000	0.5	0.6	0.6	0.6	0.6
9.500	0.6	0.6	0.6	0.6	0.7
10.000	0.7	0.7	0.7	0.7	0.7
10.500	0.8	0.8	0.8	0.8	0.9
11.000	0.9	0.9	0.9	1.0	1.0
11.500	1.1	1.1	1.3	1.6	2.1
12.000	2.5	2.6	2.6	2.7	2.7
12.500	2.7	2.8	2.8	2.8	2.9
13.000	2.9	2.9	2.9	3.0	3.0
13.500	3.0	3.0	3.0	3.0	3.1
14.000	3.1	3.1	3.1	3.1	3.1
14.500	3.1	3.1	3.2	3.2	3.2
15.000	3.2	3.2	3.2	3.2	3.2
15.500	3.2	3.3	3.3	3.3	3.3
16.000	3.3	3.3	3.3	3.3	3.3
16.500	3.3	3.3	3.3	3.4	3.4
17.000	3.4	3.4	3.4	3.4	3.4

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Pre-Development 10--year

Return Event: 10 years
Storm Event: 10-year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	3.4	3.4	3.4	3.4	3.4
18.000	3.4	3.5	3.5	3.5	3.5
18.500	3.5	3.5	3.5	3.5	3.5
19.000	3.5	3.5	3.5	3.5	3.5
19.500	3.5	3.5	3.5	3.6	3.6
20.000	3.6	3.6	3.6	3.6	3.6
20.500	3.6	3.6	3.6	3.6	3.6
21.000	3.6	3.6	3.6	3.6	3.6
21.500	3.6	3.6	3.6	3.6	3.6
22.000	3.7	3.7	3.7	3.7	3.7
22.500	3.7	3.7	3.7	3.7	3.7
23.000	3.7	3.7	3.7	3.7	3.7
23.500	3.7	3.7	3.7	3.7	3.7
24.000	3.7	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Post-Development 1-year

Return Event: 1 years
Storm Event: 1-year

Time-Depth Curve: 1-year	
Label	1-year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	1 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.0	0.0	0.0	0.0
2.000	0.0	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.1	0.1
4.500	0.1	0.1	0.1	0.1	0.1
5.000	0.1	0.1	0.1	0.1	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.2
6.500	0.2	0.2	0.2	0.2	0.2
7.000	0.2	0.2	0.2	0.2	0.2
7.500	0.2	0.2	0.2	0.3	0.3
8.000	0.3	0.3	0.3	0.3	0.3
8.500	0.3	0.3	0.3	0.3	0.3
9.000	0.3	0.3	0.3	0.3	0.4
9.500	0.4	0.4	0.4	0.4	0.4
10.000	0.4	0.4	0.4	0.4	0.4
10.500	0.4	0.5	0.5	0.5	0.5
11.000	0.5	0.5	0.6	0.6	0.6
11.500	0.6	0.7	0.8	0.9	1.2
12.000	1.5	1.5	1.5	1.6	1.6
12.500	1.6	1.6	1.7	1.7	1.7
13.000	1.7	1.7	1.7	1.7	1.7
13.500	1.8	1.8	1.8	1.8	1.8
14.000	1.8	1.8	1.8	1.8	1.8
14.500	1.8	1.9	1.9	1.9	1.9
15.000	1.9	1.9	1.9	1.9	1.9
15.500	1.9	1.9	1.9	1.9	1.9
16.000	1.9	1.9	1.9	2.0	2.0
16.500	2.0	2.0	2.0	2.0	2.0
17.000	2.0	2.0	2.0	2.0	2.0

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Post-Development 1-year

Return Event: 1 years
Storm Event: 1-year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	2.0	2.0	2.0	2.0	2.0
18.000	2.0	2.0	2.0	2.0	2.0
18.500	2.0	2.0	2.1	2.1	2.1
19.000	2.1	2.1	2.1	2.1	2.1
19.500	2.1	2.1	2.1	2.1	2.1
20.000	2.1	2.1	2.1	2.1	2.1
20.500	2.1	2.1	2.1	2.1	2.1
21.000	2.1	2.1	2.1	2.1	2.1
21.500	2.1	2.1	2.1	2.1	2.1
22.000	2.1	2.2	2.2	2.2	2.2
22.500	2.2	2.2	2.2	2.2	2.2
23.000	2.2	2.2	2.2	2.2	2.2
23.500	2.2	2.2	2.2	2.2	2.2
24.000	2.2	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: 1-year	
Label	1-year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	1 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.0	0.0	0.0	0.0
2.000	0.0	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.1	0.1
4.500	0.1	0.1	0.1	0.1	0.1
5.000	0.1	0.1	0.1	0.1	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.2
6.500	0.2	0.2	0.2	0.2	0.2
7.000	0.2	0.2	0.2	0.2	0.2
7.500	0.2	0.2	0.2	0.3	0.3
8.000	0.3	0.3	0.3	0.3	0.3
8.500	0.3	0.3	0.3	0.3	0.3
9.000	0.3	0.3	0.3	0.3	0.4
9.500	0.4	0.4	0.4	0.4	0.4
10.000	0.4	0.4	0.4	0.4	0.4
10.500	0.4	0.5	0.5	0.5	0.5
11.000	0.5	0.5	0.6	0.6	0.6
11.500	0.6	0.7	0.8	0.9	1.2
12.000	1.5	1.5	1.5	1.6	1.6
12.500	1.6	1.6	1.7	1.7	1.7
13.000	1.7	1.7	1.7	1.7	1.7
13.500	1.8	1.8	1.8	1.8	1.8
14.000	1.8	1.8	1.8	1.8	1.8
14.500	1.8	1.9	1.9	1.9	1.9
15.000	1.9	1.9	1.9	1.9	1.9
15.500	1.9	1.9	1.9	1.9	1.9
16.000	1.9	1.9	1.9	2.0	2.0
16.500	2.0	2.0	2.0	2.0	2.0
17.000	2.0	2.0	2.0	2.0	2.0

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Pre-Development 1-year

Return Event: 1 years
Storm Event: 1-year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	2.0	2.0	2.0	2.0	2.0
18.000	2.0	2.0	2.0	2.0	2.0
18.500	2.0	2.0	2.1	2.1	2.1
19.000	2.1	2.1	2.1	2.1	2.1
19.500	2.1	2.1	2.1	2.1	2.1
20.000	2.1	2.1	2.1	2.1	2.1
20.500	2.1	2.1	2.1	2.1	2.1
21.000	2.1	2.1	2.1	2.1	2.1
21.500	2.1	2.1	2.1	2.1	2.1
22.000	2.1	2.2	2.2	2.2	2.2
22.500	2.2	2.2	2.2	2.2	2.2
23.000	2.2	2.2	2.2	2.2	2.2
23.500	2.2	2.2	2.2	2.2	2.2
24.000	2.2	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: 25-year	
Label	25-year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	25 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.3	0.3	0.3	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.3	0.3	0.3
6.000	0.4	0.4	0.4	0.4	0.4
6.500	0.4	0.4	0.4	0.4	0.4
7.000	0.4	0.4	0.5	0.5	0.5
7.500	0.5	0.5	0.5	0.5	0.5
8.000	0.5	0.5	0.6	0.6	0.6
8.500	0.6	0.6	0.6	0.6	0.6
9.000	0.7	0.7	0.7	0.7	0.7
9.500	0.7	0.7	0.8	0.8	0.8
10.000	0.8	0.8	0.8	0.9	0.9
10.500	0.9	0.9	1.0	1.0	1.0
11.000	1.0	1.1	1.1	1.2	1.2
11.500	1.3	1.4	1.6	1.9	2.5
12.000	2.9	3.0	3.1	3.2	3.2
12.500	3.3	3.3	3.3	3.4	3.4
13.000	3.4	3.5	3.5	3.5	3.5
13.500	3.5	3.6	3.6	3.6	3.6
14.000	3.6	3.7	3.7	3.7	3.7
14.500	3.7	3.7	3.7	3.8	3.8
15.000	3.8	3.8	3.8	3.8	3.8
15.500	3.9	3.9	3.9	3.9	3.9
16.000	3.9	3.9	3.9	3.9	3.9
16.500	4.0	4.0	4.0	4.0	4.0
17.000	4.0	4.0	4.0	4.0	4.0

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Post-Development 25-year

Return Event: 25 years
Storm Event: 25-year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	4.0	4.1	4.1	4.1	4.1
18.000	4.1	4.1	4.1	4.1	4.1
18.500	4.1	4.1	4.1	4.1	4.2
19.000	4.2	4.2	4.2	4.2	4.2
19.500	4.2	4.2	4.2	4.2	4.2
20.000	4.2	4.2	4.2	4.2	4.2
20.500	4.3	4.3	4.3	4.3	4.3
21.000	4.3	4.3	4.3	4.3	4.3
21.500	4.3	4.3	4.3	4.3	4.3
22.000	4.3	4.3	4.3	4.4	4.4
22.500	4.4	4.4	4.4	4.4	4.4
23.000	4.4	4.4	4.4	4.4	4.4
23.500	4.4	4.4	4.4	4.4	4.4
24.000	4.4	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: 25-year	
Label	25-year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	25 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.3	0.3	0.3	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.3	0.3	0.3	0.3	0.3
6.000	0.4	0.4	0.4	0.4	0.4
6.500	0.4	0.4	0.4	0.4	0.4
7.000	0.4	0.4	0.5	0.5	0.5
7.500	0.5	0.5	0.5	0.5	0.5
8.000	0.5	0.5	0.6	0.6	0.6
8.500	0.6	0.6	0.6	0.6	0.6
9.000	0.7	0.7	0.7	0.7	0.7
9.500	0.7	0.7	0.8	0.8	0.8
10.000	0.8	0.8	0.8	0.9	0.9
10.500	0.9	0.9	1.0	1.0	1.0
11.000	1.0	1.1	1.1	1.2	1.2
11.500	1.3	1.4	1.6	1.9	2.5
12.000	2.9	3.0	3.1	3.2	3.2
12.500	3.3	3.3	3.3	3.4	3.4
13.000	3.4	3.5	3.5	3.5	3.5
13.500	3.5	3.6	3.6	3.6	3.6
14.000	3.6	3.7	3.7	3.7	3.7
14.500	3.7	3.7	3.7	3.8	3.8
15.000	3.8	3.8	3.8	3.8	3.8
15.500	3.9	3.9	3.9	3.9	3.9
16.000	3.9	3.9	3.9	3.9	3.9
16.500	4.0	4.0	4.0	4.0	4.0
17.000	4.0	4.0	4.0	4.0	4.0

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Pre-Development 25-year

Return Event: 25 years
Storm Event: 25-year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	4.0	4.1	4.1	4.1	4.1
18.000	4.1	4.1	4.1	4.1	4.1
18.500	4.1	4.1	4.1	4.1	4.2
19.000	4.2	4.2	4.2	4.2	4.2
19.500	4.2	4.2	4.2	4.2	4.2
20.000	4.2	4.2	4.2	4.2	4.2
20.500	4.3	4.3	4.3	4.3	4.3
21.000	4.3	4.3	4.3	4.3	4.3
21.500	4.3	4.3	4.3	4.3	4.3
22.000	4.3	4.3	4.3	4.4	4.4
22.500	4.4	4.4	4.4	4.4	4.4
23.000	4.4	4.4	4.4	4.4	4.4
23.500	4.4	4.4	4.4	4.4	4.4
24.000	4.4	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: 2-year	
Label	2-year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	2 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.0	0.0	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.1	0.1
4.500	0.1	0.1	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.2
6.500	0.2	0.2	0.2	0.2	0.3
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.3	0.3	0.3	0.3	0.3
8.000	0.3	0.3	0.3	0.3	0.3
8.500	0.3	0.4	0.4	0.4	0.4
9.000	0.4	0.4	0.4	0.4	0.4
9.500	0.4	0.4	0.4	0.5	0.5
10.000	0.5	0.5	0.5	0.5	0.5
10.500	0.5	0.6	0.6	0.6	0.6
11.000	0.6	0.6	0.7	0.7	0.7
11.500	0.7	0.8	0.9	1.1	1.5
12.000	1.7	1.8	1.8	1.9	1.9
12.500	1.9	2.0	2.0	2.0	2.0
13.000	2.0	2.0	2.1	2.1	2.1
13.500	2.1	2.1	2.1	2.1	2.1
14.000	2.2	2.2	2.2	2.2	2.2
14.500	2.2	2.2	2.2	2.2	2.2
15.000	2.2	2.3	2.3	2.3	2.3
15.500	2.3	2.3	2.3	2.3	2.3
16.000	2.3	2.3	2.3	2.3	2.3
16.500	2.3	2.3	2.4	2.4	2.4
17.000	2.4	2.4	2.4	2.4	2.4

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: 2-year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	2.4	2.4	2.4	2.4	2.4
18.000	2.4	2.4	2.4	2.4	2.4
18.500	2.4	2.4	2.5	2.5	2.5
19.000	2.5	2.5	2.5	2.5	2.5
19.500	2.5	2.5	2.5	2.5	2.5
20.000	2.5	2.5	2.5	2.5	2.5
20.500	2.5	2.5	2.5	2.5	2.5
21.000	2.5	2.5	2.5	2.5	2.6
21.500	2.6	2.6	2.6	2.6	2.6
22.000	2.6	2.6	2.6	2.6	2.6
22.500	2.6	2.6	2.6	2.6	2.6
23.000	2.6	2.6	2.6	2.6	2.6
23.500	2.6	2.6	2.6	2.6	2.6
24.000	2.6	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Pre-Development 2 year

Return Event: 2 years
Storm Event: 2-year

Time-Depth Curve: 2-year	
Label	2-year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	2 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.0	0.0	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.1	0.1	0.1
4.500	0.1	0.1	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.2	0.2
6.500	0.2	0.2	0.2	0.2	0.3
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.3	0.3	0.3	0.3	0.3
8.000	0.3	0.3	0.3	0.3	0.3
8.500	0.3	0.4	0.4	0.4	0.4
9.000	0.4	0.4	0.4	0.4	0.4
9.500	0.4	0.4	0.4	0.5	0.5
10.000	0.5	0.5	0.5	0.5	0.5
10.500	0.5	0.6	0.6	0.6	0.6
11.000	0.6	0.6	0.7	0.7	0.7
11.500	0.7	0.8	0.9	1.1	1.5
12.000	1.7	1.8	1.8	1.9	1.9
12.500	1.9	2.0	2.0	2.0	2.0
13.000	2.0	2.0	2.1	2.1	2.1
13.500	2.1	2.1	2.1	2.1	2.1
14.000	2.2	2.2	2.2	2.2	2.2
14.500	2.2	2.2	2.2	2.2	2.2
15.000	2.2	2.3	2.3	2.3	2.3
15.500	2.3	2.3	2.3	2.3	2.3
16.000	2.3	2.3	2.3	2.3	2.3
16.500	2.3	2.3	2.4	2.4	2.4
17.000	2.4	2.4	2.4	2.4	2.4

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Pre-Development 2 year

Return Event: 2 years
Storm Event: 2-year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	2.4	2.4	2.4	2.4	2.4
18.000	2.4	2.4	2.4	2.4	2.4
18.500	2.4	2.4	2.5	2.5	2.5
19.000	2.5	2.5	2.5	2.5	2.5
19.500	2.5	2.5	2.5	2.5	2.5
20.000	2.5	2.5	2.5	2.5	2.5
20.500	2.5	2.5	2.5	2.5	2.5
21.000	2.5	2.5	2.5	2.5	2.6
21.500	2.6	2.6	2.6	2.6	2.6
22.000	2.6	2.6	2.6	2.6	2.6
22.500	2.6	2.6	2.6	2.6	2.6
23.000	2.6	2.6	2.6	2.6	2.6
23.500	2.6	2.6	2.6	2.6	2.6
24.000	2.6	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: 50-year	
Label	50-year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	50 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.2	0.2	0.2
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.3	0.3	0.3
4.500	0.3	0.3	0.3	0.3	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.4	0.4	0.4	0.4	0.4
6.000	0.4	0.4	0.4	0.4	0.4
6.500	0.4	0.5	0.5	0.5	0.5
7.000	0.5	0.5	0.5	0.5	0.5
7.500	0.5	0.6	0.6	0.6	0.6
8.000	0.6	0.6	0.6	0.6	0.7
8.500	0.7	0.7	0.7	0.7	0.7
9.000	0.7	0.8	0.8	0.8	0.8
9.500	0.8	0.8	0.9	0.9	0.9
10.000	0.9	0.9	1.0	1.0	1.0
10.500	1.0	1.1	1.1	1.1	1.1
11.000	1.2	1.2	1.3	1.3	1.4
11.500	1.4	1.5	1.8	2.2	2.9
12.000	3.3	3.4	3.5	3.6	3.6
12.500	3.7	3.7	3.8	3.8	3.8
13.000	3.9	3.9	3.9	4.0	4.0
13.500	4.0	4.0	4.1	4.1	4.1
14.000	4.1	4.1	4.2	4.2	4.2
14.500	4.2	4.2	4.2	4.3	4.3
15.000	4.3	4.3	4.3	4.3	4.3
15.500	4.4	4.4	4.4	4.4	4.4
16.000	4.4	4.4	4.4	4.5	4.5
16.500	4.5	4.5	4.5	4.5	4.5
17.000	4.5	4.5	4.5	4.6	4.6

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Post-Development 50-year

Return Event: 50 years
Storm Event: 50-year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	4.6	4.6	4.6	4.6	4.6
18.000	4.6	4.6	4.6	4.6	4.7
18.500	4.7	4.7	4.7	4.7	4.7
19.000	4.7	4.7	4.7	4.7	4.7
19.500	4.7	4.8	4.8	4.8	4.8
20.000	4.8	4.8	4.8	4.8	4.8
20.500	4.8	4.8	4.8	4.8	4.8
21.000	4.8	4.8	4.9	4.9	4.9
21.500	4.9	4.9	4.9	4.9	4.9
22.000	4.9	4.9	4.9	4.9	4.9
22.500	4.9	4.9	4.9	5.0	5.0
23.000	5.0	5.0	5.0	5.0	5.0
23.500	5.0	5.0	5.0	5.0	5.0
24.000	5.0	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: 50-year	
Label	50-year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	50 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.2	0.2	0.2
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.3	0.3	0.3
4.500	0.3	0.3	0.3	0.3	0.3
5.000	0.3	0.3	0.3	0.3	0.3
5.500	0.4	0.4	0.4	0.4	0.4
6.000	0.4	0.4	0.4	0.4	0.4
6.500	0.4	0.5	0.5	0.5	0.5
7.000	0.5	0.5	0.5	0.5	0.5
7.500	0.5	0.6	0.6	0.6	0.6
8.000	0.6	0.6	0.6	0.6	0.7
8.500	0.7	0.7	0.7	0.7	0.7
9.000	0.7	0.8	0.8	0.8	0.8
9.500	0.8	0.8	0.9	0.9	0.9
10.000	0.9	0.9	1.0	1.0	1.0
10.500	1.0	1.1	1.1	1.1	1.1
11.000	1.2	1.2	1.3	1.3	1.4
11.500	1.4	1.5	1.8	2.2	2.9
12.000	3.3	3.4	3.5	3.6	3.6
12.500	3.7	3.7	3.8	3.8	3.8
13.000	3.9	3.9	3.9	4.0	4.0
13.500	4.0	4.0	4.1	4.1	4.1
14.000	4.1	4.1	4.2	4.2	4.2
14.500	4.2	4.2	4.2	4.3	4.3
15.000	4.3	4.3	4.3	4.3	4.3
15.500	4.4	4.4	4.4	4.4	4.4
16.000	4.4	4.4	4.4	4.5	4.5
16.500	4.5	4.5	4.5	4.5	4.5
17.000	4.5	4.5	4.5	4.6	4.6

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Pre-Development 50-year

Return Event: 50 years
Storm Event: 50-year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	4.6	4.6	4.6	4.6	4.6
18.000	4.6	4.6	4.6	4.6	4.7
18.500	4.7	4.7	4.7	4.7	4.7
19.000	4.7	4.7	4.7	4.7	4.7
19.500	4.7	4.8	4.8	4.8	4.8
20.000	4.8	4.8	4.8	4.8	4.8
20.500	4.8	4.8	4.8	4.8	4.8
21.000	4.8	4.8	4.9	4.9	4.9
21.500	4.9	4.9	4.9	4.9	4.9
22.000	4.9	4.9	4.9	4.9	4.9
22.500	4.9	4.9	4.9	5.0	5.0
23.000	5.0	5.0	5.0	5.0	5.0
23.500	5.0	5.0	5.0	5.0	5.0
24.000	5.0	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: 5-year	
Label	5-year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	5 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.2	0.2	0.3
6.000	0.3	0.3	0.3	0.3	0.3
6.500	0.3	0.3	0.3	0.3	0.3
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.4	0.4	0.4	0.4	0.4
8.000	0.4	0.4	0.4	0.4	0.4
8.500	0.4	0.4	0.4	0.5	0.5
9.000	0.5	0.5	0.5	0.5	0.5
9.500	0.5	0.5	0.5	0.6	0.6
10.000	0.6	0.6	0.6	0.6	0.6
10.500	0.7	0.7	0.7	0.7	0.7
11.000	0.8	0.8	0.8	0.8	0.9
11.500	0.9	1.0	1.1	1.4	1.8
12.000	2.1	2.2	2.3	2.3	2.3
12.500	2.4	2.4	2.4	2.5	2.5
13.000	2.5	2.5	2.5	2.6	2.6
13.500	2.6	2.6	2.6	2.6	2.6
14.000	2.7	2.7	2.7	2.7	2.7
14.500	2.7	2.7	2.7	2.7	2.8
15.000	2.8	2.8	2.8	2.8	2.8
15.500	2.8	2.8	2.8	2.8	2.8
16.000	2.9	2.9	2.9	2.9	2.9
16.500	2.9	2.9	2.9	2.9	2.9
17.000	2.9	2.9	2.9	2.9	2.9

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Post-Development 5-year

Return Event: 5 years
Storm Event: 5-year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	3.0	3.0	3.0	3.0	3.0
18.000	3.0	3.0	3.0	3.0	3.0
18.500	3.0	3.0	3.0	3.0	3.0
19.000	3.0	3.0	3.0	3.1	3.1
19.500	3.1	3.1	3.1	3.1	3.1
20.000	3.1	3.1	3.1	3.1	3.1
20.500	3.1	3.1	3.1	3.1	3.1
21.000	3.1	3.1	3.1	3.1	3.1
21.500	3.1	3.1	3.2	3.2	3.2
22.000	3.2	3.2	3.2	3.2	3.2
22.500	3.2	3.2	3.2	3.2	3.2
23.000	3.2	3.2	3.2	3.2	3.2
23.500	3.2	3.2	3.2	3.2	3.2
24.000	3.2	(N/A)	(N/A)	(N/A)	(N/A)

Time-Depth Curve: 5-year	
Label	5-year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	5 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.2	0.2	0.3
6.000	0.3	0.3	0.3	0.3	0.3
6.500	0.3	0.3	0.3	0.3	0.3
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.4	0.4	0.4	0.4	0.4
8.000	0.4	0.4	0.4	0.4	0.4
8.500	0.4	0.4	0.4	0.5	0.5
9.000	0.5	0.5	0.5	0.5	0.5
9.500	0.5	0.5	0.5	0.6	0.6
10.000	0.6	0.6	0.6	0.6	0.6
10.500	0.7	0.7	0.7	0.7	0.7
11.000	0.8	0.8	0.8	0.8	0.9
11.500	0.9	1.0	1.1	1.4	1.8
12.000	2.1	2.2	2.3	2.3	2.3
12.500	2.4	2.4	2.4	2.5	2.5
13.000	2.5	2.5	2.5	2.6	2.6
13.500	2.6	2.6	2.6	2.6	2.6
14.000	2.7	2.7	2.7	2.7	2.7
14.500	2.7	2.7	2.7	2.7	2.8
15.000	2.8	2.8	2.8	2.8	2.8
15.500	2.8	2.8	2.8	2.8	2.8
16.000	2.9	2.9	2.9	2.9	2.9
16.500	2.9	2.9	2.9	2.9	2.9
17.000	2.9	2.9	2.9	2.9	2.9

Subsection: Time-Depth Curve
Label: Time-Depth - 1
Scenario: Pre-Development 5-year

Return Event: 5 years
Storm Event: 5-year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	3.0	3.0	3.0	3.0	3.0
18.000	3.0	3.0	3.0	3.0	3.0
18.500	3.0	3.0	3.0	3.0	3.0
19.000	3.0	3.0	3.0	3.1	3.1
19.500	3.1	3.1	3.1	3.1	3.1
20.000	3.1	3.1	3.1	3.1	3.1
20.500	3.1	3.1	3.1	3.1	3.1
21.000	3.1	3.1	3.1	3.1	3.1
21.500	3.1	3.1	3.2	3.2	3.2
22.000	3.2	3.2	3.2	3.2	3.2
22.500	3.2	3.2	3.2	3.2	3.2
23.000	3.2	3.2	3.2	3.2	3.2
23.500	3.2	3.2	3.2	3.2	3.2
24.000	3.2	(N/A)	(N/A)	(N/A)	(N/A)

Storm Event	1-year
Return Event	1 years
Duration	24.000 hours
Depth	2.2 in
Time of Concentration (Composite)	0.100 hours
Area (User Defined)	9.060 acres

Computational Time Increment	0.013 hours
Time to Peak (Computed)	11.933 hours
Flow (Peak, Computed)	16.52 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	16.25 ft³/s

Drainage Area	
SCS CN (Composite)	89.000
Area (User Defined)	9.060 acres
Maximum Retention (Pervious)	1.2 in
Maximum Retention (Pervious, 20 percent)	0.2 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.2 in
Runoff Volume (Pervious)	0.903 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.902 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.100 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	102.65 ft³/s

Subsection: Unit Hydrograph Summary
Label: Basin DA
Scenario: Post-Development 1-year

Return Event: 1 years
Storm Event: 1-year

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.067 hours
Unit receding limb, Tr	0.267 hours
Total unit time, Tb	0.333 hours

Storm Event	1-year
Return Event	1 years
Duration	24.000 hours
Depth	2.2 in
Time of Concentration (Composite)	0.705 hours
Area (User Defined)	9.060 acres

Computational Time Increment	0.094 hours
Time to Peak (Computed)	12.314 hours
Flow (Peak, Computed)	7.79 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.300 hours
Flow (Peak Interpolated Output)	7.74 ft³/s

Drainage Area	
SCS CN (Composite)	90.000
Area (User Defined)	9.060 acres
Maximum Retention (Pervious)	1.1 in
Maximum Retention (Pervious, 20 percent)	0.2 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.3 in
Runoff Volume (Pervious)	0.956 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.947 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.705 hours
Computational Time Increment	0.094 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	14.56 ft³/s

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.470 hours
Unit receding limb, Tr	1.880 hours
Total unit time, Tb	2.350 hours

Storm Event	1-year
Return Event	1 years
Duration	24.000 hours
Depth	2.2 in
Time of Concentration (Composite)	0.084 hours
Area (User Defined)	4.990 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	11.928 hours
Flow (Peak, Computed)	9.37 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.900 hours
Flow (Peak Interpolated Output)	8.96 ft³/s

Drainage Area	
SCS CN (Composite)	89.000
Area (User Defined)	4.990 acres
Maximum Retention (Pervious)	1.2 in
Maximum Retention (Pervious, 20 percent)	0.2 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.2 in
Runoff Volume (Pervious)	0.497 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.497 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.084 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	67.31 ft³/s

Subsection: Unit Hydrograph Summary
Label: Offsite
Scenario: Post-Development 1-year

Return Event: 1 years
Storm Event: 1-year

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.224 hours
Total unit time, Tb	0.280 hours

Storm Event	1-year
Return Event	1 years
Duration	24.000 hours
Depth	2.2 in
Time of Concentration (Composite)	0.084 hours
Area (User Defined)	4.990 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	11.928 hours
Flow (Peak, Computed)	7.36 ft³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	7.10 ft³/s

Drainage Area	
SCS CN (Composite)	85.000
Area (User Defined)	4.990 acres
Maximum Retention (Pervious)	1.8 in
Maximum Retention (Pervious, 20 percent)	0.4 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.9 in
Runoff Volume (Pervious)	0.393 ac-ft

Hydrograph Volume (Area under Hydrograph curve)	
Volume	0.392 ac-ft

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.084 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	67.31 ft³/s

Subsection: Unit Hydrograph Summary
Label: Offsite
Scenario: Pre-Development 1-year

Return Event: 1 years
Storm Event: 1-year

SCS Unit Hydrograph Parameters	
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.224 hours
Total unit time, Tb	0.280 hours

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
Outlet-1	PO-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-1	0.212	19.950	0.22
Flow (In)	O-1	0.212	19.950	0.22

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Basin DA

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Basin DA	0.947	12.300	7.74
Flow (In)	O-1	0.947	12.300	7.74

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
Outlet-1	PO-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-1	0.320	16.500	0.45
Flow (In)	O-1	0.320	16.500	0.45

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Basin DA

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Basin DA	1.232	12.300	10.08
Flow (In)	O-1	1.232	12.300	10.08

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
Outlet-1	PO-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-1	0.726	12.850	1.88
Flow (In)	O-1	0.726	12.850	1.88

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Basin DA

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Basin DA	1.651	12.300	13.45
Flow (In)	O-1	1.651	12.300	13.45

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
Outlet-1	PO-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-1	1.070	12.400	3.94
Flow (In)	O-1	1.070	12.400	3.94

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Basin DA

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Basin DA	2.001	12.300	16.24
Flow (In)	O-1	2.001	12.300	16.24

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
Outlet-1	PO-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-1	1.562	12.200	7.47
Flow (In)	O-1	1.562	12.200	7.47

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Basin DA

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Basin DA	2.500	12.300	20.14
Flow (In)	O-1	2.500	12.300	20.14

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
Outlet-1	PO-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-1	1.975	12.150	10.49
Flow (In)	O-1	1.975	12.150	10.49

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Basin DA

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Basin DA	2.918	12.300	23.37
Flow (In)	O-1	2.918	12.300	23.37

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
Outlet-1	PO-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-1	2.414	12.150	13.56
Flow (In)	O-1	2.414	12.150	13.56

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Basin DA

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Basin DA	3.360	12.300	26.76
Flow (In)	O-1	3.360	12.300	26.76

Summary for Hydrograph Addition at 'O-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Offsite

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Offsite	0.497	11.900	8.96
Flow (In)	O-2	0.497	11.900	8.96

Summary for Hydrograph Addition at 'O-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Offsite

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Offsite	0.392	11.950	7.10
Flow (In)	O-2	0.392	11.950	7.10

Summary for Hydrograph Addition at 'O-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Offsite

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Offsite	0.652	11.900	11.78
Flow (In)	O-2	0.652	11.900	11.78

Summary for Hydrograph Addition at 'O-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Offsite

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Offsite	0.533	11.950	9.64
Flow (In)	O-2	0.533	11.950	9.64

Summary for Hydrograph Addition at 'O-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Offsite

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Offsite	0.880	11.900	15.85
Flow (In)	O-2	0.880	11.900	15.85

Summary for Hydrograph Addition at 'O-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Offsite

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Offsite	0.744	11.900	13.43
Flow (In)	O-2	0.744	11.900	13.43

Summary for Hydrograph Addition at 'O-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Offsite

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Offsite	1.072	11.900	19.22
Flow (In)	O-2	1.072	11.900	19.22

Summary for Hydrograph Addition at 'O-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Offsite

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	Offsite	0.925	11.900	16.71
Flow (In)	O-2	0.925	11.900	16.71

Summary for Hydrograph Addition at 'O-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Offsite

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Offsite	1.345	11.900	23.95
Flow (In)	O-2	1.345	11.900	23.95

Summary for Hydrograph Addition at 'O-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Offsite

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Offsite	1.186	11.900	21.38
Flow (In)	O-2	1.186	11.900	21.38

Summary for Hydrograph Addition at 'O-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Offsite

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Offsite	1.575	11.900	27.87
Flow (In)	O-2	1.575	11.900	27.87

Summary for Hydrograph Addition at 'O-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Offsite

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Offsite	1.407	11.900	25.29
Flow (In)	O-2	1.407	11.900	25.29

Summary for Hydrograph Addition at 'O-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Offsite

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Offsite	1.819	11.900	31.98
Flow (In)	O-2	1.819	11.900	31.98

Summary for Hydrograph Addition at 'O-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	Offsite

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	Offsite	1.643	11.900	29.41
Flow (In)	O-2	1.643	11.900	29.41

Subsection: Elevation-Area Volume Curve
Label: PO-1
Scenario: Post-Development 1-year

Return Event: 1 years
Storm Event: 1-year

Elevation (ft)	Planimeter (ft²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
942.00	0.0	0.081	0.000	0.000	0.000
943.00	0.0	0.217	0.431	0.144	0.144
943.25	0.0	0.583	1.156	0.096	0.240
944.00	0.0	0.644	1.839	0.460	0.700
945.00	0.0	0.726	2.054	0.685	1.384
946.00	0.0	0.811	2.305	0.768	2.153
946.50	0.0	0.855	2.498	0.416	2.569

Requested Pond Water Surface Elevations	
Minimum (Headwater)	943.25 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	946.50 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	Culvert - 1	943.25	946.50
Rectangular Weir	Weir - 1	Forward	Culvert - 1	944.26	946.50
Culvert-Circular	Culvert - 1	Forward	TW	943.25	946.50
Tailwater Settings	Tailwater			(N/A)	(N/A)

Subsection: Outlet Input Data
Label: Composite Outlet Structure - 1
Scenario: Post-Development 1-year

Return Event: 1 years
Storm Event: 1-year

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	24.0 in
Length	30.00 ft
Length (Computed Barrel)	30.00 ft
Slope (Computed)	0.008 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	0.000
T2 ratio (HW/D)	1.193
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	943.25 ft	T1 Flow	15.55 ft³/s
T2 Elevation	945.64 ft	T2 Flow	17.77 ft³/s

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	943.25 ft
Orifice Diameter	3.5 in
Orifice Coefficient	0.600

Structure ID: Weir - 1 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	944.26 ft
Weir Length	6.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Subsection: Level Pool Pond Routing Summary
Label: PO-1 (IN)
Scenario: Post-Development 1-year

Return Event: 1 years
Storm Event: 1-year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	942.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	16.25 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	0.22 ft³/s	Time to Peak (Flow, Outlet)	19.950 hours

Elevation (Water Surface, Peak)	943.99 ft
Volume (Peak)	0.694 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.902 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.212 ac-ft
Volume (Retained)	0.687 ac-ft
Volume (Unrouted)	-0.003 ac-ft
Error (Mass Balance)	0.4 %

Subsection: Level Pool Pond Routing Summary
Label: PO-1 (IN)
Scenario: Post-Development 2 year

Return Event: 2 years
Storm Event: 2-year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	942.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	21.18 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	0.45 ft³/s	Time to Peak (Flow, Outlet)	16.500 hours

Elevation (Water Surface, Peak)	944.28 ft
Volume (Peak)	0.880 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	1.183 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.320 ac-ft
Volume (Retained)	0.861 ac-ft
Volume (Unrouted)	-0.001 ac-ft
Error (Mass Balance)	0.1 %

Subsection: Level Pool Pond Routing Summary
Label: PO-1 (IN)
Scenario: Post-Development 5-year

Return Event: 5 years
Storm Event: 5-year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	942.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	28.29 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	1.88 ft³/s	Time to Peak (Flow, Outlet)	12.850 hours

Elevation (Water Surface, Peak)	944.41 ft
Volume (Peak)	0.968 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	1.597 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.726 ac-ft
Volume (Retained)	0.870 ac-ft
Volume (Unrouted)	-0.001 ac-ft
Error (Mass Balance)	0.1 %

Subsection: Level Pool Pond Routing Summary
Label: PO-1 (IN)
Scenario: Post-Development 10--year

Return Event: 10 years
Storm Event: 10-year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	942.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	34.14 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	3.94 ft³/s	Time to Peak (Flow, Outlet)	12.400 hours

Elevation (Water Surface, Peak)	944.60 ft
Volume (Peak)	1.098 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	1.945 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	1.070 ac-ft
Volume (Retained)	0.873 ac-ft
Volume (Unrouted)	-0.002 ac-ft
Error (Mass Balance)	0.1 %

Subsection: Level Pool Pond Routing Summary
Label: PO-1 (IN)
Scenario: Post-Development 25-year

Return Event: 25 years
Storm Event: 25-year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	942.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	42.34 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	7.47 ft³/s	Time to Peak (Flow, Outlet)	12.200 hours

Elevation (Water Surface, Peak)	944.92 ft
Volume (Peak)	1.324 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	2.442 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	1.562 ac-ft
Volume (Retained)	0.878 ac-ft
Volume (Unrouted)	-0.002 ac-ft
Error (Mass Balance)	0.1 %

Subsection: Level Pool Pond Routing Summary
Label: PO-1 (IN)
Scenario: Post-Development 50-year

Return Event: 50 years
Storm Event: 50-year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	942.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	49.12 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	10.49 ft³/s	Time to Peak (Flow, Outlet)	12.150 hours

Elevation (Water Surface, Peak)	945.19 ft
Volume (Peak)	1.525 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	2.859 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	1.975 ac-ft
Volume (Retained)	0.881 ac-ft
Volume (Unrouted)	-0.002 ac-ft
Error (Mass Balance)	0.1 %

Subsection: Level Pool Pond Routing Summary
Label: PO-1 (IN)
Scenario: Post-Development 100-year

Return Event: 100 years
Storm Event: 100-year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	942.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	56.22 ft³/s	Time to Peak (Flow, In)	11.950 hours
Flow (Peak Outlet)	13.56 ft³/s	Time to Peak (Flow, Outlet)	12.150 hours

Elevation (Water Surface, Peak)	945.47 ft
Volume (Peak)	1.731 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	3.301 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	2.414 ac-ft
Volume (Retained)	0.885 ac-ft
Volume (Unrouted)	-0.003 ac-ft
Error (Mass Balance)	0.1 %

Index

Outlet Structure and Emergency Spillway

Emergency Spillway

Project Description

Solve For	Headwater Elevation

Input Data

Discharge		56.22	ft³/s
Crest Elevation		945.50	ft
Tailwater Elevation		945.50	ft
Crest Surface Type	Gravel		
Crest Breadth		5.00	ft
Crest Length		30.00	ft

Results

Headwater Elevation	946.25	ft
Headwater Height Above Crest	0.75	ft
Tailwater Height Above Crest	0.00	ft
Weir Coefficient	2.95	US
Submergence Factor	1.00	
Adjusted Weir Coefficient	2.95	US
Flow Area	22.50	ft²
Velocity	2.50	ft/s
Wetted Perimeter	31.50	ft
Top Width	30.00	ft

Outlet Structure Discharge Pipe

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00800	ft/ft
Diameter	2.00	ft
Discharge	13.55	ft^3/s

Results

Normal Depth	1.20	ft
Flow Area	1.96	ft^2
Wetted Perimeter	3.54	ft
Hydraulic Radius	0.55	ft
Top Width	1.96	ft
Critical Depth	1.33	ft
Percent Full	59.9	%
Critical Slope	0.00594	ft/ft
Velocity	6.90	ft/s
Velocity Head	0.74	ft
Specific Energy	1.94	ft
Froude Number	1.22	
Maximum Discharge	21.76	ft^3/s
Discharge Full	20.23	ft^3/s
Slope Full	0.00359	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	59.88	%
Downstream Velocity	Infinity	ft/s

Outlet Structure Discharge Pipe

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.20	ft
Critical Depth	1.33	ft
Channel Slope	0.00800	ft/ft
Critical Slope	0.00594	ft/ft

APPENDIX D

Soils Information

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Franklin County, Ohio

November 27, 2019

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

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

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

Soil Map

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

Custom Soil Resource Report
Soil Map

Map Scale: 1:3,860 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Franklin County, Ohio
Survey Area Data: Version 18, Sep 16, 2019

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

Date(s) aerial images were photographed: Nov 12, 2009—Dec 26, 2016

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ko	Kokomo silty clay loam, 0 to 2 percent slopes	8.8	21.8%
LeB	Lewisburg-Crosby complex, 2 to 6 percent slopes	31.5	78.2%
Totals for Area of Interest		**40.2**	**100.0%**

Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

Franklin County, Ohio

Ko—Kokomo silty clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2rwj8
Elevation: 820 to 1,140 feet
Mean annual precipitation: 37 to 46 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 145 to 180 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Kokomo

Setting

Landform: Depressions on till plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy glaciofluvial deposits derived from sedimentary rock over loamy till derived from limestone and dolomite

Typical profile

Ap - 0 to 11 inches: silty clay loam
Btg - 11 to 41 inches: clay loam
Bt - 41 to 64 inches: clay loam
2C - 64 to 79 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 35 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Celina

Percent of map unit: 5 percent
Landform: Till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Crosby

Percent of map unit: 5 percent
Landform: Till plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

LeB—Lewisburg-Crosby complex, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 5mqh
Elevation: 600 to 1,200 feet
Mean annual precipitation: 33 to 45 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 140 to 195 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lewisburg and similar soils: 45 percent
Crosby and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lewisburg

Setting

Landform: Till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

H1 - 0 to 6 inches: silt loam
H2 - 6 to 16 inches: silty clay loam
H3 - 16 to 70 inches: loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 24 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 47 percent
Available water storage in profile: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Crosby

Setting

Landform: Till plains
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy till

Typical profile

H1 - 0 to 9 inches: silt loam
H2 - 9 to 31 inches: silty clay loam
H3 - 31 to 70 inches: loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 12 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Available water storage in profile: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Forage suitability group: Unnamed (G111AYC-1OH)
Hydric soil rating: No

Minor Components

Kokomo

Percent of map unit: 15 percent
Landform: Depressions

Hydric soil rating: Yes

Eroded areas with a clay loam surface layer

Percent of map unit:

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APPENDIX E

Construction Plans

DWG. NO. E-1302

AMERICAN ELECTRIC POWER
HAYDEN STATION

7210 HAYDEN RUN ROAD
AMLIN, OH 43002
FRANKLIN COUNTY
W.O.# 42886024-02

ISSUED FOR CONSTRUCTION

OWNER / APPLICANT

AMERICAN ELECTRIC POWER
8800 SMITHS MILL ROAD
NEW ALBANY, OHIO 43054
PROJECT ENGINEER: MATTHEW PANZITTA
PHONE: (380) 208-5114

ENGINEER

ms consultants, inc.
2221 SCHROCK ROAD
COLUMBUS, OHIO 43229
PHONE: (614) 898-7100

SURVEYOR

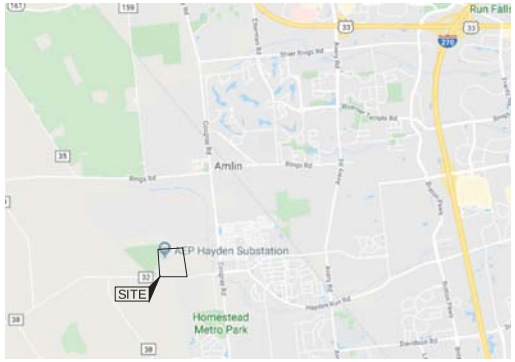
CENTRAL SURVEYING CO., LTD.
7563 EAST MAIN STREET
REYNOLDSBURG, OHIO 43068

FLOOD INFORMATION

BY GRAPHICAL PLOTTING ONLY, THIS SITE IS SITUATED IN FLOOD ZONE X - PER FEMA FIRM MAP #39049C0130K, EFFECTIVE JUNE 17, 2008, AND FIRM MAP #39049C0137K, EFFECTIVE JUNE 17, 2008.

SHEET INDEX

VICINITY MAP
N.T.S.



LOCATION MAP
N.T.S.

SITE COORDINATES:
LATITUDE: 40°03'39.66" N
LONGITUDE: 83°11'37.49" W

GENERAL NOTES:

A. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE APPROPRIATE SECTION OF THE AEP "TECHNICAL SPECIFICATION FOR SUBSTATION AND SWITCHING STATION CONSTRUCTION" #SS-180102 ("SPECIFICATION") AND "SITE PREPARATION GUIDELINES" #SS-710000.
B. THE EARTHWORK QUANTITIES SHOWN BELOW ARE BASED ON STRIPPING TOPSOIL TO A DEPTH OF 1.2" WITHIN THE CONSTRUCTION LIMITS. THE ACTUAL DEPTH OF STRIPPING MAY INCREASE OR DECREASE UNDER THE STATION PAD DEPENDING ON ACTUAL SITE CONDITIONS.
C. ALL SOFT, WET, ORGANIC, OR OTHERWISE UNSUITABLE MATERIAL SHALL BE REMOVED AND REPLACED IN ACCORDANCE WITH THE "SPECIFICATION".
D. THE ELEVATIONS SHOWN FOR ALL GRADED AREAS ARE EARTH GRADE (TOP OF ODOT #304 STONE AGGREGATE) ELEVATIONS, UNLESS OTHERWISE NOTED. DRIVEWAY ELEVATIONS ARE BOTH TOP OF FINISHED SURFACE (TOP OF CONCRETE) AND TOP OF ADJACENT ODOT #304 STONE AGGREGATE). THE CONTOUR INTERVAL SHOWN IS ONE FOOT.
E. ALL DISTURBED AREAS THAT WILL NOT BE STONED SHALL BE SEEDED IN ACCORDANCE WITH THE "SPECIFICATION".
F. SIDE SLOPES SHALL BE A MAXIMUM OF THREE HORIZONTAL TO ONE VERTICAL UNLESS OTHERWISE NOTED.
G. THE STATION PAD AREA SHALL BE COVERED WITH 4 INCHES OF CRUSHED #57 STONE TO 4 FEET OUTSIDE THE STATION FENCE. (BY OTHERS)
H. ALL TREES AND SHRUBS LOCATED WITHIN THE CONSTRUCTION LIMITS SHALL BE REMOVED UNLESS NOTED TO REMAIN. ALL TREES AND SHRUBS ARE NOT SHOWN ON THE GRADING PLAN FOR CLARITY.
I. ALL DEBRIS SHALL BE REMOVED FROM THE SITE.
J. ALL GRADING WORK SHALL BE WITHIN PROPERTY LINES OR THE RIGHT-OF-WAY LINE. DO NOT DISTURB ADJACENT PROPERTY LINES.
K. CULVERTS SHALL BE INSTALLED IN ACCORDANCE WITH AEP "SPECIFICATION" AND ODOT, OHIO DEPARTMENT OF TRANSPORTATION SPECIFICATIONS.
L. CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTION AND MAINTENANCE OF ALL EROSION CONTROL MEASURES.
M. SCALES AS NOTED ON THE PLANS ARE FOR 30" X 44" SIZE SHEETS.
N. CONTRACTOR INITIATED CHANGES SHALL BE SUBMITTED IN WRITING TO THE OWNER'S REPRESENTATIVE FOR APPROVAL PRIOR TO FABRICATION OR CONSTRUCTION.
O. LOCATIONS OF ALL EXISTING UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. CONTRACTOR SHALL VERIFY ALL EXISTING UTILITY LOCATIONS PRIOR TO CONSTRUCTION. REPAIR OF ANY DAMAGED UTILITY SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. PRIOR TO EXCAVATION WORK, CONTRACTOR SHALL HAVE ALL UTILITIES MARKED IN THE FIELD.

STATION ESTIMATED QUANTITIES*

CONTRACTOR SHALL VERIFY ALL QUANTITIES DURING BID PHASE

STRIPPING (ASSUMING 1.2" TOPSOIL REMOVAL)	19,638	CY
6" OF TOPSOIL TO BE SPREAD IN AREAS TO BE SEEDED	6,141	CY
AASHTO #57 WASHED LIMESTONE AGGREGATE, 4" THICK FOR STATION PAD (BY OTHERS)	8,840	TONS
ODOT 304 BASE STONE, 8" THICK FOR STATION BASE	23,572	TONS
FENCE	3,465	LF
SECONDARY FENCE (BY OTHERS)	3,310	LF
SEEDING & MULCHING	36,700	SY
OUTLET CONTROL STRUCTURE	1	EA
24" CLASS III RCP PIPE	30	LF
24" CORRUGATED METAL PIPE	68	LF
6" ADS PERFORATED UNDERDRAIN PIPE	533	LF
6" ADS DW HDPE PIPE	267	LF
SILT FENCE	4,034	LF
ODOT TYPE C DUMP ROCK	775	CY
LEVEL SPREADER	1	LS

T-LINE EROSION CONTROL ESTIMATED QUANTITIES*

CONTRACTOR SHALL VERIFY ALL QUANTITIES DURING BID PHASE

TIMBER MATTING (INCLUDES ANTICIPATED ACCESS ROADS)	5,227	SY
FILTER SOCK	1,490	LF
PULL PADS	1,875	SY

* THE QUANTITIES LISTED HEREON ARE FOR ESTIMATING PURPOSES ONLY. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL ITEMS REQUIRED TO COMPLETE THE PROJECT.

SITE DATA

	SQ. FT.	ACRES
STATION CONSTRUCTION LIMITS / DISTURBED AREA	811,238	18.62
STATION PAD AREA	478,075	10.98
ACCESS DRIVE AREA	1,440	0.03

CUT/FILL QUANTITIES

	CUBIC YARDS
CUT	6,511
FILL	24,932
NET	22,421 (FILL)

NOTE: FILL QUANTITY DOES NOT INCLUDE #57 SURFACE COURSE OF STATION PAD

NO.	DATE	REVISION DESCRIPTION	DR	ENG	CK
1	3/27/20	UNDERDRAIN AND ACCESS GATE REVISIONS	SAZ	KPD	IA

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OLD DWG #: STD DWG #:

AMERICAN ELECTRIC POWER
HAYDEN STATION
COLUMBUS OHIO
345kV / 138kV / 13kV

COVER SHEET

SCALE: AS SHOWN	DR: ILK	END: IA	CH: IA
	WO#: 42886024	APPD:	DATE:
	1 RIVERSIDE PLAZA COLUMBUS, OH 43215	DWG. NO. E-1302	SHT. 1 OF 1

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AEP-S (30 X 42)

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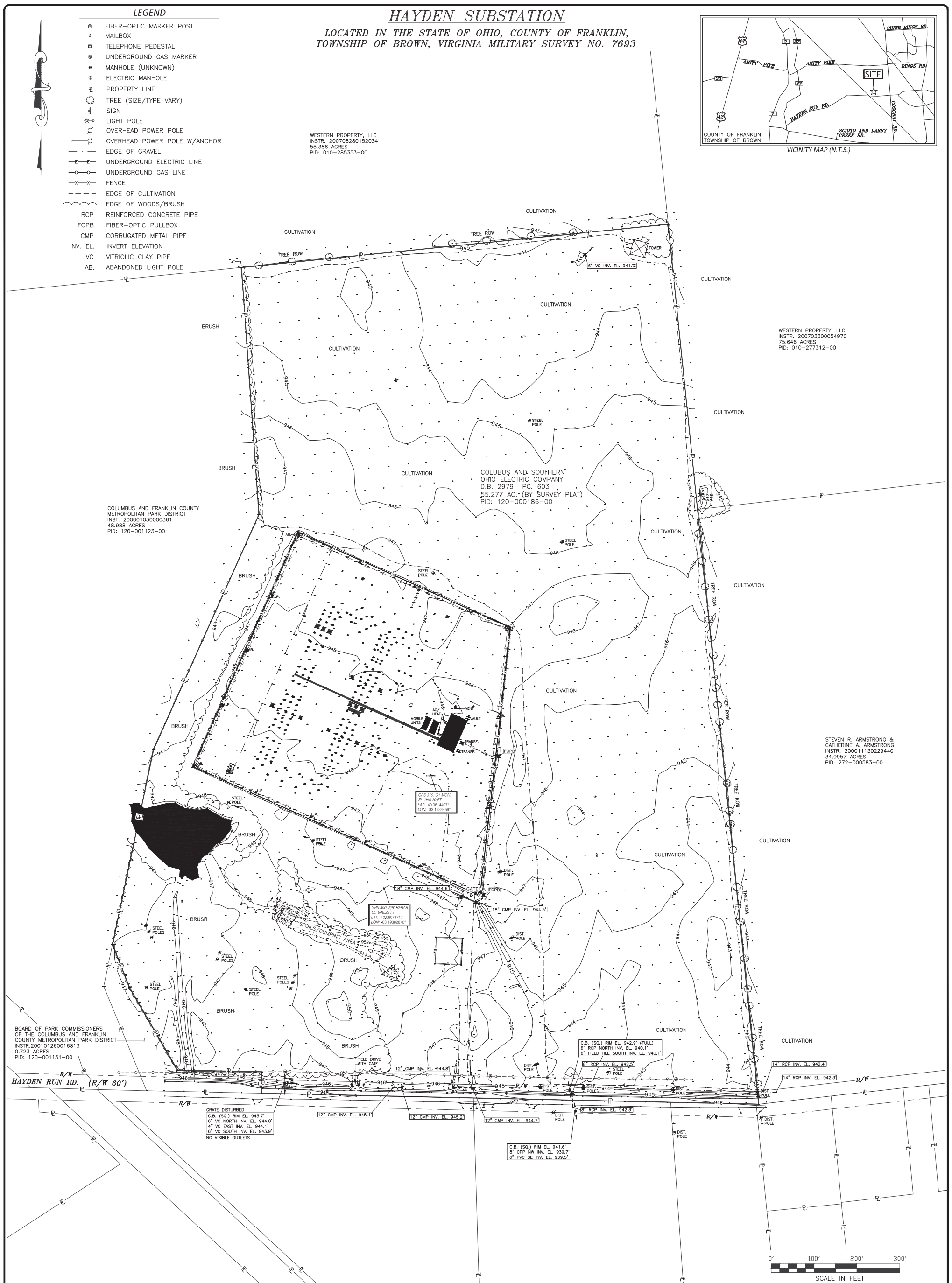
AMERICAN ELECTRIC POWER
HAYDEN STATION
345KV/138KV/13KV
EXISTING CONDITIONS
COLUMBUS, OHIO
DWG. NO. E-1303
REV. 1

HAYDEN SUBSTATION

LOCATED IN THE STATE OF OHIO, COUNTY OF FRANKLIN, TOWNSHIP OF BROWN, VIRGINIA MILITARY SURVEY NO. 7693

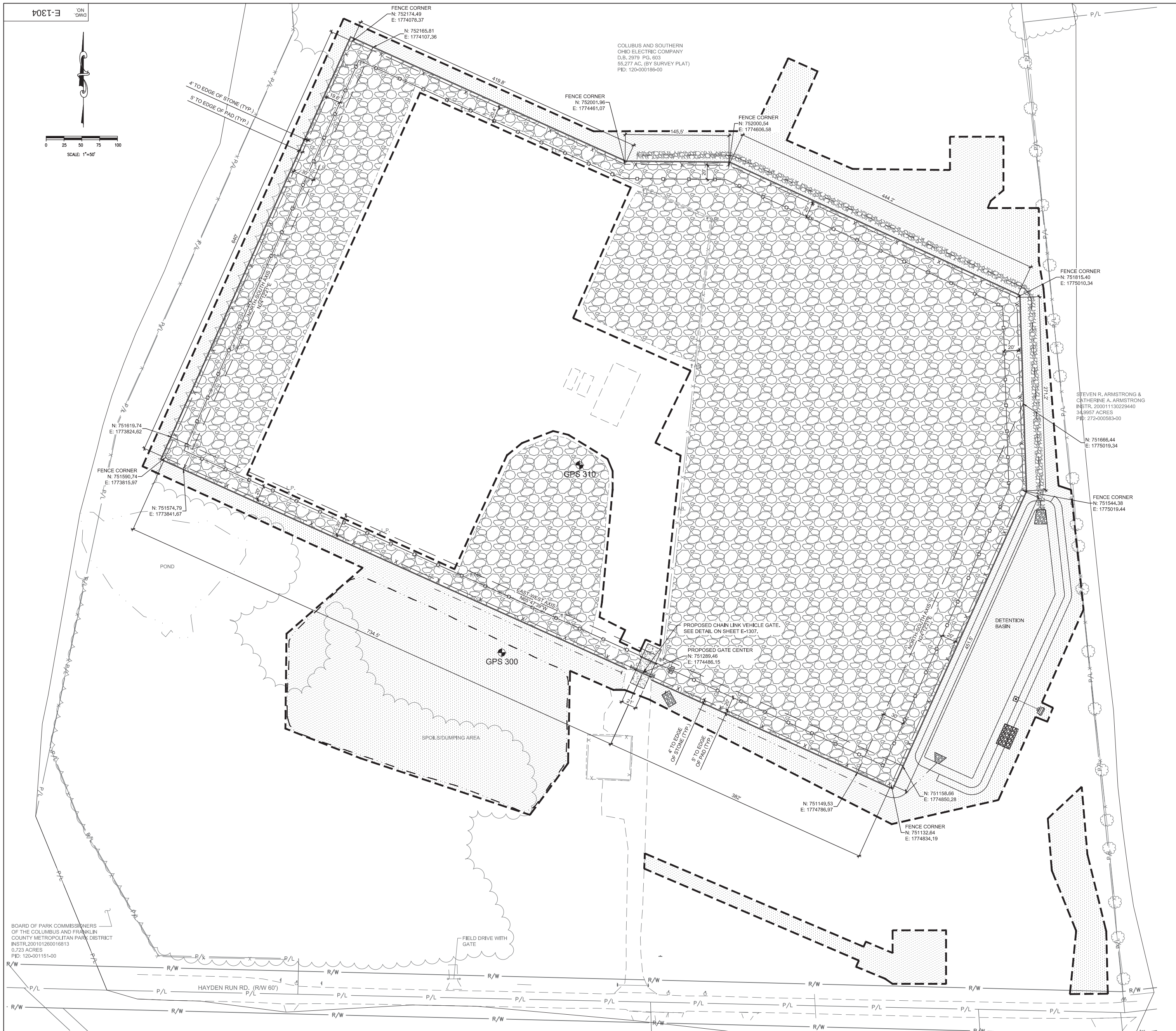


Central Surveying Co., Ltd.
7563 East Main Street
Reynoldsburg, Ohio 43068

FOR: OHIO POWER COMPANY
HAYDEN STATION

Drawn By: DS	Checked By: WW
Scale: 1"=100'	Date: 12/12/18
File Name: AEP20180918-HAYDEN	Drawing Number: 2018-0918
Revisions: -	

DWG. NO. E-1303



GENERAL NOTES:

A. FOR CONSTRUCTION NOTES, SEE AEP "TECHNICAL SPECIFICATIONS FOR SUBSTATION AND SWITCHING STATION CONSTRUCTION" #SS-160102

LEGEND

EXISTING	PROPOSED	DESCRIPTION
		CONSTRUCTION LIMITS
P/L		PROPERTY LINE
R/W		RIGHT-OF-WAY LINE
		SETBACK
	X	FENCE
		SECONDARY FENCE (BY GENERAL CONTRACTOR)
		UTILITY POLE
		POLE GUY
	OE	OVERHEAD ELECTRICAL LINE
T		UNDERGROUND TELEPHONE LINE
ST	ST	STORM LINE
		STORM STRUCTURE
608	608	CONTOUR
730.00 EX. / 729.67 EX.	730.00 / 729.67	FINISHED GRADE (TOP OF CONCRETE PAD) PAD GRADE (TOP OF ADJACENT BASE STONE)
730.00 EX.	730.00	PAD GRADE (TOP OF BASE STONE)
	1.00%	GRADE SLOPE
		MAJOR FLOOD ROUTING
	HP	HIGH POINT
	SF	SILT FENCE
		ORANGE BARRIER CONSTRUCTION FENCE
		INLET PROTECTION
		CONCRETE WASHOUT
		CONSTRUCTION ENTRANCE
		SEEDING AREA
		STONE PAD
		CONCRETE DRIVE
		EMERGENCY SPILLWAY / CHANNEL LINING
		AEP STANDARD PLASTIBETON CABLE TRENCH
		WETLANDS
		TIMBER MATTING / PULL PADS
		FILTER SOCK

BENCHMARKS:

GPS 300: 5/8" REBAR
ELEV: 948.22
LAT: 40.06071717°
LONG: -83.19382870°

GPS 310: G1 MON.
ELEV: 948.20
LAT: 40.0614407°
LONG: -83.1934459°

NO.	DATE	REVISION DESCRIPTION	DR	ENG	CK
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AMERICAN ELECTRIC POWER
HAYDEN STATION
COLUMBUS OHIO
345kV / 138kV / 13kV
SITE DIMENSION PLAN

SCALE: AS SHOWN	DR: LLK	ENG: IA	CH: IA
	WO#: 42886024	APPD:	DATE:
	1 RIVERSIDE PLAZA COLUMBUS, OH 43215	DWG. NO. E-1304	REV 1

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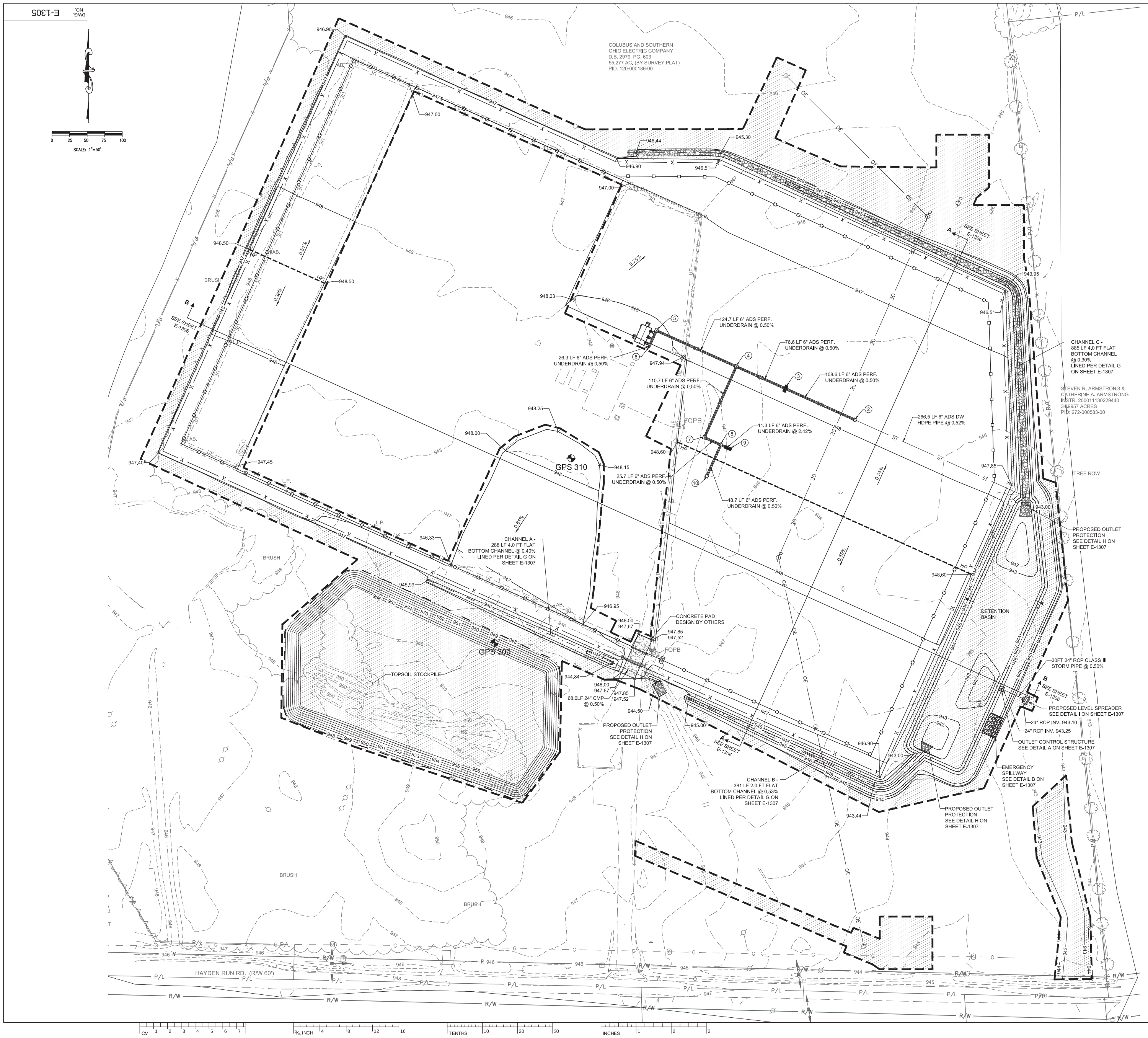
AEP G (30 X 46)



GENERAL NOTES:

A. FOR CONSTRUCTION NOTES, SEE AEP "TECHNICAL SPECIFICATIONS FOR SUBSTATION AND SWITCHING STATION CONSTRUCTION" #SS-160102

B. PAD SECTION CONSISTS OF 8" OF ODOT ITEM #304 WITH A SURFACE COURSE OF 4" OF #57 STONE (NOT BY GRADING CONTRACTOR). CONTOURS SHOWN IN THE PAD REFLECT TOP OF BASE STONE (#304) ELEVATIONS. ELEVATION CALLOUTS REFLECT TOP OF BASE STONE (#304).

C. ALL 6" STORM CONDUIT SHALL BE ADS DW HDPE PIPE OR APPROVED EQUAL UNLESS OTHERWISE NOTED.

D. CONTRACTOR TO ENSURE ANY UNEARTHED FIELD TILE LINES WILL MAINTAIN CONDUCTIVITY IN AND OUT OF THE PROPERTY TO NOT DISTURB DRAINAGE FOR SURROUNDING LANDOWNERS. CONTRACTOR TO ROUTE ANY TILES THAT CANNOT BE REPAIRED IN PLACE TO THE ON-SITE DETENTION BASIN.

STORM STRUCTURE DATA

1. PROPOSED PLAIN END PIPE 6" INV (W) = 943.03
2. PROPOSED CONNECTION 6" INV (E,W) = 944.41
3. PROPOSED CONNECTION 6" INV (E,W) = 944.96
4. PROPOSED TEE CONNECTION 6" INV (S,E,W) = 945.34
5. PROPOSED TEE CONNECTION 6" INV (S,E) = 945.97
6. PROPOSED END CONNECTION 6" INV (N) = 946.10
7. PROPOSED TEE CONNECTION 6" INV (N,E) = 945.93
8. PROPOSED TEE CONNECTION 6" INV (S,E,W) = 946.06
9. PROPOSED END CONNECTION 6" INV (W) = 946.33
10. PROPOSED END CONNECTION 6" INV (N) = 946.30

LEGEND

EXISTING	PROPOSED	DESCRIPTION
		CONSTRUCTION LIMITS
P/L		PROPERTY LINE
R/W		RIGHT-OF-WAY LINE
		SETBACK
	X	FENCE
		SECONDARY FENCE (BY GENERAL CONTRACTOR)
		UTILITY POLE
		POLE GUY
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ST	ST	STORM LINE
		STORM STRUCTURE
608	608	CONTOUR
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730.00 EX.	730.00	PAD GRADE (TOP OF BASE STONE)
	1.00%	GRADE SLOPE
		MAJOR FLOOD ROUTING
	HP	HIGH POINT
	SF	SILT FENCE
		ORANGE BARRIER CONSTRUCTION FENCE
		INLET PROTECTION
		CONCRETE WASHOUT
		CONSTRUCTION ENTRANCE
		SEEDING AREA
		STONE PAD
		CONCRETE DRIVE
		EMERGENCY SPILLWAY / CHANNEL LINING
		AEP STANDARD PLASTIBETON CABLE TRENCH
		WETLANDS
		TIMBER MATTING / PULL PADS
		FILTER SOCK

DETENTION POND

WQv REQUIRED	VOLUME PROVIDED AT ELEV. 944.26	TOTAL VOLUME AT OVERFLOW ELEV. 946.50
27,709 CU.FT.	27,709 CU. FT.	101,503 CU. FT.

BENCHMARKS:

GPS 300: 5/8" REBAR
ELEV: 948.22
LAT: 40.06071717°
LONG: -83.19382870°

GPS 310: G1 MON.
ELEV: 948.20
LAT: 40.0614407°
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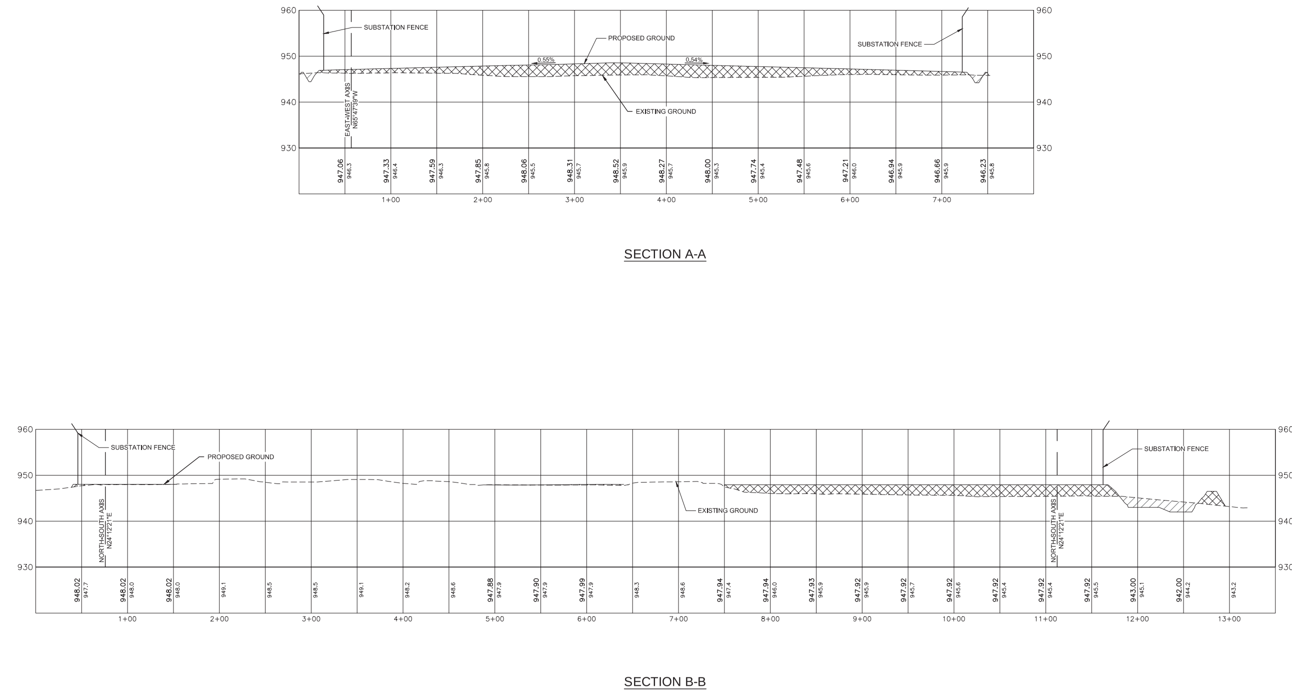
AMERICAN ELECTRIC POWER
HAYDEN STATION
COLUMBUS OHIO
345kV / 138kV / 13kV

GRADING AND DRAINAGE PLAN

SCALE: AS SHOWN | DR: LLK | ENG: IA | CH: IA
WO#: 42886024 | APPD: | DATE:
1 RIVERSIDE PLAZA COLUMBUS, OH 43215 | DWG. NO. E-1305 | REV 1

AEP G (30 X 46)



LEGEND

DESCRIPTION	
▨	CUT
▩	FILL

GENERAL NOTES:

A. PROPOSED GROUND ELEVATION SHOWN ARE FOR PAD GRADE (TOP OF #304 STONE) AND DO NOT INCLUDE THE TOP 4" OF #57 STONE.

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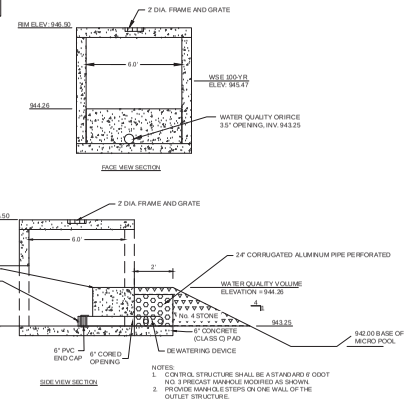
COLUMBUS OHIO
345kV / 138kV / 13kV
CROSS SECTIONS

SCALE: AS SHOWN	DR: LLK	ENG: IA	CH: IA
	WO#: 42886024	APPD:	DATE:
	1 RIVERSIDE PLAZA COLUMBUS, OH 43215	DWG. NO. E-1306	REV 1

SCALE: 1"=10'
SCALE: 1"=50'

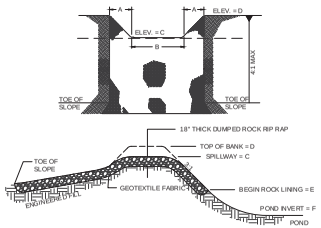
DWG. NO. E-1306

DWG. NO. E-1307



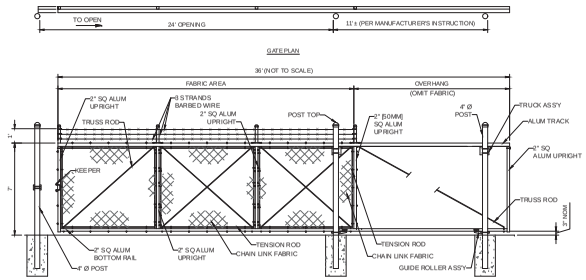
NOTES:
1. CONTROL STRUCTURE SHALL BE A STANDARD 6' ODOT NO. 3 PRECAST MANHOLE MODIFIED AS SHOWN.
2. PROVIDE MANHOLESTEPS ON ONE WALL OF THE OUTLET STRUCTURE.

BASIN OUTLET CONTROL STRUCTURE (A)
NTS



BASIN EMERGENCY SPILLWAY TABLE						
POND	A	B	C	D	E	F
DETENTION POND	1.5'	30'	945.50	946.50	944.50	943.25

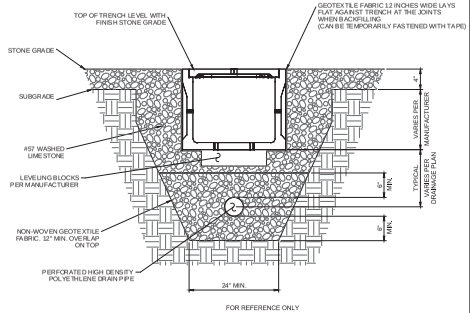
EMERGENCY SPILLWAY (B)
NTS



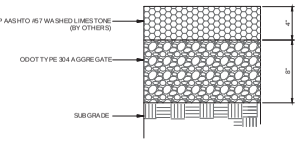
GATE ELEVATION - (3) BAYS SHOWN

NOTES: 1. FOOTING DESIGN PER MANUFACTURER. MINIMUM DIAMETER SHALL BE 16" WITH A MINIMUM DEPTH OF 42".

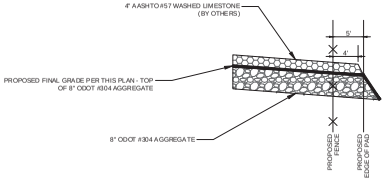
CHAIN LINK VEHICLE GATE (C)
NTS



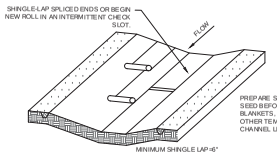
PLASTIBETON UNDER DRAIN (D)
NTS



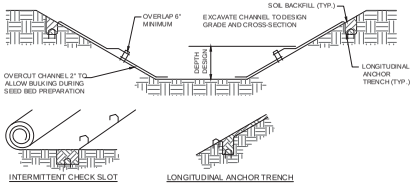
TYPICAL STATION PAD DETAIL (E)
NTS



TYPICAL EDGE OF STATION PAD (F)
NTS

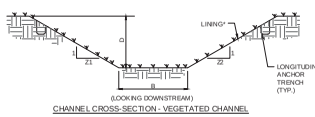


ISOMETRIC VIEW



INTERMITTENT CHECK SLOT

LONGITUDINAL ANCHOR TRENCH



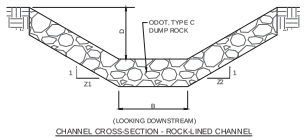
CHANNEL CROSS-SECTION - VEGETATED CHANNEL

* SEE MANUFACTURER'S LINING INSTALLATION DETAIL FOR STAPLE PATTERNS, AND VEGETATIVE STABILIZATION SPECIFICATIONS FOR SOIL AMENDMENTS, SEED MIXTURES, AND MULCHING INFORMATION.

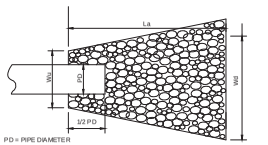
NOTES:
1. ANCHOR TRENCHES SHALL BE INSTALLED AT BEGINNING AND END OF CHANNEL IN THE SAME MANNER AS LONGITUDINAL ANCHOR TRENCHES.
2. CHANNEL DIMENSIONS SHALL BE CONSTANTLY MAINTAINED. CHANNEL SHALL BE CLEANED WHENEVER TOTAL CHANNEL DEPTH IS REDUCED BY 25% AT ANY LOCATION. SEDIMENT DEPOSITS SHALL BE REMOVED WITHIN 24 HOURS OF DISCOVERY OR AS SOON AS SOIL CONDITIONS PERMIT ACCESS TO THE CHANNEL WITHOUT FURTHER DAMAGE.
3. DAMAGED LINING SHALL BE REPAIRED OR REPLACED WITHIN 48 HOURS OF DISCOVERY.

SWALE SCHEDULE							
CHANNEL NUMBER	STATIONS	BOTTOM WIDTH B (FT)	TOP WIDTH W (FT)	DEPTH D (FT)	Z1 (FT)	Z2 (FT)	LINING*
A	ALL	4	VARIES	1.5	3	3	SC150
B	ALL	2	VARIES	2	3	3	SC150
C	ALL	4	VARIES	1 - 2	3	3	ROCK TYPE C

CHANNEL LINING (G)
NTS



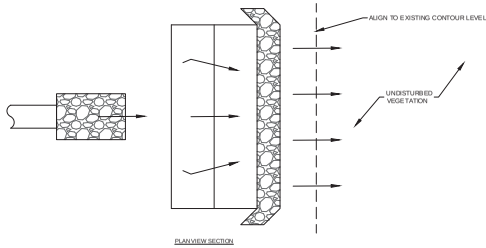
CHANNEL CROSS-SECTION - ROCK-LINED CHANNEL



OUTFALL	PD	La	Wu	Wd	t
DRIVEWAY CULVERT/ CHANNEL A	24"	20'	6'	22'	24"
CHANNEL B	N/A	12'	6'	18'	24"
CHANNEL C	N/A	20'	12	18'	24"

NOTES:
1. ALL APRONS SHALL BE CONSTRUCTED TO THE DIMENSIONS SHOWN. TERMINAL WIDTHS SHALL BE ADJUSTED AS NECESSARY TO MATCH RECEIVING CHANNELS.
2. ALL APRONS SHALL BE INSPECTED AT LEAST WEEKLY AND AFTER EACH RUNOFF EVENT. DISPLACED RIP RAP WITHIN THE APRON SHALL BE REPLACED IMMEDIATELY.
3. EXTEND RIP RAP ON BACK SIDE OF APRON TO AT LEAST 1.0' DEPTH OF PIPE ON BOTH SIDES TO PREVENT SCOUR AROUND THE PIPE.
4. RIP RAP ROCK SIZE SHALL BE 9"-18" AT LEAST 85% LARGER THAN 6" BUT LESS THAN 1.0' AND AT LEAST 50% LARGER THAN 9".

OUTLET PROTECTION (H)
NTS



LEVEL SPREADER DIMENSIONS		
LOCATION	W	ALLOWABLE FLOW
DETENTION BASIN OUTLET	20'	1.0-20 CFS

LEVEL SPREADER NOTES:
1. CONSTRUCT LEVEL SPREADER ON A LEVEL GRADE TO ENSURE UNIFORM SPREADING OF STORM RUNOFF.
2. LEVEL SPREADERS MUST BE CONSTRUCTED ON UNDISTURBED SOIL, NOT ON FILL.
3. THE LEVEL SPREADER MUST OUTLET TO EROSION-RESISTANT AREAS WITH ESTABLISHED EXISTING VEGETATION.
4. ROCK SHALL BE ODOT TYPE D WHERE 50% OF THE MATERIAL BY WEIGHT IS LARGER THAN 6 INCHES, AND 85% OF THE MATERIAL BY WEIGHT IS LARGER THAN 3 INCHES BUT LESS THAN 12 INCHES.
5. ROCK IN LEVEL SPREADER SHALL BE COMPACTED WITH AT LEAST TWO PASSES OF HEAVY MACHINERY TO PREVENT FURTHER SETTLING. SPREAD GRAVEL OR SOIL OVER TOP OF THE PLACED RIPRAP SURFACE TO FILL THE VOIDS AND INTERLOCK THE RIPRAP TOGETHER.
6. FERTILIZING, SEEDING, AND MULCHING SHALL CONFORM TO THE RECOMMENDATIONS IN THE APPLICABLE VEGETATIVE SPECIFICATION.

LEVEL SPREADER (I)
NTS

NO.	DATE	REVISION DESCRIPTION	DR	ENG	CK
1	3/27/20	UNDERDRAIN AND ACCESS GATE REVISIONS	SAZ	KPD	IA

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Columbus, OH 43229
phone (614) 898-7100
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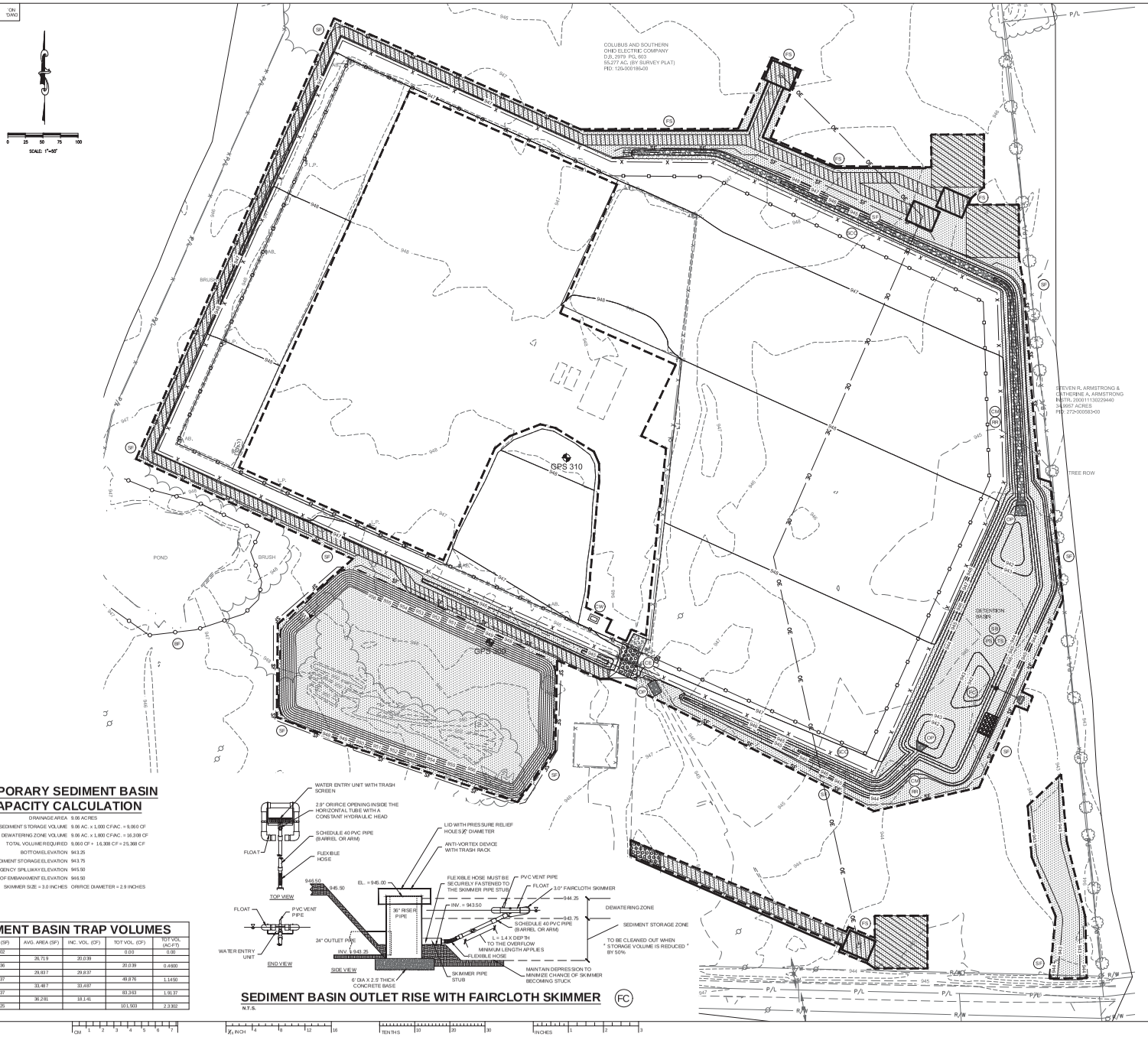
OLD DWG #: STD DWG #:

AMERICAN ELECTRIC POWER
HAYDEN STATION
COLUMBUS OHIO
3-69kV / 138kV / 13kV

SITE DETAILS

SCALE: AS SHOWN	DR: LLK	END: IA	CH: IA
	WO#: 420360.24	APPD:	DATE:
	1 RIVERSIDE PLAZA, COLUMBUS, OH 43215	DWG. NO. E-1307	R 1

DWG. NO. E-1308



GENERAL NOTES:

A. FOR CONSTRUCTION NOTES, SEE AEP "TECHNICAL SPECIFICATIONS FOR SUBSTATION AND SWITCHING STATION CONSTRUCTION" 4SS-1610.02

B. FINAL REMOVAL OF SEDIMENT BASINS SHALL TAKE PLACE AFTER UPSTREAM DRAINAGE AREAS ARE STABILIZED OR AS INDICATED IN PLANS. DEWATERING AND REMOVAL SHALL NOT CAUSE SEDIMENT TO BE DISCHARGED. THE SEDIMENT BASIN SITE AND SEDIMENT REMOVED SHALL BE STABILIZED AND GRADED AS INDICATED IN PLANS.

C. FINAL REMOVAL OF FAIRCLOTH SKIMMER SHALL TAKE PLACE AFTER UPSTREAM DRAINAGE AREAS AND DETENTION BASINS ARE STABILIZED OR AS INDICATED IN PLANS. PERMANENT OUTLET CONTROL STRUCTURE SHALL BE BROUGHT ONLINE UPON STABILIZATION OF DRAINAGE AREAS AND DETENTION BASINS.

D. CONTRACTOR TO ENSURE ANY UNEARTHED FIELD TILE LINES WILL MAINTAIN CONDUCTIVITY IN AND OUT OF THE PROPERTY TO NOT DISTURB DRAINAGE FOR SURROUNDING LANDOWNERS. CONTRACTOR TO ROUTE ANY TILES THAT CANNOT BE REPAIRED IN PLACE TO THE ON-SITE DETENTION BASIN.

SYMBOL LEGEND

SF	STANDARD SILT FENCE	OP	OUTLET PROTECTION
TS	TEMPORARY SEEDING	VCX	STORM CONVEYANCE CHANNEL
PS	PERMANENT SEEDING	CM	CHANNEL MATTING
SB	SEDIMENT BASIN	RIP	RIP RAP
FC	FAIRCLOTH SKIMMER	BF	ORANGE BARRIER CONSTRUCTION FENCE
CW	CONCRETE WASHOUT	FS	FILTER SOCK
CK	CONSTRUCTION ENTRANCE		

LEGEND

EXISTING	PROPOSED	DESCRIPTION
		CONSTRUCTION LIMITS
P/L		PROPERTY LINE
R/W		RIGHT-OF-WAY LINE
		SETBACK
	X	FENCE
		SECONDARY FENCE (BY GENERAL CONTRACTOR)
		UTILITY POLE
		POLE GUY
	OE	OVERHEAD ELECTRICAL LINE
T		UNDERGROUND TELEPHONE LINE
ST	ST	STORM LINE
		STORM STRUCTURE
600	600	CONTOUR
730.00 FS, 730.00 PS	730.00 FS, 730.00 PS	FINISHED GRADE (TOP OF CONCRETE PAD) PAD GRADE (TOP OF ADJACENT BASE STONE)
730.00 PS	730.00	PAD GRADE (TOP OF BASE STONE)
	3.00%	GRADE SLOPE
		MAJOR FLOOD ROUTING
HP	HP	HIGH POINT
	SF	SILT FENCE
		ORANGE BARRIER CONSTRUCTION FENCE
		INLET PROTECTION
		CONCRETE WASHOUT
		CONSTRUCTION ENTRANCE
		SEEDING AREA
		STONE PAD
		CONCRETE DRIVE
		EMERGENCY SPILLWAY / CHANNEL LINING
		AEP STANDARD PLASTIBETON CABLE TRENCH
		WETLANDS
		TIMBER MATTING / PULL PADS
		FILTER SOCK

TEMPORARY SEDIMENT BASIN CAPACITY CALCULATION

DRAINAGE AREA 9.06 ACRES
SEDIMENT STORAGE VOLUME 9.06 AC. x 1,000 CF/AC. = 9,060 CF
DEWATERING ZONE VOLUME 9.06 AC. x 1,800 CF/AC. = 16,308 CF
TOTAL VOLUME REQUIRED 9,060 CF + 16,308 CF = 25,368 CF
BOTTOM ELEVATION 943.25
SEDIMENT STORAGE ELEVATION 943.75
EMERGENCY SPILLWAY ELEVATION 945.50
TOP OF EMBANKMENT ELEVATION 946.90
SKIMMER SIZE = 3.0 INCHES ORIFICE DIAMETER = 2.9 INCHES

SEDIMENT BASIN TRAP VOLUMES

STAGE	AREA (SF)	AVG. AREA (SF)	INC. VOL. (CF)	TOT VOL. (CF)	TOT VOL. (AC-FT)
943.25	75,402			0.00	0.00
		26,719	20,039		
944.00	28,036			20,039	0.4600
		29,837	29,837		
945.00	31,637			49,876	1.1450
		33,487	33,487		
946.00	35,337			83,363	1.9137
		36,281	18,141		
946.50	37,225			101,503	2.3302

SEDIMENT BASIN OUTLET RISE WITH FAIRCLOTH SKIMMER (FC)

N.T.S.

BENCHMARKS:

GPS 300 5/8" REBAR
ELEV: 948.22
LAT: 40.06071717°
LONG: -83.1938270°

GPS 310 CL MON.
ELEV: 948.20
LAT: 40.06144 07°
LONG: -83.1934459°

NO.	DATE	REVISION DESCRIPTION	DR	ENG	CK
1	3/27/20	UNDERDRAIN AND ACCESS GATE REVISIONS	SAZ	KPD	IA

OHIO UTILITIES PROTECTION SERVICE
CALL BEFORE YOU DIG
811 OR 1-800-362-2764

ms consultants, inc.
engineers, architects, planners
2221 Schrock Road
Columbus, OH 43229
phone: (614) 898-7100
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OLD DWG #: STD DWG #:

THE DRAWINGS AND THE DESIGN OF THE STRUCTURES AND EQUIPMENT AS CONTAINED THEREIN ARE THE PROPERTY OF AMERICAN ELECTRIC POWER, OR FOR ANY PURPOSE OTHER THAN THE PROJECT, AND IS TO BE RETURNED UPON REQUEST

AMERICAN ELECTRIC POWER
HAYDEN STATION
COLUMBUS OHIO
3-HBAV / 13KV / 13KV

STORMWATER POLLUTION PREVENTION PLAN

SCALE: AS SHOWN	DR: ILK	ENG: IA	CH: IA
	WO#: 428960.04	APPD:	DATE:
	1 RIVERSIDE PLAZA COLUMBUS, OH 43215	DWG. NO. E-1308	SHT. NO. 1

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AEP 5 (30 X 42)

SITE EVALUATION, ASSESSMENT, AND PLANNING

PROJECT/SITE INFORMATION
AMERICAN ELECTRIC POWER, HAYDEN STATION
7210 HAYDEN RUN ROAD
AMLIN, OHIO 43002
FRANKLIN COUNTY

CONTACT INFORMATION
AMERICAN ELECTRIC POWER
8600 SMITH'S MILL ROAD
NEW ALBANY, OHIO 43054
PH: (380) 205-5114

GENERAL SCOPE OF PROJECT

THIS PROJECT WILL CONSIST OF THE CONSTRUCTION OF A SUBSTATION PAD, CONSTRUCTION OF DRAINAGE SWALES, DETENTION POND, AND THE CONSTRUCTION OF OTHER MISCELLANEOUS SITE WORK.

NATURE OF CONSTRUCTION ACTIVITY (CHECK ALL THAT APPLY)

SUBDIVISION	
COMMERCIAL	
INDUSTRIAL	X
P.U.D.	
OTHER	

SOIL TYPES

Ko - KOKOMO SILTY CLAY LOAM, 0 TO 2 PERCENT SLOPES
LeB - LEWISBURG-CROSBY COMPLEX, 2 TO 6 PERCENT SLOPES

CONSTRUCTION SITE ESTIMATES

TOTAL SITE AREA:	55.28 AC
CONSTRUCTION SITE AREA TO BE DISTURBED:	18.62 AC
PERCENTAGE IMPERVIOUS AREA BEFORE CONSTRUCTION:	11.75%
RUNOFF COEFFICIENT BEFORE CONSTRUCTION:	0.49
PERCENTAGE IMPERVIOUS AREA AFTER CONSTRUCTION:	31.64%
RUNOFF COEFFICIENT AFTER CONSTRUCTION:	0.57

RECEIVING WATERS

THE PROJECT SITE WILL DRAIN VIA SHEET AND CHANNEL FLOW TO A PROPOSED DETENTION BASIN. THE BASIN WILL DISCHARGE TO THE EAST OF THE PROJECT, THROUGH A LEVEL SPREADER, AND WILL EVENTUALLY REACH HAYDEN RUN.

SEQUENCE OF MAJOR ACTIVITIES:
THE ORDER OF ACTIVITIES WILL BE AS FOLLOWS:

1. CONSTRUCT CONCRETE WASHOUT AREA, CONSTRUCTION ENTRANCE, AND TIMBER MATTING AREAS.
2. INSTALL SILT FENCE AND FILTER SOCK AT THE LOCATIONS INDICATED ON THE STORM WATER POLLUTION PREVENTION (SWPPP) PLANS PRIOR TO ANY EARTH DISTURBANCE.
3. CONSTRUCT SEDIMENT BASIN AND TEMPORARY RISER WITH SKIMMER. BEGIN GRADING OF PROPOSED STATION AND ASSOCIATED DRAINAGE FACILITIES AS NEEDED. SPREAD TEMPORARY SEEDING AND MULCH OVER ALL DISTURBED AREAS (EXCLUDING AREAS THAT WILL BE COVERED WITH GRAVEL).
4. BEGIN PLACEMENT OF GRAVEL PAVEMENT SECTION OF THE PAD. BEGIN FINAL GRADING THROUGHOUT THE REMAINDER OF THE SITE.
5. REMOVE SEDIMENT BUILDUP IN THE SEDIMENT BASIN AND RE-GRADE SEDIMENT BASIN TO FINAL DETENTION BASIN CONFIGURATION AS SHOWN ON THE GRADING PLAN. REMOVE THE TEMPORARY RISER AND SKIMMER.
6. INSTALL LANDSCAPING AND SPREAD PERMANENT SEEDING ON THE NON-GRAVEL AREAS OF THE SITE.
7. ONCE 70% VEGETATIVE COVERAGE IS ACHIEVED, CONTACT AEP ENVIRONMENTAL SERVICES TO CONFIRM REMOVAL OF SILT FENCE, FILTER SOCK AND ACCUMULATED SEDIMENT FROM BASIN. INSPECTIONS WILL CONTINUE UNTIL AEP DETERMINES ADEQUATE VEGETATIVE COVERAGE IS ACHIEVED.

POTENTIAL SOURCES OF POLLUTION

CONCRETE
DETERGENTS
WOOD
FERTILIZERS
PAINTS (ENAMEL AND LATEX)
CLEANING SOLVENTS
PETROLEUM BASED PRODUCTS

EROSION AND SEDIMENT CONTROLS

BMP DESCRIPTION:	CLEARING AND GRUBBING
MAINTENANCE AND INSPECTION:	AS NEEDED
REFERENCE:	TECHNICAL SPECIFICATION
BMP DESCRIPTION:	DUST CONTROL
MAINTENANCE AND INSPECTION:	AS NEEDED
REFERENCE:	E&S DETAILS
BMP DESCRIPTION:	CONSTRUCTION ENTRANCE
MAINTENANCE AND INSPECTION:	AS NEEDED
REFERENCE:	E&S DETAILS
BMP DESCRIPTION:	TEMPORARY SEEDING AND MULCHING
MAINTENANCE AND INSPECTION:	EVERY SEVEN DAYS AND AFTER HEAVY RAIN
REFERENCE:	E&S DETAILS
BMP DESCRIPTION:	PERMANENT SEEDING AND MULCHING
MAINTENANCE AND INSPECTION:	EVERY SEVEN DAYS AND AFTER HEAVY RAIN
REFERENCE:	E&S DETAILS
BMP DESCRIPTION:	SILT FENCE
MAINTENANCE AND INSPECTION:	EVERY SEVEN DAYS AND AFTER HEAVY RAIN
REFERENCE:	E&S DETAILS

OTHER SEDIMENT AND EROSION CONTROL NOTES

- TEMPORARY EROSION CONTROLS WILL BE APPLIED PRIOR TO ONSET OF WINTER WEATHER FOR DISTURBED AREAS THAT WILL BE LEFT IDLE OVER WINTER.
- PERMANENT EROSION CONTROLS WILL BE APPLIED WITHIN 7 DAYS FOR DISTURBED AREAS REMAINING DORMANT FOR OVER 1 YEAR OR AT FINAL GRADE.
- SEDIMENT CONTROL DEVICES WILL BE IMPLEMENTED FOR ALL AREAS REMAINING DISTURBED OVER 7 DAYS.
- DO NOT PLACE SILT FENCE OR ORANGE BARRIER FENCE WITHIN SENSITIVE AREAS (E.G. WETLAND OR STREAM).
- IF AN ORANGE BARRIER FENCE IS BEING INSTALLED TO AVOID DISTURBANCE TO A STREAM/WETLAND, THEN A SIGN SHALL BE INSTALLED THAT STATES, "STOP, WETLAND AREA, DO NOT DISTURB OR CROSS WITH EQUIPMENT."
- NO MECHANIZED CLEARING OR GRUBBING IS PERMITTED IN STREAM/WETLAND AREAS. IF CLEARING IS NEEDED THEN ONLY HAND CLEARING IS ALLOWED.
- THE SIZE OF THE FILTER SOCK OR SILT FENCE CANNOT BE CHANGED WITHOUT THE APPROVAL FROM AEP ENVIRONMENTAL SPECIALIST AMY TOOHEY (614-552-1996).

POST CONSTRUCTION BMP'S

BASED ON THE OHIO GENERAL CONSTRUCTION PERMIT, THE PROJECT IS REQUIRED TO PROVIDE A WATER QUALITY BMP FOR THE SITE. DISTURBED AREA IS LARGER THAN 1 ACRE, THEREFORE AN EXTENDED DETENTION BASIN WAS DESIGNED FOR THE IMPERVIOUS AREA OF THE PROPOSED SUBSTATION PAD, WHICH INCLUDES SEDIMENT FOREBAYS, MICROPOOLS, AND VOLUME STORAGE FOR THE WATER QUALITY VOLUME, CALCULATED AS FOLLOWS:

WQv = Rv*P*A/12 + 20%
= (0.05+0.9*(7.35/9.06)) * (0.90) * (9.06/12) + 20%
= 0.64 AC/FT OR 27,709 CF

DETENTION BASIN AS DESIGNED:

WQv REQUIRED = 27,709 CF
BASIN VOLUME PROVIDED = 27,709 CF

ADDITIONAL BMP'S

OPEN BURNING: NO MATERIALS MAY BE BURNED WHICH CONTAIN RUBBER, GREASE, ASPHALT, OR PETROLEUM PRODUCTS SUCH AS TIRES, CARS, AUTO PARTS, PLASTICS OR PLASTIC COATED WIRE. (SEE OAC 3745-19) OPEN BURNING IS NOT ALLOWED IN RESTRICTED AREAS. RESTRICTED AREAS ARE DEFINED AS:

1. WITHIN CORPORATION LIMITS
2. WITHIN 1,000 FEET OF A MUNICIPAL CORPORATION
3. WITHIN A ONE MILE ZONE OUTSIDE OF A CORPORATION OF 10,000 OR MORE

OUTSIDE THE RESTRICTED AREA, NO OPEN BURNING CAN TAKE PLACE WITHIN 1,000 FEET OF AN INHABITED BUILDING LOCATED OFF THE PROPERTY WHERE THE FIRE IS SET. OPEN BURNING IS PERMISSIBLE IN A RESTRICTED AREA FOR THE FOLLOWING ACTIVITIES: HEATING TAR, WELDING AND ACETYLENE TORCHES, SMUDGE POTS AND SIMILAR OCCUPATIONAL NEEDS, AND HEATING OR WARMTH FOR OUTDOOR BARBEQUES. OUTSIDE OF RESTRICTED AREAS, OPEN BURNING IS PERMISSIBLE FOR LANDSCAPE WASTES (PLANT MATERIAL), LAND-CLEARING WASTES (PLANT MATERIAL, WITH PRIOR WRITTEN PERMISSION FROM OHIO EPA AND AEP), AND AGRICULTURAL WASTES (MATERIAL GENERATED BY CROP, HORTICULTURAL, OR LIVESTOCK PRODUCTION PRACTICES.

DUST CONTROL/SUPPRESSANTS: DUST CONTROL IS REQUIRED TO PREVENT NUISANCE CONDITIONS. DUST CONTROLS MUST BE USED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATION AND NOT BE APPLIED IN A MANNER, WHICH WOULD RESULT IN A DISCHARGE TO WATERS OF THE STATE. ISOLATION DISTANCES FROM BRIDGES, CATCH BASINS, AND OTHER DRAINAGE WAYS MUST BE OBSERVED. APPLICATION (EXCLUDING WATER) MAY NOT OCCUR WHEN PRECIPITATION IS IMMINENT AS NOTED IN THE SHORT TERM FORECAST. USED OIL MAY NOT BE APPLIED FOR DUST CONTROL. CHEMICAL STABILIZERS MAY ONLY BE USED WITH AEP PERMISSION.

AIR PERMITTING REQUIREMENTS: ALL CONTRACTORS AND SUB CONTRACTORS MUST BE MADE AWARE THAT CERTAIN ACTIVITIES ASSOCIATED WITH CONSTRUCTION WILL REQUIRE AIR PERMITS. ACTIVITIES INCLUDING BUT NOT LIMITED TO MOBILE CONCRETE BATCH PLANTS, MOBILE ASPHALT PLANTS, CONCRETE CRUSHERS, LARGE GENERATORS, ETC., WILL REQUIRE SPECIFIC OHIO EPA AIR PERMITS FOR INSTALLATION AND OPERATION. THESE ACTIVITIES MUST SEE AUTHORIZATION FROM THE CORRESPONDING OF OHIO EPA. NOTIFICATION FOR RESTORATION AND DEMOLITION MUST BE SUBMITTED TO OHIO EPA FOR ALL COMMERCIAL SITES TO DETERMINE IF ASBESTOS CORRECTIVE ACTIONS ARE REQUIRED.

WASTE DISPOSAL: THE CONTRACTOR SHALL PROVIDE LITTER CONTROL AND COLLECTION OF MATERIALS WITHIN THE PROJECT BOUNDARIES DURING CONSTRUCTION. ALL FERTILIZER, HYDROCARBON, OR OTHER CHEMICAL CONTAINERS SHALL BE DISPOSED OF BY THE CONTRACTOR IN ACCORDANCE WITH THE EPA'S STANDARD PRACTICES. NO SOLID MATERIAL INCLUDING BUILDING AND CONSTRUCTION MATERIAL SHALL BE DISPOSED OF, DISCHARGED OR BURIED ONSITE.

OFFSITE VEHICLE TRACKING: LOADED HAUL TRUCKS SHALL BE COVERED WITH A TARPAULIN. EXCESS DIRT MATERIAL ON THE ROADS SHALL BE REMOVED IMMEDIATELY. HAULING ON UNPAVED SURFACES SHALL BE MONITORED TO MINIMIZE DUST AND CONTROL EROSION. HAUL ROADS SHALL BE WATERED OR OTHER CONTROLS PROVIDED AS NECESSARY TO REDUCE DUST AND CONTROL SEDIMENTS.

SANITARY WASTE: THE CONTRACTOR SHALL PROVIDE PORTABLE SANITARY WASTE FACILITIES. THESE FACILITIES SHALL BE COLLECTED OR EMPTIED BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR AS REQUIRED BY STATE REGULATIONS.

FERTILIZERS AND PESTICIDES: FERTILIZER SHALL BE APPLIED AT A RATE SPECIFIED BY THE SPECIFICATIONS OR THE MANUFACTURER. THE APPLICATION OF FERTILIZERS SHALL BE ACCOMPLISHED IN A MANNER AS DESCRIBED BY THE SPECIFICATION OR MANUFACTURER TO ENSURE THE PROPER INSTALLATION AND TO AVOID OVER FERTILIZING. PESTICIDES ARE NOT ANTICIPATED FOR THIS PROJECT.

MAINTENANCE

THE CONTRACTOR WILL BE RESPONSIBLE FOR MAINTENANCE AND REPAIRS OF EROSION AND SEDIMENT CONTROL DEVICES AND THE REMOVAL OF THE EROSION AND SEDIMENT CONTROL DEVICES AFTER THE NOTICE OF TERMINATION IS EXECUTED.

THE CONTRACTOR SHALL REVIEW, INSPECT AND MAINTAIN PER THE OEPA CONSTRUCTION PERMIT THE PROJECT AND ALL EROSION AND SEDIMENT CONTROLS ON A REGULAR BASIS AND DURING AND FOLLOWING RAINFALL EVENTS. AN INSPECTION FORM HAS BEEN PROVIDED IN THE SPECIFICATIONS. THE CONTRACTOR SHALL BE REQUIRED TO KEEP A LOG OF ALL THE INSPECTION REPORTS, GRADING AND STABILIZATION ACTIVITIES, AND SWPPP AMENDMENTS AT THE SITE. THE FOLLOWING PRACTICES WILL BE IMPLEMENTED TO MAINTAIN AND MONITOR EROSION AND SEDIMENT CONTROLS.

A. PROJECT REVIEW ON A REGULAR BASIS.
B. PROVIDE AND MAINTAIN RAIN GAUGES ONSITE (IF NOT AVAILABLE IN THE AREA) TO RECORD RAINFALL DATA DAILY.
C. REVIEW STABILIZATION PRACTICES AND CONTROLS ON A REGULAR BASIS AND MAINTAIN AND REPAIR THESE MEASURES AND CONTROLS AS NECESSARY. TEMPORARY AND/OR PERMANENT SEEDING, MULCHING AND SODDING SHALL BE REPAIRED IN BARE SPOTS AND WASHOUTS, AND HEALTHY GROWTH ESTABLISHED. LINE AND GRADE OF SWALES AND CULVERTS SHALL BE MAINTAINED THROUGHOUT.
D. ONCE HEALTHY GROWTH OF TURF IS ESTABLISHED, THE CONTRACTOR SHALL MAINTAIN THESE AREAS TO INSURE THE HEIGHT OF THE GRASS DOES NOT REACH MORE THAN 6 INCHES ABOVE THE ESTABLISHED GRADE.
E. REVIEW EROSION CONTROL MEASURES ON A REGULAR BASIS AND MAINTAIN AND REPAIR THESE MEASURES AND CONTROLS AS NECESSARY. BUILT UP SEDIMENTS SHALL BE REMOVED FROM SILT FENCES AND FILTER CLOTH SHALL BE REPLACED AS NECESSARY AND WHEN THEY HAVE SERVED THEIR USEFULNESS. ACCUMULATED SEDIMENT SHALL BE REMOVED FROM DRAINAGE SWALES AND CULVERTS.
F. AN INSPECTION AND MAINTENANCE REPORT SHALL BE COMPLETED EVERY SEVEN DAYS AND WITHIN 24 HOURS OF A RAINFALL EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR SHALL CREATE AN INSPECTION AND MAINTENANCE REPORT LOG AND NOTE ANY AMENDMENTS TO THE SWPPP THAT OCCUR DURING CONSTRUCTIO

INSPECTIONS

QUALIFIED PERSONNEL SHALL INSPECT ALL POINTS OF DISCHARGE, AS APPLICABLE, FROM THE PROJECT SITE AND ALL DISTURBED AREAS OF THE CONSTRUCTION SITE THAT HAVE NOT BEEN STABILIZED. INSPECTIONS TO BE COMPLETED IN COMPLIANCE WITH SWPPP AND OEPA CONSTRUCTION STORMWATER PERMIT.

DISTURBED AREAS AND AREAS USED FOR STORAGE OF MATERIALS EXPOSED TO PRECIPITATION SHALL BE INSPECTED FOR EVIDENCE OF, OR POTENTIAL FOR POLLUTANTS ENTERING THE STORMWATER MANAGEMENT SYSTEM. THE STORMWATER MANAGEMENT SYSTEM AND EROSION AND SEDIMENT CONTROL MEASURES SHALL BE OBSERVED TO ENSURE THAT THEY ARE OPERATING CORRECTLY. INSPECTION AND MAINTENANCE REPORTS SHALL BE COMPLETED AT LEAST EVERY WEEK AND FOLLOWING A RAINFALL EVENT OF 0.5 INCHES OF WATER OR GREATER (SEE ATTACHED FORM). THESE FORMS SHALL BE RETAINED FOR A PERIOD OF AT LEAST 3 YEARS FOLLOWING THE DATE THE SITE IS FINALLY STABILIZED.

ALLOWABLE NON-STORMWATER DISCHARGE MANAGEMENT

ALLOWABLE NON-STORMWATER DISCHARGES AND THE MEASURES USED TO ELIMINATE OR REDUCE THEM AND TO PREVENT THEM FROM BECOMING CONTAMINATED MAY INCLUDE DEPENDING ON THE PERMIT:

1. POTABLE WATER USED TO CONTROL DUST
2. POTABLE WATER INCLUDING UNCONTAMINATED WATER LINE FLUSHINGS
3. ROUTINE EXTERNAL BUILDING WASH DOWN THAT DOES NOT USE DETERGENTS
4. PAVEMENT WASH WATER WHERE SPILLS OR LEAKS OF TOXIC OR HAZARDOUS MATERIALS HAVE NOT OCCURRED (UNLESS ALL SPILLED MATERIAL HAS BEEN REMOVED) AND WHERE DETERGENTS ARE NOT USED
5. UNCONTAMINATED AIR CONDITIONING OR COMPRESSOR CONDENSATE
6. UNCONTAMINATED GROUND WATER OR SPRING WATER
7. FOUNDATION OR FOOTING DRAINS WHERE FLOWS ARE NOT CONTAMINATED WITH PROCESS MATERIALS SUCH AS SOLVENTS
8. LANDSCAPE IRRIGATION

ESTABLISH PROPER EQUIPMENT/VEHICLE FUELING AND MAINTENANCE PRACTICES

EQUIPMENT FUELING AND MAINTENANCE, OIL CHANGING, ETC., SHALL BE PERFORMED AWAY FROM WATERCOURSES, DITCHES, OR STORM DRAINS, IN AN AREA DESIGNATED FOR THAT PURPOSE. THE DESIGNATED AREA SHALL BE EQUIPPED FOR RECYCLING OIL AND CATCHING SPILLS. SECONDARY CONTAINMENT SHALL BE PROVIDED FOR ALL FUEL OIL STORAGE TANKS. THESE AREAS MUST BE INSPECTED EVERY SEVEN DAYS AND WITHIN 24 HOURS OF A 0.5 INCH OR GREATER RAIN EVENT TO ENSURE THERE ARE NO EXPOSED MATERIALS WHICH WOULD CONTAMINATE STORM WATER.

SPILL PREVENTION CONTROL PLAN

SITE OPERATORS MUST BE AWARE THAT SPILL PREVENTION CONTROL AND COUNTERMEASURES (SPCC) REQUIREMENTS APPLY. AN SPCC PLAN IS REQUIRED FOR SITES WITH ABOVEGROUND STORAGE CAPACITY (ONLY FOR CONTAINERS 55 GALLONS OR GREATER) OF 1,320 GALLONS OR MORE, OR 42,000 GALLONS OF UNDERGROUND STORAGE. SOILS THAT HAVE BEEN CONTAMINATED MUST BE DISPOSED OF IN ACCORDANCE WITH SECTION "CONTAMINATED SOILS."

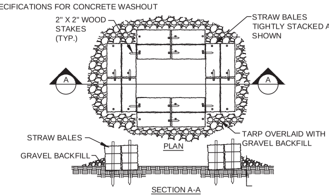
SPILLS ON PAVEMENT SHALL BE ABSORBED WITH SAWDUST, CAT LITTER OR OTHER ABSORBENT MATERIAL AND DISPOSED OF WITH THE TRASH AT A LICENSED SANITARY LANDFILL. HAZARDOUS OR INDUSTRIAL WASTES SUCH AS MOST SOLVENTS, GASOLINE, OIL-BASED PAINTS, AND CEMENT CURING COMPOUNDS REQUIRE SPECIAL HANDLING. SPILLS SHALL BE REPORTED TO THE AEP REGIONAL ENVIRONMENTAL COORDINATOR AND OHIO EPA (1-800-282-9378). SPILLS OF 25 GALLONS OR MORE OF PETROLEUM PRODUCTS SHALL BE REPORTED TO THE AEP REGIONAL ENVIRONMENTAL COORDINATOR, OHIO EPA (1-800-282-9378), THE LOCAL FIRE DEPARTMENT, AND THE LOCAL EMERGENCY PLANNING COMMITTEE WITHIN 30 MINUTES OF THE DISCOVERY OF THE RELEASE. ALL SPILLS, WHICH RESULT IN CONTACT WITH WATER OF THE STATE, MUST BE REPORTED TO OHIO EPA'S HOTLINE. VAUGHN KAUFMANN, AEP REGIONAL ENVIRONMENTAL COORDINATOR (REC) SHALL BE CONTACTED AT (740) 779-5252.

CONTAMINATED SOILS

IF SUBSTANCES SUCH AS OIL, DIESEL FUEL, HYDRAULIC FLUID, ANTIFREEZE, ETC., ARE SPILLED, LEAKED, OR RELEASED ONTO THE SOIL, THE SOIL SHOULD BE DUG UP AND DISPOSED OF AT A LICENSED SANITARY LANDFILL OR OTHER APPROVED PETROLEUM CONTAMINATED SOIL REMEDIATION FACILITY (NOT A CONSTRUCTION/DEMOLITION DEBRIS LANDFILL). PLEASE BE AWARE THAT STORM WATER RUN OFF ASSOCIATED WITH CONTAMINATED SOILS ARE NOT BEING AUTHORIZED UNDER OHIO EPA'S GENERAL STORMWATER PERMIT ASSOCIATED WITH CONSTRUCTION ACTIVITIES. IN THE EVENT THERE ARE LARGE EXTENSIVE AREAS OF CONTAMINATED SOILS ADDITIONAL MEASURES ABOVE AND BEYOND THE CONDITIONS OF OHIO EPA'S GENERAL CONSTRUCTION STORMWATER PERMIT WILL BE REQUIRED. DEPENDING ON THE EXTENT OF CONTAMINATION, ADDITIONAL TREATMENT AND/OR COLLECTION AND DISPOSAL MAY BE REQUIRED. ALL STORMWATER DISCHARGES ASSOCIATED WITH CONTAMINATED SOILS MUST BE AUTHORIZED UNDER AN ALTERNATE NPDES PERMIT.

CONCRETE WASHOUT (CW)

SPECIFICATIONS FOR CONCRETE WASHOUT



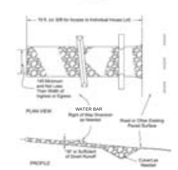
1. THE RESIDUE OR CONTENTS OF ALL CONCRETE MIXERS, DUMP TRUCKS, OTHER CONVEYANCE EQUIPMENT AND FINISHING TOOLS SHALL BE WASHED INTO CONCRETE CLEAN-OUT STRUCTURES CONSISTING OF A STRAW BALE BARRIER WITH GRAVEL BACKFILL. THE LENGTH AND WIDTH OF THESE STRUCTURES SHALL BE AS DETERMINED BY THE CONTRACTOR TO FACILITATE THE PARTICULAR EQUIPMENT USED. THESE STRUCTURES SHALL BE CONSTRUCTED ON LEVEL GROUND AT LEAST 100' FROM THE NEAREST WATERCOURSE, DRAINAGE SWALE OR INLET. AT NO TIME SHALL THE STRUCTURE BE ALLOWED TO BE MORE THAN 50% FULL. THE CONTRACTOR SHALL MAINTAIN THESE PONDS UNTIL ALL CONCRETE PLACEMENT IS COMPLETE FOR THE PROJECT.
2. EMBED THE STRAW BALES 4" INTO THE SOIL. PROVIDE TWO ROWS OF BALES, AS SHOWN ON THE DETAIL, WITH ENDS AND CORNERS TIGHTLY ABUTING. ORIENT THE STRAW BALES LENGTHWISE WITH BINDINGS AROUND THE SIDES OF THE BALES SO THE WIRE DOES NOT CONTACT THE SOIL. DRIVE 2"X2" WOOD STAKES THROUGH EACH BALE, TO SECURELY ANCHOR THE BALE AND CONNECT ADJACENT BALES. GRAVEL BACKFILL SHALL BE PROVIDED AND TAMPED AROUND THE OUTSIDE PERIMETER OF THE BALES TO PREVENT EROSION AND FLOW AROUND THE BALES.
3. THE INTENT OF THESE STRUCTURES IS TO COLLECT ALL CONCRETE WASH OUT WATER AND ALLOW IT TO DRY TO A SOLID MATERIAL. AFTER DRYING, THE SOLID MATERIAL CAN BE REMOVED WITH A LOADER OR EXCAVATOR FOR PROPER DISPOSAL. WASH OUT WILL NOT BE PERMITTED IN ANY OTHER AREAS.
4. USE THE MINIMUM AMOUNT OF WATER TO WASH THE VEHICLES AND EQUIPMENT. NEVER DISPOSE OF WASH OUT INTO THE STREET, STORM INLET, DRAINAGE SWALE OR WATERCOURSE. DISPOSE OF SMALL AMOUNTS OF EXCESS DRY CONCRETE, GROUT AND MORTAR IN THE TRASH. ANY SOAPS THAT ARE UTILIZED SHALL BE PHOSPHATE-FREE AND BIODEGRADABLE.
5. ADDITIONAL CONCRETE CLEAN-OUT STRUCTURES SHALL BE CONSTRUCTED WITHIN THE SPECIFIED AREA AS NEEDED BASED UPON THE VOLUME OF WASH OUT GENERATED DAILY.

CONSTRUCTION ENTRANCE (CE)

DESCRIPTION

A CONSTRUCTION ENTRANCE IS A STABILIZED PAD OF STONE UNDERLAIN WITH GEOTEXTILE AND IS USED TO REDUCE THE AMOUNT OF MUD TRACKED OFF-SITE WITH CONSTRUCTION TRAFFIC. LOCATED AT POINTS OF INGRESS/EGRESS, THE PRACTICE IS USED TO REDUCE THE AMOUNT OF MUD TRACKED OFF-SITE WITH CONSTRUCTION TRAFFIC.

SPECIFICATIONS FOR CONSTRUCTION ENTRANCE



1. STONE SIZE - ODOT #2 (1.5-2.5 INCH) STONE SHALL BE USED, OR RECYCLED CONCRETE EQUIVALENT (WITH NO REBAR).
2. LENGTH- THE CONSTRUCTION ENTRANCE SHALL BE AS LONG AS REQUIRED TO STABILIZE HIGH TRAFFIC AREAS BUT NOT LESS THAN 70 FT. (EXCEPTION: APPLY30 FT. MINIMUM TO SINGLE RESIDENCE LOTS).
3. THICKNESS - THE STONE LAYER SHALL BE AT LEAST 6 INCHES THICK FOR LIGHT DUTY ENTRANCES OR AT LEAST 10 INCHES FOR HEAVY DUTY USE.
4. WIDTH - THE ENTRANCE SHALL BE AT LEAST 14 FEET WIDE, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
5. GEOTEXTILE - A GEOTEXTILE SHALL BE LAID OVER THE ENTIRE AREA, PRIOR TO PLACING STONE. IT SHALL BE COMPOSED OF STRONG ROT-PROOF POLYMERIC FIBERS AND MEET THE FOLLOWING SPECIFICATIONS:

FIGURE 7.4.1

GEOTEXTILE SPECIFICATION FOR CONSTRUCTION ENTRANCE	
MINIMUM TENSILE STRENGTH	200 LBS.
MINIMUM PUNCTURE STRENGTH	80 PSI.
MINIMUM TEAR STRENGTH	50 LBS.
MINIMUM BURST STRENGTH	320 PSI.
MINIMUM ELONGATION	20%
EQUIVALENT OPENING SIZE	EOS < 0.6 MM.
PERMITTIVITY	1X10-3 CM/SEC.

6. TIMING - THE CONSTRUCTION ENTRANCE SHALL BE INSTALLED AS SOON AS IS PRACTICABLE BEFORE MAJOR GRADING ACTIVITIES.
7. CULVERT - A PIPE OR CULVERT SHALL BE CONSTRUCTED UNDER THE ENTRANCE IF NEEDED TO PREVENT SURFACE WATER FROM FLOWING ACROSS THE ENTRANCE OR TO PREVENT RUNOFF FROM BEING DIRECTED OUT ONTO PAVED SURFACES.
8. MAINTENANCE - TOP DRESSING OF ADDITIONAL STONE SHALL BE APPLIED AS CONDITIONS DEMAND. MUD SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC ROADS, OR ANY SURFACE WHERE RUNOFF IS NOT CHECKED BY SEDIMENT CONTROLS, SHALL BE REMOVED IMMEDIATELY. REMOVAL SHALL BE ACCOMPLISHED BY SCRAPING OR SWEEPING.
9. CONSTRUCTION ENTRANCES SHALL NOT BE RELIED UPON TO REMOVE MUD FROM VEHICLES AND PREVENT OFF-SITE TRACKING. VEHICLES THAT ENTER AND LEAVE THE CONSTRUCTION-SITE SHALL BE RESTRICTED FROM MUDDY AREAS.
10. REMOVAL - THE ENTRANCE SHALL REMAIN IN PLACE UNTIL THE DISTURBED AREA IS STABILIZED OR REPLACED WITH A PERMANENT ROADWAY OR ENTRANCE.

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DUST CONTROL

DESCRIPTION

DUST CONTROL INVOLVES PREVENTING OR REDUCING DUST FROM EXPOSED SOILS OR OTHER SOURCES DURING LAND DISTURBING, DEMOLITION AND CONSTRUCTION ACTIVITIES TO REDUCE THE PRESENCE OF AIRBORNE SUBSTANCES WHICH MAY PRESENT HEALTH HAZARDS, TRAFFIC SAFETY PROBLEMS OR HARM ANIMAL OR PLANT LIFE.

SPECIFICATIONS FOR DUST CONTROL

1. VEGETATIVE COVER AND/MULCH APPLY TEMPORARY OR PERMANENT SEEDING AND MULCH TO AREAS THAT WILL REMAIN IDLE FOR OVER 14 DAYS. SAVING EXISTING TREES AND LARGE SHRUBS WILL ALSO REDUCE SOIL AND AIR MOVEMENT ACROSS DISTURBED AREAS. SEE TEMPORARY SEEDING; PERMANENT SEEDING; MULCHING PRACTICES; AND TREE AND NATURAL AREA PROTECTION PRACTICES.
2. WATERING SPRAY SITE WITH WATER UNTIL THE SURFACE IS WET BEFORE AND DURING GRADING AND REPEAT AS NEEDED, ESPECIALLY ON HAUL ROADS AND OTHER HEAVY TRAFFIC ROUTES. WATERING SHALL BE DONE AT A RATE THAT PREVENTS DUST BUT DOES NOT CAUSE SOIL EROSION. WETTING AGENTS SHALL BE UTILIZED ACCORDING TO MANUFACTURERS INSTRUCTIONS.
3. SPRAY-ON ADHESIVES APPLY ADHESIVE ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS. MAY ONLY BE USED WITH AEP PERMISSION.
4. STONE GRADED ROADWAYS AND OTHER SUITABLE AREAS WILL BE STABILIZED USING CRUSHED STONE OR COARSE GRAVEL AS SOON AS PRACTICABLE AFTER REACHING AN INTERIM OR FINAL GRADE. CRUSHED STONE OR COARSE GRAVEL CAN BE USED AS A PERMANENT COVER TO PROVIDE CONTROL OF SOIL EMISSIONS.
5. BARRIERS EXISTING WINDBREAK VEGETATION SHALL BE MARKED AND PRESERVED. SNOW FENCING OR OTHER SUITABLE BARRIER MAY BE PLACED PERPENDICULAR TO PREVAILING AIR CURRENTS AT INTERVALS OF ABOUT 15 TIMES THE BARRIER HEIGHT TO CONTROL AIR CURRENTS AND BLOWING SOIL.
6. OPERATION AND MAINTENANCE - WHEN TEMPORARY DUST CONTROL MEASURES ARE USED; REPETITIVE TREATMENT SHOULD BE APPLIED AS NEEDED TO ACCOMPLISH CONTROL. STREET CLEANING - PAVED AREAS THAT HAVE ACCUMULATED SEDIMENT FROM CONSTRUCTION SHOULD BE CLEANED DAILY, OR AS NEEDED, UTILIZING A STREET SWEEPER OR BUCKET -TYPE END LOADER OR SCRAPER.
7. USED OIL MAY NOT BE USED AS A DUST SUPPRESSANT.

TEMPORARY SEEDING (TS)

DESCRIPTION

TEMPORARY SEEDINGS ESTABLISH TEMPORARY COVER ON DISTURBED AREAS BY PLANTING APPROPRIATE RAPIDLY GROWING ANNUAL GRASSES OR SMALL GRAINS. TEMPORARY SEEDING PROVIDES EROSION CONTROL ON AREAS IN BETWEEN CONSTRUCTION OPERATIONS. GRASSES, WHICH ARE QUICK GROWING, ARE SEEDED AND USUALLY MULCHED TO PROVIDE PROMPT, TEMPORARY SOIL STABILIZATION. IT EFFECTIVELY MINIMIZES THE AREA OF A CONSTRUCTION SITE PRONE TO EROSION AND SHOULD BE USED EVERYWHERE THE SEQUENCE OF CONSTRUCTION OPERATIONS ALLOWS VEGETATION TO BE ESTABLISHED.

SPECIFICATIONS FOR TEMPORARY SEEDING

LBS/AC.	BOTANICAL NAME	COMMON NAME
32	AVENA SATIVA	SEED OATS
10	LOLIUM MULTIFLORUM	ANNUAL RYEGRASS

1. STRUCTURAL EROSION AND SEDIMENT CONTROL PRACTICES SUCH AS DIVERSIONS AND SEDIMENT TRAPS SHALL BE INSTALLED AND STABILIZED WITH TEMPORARY SEEDING PRIOR TO GRADING THE REST OF THE CONSTRUCTION SITE.
2. TEMPORARY SEED SHALL BE APPLIED BETWEEN CONSTRUCTION OPERATIONS ON SOIL THAT WILL NOT BE GRADED OR REWORKED FOR 14 DAYS OR GREATER. THESE IDLE AREAS SHALL BE SEEDED WITHIN 7 DAYS AFTER GRADING.
3. THE SEEDBED SHOULD BE PULVERIZED AND LOOSE TO ENSURE THE SUCCESS OF ESTABLISHING VEGETATION. TEMPORARY SEEDING SHOULD NOT BE POSTPONED IF IDEAL SEEDBED PREPARATION IS NOT POSSIBLE. TEMPORARY SEEDING SHALL BE APPLIED WITHIN 2 DAYS FOR DISTURBED AREAS WITHIN 50 FET OF A STREAM REMAINING DORMANT FOR OVER 14 DAYS.
4. SOIL AMENDMENTS TEMPORARY VEGETATION SEEDING RATES SHALL ESTABLISH ADEQUATE STANDS OF VEGETATION, WHICH MAY REQUIRE THE USE OF SOIL AMENDMENTS. BASE RATES FOR LIME AND FERTILIZER SHALL BE USED. TEMPORARY SEED SHALL BE APPLIED WITHIN 7 DAYS FOR DISTURBED AREAS.
5. SEEDING METHOD SEED SHALL BE APPLIED UNIFORMLY WITH A CYCLONE SPREADER, DRILL, CULTIPACKER SEEDER, OR HYDROSEEDER. WHEN FEASIBLE, SEED THAT HAS BEEN BROADCAST SHALL BE COVERED BY RAKING OR DRAGGING AND THEN LIGHTLY TRAMPED INTO PLACE USING A ROLLER OR CULTIPACKER. IF HYDROSEEDING IS USED, THE SEED AND FERTILIZER WILL BE MIXED ON-SITE AND THE SEEDING SHALL BE DONE IMMEDIATELY AND WITHOUT INTERRUPTION.

MULCHING TEMPORARY SEEDING:

1. APPLICATIONS OF TEMPORARY SEEDING SHALL INCLUDE MULCH. WHICH SHALL BE APPLIED DURING OR IMMEDIATELY AFTER SEEDING. SEEDINGS MADE DURING OPTIMUM SEEDING DATES ON FAVORABLE, VERY FLAT SOIL CONDITIONS MAY NOT NEED MULCH TO ACHIEVE ADEQUATE STABILIZATION.
2. MATERIALS:
   - 2.1. STRAW IF STRAW IS USED, IT SHALL BE UNROTTED SMALL-GRAIN STRAW APPLIED AT A RATE OF 2 TONS PER ACRE OR 90 LBS./ 1,000 SQ. FT. (2-3 BALES)
   - 2.2. HYDROSEEDERS IF WOOD CELLULOSE FIBER IS USED, IT SHALL BE USED AT 2000 LBS./ AC. OR 46 LB./ 1,000-SQ.-FT.
   - 2.3. OTHER OTHER ACCEPTABLE MULCHES INCLUDE MULCH MATTINGS APPLIED ACCORDING TO MANUFACTURERÍFS RECOMMENDATIONS OR WOOD CHIPS APPLIED AT 6 TON/ AC.
3. STRAW MULCH SHALL BE ANCHORED IMMEDIATELY TO MINIMIZE LOSS BY WIND OR WATER. ANCHORING METHODS:
   - 3.1. MECHANICAL A DISK, CRIMPER, OR SIMILAR TYPE TOOL SHALL BE SET STRAIGHT TO PUNCH OR ANCHOR THE MULCH MATERIAL INTO THE SOIL. STRAW MECHANICALLY ANCHORED SHALL NOT BE FINELY CHOPPED BUT LEFT TO A LENGTH OF APPROXIMATELY 6 INCHES.
   - 3.2. MULCH NETTING NETTING SHALL BE USED ACCORDING TO THE MANUFACTURERS RECOMMENDATIONS. NETTING MAY BE NECESSARY TO HOLD MULCH IN PLACE IN AREAS OF CONCENTRATED RUNOFF AND ON CRITICAL SLOPES.
   - 3.3. SYNTHETIC BINDERS SYNTHETIC BINDERS SUCH AS ACRYLIC DLR (AGRI-TAC), DCA-70, PETROSET, TERRA TRACK OR EQUIVALENT MAY BE USED AT RATES RECOMMENDED BY THE MANUFACTURER.
   - 3.4. WOOD CELLULOSE FIBER WOOD CELLULOSE FIBER BINDER SHALL BE APPLIED AT A NET DRY WT. OF 750 LB./AC. THE WOOD CELLULOSE FIBER SHALL BE MIXED WITH WATER AND THE MIXTURE SHALL CONTAIN A MAXIMUM OF 50 LB. / 100 GAL.

Slope Stability & Natural Corridors Seed Mix

Temporary Matrix		
rate	Grasses	
512	Avena sativa	Seed Oats
160	Lolium multiflorum	Annual Ryegrass
Permanent Matrix		
rate/acre	Grasses	
16	Andropogon gerardii	Big Bluestem
16	Bouteloua curtipendula	Side-Oats Grama
40	Elymus canadensis	Canada Wild Rye
48	Elymus virginicus	Virginia Wild Rye
32	Schizachyrium scoparium	Little Bluestem
16	Sorghastrum nutans	Indian Grass
rate/acre	Forbs	
1	Monarda fistulosa	Bergamot
2	Ceanothus herbaceus	Lanceleaf ceanothus
8	Rudbeckia hirta	Black-eyed Susan
2	Solidago nemoralis	Grey Goldenrod
1	Solidago speciosa	Showy Goldenrod

Lawn Mix – Sun to partial shade

Rate/acre	Grasses	
20	Lolium multiflorum	Annual Ryegrass
100	Poa pratensis	Kentucky Bluegrass
100	Lolium perenne	Perennial Ryegrass

Lawn Mix - Shade

Rate/acre	Grasses	
20	Lolium multiflorum	Annual Ryegrass
100	Poa pratensis	Kentucky Bluegrass
100	Festuca rubra	Creeping Red Fescue

Swale and Retention Area Seed Mix

Temporary Matrix		
rate	Grasses	
512	Avena sativa	Seed Oats
160	Lolium multiflorum	Annual Ryegrass
Permanent Matrix		
rate/acre	Grasses	
8	Carex frankii	Frank's Sedge
2	Juncharm effusus	Blunt Spike Rush
8	Carex subnigricilis	Fox Sedge
32	Panicum virgatum	Switchgrass
2	Scirpus atrovirens	Field Stem Rush
rate/acre	Forbs	
2	Asclepias incarnata	Swamp milkweed
2	Aster novae-angliae	New England Aster
2	Eupatorium perfoliatum	Boneset
1	Helenium autumnale	Autumn Sneezeweed
2	Monarda fistulosa	Bergamot
2	Rudbeckia hirta	Yellow Coneflower
1	Rudbeckia subtomentosa	Sweet Black-Eyed Susan

Farm Loss Area Seed Mix

Temporary Matrix	
rate	Grasses
512	Avena sativa / Seed Oats
160	Lolium multiflorum / Annual Ryegrass
Permanent Matrix	
rate/acre	
64	Trifolium pratense / Red Clover
32	Trifolium repens / White Clover

PERMANENT SEEDING (PS)

DESCRIPTION

PERENNIAL VEGETATION IS ESTABLISHED ON AREAS THAT ARE AT FINAL GRADE OR WILL NOT BE RE-DISTURBED FOR PERIODS LONGER THAN 12 MONTHS, WITHIN 7 DAYS OF LAST EARTH DISTURBING ACTIVITY. PERMANENT SEEDING INCLUDES SITE PREPARATION, SEEDBED PREPARATION, PLANTING SEED, MULCHING, IRRIGATION AND MAINTENANCE.

PROVIDE PERMANENT SEEDING FOR DISTURBED AREAS WITHIN 50 FEET OF A STREAM WITHIN 2 DAYS OF ESTABLISHING FINAL GRADE.

PERMANENT VEGETATION IS USED TO STABILIZE SOIL, REDUCE EROSION, PREVENT SEDIMENT POLLUTION, REDUCE RUNOFF BY PROMOTING INFILTRATION, AND PROVIDE STORMWATER QUALITY BENEFITS OFFERED BY DENSE GRASS COVER.

SPECIFICATION FOR PERMANENT SEEDING

SITE PREPARATION:
1. SUBSOILER, PLOW, OR OTHER IMPLEMENT SHALL BE USED TO REDUCE SOIL COMPACTION AND ALLOW MAXIMUM INFILTRATION. (MAXIMIZING INFILTRATION WILL HELP CONTROL BOTH RUNOFF RATE AND WATER QUALITY.) SUBSOILING SHOULD BE DONE WHEN THE SOIL MOISTURE IS LOW ENOUGH TO ALLOW THE SOIL TO CRACK OR FRACTURE. SUBSOILING SHALL NOT BE DONE ON SLIP-PRONE AREAS WHERE SOIL PREPARATION SHOULD BE LIMITED TO WHAT IS NECESSARY FOR ESTABLISHING VEGETATION.
2. THE SITE SHALL BE GRADED AS NEEDED TO PERMIT THE USE OF CONVENTIONAL EQUIPMENT FOR SEEDBED PREPARATION AND SEEDING.
3. TOPSOIL SHALL BE APPLIED WHERE NEEDED TO ESTABLISH VEGETATION.

SEEDBED PREPARATION:
1. TEST THE SOIL CONDITIONS FOR FEEDING BEFORE STARTING SEEDING AND MULCHING.
2. LIME AGRICULTURAL GROUND LIMESTONE SHALL BE APPLIED TO ACID SOIL AS RECOMMENDED BY A SOIL TEST. IN LIEU OF A SOIL TEST, LIME SHALL BE APPLIED AT THE RATE OF 100 POUNDS PER 1,000-SQ. FT. OR 2 TONS PER ACRE.
3. FERTILIZER FERTILIZER SHALL BE APPLIED AS RECOMMENDED BY A SOIL TEST. CONTRACTOR SHALL PERFORM LAB TESTING ON SOIL AND PROVIDE A CERTIFIED FERTILIZER RATIO FOR THE SITE SOILS AND SPECIFIED SEED MIX.
4. THE LIME AND FERTILIZER SHALL BE WORKED INTO THE SOIL WITH A DISK HARROW, SPRING-TOOTH HARROW, OR OTHER SUITABLE FIELD IMPLEMENT TO A DEPTH OF 3 INCHES. ON SLOPING LAND, THE SOIL SHALL BE WORKED ON THE CONTOUR.

SEEDING DATES AND SOIL CONDITIONS:
SEEDING SHOULD BE DONE MARCH 1 TO MAY 31 OR AUGUST 1 TO SEPTEMBER 30. IF SEEDING OCCURS OUTSIDE OF THE ABOVE SPECIFIED DATES, ADDITIONAL MULCH AND IRRIGATION MAY BE REQUIRED TO ENSURE A MINIMUM OF 80% GERMINATION. TILLAGE FOR SEEDBED PREPARATION SHOULD BE DONE WHEN THE SOIL IS DRY ENOUGH TO CRUMBLE AND NOT FORM RIBBONS WHEN COMPRESSED BY HAND. FOR WINTER SEEDING, SEE THE FOLLOWING SECTION ON DORMANT SEEDING.

DORMANT SEEDINGS:
1. SEEDINGS SHOULD NOT BE MADE FROM OCTOBER 1 THROUGH NOVEMBER 20. DURING THIS PERIOD, THE SEEDS ARE LIKELY TO GERMINATE BUT PROBABLY WILL NOT BE ABLE TO SURVIVE THE WINTER.
2. THE FOLLOWING METHODS MAY BE USED FOR DORMANT SEEDING :
   - 2.1. FROM OCTOBER 1 THROUGH NOVEMBER 20, PREPARE THE SEEDBED, ADD THE REQUIRED AMOUNTS OF LIME AND FERTILIZER, THEN MULCH AND ANCHOR. AFTER NOVEMBER 20, AND BEFORE MARCH 15, BROADCAST THE SELECTED SEED MIXTURE. INCREASE THE SEEDING RATES BY 50% FOR THIS TYPE OF SEEDING.
   - 2.2. FROM NOVEMBER 20 THROUGH MARCH 15, WHEN SOIL CONDITIONS PERMIT, PREPARE THE SEEDBED, LIME AND FERTILIZE, APPLY THE SELECTED SEED MIXTURE, MULCH AND ANCHOR. INCREASE THE SEEDING RATES BY 50% FOR THIS TYPE OF SEEDING.
   - 2.3. APPLY SEED UNIFORMLY WITH A CYCLONE SEEDER, DRILL, CULTIPACKER SEEDER, OR HYDRO-SEEDER (SLURRY MAY INCLUDE SEED AND FERTILIZER) ON A FIRM, MOIST SEEDBED.
   - 2.4. WHERE FEASIBLE, EXCEPT WHEN A CULTIPACKER TYPE SEEDER IS USED, THE SEEDBED SHOULD BE FIRMED FOLLOWING SEEDING OPERATIONS WITH A CULTIPACKER, ROLLER, OR LIGHT DRAG. ON SLOPING LAND, SEEDING OPERATIONS SHOULD BE ON THE CONTOUR WHERE FEASIBLE.

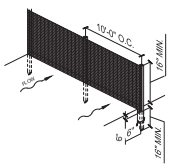
MULCHING:
1. MULCH MATERIAL SHALL BE APPLIED IMMEDIATELY AFTER SEEDING. DORMANT SEEDING SHALL BE MULCHED. 100% OF THE GROUND SURFACE SHALL BE COVERED WITH AN APPROVED MATERIAL.
2. MATERIALS:
   - 2.1. STRAW IF STRAW IS USED IT SHALL BE UNROTTED SMALL-GRAIN STRAW APPLIED AT THE RATE OF 2 TONS PER ACRE OR 90 POUNDS (TWO TO THREE BALES) PER 1,000-SQ. FT. THE MULCH SHALL BE SPREAD UNIFORMLY BY HAND OR MECHANICALLY APPLIED SO THE SOIL SURFACE IS COVERED. FOR UNIFORM DISTRIBUTION OF HAND-SPREAD MULCH, DIVIDE AREA INTO APPROXIMATELY 1,000-SQ.-FT. SECTIONS AND SPREAD TWO 45-LB. BALES OF STRAW IN EACH SECTION.
   - 2.2. HYDROSEEDERS IF WOOD CELLULOSE FIBER IS USED, IT SHALL BE APPLIED AT 2,000 LB./AC. OR 46 LB./1,000 SQ. FT.
   - 2.3. OTHER OTHER ACCEPTABLE MULCHES INCLUDE ROLLED EROSION CONTROL MATTINGS OR BLANKETS APPLIED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS OR WOOD CHIPS APPLIED AT 6 TONS PER ACRE.
3. STRAW AND MULCH ANCHORING METHODS- STRAW MULCH SHALL BE ANCHORED IMMEDIATELY TO MINIMIZE LOSS BY WIND OR WATER:
   - 3.1. MECHANICAL A DISK, CRIMPER, OR SIMILAR TYPE TOOL SHALL BE SET STRAIGHT TO PUNCH OR ANCHOR THE MULCH MATERIAL INTO THE SOIL. STRAW MECHANICALLY ANCHORED SHALL NOT BE FINELY CHOPPED BUT, GENERALLY, BE LEFT LONGER THAN 6 INCHES.
   - 3.2. MULCH NETTING NETTING SHALL BE USED ACCORDING TO THE MANUFACTURERÍFS RECOMMENDATIONS. NETTING MAY BE NECESSARY TO HOLD MULCH IN PLACE IN AREAS OF CONCENTRATED RUNOFF AND ON CRITICAL SLOPES.
   - 3.3. ASPHALT EMULSION ASPHALT SHALL BE APPLIED AS RECOMMENDED BY THE MANUFACTURE OR AT THE RATE OF 160 GALLONS PER ACRE.
   - 3.4. SYNTHETIC BINDERS SYNTHETIC BINDERS SUCH AS ACRYLIC DLR (AGRI-TAC), DCA-70, PETROSET, TERRA TACK OR EQUIVALENT MAY BE USED AT RATES SPECIFIED BY THE MANUFACTURER.
   - 3.5. WOOD CELLULOSE FIBER WOOD CELLULOSE FIBER SHALL BE APPLIED AT A NET DRY WEIGHT OF 750 POUNDS PER ACRE. THE WOOD CELLULOSE FIBER SHALL BE MIXED WITH WATER WITH THE MIXTURE CONTAINING A MAXIMUM OF 50 POUNDS CELLULOSE PER 100 GALLONS OF WATER.

IRRIGATION:
PERMANENT SEEDING SHALL INCLUDE IRRIGATION TO ESTABLISH VEGETATION DURING DRY WEATHER OR ON ADVERSE SITE CONDITIONS, WHICH REQUIRE ADEQUATE MOISTURE FOR SEED GERMINATION AND PLANT GROWTH. IRRIGATION RATES SHALL BE MONITORED TO PREVENT EROSION AND DAMAGE TO SEEDED AREAS FROM EXCESSIVE RUNOFF. CONTRACTOR SHALL MAINTAIN PERMANENT SEEDING FOR UP TO ONE YEAR FROM SUBSTANTIAL COMPLETION TO FIX, REPAIR, WATER, REFERTILIZE AND/OR RESEED GRASSED AREAS.

TEMPORARY SILT FENCE (SF)

1. THIS SEDIMENT BARRIER UTILIZES STANDARD STRENGTH OR EXTRA STRENGTH SYNTHETIC FILTER FABRICS. IT IS DESIGNED FOR SITUATIONS IN WHICH ONLY SHEET OR OVERLAND FLOWS ARE EXPECTED.
2. THE HEIGHT OF A SEDIMENT FENCE SHALL NOT EXCEED 36-INCHES (HIGHER FENCES MAY IMPOUND VOLUMES OF WATER SUFFICIENT TO CAUSE FAILURE OF THE STRUCTURE).
3. THE FILTER FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID THE USE OF JOINTS. WHEN JOINTS ARE NECESSARY, FILTER CLOTH SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST, WITH A MINIMUM 6-INCH OVERLAP, AND SECURELY SEALED.
4. POSTS SHALL BE SPACED A MAXIMUM OF 10 FEET APART AT THE BARRIER LOCATION AND DRIVEN SECURELY INTO THE GROUND (MINIMUM OF 16 INCHES). WHEN EXTRA STRENGTH FABRIC IS USED WITHOUT THE WIRE SUPPORT FENCE, POST SPACING SHALL NOT EXCEED 6 FEET.
5. A TRENCH SHALL BE EXCAVATED APPROXIMATELY 6 INCHES WIDE AND 6 INCHES DEEP ALONG THE LINE OF POSTS AND UPSLOPE FROM THE BARRIER.
6. WHEN STANDARD STRENGTH FILTER FABRIC IS USED, A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY DUTY WIRE STAPLES AT LEAST 1-INCH LONG, TIE WIRES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 2 INCHES AND SHALL NOT EXTEND MORE THAN 16 INCHES ABOVE THE ORIGINAL GROUND SURFACE.
7. THE STANDARD STRENGTH FILTER FABRIC SHALL BE STAPLED OR WIRED TO THE FENCE, AND 8-INCHES OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE THE ORIGINAL GROUND SURFACE. FILTER FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
8. WHEN EXTRA STRENGTH FILTER FABRIC AND CLOSURE POST SPACING ARE USED, THE WIRE MESH SUPPORT FENCE MAY BE ELIMINATED IN SUCH A CASE, THE FILTER FABRIC IS STAPLED OR WIRED DIRECTLY TO THE POSTS WITH ALL OTHER PROVISIONS OF ITEM NO. 6 APPLYING.
9. THE TRENCH SHALL BE BACKFILLED AND SOIL COMPACTED OVER THE FILTER FABRIC.
10. SEDIMENT FENCES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE, BUT NOT BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.
11. 12-INCH FILTER SOCKS ARE AN ACCEPTABLE ALTERNATIVE TO SILT FENCING.

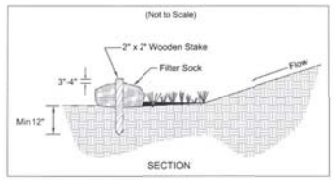
MAINTENANCE:
1. SEDIMENT FENCES AND FILTER BARRIERS SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.
2. SHOULD THE FABRIC ON A SEDIMENT FENCE OR FILTER BARRIER DECOMPOSE OR BECOME INEFFECTIVE PRIOR TO THE END OF THE EXPECTED USABLE LIFE AND THE BARRIER IS STILL NECESSARY, THE FABRIC SHALL BE REPLACED PROMPTLY.
3. SEDIMENT DEPOSITS SHOULD BE REMOVED AFTER EACH STORM EVENT. THEY MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE-HALF THE HEIGHT OF THE BARRIER.
4. ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE SEDIMENT FENCE OR FILTER BARRIER IS NO LONGER REQUIRED SHALL BE DRESSED TO CONFORM WITH THE EXISTING GRADE, PREPARED, AND SEEDED.



FILTER SOCK (FS)

Specifications for

Filter Sock



1. Materials – Compost used for filter socks shall be weed, pathogen and insect free and free of any refuse, contaminants or other materials toxic to plant growth. They shall be derived from a well-decomposed source of organic matter and consist of a particles ranging from 3/8" to 2".
2. Filter Socks shall be 3 or 5 mil continuous, tubular, 4DPE 3/8" knitted mesh netting material, filled with compost passing the above specifications for compost products.

INSTALLATION:

3. Filter socks will be placed on a level line across slopes, generally parallel to the base of the slope or other affected area. On slopes steeper than 2:1, additional socks shall be provided at the top and as needed mid-slope.
4. Filter socks intended to be left as a permanent fiber or part of the natural landscape, shall be seeded at the time of installation for establishment of permanent vegetation.
5. Filter Socks are not to be used in concentrated flow situations or in runoff channels.

MAINTENANCE:

6. Routinely inspect filter socks after each significant rain, maintaining filter socks in a functional condition at all times.
7. Remove sediments collected at the base of the filter socks when they reach 1/3 of the exposed height of the practice.
8. Where the filter sock deteriorates or fails, it will be repaired or replaced with a more effective alternative.
9. Removal – Filter socks will be dispersed on site when no longer required in such as way as to facilitate and not obstruct seedings.

NO.	DATE	REVISION DESCRIPTION	DR	ENG	CK
1	3/27/20	UNDERDRAIN AND ACCESS GATE REVISIONS	SAZ	KPD	IA

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OLD DWG #: STD DWG #:

AMERICAN ELECTRIC POWER

HAYDEN STATION

COLUMBUS OHIO

345kV / 138kV / 13kV

SWPPP NOTES AND DETAILS

SCALE: AS SHOWN	DR: ILK	END: IA	CH: IA
	WO#: 42B1900.24	APPD:	DATE:
	1 RIVERSIDE PLAZA, COLUMBUS, OH 43215	DWG. NO.: E-1310	S 1

ANSI C (22 X 17)

APPENDIX 6

Long-term Maintenance Plan

LONG-TERM MAINTENANCE PLAN

AEP OHIO TRANSMISSION COMPANY
HAYDEN STATION

The Storm Water Pollution Prevention Plan (SWPPP) prepared for construction of the Hayden Station includes Best Management Practices (BMPs) for storm water management. As a condition of Part III.G.2.e of the General Permit (OHC000005), a maintenance plan is required for all post-construction BMPs to ensure that permanent storm water management systems continue to function as designed and constructed. For this Project, BMPs that will remain in place following the Notice of Termination (NOT) to Ohio EPA include an Extended Dry Detention Basin with outlet control structure, micropool and forebay, vegetated channels, a level spreader, and culverts (see Grading Plan and Details).

INSPECTION AND MAINTENANCE RESPONSIBILITIES

Following construction, the Hayden Station will be operated and maintained by AEP. As part of routine and periodic maintenance activities, a representative from AEP's Transmission Field Services (TFS) will inspect the BMPs according to the schedule outlined in Table 1 below.

INSPECTION AND MAINTENANCE ACTIVITIES FOR BMPs	
ACTIVITY	SCHEDULE
Rock Lined Channel: ▪ Check for riprap failures ▪ Inspect and correct slope erosion problems ▪ Remove vegetative growth from within the channel	Annually
Vegetated Channel: ▪ Check for vegetative lining failures ▪ Inspect and correct slope erosion problems ▪ Remove any debris or sediment buildup within the channels	Semi-Annually
Detention Basin (dry) with Micropool and Forebay: ▪ Check for condition of berms ▪ Mowing/clean up	Annually
Culverts: ▪ Ensure pipe is intact and functioning correctly ▪ Ensure inlet/outlet is clear of debris	Annually
Level Spreader: ▪ Mow vegetation, remove sediment	As Warranted

Summary: Notice Proof of Compliance associated exhibit for the Hayden Transmission Station Expansion Project electronically filed by Tanner Wolffram on behalf of Ohio Power Company