

Site 1



I have reviewed and agree with the content of the attached plan prepared by the NRCS.

Landowner: \_\_\_\_\_ Date: \_\_\_\_\_

I certify that this practice has been constructed in accordance with the plans and specifications.

Contractor: \_\_\_\_\_ Date: \_\_\_\_\_

NRCS Rep.: \_\_\_\_\_ Date: \_\_\_\_\_

Contractor is required to follow Iowa One Call law.  
 iowaOneCall.com or Call 811  
 Ticket # \_\_\_\_\_

If a cultural resource is identified during construction, stop immediately and notify the local Natural Resources Conservation Service office.



United States Department of Agriculture

Natural Resources Conservation Service

Owner: \_\_\_\_\_

Location: Sec \_\_\_\_\_, T 86N N, R 33W

Calhoun Township

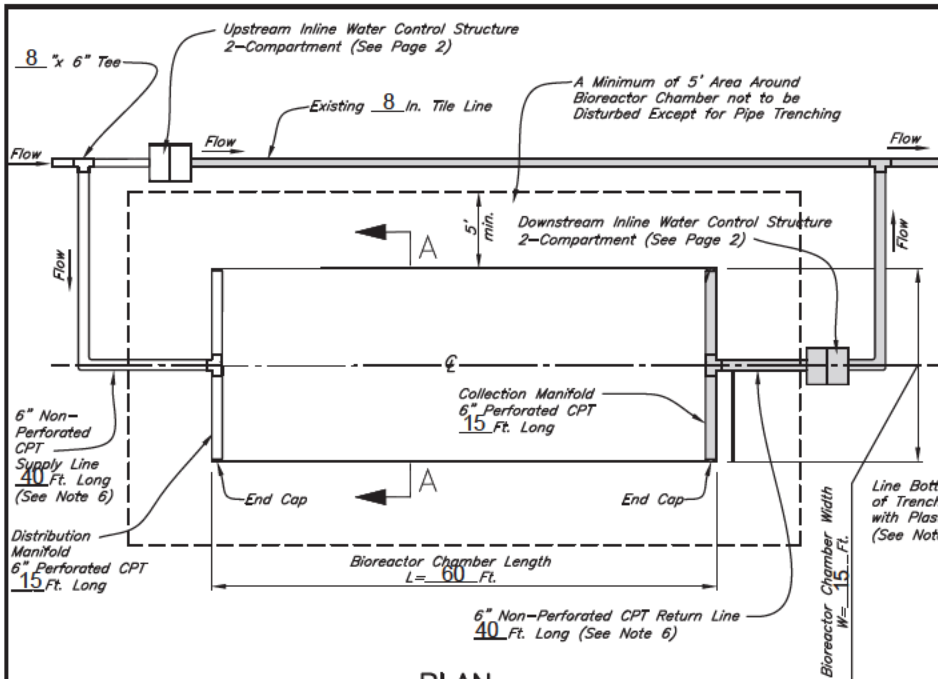
Calhoun County, Iowa

Designed	TJL	Date	03/23
Drawn	TJL	Date	03/23
Checked	DJA	Date	07/23
Approved	DJA	Date	07/23

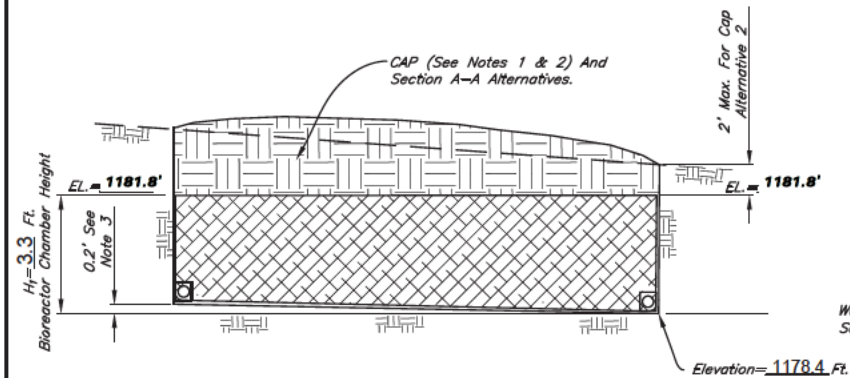
Eng. Job Class  
II

Revision Date  
November 2017

Sheet 1 of 4

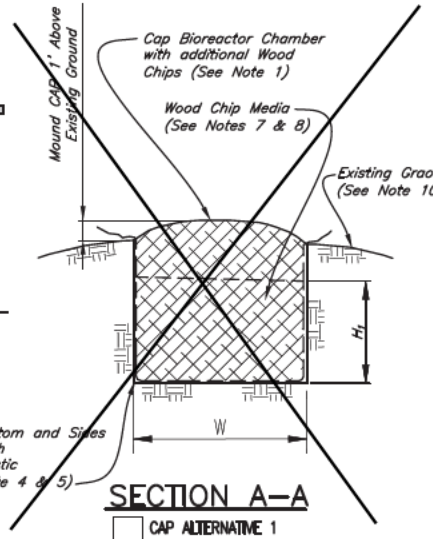


**PLAN**



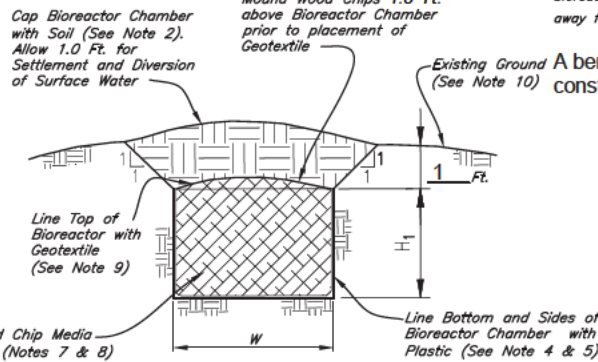
**ELEVATION**

NOT TO SCALE



**SECTION A-A**

CAP ALTERNATIVE 1



**SECTION A-A**

CAP ALTERNATIVE 2

**NOTES:**

- ~~1. Utilize CAP ALTERNATIVE 1 for the bioreactor chamber unless traffic over the top is anticipated.~~
- For CAP ALTERNATIVE 2, fill the area above the bioreactor chamber with compacted soil. Use topsoil for at least the top 6" Vegetate according to Conservation Practice Standard 342, Critical Area Planting.
- Set bottom of bioreactor chamber to drain towards exit end.
- Line bottom and sides of bioreactor chamber with plastic, minimum 4 mil thickness. Overlap any splices at least 6 inches. Wrap plastic carefully around tiles that enter/exit the chamber; no need to seal around tiles.
- If bioreactor is located in glacial till soil and has Unified Soil Classification System designation of CL or CH and no sand is encountered during construction chamber sides and bottom do not need to be lined.
- Route supply line to corner of entrance end and return line from corner of exit end of bioreactor chamber.
- Wood chip media must meet requirements in Iowa Construction Specification IA-605, Denitrifying Bioreactor.
- Obtain approval of engineer on the wood chips / media prior to installation.
- Geotextile must be non-woven, class II, and meet the requirements of Iowa Construction Specification IA-95, Geotextile. Overlap splices at least 6 inches.
- Grade site for positive drainage away from the bioreactor chamber. Spread spoil in designated location away from bioreactor.

A benchmark will be set prior to construction.

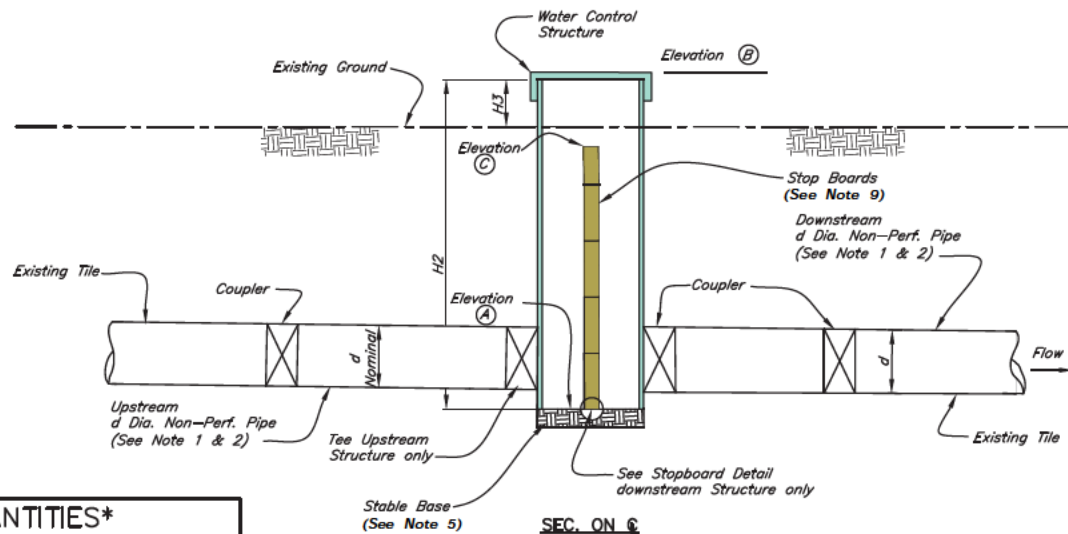
Date	03/23
Designed	TJL
Drawn	TJL
Checked	DJA
Approved	

**DENITRIFYING BIOREACTOR  
TYPE 2 (Page 1 of 3)**

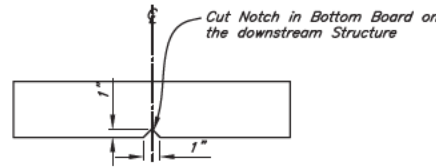


File No.	
Drawing No.	
Sheet	2 of 4

IOWA STANDARD DWG. NO. 1555  
DATE June 2022 SHEET 7 OF 3



**SEC. ON 6  
TYPICAL SECTION  
EACH STRUCTURE**

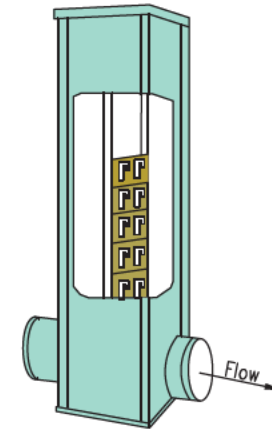


**STOP-BOARD DETAIL**  
(Downstream Structure Only)  
NOT TO SCALE

	Inlet WCS	Outlet WCS
WCS Box Bottom El. (A)	1178.3	1178.1
WCS Box Top El. (B)	1184.3	1184.1
WCS Ht Above EG, H <sub>3</sub>	1.5	1.3
Designed Weir El. (C)	1181.3	1178.8
US Non-Perforated Pipe Length, (ft)	20	20
DS Non-Perforated Pipe Length, (ft)	20	20

**NOTES:**

1. Install a minimum of 20 feet of non-perforated pipe adjacent to the water control structure, both upstream and downstream.
2. Pipe must be PVC or PE. Pipe, pipe sizes, fittings and other appurtenances shall conform to the "Materials" section of Iowa NRCS Construction Specification (CS) IA-620, Underground Outlet.
3. Bioreactor installation shall be in conformance with CS IA-605, Denitrifying Bioreactor.
4. Water Control Structure (WCS) materials shall be in conformance with CS IA-45, Plastic (PVC, PE) Pipe.
5. Place structure and pipe coupler on a minimum 4 inch stable base. A stable base may be compacted earth, compacted fill gravel, or a concrete pad. Extend the stable base no less than 1 foot around structure.
6. Stop board removal tool shall be provided.
7. Structure lid shall be provided with locking mechanism.
8. Normal stop board operation shall be verified following backfill.
9. Stop boards must provide water tight seals under a minimum of 4 foot pressure head (except notched board).
10. Mark location of structure using post or manufactured marker flag for safety in the field.
11. Refer to Operation and Maintenance (O&M) Plan for adjusting WCS weir settings.
12. Seeding and Mulching shall be performed in accordance with attached IA-CPA-4, Seeding Plan and Construction Specification IA-6, Seeding and Mulching for Protective Cover.



**IN-LINE CONTROL  
STRUCTURE**

QUANTITIES*	
Upstream Water Control Structure (Inlet WCS) 2 - Compartment H <sub>2</sub> = 6 ft. d = 8 in	1
Downstream Water Control Structure (Outlet WCS) 2 - Compartment H <sub>2</sub> = 6 ft. d = 6 in	1
8" Non-perforated Pipe (ft)	40
6" Non-perforated Pipe (ft)	80
6" Perforated CPT (ft)	30
Tee 8" x 6"	2
Tee 6" x 6"	
Elbows 6"	2
6" End Caps	2
Wood Chips (cu. yd.)	122
4 Mil Plastic (sq. yd.)	160
Geotextile (sq. yd.)	100
Excavation (cu. yd.)	150

\* Quantities Do Not Include Tile/Pipe Couplers or Extra Material For Geotextile/Plastic Overlap. These items are incidental. See Contract Documents for full quantities list.

Date 03/23  
Designed TJL  
Drawn TJL  
Checked DJA  
Approved

**DENITRIFYING BIOREACTOR  
TYPE 2 (Page 2 of 3)**

United States  
Department of  
Agriculture  
USDA  
Natural Resources  
Conservation Service

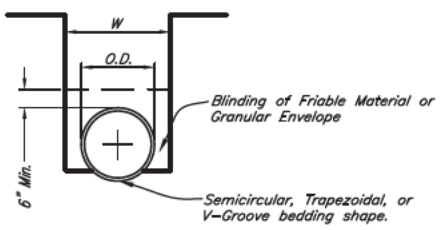
File No.  
Drawing No.  
Sheet 3 of 4

Date 03/23  
 Designed TJL  
 Drawn TJL  
 Checked DJA  
 Approved \_\_\_\_\_

**DENITRIFYING BIOREACTOR**  
**TYPE 2 (Page 3 of 3)**

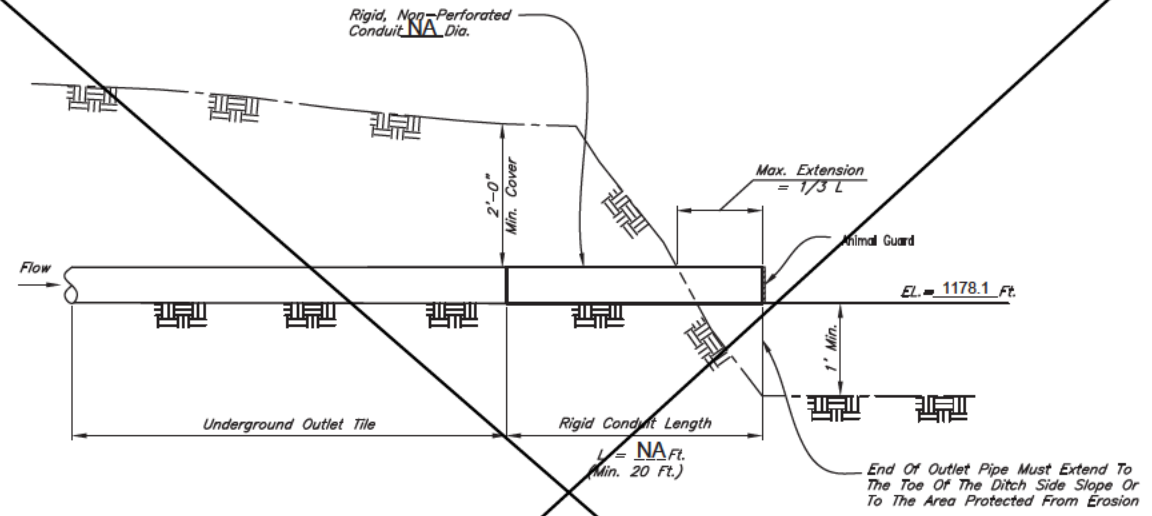


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 Drawing No. \_\_\_\_\_  
 Sheet 4 of 4

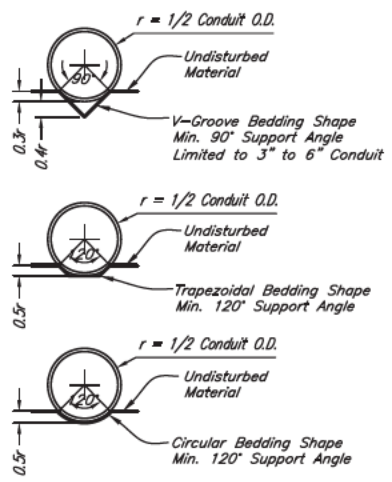


1.  $W$  = trench width at top of conduit
2.  $W$  =  $O.D. + 6"$  min. for trench installation;  
 $W$  =  $O.D. + 4"$  min. for plow installation.
3. Where  $W > O.D. + 12"$ , hand compact the blinding or use a granular envelope.

**TRENCH DETAIL**



**PIPE OUTLET DETAIL**



**BEDDING DETAIL**

- NOTES:
1. Connection with outlet pipe shall be made watertight.
  2. Maximum fill over conduit installed in a trench condition ( $w < O.D. + 24"$ ) shall be 11 feet or as specified by the manufacturer.
  3. The fill height over the underground outlet conduit or pipe shall not exceed the values shown in Table 2 or 3 of IA NRCS Conservation Standard 620, Underground Outlet.
  4. Outlet pipe shall be a continuous section of non-perforated conduit at least 20 feet long.
  5. All changes must be approved by person approving the original plans prior to change.
- Outlet already established. No new CMP or animal guard required.

IOWA STANDARD DWG. NO. 1555  
 DATE June 2022 SHEET 3 OF 3

Site 2



**Legend**

- WCS\_Tile\_A
- West\_Distribution\_Tile\_A\_450'
- East\_Distribution\_Tile\_A\_445'
- Existing\_Tile\_A



I have reviewed and agree with the content of the attached plan prepared by the NRCS.

Landowner: \_\_\_\_\_ Date: \_\_\_\_\_

I certify that this practice has been constructed in accordance with the plans and specifications.

Contractor: \_\_\_\_\_ Date: \_\_\_\_\_

NRCS Rep.: \_\_\_\_\_ Date: \_\_\_\_\_

Contractor is required to follow Iowa One Call law.  
 iowaOneCall.com or Call 811  
 Ticket # \_\_\_\_\_

If a cultural resource is identified during construction, stop immediately and notify the local Natural Resources Conservation Service office.



United States Department of Agriculture

Natural Resources Conservation Service

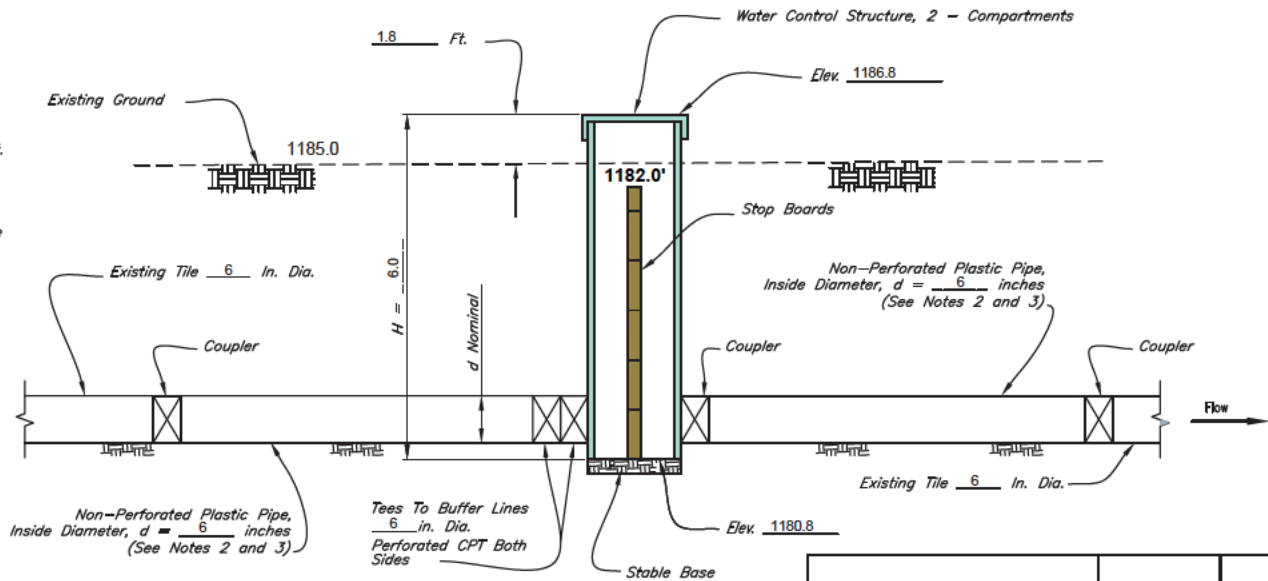
Owner: [REDACTED]  
 Location: Sec [REDACTED], T 87 N, R 35W  
Coon Valley Township  
Sac County, Iowa

Designed	TJL	Date	12/22
Drawn	TJL	Date	12/22
Checked	DJA	Date	9/23
Approved	Kevin Barkely CET 9/23		

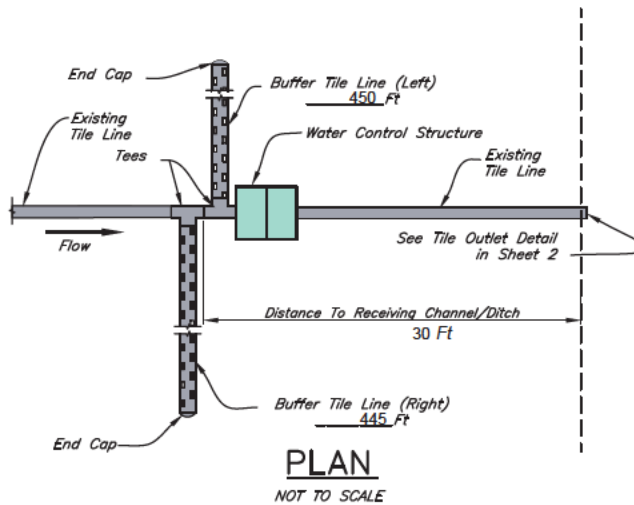
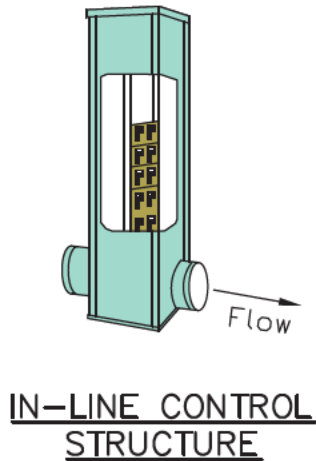
Eng. Job Class	I
Revision Date	November 2017
Sheet	1 of 3

**NOTES:**

1. Install perforated buffer tile parallel to ditch.
2. Install a minimum of 20 feet of non-perforated pipe adjacent to the water control structure, both upstream and downstream.
3. Pipe must be PVC or PE. Pipe, pipe sizes, fittings and other appurtenances shall conform to the "Materials" section of Iowa NRCS Construction Specification (CS) IA-620, Underground Outlet.
4. Saturated Buffer installation shall be in conformance with CS IA-604, Saturated Buffer.
5. Water Control Structure (WCS) materials shall be in conformance with CS IA-45, Plastic (PVC, PE) Pipe.
6. Place structure and pipe coupler on a minimum 4 inch stable base. A stable base may be compacted earth, compacted fill gravel, or a concrete pad. Extend the stable base no less than 1 foot around structure.
7. Stop board removal tool shall be provided.
8. Structure lid shall be provided with locking mechanism.
9. Normal stop board operation shall be verified following backfill.
10. Stop boards must provide water tight seals under a minimum of 4 foot pressure head.
11. Mark location of structure using post or manufactured marker lag for safety in the field.
12. Refer to Operation and Maintenance (O&M) Plan for adjusting WCS weir settings.
13. Seeding and Mulching shall be performed in accordance with attached IA-CPA-4, Seeding Plan and Construction Specification IA-6, Seeding and Mulching for Protective Cover.



**TYPICAL SECTION**



**A benchmark will be set prior to construction.**

WORK or MATERIAL	QUANTITY*	UNITS
Water Control Structure 2 - Compartment (H = <u>6.0</u> FT) (d = <u>6.0</u> in)	1	Job
<u>6</u> inch Diam., Non-Perforated Plastic Pipe (Upstream)	20	Lin.Ft.
<u>6</u> inch Diam., Non-Perforated Plastic Pipe (Downstream)	10	Lin.Ft.
<u>6</u> inch Diam., Perforated Plastic Pipe, Buffer Line (Right)	445	Lin.Ft.
<u>6</u> inch Diam., Perforated Plastic Pipe, Buffer Line (Left)	450	Lin.Ft.
<u>6</u> in. x <u>6</u> in. x <u>6</u> in. T Connection	2	Each
<u>6</u> inch Diam., End Caps	2	Each
<u>    </u> inch to <u>    </u> inch reducer	NA	Each
<u>NA</u> inch Diam., Rigid, Non-Perforated Conduit w/Animal Guard	NA	Lin.Ft.

\* Quantities Do Not include Couplers. These items are incidental. See Contract Documents for full quantities list.

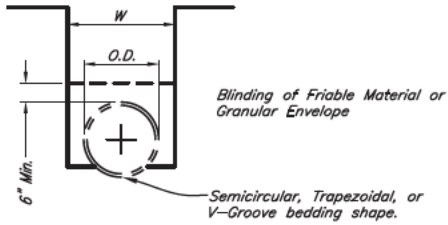
Date: 12/2022  
 Designed: -TJL  
 Drawn: -TJL  
 Checked: DJA  
 Approved: -  
 9/23

SATURATED BUFFER  
 TYPE 1  
 Sheet 1 of 2

United States Department of Agriculture  
 Natural Resources Conservation Service

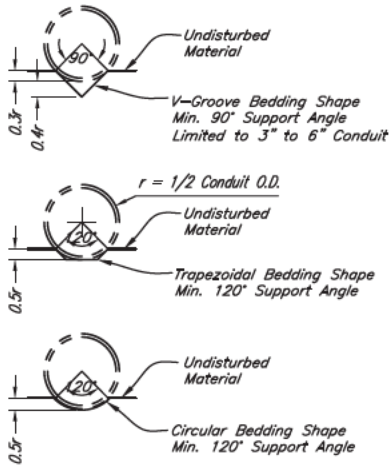
File No.  
 Drawing No.  
 Sheet 2 of 3

Contract Sec. T 87, N, R, 35, W  
 Sac. County, IA

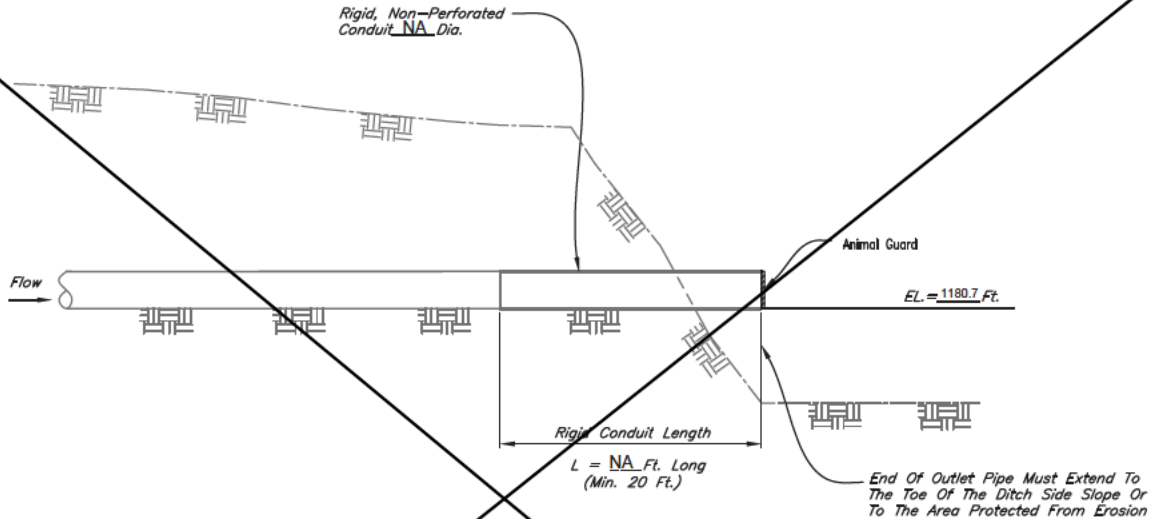


1.  $W$  = trench width at top of conduit
2.  $W$  =  $O.D. + 6"$  min. for trench installation;  
 $W$  =  $O.D. + 4"$  min. for plow installation.
3. Where  $W > O.D. + 12"$ , hand compact the blinding or use a granular envelope.

**TRENCH DETAIL**



**BEDDING DETAIL**



**TITLE OUTLET DETAIL**

No work will be needed on the outlet.

**NOTES:**

1. Connection with outlet pipe shall be made watertight.
2. Maximum fill over conduit installed in a trench condition ( $w < O.D. + 24"$ ) shall be 11 feet or as specified by the manufacturer.
3. The fill height over the underground outlet conduit or pipe shall not exceed the values shown in Table 2 or 3 of IA NRCS Conservation Standard 620, Underground Outlet.
4. Outlet pipe shall be a continuous section of non-perforated conduit at least 20 feet long.
5. All changes must be approved by person approving the original plans prior to change.

IOWA STANDARD DWG. NO. 1552

DATE Jan. 2021 SHEET 2 OF 2

Date 12/2022  
 Designed -TJL  
 Drawn -TJL  
 Checked DJA  
 Approved 9/23

SATURATED BUFFER  
 TYPE 1  
 Sheet 2 of 2

Sac County, IA

Coord. Sec. T. 87. N. R. 35. W.



File No.

Drawing No.

Sheet 3 of 3



**Legend**

- Distribution\_Line\_West\_300'
- Distribution\_Line\_East\_130'
- WCS\_Location
- Existing\_Tile\_Line



I have reviewed and agree with the content of the attached plan prepared by the NRCS.

Landowner: \_\_\_\_\_ Date: \_\_\_\_\_

I certify that this practice has been constructed in accordance with the plans and specifications.

Contractor: \_\_\_\_\_ Date: \_\_\_\_\_

NRCS Rep.: \_\_\_\_\_ Date: \_\_\_\_\_

Contractor is required to follow Iowa One Call law.  
 iowaOneCall.com or Call 811  
 Ticket # \_\_\_\_\_

If a cultural resource is identified during construction, stop immediately and notify the local Natural Resources Conservation Service office.



United States Department of Agriculture

Natural Resources Conservation Service

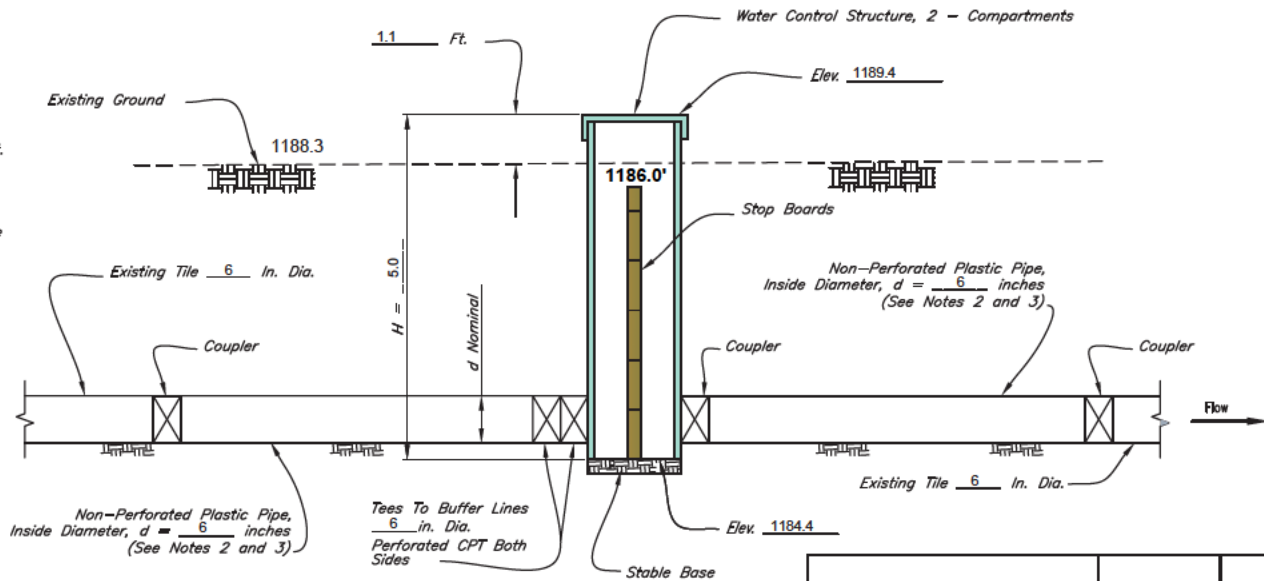
Owner: [REDACTED]  
 Location: Sec [REDACTED], T 87 N, R 35W  
Coon Valley Township  
Sac County, Iowa

Designed	TJL	Date	12/22
Drawn	TJL	Date	12/22
Checked	DJA	Date	9/23
Approved	Kevin Barkley CET 9/23		

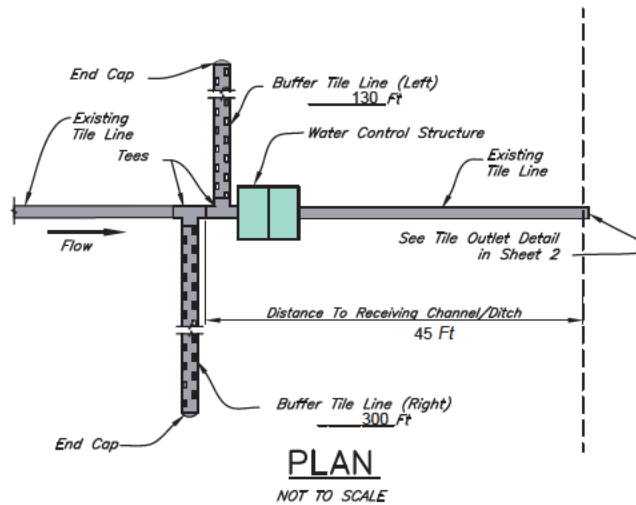
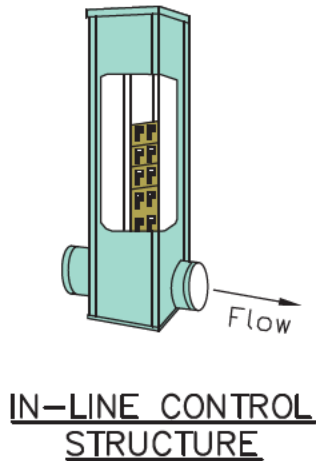
Eng. Job Class	I
Revision Date	November 2017
Sheet	1 of 3

**NOTES:**

1. Install perforated buffer tile parallel to ditch.
2. Install a minimum of 20 feet of non-perforated pipe adjacent to the water control structure, both upstream and downstream.
3. Pipe must be PVC or PE. Pipe, pipe sizes, fittings and other appurtenances shall conform to the "Materials" section of Iowa NRCS Construction Specification (CS) IA-620, Underground Outlet.
4. Saturated Buffer installation shall be in conformance with CS IA-604, Saturated Buffer.
5. Water Control Structure (WCS) materials shall be in conformance with CS IA-45, Plastic (PVC, PE) Pipe.
6. Place structure and pipe coupler on a minimum 4 inch stable base. A stable base may be compacted earth, compacted fill gravel, or a concrete pad. Extend the stable base no less than 1 foot around structure.
7. Stop board removal tool shall be provided.
8. Structure lid shall be provided with locking mechanism.
9. Normal stop board operation shall be verified following backfill.
10. Stop boards must provide water tight seals under a minimum of 4 foot pressure head.
11. Mark location of structure using post or manufactured marker lag for safety in the field.
12. Refer to Operation and Maintenance (O&M) Plan for adjusting WCS weir settings.
13. Seeding and Mulching shall be performed in accordance with attached IA-CPA-4, Seeding Plan and Construction Specification IA-6, Seeding and Mulching for Protective Cover.



**TYPICAL SECTION**

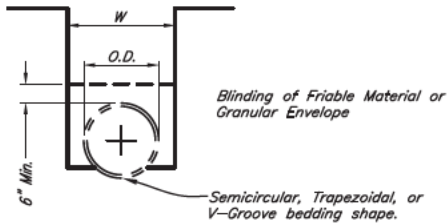


**A benchmark will be set prior to construction.**

WORK or MATERIAL	QUANTITY*	UNITS
Water Control Structure 2 - Compartment (H = <u>5.0</u> FT) (d = <u>6.0</u> in)	1	Job
<u>6</u> inch Diam., Non-Perforated Plastic Pipe (Upstream)	20	Lin.Ft.
<u>6</u> inch Diam., Non-Perforated Plastic Pipe (Downstream)	25	Lin.Ft.
<u>6</u> inch Diam., Perforated Plastic Pipe, Buffer Line (Right)	300	Lin.Ft.
<u>6</u> inch Diam., Perforated Plastic Pipe, Buffer Line (Left)	130	Lin.Ft.
<u>6</u> in. x <u>6</u> in. x <u>6</u> in. T Connection	2	Each
<u>6</u> inch Diam., End Caps	2	Each
<u>    </u> inch to <u>    </u> inch reducer	NA	Each
<u>8</u> inch Diam., Rigid, Non-Perforated Conduit w/Animal Guard	20	Lin.Ft.

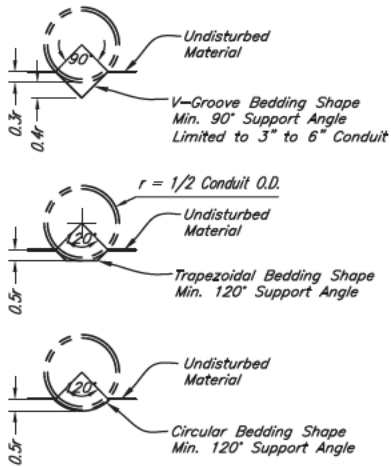
\*Quantities Do Not include Couplers. These items are incidental. See Contract Documents for full quantities list.

Date: 12/2022  
 Designed: -TJL  
 Drawn: -TJL  
 Checked: -  
 Approved: -  
 Sac. County, IA  
**SATURATED BUFFER TYPE 1**  
 Sheet 1 of 2  
 T. B. N. R. 35 W  
 Grant Sec  
 United States Department of Agriculture  
 Natural Resources Conservation Service  
 File No.  
 Drawing No.  
 Sheet 2 of 3

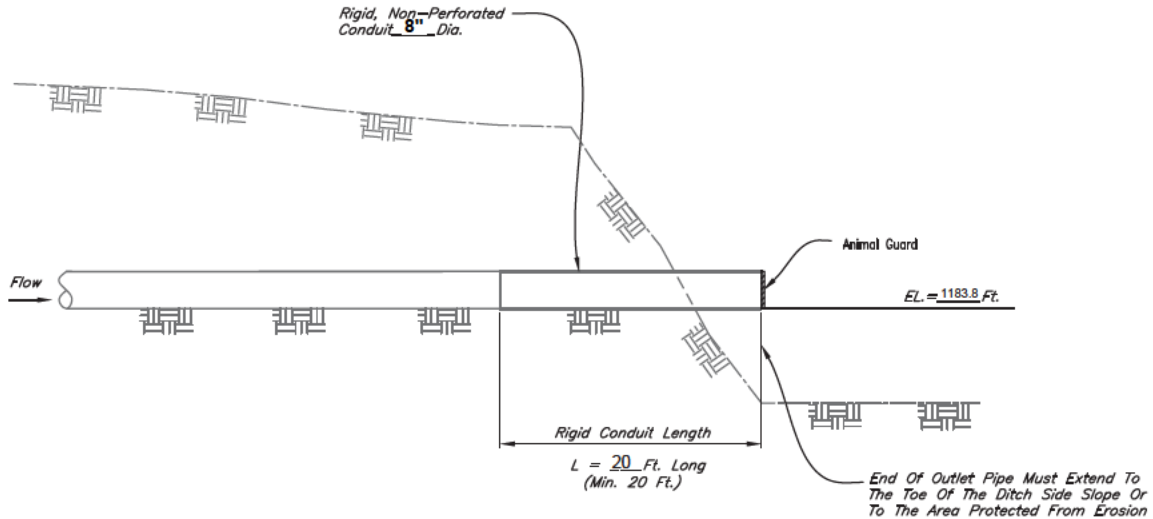


1.  $W$  = trench width at top of conduit
2.  $W = O.D. + 6"$  min. for trench installation;  
 $W = O.D. + 4"$  min. for plow installation.
3. Where  $W > O.D. + 12"$ , hand compact the blinding or use a granular envelope.

**TRENCH DETAIL**



**BEDDING DETAIL**



**TILE OUTLET DETAIL**

**NOTES:**

1. Connection with outlet pipe shall be made watertight.
2. Maximum fill over conduit installed in a trench condition ( $w < O.D. + 24"$ ) shall be 11 feet or as specified by the manufacturer.
3. The fill height over the underground outlet conduit or pipe shall not exceed the values shown in Table 2 or 3 of IA NRCS Conservation Standard 620, Underground Outlet.
4. Outlet pipe shall be a continuous section of non-perforated conduit at least 20 feet long.
5. All changes must be approved by person approving the original plans prior to change.

IOWA STANDARD DWG. NO. 1552

DATE Jan. 2021 SHEET 2 OF 2

Date	12/2022
Designed -TJL	
Drawn -TJL	
Checked	
Approved	

SATURATED BUFFER  
TYPE 1  
Sheet 2 of 2

Sac County, IA

T 87, N, R, 35, W



File No.	
Drawing No.	
Sheet 3 of 3	



**Legend**

-  WCS
-  West\_Distribution\_Tile\_C\_365'
-  Potential\_House\_Drain
-  Existing\_Tile



I have reviewed and agree with the content of the attached plan prepared by the NRCS.

Landowner: \_\_\_\_\_ Date: \_\_\_\_\_

I certify that this practice has been constructed in accordance with the plans and specifications.

Contractor: \_\_\_\_\_ Date: \_\_\_\_\_

NRCS Rep.: \_\_\_\_\_ Date: \_\_\_\_\_

Contractor is required to follow Iowa One Call law. IowaOneCall.com or Call 811 Ticket # \_\_\_\_\_

If a cultural resource is identified during construction, stop immediately and notify the local Natural Resources Conservation Service office.



United States Department of Agriculture

Natural Resources Conservation Service

Owner: [REDACTED]

Location: Sec [REDACTED], T 87 N, R 35W

Coon Valley Township

Sac County, Iowa

Designed TJL Date 12/22

Drawn TJL Date 12/22

Checked DJA Date 9/23

Approved Kevin Barkley CET 9/23

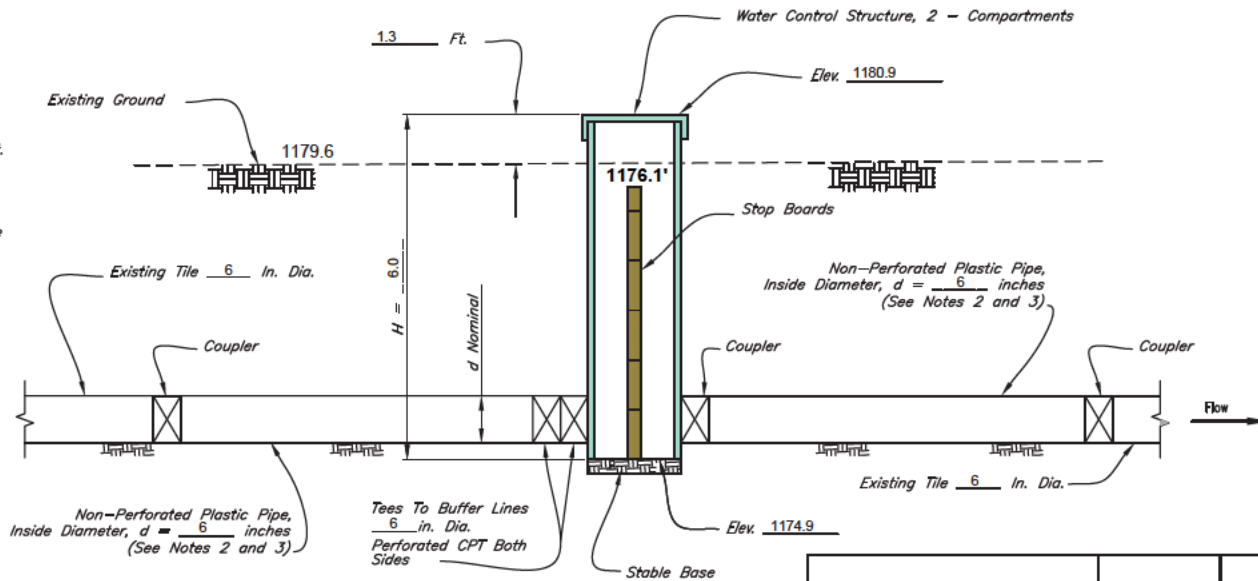
Eng. Job Class I

Revision Date November 2017

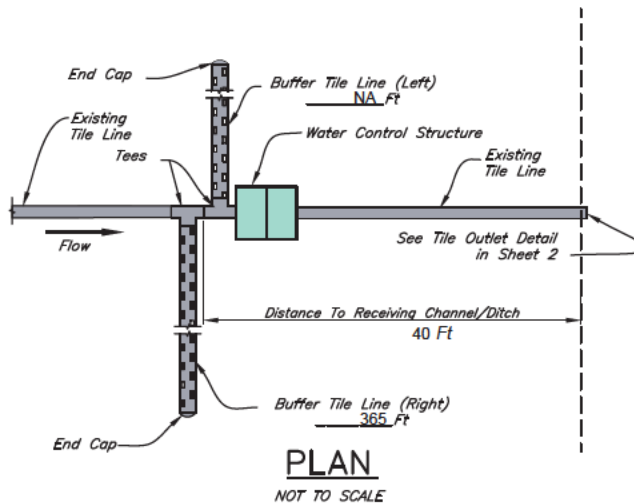
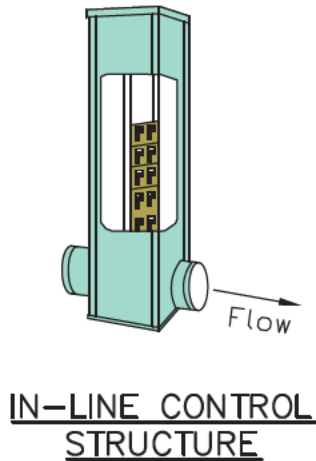
Sheet 1 of 3

**NOTES:**

1. Install perforated buffer tile parallel to ditch.
2. Install a minimum of 20 feet of non-perforated pipe adjacent to the water control structure, both upstream and downstream.
3. Pipe must be PVC or PE. Pipe, pipe sizes, fittings and other appurtenances shall conform to the "Materials" section of Iowa NRCS Construction Specification (CS) IA-620, Underground Outlet.
4. Saturated Buffer installation shall be in conformance with CS IA-604, Saturated Buffer.
5. Water Control Structure (WCS) materials shall be in conformance with CS IA-45, Plastic (PVC, PE) Pipe.
6. Place structure and pipe coupler on a minimum 4 inch stable base. A stable base may be compacted earth, compacted fill gravel, or a concrete pad. Extend the stable base no less than 1 foot around structure.
7. Stop board removal tool shall be provided.
8. Structure lid shall be provided with locking mechanism.
9. Normal stop board operation shall be verified following backfill.
10. Stop boards must provide water tight seals under a minimum of 4 foot pressure head.
11. Mark location of structure using post or manufactured marker lag for safety in the field.
12. Refer to Operation and Maintenance (O&M) Plan for adjusting WCS weir settings.
13. Seeding and Mulching shall be performed in accordance with attached IA-CPA-4, Seeding Plan and Construction Specification IA-6, Seeding and Mulching for Protective Cover.



**TYPICAL SECTION**



**A benchmark will be set prior to construction.**

WORK or MATERIAL	QUANTITY*	UNITS
Water Control Structure 2 - Compartment (H = <u>6.0</u> FT) (d = <u>6.0</u> in)	1	Job
<u>6</u> inch Diam., Non-Perforated Plastic Pipe (Upstream)	20	Lin.Ft.
<u>6</u> inch Diam., Non-Perforated Plastic Pipe (Downstream)	20	Lin.Ft.
<u>6</u> inch Diam., Perforated Plastic Pipe, Buffer Line (Right)	365	Lin.Ft.
<u>6</u> inch Diam., Perforated Plastic Pipe, Buffer Line (Left)	NA	Lin.Ft.
<u>6</u> in. x <u>6</u> in. x <u>6</u> in. T Connection	1	Each
<u>6</u> inch Diam., End Caps	1	Each
<u>6</u> inch to <u>6</u> inch reducer	NA	Each
<u>NA</u> inch Diam., Rigid, Non-Perforated Conduit w/Animal Guard	NA	Lin.Ft.

\*Quantities Do Not include Couplers. These items are incidental. See Contract Documents for full quantities list.

Date  
12/2022-  
12/2022-

Designed -TJL  
Drawn -TJL  
Checked -  
Approved -

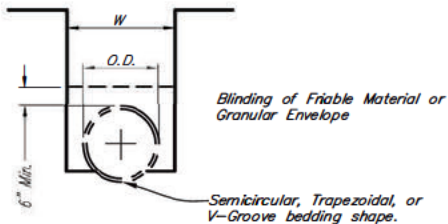
SAC County, IA

SATURATED BUFFER  
TYPE 1  
Sheet 1 of 2

Contract Sec T 87, N, R, 35, W

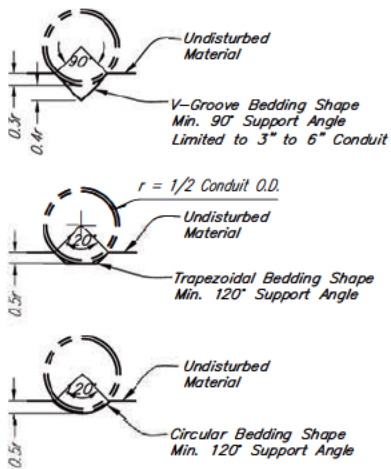
United States  
Department of  
Agriculture  
USDA  
Natural Resources  
Conservation Service

File No.  
Drawing No.  
Sheet 1 of 2

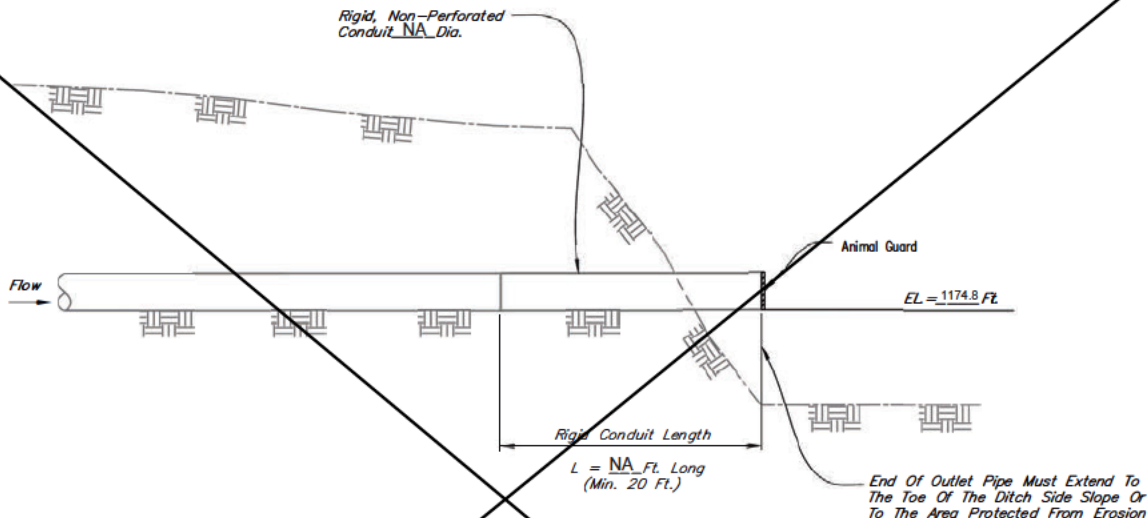


1.  $W$  = trench width at top of conduit
2.  $W = O.D. + 6"$  min. for trench installation;  
 $W = O.D. + 4"$  min. for plow installation.
3. Where  $W > O.D. + 12"$ , hand compact the blinding or use a granular envelope.

**TRENCH DETAIL**



**BEDDING DETAIL**



**TILE OUTLET DETAIL**

*The outlet is in good shape and no work is needed. System should function properly through this outlet.*

**NOTES:**

1. Connection with outlet pipe shall be made watertight.
2. Maximum fill over conduit installed in a trench condition ( $w < O.D + 24"$ ) shall be 11 feet or as specified by the manufacturer.
3. The fill height over the underground outlet conduit or pipe shall not exceed the values shown in Table 2 or 3 of IA NRCS Conservation Standard 620, Underground Outlet.
4. Outlet pipe shall be a continuous section of non-perforated conduit at least 20 feet long.
5. All changes must be approved by person approving the original plans prior to change.

Date	12/2022
Designed -TJL	
Drawn -TJL	
Checked	
Approved	

**SATURATED BUFFER  
TYPE 1**  
Sheet 2 of 2

Sac County, IA  
T 87, N, R, 35, W



File No.  
Drawing No.  
Sheet 2 of 2



**Legend**

- WCS Tile D
- West\_Distribution\_Tile\_D\_1,360'
- Existing\_6\_Inch\_Clay\_or\_Concrete Tile D



I have reviewed and agree with the content of the attached plan prepared by the NRCS.

Landowner: \_\_\_\_\_ Date: \_\_\_\_\_

I certify that this practice has been constructed in accordance with the plans and specifications.

Contractor: \_\_\_\_\_ Date: \_\_\_\_\_

NRCS Rep.: \_\_\_\_\_ Date: \_\_\_\_\_

Contractor is required to follow Iowa One Call law.  
 iowaOneCall.com or Call 811  
 Ticket # \_\_\_\_\_

If a cultural resource is identified during construction, stop immediately and notify the local Natural Resources Conservation Service office.



United States Department of Agriculture

Natural Resources Conservation Service

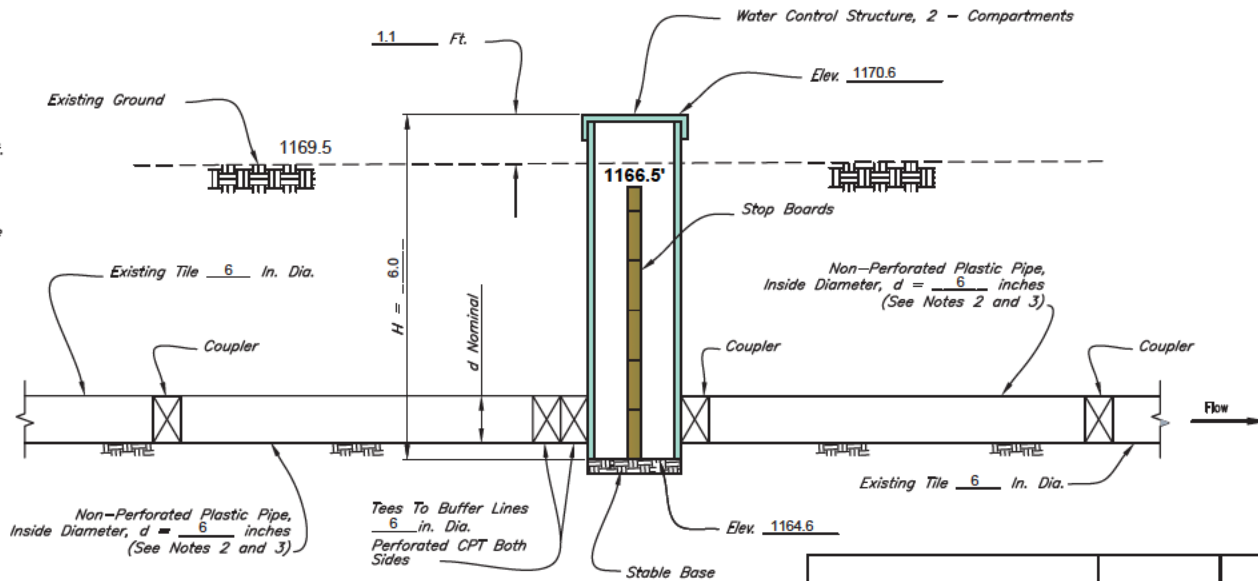
Owner: [Redacted]  
 Location: Sec [Redacted], T 87 N, R 34W  
 Elm Grove Township  
 Calhoun County, Iowa

Designed	TJL	Date	12/22
Drawn	TJL	Date	12/22
Checked	DJA	Date	9/23
Approved	Kevin Barkley CET	Date	9/23

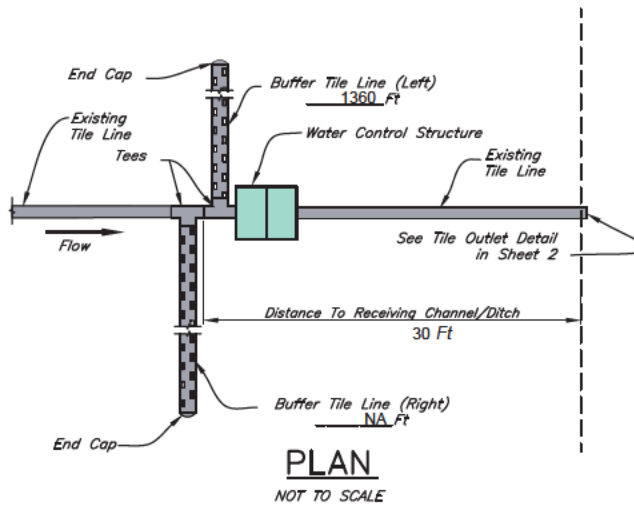
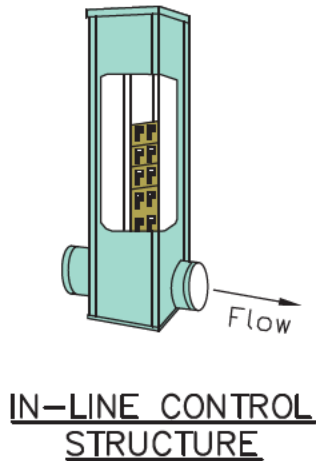
Eng. Job Class	I
Revision Date	November 2017
Sheet	1 of 3

**NOTES:**

1. Install perforated buffer tile parallel to ditch.
2. Install a minimum of 20 feet of non-perforated pipe adjacent to the water control structure, both upstream and downstream.
3. Pipe must be PVC or PE. Pipe, pipe sizes, fittings and other appurtenances shall conform to the "Materials" section of Iowa NRCS Construction Specification (CS) IA-620, Underground Outlet.
4. Saturated Buffer installation shall be in conformance with CS IA-604, Saturated Buffer.
5. Water Control Structure (WCS) materials shall be in conformance with CS IA-45, Plastic (PVC, PE) Pipe.
6. Place structure and pipe coupler on a minimum 4 inch stable base. A stable base may be compacted earth, compacted fill gravel, or a concrete pad. Extend the stable base no less than 1 foot around structure.
7. Stop board removal tool shall be provided.
8. Structure lid shall be provided with locking mechanism.
9. Normal stop board operation shall be verified following backfill.
10. Stop boards must provide water tight seals under a minimum of 4 foot pressure head.
11. Mark location of structure using post or manufactured marker lag for safety in the field.
12. Refer to Operation and Maintenance (O&M) Plan for adjusting WCS weir settings.
13. Seeding and Mulching shall be performed in accordance with attached IA-CPA-4, Seeding Plan and Construction Specification IA-6, Seeding and Mulching for Protective Cover.



**TYPICAL SECTION**

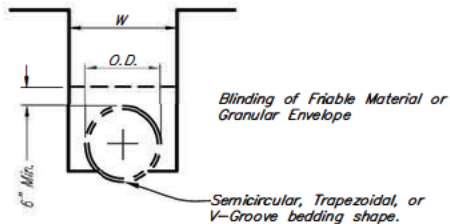


**A benchmark will be set prior to construction.**

WORK or MATERIAL	QUANTITY*	UNITS
Water Control Structure 2 - Compartment (H = <u>6.0</u> FT) (d = <u>6.0</u> in)	1	Job
<u>6</u> inch Diam., Non-Perforated Plastic Pipe (Upstream)	20	Lin.Ft.
<u>6</u> inch Diam., Non-Perforated Plastic Pipe (Downstream)	10	Lin.Ft.
<u>  </u> inch Diam., Perforated Plastic Pipe, Buffer Line (Right)	NA	Lin.Ft.
<u>6</u> inch Diam., Perforated Plastic Pipe, Buffer Line (Left)	1360	Lin.Ft.
<u>6</u> in. x <u>6</u> in. x <u>6</u> in. T Connection	1	Each
<u>6</u> inch Diam., End Caps	1	Each
<u>  </u> inch to <u>  </u> inch reducer	NA	Each
<u>8</u> inch Diam., Rigid, Non-Perforated Conduit w/Animal Guard	20	Lin.Ft.

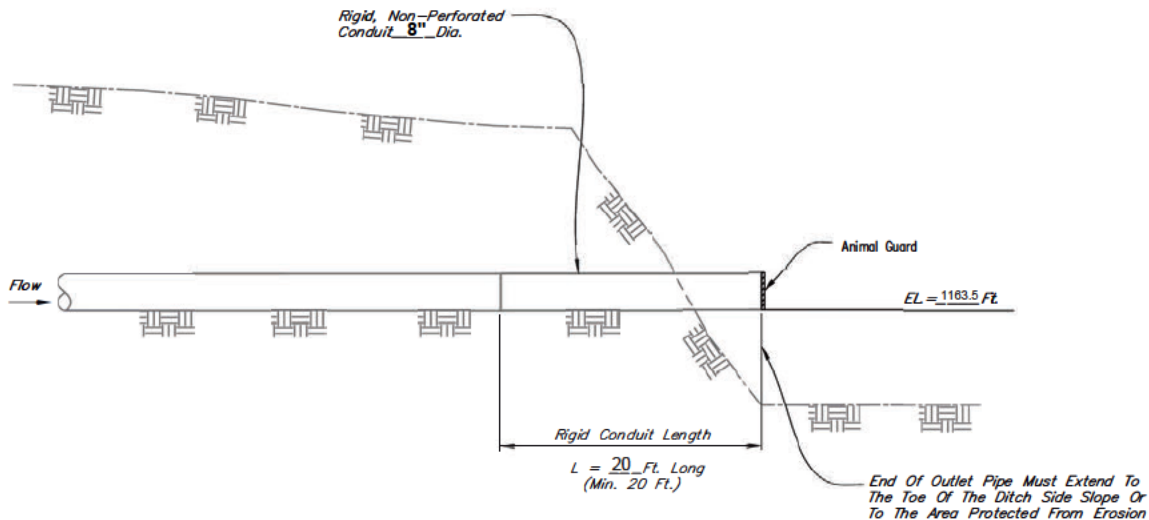
\*Quantities Do Not include Couplers. These items are incidental. See Contract Documents for full quantities list.

Date: 12/2022-12/2022  
 Designed: -TJL  
 Drawn: -TJL  
 Checked: DJA  
 Approved:   
 California County, IA  
 T. 87, N. R. 34, W.  
 Elm 4, Sec 1  
 United States Department of Agriculture  
 Natural Resources Conservation Service  
 File No.   
 Drawing No.   
 Sheet 2 of 3



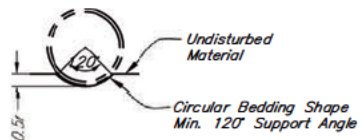
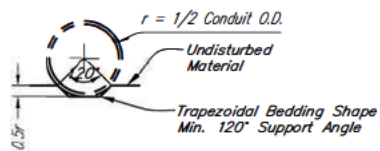
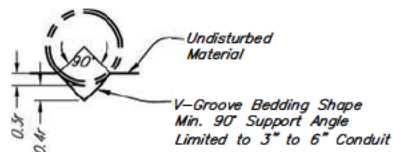
1.  $W$  = trench width at top of conduit
2.  $W = O.D. + 6"$  min. for trench installation;  
 $W = O.D. + 4"$  min. for plow installation.
3. Where  $W > O.D. + 12"$ , hand compact the blinding or use a granular envelope.

**TRENCH DETAIL**



**TILE OUTLET DETAIL**

A new outlet will be established with a 20' CMP. The outlet elevation will be the same as the current outlet.



**BEDDING DETAIL**

**NOTES:**

1. Connection with outlet pipe shall be made watertight.
2. Maximum fill over conduit installed in a trench condition ( $w < O.D + 24"$ ) shall be 11 feet or as specified by the manufacturer.
3. The fill height over the underground outlet conduit or pipe shall not exceed the values shown in Table 2 or 3 of IA NRCS Conservation Standard 620, Underground Outlet.
4. Outlet pipe shall be a continuous section of non-perforated conduit at least 20 feet long.
5. All changes must be approved by person approving the original plans prior to change.

IOWA STANDARD DWG. NO. 1552

DATE Jan 2021 SHEET 2 OF 2

Date	12/2022
Designed -TJL	
Drawn -TJL	
Checked -DJA	9/23
Approved -	

**SATURATED BUFFER TYPE 1**  
Sheet 2 of 2





Elm Sec T 87 N R 34 W Calhoun County, IA



File No.  
Drawing No.  
Sheet 3 of 3



**Legend**

-  WCS
-  South\_Distribution\_Tile\_E\_560'
-  North\_Distribution\_Tile\_E\_85'
-  Existing\_12\_Inch\_Concrete\_Tile



I have reviewed and agree with the content of the attached plan prepared by the NRCS.

Landowner: \_\_\_\_\_ Date: \_\_\_\_\_

I certify that this practice has been constructed in accordance with the plans and specifications.

Contractor: \_\_\_\_\_ Date: \_\_\_\_\_

NRCS Rep.: \_\_\_\_\_ Date: \_\_\_\_\_

Contractor is required to follow Iowa One Call law.  
 iowaOneCall.com or Call 811  
 Ticket # \_\_\_\_\_

If a cultural resource is identified during construction, stop immediately and notify the local Natural Resources Conservation Service office.



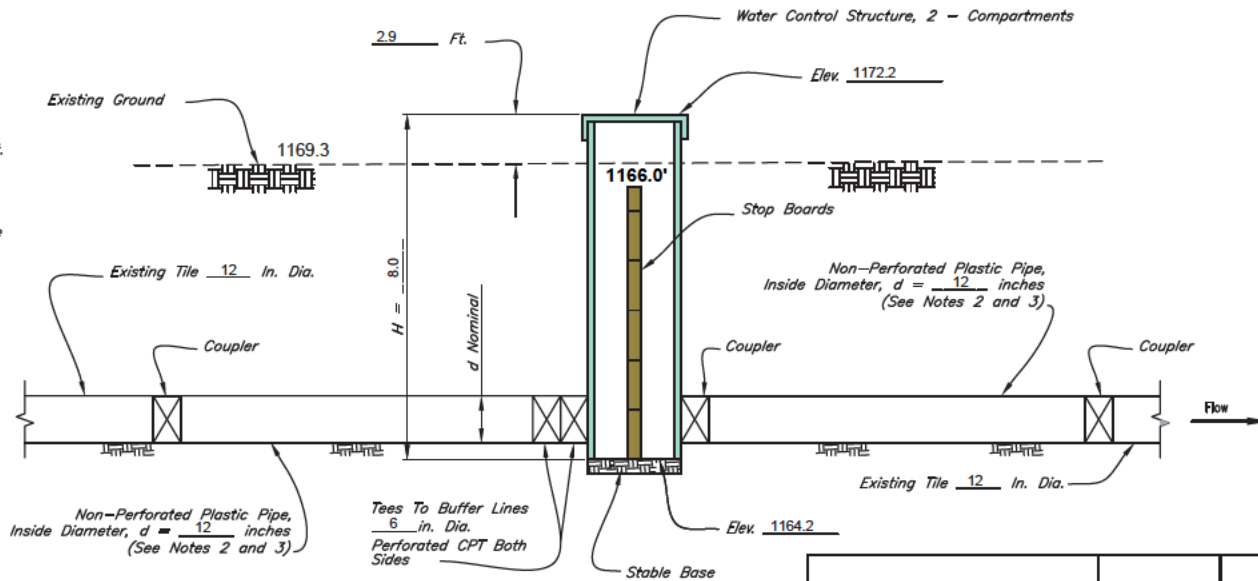
Owner: [REDACTED]  
 Location: Sec [REDACTED], T 87 N, R 34W  
Elm Grove Township  
Calhoun County, Iowa

Designed	TJL	Date	12/22
Drawn	TJL	Date	12/22
Checked	DJA	Date	9/23
Approved	Kevin Barkley CET 9/23		

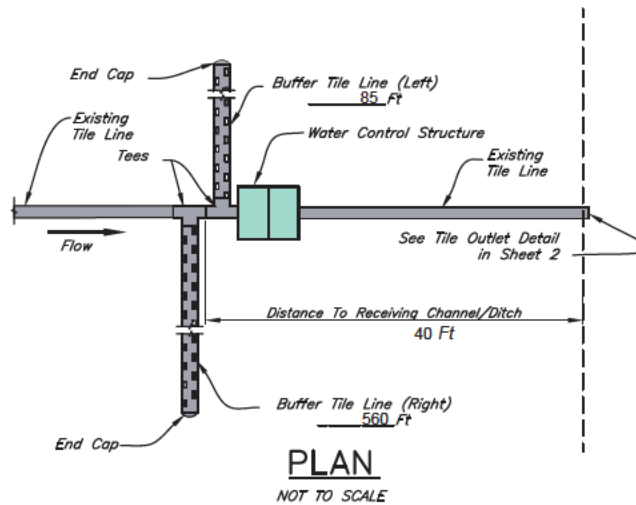
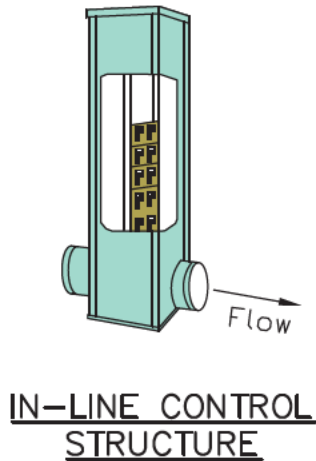
Eng. Job Class	III
Revision Date	November 2017
Sheet	1 of 3

**NOTES:**

1. Install perforated buffer tile parallel to ditch.
2. Install a minimum of 20 feet of non-perforated pipe adjacent to the water control structure, both upstream and downstream.
3. Pipe must be PVC or PE. Pipe, pipe sizes, fittings and other appurtenances shall conform to the "Materials" section of Iowa NRCS Construction Specification (CS) IA-620, Underground Outlet.
4. Saturated Buffer installation shall be in conformance with CS IA-604, Saturated Buffer.
5. Water Control Structure (WCS) materials shall be in conformance with CS IA-45, Plastic (PVC, PE) Pipe.
6. Place structure and pipe coupler on a minimum 4 inch stable base. A stable base may be compacted earth, compacted fill gravel, or a concrete pad. Extend the stable base no less than 1 foot around structure.
7. Stop board removal tool shall be provided.
8. Structure lid shall be provided with locking mechanism.
9. Normal stop board operation shall be verified following backfill.
10. Stop boards must provide water tight seals under a minimum of 4 foot pressure head.
11. Mark location of structure using post or manufactured marker lag for safety in the field.
12. Refer to Operation and Maintenance (O&M) Plan for adjusting WCS weir settings.
13. Seeding and Mulching shall be performed in accordance with attached IA-CPA-4, Seeding Plan and Construction Specification IA-6, Seeding and Mulching for Protective Cover.



**TYPICAL SECTION**



**A benchmark will be set prior to construction.**

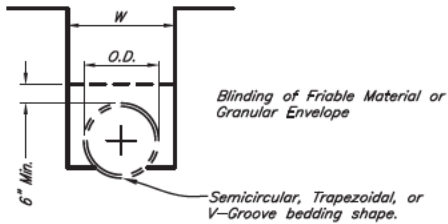
WORK or MATERIAL	QUANTITY*	UNITS
Water Control Structure 2 - Compartment (H = <u>8.0</u> FT) (d = <u>12.0</u> In)	1	Job
<u>12</u> inch Diam., Non-Perforated Plastic Pipe (Upstream)	20	Lin.Ft.
<u>12</u> inch Diam., Non-Perforated Plastic Pipe (Downstream)	20	Lin.Ft.
<u>6</u> inch Diam., Perforated Plastic Pipe, Buffer Line (Right)	560	Lin.Ft.
<u>6</u> inch Diam., Perforated Plastic Pipe, Buffer Line (Left)	85	Lin.Ft.
<u>12</u> in. x <u>12</u> in. x <u>6</u> in. T Connection	2	Each
<u>6</u> inch Diam., End Caps	2	Each
<u>    </u> inch to <u>    </u> inch reducer	NA	Each
<u>14</u> inch Diam., Rigid, Non-Perforated Conduit w/Animal Guard	20	Lin.Ft.

\* Quantities Do Not include Couplers. These items are incidental. See Contract Documents for full quantities list.

Date: 12/2022-  
 Designed: -TJL  
 Drawn: -TJL  
 Checked: -  
 Approved: -  
 Calhoun County, IA  
**SATURATED BUFFER TYPE 1**  
 Sheet 1 of 2  
 T. B. N. R. 34 W  
 Elm 4 Sec  
 United States Department of Agriculture  
**USDA** Natural Resources Conservation Service  
 File No.  
 Drawing No.  
 Sheet 2 of 3

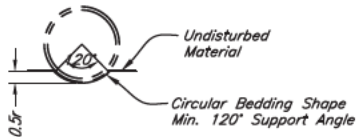
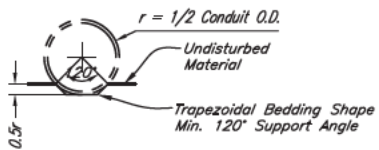
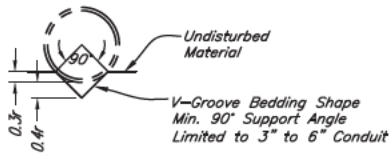
IOWA STANDARD DWG. NO. 1552

DATE Jan. 2021 SHEET 1 OF 2

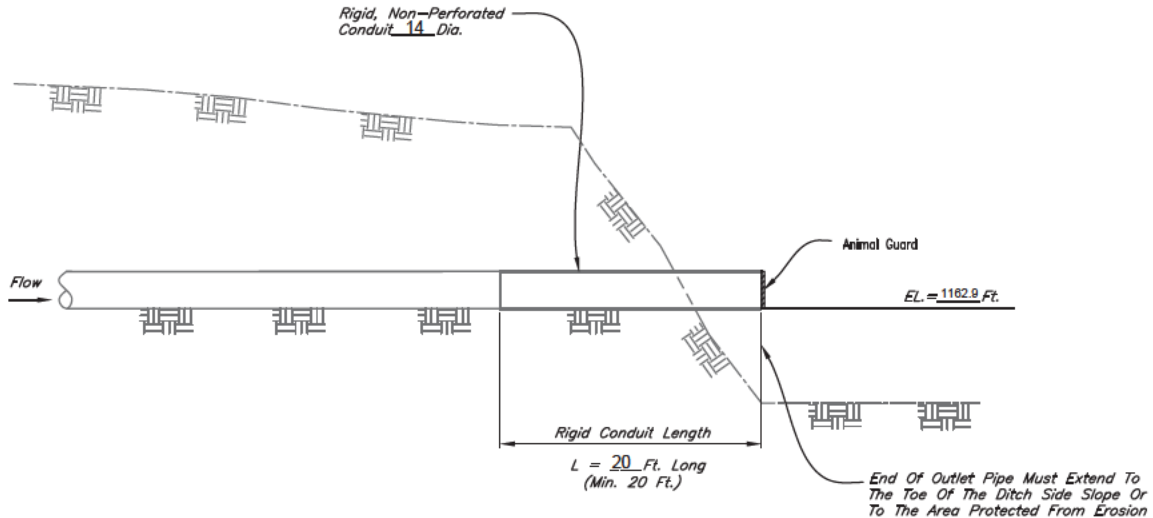


1.  $W$  = trench width at top of conduit
2.  $W$  =  $O.D. + 6$ " min. for trench installation;  
 $W$  =  $O.D. + 4$ " min. for plow installation.
3. Where  $W > O.D. + 12$ ", hand compact the blinding or use a granular envelope.

**TRENCH DETAIL**



**BEDDING DETAIL**



**TILE OUTLET DETAIL**

Plan for 20' of 12" nonperforated dual wall pipe downstream of the water control structure and then connect to the 14" CMP.

**NOTES:**

1. Connection with outlet pipe shall be made watertight.
2. Maximum fill over conduit installed in a trench condition ( $w < O.D. + 24$ ") shall be 11 feet or as specified by the manufacturer.
3. The fill height over the underground outlet conduit or pipe shall not exceed the values shown in Table 2 or 3 of IA NRCS Conservation Standard 620, Underground Outlet.
4. Outlet pipe shall be a continuous section of non-perforated conduit at least 20 feet long.
5. All changes must be approved by person approving the original plans prior to change.

IOWA STANDARD DWG. NO. 1552

DATE Jan. 2021 SHEET 2 OF 2

Date	12/2022
Designed -TJL	
Drawn -TJL	
Checked	
Approved	

SATURATED BUFFER  
TYPE 1  
Sheet 2 of 2

Elm. Sec. T. 87. N. R. 34. W. Calhoun County, IA



File No.	
Drawing No.	
Sheet 3 of 3	

Site 7



I have reviewed and agree with the content of the attached plan prepared by the NRCS.

Landowner: \_\_\_\_\_ Date: \_\_\_\_\_

I certify that this practice has been constructed in accordance with the plans and specifications.

Contractor: \_\_\_\_\_ Date: \_\_\_\_\_

NRCS Rep.: \_\_\_\_\_ Date: \_\_\_\_\_

Contractor is required to follow Iowa One Call law.  
 iowaOneCall.com or Call 811  
 Ticket # \_\_\_\_\_

If a cultural resource is identified during construction, stop immediately and notify the local Natural Resources Conservation Service office.



United States Department of Agriculture

Natural Resources Conservation Service

Owner: \_\_\_\_\_

Location: Sec \_\_\_\_\_, T 88N N, R 34W

Garfield Township

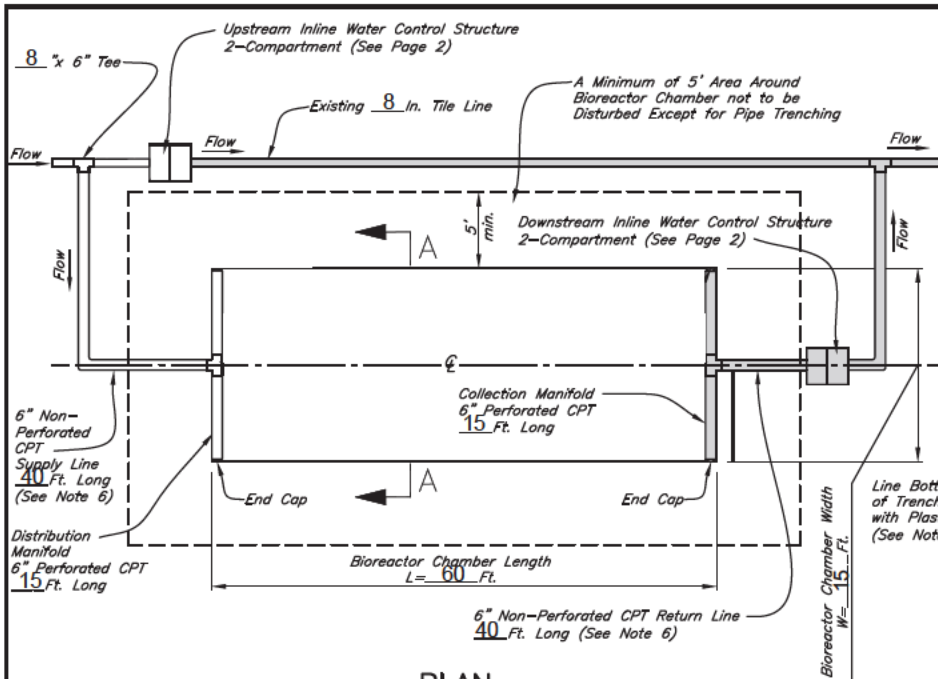
Calhoun County, Iowa

Designed	TJL	Date	10/22
Drawn	TJL	Date	10/22
Checked	DJA	Date	7/23
Approved	Doug Adams	Date	7/23

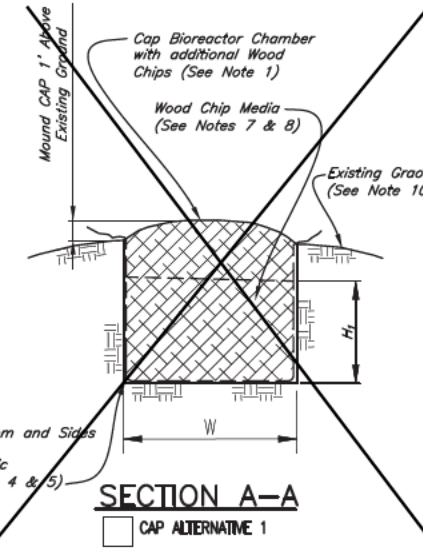
Eng. Job Class  
II

Revision Date  
November 2017

Sheet 1 of 4

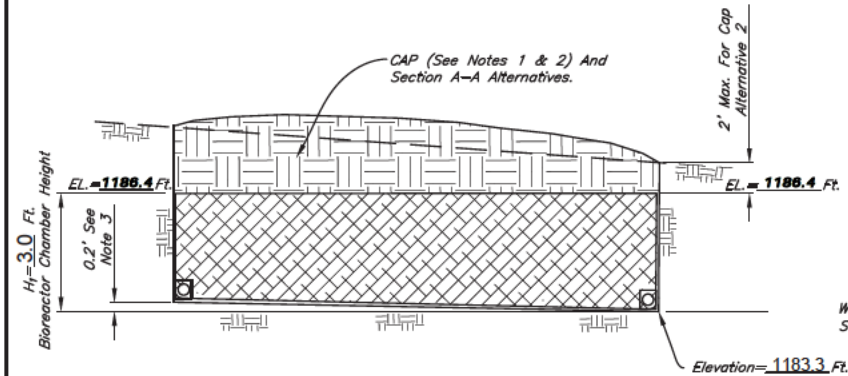


**PLAN**

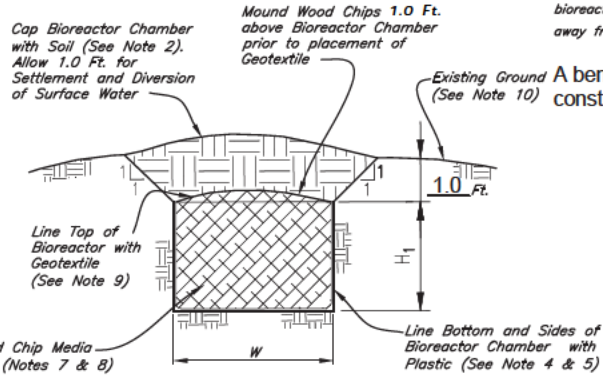


**SECTION A-A**

CAP ALTERNATIVE 1



**ELEVATION**



**SECTION A-A**

CAP ALTERNATIVE 2

**NOTES:**

- ~~1. Use CAP ALTERNATIVE 1 for the bioreactor chamber unless traffic over the top is anticipated.~~
- For CAP ALTERNATIVE 2, fill the area above the bioreactor chamber with compacted soil. Use topsoil for at least the top 6". Vegetate according to Conservation Practice Standard 342, Critical Area Planting.
- Set bottom of bioreactor chamber to drain towards exit end.
- Line bottom and sides of bioreactor chamber with plastic, minimum 4 mil thickness. Overlap any splices at least 6 inches. Wrap plastic carefully around tiles that enter/exit the chamber; no need to seal around tiles.
- If bioreactor is located in glacial till soil and has Unified Soil Classification System designation of CL or CH and no sand is encountered during construction chamber sides and bottom do not need to be lined.
- Route supply line to corner of entrance end and return line from corner of exit end of bioreactor chamber.
- Wood chip media must meet requirements in Iowa Construction Specification IA-605, Denitrifying Bioreactor.
- Obtain approval of engineer on the wood chips / media prior to installation.
- Geotextile must be non-woven, class II, and meet the requirements of Iowa Construction Specification IA-95, Geotextile. Overlap splices at least 6 inches.
- Grade site for positive drainage away from the bioreactor chamber. Spread spoil in designated location away from bioreactor.

A benchmark will be set prior to construction.

NOT TO SCALE

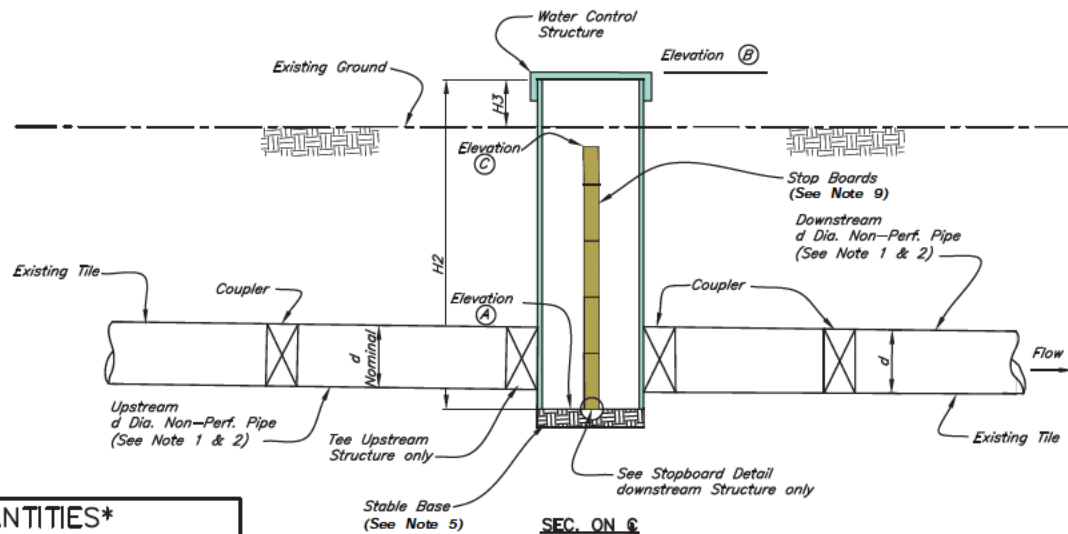
IOWA STANDARD DWG. NO. 1555  
DATE: June 2022 SHEET 7 OF 3

Date	3/23
Designed	TJL
Drawn	TJL
Checked	DJA
Approved	

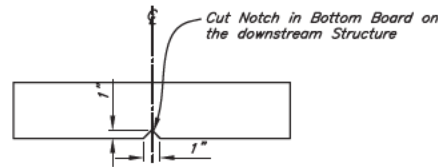
**DENITRIFYING BIOREACTOR  
TYPE 2 (Page 1 of 3)**



File No.	
Drawing No.	
Sheet	2 of 4



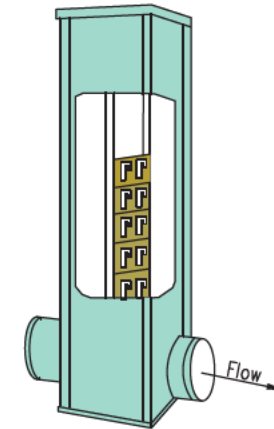
**SEC. ON 6  
TYPICAL SECTION  
EACH STRUCTURE**



**STOP-BOARD DETAIL**  
(Downstream Structure Only)  
NOT TO SCALE

**NOTES:**

1. Install a minimum of 20 feet of non-perforated pipe adjacent to the water control structure, both upstream and downstream.
2. Pipe must be PVC or PE. Pipe, pipe sizes, fittings and other appurtenances shall conform to the "Materials" section of Iowa NRCS Construction Specification (CS) IA-620, Underground Outlet.
3. Bioreactor installation shall be in conformance with CS IA-605, Denitrifying Bioreactor.
4. Water Control Structure (WCS) materials shall be in conformance with CS IA-45, Plastic (PVC, PE) Pipe.
5. Place structure and pipe coupler on a minimum 4 inch stable base. A stable base may be compacted earth, compacted fill gravel, or a concrete pad. Extend the stable base no less than 1 foot around structure.
6. Stop board removal tool shall be provided.
7. Structure lid shall be provided with locking mechanism.
8. Normal stop board operation shall be verified following backfill.
9. Stop boards must provide water tight seals under a minimum of 4 foot pressure head (except notched board).
10. Mark location of structure using post or manufactured marker flag for safety in the field.
11. Refer to Operation and Maintenance (O&M) Plan for adjusting WCS weir settings.
12. Seeding and Mulching shall be performed in accordance with attached IA-CPA-4, Seeding Plan and Construction Specification IA-6, Seeding and Mulching for Protective Cover.



**IN-LINE CONTROL  
STRUCTURE**

QUANTITIES*	
Upstream Water Control Structure (Inlet WCS) 2 - Compartment H <sub>2</sub> = 6 ft. d = 8 in	1
Downstream Water Control Structure (Outlet WCS) 2 - Compartment H <sub>2</sub> = 6 ft. d = 6 in	1
8" Non-perforated Pipe (ft)	40
6" Non-perforated Pipe (ft)	80
6" Perforated CPT (ft)	30
Tee 8" x 6"	2
Tee 6" x 6"	
Elbows 6"	2
6" End Caps	2
Wood Chips (cu. yd.)	111
4 Mil Plastic (sq. yd.)	154
Geotextile (sq. yd.)	100
Excavation (cu. yd.)	138

	Inlet WCS	Outlet WCS
WCS Box Bottom El. (A)	1183.3	1183.1
WCS Box Top El. (B)	1189.3	1189.1
WCS Ht Above EG, H <sub>3</sub>	1.9	1.7
Designed Weir El. (C)	1185.9	1184.0
US Non-Perforated Pipe Length, (ft)	20	20
DS Non-Perforated Pipe Length, (ft)	20	20

\* Quantities Do Not Include Tile/Pipe Couplers or Extra Material For Geotextile/Plastic Overlap. These items are incidental. See Contract Documents for full quantities list.

Date	3/23
Designed	TJL
Drawn	TJL
Checked	DJA
Approved	

**DENITRIFYING BIOREACTOR  
TYPE 2 (Page 2 of 3)**



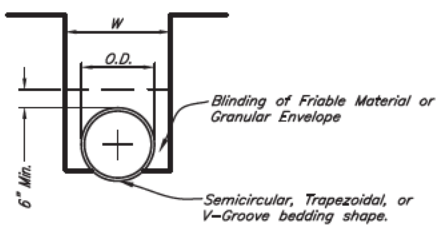
File No.	
Drawing No.	
Sheet	3 of 4

Date 3/23  
 Designed TJL  
 Drawn TJL  
 Checked DJA  
 Approved TJL

**DENITRIFYING BIOREACTOR  
 TYPE 2 (Page 3 of 3)**

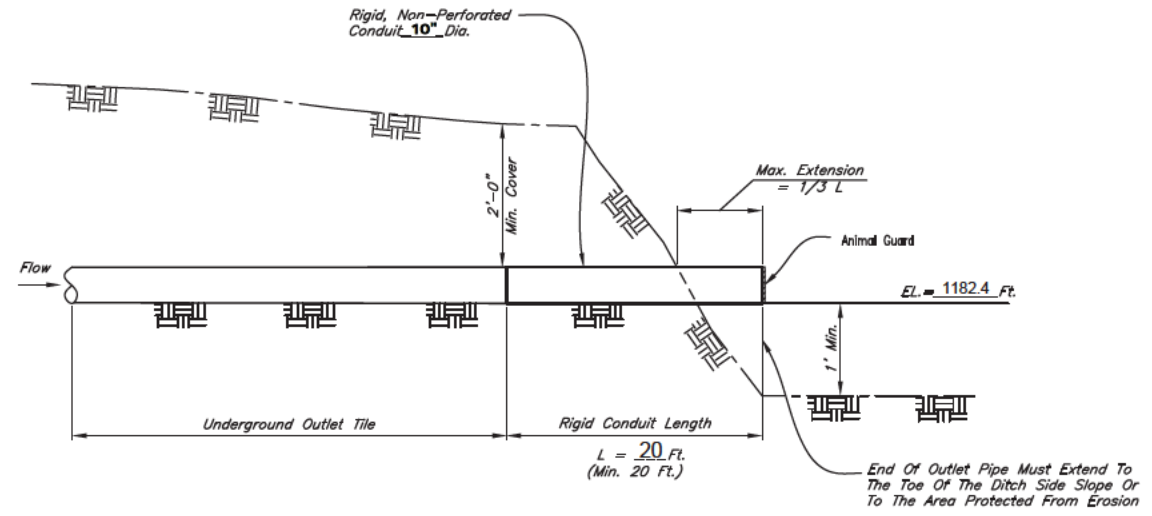
United States  
 Department of  
 Agriculture  
**USDA**  
 Natural Resources  
 Conservation Service

File No.  
 Drawing No.  
 Sheet 4 of 4

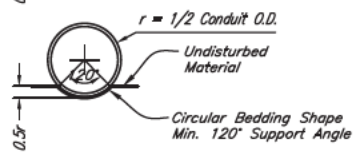
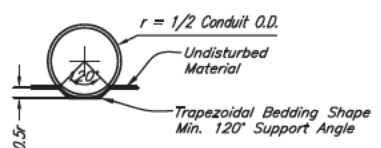
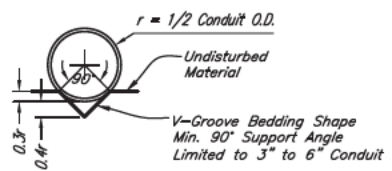


1.  $W$  = trench width at top of conduit
2.  $W = O.D. + 6"$  min. for trench installation;  
 $W = O.D. + 4"$  min. for plow installation.
3. Where  $W > O.D. + 12"$ , hand compact the blinding or use a granular envelope.

**TRENCH DETAIL**



**TILE OUTLET DETAIL**



**BEDDING DETAIL**

- NOTES:
1. Connection with outlet pipe shall be made watertight.
  2. Maximum fill over conduit installed in a trench condition ( $w < O.D. + 24"$ ) shall be 11 feet or as specified by the manufacturer.
  3. The fill height over the underground outlet conduit or pipe shall not exceed the values shown in Table 2 or 3 of IA NRCS Conservation Standard 620, Underground Outlet.
  4. Outlet pipe shall be a continuous section of non-perforated conduit at least 20 feet long.
  5. All changes must be approved by person approving the original plans prior to change.  
 The CMP will need to be replaced. Plan to replace with a 10" CMP.

IOWA STANDARD DWG. NO. 1555  
 DATE June 2022 SHEET 3 OF 3