



**BOLTON
& MENK**

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Engineer's Report for

Proposed Repairs and Improvements

Drainage District No. 2

Pigeon Creek

Main Open Ditch

Pottawattamie County, Iowa

2018

Submitted by:

Bolton & Menk, Inc.
300 W. McKinley Street
Jefferson, IA 50129
Phone: 515-386-4101

Certification

Engineer's Report

for

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Pigeon Creek
Main Open Ditch
Pottawattamie County, Iowa
P12.111254

2018



I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Iowa. My renewal date is December 31, 2018.

By: Jonathan P. Rosengren
Jonathan P. Rosengren, P.E.
License No. 21661

Date: November 7, 2018

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1. INTRODUCTION

A. Scope of Work

In the fall of 2016, Bolton & Menk, Inc. was appointed Engineer to review the facilities under the jurisdiction of the Drainage District No. 2 Board of Trustees and recommend necessary repairs or improvements. Upon review of the existing system, records in the office of the County Auditor, and discussions with the Board of Trustees, the scope has been modified to include re-establishment of the repair elevation and cross section of the Main Open Ditch.

B. Location

The Drainage District No. 2 Main Open Ditch runs from north of Crescent in a southwesterly direction crossing Mormon Bridge Road near the Union Pacific Railroad line continuing south crossing Interstate 29 and outletting in the Missouri River.

The contributing watershed to Drainage District No. 2 Main Open Ditch covers approximately 165.5 square miles (106,000 acres). 10,044.26 acres currently in the district are located in the Missouri River and Lower Pigeon Creek river valleys, though the majority of the lands in the watershed are in the Loess Hills and upstream lands of Pigeon Creek and have not been assessed. The schedule of lands currently listed for benefit in Drainage District No. 2 is on file in the Pottawattamie County Auditor's Office.

C. History

Commissioner's Report – March 3, 1903

1. Proposed channel will have more than double the fall of the existing creek, with an outlet more than three feet lower than existing. Grade is 7 inches per mile or 0.0011%. Report states this will provide "a carrying current and if the maintenance of the channel is provided for, there is good cause to believe it will remain a permanent relief".
2. Channel will have a 170 foot wide right-of-way. The right-of-way through west of the railroad, south to outfall, is 60 feet each side. West of railroad, ditch runs parallel 3,090 feet with railroad right-of-way. (This channel is visible in 1930's aerial photo.)
3. Thence 600 feet to dump to a flowing stream and washing channel to the Missouri River 3,500 feet more or less of sufficient capacity. It is the probable outlet of the Crescent City Lateral and the other streams in this vicinity.
4. Right-of-way in NW SE of Section 34 included for Levee purposes.

Engineer's Report – December 8, 1917

1. Levee Repairs in NW SE, Section 34.
2. Additional right-of-way purchased, 0.23 acres, 50 feet wide adjoining existing DD right-of-way 300 feet long, from Railroad.

Engineer's Report – No Date (Response to April 28, 1920 Petition)

1. Recommends construction of levees on each side of the waterway entering the Main Ditch from the east side in the NE SW, Section 13. Two Levees 600 feet long, one on each side with 4 foot top, and 1.5:1 side slopes to be built, including three pipes with flood gates.

Engineer's Report – April 14, 1924

1. Ditch has been realigned at some point prior to this report (likely 1910-1914).

2. Report finds old levees are too close to ditch and should be moved back and improved.
3. Levees will be 17.5' above ditch flow line with an 8' top width.
 - Station 236+00 is N line of SW NW of Section 3-75-44 known as the Mayne Bridge.
 - Station 116+40 is C&N RR Bridge.
4. From station 0 to 116+40, levees to be moved back 10' and additional 10' of right-of-way added on each side of ditch.
5. From 116+40 to 236+00, 40' of right-of-way added on east side of original right-of-way where the new levee will be built. Except for 700 feet above the ICRR Railroad additional ROW and levee work to be on west side to better align the ditch with the railroad bridge.
6. Flood gate on Sub District 1 has been destroyed. It is recommended to be rebuilt.
7. Levees recommended along Crescent and Lapworth Laterals.

Report of Commissioners – After October 14th, 1929

1. Common Outlet of DD 8 and Harrison County Pigeon Creek made for improvements made in 1924 and 1925.

Report of Commissioners - 1935

District Court Decision – July 22, 1950

1. Sought permanent injunction against the district performing maintenance on a dam or levy in 1948, and removal of said dam or levee.
2. District claims right-of-way on levee. Levee constructed to direct water from upper Pigeon Creek Valley into Main Ditch. June 5, 1925 Board of Supervisors signed a contract with WE Mills to raise the dike approximately 5 feet and other repairs. Dike originally constructed and maintained in 1909.
3. Court finds the Board gave itself authority only to strengthen or widen the dike, not raise it.
4. Court finds the district cannot be prevented from maintaining the levee, but an enlarged outlet should be provided for the lands north and east of the levee. The outlet to be constructed by the district, but the district is “enjoined from maintaining the outlet”.

Petition for Establishment of Drainage Subdistrict – May 7, 1993

1. Requests establishment of a ditch draining Sections 15 and 16. Same request as October 6, 1917 Sub 2, DD 2.

Notes:

District Court decision appealed to Supreme Court in 1929 regarding repair vs improvements.

Summary of work completed filed on September 5, 1929.

District still controlled by Board of Supervisors in 1929.

District controlled by trustees in 1950 court decision.

2. INVESTIGATION

Survey of the Drainage District No. 2 facilities was made during the spring of 2018. This survey was used to determine the repair grade of the Subdrainage District No. 1 Open Ditch.

The best fit repair cross section of the Main Open Ditch upstream of the Old Mormon Bridge Road is a sixteen foot bottom with 2:1 side slopes and a grade of 0.07%. Downstream of the Old Mormon Bridge Road the best fit repair cross section is a twenty five foot bottom with 2:1 side slopes and a grade of 0.07% in the upper stretch and a grade of 0.03% in the lower stretch of the Open Ditch.

The survey found that lands west of Interstate 29 and north of Interstate 680 that are currently part of the district do not have an outlet to the Main Open Ditch. We are proposing a surface drain to provide an outlet for these lands.

Also found during review of the Main Open Ditch were two small lateral ditches, referred to as the Lapworth Lateral and the Crescent Lateral, and three levees, referred to as the North Cutoff Levee and North and South Lateral Levees.

A. District Right-of-Way

A 170 foot wide right-of-way was purchased at the establishment of the district along the Main Open Ditch. Additional right-of-way was purchased in 1917, 1924, and 1950. The existing right-of-way widths are not uniform on either the Main Open Ditch or the laterals. The existing rights-of-way are in some areas adequate to contain the facility, in other areas additional rights-of-way will need to be purchased.

Included in Appendix C are the existing and proposed right-of-way tabulations for each of the facilities.

3. PROPOSED WORK

A. Levee Repairs

We recommend the district repair the Main Open Ditch levee in the lower stretches between stations 171+00 and 237+00 and the North Cutoff Levee. The levees in these locations are below the design grade and will need to be raised to provide the designed protection.

Included with this report is a plan set showing the repair grades and cross section of the district's facilities. The estimated construction cost of these repairs is \$73,000. This plan set also includes our recommended repair grade and cross section for each facility.

B. Surface Drain

We recommend the district construct three surface drains to drain lands that currently aren't being served by the Main Open Ditch. These lands west of Interstate 29 have no access to the Main Open Ditch and would benefit from surface drains following the natural drainage path and outletting in the Missouri River. Two of the proposed surface drains will follow the old river oxbows eventually flowing together to outlet at the levee. The third surface drain will act as an overflow drainage way for the borrow pit pond located in Section 28.

The lower surface drain would be constructed as a eight feet bottom with 8:1 side slopes, so it could be cropped. The upper surface drains would be designed a v-notch with 8:1 side slopes and could be cropped. The surface drains would not be seeded. They could be cropped or the individual landowners could seed them themselves. At the levee, a 60" pipe with flap gate will need to be installed through the levee to protect the lands from Missouri River flooding.

Downstream of this surface drain, an open ditch would need to be constructed to drain to the Missouri River. This open ditch would have a four foot bottom and 2:1 side slopes.

Currently, where the open ditch is proposed, only 0.3 acres of row crop is being grown and most of the area is covered in trees. The trees within the work limits will be removed as part of the project.

The spoil material is recommended to be uniformly leveled and shaped to a typical cross section with a fairly flat top (2% slope) about 16 feet wide, adjacent to the ditch with a 10:1 back slope pushed out onto the adjacent land. The leveled spoil will then be deep tilled by the contractor and exposed rocks and debris are to be gathered and disposed of. The leveling of the spoil banks will allow that area to be used for row crop production. This will make the spoil bank tillable.

The landowner will have beneficial use rights. It would be preferred the landowner have the spoil banks to manage weeds and restrict the growth of trees. We estimate after clearing the trees and leveling the spoil bank approximately six acres of land will be available for hay production. The land could be accessed on each side of the open ditch via an existing path on the levee top.

It is recommended that the newly exposed open ditch banks be fertilized and seeded. NRCS research indicates that broadcasting the seed and fertilizer at the end of each day's work is the best way to secure good growth, and because additional seedbed work isn't needed, the cost is more reasonable than for other methods. Economically successful seeding remains a difficult goal for drainage ditches, it being so dependent upon favorable weather. Typically, the best that is achieved is a sparse growth that supplements and aids the progress of natural revegetation.

There are locations along the proposed open ditch where we recommend erosion stone be placed to prevent bank scour during and after construction. These locations are called out on the plans on the two curves and on the levee to protect the pipe during flooding. If any additional areas need armoring, those areas will be determined in the field during construction.

These proposed surface drains and open ditch will require an Army Corps of Engineers permit before proceeding. The estimated cost of these surface drains would be \$424,000, including the construction, engineering, and right-of-way acquisition. This cost would be assessed only to the lands that drain to the surface drains. A complete opinion of probable cost is included in Appendix B.

C. Utilities

Overhead power lines and other utility lines likely parallel or cross the ditches and levees at various locations. Extra care will need to be taken when working under or near these utility lines. The contractor will be responsible to use Iowa One Call to notify utility companies and to cooperate in the locating, marking, and protection of these facilities.

D. Work Limits

The permanent right-of-way is not intended to be wide enough to accommodate construction activities associated with major repairs or improvements. The district will need a larger area within which to clear and grub the trees, to perform the excavation, and to shape and level the spoil. The extent of the work limits on the facilities will be finalized when the final construction plans are developed, but it will typically be out to 150 feet from the facility centerline on the side or sides on which work will be done. Landowners will also be entitled to compensation for damages in the work areas outside the right-of-way. Within the permanent right-of-way, construction-related damages will not be compensated. It is recommended that in cropped areas, whenever possible, a landowner not crop the work area and instead accept fair rent for the land. Compensation for use of and damages within the temporary work area are normally determined at the project completion hearing.

E. District Right-of-Way

If right-of-way is to be acquired, an appraisal commission, made up of two landowners from the county and the engineer, are appointed to recommend fair payment. The right-of-way appraiser's report is considered at a continued or separate public hearing prior to adoption. Included in Appendix C are the existing and proposed right-of-way tabulations for each of the facilities.

Drainage district right-of-ways are exempt from real estate taxes and drainage district assessments. Under Iowa law, landowners have the right to the beneficial use of the spoil bank in the right-of-way subject only to the district's use of the right-of-way to monitor, protect, and maintain the open ditch.

Because the landowners will retain the rights of beneficial use, right-of-way is generally compensated at far less than market value. Assuming a compensation rate of \$400 per acre of right-of-way, the estimated cost for the Main Open Ditch would be \$18,000, and for the proposed surface drains, the total cost for the right-of-way is estimated at \$12,000.

4. ASSESSMENT SCHEDULE REVIEW

A. Benefited Lands Not Now Assessed

There are approximately 96,000 acres within the Drainage District No. 2 watershed which have never been assessed for benefits received from district facilities. This area is shown as the watershed boundary on sheet A.02 of the attached plans.

Of the 96,000 acres, a large portion are assessed in other drainage districts and most of these lands receive little benefit from the DD 2 open ditches and levees. Therefore, we are not recommending annexing the lands upstream of the North Cutoff Levee. Major repairs can be assessed by common outlet for the lands in drainage districts upstream of DD 2.

There are approximately 285 acres in the valley, including most of the town of Crescent, which drain to the open ditch. The benefits these lands receive would be similar to the currently assessed lands in the Drainage District No. 2 Main Open Ditch.

Commonly, in the lands drained by a district facility, all lands that drain to the facility are included in the schedule. However in this part of the state, the Loess Hills have tended to be excluded from the schedule of any drainage facilities in the valley below. This was likely due to the small benefit received by the hills and to limit remonstrance rights to those who rely on such drainage. There are approximately 6,817 acres in the hills that directly drain to the Main Open Ditch that have not been assessed for benefit. The benefits these lands receive would be small and the individual assessments for each parcel would also likely be small, but collectively the increased acres would help offset the maintenance costs for the lands currently being assessed. If these lands are annexed, they will have the right to remonstrance for any proposed future improvements.

We recommend annexing the 285 acres in the valley, and that trustees and landowners consider annexation for the 6,817 acres in the hills at the next public hearing.

B. Existing Assessment Schedule Review

Appendix A contains three maps showing the existing assessment schedule for the Drainage District No. 2 benefited area, the Lapworth Lateral benefitted area, and the Crescent Lateral benefitted area. The existing DD 2 schedule was setup at the start of the district and has not been changed since. The North Cutoff Levee and the North and South Lateral Levees do not have any existing schedules and are currently on the same schedule as the Main Open Ditch. Considering the age and the general change in reclassification procedures starting in approximately 1970, the current schedule is inequitable.

Upstream of the Main Open Ditch, there are several acres assessed on the DD 2 schedule, we recommend removing these lands as they are already being assessed by the DD 8 schedule. Drainage District No. 8 and the drainage districts further upstream can be assessed via common outlet for any major repair or improvement.

There are currently lands on the river side of the levee and lands with no access to the open ditch that are being assessed on the Drainage District No. 2 Main Open Ditch schedule. These lands should be removed as they receive no benefit from the open ditch.

The lands served by the Main Open Ditch receive no benefit from the proposed surface drains, therefore we recommend those lands will not be assessed for the surface drains. A new schedule is recommended to be created for the proposed surface drains.

We recommend reclassification to balance the costs between each of the district facilities and to correct the issues regarding removal of parcels described. If the Trustees choose to annex the 6,817 acres in the Loess Hills, reclassification would need to be done to create a fair and equitable schedule balancing the benefits received from the valley and the hills.

If reclassification is ordered, four schedules are recommended. One for the Main Open Ditch, including the North and South Lateral Levees and North Cutoff Levee; one for the Crescent Lateral; one for the Lapworth Lateral; and one for the proposed surface drains. The cost to create these four schedules would be approximately \$40,000.

C. General Reclassification Methodology

The process of reclassification uses several factors to equitably spread project costs based upon benefits received. The three common factors are: Use; Proximity; and Wetness.

The Use Factor takes into account how much of the facility is required to bring an outlet to a particular location. The more a facility is used by any given property, the higher the Use Factor on that property. A parcel using one mile of a facility should pay less than a parcel using 5 miles of the facility.

The Proximity Factor takes into account the portion of the outlet provided. Lands nearer to the ditch receive a higher assessment because they have easy access to district facilities. Lands farther from the facility must invest in additional private drainage to access the facility. A 40 acre tract which is crossed by a ditch should pay more than a 40 acre tract a mile away which must build a private system to reach the open ditch.

The Wetness Factor accounts for the soil types' varying natural wetness and need for drainage. Wet soils in a pothole are high because the soils have more need for drainage than drier soils on the hill tops.

For Levees, the reclassification uses slightly different factors to equitably spread the project costs. Commonly, an Elevation Factor will be used instead of the Use Factor to determine how much protection the levee provides the farmland behind it, and the Wetness Factor will not be used.

Other considerations may be necessary to achieve equitable assessments.

5. DISCUSSIONS & RECOMMENDATIONS

This report confirms the Drainage District No. 2 facilities are in need of repair to restore the facilities' historic drainage efficiency and capacity. The work described in this report will provide this restoration.

Repair Recommended. We recommend repair of the Main Open Ditch and its lateral open ditches and levees as described in this report. The Engineer's Opinion of Probable Cost for this repair of Drainage District No. 2 as proposed is \$133,000, or \$13 per benefitted acre. We find that the proposed repair project will be practicable, feasible, and beneficial to the public.

Surface Drains Recommended. We recommend the district construct surface drains to serve the lands west of the Interstate that are too low to drain to the Main Open Ditch. This surface drain would be maintained as a district facility, protecting the drainage rights of those lands which use the drains. The Engineer's Opinion of Probable Cost for this improvement of Drainage District No. 2 as proposed is \$424,000 or \$500 per benefitted acre. This improvement would be assessed only to the lands on the proposed surface drain schedule. The Main Open Ditch would not be assessed for this project. We find that the proposed improvement project will be practicable, feasible, and beneficial to the public.

Right-of-Way Recommended. We recommend the district purchase a permanent right-of-way encompassing the existing Levee North and South Laterals and widen the existing right-of-way on the Main, Crescent and Lapworth Open Ditch, and the North Cutoff Levee. If the surface drains are constructed, right-of-way would need to be purchased to encompass those facilities as well. This right-of-way would be used to maintain the ditch as a district facility, protecting the drainage rights of those lands which use the district facilities.

Annexation Recommended. Approximately 91% of the lands which drain to the improved outlet provided by Drainage District No. 2 Main Open Ditch have not been assessed for maintenance costs of the facilities. We are not recommending annexing the lands upstream of the ditch. Only the 285 acres in the valley should be annexed. In order for these lands to now be assessed to help pay for future maintenance, it is necessary to bring them into Drainage District No. 2 by annexation procedures described in Iowa Drainage Code. Annexation procedures are estimated to cost approximately \$5,000. We also recommend discussing annexation of the 6,817 acres in the Loess Hills which shed water into the open ditch at the next public hearing to gauge interest in annexing these lands.

Reclassification Recommended. There are several acres north of Interstate 680 and west of Interstate 29 that do not drain to the Main Open Ditch. There are also several acres upstream of the Main Open Ditch that are currently in DD 8. These acres should be removed from the Main Open Ditch schedule. The proposed surface drains serving the lands northwest of the Interstate will require a schedule for the maintenance of the surface drains. These issues necessitate reclassification of the district to create an equitable basis upon which to spread the costs of future maintenance.

Installment Payments. Iowa Drainage District Law provides that large assessments may be spread over not less than ten nor more than twenty annual installments at the discretion of the Board of Trustees. Typically the Board would spread assessments of the magnitude contemplated in this report over ten years.

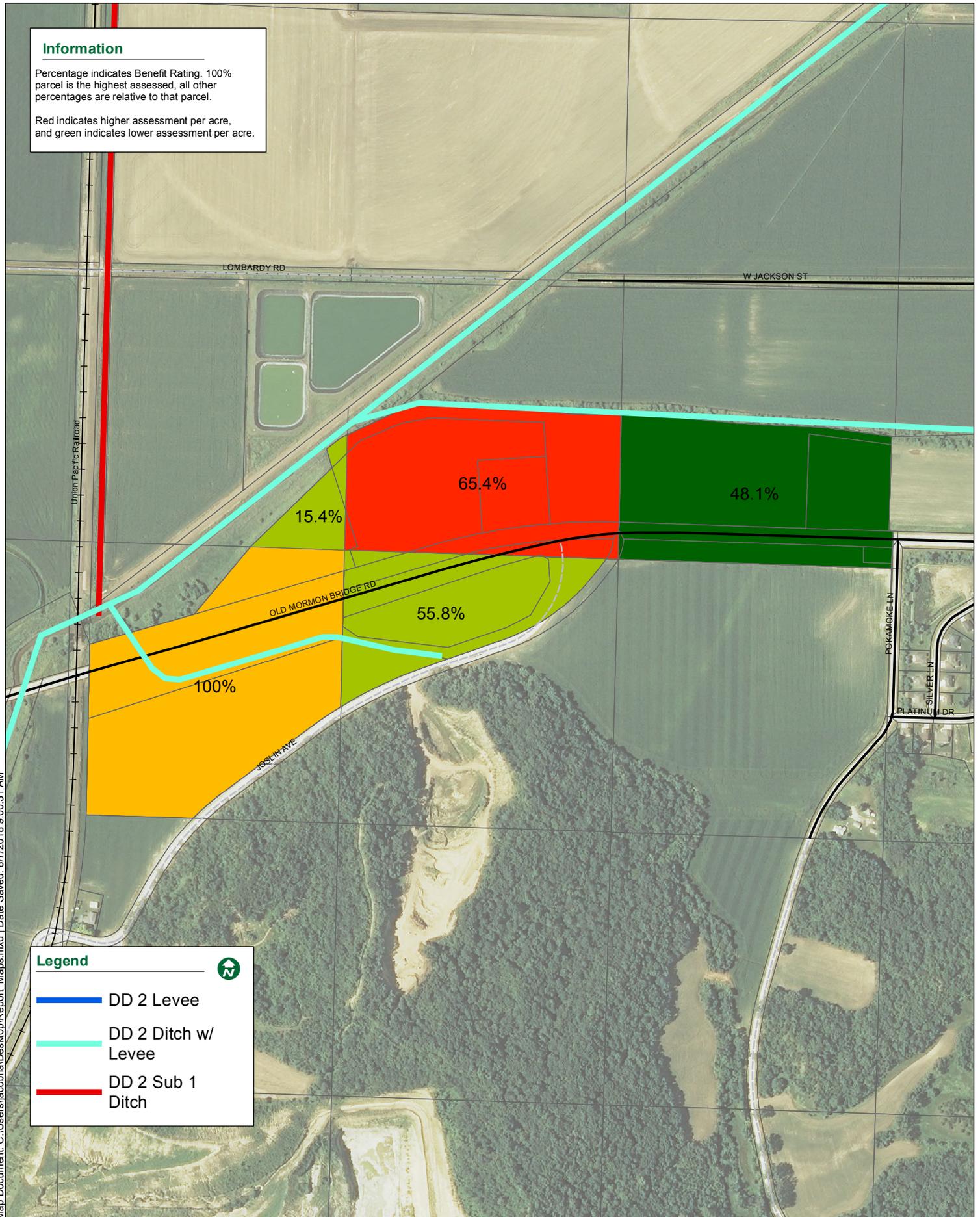
It is recommended that the Board of Trustees for Drainage District No. 2 take appropriate action, with legal guidance, to accomplish the following:

- Tentatively approve this Engineer's Report.
- Conduct a public hearing on the proposal concerning the proposed repairs, improvements, and annexation.
- Direct the Engineer to prepare the necessary Plans and Specifications and to proceed toward a Bid Letting.
- Appoint rights-of-way appraisers and continue hearing.
- Approve rights-of-way compensation.
- Initiate procedures to annex benefited lands to Drainage District No. 2.
- Initiate reclassification procedures.

Respectfully submitted,

Bolton & Menk, Inc.

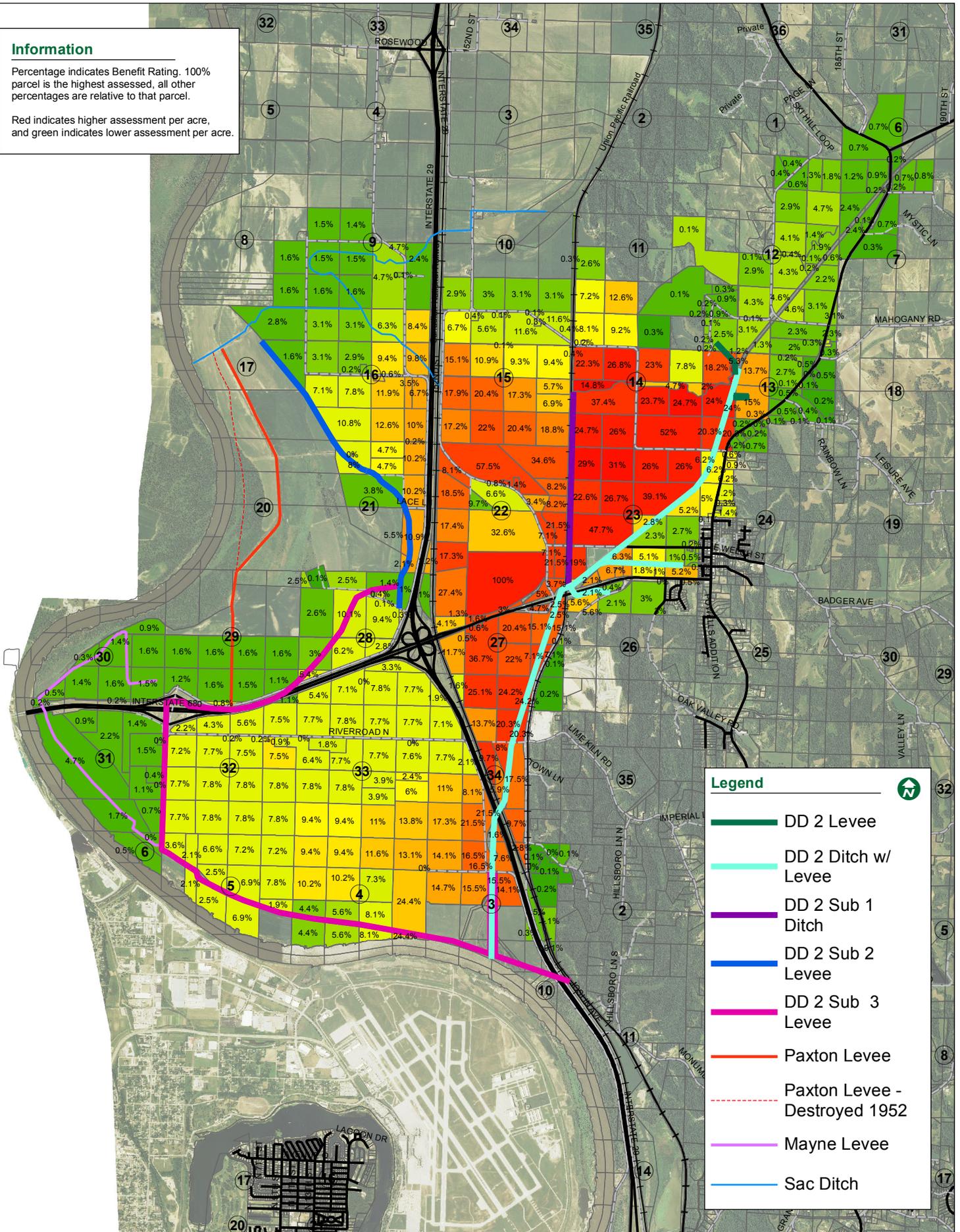
Appendix A: Existing Assessment Schedule Review & Benefitted Lands Schedule



Information

Percentage indicates Benefit Rating. 100% parcel is the highest assessed, all other percentages are relative to that parcel.

Red indicates higher assessment per acre, and green indicates lower assessment per acre.



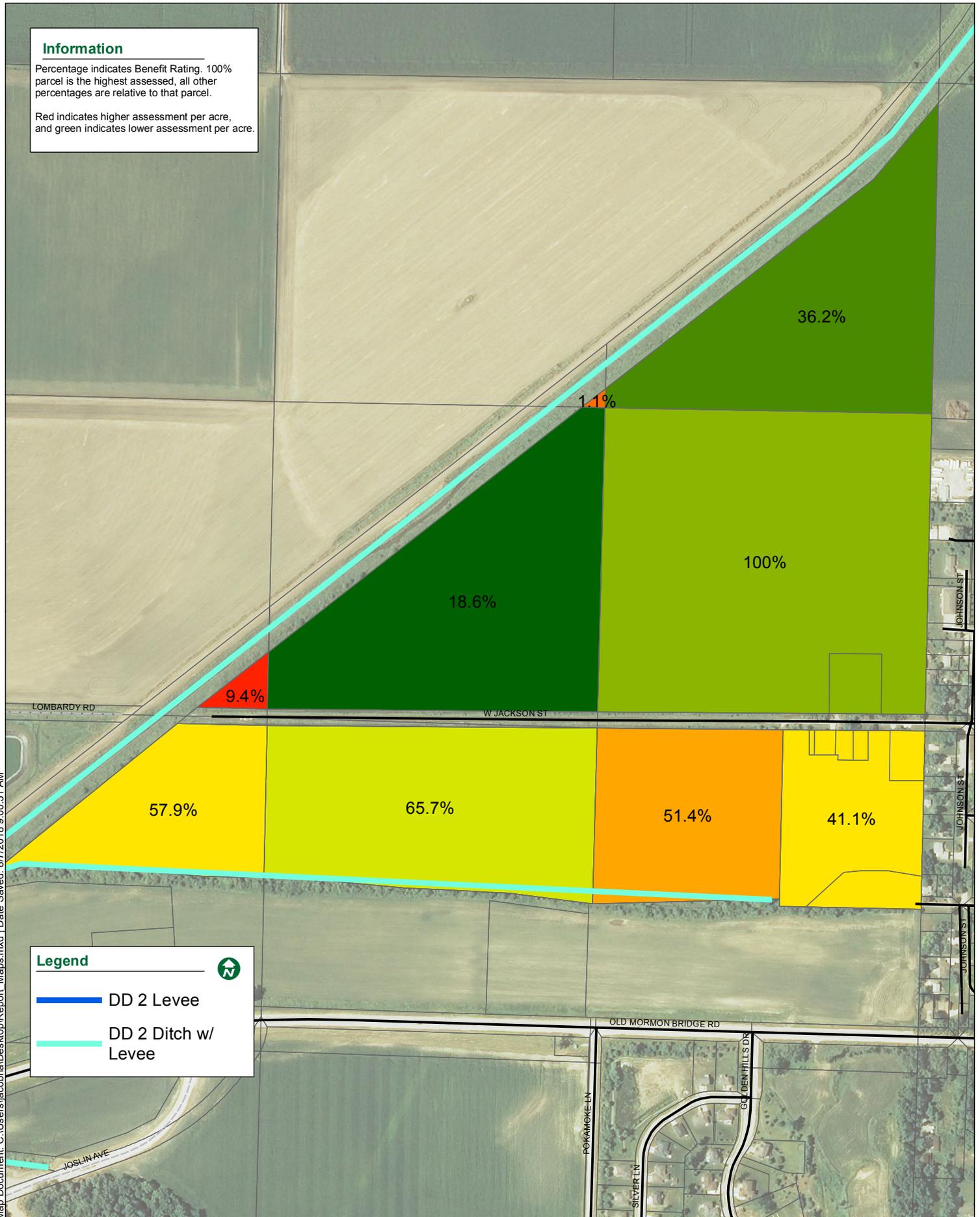
Legend

- █ DD 2 Levee
- █ DD 2 Ditch w/ Levee
- █ DD 2 Sub 1 Ditch
- █ DD 2 Sub 2 Levee
- █ DD 2 Sub 3 Levee
- █ Paxton Levee
- █ Paxton Levee - Destroyed 1952
- █ Mayne Levee
- █ Sac Ditch

Information

Percentage indicates Benefit Rating. 100% parcel is the highest assessed, all other percentages are relative to that parcel.

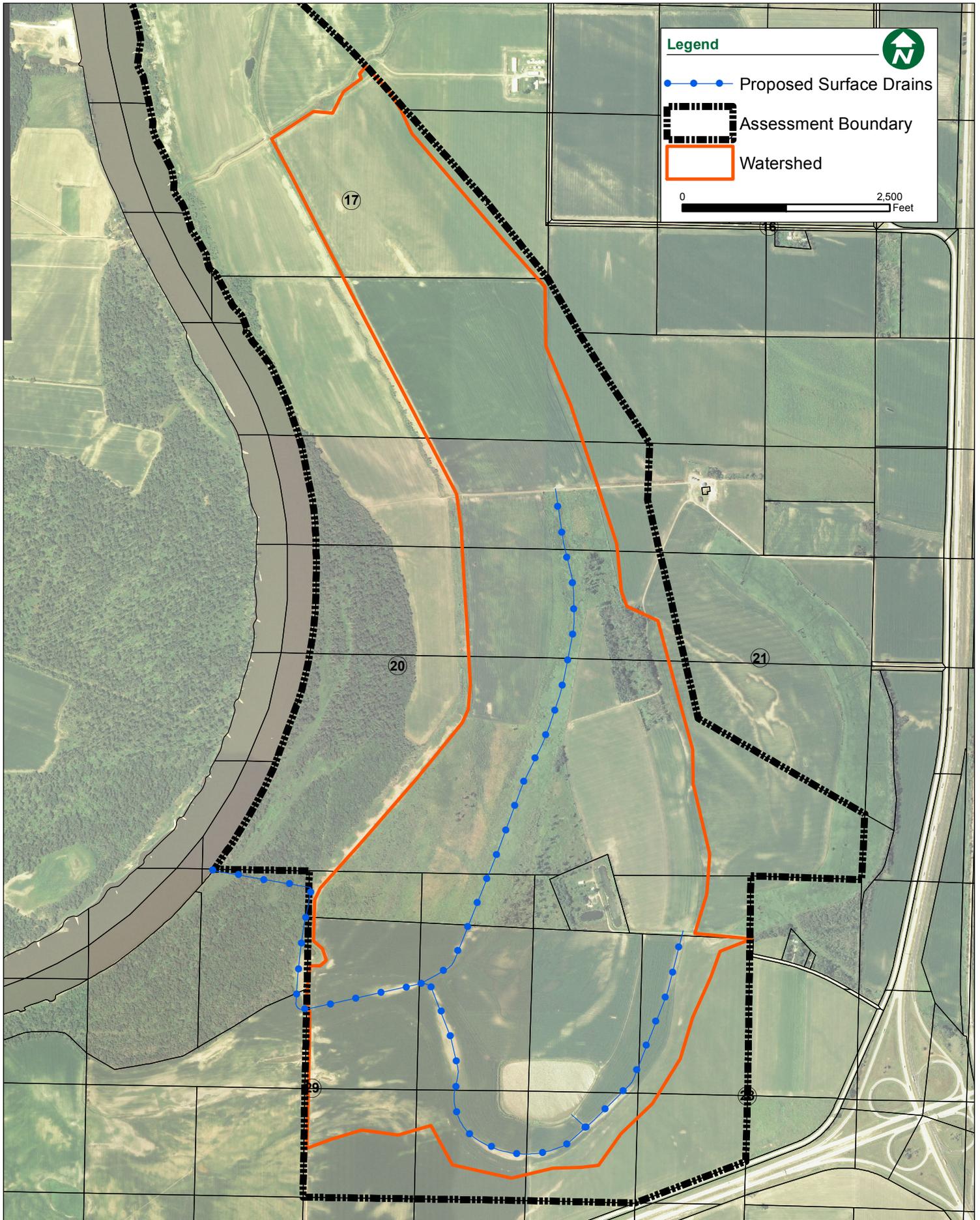
Red indicates higher assessment per acre, and green indicates lower assessment per acre.



Legend

-  DD 2 Levee
-  DD 2 Ditch w/ Levee





**BENEFITED LANDS SCHEDULE
PROPOSED SURFACE DRAIN
DRAINAGE DISTRICT NO. 2
POTTAWATTAMIE COUNTY, IOWA**

Landowner(s)	Parcel No.	Sec-Twp-Rng	Description	Benefited Acres	Percent of Total Benefiting Area
FROST, GARY TRUST	764417100001	17-76-44	ACRE TO G/L 1 & 2	94.0	11.10%
GENERAL SALES-INVESTMENT PTSP	764429200003	29-76-44	ACRE G/L 1 NE NE EXC S1969'	19.4	2.29%
GENERAL SALES-INVESTMENT PTSP	764429200001	29-76-44	ACRE G/L 2 NW NE EXC S2040'	16.4	1.94%
GENERAL SALES-INVESTMENT PTSP	764417400001	16-76-44	ACRE TO GOVT LTS 1 & 2	92.4	10.91%
GENERAL SALES-INVESTMENT PTSP	764421100001	21-76-44	ACRE TO GOVT LT 1	54.5	6.44%
GENERAL SALES-INVESTMENT PTSP	764421300001	21-76-44	ACRE TO GOVT LT 3	193.9	22.90%
GENERAL SALES-INVESTMENT PTSP	764421100003	21-76-44	ACRE TO GOVT LT 2	62.9	7.43%
GENERAL SALES-INVESTMENT PTSP	764428100002	28-76-44	G/LTS 3 & 4 & ACRE N1/2 NW EXC COMM 1898'N & 1450'W CENTER SECTION THNW987.14' SW765.64'SE661.15' E716.04'TO POB	20.9	2.47%
				460.4	54.38%
PRICKETT, WESLEY R-MEGAN L	764428100001	28-76-44	PT ACRE G/L 4 NW NW & PT ACCRE G/L 3 SW SW COMM 1880'N &1450.'WLY OF CENTEROF SECTION 28 THNWLY987' SWLY765' SELY661' ELY716' TO POB	13.5	1.59%
RIEF, RONALD E	764428100003	28-76-44	S1969' ACRE G/L 4 W1/2 NW	58.9	6.96%
RIEF, RONALD E	764429400001	29-76-44	NW SE	16.8	1.98%
RIEF, RONALD E	764429200004	29-76-44	GOVT LT 2 & ACRE S1969' E1/2 NE	61.6	7.28%
RIEF, RONALD E	764428300002	28-76-44	NE SW N OF I-680	0.9	0.11%
RIEF, RONALD E	764428300001	28-76-44	NW SW	24.3	2.87%
RIEF, RONALD E	764429400002	29-76-44	NE SE	26.2	3.09%
RIEF, RONALD E	764428100004	28-76-44	SE NW & S578' G/L 3 & ACRE	29.4	3.47%
RIEF, RONALD E	764429200002	29-76-44	GOVT LT 2 & ACCRE S2040' W1/2 NE	60.6	7.16%
				278.7	32.92%
Totals of all Benefiting Lands				846.6	100.00%

Appendix B: Right-of-Way Tabulation

Main Open Ditch Right-of-Way Table

Landowner	S-T-R	Legal Description	Existing Right-of-Way (ac)	Right-of-Way Required (ac)	Right-of-Way to be Acquired (ac)
B G J LLC	23-76-44	PT S1/2 SW & 26-76-44 PT N1/2 NW COMM 180.11'N 2628.88'WLY SW COR SE SW SECT 23 TH SW805.46' NELY978.8' SE409.78' SW40' SE80' TO POB (PARCEL D)	0.9	1.6	0.7
BREWER, O WARREN JR	13-76-44	SW NW EXC LYING SE OF CRK	0.0	1.3	1.3
BREWER, O WARREN JR	13-76-44	EXC NW OF DITCH SE NW	1.1	1.0	-0.1
BREWER, O WARREN JR	23-76-44	SE NE SE OF DITCH	2.7	3.6	0.9
BREWER, O WARREN JR	23-76-44	NW SE & NE SW LYING SE OF DITCH	3.0	4.7	1.7
BREWER, O WARREN JR	24-76-44	W OF RD SW NW EXC SE COR	0.1	0.1	0.0
CRESCENT, CITY OF	23-76-44	PT S1/2 SW COMM 1319.51'N 821.99'E SW COR SECT 23 TH E1381.28' TO C/L CRK SWLY1786.37' N1144.69' TO POB (PARCEL B)	3.5	3.6	0.1
DEWAELE, DOROTHY L	34-76-44	PT SW NE & PT NW SE W OF DITCH & NE OF RR EXC NELY1432.3'	2.8	2.8	0.0
DEWAELE, DOROTHY L	34-76-44	PT SW NE & PT NW SE E OF CRK & W OF RR	0.4	9.1	8.7
DILTS, CLIFFORD D TRUST	3-75-44	SE NW	6.1	2.9	-3.2
DILTS, CLIFFORD D TRUST	3-75-44	W OF I-29 SW NE	5.9	2.4	-3.5
DILTS, CLIFFORD D TRUST	3-75-44	ACRE TO GOVT LT 2 & LT 3 W1/2 SW & SE SW	0.0	3.6	3.6
DILTS, CLIFFORD D TRUST	3-75-44	GOVT LT 2 NE SW	5.8	6.6	0.8
DILTS, CLIFFORD D TRUST	3-75-44	NW SE EXC I-29	6.8	5.3	-1.5

Landowner	S-T-R	Legal Description	Existing Right-of-Way (ac)	Right-of-Way Required (ac)	Right-of-Way to be Acquired (ac)
DOUG CO NEBR NO OMAHA BRIDGE	27-76-44	PT G/L 1 NE NE LYING S & E PIGEON CRK #2	2.4	3.8	1.4
MORAN BEEF INC	13-76-44	NW NW EXC PLATTED ADD		1.0	1.0
MORAN BEEF INC	23-76-44	S1/2 NE NW OF DITCH & E16.5' NE NW	3.7	4.5	0.8
MORAN BEEF INC	23-76-44	N1/2 SW N & W OF CRK EXC RR E OF CRK NW SW	3.6	1.2	-2.4
MORAN BEEF INC	23-76-44	PT SW SW COMM 1319.51'N 100'E SW COR TH E721.99' S1144.69' TO C/L CRK SW276.77' W510.22' N1319.69' TO POB (PARCEL C)	2.6	0.8	-1.8
MORAN BEEF INC	23-76-44	N1/2 SE SW E PIGEON CRK	1.5	2.1	0.6
MORAN BEEF INC	23-76-44	NW SE NW OF DITCH	2.4	2.7	0.3
MORAN BEEF INC	26-76-44	PT NW NW N OF PIGEON CRK	2.0	1.7	-0.3
MURRAY, RONALD E TRUST	23-76-44	NE NE	0.2	0.3	0.1
MURRAY, RONALD E TRUST	24-76-44	NW NW EXC NLY721.59' E OF HWY	4.3	5.3	1.0
OAMEK, GEORGE-SHARON	13-76-44	NW OF DITCH SE NW	0.7	0.4	-0.3
POTTAWATTAMIE COUNTY	34-76-44	PT SE NW & PT SW NE & PT NW SE COMM 606'E INTERSECTION N LINE SE NW & E RR ROW TH E727.8' TO DITCH SELY1432.3' NW1514.3' TO POB	3.1	3.6	0.5
RESPELIERS, JOE SR- MARGARET E TRUST	3-75-44	W OF I-29 NW NE	2.9	4.3	1.4
RESPELIERS, JOE SR- MARGARET E TRUST	34-76-44	W OF I-29 SW SE	3.8	4.9	1.1

Landowner	S-T-R	Legal Description	Existing Right-of-Way (ac)	Right-of-Way Required (ac)	Right-of-Way to be Acquired (ac)
RESPELIERS, THOMAS E- ANNETTE S	34-76-44	SE SW & S160.91' W826.77' NE SW & TRI NE SW BETWEEN RD & I-29	1.9	4.0	2.1
ROCKING R FARMS INC	23-76-44	PT S1/2 SW COMM INTERSECT E LINE SE SW & N LINE HWY RD ROW TH WLY 320' NLY486.56' TO CRK BERM WLY538.58' SWLY537.16' NE TO C/L CRK E ALONG C/L TO E LINE SE SW S TO POB (INCLUDES PARCEL C FOR EASEMENT)	0.2	0.3	0.1
SCHROPP, MICHAEL	27-76-44	SE NE W OF RR EXC DD	5.0	5.2	0.2
SCHROPP, MICHAEL	27-76-44	W OF RR NE SE EXC DITCH	5.0	4.6	-0.4
SCHROPP, MICHAEL	27-76-44	S1/2 SE W OF RR EXC CRK	5.1	5.7	0.6
SCHROPP, MICHAEL	34-76-44	NW NE EXC DITCH	5.0	6.1	1.1
SCHROPP, MICHAEL P	3-75-44	NE NW	3.6	5.1	1.5
SCHROPP, MICHAEL P	34-76-44	SW SE E OF I-29 & W OF RR	0.1	0.1	0.0
TERRY, PHILIP D	13-76-44	SE OF CRK SW NW EXC DITCH	0.7	2.3	1.6
TERRY, PHILIP D	13-76-44	NW SW EXC DITCH & EXC NW OF CRK	4.4	5.9	1.5
TERRY, PHILIP D	13-76-44	EXC SE OF HWY NE SW	0.0	2.3	2.3
TERRY, PHILIP D	13-76-44	SW SW EXC SE OF HWY & EXC CRK	4.3	5.5	1.2
TOTALS			107.6	132.3	24.7

Lapworth Lateral Right-of-Way Table

Landowner	S-T-R	Legal Description	Existing Right-of-Way (ac)	Right-of-Way Required (ac)	Right-of-Way to be Acquired (ac)
MIDWEST ROCK PRODUCTS	26-76-44	NE NW LYING S OLD HWY & S CRK	0.4	0.3	0.1
SCHROPP, MICHAEL	26-76-44	NW NW S OLD MORMAN BRIDGE RD & E OF RR	0.0	0.1	0.1
TOTALS			0.4	0.4	0.2

Crescent Lateral Right-of-Way Table

Landowner	S-T-R	Legal Description	Existing Right-of-Way (ac)	Right-of-Way Required (ac)	Right-of-Way to be Acquired (ac)
MORAN BEEF INC	23-76-44	SW SE N OF C/L DITCH	1.5	1.5	0.0
MORAN BEEF INC	23-76-44	N1/2 SE SW E PIGEON CRK	0.9	1.1	0.2
MORAN BEEF INC	23-76-44	W746' E1/2 SE S OF JACKSON ST & N OF DITCH	0.8	0.6	-0.2
ROCKING R FARMS INC	23-76-44	SE SE N OF HWY & S OF DITCH	0.2	1	0.8
ROCKING R FARMS INC	23-76-44	SW SE S C/L LATERAL & N HWY EXC COMM 180.11'N 17'W SE COR TH W399.83' N455.84' E401.84' S415.72' TO POB	0.3	1.2	0.9
ROCKING R FARMS INC	23-76-44	PT S1/2 SW COMM INTERSECT E LINE SE SW & N LINE HWY RD ROW TH WLY 320' NLY486.56' TO CRK BERM WLY538.58' SWLY537.16' NE TO C/L CRK E ALONG C/L TO E LINE SE SW S TO POB (INCLUDES PARCEL C FOR EASEMENT)	0.6	1.5	0.9
TOTALS			4.3	6.9	2.6

North and South Lateral Levees Right-of-Way Table

Landowner	S-T-R	Legal Description	Existing Right-of-Way (ac)	Right-of-Way Required (ac)	Right-of-Way to be Acquired (ac)
TERRY, PHILIP D	13-76-44	EXC SE OF HWY NE SW	0.0	2.2	2.2
TERRY, PHILIP D	13-76-44	NW SW EXC DITCH & EXC NW OF CRK	0.0	0.4	0.4
TOTALS			0.0	2.6	2.6

North Cutoff Levee Right-of-Way Table

Landowner	S-T-R	Legal Description	Existing Right-of-Way (ac)	Right-of-Way Required (ac)	Right-of-Way to be Acquired (ac)
BREWER, O WARREN JR	13-76-44	SW NW EXC LYING SE OF CRK	1.2	1.3	0.1
OAMEK, GEORGE-SHARON	13-76-44	NW OF DITCH SE NW	0.2	0.0	0.2
MORAN BEEF INC	13-76-44	NW NW EXC PLATTED ADD	1.0	1.0	0.0
TERRY, PHILIP D	13-76-44	SE OF CRK SW NW EXC DITCH	0.4	1.4	1.0
TOTALS			2.8	3.7	1.3

Outside Open Ditch Right-of-Way Table

Landowner	S-T-R	Legal Description	Existing Right-of-Way (ac)	Right-of-Way Required (ac)	Right-of-Way to be Acquired (ac)
GENERAL SALES- INVESTMENT PTSP	29-76-44	ACRE G/L 3 E1/2 NW N OF CRK	0.0	2.6	2.6
GENERAL SALES- INVESTMENT PTSP	29-76-44	ACRE G/L 2 NW NE EXC S2040'	0.0	0.2	0.2
STRATBUCKER, ROBERT A	29-76-44	LT 3 SE NW & SW NW LYING S OF CRK	0.0	0.3	0.3
TOTALS			0.0	3.1	3.1

Surface Drains Right-of-Way Table

Landowner	S-T-R	Legal Description	Existing Right-of-Way (ac)	Right-of-Way Required (ac)	Right-of-Way to be Acquired (ac)
GENERAL SALES- INVESTMENT PTSP	21-76-44	ACRE TO GOVT LT 1	0.0	0.4	0.4
GENERAL SALES- INVESTMENT PTSP	21-76-44	ACRE TO GOVT LT 2	0.0	0.8	0.8
GENERAL SALES- INVESTMENT PTSP	21-76-44	ACRE TO GOVT LT 3	0.0	1.8	1.8
GENERAL SALES- INVESTMENT PTSP	29-76-44	ACRE G/L 1 NE NE EXC S1969'	0.0	0.8	0.8
RIEF, RONALD E	28-76-44	S1969' ACCRE G/L 4 W1/2 NW	0.0	0.2	0.2
RIEF, RONALD E	28-76-44	SE NW & S578' G/L 3 & ACRE	0.0	0.9	0.9
RIEF, RONALD E	28-76-44	NW SW	0.0	0.9	0.9
RIEF, RONALD E	29-76-44	GOVT LT 2 & ACCRE S2040' W1/2 NE	0.0	2.3	2.3
RIEF, RONALD E	29-76-44	GOVT LT 2 & ACCRE S1969' E1/2 NE	0.0	1.9	1.9
RIEF, RONALD E	29-76-44	NE SE	0.0	0.8	0.8
TOTALS			0.0	10.8	10.8

Appendix C: Cost Estimates

**Engineer's Opinion of Probable Cost
Proposed Levee Repairs
Drainage District No. 2
Main Open Ditch
Pottawattamie County, Iowa
2018**

Construction Division 1--Main Open Ditch Levee

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total</u>
101	Strip Stockpile Topsoil	CY	2,050	\$4	\$7,175
102	Respread Topsoil	CY	2,050	\$2	\$4,100
103	Levee Fill	CY	10,800	\$4	\$43,200
104	Clearing & Grubbing	LS			\$10,000
105	Seed & Fertilize Levee	AC	2.6	\$500	\$1,300
106	Administration of Erosion Management Plan	LS			\$250
107	Seeding of Temporary Stabilization	AC	2.6	\$800	\$2,080
108	Silt Fence Install and Review	LF	500	\$3	\$1,500
109	Mobilization	LS	1	\$3,500	\$3,500
Estimated Division 1 Subtotal					\$73,000
Construction Contingency					\$3,700
Total Estimated Construction Cost					\$76,700

Construction Related Damages

Work Area Rental (4.0 ac)	\$1,000
Right-of-Way Acquisition (45.1 ac)	\$18,000
Other Damages	\$2,000

Basic Engineering Services

Survey, Study & Report. All Meetings & Hearings	\$10,000
Construction Plans, Specifications, & Bid Letting	\$5,000
Construction Engineering Services	\$7,500

Legal Services, Publications, Mailings, Etc..

\$10,000

Finance, Interest & Contingency

\$2,700

Total Estimated Assessable Project Cost \$133,000

Estimated Average Cost Per Currently Assessed Acre (10,044 ac)	\$13
Estimated Average Cost Per Acre Per Year (10 years)	\$2
Estimated Average Cost Per Acre Per Year (20 years)	\$1

**Engineer's Opinion of Probable Cost
Proposed Surface Drain
Drainage District No. 2 Pigeon Creek
Pottawattamie County, Iowa
2018**

Construction Division 1--Ditch Repair Assessable to District

<u>Item</u>	<u>Description</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total</u>
100	Clearing & Grubbing	AC	6	\$5,000	\$30,000
101	Excavation- Surface Drain	CY	20,000	\$3.00	\$60,000
102	Excavation- Open Ditch	CY	33,000	\$3.00	\$99,000
103	Spoil Leveling	Sta	28.0	\$300	\$8,400
104	Bank Seeding	Sta	28.0	\$175	\$4,900
105	60" Diameter CI IV RCP	LF	100	\$250	\$25,000
106	Flap Gate	EA	1	\$9,000	\$9,000
107	Riprap, Class E	TN	600	\$50	\$30,000
108	Mobilization	LS	1	\$14,000	\$14,000

Total Estimated Assessable Construction Subtotal (Repair) \$280,000

Construction Contingency \$14,000

Total Estimated Construction Cost \$294,000

Construction Related Damages

Work Area Rental (41.5 ac)	\$8,300
Right-of-Way Acquisition Open Ditch (3.1 ac)	\$8,000
Right-of-Way Acquisition Surface Drain (10.9 ac)	\$5,000
Other Damages	\$8,000

Basic Engineering Services

Survey, Study & Report. Meetings & Hearing	\$15,000
Permitting	\$20,000
Construction Plans, Specifications, & Bid Letting	\$10,000
Construction Engineering Services	\$25,000

Legal Services, Publications, Mailings, Etc..

Finance, Interest & Contingency

\$10,000

\$21,000

Total Estimated Assessable Project Cost \$424,000

Estimated Average Cost Per Currently Assessed Acre (848 ac)	\$500
Estimated Average Cost Per Acre Per Year (10 years)	\$64
Estimated Average Cost Per Acre Per Year (20 years)	\$38

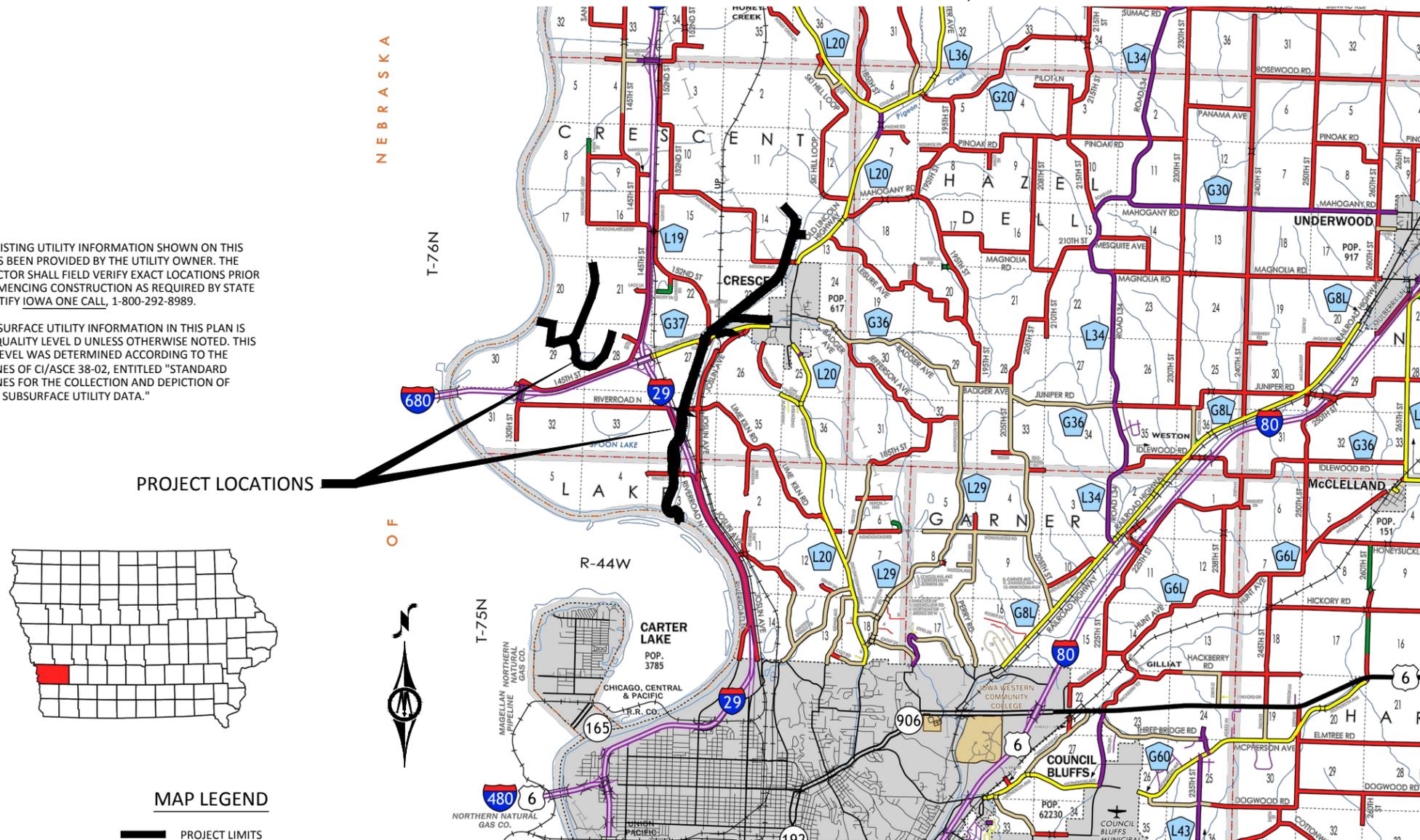
Appendix D: Proposed Plans

PRELIMINARY PLANS FOR PROPOSED REPAIRS & IMPROVEMENTS DRAINAGE DISTRICT NO. 2 PIGEON CREEK POTTAWATTAMIE COUNTY, IOWA

MAY, 2018

NOTE: EXISTING UTILITY INFORMATION SHOWN ON THIS PLAN HAS BEEN PROVIDED BY THE UTILITY OWNER. THE CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS PRIOR TO COMMENCING CONSTRUCTION AS REQUIRED BY STATE LAW. NOTIFY IOWA ONE CALL, 1-800-292-8989.

THE SUBSURFACE UTILITY INFORMATION IN THIS PLAN IS UTILITY QUALITY LEVEL D UNLESS OTHERWISE NOTED. THIS UTILITY LEVEL WAS DETERMINED ACCORDING TO THE GUIDELINES OF CI/ASCE 38-02, ENTITLED "STANDARD GUIDELINES FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA."



MAP LEGEND

— PROJECT LIMITS



Sheet List Table	
Sheet Number	Sheet Title
A.01	TITLE SHEET
A.02	MAIN OPEN DITCH LANDOWNERS PLAT
A.03	SURFACE DRAIN LANDOWNERS PLAT
A.04	PIGEON CREEK WATERSHED
A.05	PROJECT LOCATION
B.01	TYPICAL CROSS SECTIONS
1	PIGEON CREEK MAIN OPEN DITCH PLAN & PROFILE
2	PIGEON CREEK MAIN OPEN DITCH PLAN & PROFILE
3	PIGEON CREEK MAIN OPEN DITCH PLAN & PROFILE
4	PIGEON CREEK MAIN OPEN DITCH PLAN & PROFILE
5	PIGEON CREEK MAIN OPEN DITCH PLAN & PROFILE
6	PIGEON CREEK MAIN OPEN DITCH PLAN & PROFILE
7	PIGEON CREEK MAIN OPEN DITCH PLAN & PROFILE
8	PIGEON CREEK MAIN OPEN DITCH PLAN & PROFILE
9	PIGEON CREEK MAIN OPEN DITCH PLAN & PROFILE
10	LAPWORTH LATERAL PLAN & PROFILE
11	CRESCENT LATERAL PLAN & PROFILE
12	CRESCENT LATERAL PLAN & PROFILE
13	LATERAL LEVEES PLAN & PROFILE
14	NORTH CUTOFF LEVEE PLAN & PROFILE
15	OUTSIDE OPEN DITCH PLAN & PROFILE
16	SURFACE DRAIN NO. 1 PLAN & PROFILE
17	SURFACE DRAIN NO. 1 PLAN & PROFILE
18	SURFACE DRAIN NO. 1 PLAN & PROFILE
19	SURFACE DRAIN NO. 2 PLAN & PROFILE
20	SURFACE DRAIN NO. 2 PLAN & PROFILE
21	SURFACE DRAIN NO. 2 PLAN & PROFILE
22	SURFACE DRAIN NO. 3 PLAN & PROFILE
G.01	BENCHMARKS
G.02	MAIN OPEN DITCH ALIGNMENT GEOMETRY
G.04	SURFACE DRAIN ALIGNMENT GEOMETRY
X.01	MAIN OPEN DITCH CROSS SECTIONS

⚡ BM=994.00 USGS MONUMENT V138 W END OF S WING WALL OF RR BRIDGE	PROJECT DATUM:	RECORD DRAWING INFORMATION
	HORIZONTAL: IOWA STATE PLANE SOUTH ZONE NAVD 88	OBSERVER: CONTRACTOR: DATE:

PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA		SHEET
DRAINAGE DISTRICT NO. 2 REPAIRS & IMPROVEMENTS		A.01
TITLE SHEET		

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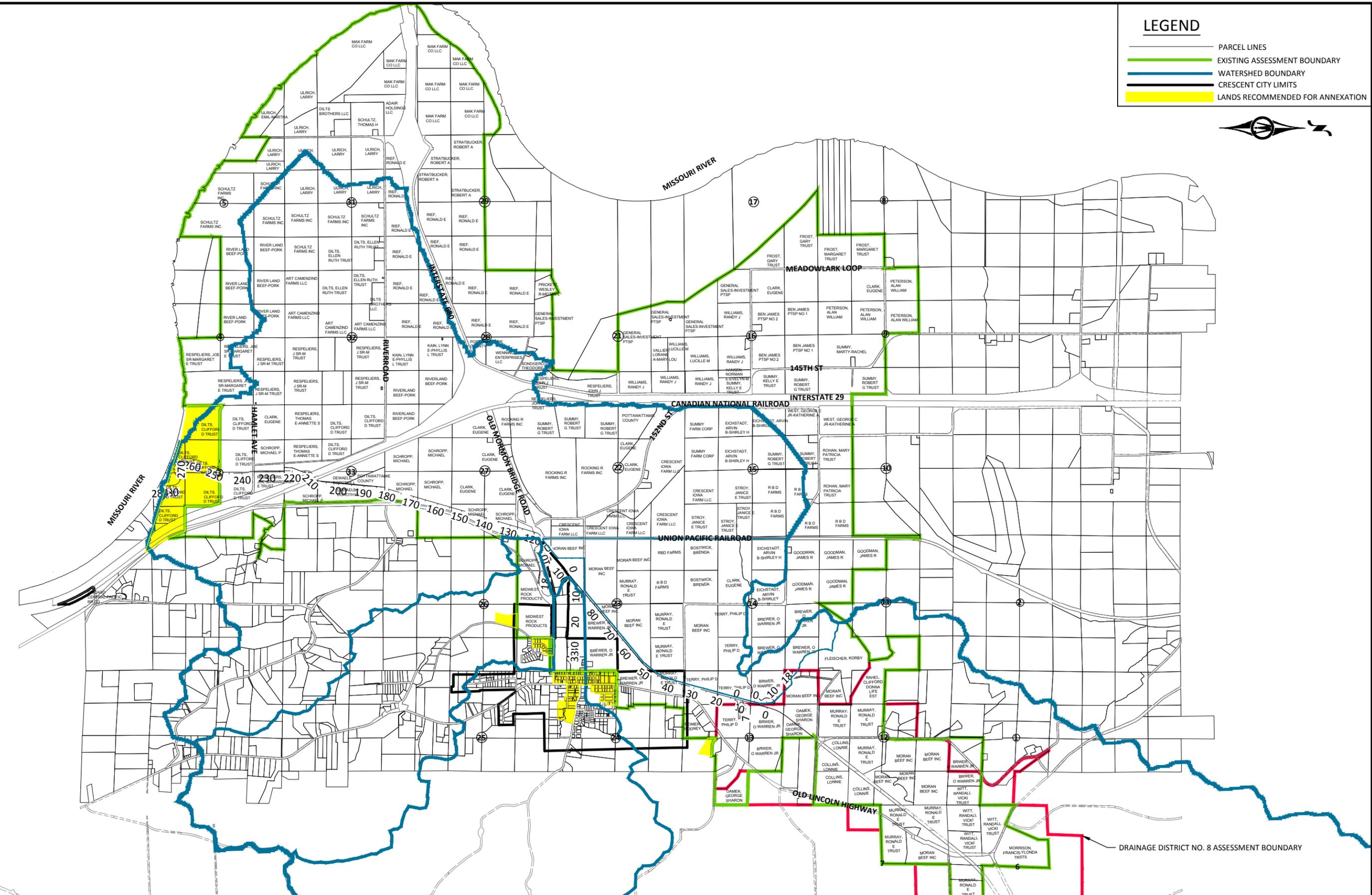


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JPR			
DDE			
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LEGEND

-  PARCEL LINES
-  EXISTING ASSESSMENT BOUNDARY
-  WATERSHED BOUNDARY
-  CRESCENT CITY LIMITS
-  LANDS RECOMMENDED FOR ANNEXATION



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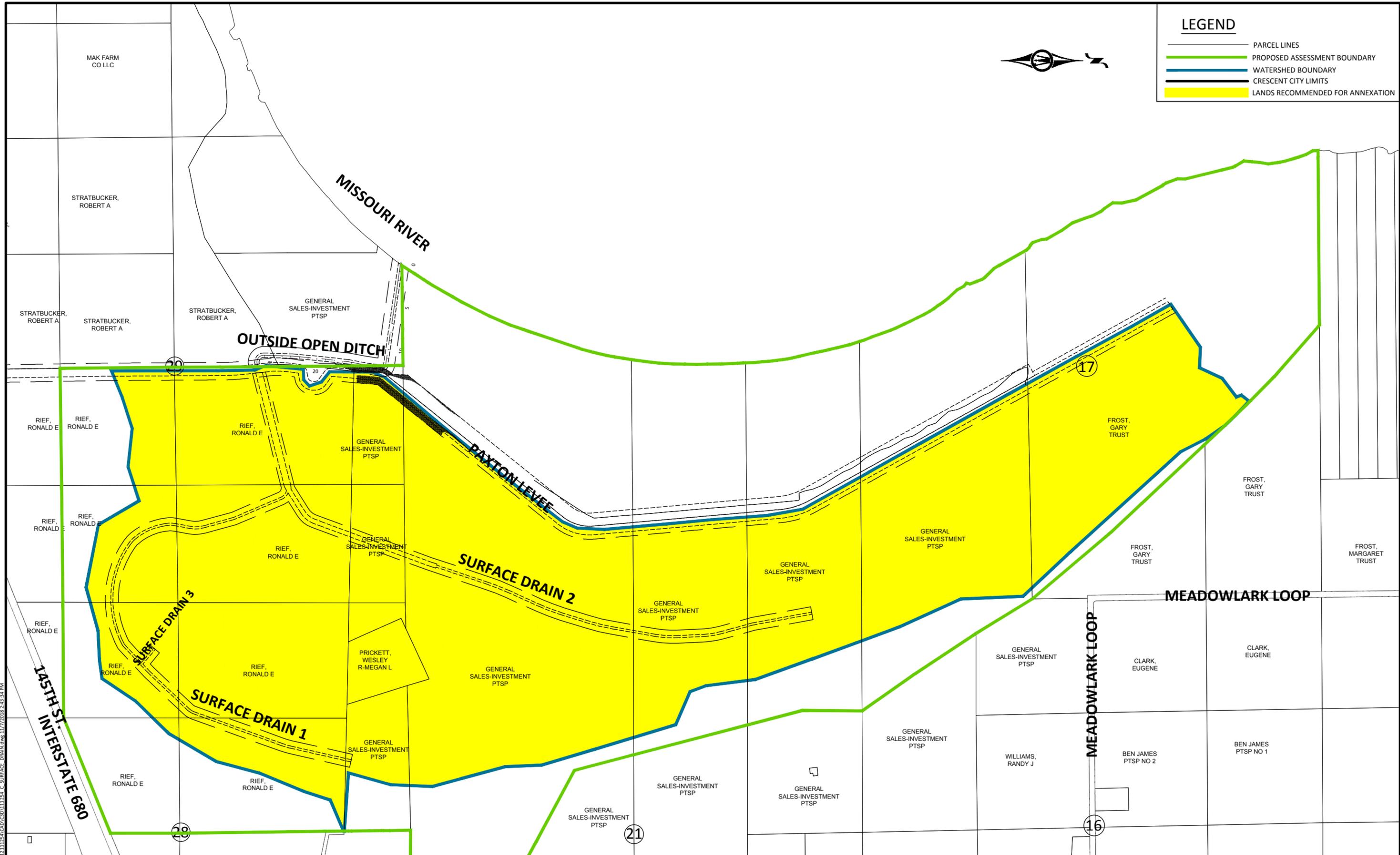
PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
 DRAINAGE DISTRICT NO. 2 REPAIRS & IMPROVEMENTS
 MAIN OPEN DITCH LANDOWNERS PLAT

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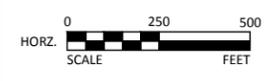
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LEGEND

-  PARCEL LINES
-  PROPOSED ASSESSMENT BOUNDARY
-  WATERSHED BOUNDARY
-  CRESCENT CITY LIMITS
-  LANDS RECOMMENDED FOR ANNEXATION



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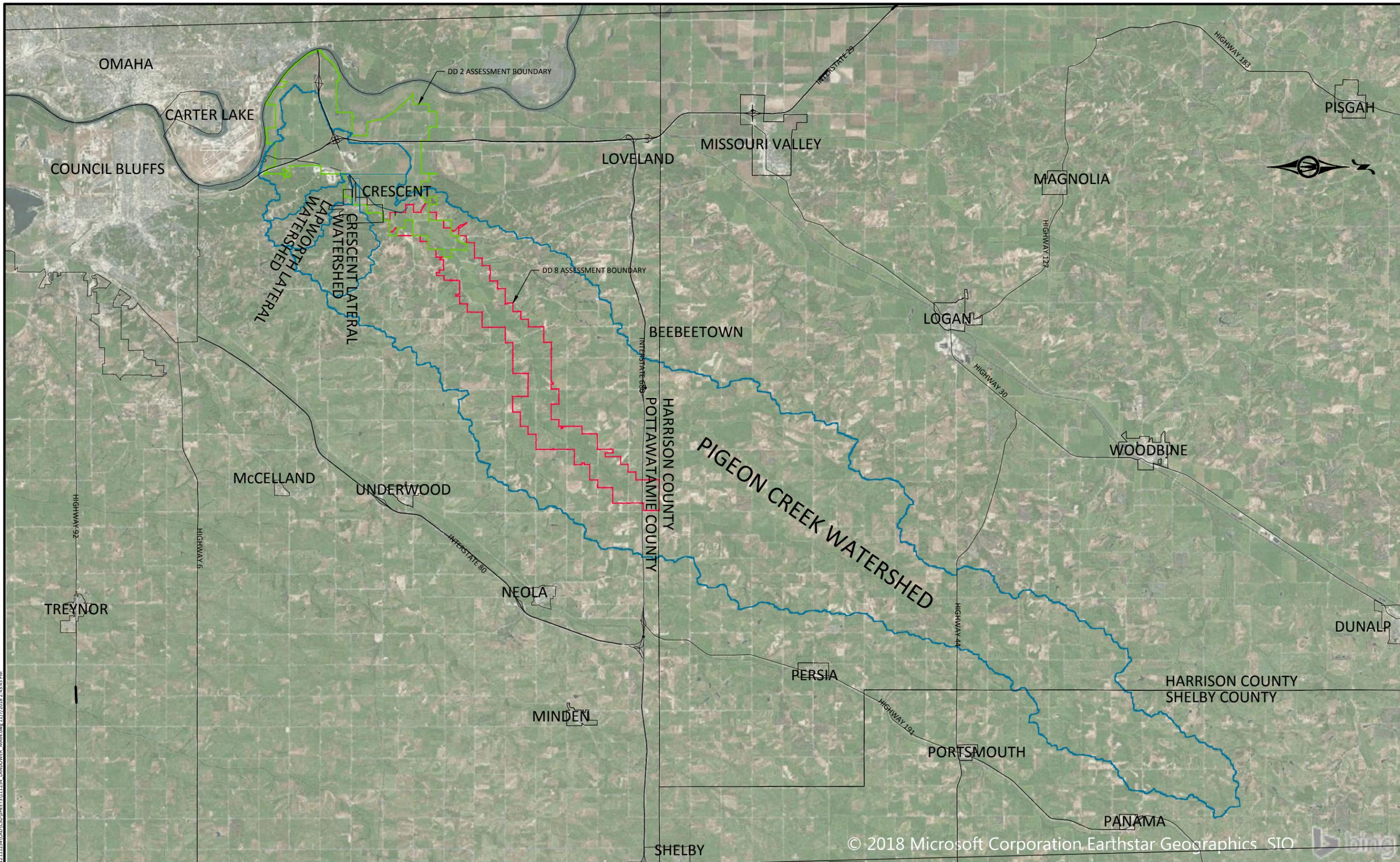


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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
DRAINAGE DISTRICT NO. 2 REPAIRS & IMPROVEMENTS
SURFACE DRAIN LANDOWNERS PLAT

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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA

DRAINAGE DISTRICT NO. 2 REPAIRS & IMPROVEMENTS

PIGEON CREEK WATERSHED

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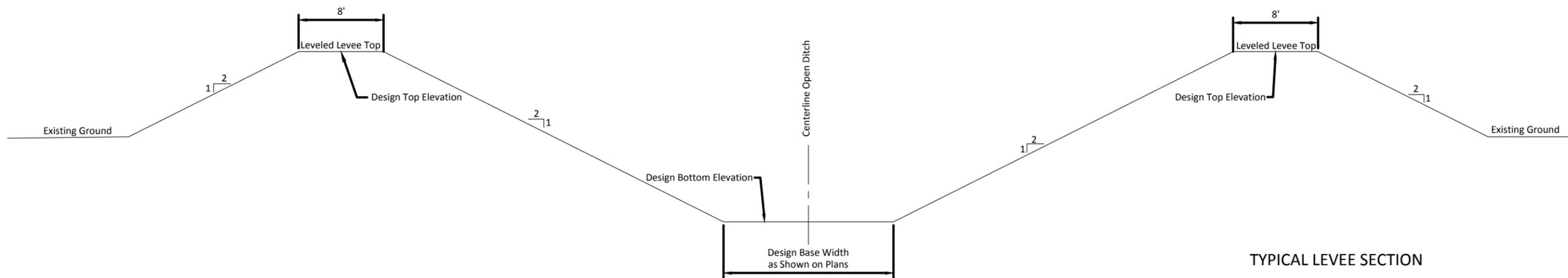
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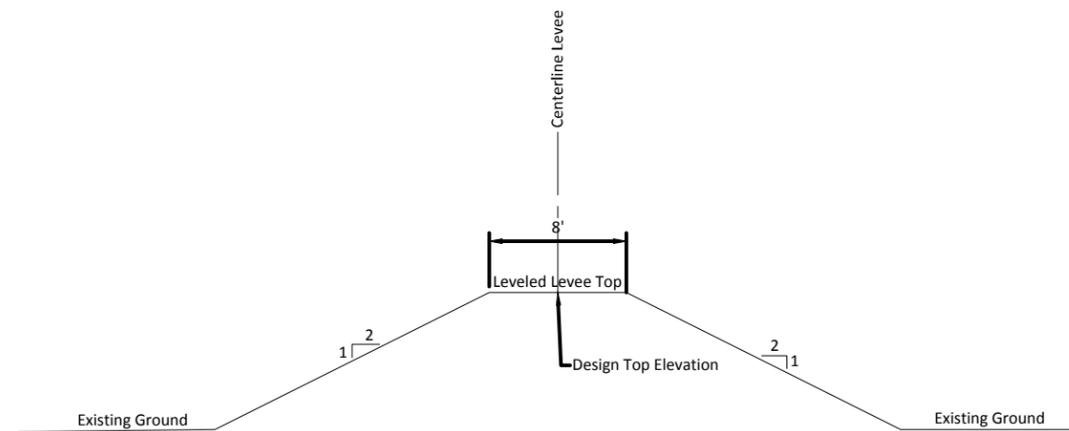
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PROJECT LOCATION		

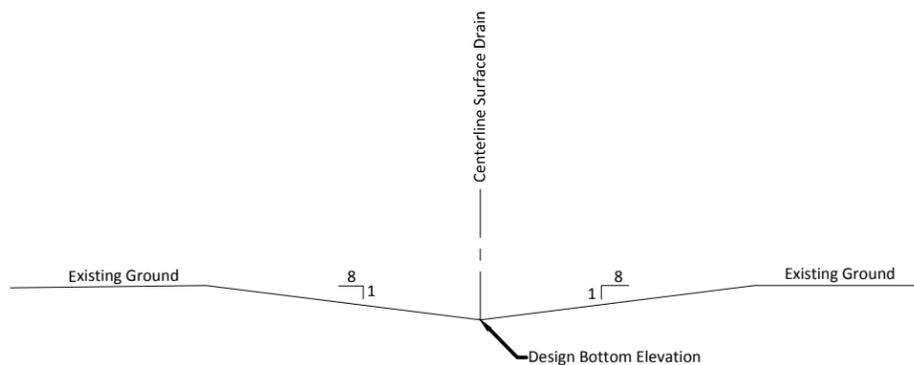
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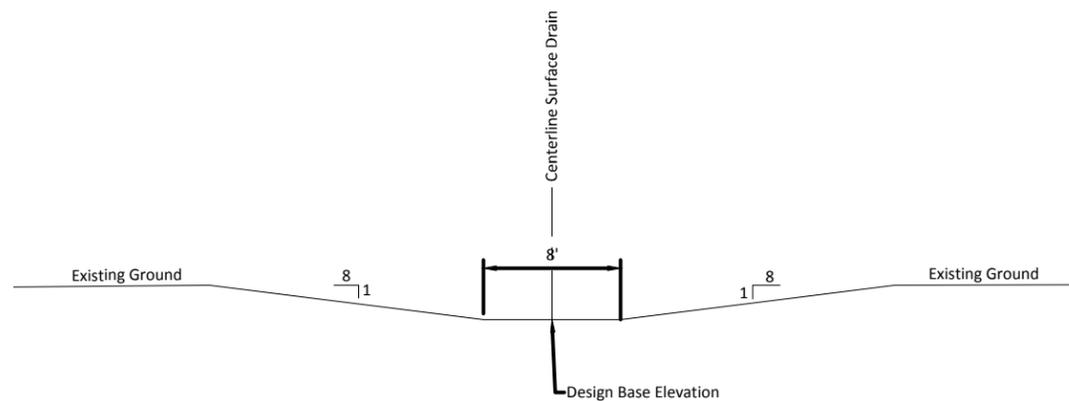
TYPICAL LEVEE SECTION



TYPICAL VEE SURFACE DRAIN SECTION



TYPICAL SURFACE DRAIN SECTION



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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
DRAINAGE DISTRICT NO. 2 REPAIRS & IMPROVEMENTS
TYPICAL CROSS SECTIONS

SHEET
B.01

OLD LINCOLN HIGHWAY



BREWER, O
WARREN JR
EXC NW OF DITCH
SE NW

TERRY,
PHILIP D
EXC SE OF HWY
NE SW
13-76-44

TERRY, PHILIP D
NW SW EXC DITCH & EXC
NW OF CRK
13-76-44

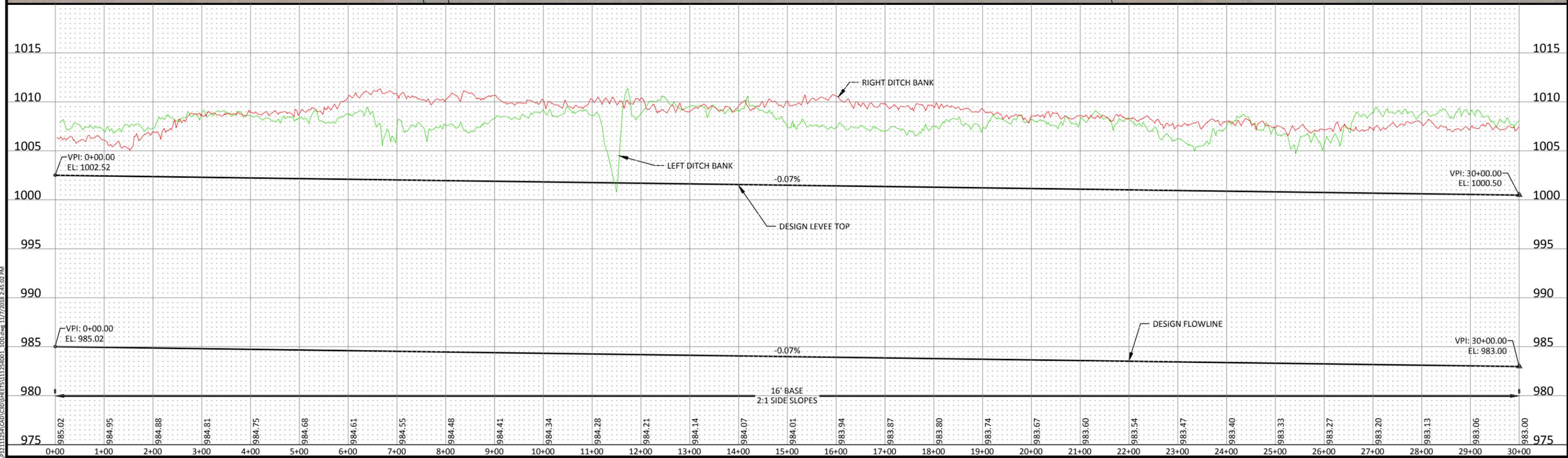
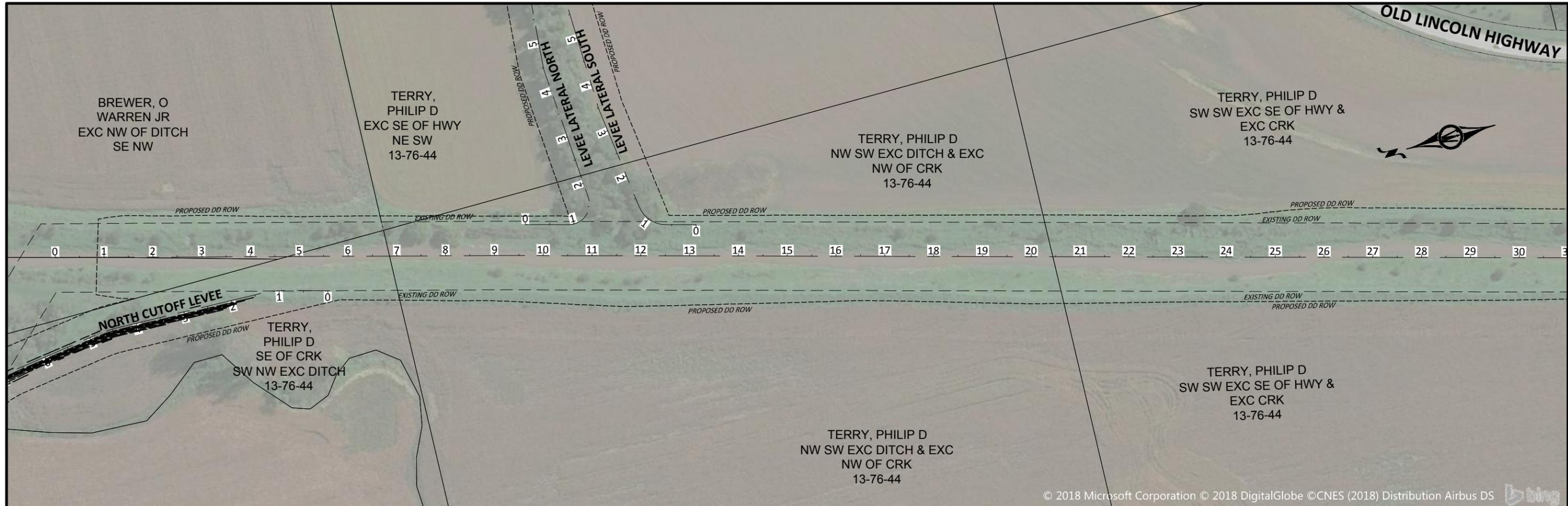
TERRY, PHILIP D
SW SW EXC SE OF HWY &
EXC CRK
13-76-44

TERRY,
PHILIP D
SE OF CRK
SW NW EXC DITCH
13-76-44

TERRY, PHILIP D
NW SW EXC DITCH & EXC
NW OF CRK
13-76-44

TERRY, PHILIP D
SW SW EXC SE OF HWY &
EXC CRK
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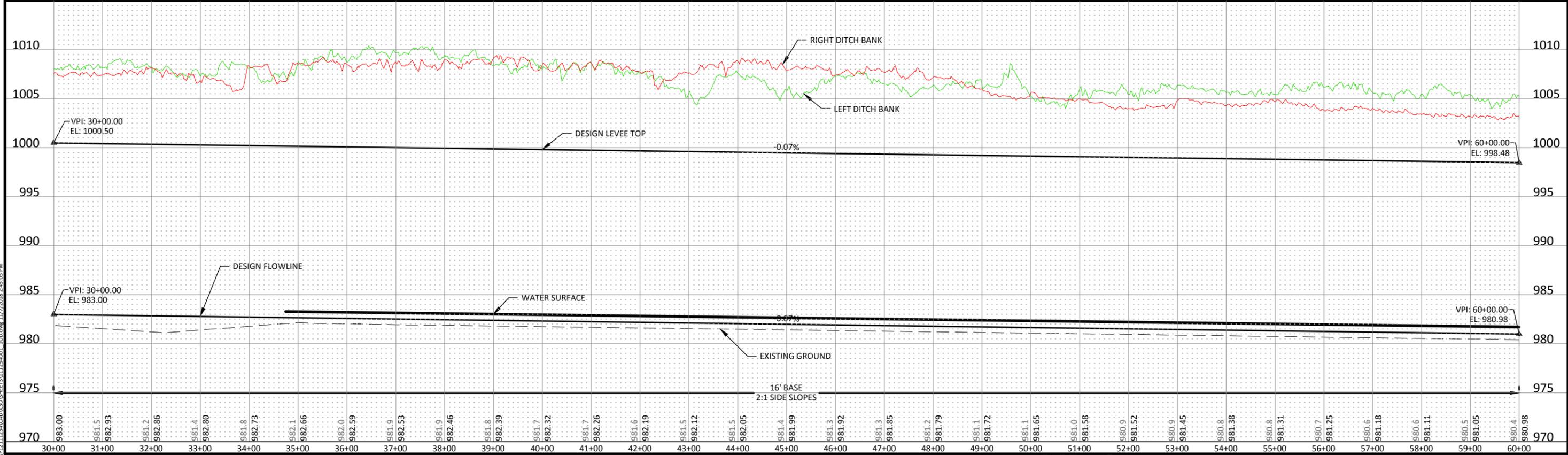
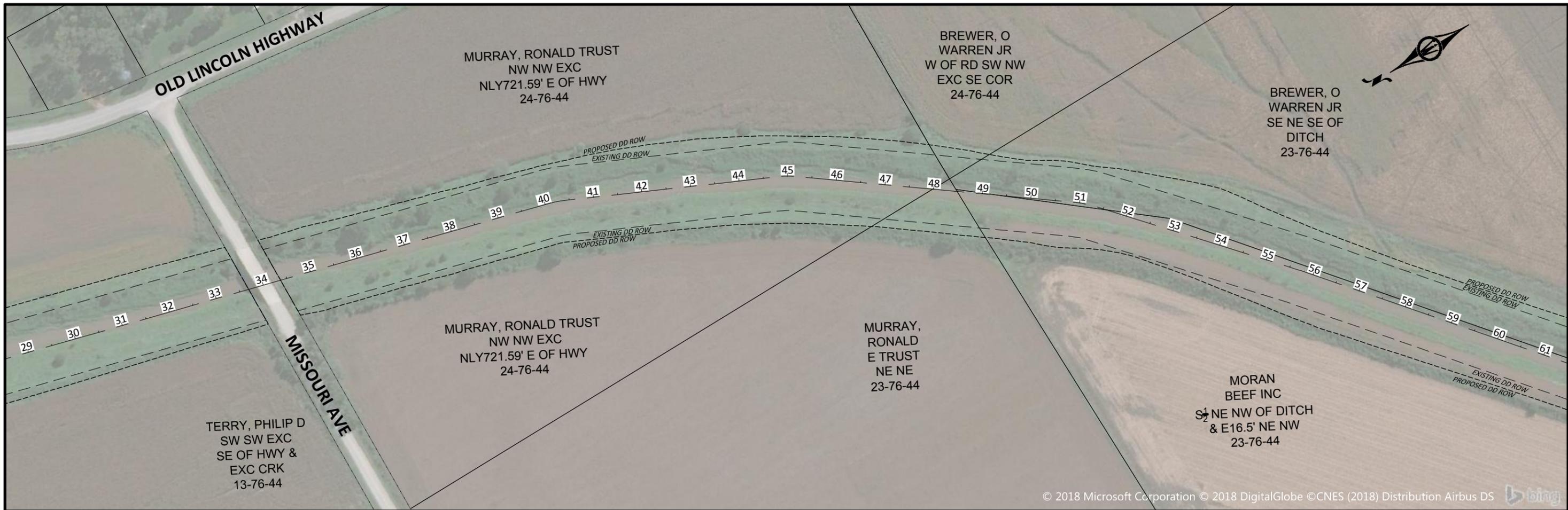


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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
DRAINAGE DISTRICT NO. 2 FACILITY RECORDS
PIGEON CREEK MAIN OPEN DITCH PLAN & PROFILE

SHEET
1



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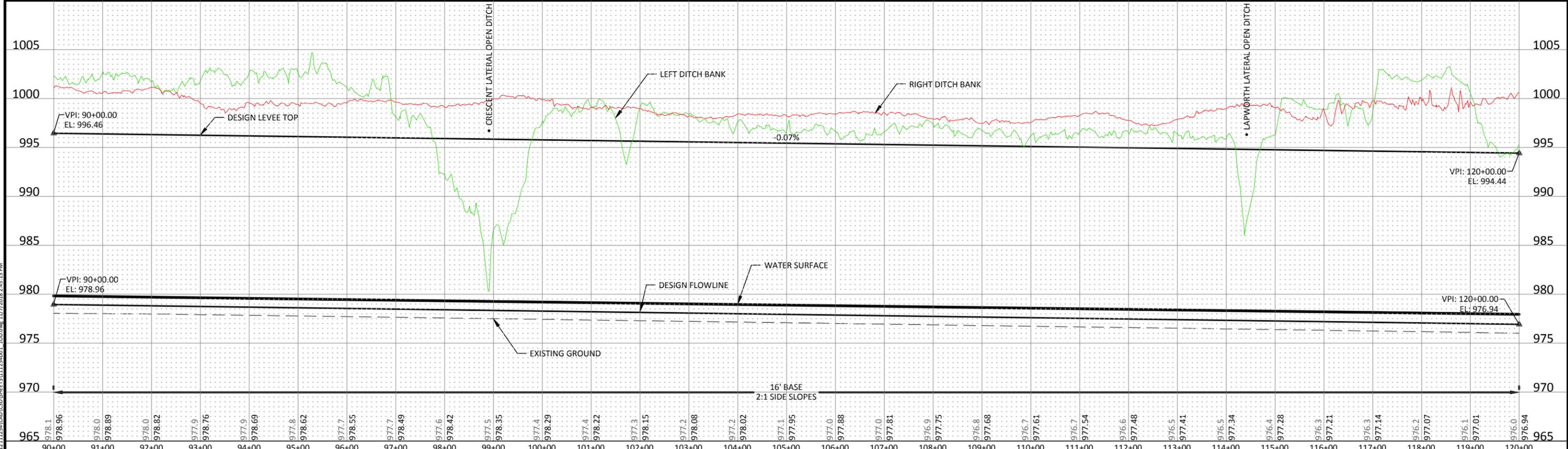
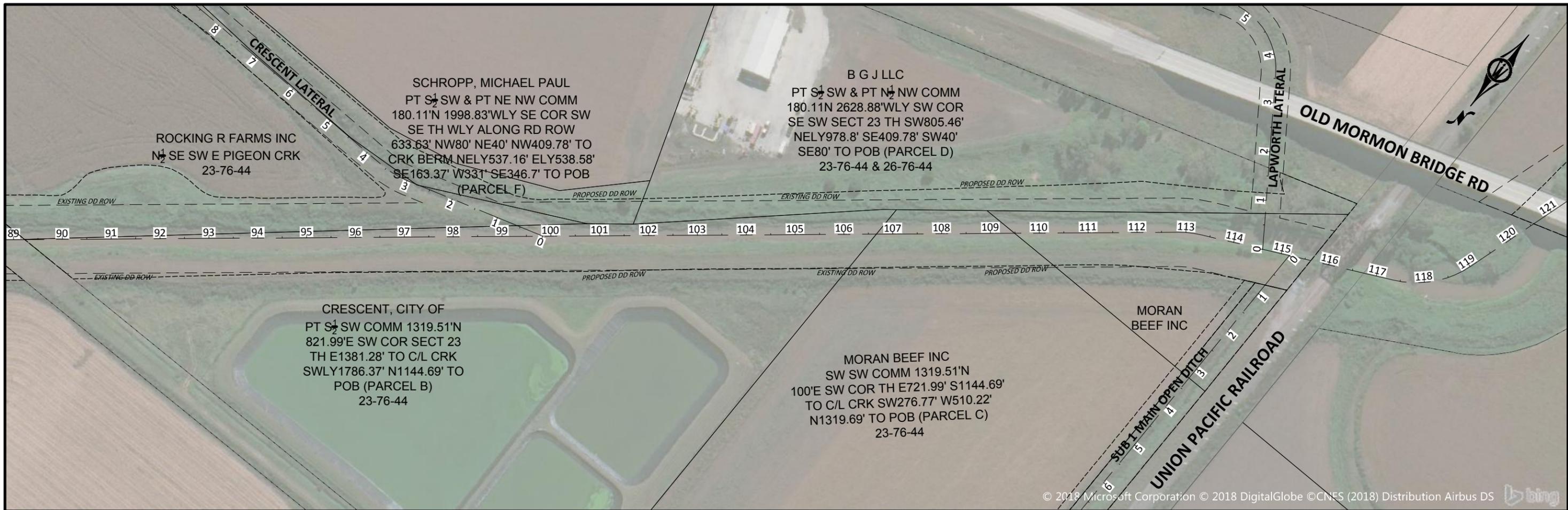


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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
 DRAINAGE DISTRICT NO. 2 FACILITY RECORDS
 PIGEON CREEK MAIN OPEN DITCH PLAN & PROFILE

SHEET
2



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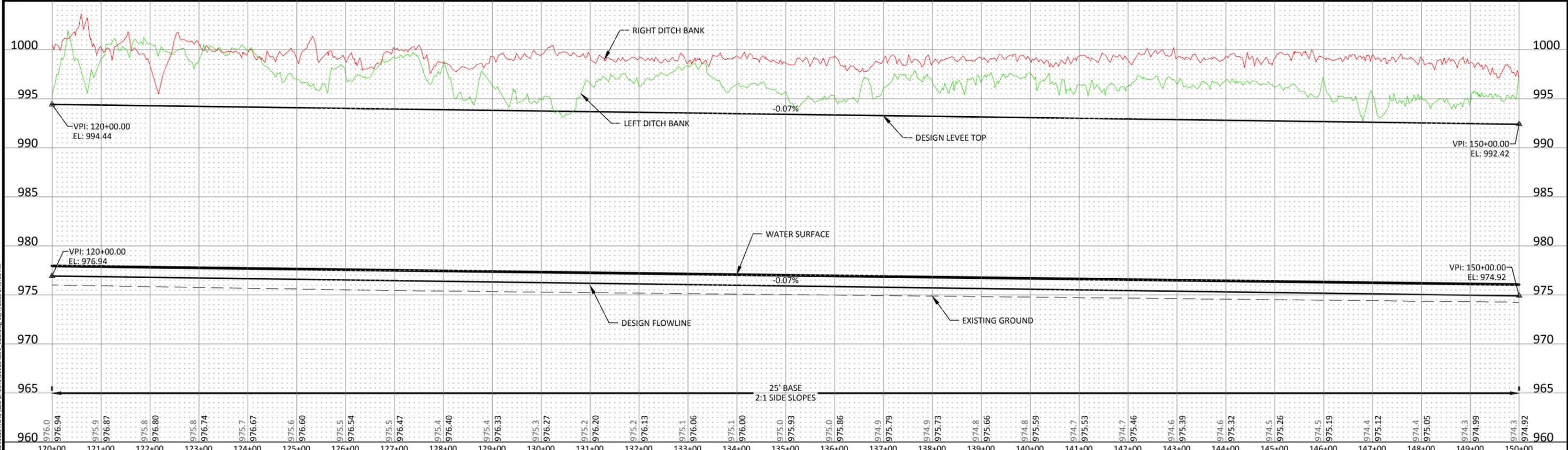
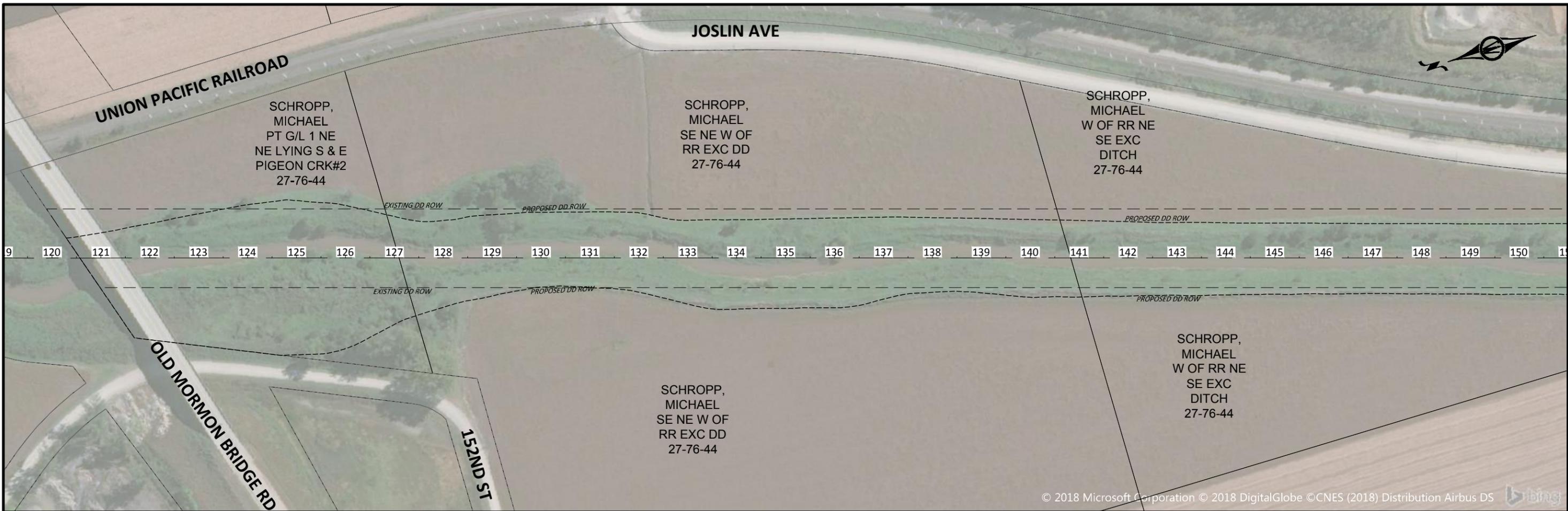


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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
 DRAINAGE DISTRICT NO. 2 FACILITY RECORDS
 PIGEON CREEK MAIN OPEN DITCH PLAN & PROFILE

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 4



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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
DRAINAGE DISTRICT NO. 2 FACILITY RECORDS
PIGEON CREEK MAIN OPEN DITCH PLAN & PROFILE

SHEET
5

JOSLIN AVE

INCA AVE

DEWAELE, DOROTHY L
PT SW NE & PT
NW SE E OF
CRK & W OF RR
34-76-44

SCHROPP,
MICHAEL P
SW SE OF I-29
& W OF RR
34-76-44

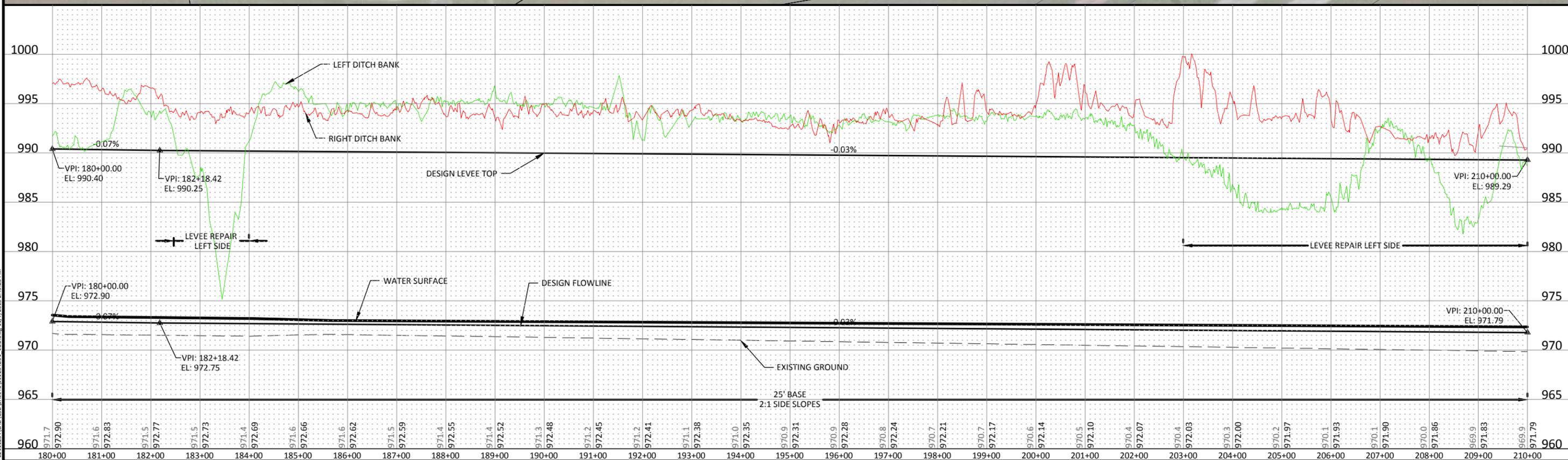


POTTAWATTAMIE COUNTY
PT SE NW & PT SW NE & PT NW SE
COMM 606'E INTERSECTION N
LINE SE NW & E RR ROW TH E727.8' TO
DITCH SELY1432.3' NW1514.3' TO POB
34-76-44

DEWAELE, DOROTHY L
PT SW NE & PT
NW SE W OF
DITCH & NE OF
RR EXC NELY 1432.3'
34-76-44

CANADIAN NATIONAL RAILROAD
INTERSTATE 29

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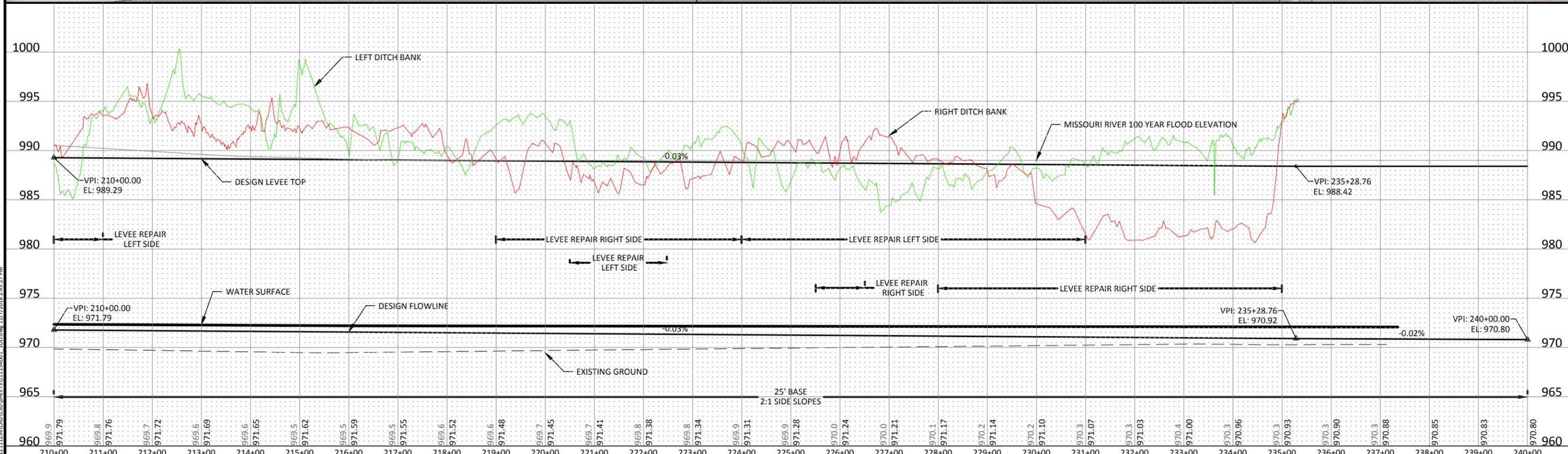
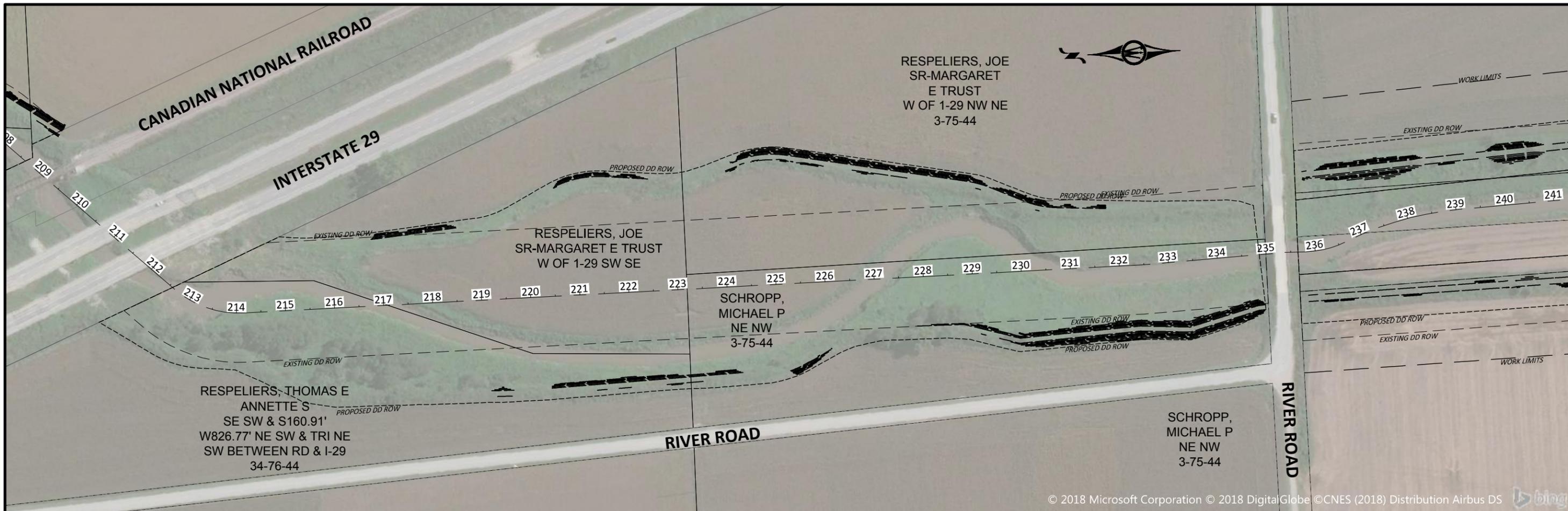


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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
DRAINAGE DISTRICT NO. 2 FACILITY RECORDS
PIGEON CREEK MAIN OPEN DITCH PLAN & PROFILE

SHEET
7



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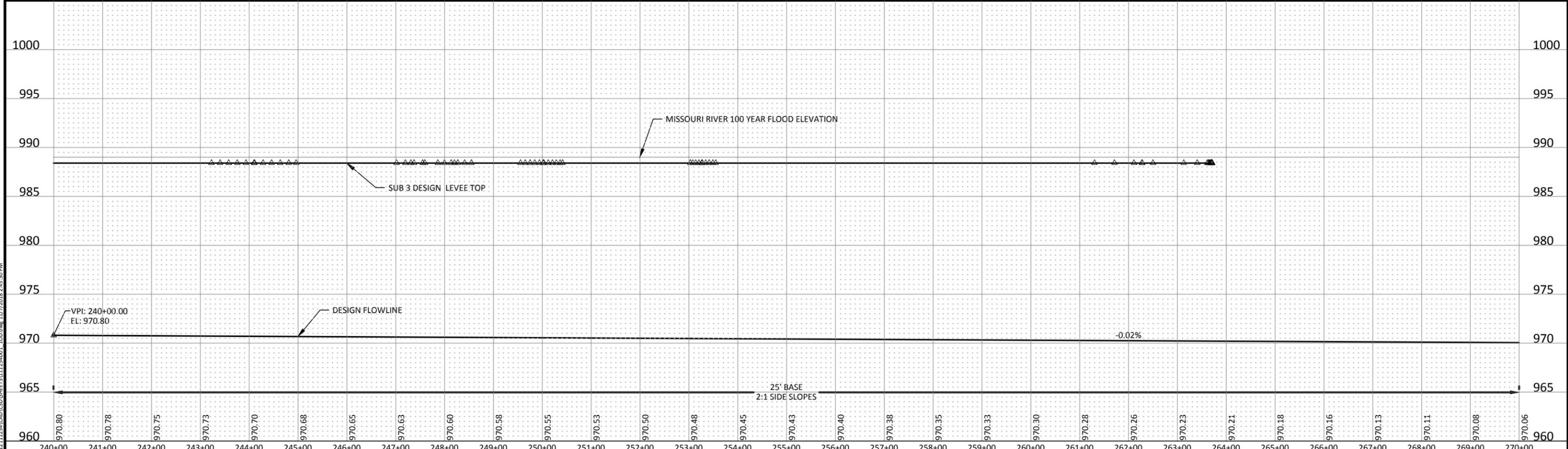
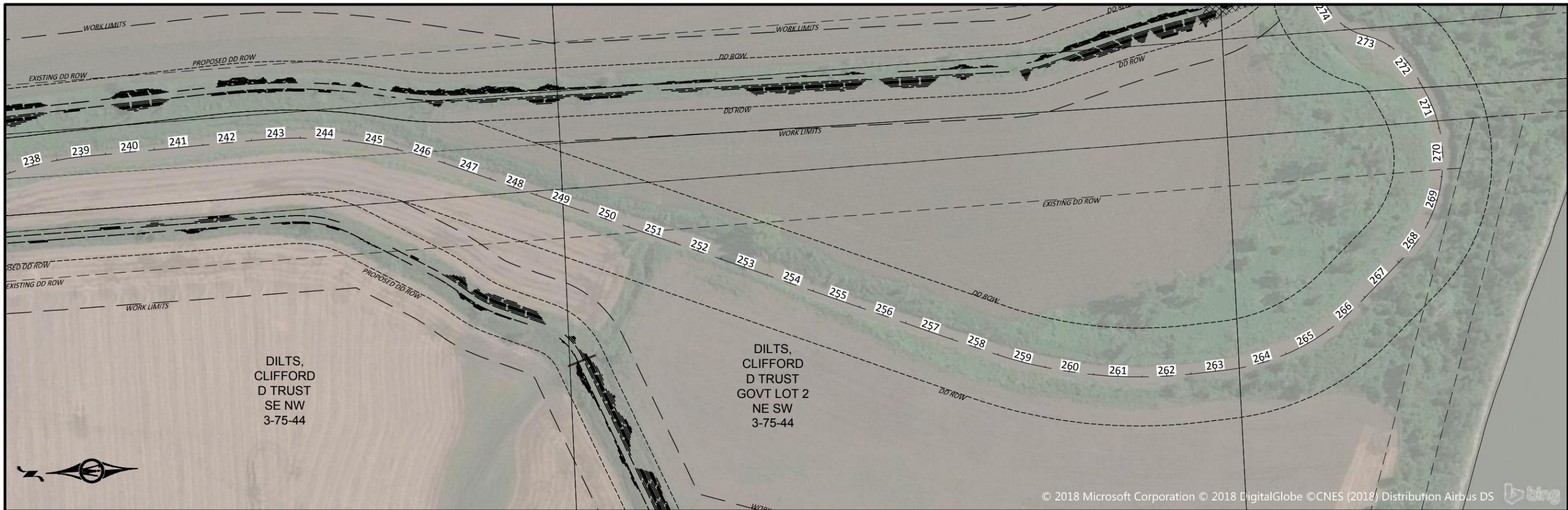


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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
DRAINAGE DISTRICT NO. 2 FACILITY RECORDS
PIGEON CREEK MAIN OPEN DITCH PLAN & PROFILE

SHEET
8



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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
 DRAINAGE DISTRICT NO. 2 FACILITY RECORDS
 PIGEON CREEK MAIN OPEN DITCH PLAN & PROFILE

SHEET 9

BREWER, O
WARREN JR
EXC NW OF DITCH
SE NW



TERRY,
PHILIP D
EXC SE OF HWY
NE SW
13-76-44

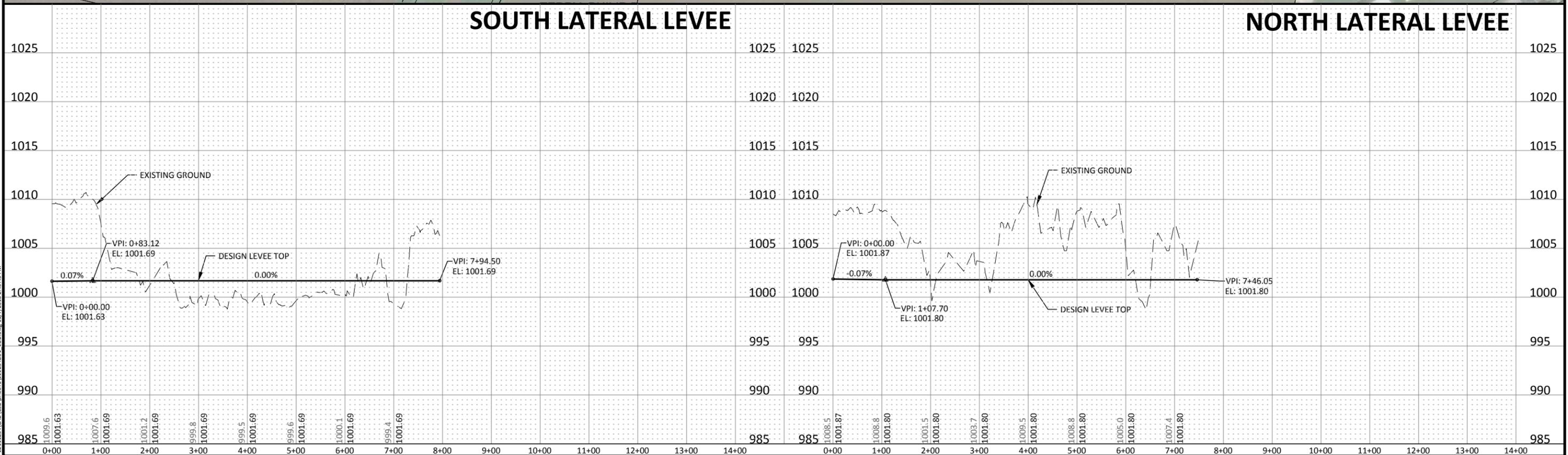
TERRY, PHILIP D
NW SW EXC DITCH & EXC
NW OF CRK
13-76-44

PROPOSED DD ROW
MAIN OPEN DITCH
PROPOSED DD ROW

PROPOSED DD ROW
NORTH LATERAL LEVEE
SOUTH LATERAL LEVEE
PROPOSED DD ROW

SOUTH LATERAL LEVEE

NORTH LATERAL LEVEE



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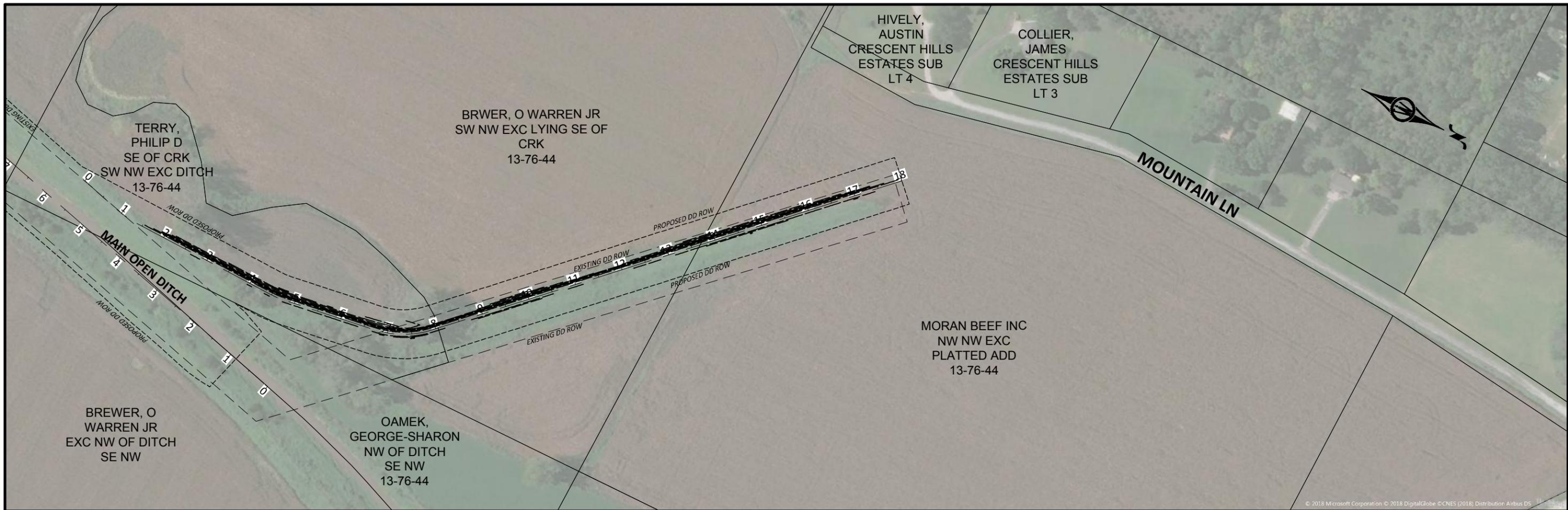


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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
DRAINAGE DISTRICT NO. 2 FACILITY RECORDS
LATERAL LEVES PLAN & PROFILE

SHEET
13



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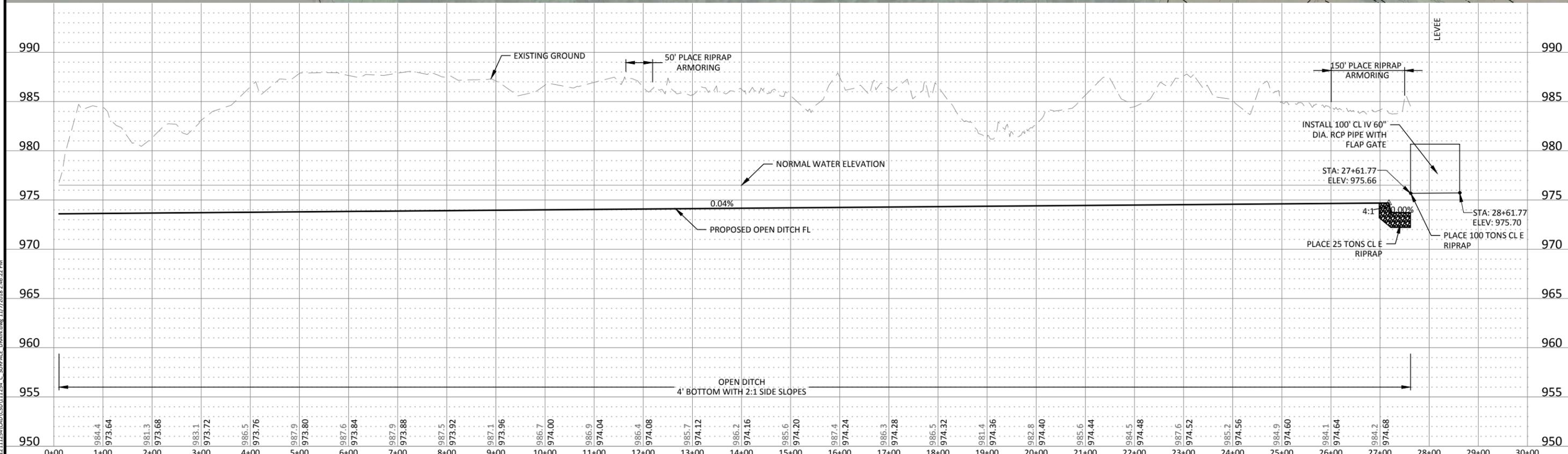
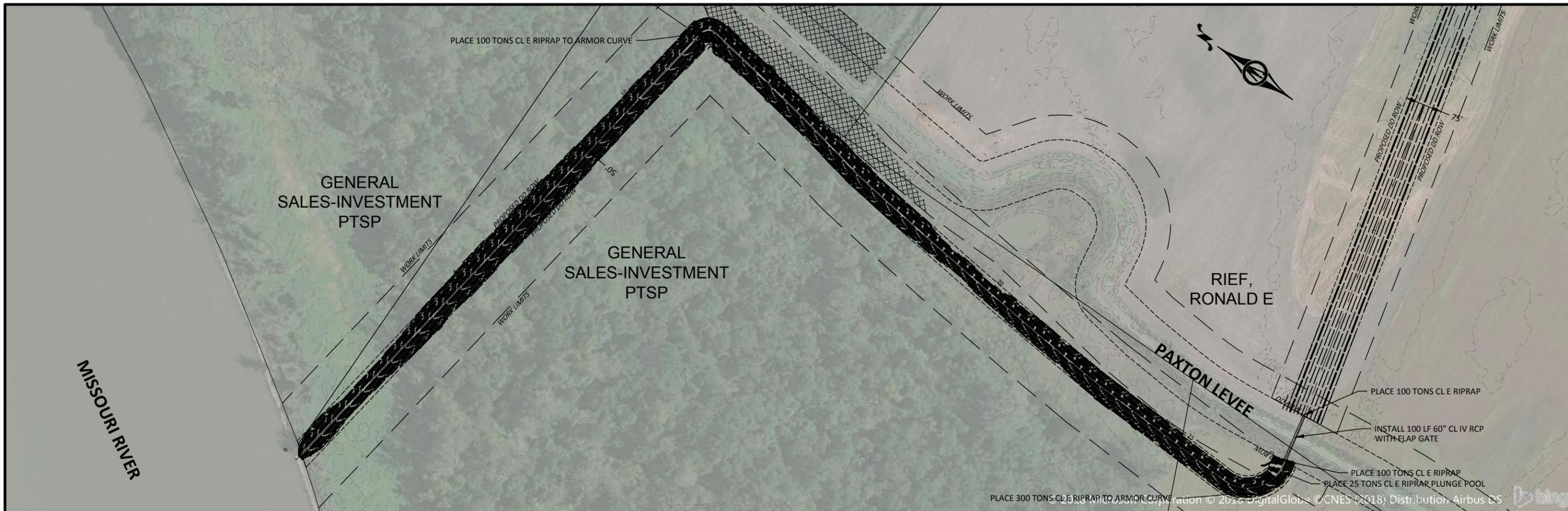


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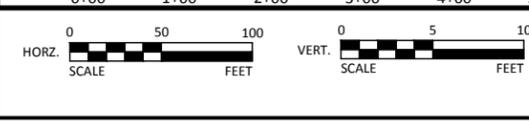
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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
 DRAINAGE DISTRICT NO. 2 FACILITY RECORDS
 NORTH CUTOFF LEVEE PLAN & PROFILE

SHEET 14



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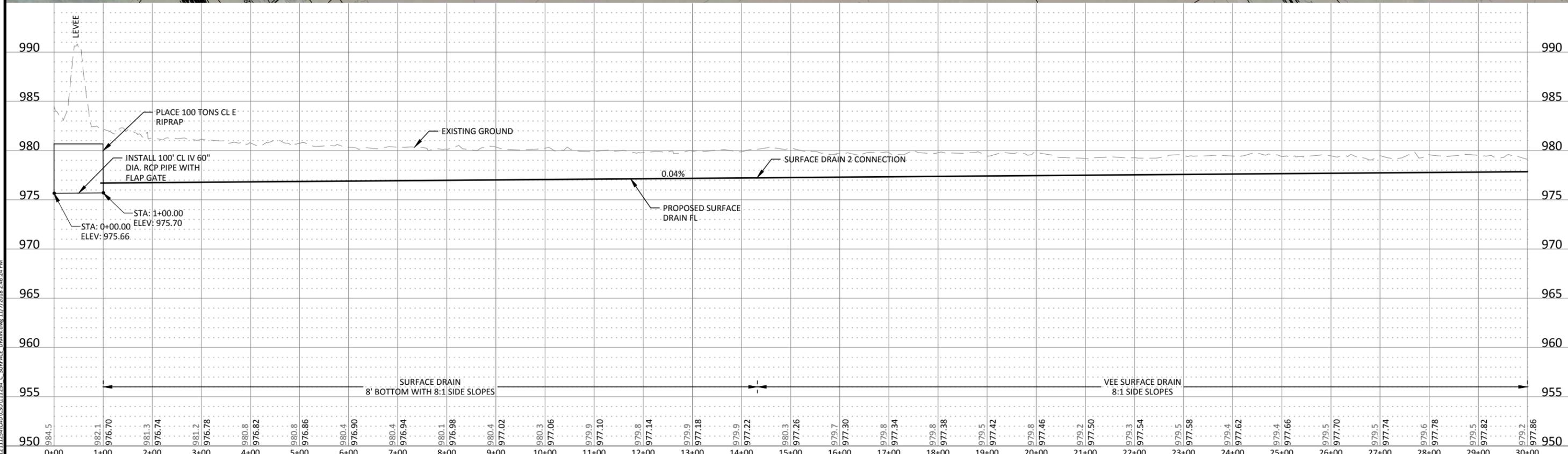


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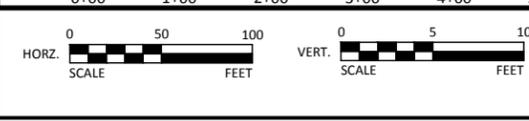
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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
 DRAINAGE DISTRICT NO. 2 REPAIRS & IMPROVEMENTS
OUTSIDE OPEN DITCH PLAN & PROFILE

SHEET 15



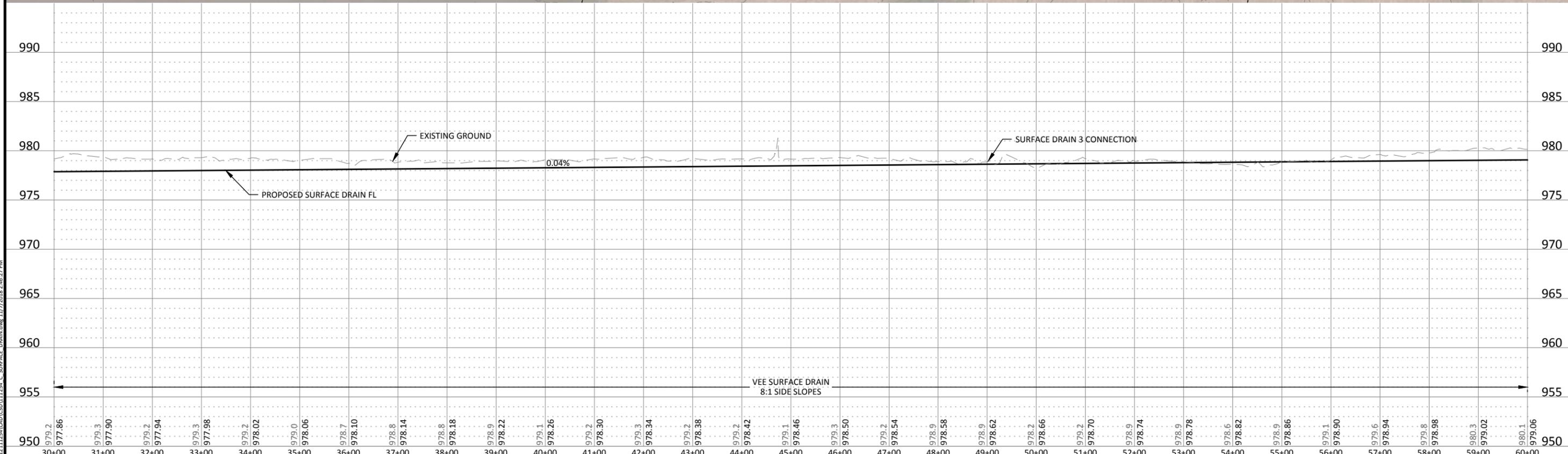
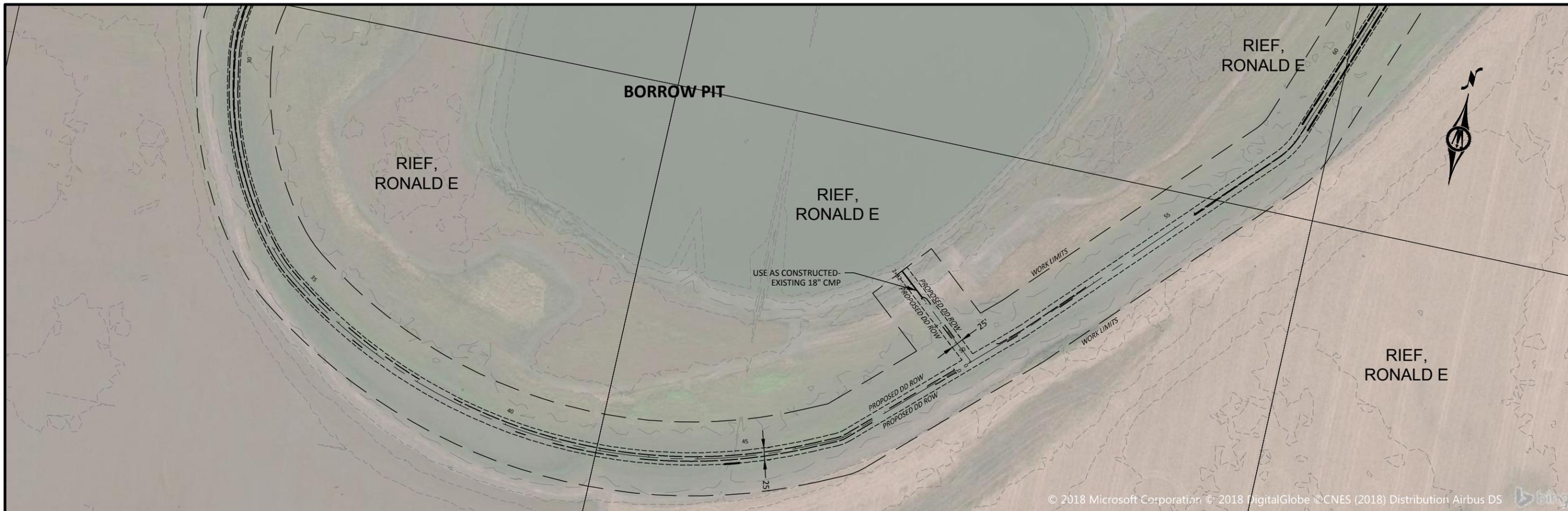
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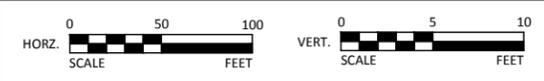

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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
DRAINAGE DISTRICT NO. 2 REPAIRS & IMPROVEMENTS
SURFACE DRAIN NO. 1 PLAN & PROFILE



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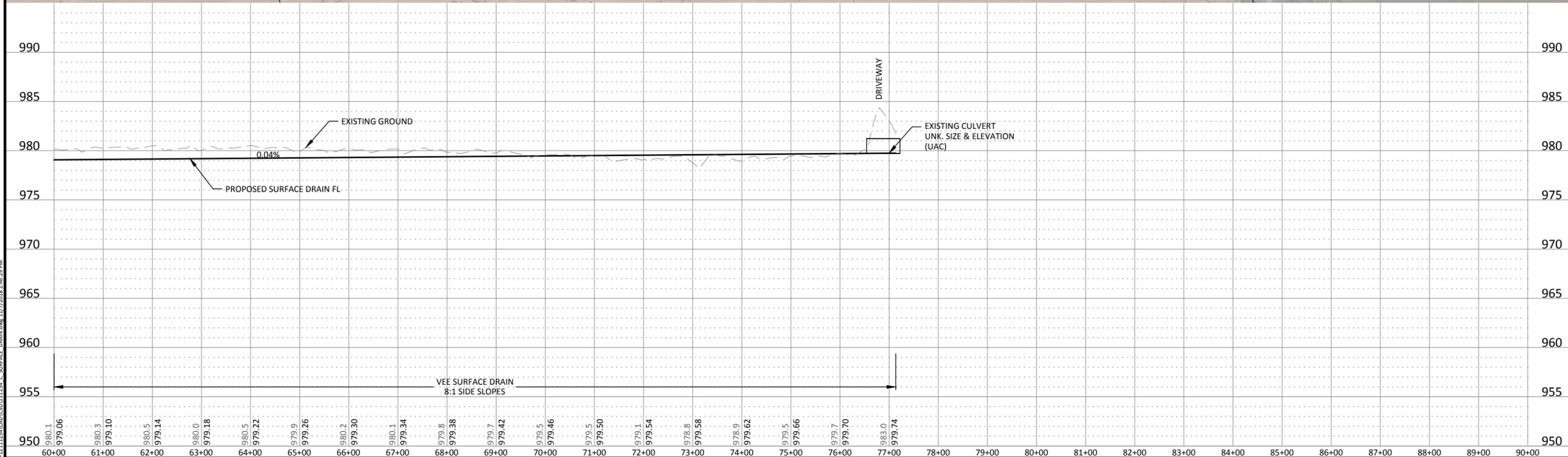
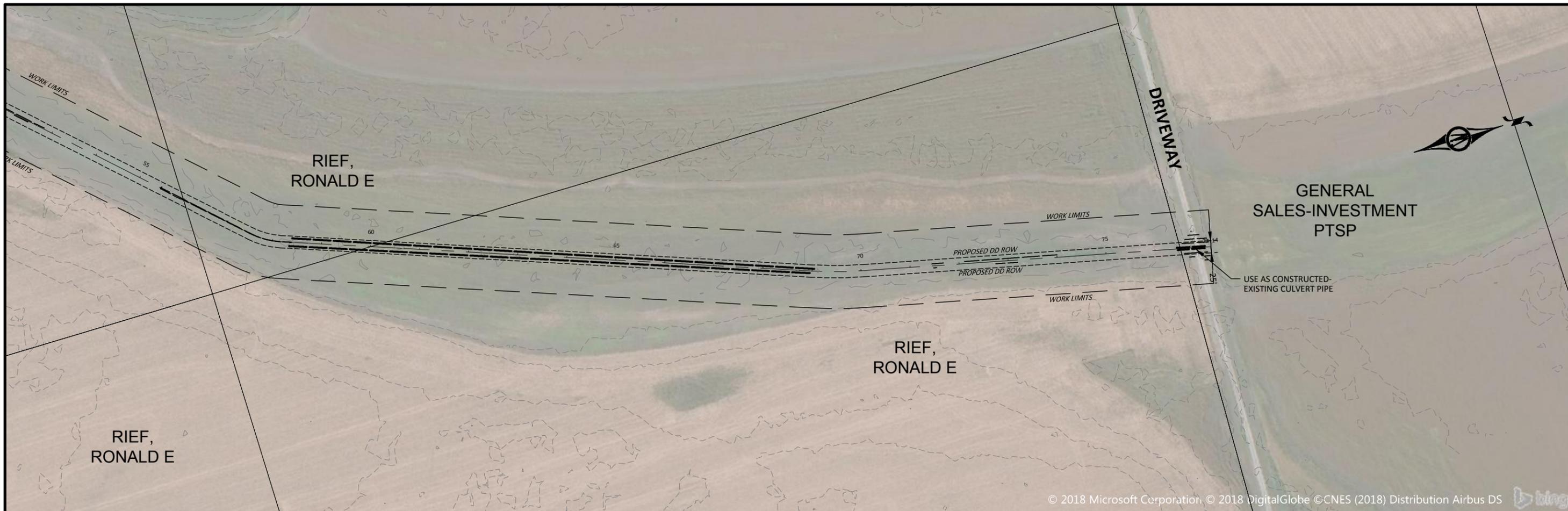


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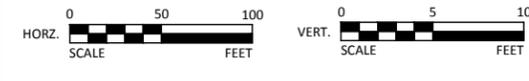
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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
DRAINAGE DISTRICT NO. 2 REPAIRS & IMPROVEMENTS
SURFACE DRAIN NO. 1 PLAN & PROFILE

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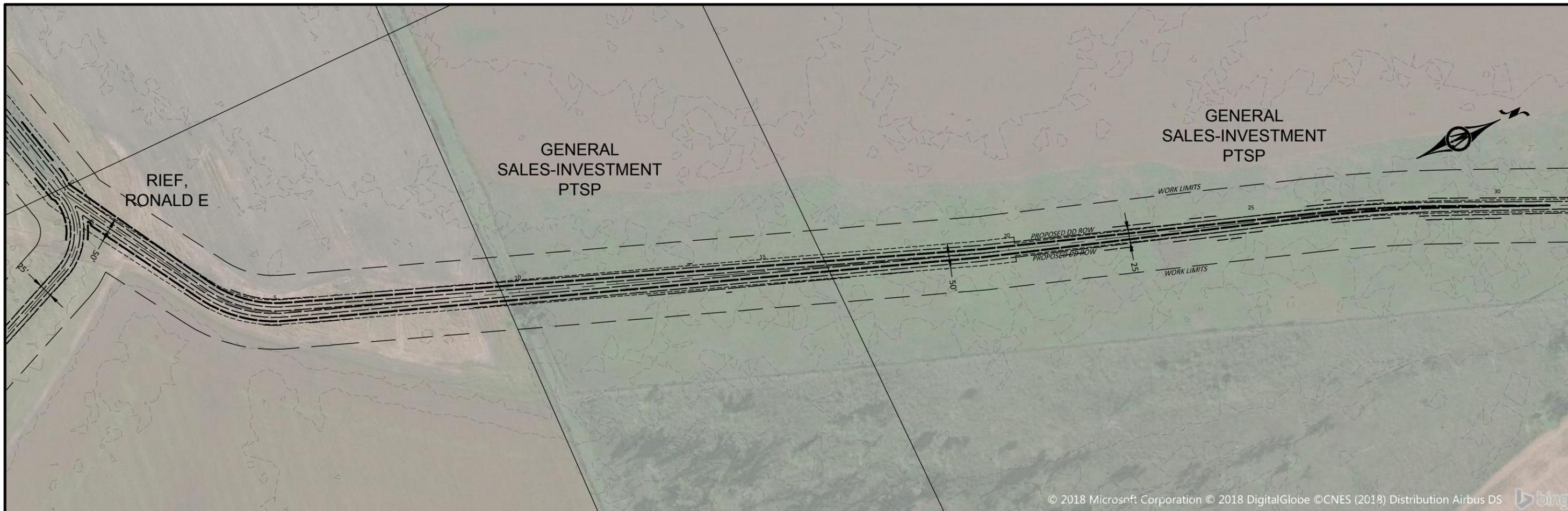


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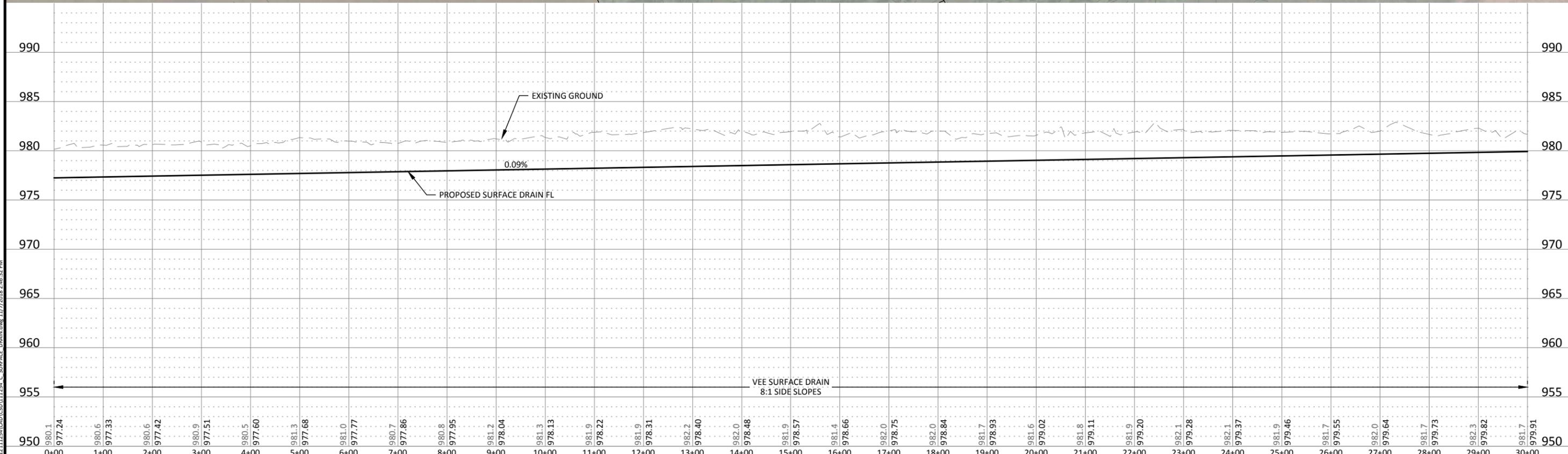
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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
DRAINAGE DISTRICT NO. 2 REPAIRS & IMPROVEMENTS
SURFACE DRAIN NO. 1 PLAN & PROFILE

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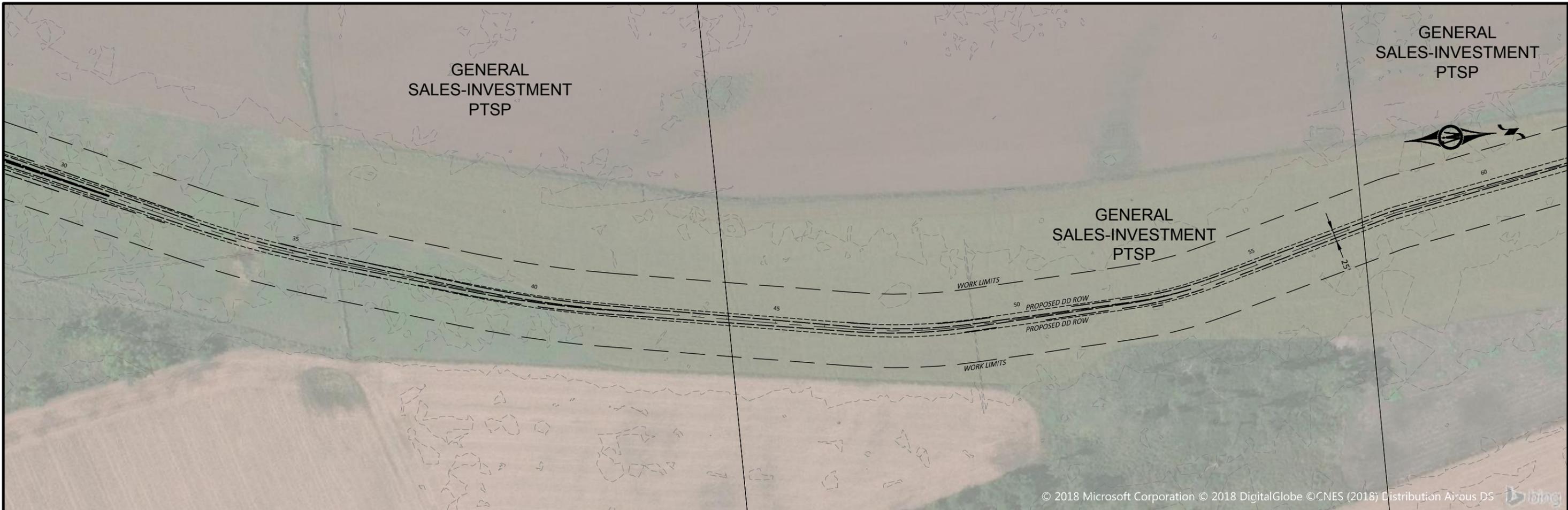


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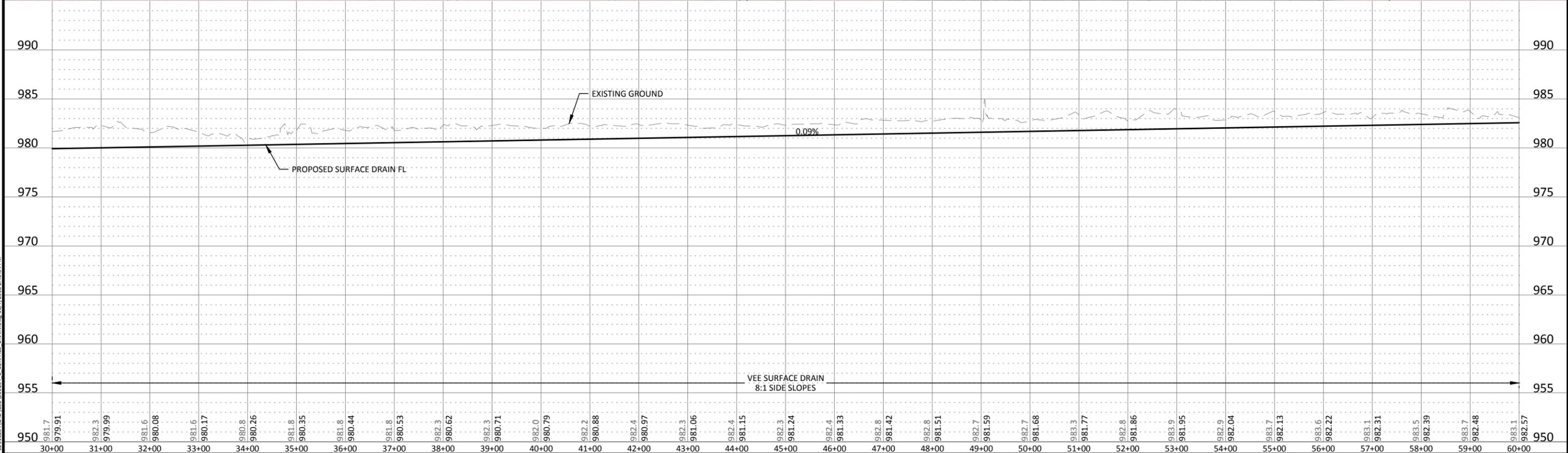
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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
 DRAINAGE DISTRICT NO. 2 REPAIRS & IMPROVEMENTS
 SURFACE DRAIN NO. 2 PLAN & PROFILE

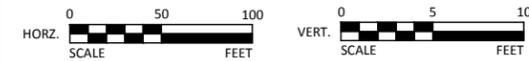
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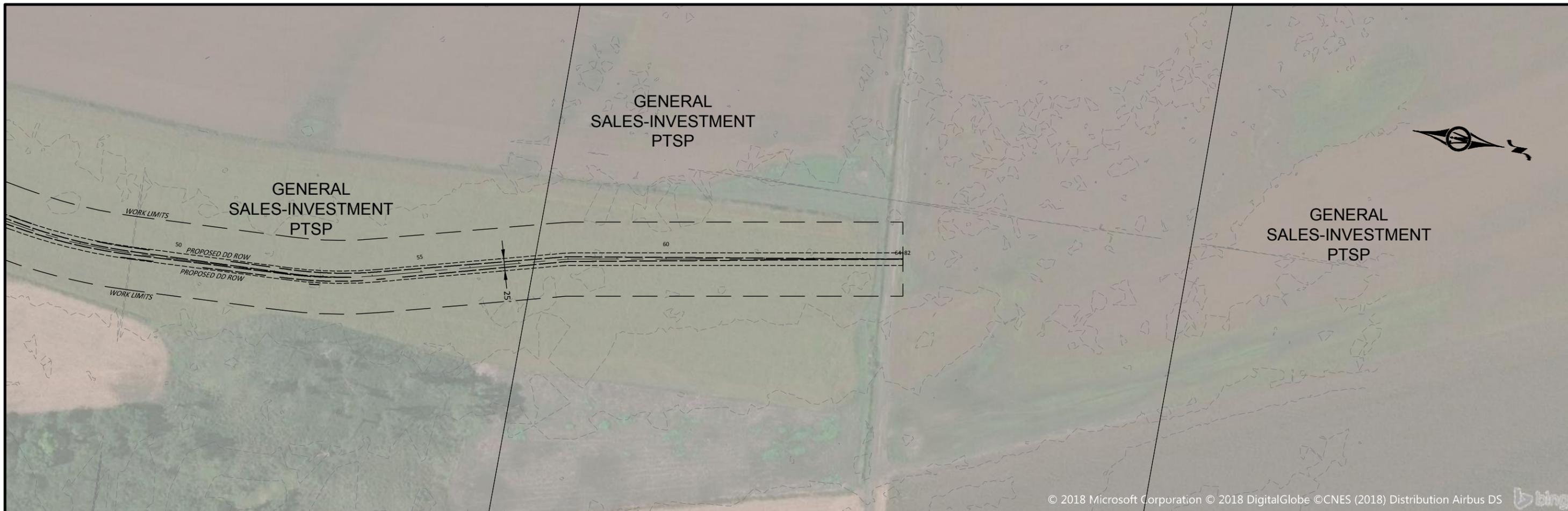


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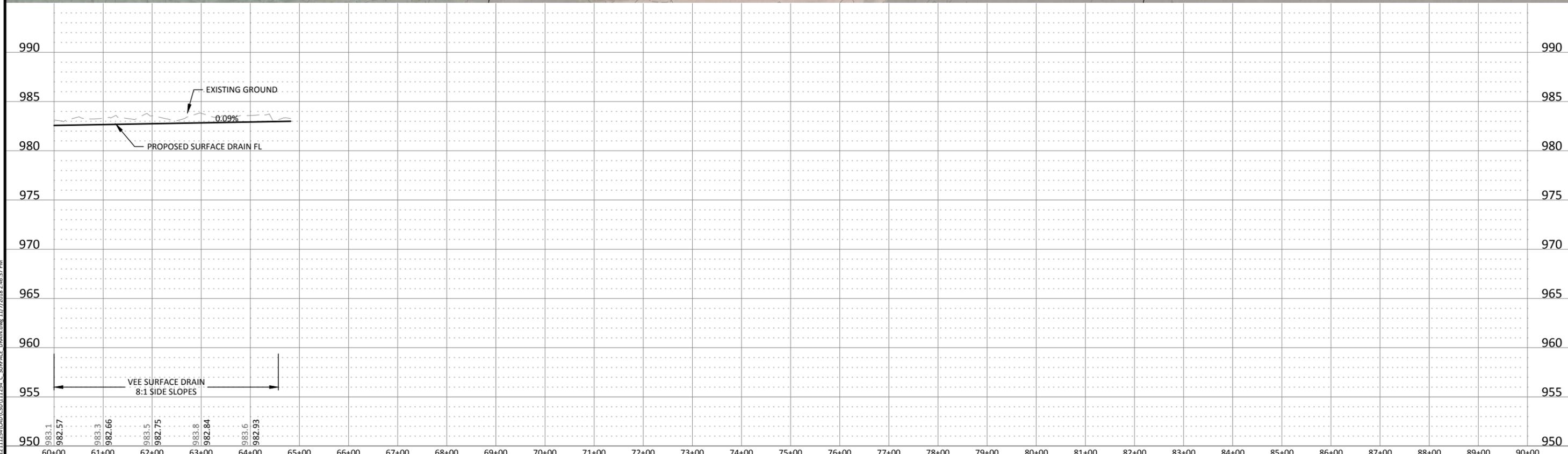
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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
DRAINAGE DISTRICT NO. 2 REPAIRS & IMPROVEMENTS
SURFACE DRAIN NO. 2 PLAN & PROFILE

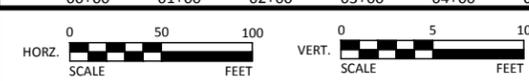
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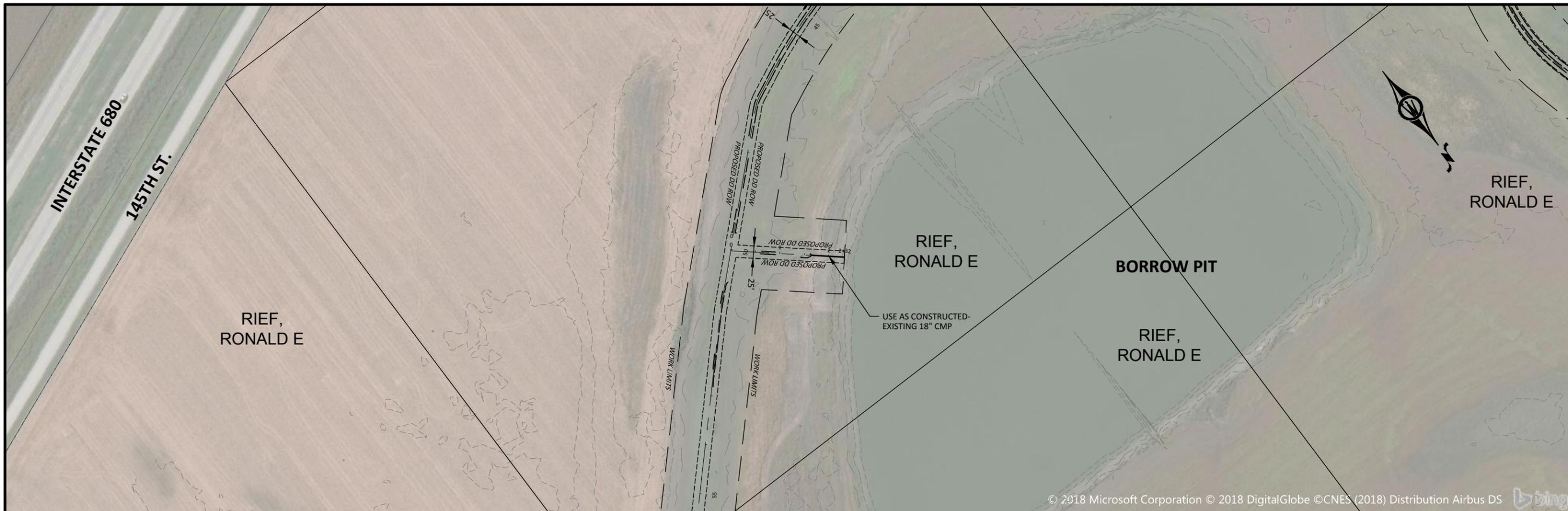


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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
DRAINAGE DISTRICT NO. 2 REPAIRS & IMPROVEMENTS
SURFACE DRAIN NO. 2 PLAN & PROFILE

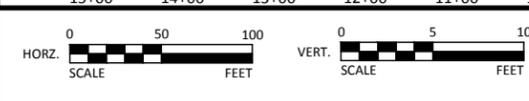
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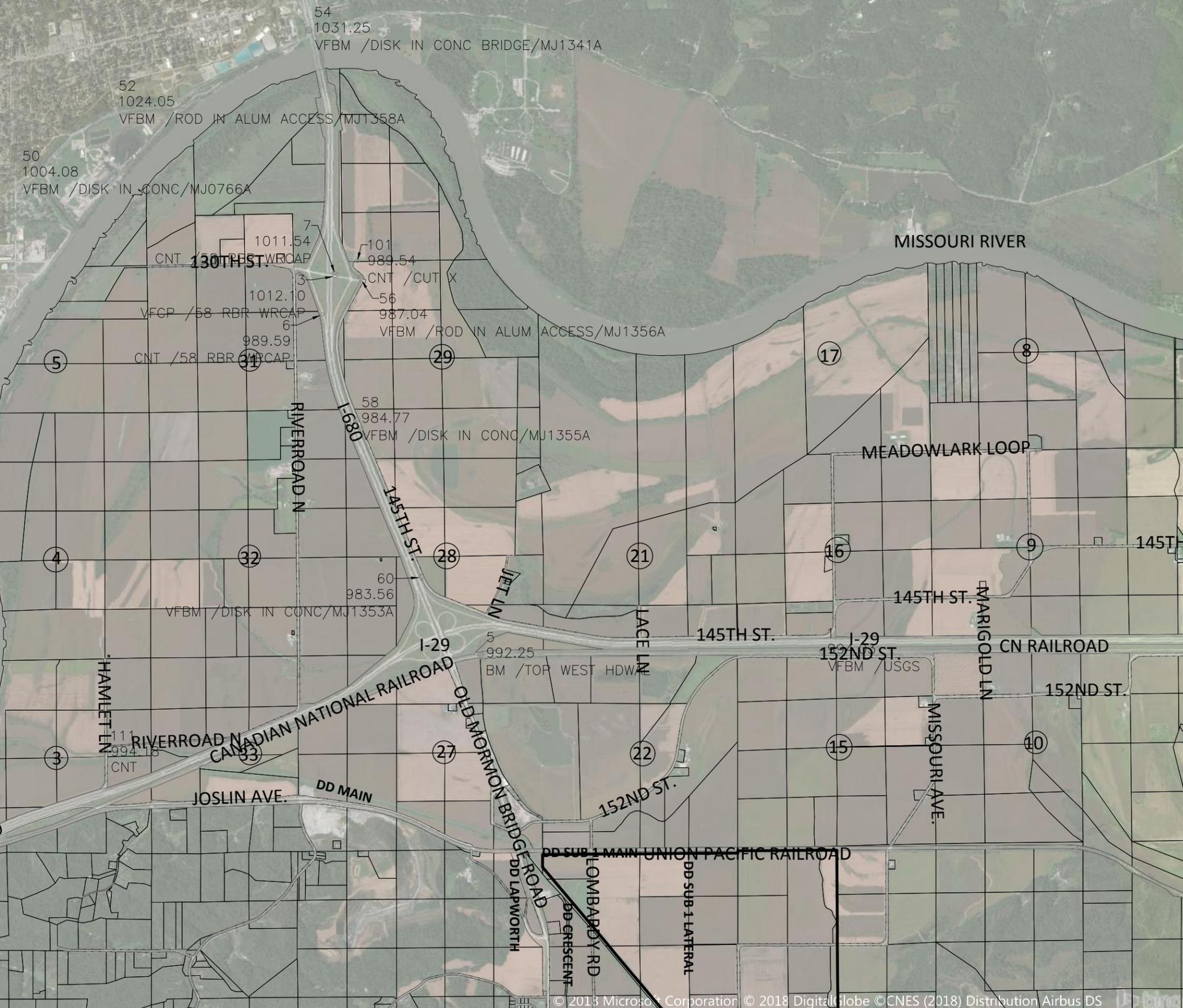
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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
DRAINAGE DISTRICT NO. 2 REPAIRS & IMPROVEMENTS
SURFACE DRAIN NO. 3 PLAN & PROFILE

SHEET
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DD 2 BENCHMARKS				
No.	Northing	Easting	Elevation	Description
1	512861.02	982290.01	994.031	VFBM /USGS
2	499701.08	972779.43	989.608	VFCP /58 RBR WRCAP
2	512861.03	982290.03	994.075	BM /USGS MON BRIDE ABUT 459+91.6
3	500081.42	971767.39	1012.104	VFCP /58 RBR WRCAP
5	503665.54	982079.27	992.246	BM /TOP WEST HDWAL
6	499701.10	972779.45	989.586	CNT /58 RBR WRCAP
7	500079.74	971678.31	1011.538	CNT /58 RBR WRCAP
10	512861.01	982290.02	993.995	VFBM /RR VFBM SAME POINT AS LUKES
50	491613.22	968727.13	1004.085	VFBM /DISK IN CONC/MJ0766A
52	494270.12	966927.20	1024.052	VFBM /ROD IN ALUM ACCESS/MJ1358A
54	499606.07	965127.35	1031.251	VFBM /DISK IN CONC BRIDGE/MJ1341A
56	500769.29	971846.54	987.039	VFBM /ROD IN ALUM ACCESS/MJ1356A
58	500521.63	975653.64	984.769	VFBM /DISK IN CONC/MJ1355A
60	502132.32	979939.65	983.563	VFBM /DISK IN CONC/MJ1353A
101	500707.97	971370.43	989.541	CNT /CUT X
111	493467.60	984321.94	994.175	CNT
289	493467.55	984321.92	994.258	VFCP /CHECK ON 111



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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
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LAPWORTH LATERAL OPEN DITCH ALIGNMENT GEOMETRY						
No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	358.81'	0+00'	3+58.81'	(987522.69',504848.02',0.00')	(987721.44',504549.28',0.00')
2	Curve	185.40'	3+58.81'	5+44.21'	(987721.44',504549.28',0.00')	(987884.25',504490.46',0.00')
3	Line	676.29'	5+44.21'	12+20.49'	(987884.25',504490.46',0.00')	(988532.23',504684.06',0.00')
4	Curve	103.31'	12+20.49'	13+23.80'	(988532.23',504684.06',0.00')	(988634.34',504687.34',0.00')
5	Line	260.23'	13+23.80'	15+84.03'	(988634.34',504687.34',0.00')	(988887.94',504628.97',0.00')
6	Curve	19.22'	15+84.03'	16+03.25'	(988887.94',504628.97',0.00')	(988906.85',504625.56',0.00')
7	Line	224.56'	16+03.25'	18+27.82'	(988906.85',504625.56',0.00')	(989129.52',504596.43',0.00')

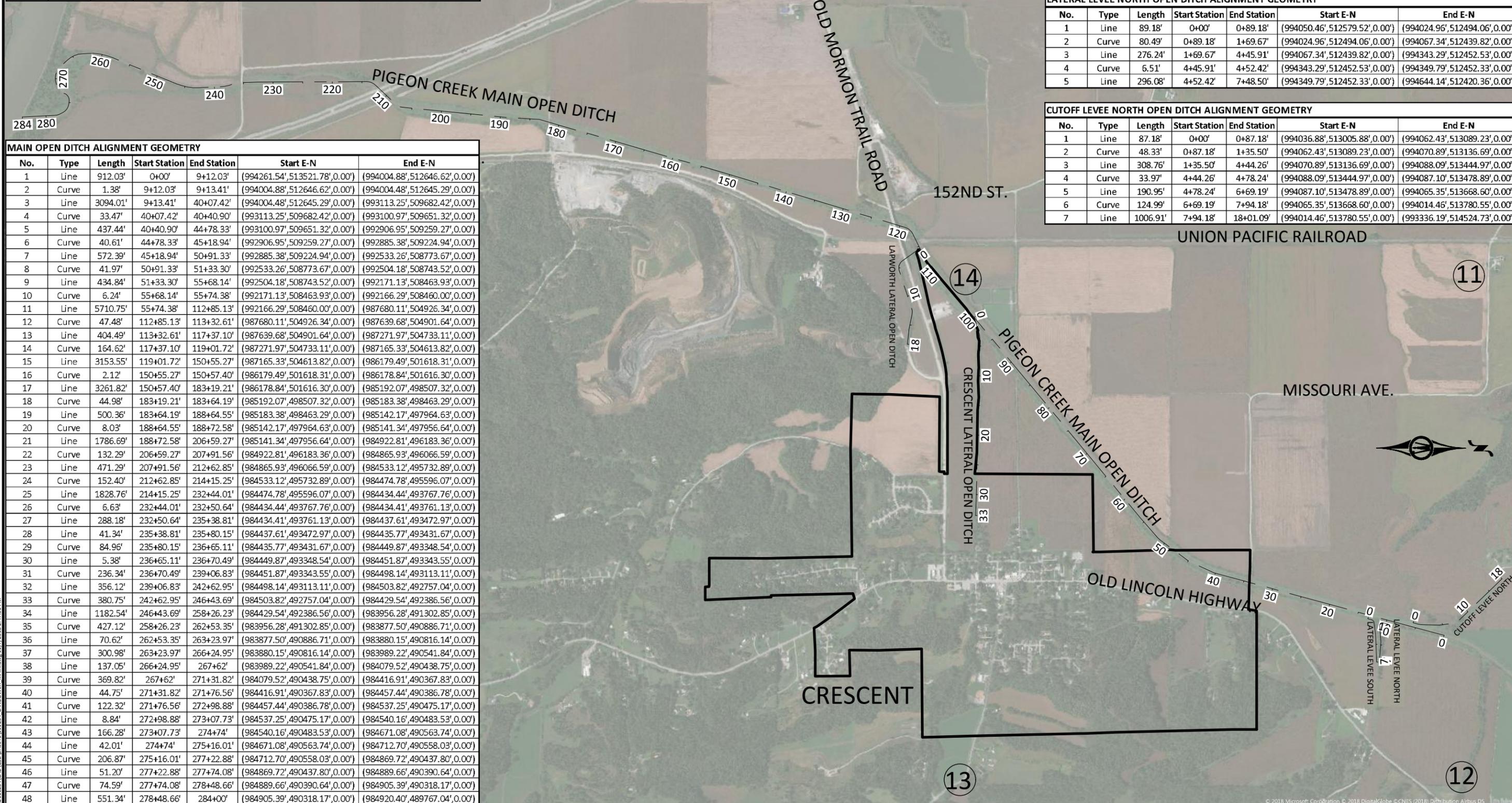
CRESCENT LATERAL OPEN DITCH ALIGNMENT GEOMETRY						
No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	297.94'	0+00'	2+97.94'	(988702.92',505731.41',0.00')	(988989.85',505811.67',0.00')
2	Curve	64.17'	2+97.94'	3+62.11'	(988989.85',505811.67',0.00')	(989053.34',505818.83',0.00')
3	Line	2991.97'	3+62.11'	33+54.08'	(989053.34',505818.83',0.00')	(992041.85',505674.99',0.00')

LATERAL LEVEE SOUTH OPEN DITCH ALIGNMENT GEOMETRY						
No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	60.96'	0+00'	0+60.96'	(993950.36',512244.14',0.00')	(993967.80',512302.55',0.00')
2	Curve	71.65'	0+60.96'	1+32.60'	(993967.80',512302.55',0.00')	(994019.84',512345.65',0.00')
3	Line	211.36'	1+32.60'	3+43.97'	(994019.84',512345.65',0.00')	(994230.09',512367.31',0.00')
4	Curve	5.80'	3+43.97'	3+49.76'	(994230.09',512367.31',0.00')	(994235.88',512367.63',0.00')
5	Line	444.74'	3+49.76'	7+94.50'	(994235.88',512367.63',0.00')	(994680.60',512370.88',0.00')

LATERAL LEVEE NORTH OPEN DITCH ALIGNMENT GEOMETRY						
No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	89.18'	0+00'	0+89.18'	(994050.46',512579.52',0.00')	(994024.96',512494.06',0.00')
2	Curve	80.49'	0+89.18'	1+69.67'	(994024.96',512494.06',0.00')	(994067.34',512439.82',0.00')
3	Line	276.24'	1+69.67'	4+45.91'	(994067.34',512439.82',0.00')	(994343.29',512452.53',0.00')
4	Curve	6.51'	4+45.91'	4+52.42'	(994343.29',512452.53',0.00')	(994349.79',512452.33',0.00')
5	Line	296.08'	4+52.42'	7+48.50'	(994349.79',512452.33',0.00')	(994644.14',512420.36',0.00')

CUTOFF LEVEE NORTH OPEN DITCH ALIGNMENT GEOMETRY						
No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	87.18'	0+00'	0+87.18'	(994036.88',513005.88',0.00')	(994062.43',513089.23',0.00')
2	Curve	48.33'	0+87.18'	1+35.50'	(994062.43',513089.23',0.00')	(994070.89',513136.69',0.00')
3	Line	308.76'	1+35.50'	4+44.26'	(994070.89',513136.69',0.00')	(994088.09',513444.97',0.00')
4	Curve	33.97'	4+44.26'	4+78.24'	(994088.09',513444.97',0.00')	(994087.10',513478.89',0.00')
5	Line	190.95'	4+78.24'	6+69.19'	(994087.10',513478.89',0.00')	(994065.35',513668.60',0.00')
6	Curve	124.99'	6+69.19'	7+94.18'	(994065.35',513668.60',0.00')	(994014.46',513780.55',0.00')
7	Line	1006.91'	7+94.18'	18+01.09'	(994014.46',513780.55',0.00')	(993336.19',514524.73',0.00')

MAIN OPEN DITCH ALIGNMENT GEOMETRY						
No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	912.03'	0+00'	9+12.03'	(994261.54',513521.78',0.00')	(994004.88',512646.62',0.00')
2	Curve	1.38'	9+12.03'	9+13.41'	(994004.88',512646.62',0.00')	(994004.48',512645.29',0.00')
3	Line	3094.01'	9+13.41'	40+07.42'	(994004.48',512645.29',0.00')	(993113.25',509682.42',0.00')
4	Curve	33.47'	40+07.42'	40+40.90'	(993113.25',509682.42',0.00')	(993100.97',509651.32',0.00')
5	Line	437.44'	40+40.90'	44+78.33'	(993100.97',509651.32',0.00')	(992906.95',509259.27',0.00')
6	Curve	40.61'	44+78.33'	45+18.94'	(992906.95',509259.27',0.00')	(992885.38',509224.94',0.00')
7	Line	572.39'	45+18.94'	50+91.33'	(992885.38',509224.94',0.00')	(992533.26',508773.67',0.00')
8	Curve	41.97'	50+91.33'	51+33.30'	(992533.26',508773.67',0.00')	(992504.18',508743.52',0.00')
9	Line	434.84'	51+33.30'	55+68.14'	(992504.18',508743.52',0.00')	(992171.13',508463.93',0.00')
10	Curve	6.24'	55+68.14'	55+74.38'	(992171.13',508463.93',0.00')	(992166.29',508460.00',0.00')
11	Line	5710.75'	55+74.38'	112+85.13'	(992166.29',508460.00',0.00')	(987680.11',504926.34',0.00')
12	Curve	47.48'	112+85.13'	113+32.61'	(987680.11',504926.34',0.00')	(987639.68',504901.64',0.00')
13	Line	404.49'	113+32.61'	117+37.10'	(987639.68',504901.64',0.00')	(987271.97',504733.11',0.00')
14	Curve	164.62'	117+37.10'	119+01.72'	(987271.97',504733.11',0.00')	(987165.33',504613.82',0.00')
15	Line	3153.55'	119+01.72'	150+55.27'	(987165.33',504613.82',0.00')	(986179.49',501618.31',0.00')
16	Curve	2.12'	150+55.27'	150+57.40'	(986179.49',501618.31',0.00')	(986178.84',501616.30',0.00')
17	Line	3261.82'	150+57.40'	183+19.21'	(986178.84',501616.30',0.00')	(985192.07',498507.32',0.00')
18	Curve	44.98'	183+19.21'	183+64.19'	(985192.07',498507.32',0.00')	(985183.38',498463.29',0.00')
19	Line	500.36'	183+64.19'	188+64.55'	(985183.38',498463.29',0.00')	(985142.17',497964.63',0.00')
20	Curve	8.03'	188+64.55'	188+72.58'	(985142.17',497964.63',0.00')	(985141.34',497956.64',0.00')
21	Line	1786.69'	188+72.58'	206+59.27'	(985141.34',497956.64',0.00')	(984922.81',496183.36',0.00')
22	Curve	132.29'	206+59.27'	207+91.56'	(984922.81',496183.36',0.00')	(984865.93',496066.59',0.00')
23	Line	471.29'	207+91.56'	212+62.85'	(984865.93',496066.59',0.00')	(984533.12',495732.89',0.00')
24	Curve	152.40'	212+62.85'	214+15.25'	(984533.12',495732.89',0.00')	(984474.78',495596.07',0.00')
25	Line	1828.76'	214+15.25'	232+44.01'	(984474.78',495596.07',0.00')	(984434.44',493767.76',0.00')
26	Curve	6.63'	232+44.01'	232+50.64'	(984434.44',493767.76',0.00')	(984434.41',493761.13',0.00')
27	Line	288.18'	232+50.64'	235+38.81'	(984434.41',493761.13',0.00')	(984437.61',493472.97',0.00')
28	Line	41.34'	235+38.81'	235+80.15'	(984437.61',493472.97',0.00')	(984435.77',493431.67',0.00')
29	Curve	84.96'	235+80.15'	236+65.11'	(984435.77',493431.67',0.00')	(984449.87',493348.54',0.00')
30	Line	5.38'	236+65.11'	236+70.49'	(984449.87',493348.54',0.00')	(984451.87',493343.55',0.00')
31	Curve	236.34'	236+70.49'	239+06.83'	(984451.87',493343.55',0.00')	(984498.14',493113.11',0.00')
32	Line	356.12'	239+06.83'	242+62.95'	(984498.14',493113.11',0.00')	(984503.82',492757.04',0.00')
33	Curve	380.75'	242+62.95'	246+43.69'	(984503.82',492757.04',0.00')	(984429.54',492386.56',0.00')
34	Line	1182.54'	246+43.69'	258+26.23'	(984429.54',492386.56',0.00')	(983956.28',491302.85',0.00')
35	Curve	427.12'	258+26.23'	262+53.35'	(983956.28',491302.85',0.00')	(983877.50',490886.71',0.00')
36	Line	70.62'	262+53.35'	263+23.97'	(983877.50',490886.71',0.00')	(983880.15',490816.14',0.00')
37	Curve	300.98'	263+23.97'	266+24.95'	(983880.15',490816.14',0.00')	(983989.22',490541.84',0.00')
38	Line	137.05'	266+24.95'	267+62'	(983989.22',490541.84',0.00')	(984079.52',490438.75',0.00')
39	Curve	369.82'	267+62'	271+31.82'	(984079.52',490438.75',0.00')	(984416.91',490367.83',0.00')
40	Line	44.75'	271+31.82'	271+76.56'	(984416.91',490367.83',0.00')	(984457.44',490386.78',0.00')
41	Curve	122.32'	271+76.56'	272+98.88'	(984457.44',490386.78',0.00')	(984537.25',490475.17',0.00')
42	Line	8.84'	272+98.88'	273+07.73'	(984537.25',490475.17',0.00')	(984540.16',490483.53',0.00')
43	Curve	166.28'	273+07.73'	274+74'	(984540.16',490483.53',0.00')	(984671.08',490563.74',0.00')
44	Line	42.01'	274+74'	275+16.01'	(984671.08',490563.74',0.00')	(984712.70',490558.03',0.00')
45	Curve	206.87'	275+16.01'	277+22.88'	(984712.70',490558.03',0.00')	(984869.72',490437.80',0.00')
46	Line	51.20'	277+22.88'	277+74.08'	(984869.72',490437.80',0.00')	(984889.66',490390.64',0.00')
47	Curve	74.59'	277+74.08'	278+48.66'	(984889.66',490390.64',0.00')	(984905.39',490318.17',0.00')
48	Line	551.34'	278+48.66'	284+00'	(984905.39',490318.17',0.00')	(984920.40',489767.04',0.00')



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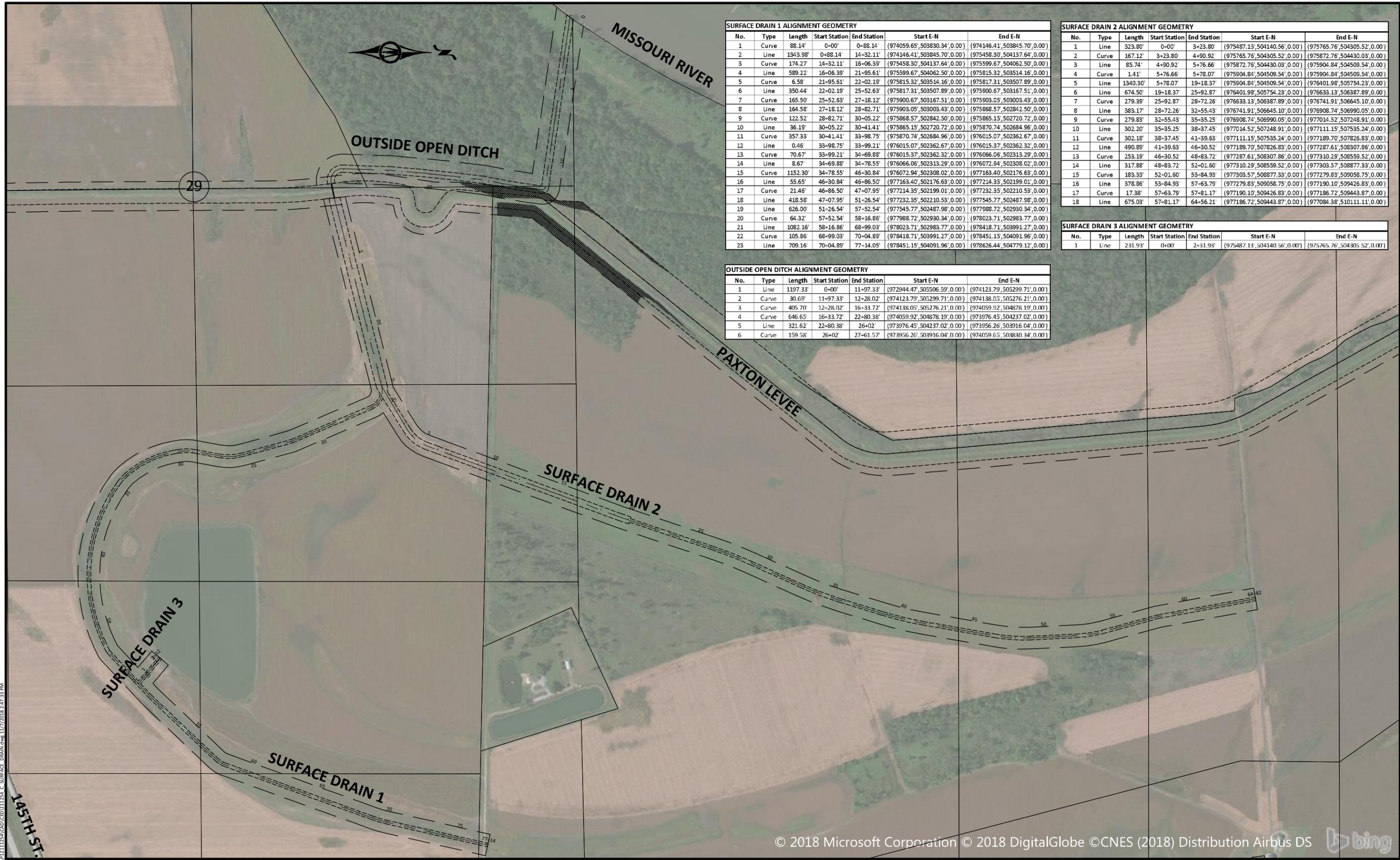


300 WEST MCKINLEY ST., P.O. BOX 68
 JEFFERSON, IOWA 50129
 Phone: (515) 386-4101
 Email: Jefferson@bolton-menk.com
 www.bolton-menk.com

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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA		SHEET G.02
DRAINAGE DISTRICT NO. 2 REPAIRS & IMPROVEMENTS		
MAIN OPEN DITCH ALIGNMENT GEOMETRY		

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SURFACE DRAIN 1 ALIGNMENT GEOMETRY						
No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Curve	88.14'	0+00'	0+88.14'	(974059.65', 503830.34', 0.00')	(974146.41', 503845.70', 0.00')
2	Line	1343.98'	0+88.14'	14+32.11'	(974146.41', 503845.70', 0.00')	(975458.30', 504137.64', 0.00')
3	Curve	174.27'	14+32.11'	16+06.39'	(975458.30', 504137.64', 0.00')	(975599.67', 504062.50', 0.00')
4	Line	589.22'	16+06.39'	21+95.61'	(975599.67', 504062.50', 0.00')	(975815.32', 503514.16', 0.00')
5	Curve	6.58'	21+95.61'	22+02.19'	(975815.32', 503514.16', 0.00')	(975817.31', 503507.89', 0.00')
6	Line	350.44'	22+02.19'	25+52.63'	(975817.31', 503507.89', 0.00')	(975900.67', 503167.51', 0.00')
7	Curve	165.50'	25+52.63'	27+18.12'	(975900.67', 503167.51', 0.00')	(975903.05', 503003.43', 0.00')
8	Line	164.58'	27+18.12'	28+82.71'	(975903.05', 503003.43', 0.00')	(975868.57', 502842.50', 0.00')
9	Curve	122.52'	28+82.71'	30+05.22'	(975868.57', 502842.50', 0.00')	(975865.15', 502720.72', 0.00')
10	Line	36.19'	30+05.22'	30+41.41'	(975865.15', 502720.72', 0.00')	(975870.74', 502684.96', 0.00')
11	Curve	357.33'	30+41.41'	33+98.75'	(975870.74', 502684.96', 0.00')	(976015.07', 502362.67', 0.00')
12	Line	0.46'	33+98.75'	33+99.21'	(976015.07', 502362.67', 0.00')	(976015.37', 502362.32', 0.00')
13	Curve	70.67'	33+99.21'	34+69.88'	(976015.37', 502362.32', 0.00')	(976066.06', 502313.29', 0.00')
14	Line	8.67'	34+69.88'	34+78.55'	(976066.06', 502313.29', 0.00')	(976072.94', 502308.02', 0.00')
15	Curve	1152.30'	34+78.55'	46+30.84'	(976072.94', 502308.02', 0.00')	(977163.40', 502176.63', 0.00')
16	Line	55.65'	46+30.84'	46+86.50'	(977163.40', 502176.63', 0.00')	(977214.35', 502199.01', 0.00')
17	Curve	21.46'	46+86.50'	47+07.95'	(977214.35', 502199.01', 0.00')	(977232.35', 502210.53', 0.00')
18	Line	418.58'	47+07.95'	51+26.54'	(977232.35', 502210.53', 0.00')	(977545.77', 502487.98', 0.00')
19	Line	626.00'	51+26.54'	57+52.54'	(977545.77', 502487.98', 0.00')	(977988.72', 502930.34', 0.00')
20	Curve	64.32'	57+52.54'	58+16.86'	(977988.72', 502930.34', 0.00')	(978023.71', 502983.77', 0.00')
21	Line	1082.16'	58+16.86'	68+99.03'	(978023.71', 502983.77', 0.00')	(978418.71', 503991.27', 0.00')
22	Curve	105.86'	68+99.03'	70+04.89'	(978418.71', 503991.27', 0.00')	(978451.15', 504091.96', 0.00')
23	Line	709.16'	70+04.89'	77+14.05'	(978451.15', 504091.96', 0.00')	(978626.44', 504779.12', 0.00')

SURFACE DRAIN 2 ALIGNMENT GEOMETRY						
No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	323.80'	0+00'	3+23.80'	(975487.13', 504140.56', 0.00')	(975765.76', 504305.52', 0.00')
2	Curve	167.12'	3+23.80'	4+90.92'	(975765.76', 504305.52', 0.00')	(975872.76', 504430.03', 0.00')
3	Line	85.74'	4+90.92'	5+76.66'	(975872.76', 504430.03', 0.00')	(975904.84', 504509.54', 0.00')
4	Curve	1.41'	5+76.66'	5+78.07'	(975904.84', 504509.54', 0.00')	(975904.84', 504509.54', 0.00')
5	Line	1340.30'	5+78.07'	19+18.37'	(975904.84', 504509.54', 0.00')	(976401.98', 505754.23', 0.00')
6	Line	674.50'	19+18.37'	25+92.87'	(976401.98', 505754.23', 0.00')	(976633.13', 506387.89', 0.00')
7	Curve	279.39'	25+92.87'	28+72.26'	(976633.13', 506387.89', 0.00')	(976741.91', 506645.10', 0.00')
8	Line	383.17'	28+72.26'	32+55.43'	(976741.91', 506645.10', 0.00')	(976908.74', 506990.05', 0.00')
9	Curve	279.83'	32+55.43'	35+35.25'	(976908.74', 506990.05', 0.00')	(977014.52', 507248.91', 0.00')
10	Line	302.20'	35+35.25'	38+37.45'	(977014.52', 507248.91', 0.00')	(977111.15', 507535.24', 0.00')
11	Curve	302.18'	38+37.45'	41+39.63'	(977111.15', 507535.24', 0.00')	(977189.70', 507826.83', 0.00')
12	Line	490.89'	41+39.63'	46+30.52'	(977189.70', 507826.83', 0.00')	(977287.61', 508307.86', 0.00')
13	Curve	253.19'	46+30.52'	48+83.72'	(977287.61', 508307.86', 0.00')	(977310.29', 508559.52', 0.00')
14	Line	317.88'	48+83.72'	52+01.60'	(977310.29', 508559.52', 0.00')	(977303.57', 508877.33', 0.00')
15	Curve	183.33'	52+01.60'	53+84.93'	(977303.57', 508877.33', 0.00')	(977279.83', 509058.75', 0.00')
16	Line	378.86'	53+84.93'	57+63.79'	(977279.83', 509058.75', 0.00')	(977190.10', 509426.83', 0.00')
17	Curve	17.38'	57+63.79'	57+81.17'	(977190.10', 509426.83', 0.00')	(977186.72', 509443.87', 0.00')
18	Line	675.03'	57+81.17'	64+56.21'	(977186.72', 509443.87', 0.00')	(977084.38', 510111.11', 0.00')

OUTSIDE OPEN DITCH ALIGNMENT GEOMETRY						
No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	1197.33'	0+00'	11+97.33'	(972944.47', 505506.59', 0.00')	(974123.79', 505299.71', 0.00')
2	Curve	30.69'	11+97.33'	12+28.02'	(974123.79', 505299.71', 0.00')	(974138.05', 505276.21', 0.00')
3	Curve	405.70'	12+28.02'	16+33.72'	(974138.05', 505276.21', 0.00')	(974059.92', 504878.19', 0.00')
4	Curve	646.65'	16+33.72'	22+80.38'	(974059.92', 504878.19', 0.00')	(973976.45', 504237.02', 0.00')
5	Line	321.62'	22+80.38'	26+02'	(973976.45', 504237.02', 0.00')	(973956.26', 503916.04', 0.00')
6	Curve	159.58'	26+02'	27+61.57'	(973956.26', 503916.04', 0.00')	(974059.65', 503830.34', 0.00')

SURFACE DRAIN 3 ALIGNMENT GEOMETRY						
No.	Type	Length	Start Station	End Station	Start E-N	End E-N
1	Line	231.93'	0+00'	2+31.93'	(975487.13', 504140.56', 0.00')	(975765.76', 504305.52', 0.00')

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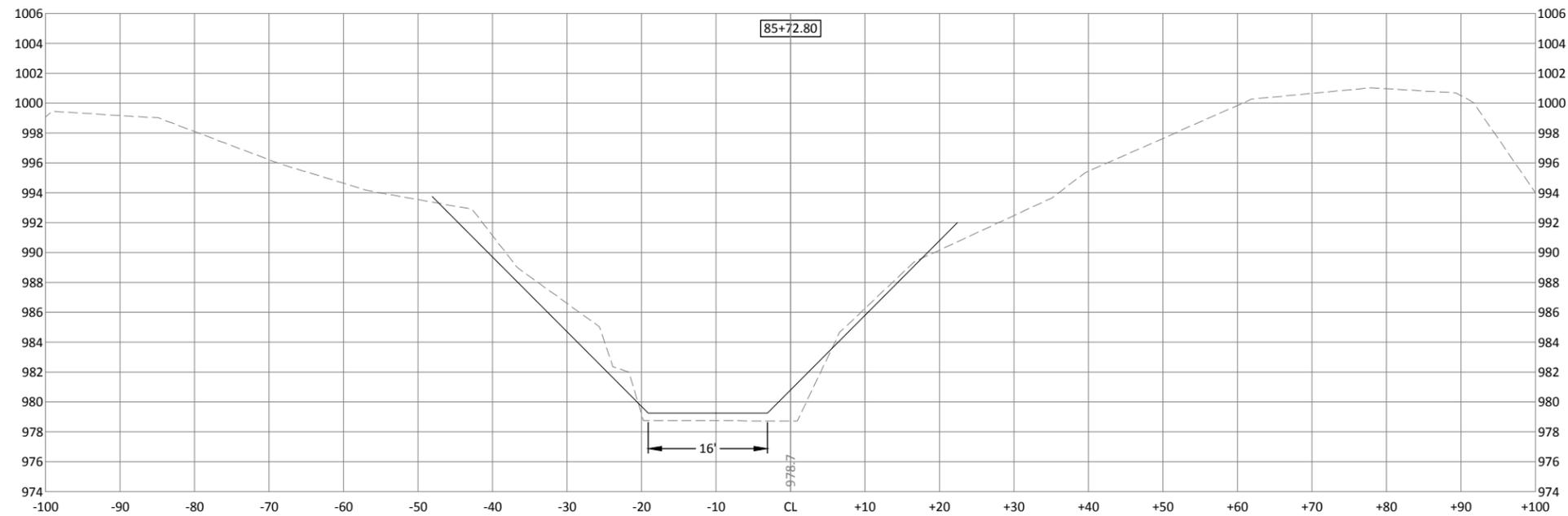
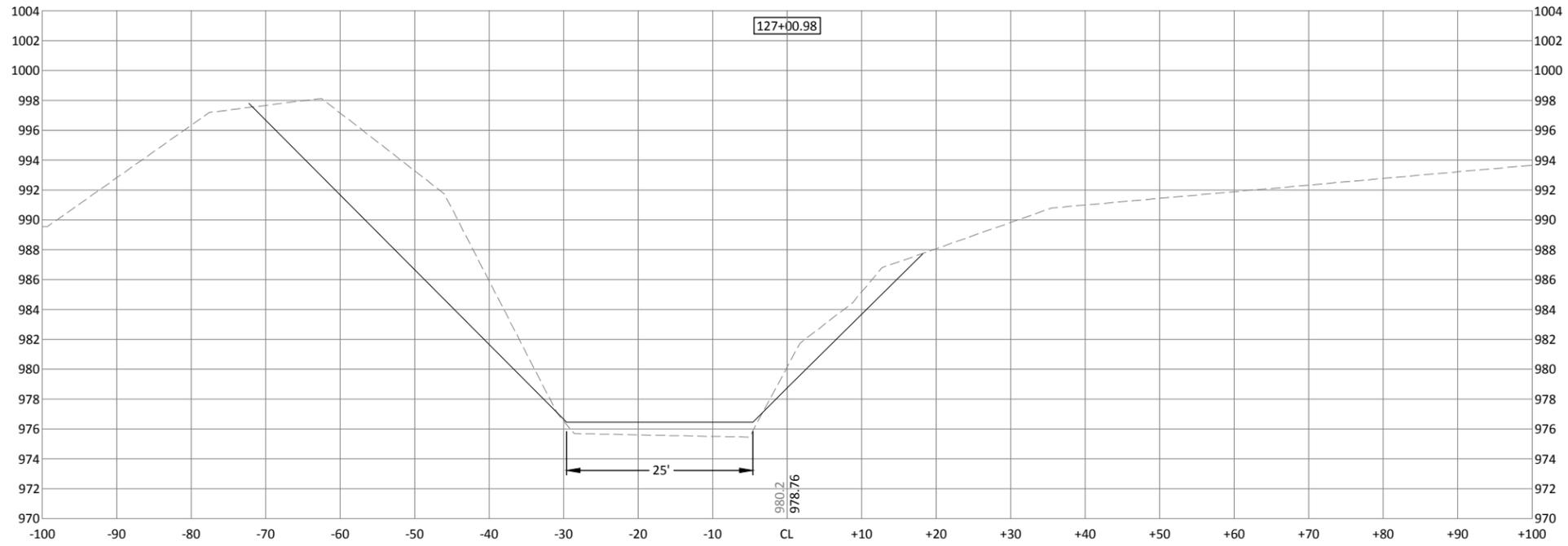
BOLTON & MENK
 300 WEST MCKINLEY ST., P.O. BOX 68
 JEFFERSON, IOWA 50129
 Phone: (515) 386-4101
 Email: Jefferson@bolton-menk.com
 www.bolton-menk.com

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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
 DRAINAGE DISTRICT NO. 2 REPAIRS & IMPROVEMENTS
 SURFACE DRAIN ALIGNMENT GEOMETRY

SHEET
G.04



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300 WEST MCKINLEY ST, P.O. BOX 68
JEFFERSON, IOWA 50129
Phone: (515) 386-4101
Email: Jefferson@bolton-menk.com
www.bolton-menk.com

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PIGEON CREEK DRAINAGE DISTRICT POTTAWATTAMIE COUNTY, IOWA
DRAINAGE DISTRICT NO. 2 FACILITY RECORDS
MAIN OPEN DITCH CROSS SECTIONS

SHEET
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