CONCEPTUAL MEMORANDUM

FOR

MARWELL BOULEVARD AND DARROW ROAD AREA

LOCATED IN
TWINSBURG TOWNSHIP
SUMMIT COUNTY, OHIO

PREPARED FOR:
SUMMIT COUNTY SURFACE WATER MANAGEMENT DISTRICT

PREPARED
JUNE 2025

PREPARED BY

Environmental Design Group
The community impact people.
450 Grant Street
Akron, Ohio 44311

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List of Acronyms

AACE - Association for the Advancement of Cost Engineering

AOI – Area of Interest

BMP – Best Management Practice

BRIC – Building Resilient Infrastructure and Communities

CMP – Corrugated Metal Pipe

EDG – Environmental Design Group

EPA – Environmental Protection Agency

FEMA – Federal Emergency Management Agency

FIRM – Flood Insurance Rate Map

H&H – Hydrologic and Hydraulic

HEC – Hydrologic Engineering Center

HMR – Hydrometeorological Report

HOA – Home Owners Association

HUC – Hydrologic Unit Code

LERRD – lands, easements, rights-of-way, relocations and disposal areas

LiDAR – Light Detection and Ranging

MWCD – Muskingum Watershed Conservancy District

NAVD 88 – North American Vertical Datum of 1988

NHD – National Hydrography Dataset

NLCD – National Land Cover Database

NPS-IS – Nonpoint Source Implementation Strategic Plan

NRCS – Natural Resources Conservation Service

NWP – Nationwide Permit

OEPA – Ohio Environmental Protection Agency

OGRIP – Ohio Geographically Referenced Information Program

OPCC – Opinion of Probably Construction Cost

PCN – Pre-Construction Notification

PWM – Partners in Watershed Management

STREAMSTATS – Web-based GIS application for water-resources engineering created and maintained by USGS

SWCD – Soil & Water Conservation District

USACE – United States Army Corps of Engineers

USGS – United States Geological Survey

USDA – United States Department of Agriculture

WRRSP – Water Resource Restoration Sponsor Program

WSEL – Water Surface Elevation

Executive Summary

Environmental Design Group was retained to identify the best and most cost-effective solution to mitigate flooding and improve water quality by reducing peak flows and their frequency along with reducing pollutants in the stormwater runoff within the Marwell & Darrow Roads area. This report summarizes the previous existing memorandum and presents three stormwater improvement concepts. The study of the three concepts will be presented for consideration to secure approvals to prepare final drawings, quantities, notes, restrictions, permitting and right-of-way acquisition for Summit County and its stakeholders for informed decision making going forward. The project area is in Summit County near the intersection of Marwell and Darrow Roads. A vicinity map is provided in ***Figure 1***.

Environmental Design Group performed a desktop analysis of the project area and its contributing drainage area including a review of existing drawings and supplied information, mapping and GIS data, aerial photography and land cover information, soils information, and hydraulic conveyance characteristics. A site visit was performed to validate site characteristics by surveying relevant drainage structures, topography, and areas of concern. The memorandum submitted for the existing condition analysis is included as **Attachment 1.** EDG then developed three concepts with Summit County and performed a desktop analysis of each concept including conceptual drawings and an OPCC for each. H&H modeling was also completed when applicable.

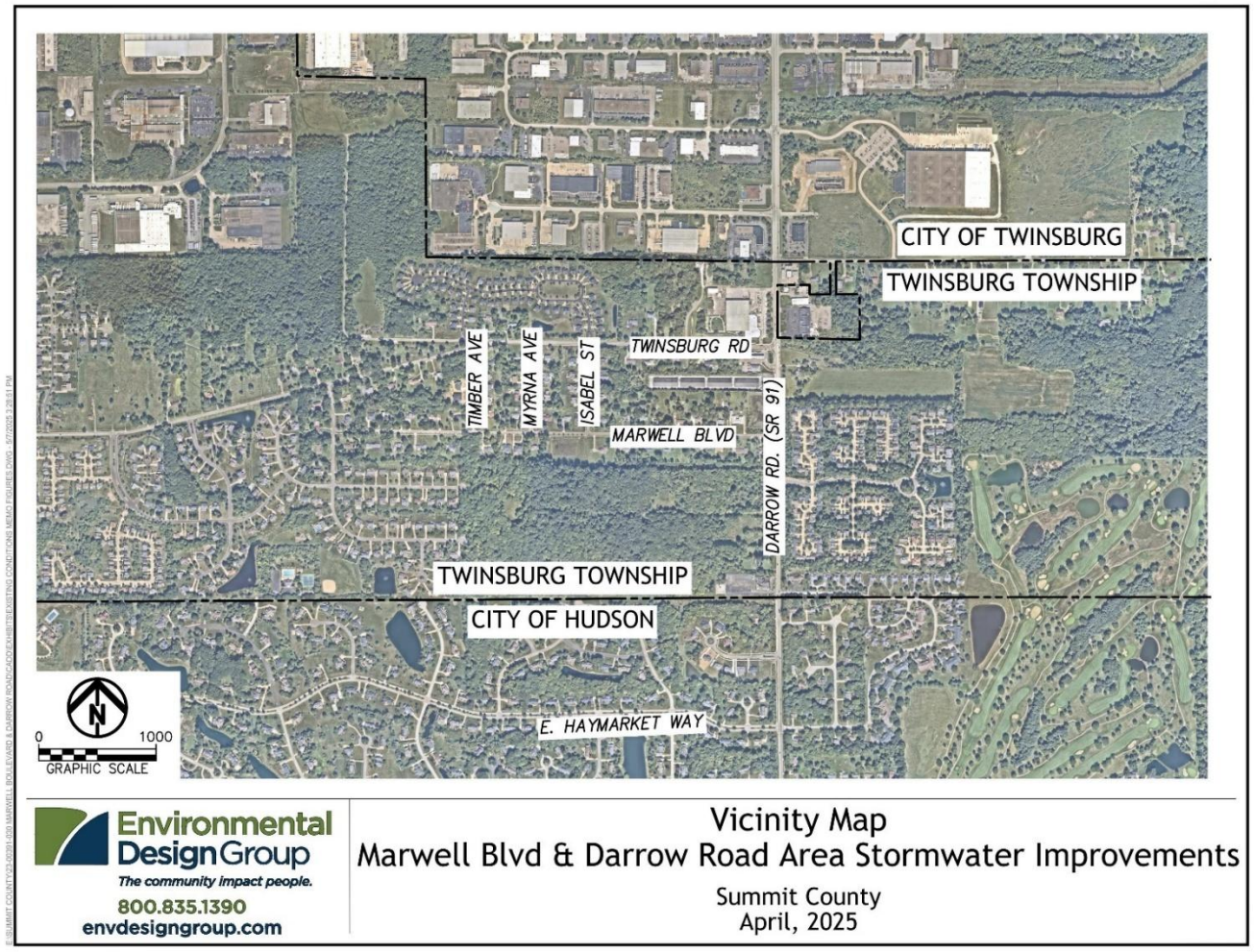


Figure 1 Vicinity Map

Drainage Study Purpose

The purpose of this study is to evaluate existing drainage conditions within the Marwell & Darrow Roads area. The area has experienced flooding in multiple locations due to undersized or aging infrastructure and increased runoff from upstream impervious surfaces. This study supports the goals of Summit County for infrastructure resilience and compliance with regional stormwater management requirements. The studied areas of focus are shown in ***Figure 2,*** and the study drainage area is shown in ***Figure 3.***

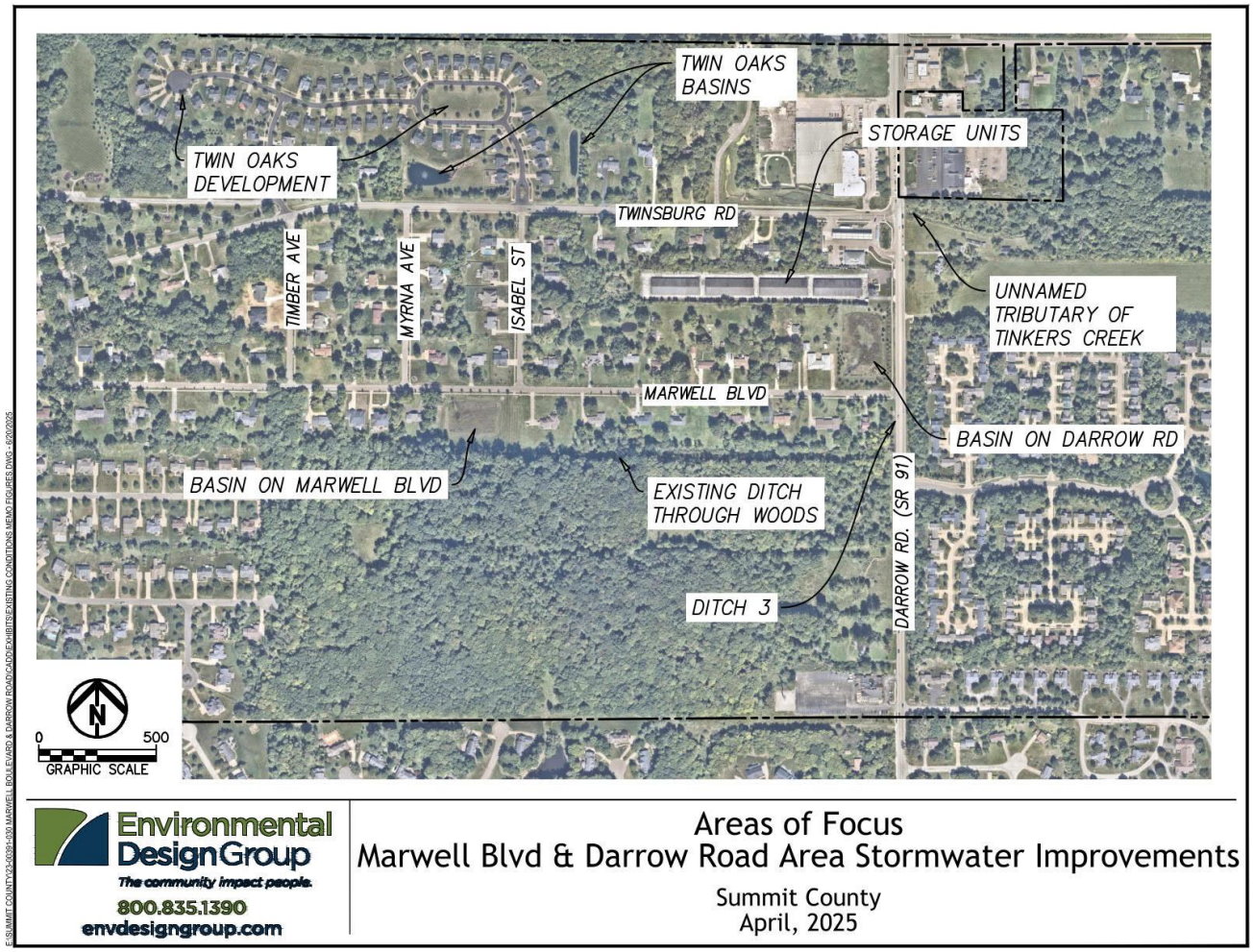


Figure 2 Study Area and Areas of Focus

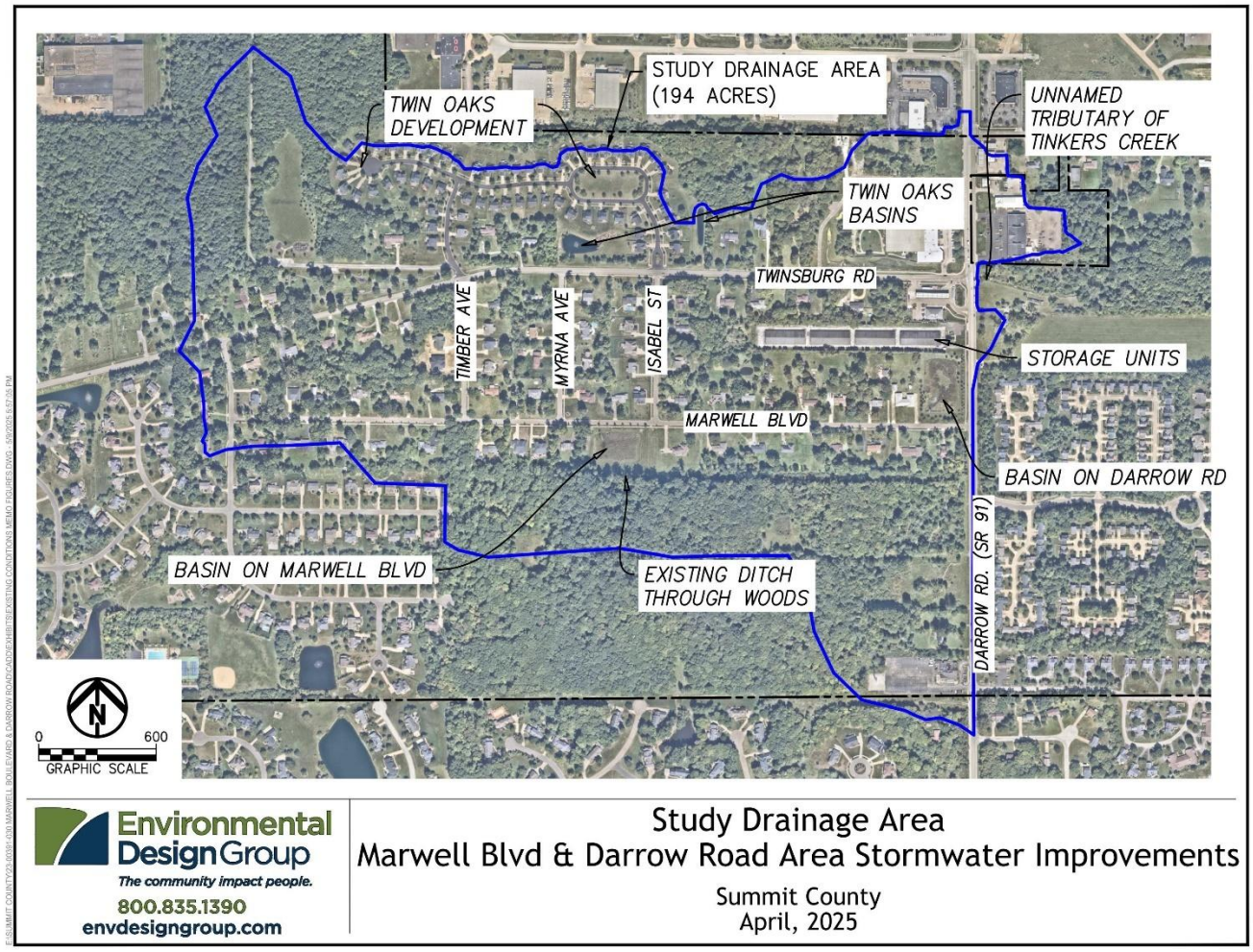


Figure 3 Study Drainage Area

Existing Conditions Review

EDG performed analysis and reviewed readily available information on the existing site conditions for the project area. The available information included the Tinker's Creek Stormwater Model, Subdivision plans for Twin Oaks and Chadds Ford, Marwell Estates Street Improvement Plans (phases 1-4), Cuyahoga River South Stormwater Master Plan – Section 1: Introduction, Tinker's Creek Watershed Master Plan, Nine-Element Nonpoint Source Implementation Strategic Plan – Tinker's Creek, Town of Twinsburg HUC-12, Nine-Element Nonpoint Source Implementation Strategic Plan – Brandywine Creek HUC-12, GIS and Land Cover Data, Aerial Photography, NRCS Soils Information, and FEMA Flood Hazard Mapping. EDG performed site investigations capturing photos of key elements within the project and collected limited survey data and information. From review, analysis and field

work EDG created an existing model of the drainage system within the project limits. This model would become the basis for concept development. The review concluded that there were several stormwater elements that could be improved. The model showed that the ditches along the wooded parcel and Darrow Road surcharged during the 100-year storm. It also showed that the outlet culvert under Darrow Road was performing near capacity. Finally, while modeling showed adequate storage in the two existing basins on Darrow Road and Marwell Boulevard, the site visit noted necessary maintenance should be performed to remove sediment and vegetation in the basin. (This report will refer to each basin as "Marwell Basin" and "Darrow Basin"). Please see **Attachment 1** for the Existing Conditions Memorandum for more information and details.

Concept Development and Selection

After substantial completion of the Existing Conditions Memorandum, EDG presented the information to Summit County staff in an online meeting. EDG prepared 4 concepts as options to pursue in the next steps of the project. The first concept included the development of a water quality-based BMP on the vacant wooded lot on the southern part of the project limits. This lot sits north of the Chadds Ford development in the City of Hudson. The wooded lot does have natural wetland features on it currently, and it may be possible to improve those and add water quality to the Tinker's Creek watershed, through channel design or other BMP improvements on the parcel. Next, EDG suggested adding water quality components to the existing basins on Marwell Boulevard and Darrow Road. Both require maintenance due to silt accumulation and vegetation within both basins. EDG would look at adding forebays and micropools to each and quantify the amount of water quality volume added and whether these basins could meet OEPA's release rate requirements. Additionally, in both the first and second concept, EDG will evaluate the modification of the Marwell basin's emergency weir and whether it could be routed south through the existing ditch that is was analyzed in concept 1. If this can be accomplished, it would be better to flood route water behind the homes east of the basin, rather than along the street where it is currently designed to flood. As a third concept EDG recommended further evaluation of the ODOT culvert under Darrow Road, which serves as the ultimate outlet point for all drainage tributaries for the project site. A fourth concept recommendation was adding small diameter storm sewer and catch basins to alleviate flooding at the rear of select residential lots within the project. Summit County selected the water quality-based BMP on the wooded lot, improvements to the basins on Marwell Boulevard and Darrow Road, and further evaluation of the ODOT culvert under Darrow Road. ***Figure 4*** shows the locations of each concept, and the Concept Drawings are provided as **Attachment 2.**

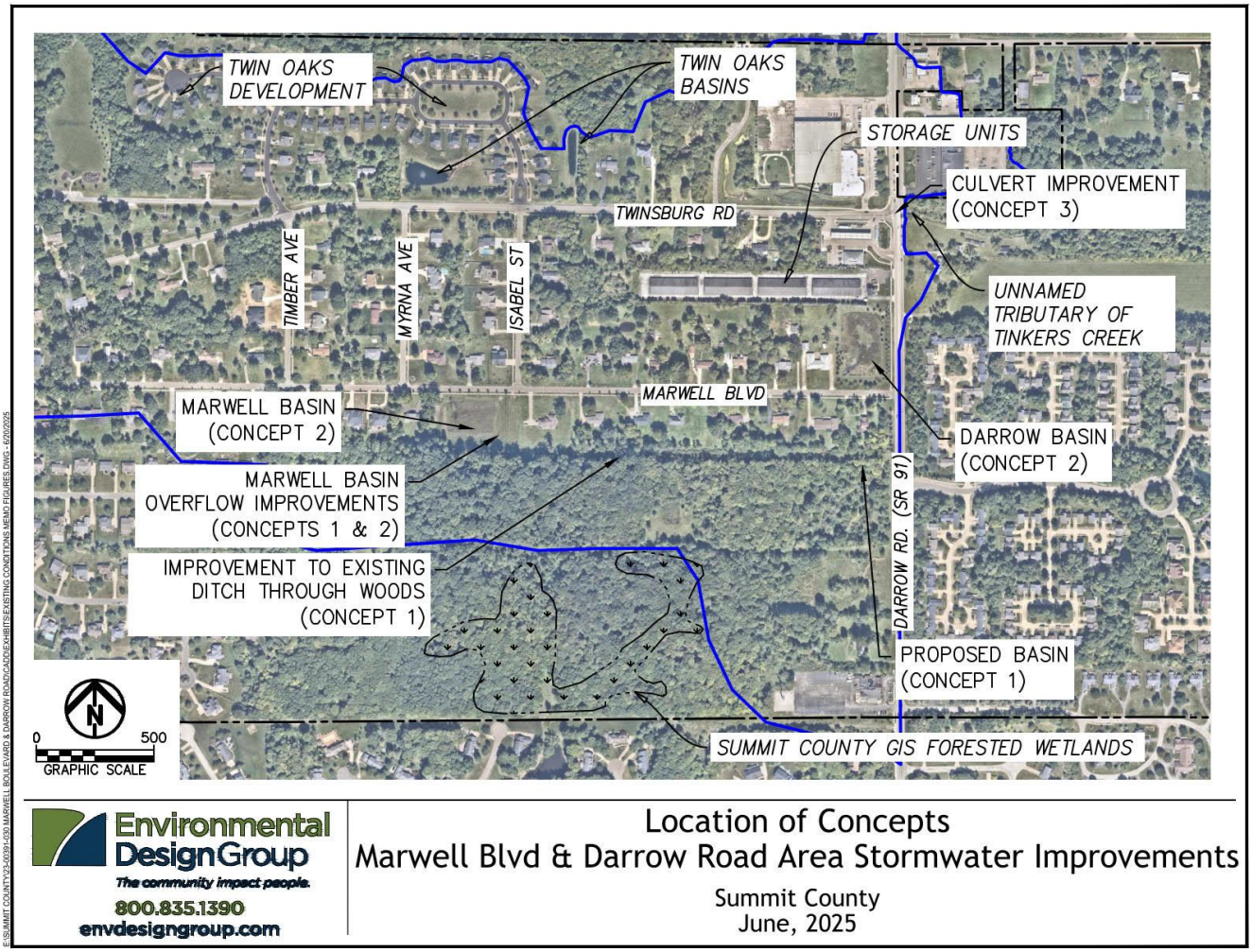


Figure 4 Location of Concepts Exhibit

Concept 1 – Water Quality Improvement on the Wooded Lot

The first concept considers analyzing potential stormwater improvements to the wooded lot located along the south edge of the drainage area (Parcel 6201233). Currently, the parcel is drained by a ditch that runs along the north side of the property. The boundary of the drainage area running through the parcel is also the boundary to the Tinkers Creek Watershed. The average shape of the channel was estimated to be trapezoidal with a base width of 3.8 feet and a height of 1 foot. However, a large embankment runs along the ditch to the north that protects the houses north of the ditch so any overflow of the ditch would flood south into the woods.

The first element analyzed in this concept was the overflow spillway of the Marwell Basin. Currently, the overflow spillway is in the northeast corner of the basin and flood routes through the street (Marwell Blvd). It would be beneficial to flood route the overflow through the ditch on the wooded lot. This would take flood water through the wooded area and divert it away from the street and any infrastructure in the area. Based on the topographic survey of the Marwell basin, there already is a secondary overflow spillway in the southeast corner of the basin directing flows to the wooded lot. However, the elevation of this spillway is higher than the spillway in the northeast corner of the basin. This improvement proposes regrading the southeast corner of the basin into a spillway with a crest elevation of 1135.50. This is lower than the existing spillway with a crest of 1136.67 and still high enough to flow into the bottom of the ditch (1135.00). The proposed spillway was modeled as a trapezoid with a width of 20 feet and a height of 0.5 feet. The flows through both the northeast and southeast spillway during existing and proposed conditions are shown are shown in Table 1.1. This improvement does not show any change to the storm infrastructure on Marwell Blvd. The maximum water surface elevation of the Marwell basin is 1135.59 under existing conditions and 1135.58 under the proposed conditions. This shows that the relocation of the spillway does not reduce peak flows through the downstream infrastructure; however, it does reroute potential flooding from the street to the forested lot.

Table 1.1: Proposed Marwell Basin Overflow

	Existing Conditions		Proposed Conditions	
Storm Frequency	SE Spillway Flow	NE Spillway Flow	SE Spillway Flow	NE Spillway Flow
	cfs	cfs	cfs	cfs
1-year	0	0	0	0
2-year	0	0	0	0
5-year	0	0	0	0
10-year	0	0	0	0
25-year	0	0	0	0
50-year	0	0	0	0
100-year	0	0	1.39	0

The second element of Concept 1 was looking at the existing ditch and developing improvements to it. Initially, a new stream channel with sinuosity was considered. However, since the existing woods south of the channel were uphill, this would require a lot of earthwork and the removal of many trees. Furthermore, since there is no baseflow in the existing ditch, realigning it into potential wetlands could result in the adverse effect of draining

any existing wetlands. So instead, a two-stage channel approach was taken. The initial channel was designed to contain the 2-year storm. A floodplain equal to the width of the channel was graded onto each side. Finally, additional banks were added with a 3:1 slope. Initially, the second stage was designed to contain the 100-year storm. However, to achieve this height, the ditch would need to be cut deeper than was possible. But, utilizing the embankment to the north of the ditch, the banks were graded with the north bank higher than the south bank. This will allow flooding into the woods to the south and keep water away from the houses to the north. The designed channel has a flow capacity of 447.5 cfs. The analysis summary for each storm through the channel is displayed in Table 1.2.

Table 1.2: Analysis Summary for Improved Ditch

Storm Frequency	Existing Peak Flow Through Ditch	Total Time Surcharged For Existing Ditch	Peak Flow Through Improved Ditch	Total Time Surcharged for Improved Ditch
	cfs	min	cfs	min
1-year	6.03	0	6.24	0
2-year	10.10	0	10.36	0
5-year	17.17	0	17.43	0
10-year	18.23	16	23.70	0
25-year	18.23	29	33.26	0
50-year	18.23	39	43.28	0
100-year	18.23	47	52.16	2.31
*Red cells denote a flooded channel with flood water entering woods				

The final element included in Concept 1 was a water quality basin at the end of the ditch. The purpose of this basin is to help control the amount of water entering the existing ditch (Ditch 3) north of the wooded parcel, running north and south along Darrow Road, to help reduce the chance of surcharging into the roadway. In addition, the basin will also provide water quality improvements for the watershed. Table 1.3 provides an summary of Ditch 3 both before and after Concept 1 improvements were added. The capacity of Ditch 3 is 20.73 cfs. The subcatchments 47 and 48 were used as drainage areas for water quality calculations as seen in *Figure 5.* Additional design information for the water quality features of the basin is provided in **Attachment 3.**

Table 1.3: Ditch 3 analysis of existing and proposed flows of upstream basin

Storm Frequency	Peak Inflow (Pre)	Peak Inflow (Post)	Max Velocity (Pre)	Max Velocity (Post)
	cfs	cfs	ft/s	ft/s
1-year	11.33	3.89	3.19	2.34
2-year	18.32	5.35	3.65	2.58
5-year	30.26	9.37	3.79	3.02
10-year	35.92	19.48	3.78	3.71
25-year	42.27	29.76	3.78	3.78
50-year	48.81	39.44	3.78	3.78
100-year	54.65	47.71	3.78	3.78
*Red cells denote a flooded channel				

Pro: This concept reduces flood routing through both Marwell Boulevard and Darrow Road by updating the Marwell basin overflow spillway and reducing the amount of flow into the ditch downstream of the wooded lot. The proposed basin also provides increased water quality for the watershed. It also takes advantage of an undeveloped parcel that may contain forested wetlands.

Con: It is near the boundary of the watershed so there is no baseflow that can be used to develop a more natural stormwater feature. The design also requires a fair amount of earthwork and the removal of many trees. There are very minimal effects on the peak flows through infrastructure near the outlet of the subbasin.

Concept 2 – Water Quality Improvement the Marwell and Darrow Basins

The second concept is the maintenance and improvement of the existing Marwell and Darrow Basins. A field review of the basins showed that there was significant vegetation throughout the bottom of the basins. Vegetation and sediment need to be removed to maintain the design capacity of the basins. In addition to the required maintenance, EDG looked at adding water quality elements into each of the basins by developing forebays and micropools. Part of the work would also include the moving of the overflow spillway of the Marwell Basin.

The addition of forebays and micropools will provide improved water quality for the watershed by removing sediment from the stormwater. The Marwell Basin could add as much as 141,078 cubic feet of treatment to the bottom of the existing basin. In addition to the earthwork, the Marwell Basin outlet orifice will need to be retrofitted to 2 inches from 8 inches to meet the drawdown requirements of OEPA. The Darrow Basin could add 154,339 cubic feet of treatment volume but does not require an orifice change on the outlet structure as it

currently would meet the drawdown requirements. Overall, this concept helps improve the water quality to the tributaries of Tinkers Creek; however, they will have little impact on the capacity of the system.

A conceptual level of plans is provided in **Attachment 2** and water quality design calcs are provided in **Attachment 3.** The area that drains into the Marwell Basin are subcatchments 1 and 2. The area that drains into the Darrow Basin are 1, 2, 10, 11, 12, 14, 33, 36, 45, 46, 47, and 48. See *Figure 5 for a map of the subcatchments.*

Pro: The existing basins require maintenance that will need to be completed to maintain the integrity of the storm system. Constructing water quality features at the same time as maintenance is a cost-effective way to improve the water quality of the downstream watershed.

Con: This concept does not provide any additional flood mitigation to the area.

Concept 3 – Darrow Road ODOT Culvert Evaluation

The third concept considered was the replacement of the ODOT culvert under the intersection of Darrow Road and Twinsburg Road. This culvert is the last component of the storm sewer system before it outlets into a creek and out of the study drainage area. The existing culvert is 36-inch reinforced concrete pipe with a slope of 0.47%. The area around the pipe is relatively flat so it is difficult to upsize the pipe due to the restraints of the cover and existing inverts. The headwater of the stream the culvert outlets into makes it difficult to gain additional capacity without significantly raising the pipe. The water surface elevation of the stream was surveyed at 1110.20 and the outlet invert of the culvert is 1109.24. It was determined that the simplest way to increase the pipe capacity was to use a larger elliptical pipe. The pipe that was modeled was a 38”x60” reinforced concrete pipe matching the existing inverts. The design capacity of the existing culvert is 49.54 cfs while the design capacity of the proposed culvert is 84.66 cfs. Table 2.1 shows the changes in peak flow between the two culverts, while Tables 2.1 and 2.2 shows the water surface elevation at the outlet of the culvert in both the existing and proposed conditions, respectively.

Table 2.1: Analysis Summary for Existing ODOT Culvert

Storm Frequency	Peak Flow Through Culvert	Max Velocity	Headwater Elevation	Tailwater Elevation	Total time surcharged
	cfs	ft/s	ft	ft	min
1-year	16.75	6.33	1114.00	1111.18	0
2-year	29.91	7.32	1114.00	1111.51	0
5-year	43.48	7.95	1114.00	1111.72	0
10-year	44.61	8.01	1114.00	1111.74	0
25-year	45.27	7.98	1114.00	1111.76	0
50-year	45.57	7.99	1114.00	1111.77	0
100-year	45.57	7.98	1114.00	1111.77	0

Table 2.2: Analysis Summary for Proposed ODOT Culvert

Storm Frequency	Peak Flow Through Culvert	Max Velocity	Headwater Elevation	Tailwater Elevation	Total time surcharged
	cfs	ft/s	ft	ft	min
1-year	16.75	5.17	1114.00	1111.18	0
2-year	29.90	6.04	1114.00	1111.51	0
5-year	43.46	6.85	1114.00	1111.72	0
10-year	44.93	6.88	1114.00	1111.75	0
25-year	45.28	6.88	1114.00	1111.76	0
50-year	45.63	6.90	1114.00	1111.76	0
100-year	45.63	6.89	1114.00	1111.76	0

The proposed elliptical culvert provides a significant increase in capacity; however, this does not result in a large reduction in the peak flow (a 0.02% decrease). This result demonstrates that flow through the culvert is likely controlled by the downstream stream it outlets to. If selected for preliminary design, the replacement of the ODOT culvert may result in additional findings leading to updates to upstream pipes or the downstream stream.

Pros: Provides significant increase in the culvert capacity, reducing the likelihood of it surcharging.

Cons: Does not provide a reduction of peak flows through the culvert. The culvert is in a busy intersection so replacement would cause a disruption in traffic and cause significant maintenance of traffic costs.

Hydrologic and Hydraulic Modeling

Storm and Sanitary Analysis (SSA) software was utilized to model existing drainage conditions and evaluate potential improvements within the project area. The SSA tool allows for detailed hydrologic and hydraulic simulation of stormwater runoff using established methods such as the SCS TR-55 and Rational Method. By incorporating site-specific data, including rainfall patterns, land use, topography, and existing storm infrastructure, the model will simulate flow rates, runoff volumes, and system performance under various design storm events. The analysis will help identify system deficiencies, such as undersized pipes or surcharging structures, and will support the design and optimization of proposed improvements such as storm sewer upgrades or detention basins. The resulting model outputs, including hydrographs, flow profiles, and flood risk indicators, will inform the design and analysis of concepts. The models that were used for the concepts were modified from the existing model discussed in the Existing Conditions Memo (**Attachment 1**). However, a slight modification was made to the subcatchments from the original existing conditions model. Subcatchment 25 as shown in Figure 12 of the existing conditions memo was split into smaller subcatchments to model the 3 basins contained in the area. *Figure 5* shows the new subcatchments numbered corresponding to the subcatchment names used in the model. The three concepts discussed in this memorandum are also labeled. A report generated from the model output is included in **Attachment 5.**

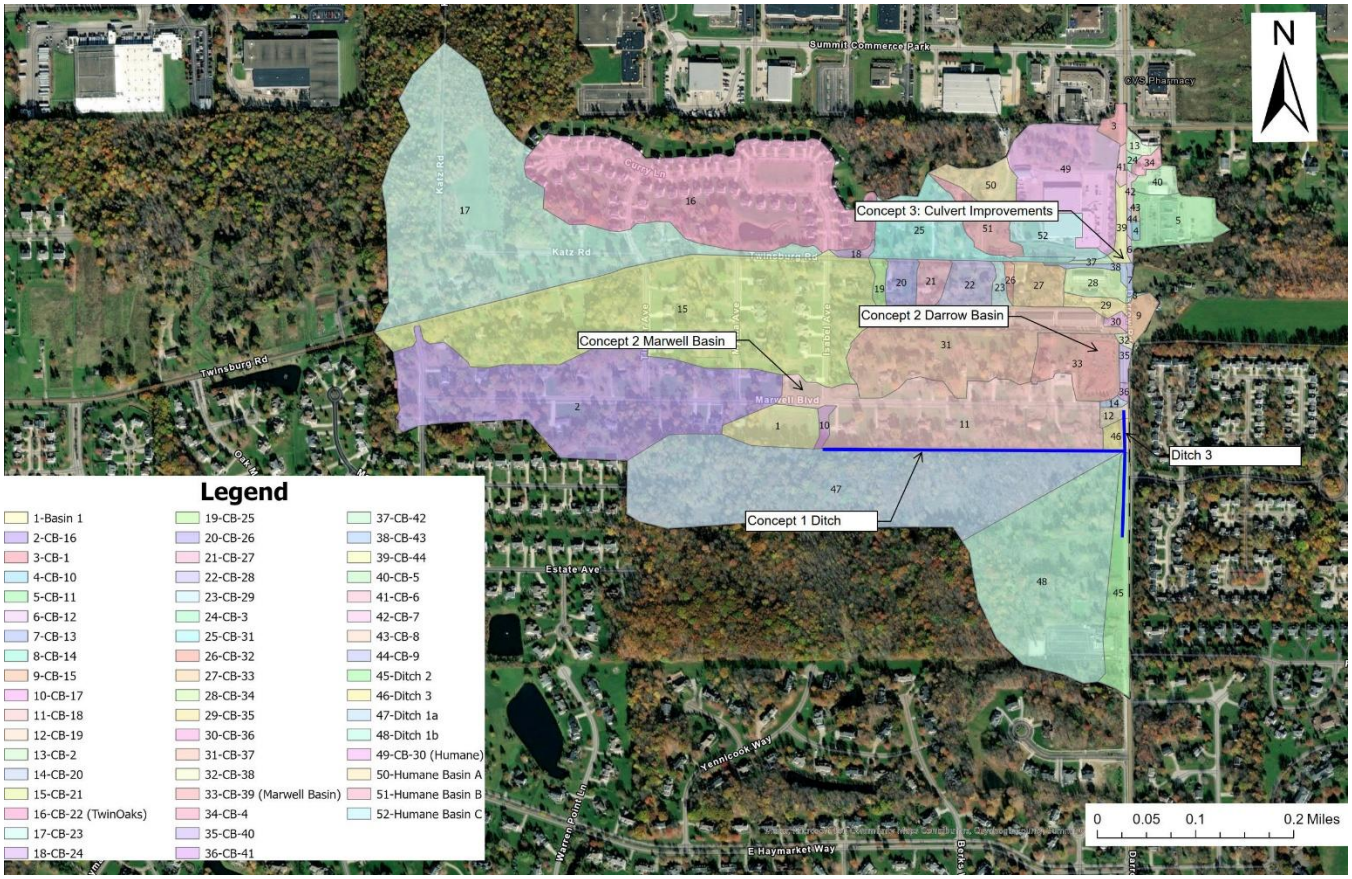


Figure 5 Updated Subcatchments for Concept Modeling

Conceptual OPCC

An opinion of probable construction costs was developed for each concept discussed in this memorandum. The OPCC was performed at a Class 5 estimate since the plans are only at a conceptual level. This leads to a large amount of unknowns, so a 20% contingency was used in the final cost. The conceptual construction costs for each concept are as follows:

- Concept 1: $322,095
- Concept 2: $394,215
- Concept 3: $921,698

Each OPCC can be found in **Attachment 4.**

Funding Sources

There are several possible funding mechanisms for restoration of Ohio Streams. From our experience there are ten that could be used for these projects based on the location of the improvement. The list below provides basic information regarding each of these potential funding options.

- Clean Water State Revolving Fund (CWSRF) / Water Pollution Control Loan Fund: Administered by the Ohio Environmental Protection Agency (EPA), the CWSRF—also known as the Water Pollution Control Loan Fund—provides low-interest or subsidized loans to public entities for water quality improvement projects. This includes stormwater infrastructure, combined sewer overflow mitigation, and the implementation of green infrastructure practices. Through the 2026 funding cycle, the program is bolstered by the Bipartisan Infrastructure Law (BIL), which offers additional principal forgiveness and funding opportunities for projects that address environmental justice and climate resilience. Communities like Twinsburg can leverage this program for large-scale capital improvements that may otherwise be financially burdensome.

- Ohio EPA Section 319 Nonpoint Source Grants: The Section 319 Grant Program, authorized under the Clean Water Act, supports projects that mitigate nonpoint source pollution—pollutants carried by runoff rather than discharged from a pipe. Administered by Ohio EPA's Division of Surface Water, the program funds implementation efforts identified in approved Nine-Element Nonpoint Source Implementation Strategies (NPS-IS), including practices like stream restoration, vegetated buffers, stormwater retrofits, and public education campaigns. Projects within the Cuyahoga River watershed, especially those addressing TMDLs or identified impairments, are eligible and highly encouraged to apply. The program is competitive and typically offers funding cycles annually.

- Ohio Water Development Authority (OWDA) Onsite Stormwater Loan Program: OWDA's Onsite Stormwater Program offers low-interest loans to government entities for the design and construction of stormwater management systems that treat runoff at or near its source. Eligible practices include bioretention cells, permeable pavement, infiltration trenches, green roofs, and detention/retention upgrades. The program is ideal for municipalities seeking to implement localized green infrastructure with measurable water quality and quantity benefits. It is structured to support both new construction and retrofit projects, and may be used in conjunction with other funding sources for comprehensive implementation.

- FEMA Hazard Mitigation Assistance Grant: FEMA's hazard mitigation assistance provides funding for eligible mitigation measures that reduce disaster losses. "Hazard mitigation" is any sustainable action that reduces or eliminates long-term risk to people and property from future disasters. Mitigation planning breaks the cycle of disaster damage, reconstruction and repeated damage. Hazard mitigation includes long-term solutions that reduce the impact of disasters in the future.

- FEMA Flood Mitigation Assistance Grant: The Flood Mitigation Assistance grant program is a competitive program that provides funding to states, federally recognized Tribal governments, U.S. territories, and local governments. Since the National Flood Insurance Reform Act of 1994 was signed into law, funds are used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program. FEMA chooses recipients based on the applicant's ranking of the project, eligibility, and cost-effectiveness of the project. FEMA requires state, local, federally recognized Tribal governments, and U.S. territories to develop and adopt hazard mitigation plans as a condition for receiving certain types of non-emergency disaster assistance, including funding for hazard mitigation assistance projects. IN 2023 this grant program was funded with $800 million.

- Awards made under this funding opportunity will be funded, in whole or in part, with funds appropriated by the Infrastructure Investment and Jobs Act, also more commonly known as the Bipartisan Infrastructure Law (BIL). The BIL is a once-in-a-generation investment in infrastructure, which will grow a more sustainable, resilient, and equitable economy by enhancing U.S. competitiveness, driving the creation of good-paying jobs with the free and fair choice to join a union, and ensuring stronger access to economic and environmental benefits for disadvantaged communities. The BIL appropriates billions of dollars to FEMA to promote resilient infrastructure, respond to the impacts of climate change, and equip our nation with the resources to combat its most pressing threats.

- NFWF Five Star and Urban Waters Restoration Program - On-the-ground wetland, riparian, in-stream and/or coastal habitat restoration; Meaningful education and training activities, either through community outreach, participation and/or integration with K-12 environmental curriculum; Measurable ecological, educational and community benefits; Partnerships: Five Star projects should engage a diverse group of community partners to achieve ecological and educational outcomes. The program is funded at $2.6 million each year. Awards range from $20,000 to $50,000 with an average size of $35,000 and about 50 grants awarded per year. Grants span 12 to 18 months in duration. Typically, NFWF requests a 1:1 financial match. Application dates vary but are typically around the January timeframe.

Conclusions and Recommendations

After the existing conditions analysis, Environmental Design Group met with Summit County to develop three concepts to analyze to help mitigate the localized flooding during moderate to heavy storm events, improve drainage, as well as improve water quality that is tributary to Tinkers Creek.

The first concept evaluated improvements to the ditch through the wooded parcel along the south border of the project drainage area. The evaluation determined that a two-stage channel was the most feasible design for the site since there is no base flow to create a more natural stream which may end up draining any potential existing wetlands on the parcel. In addition, this concept also included moving the overflow spillway for the Marwell Basin to direct flooding into the wooded parcel and the improved ditch. However, the impact on the ditch is small as the proposed spillway only conveys flow during the 100-year storm. Finally, the first concept also includes the construction of a new basin in the northeast corner of the wooded lot. This basin helps detain water and prevents

flooding in the ditch it discharges into. It also provides water quality for the Tinkers Creek Watershed. The estimated cost for Concept 1 is $322,095.00.

The second concept incorporated a water quality component into the existing Marwell and Darrow basins. The concept includes forebays and micropools. It does not provide significant storage or flood mitigation but improves downstream water quality. This concept is cost effective, as the basins do require maintenance to maintain designed storage capacity. By pairing the construction of the water quality elements with the needed maintenance, the county can update the functionality of the basins at a lower cost. In addition, this concept could also include the lowering of the Marwell Basin southeast spillway, so it becomes the primary overflow spillway as mentioned in the first concept. This will add additional flow to the existing ditch during the 100-year storm event even if that ditch is not improved. The estimated construction cost of the second concept is $394,215.

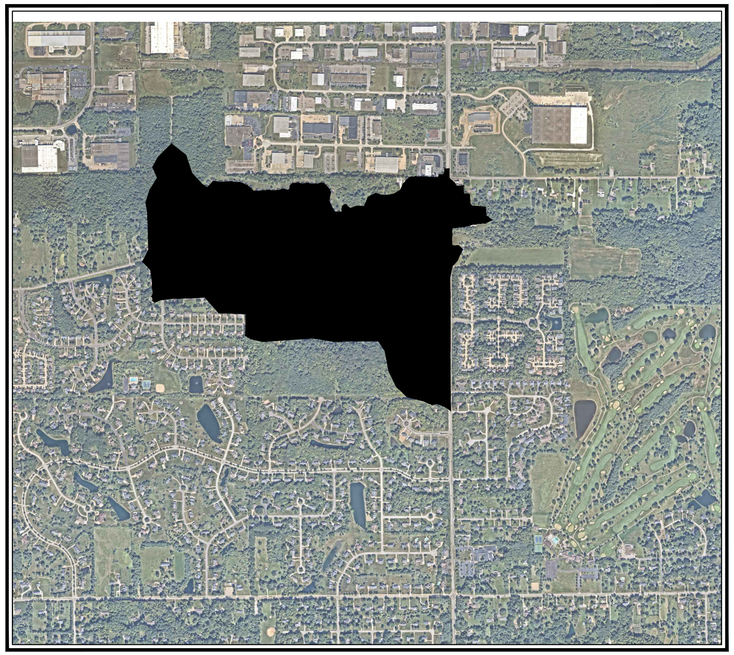
The third concept EDG analyzed was the improvement of the ODOT culvert under Darrow Road. The culvert is the outlet point for the entire study area. It was hypothesized that the culvert would control the flow of upstream storm components and by improving the capacity of the culvert, it would improve the flow through the rest of the system. However, the model showed that increasing the capacity of the culvert did not result in an increase of flow. It is likely that the flow through the culvert is controlled by the stream it discharges into. The water elevation of this stream is already approximately a foot higher than the invert of the culvert. However, with additional investigation, more components of the system could be analyzed, including the outlet stream and the pipes upstream of the culvert. The area is relatively flat so it may be difficult to adjust invert elevations to achieve the desired flow. Replacing the culvert is already quite costly as it would require work in a busy intersection. Adding more downstream components would only increase the price. The estimated cost to replace the ODOT culvert was determined to be $921,698.

After analyzing the three concepts discussed at the end of the Existing Conditions Memo, EDG recommends concepts 1 and 2. Concept one provides some water quality as well as increased storage to reduce flooding and concept 2 provides increased water quality. Both concepts are relatively cost effective and only require construction on parcels owned by the county or Twinsburg Township. Concept 3 is much more expensive and requires construction in a busy intersection. It also found to provide very little improvement to any drainage issues or flood mitigation and provides no water quality improvements.

SUMMIT COUNTY
MARWELL BOULEVARD & DARROW ROAD CONCEPTS

SUMMIT COUNTY, OHIO

ISSUED: JUNE 2025



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GRAPHIC SCALE IN FEET

LOCATION MAP

INDEX OF DRAWINGS

APPROVALS:

SUMMIT COUNTY

ALAN BRUBAKER, P.E., P.S. – SUMMIT COUNTY ENGINEER Date

CHARLES HAUBER, P.E., P.S. – SUMMIT COUNTY ENGINEER'S OFFICE Date

2023 SPECIFICATIONS

THE STANDARD SPECIFICATIONS OF THE STATE OF OHIO, DEPARTMENT OF TRANSPORTATION, INCLUDING CHANGES AND SUPPLEMENTAL SPECIFICATIONS LISTED IN THESE PLAN BID DOCUMENTS SHALL GOVERN THIS IMPROVEMENT. FOR PURPOSES OF THIS PLAN, REFERENCES TO DIRECTOR OR ENGINEER SHALL BE CONSTRUED TO MEAN THE CITY ENGINEER AND/OR HIS REPRESENTATIVES.

Know what's below.
Call before you dig.

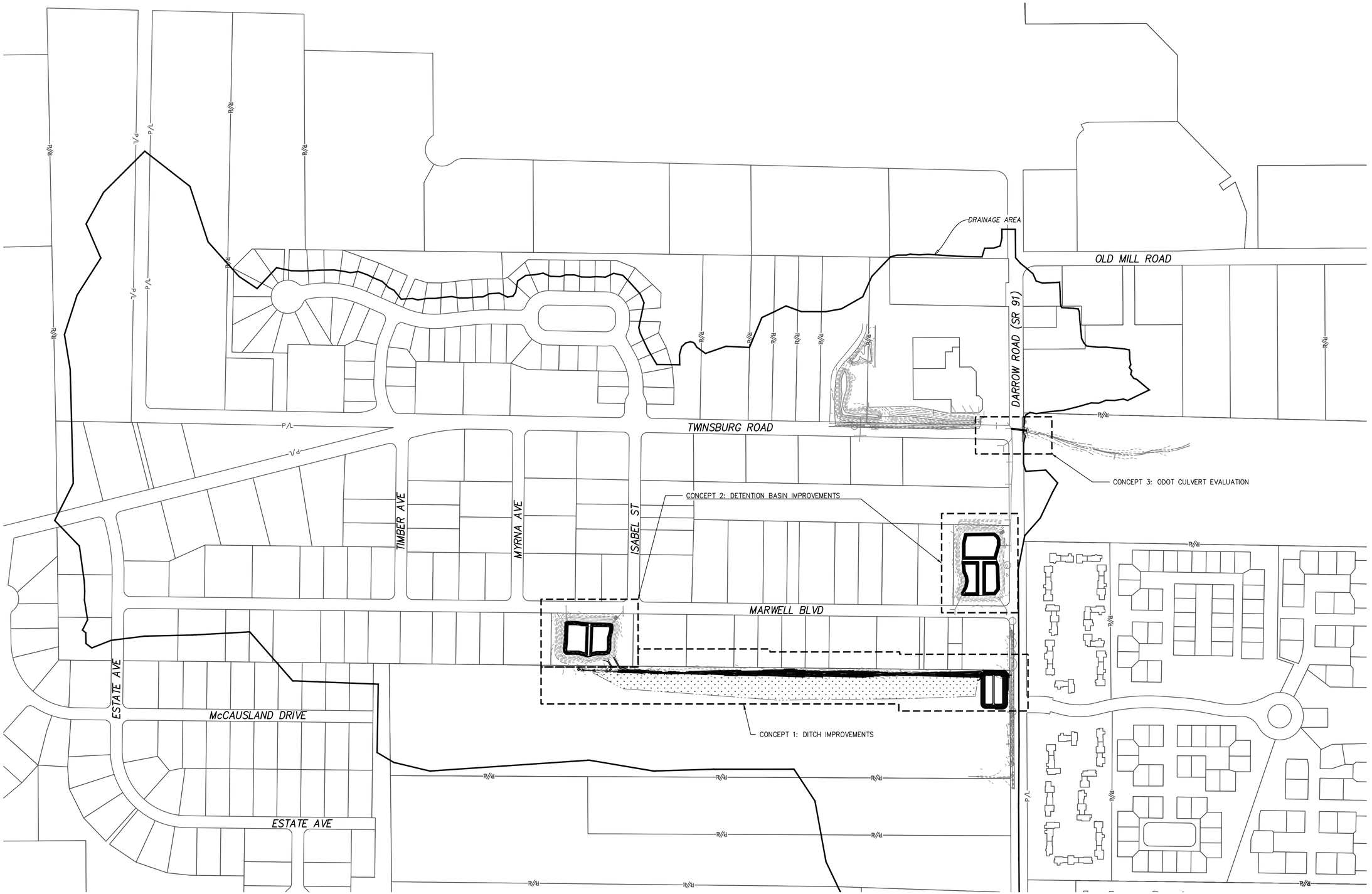
PLANS PREPARED AND RECOMMENDED BY:

Environmental Design Group
AKRON / CLEVELAND / COLUMBUS
HQ 450 GRANT ST., AKRON, OH 44311
P 330.375.1390 / TF 800.835.1390
W ENVDESIGNGROUP.COM

REVISED:

SET NO. ____

PROJ. NUMBER 23–00391–030 DESIGNED BY: WRT DRAWN BY: SWA FILE NO. ZTITL 23–00391–030.dwg	TITLE	SHEET 1 OF 16



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PROJECT NO.:	23-00391-030
DRAWN BY:	SWA
CHECKED BY:	JWO
DATE ISSUED:	JUNE 2025

OVERALL PLAN

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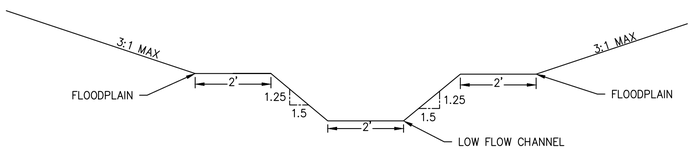
CONCEPT 1: DITCH IMPROVEMENTS



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PROJECT NO.:	23-00391-030
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CONCEPT 1 LAYOUT PLAN

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CONCEPT 1: DITCH IMPROVEMENTS

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CONCEPT 1 LAYOUT PLAN

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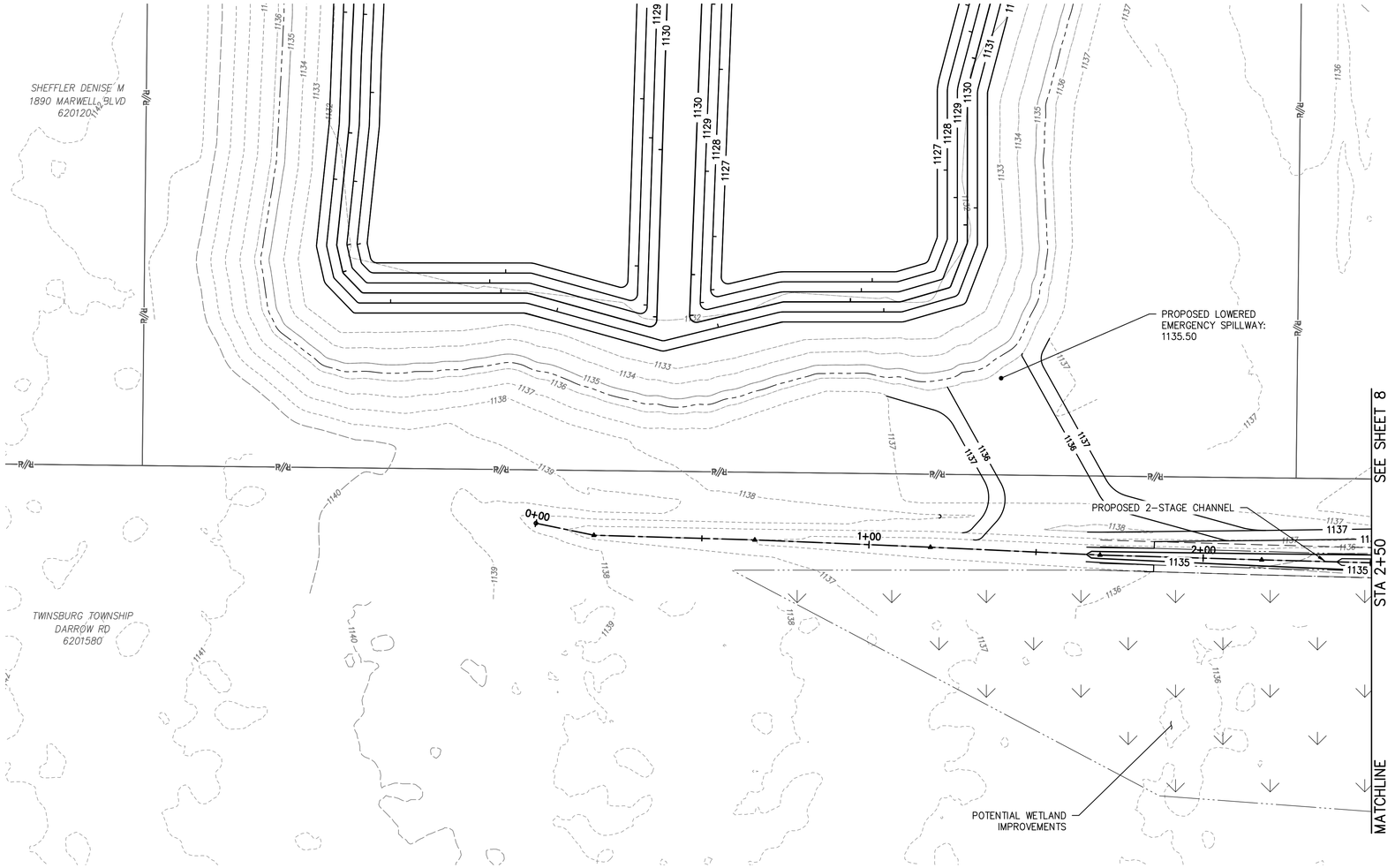

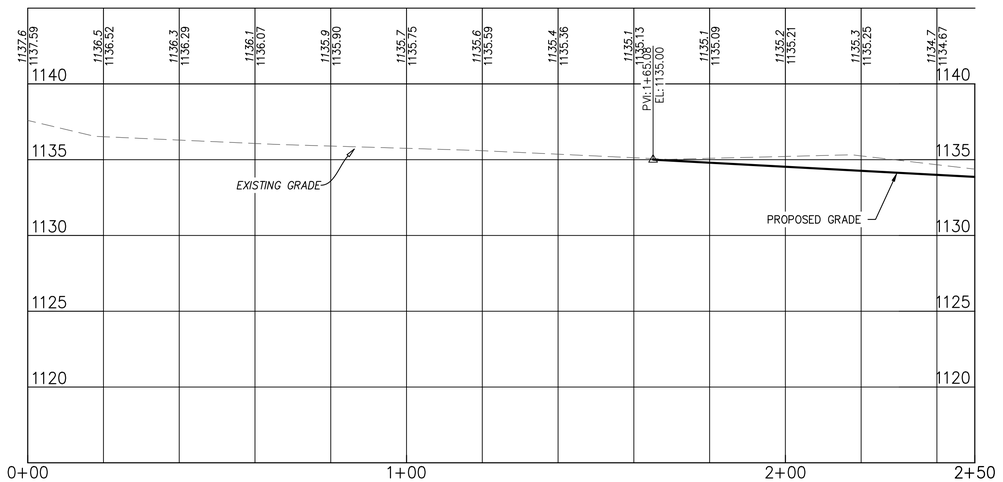

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CONCEPT 1 GRADING PLAN & PROFILE

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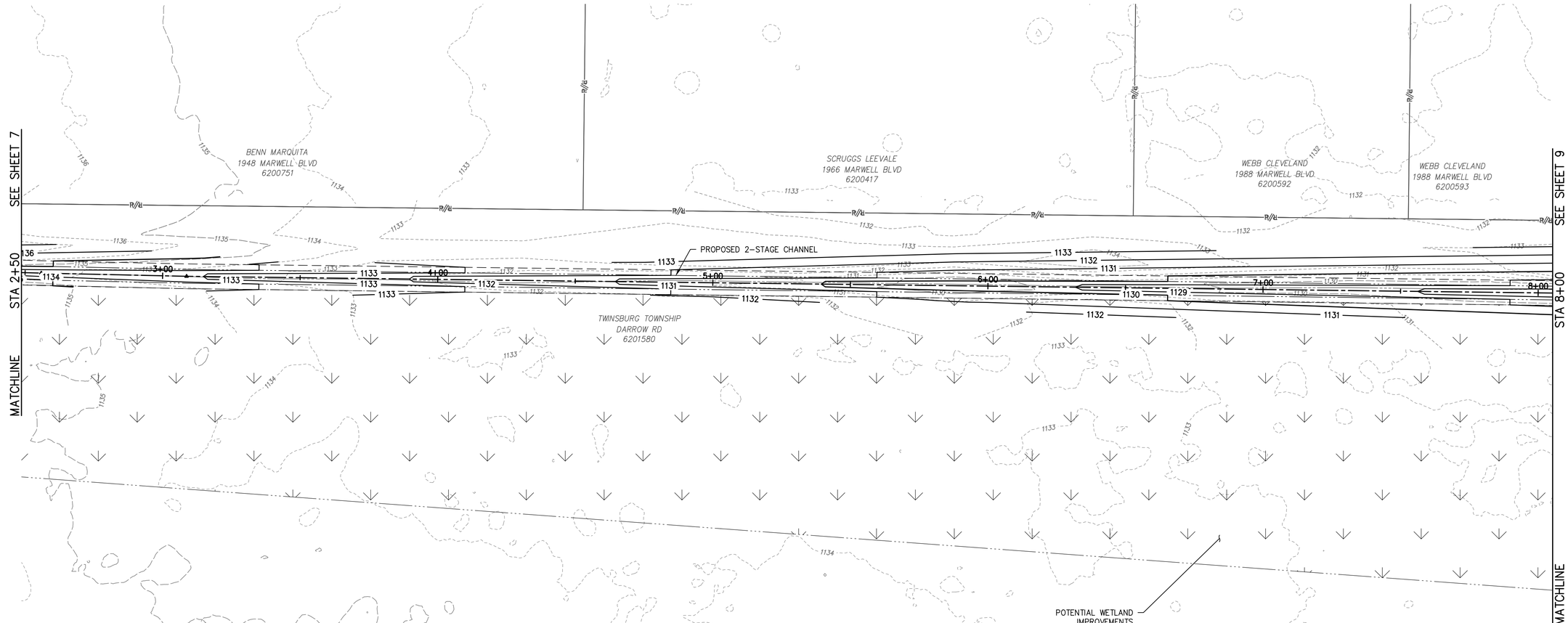

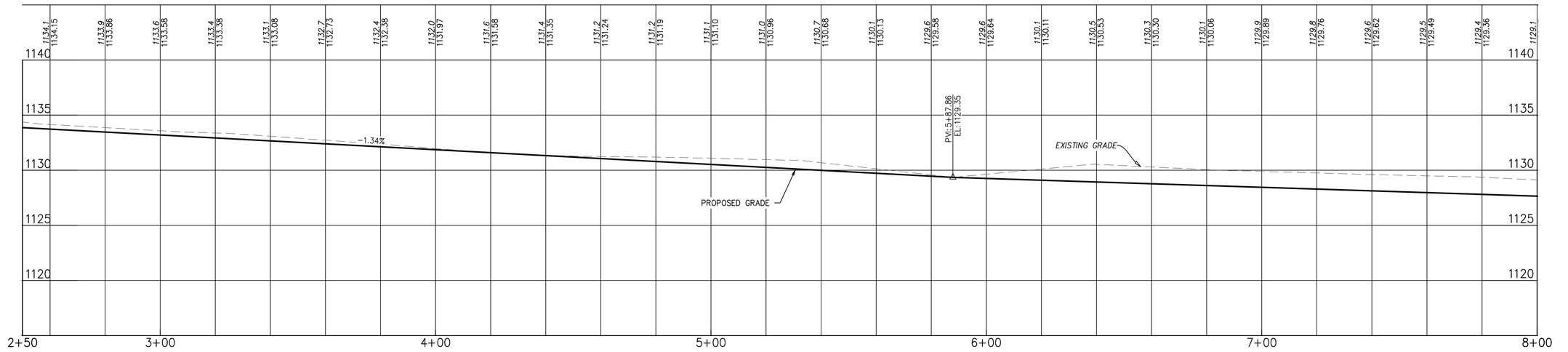

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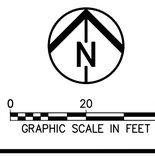

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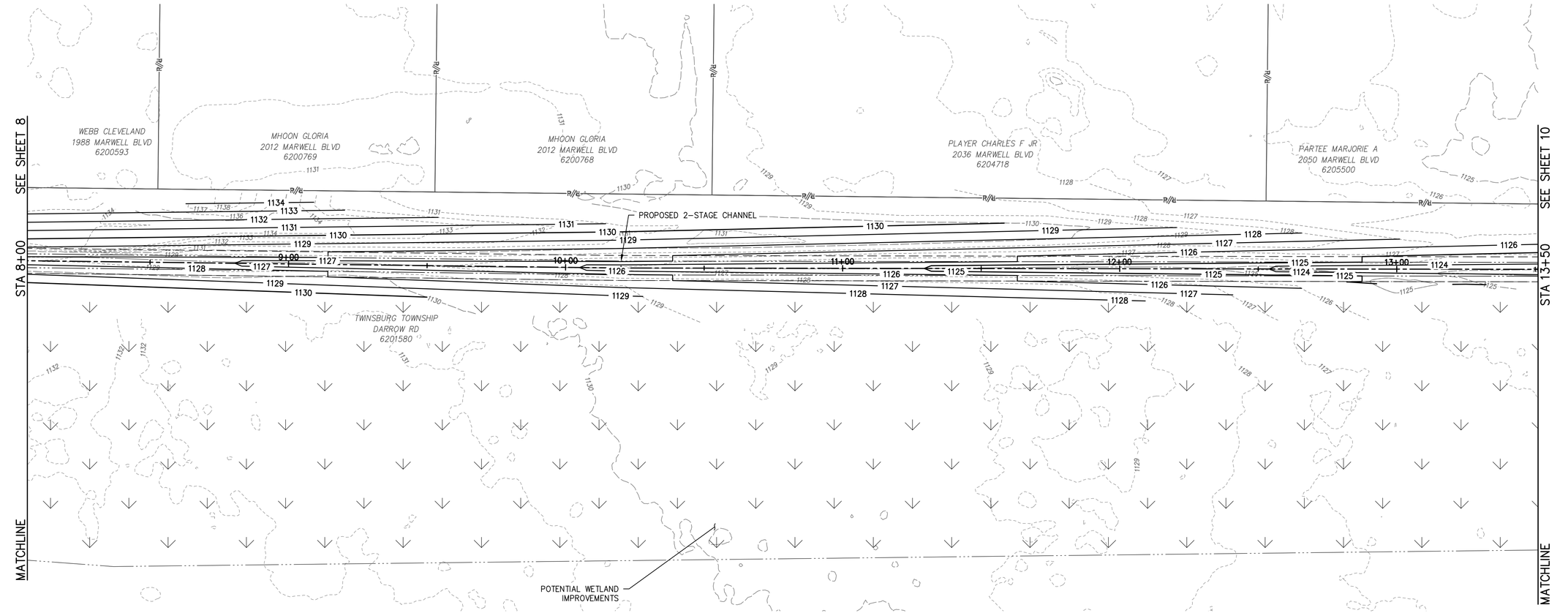

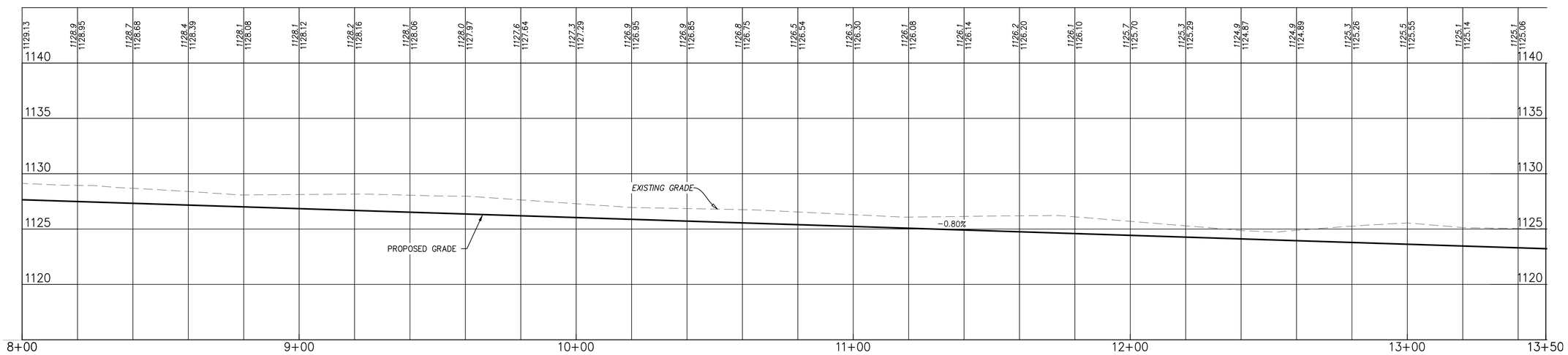

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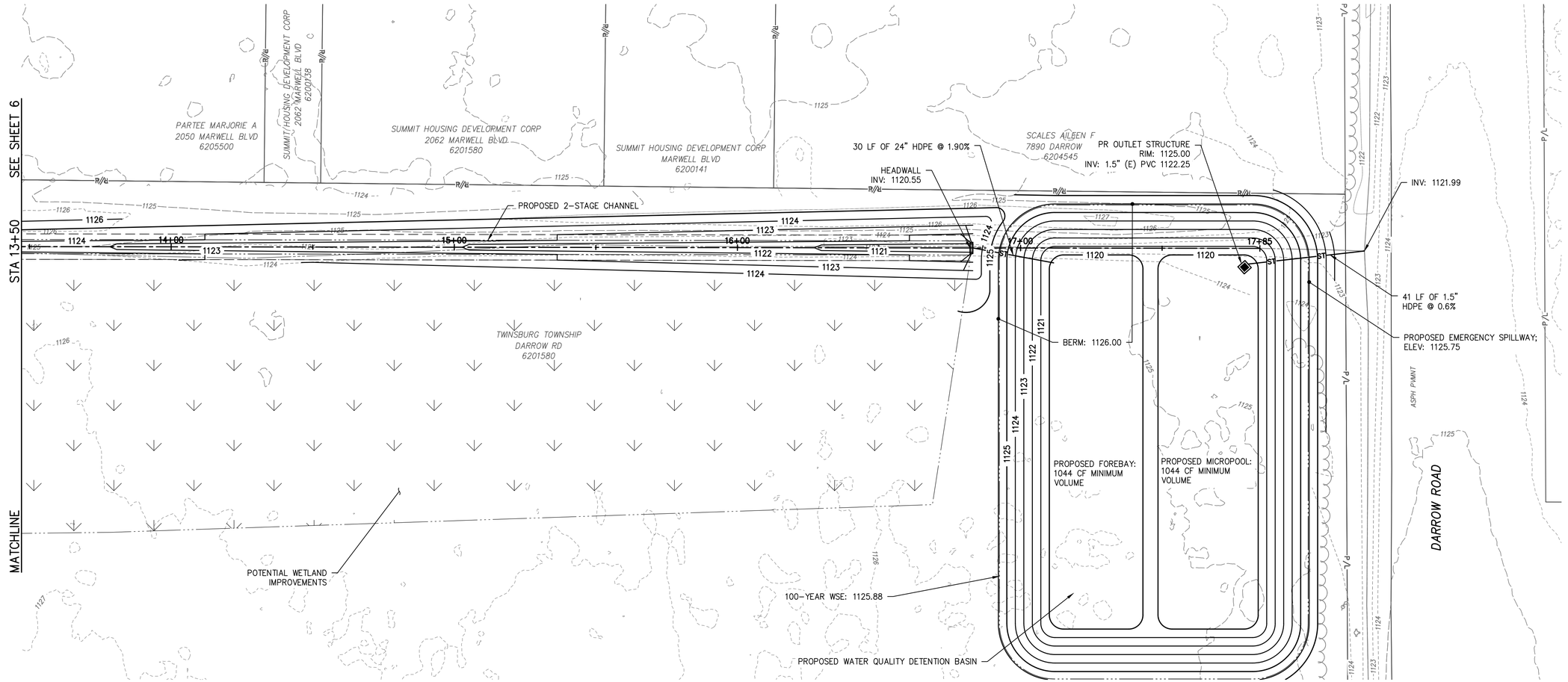

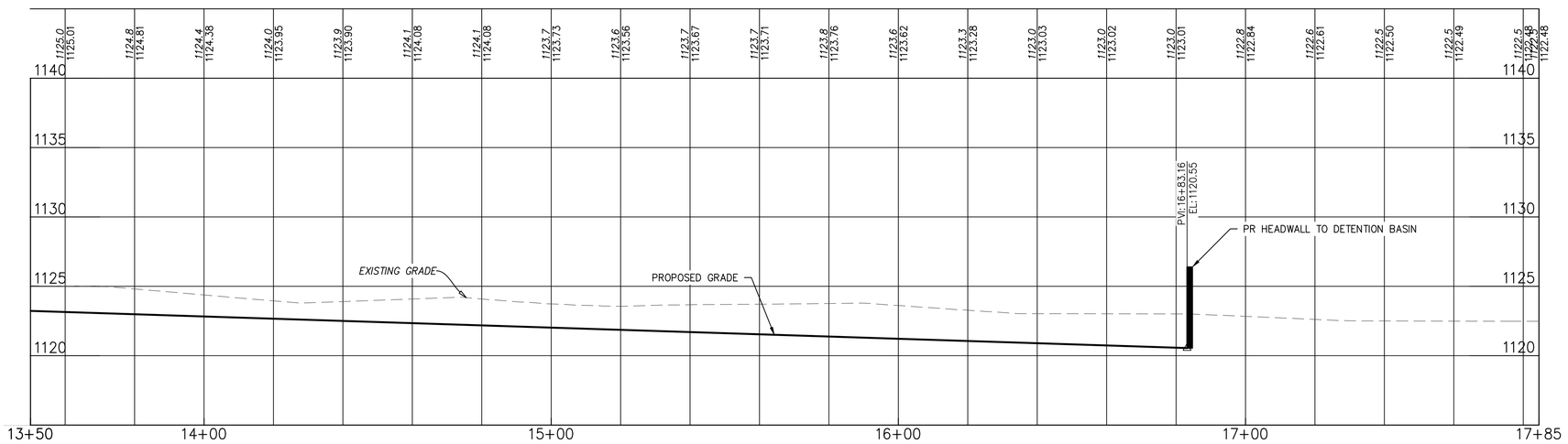

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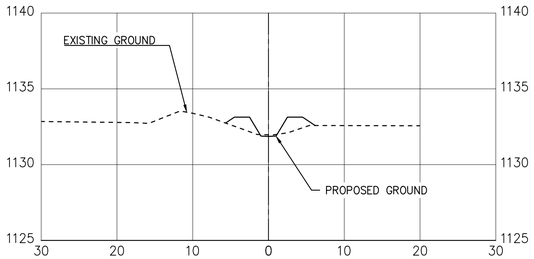

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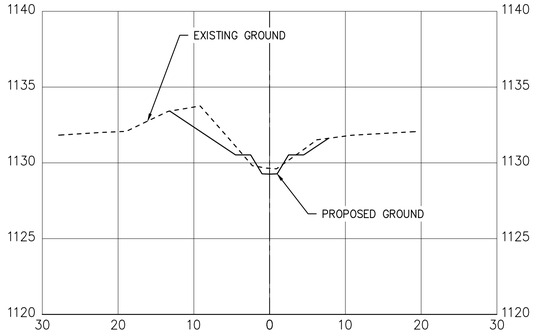

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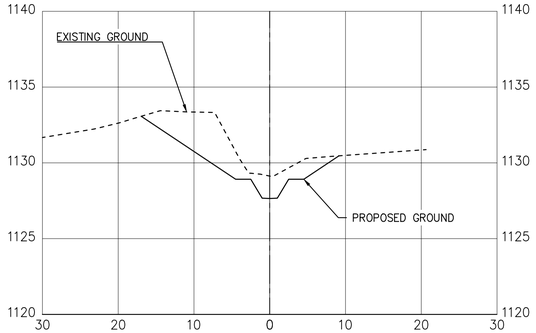

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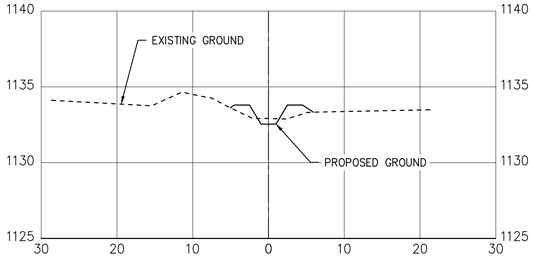

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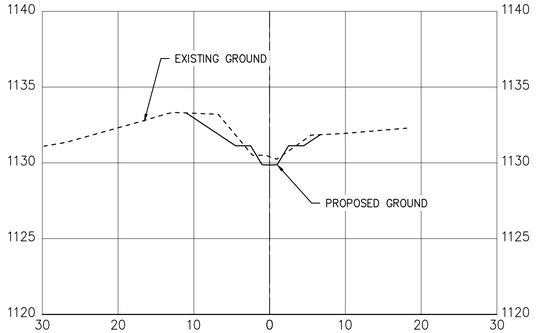

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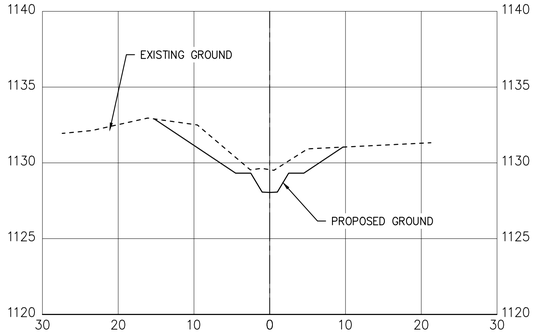

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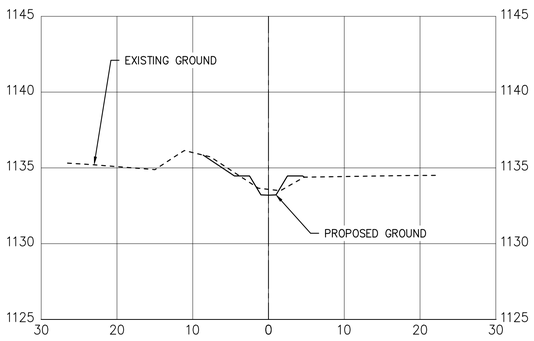

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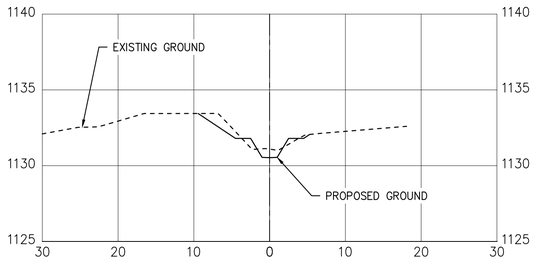

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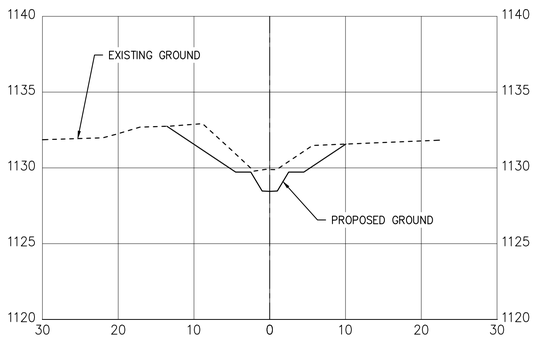

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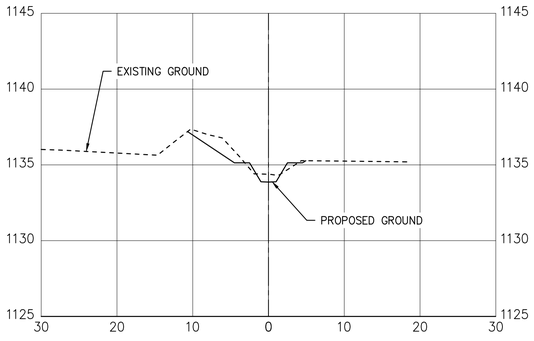

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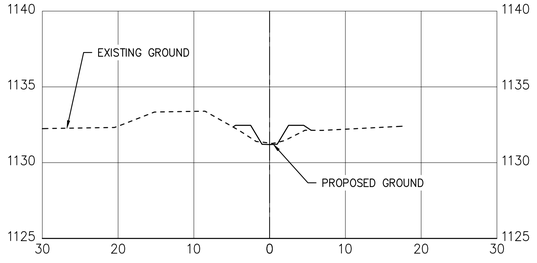

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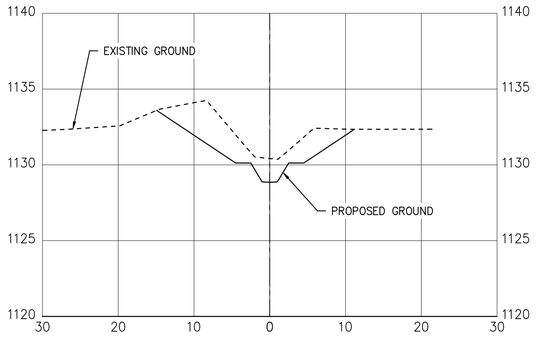

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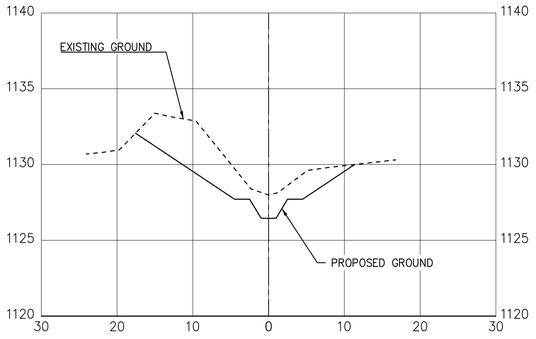

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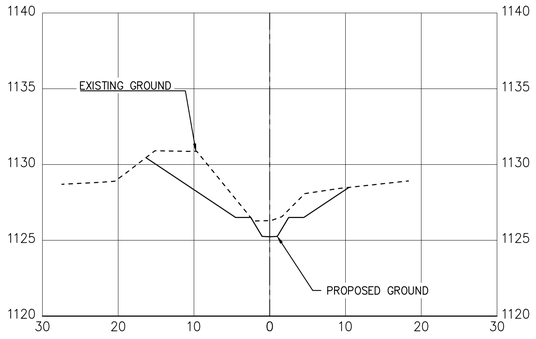

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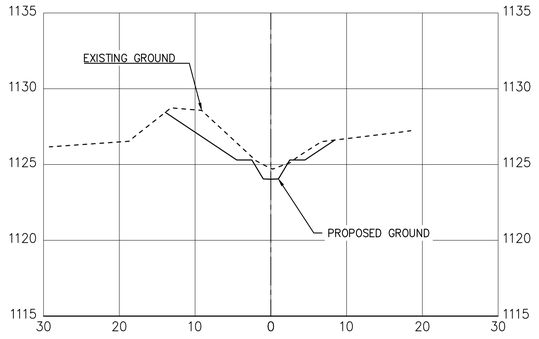

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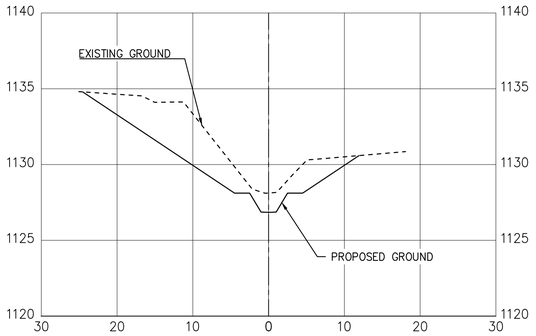

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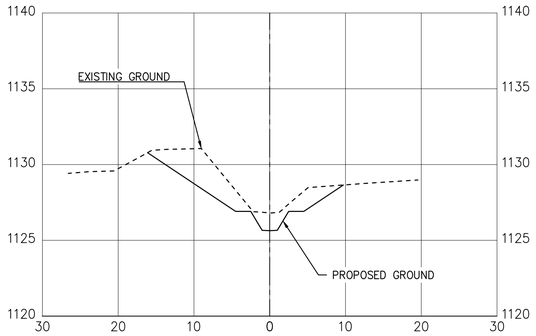

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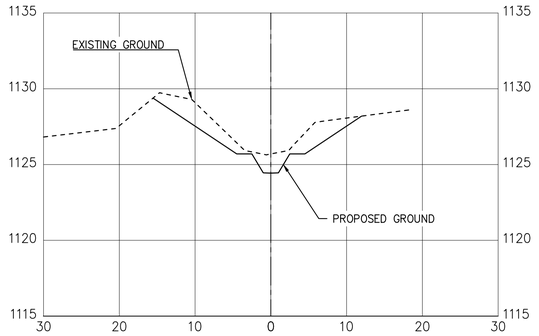

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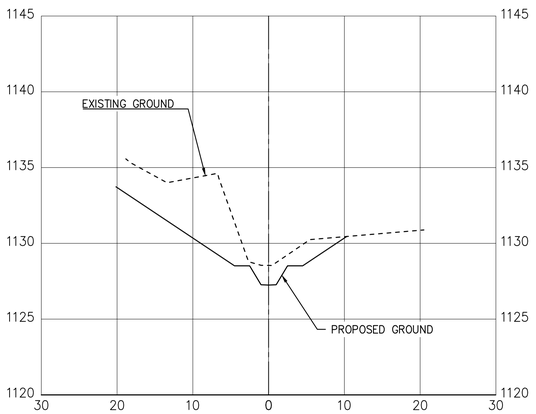

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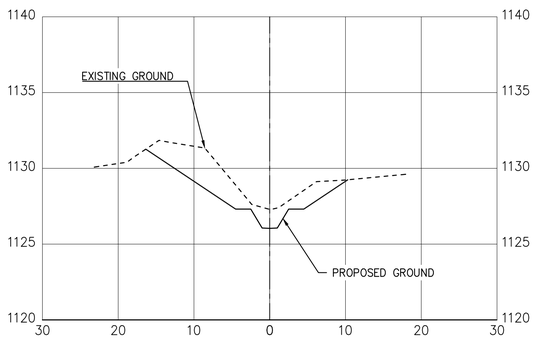

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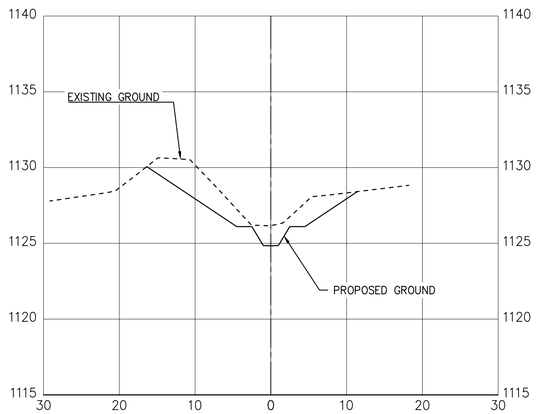

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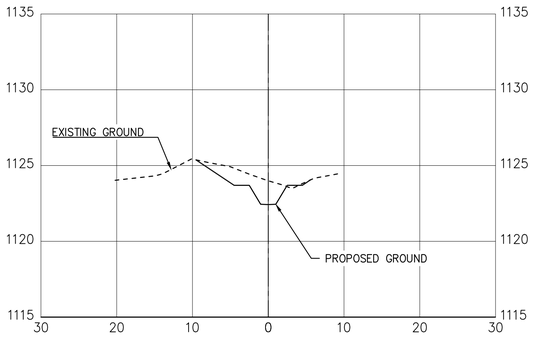

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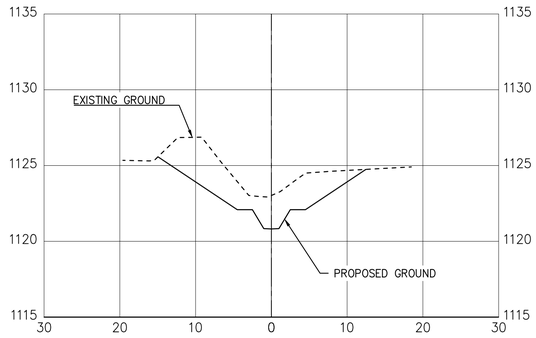

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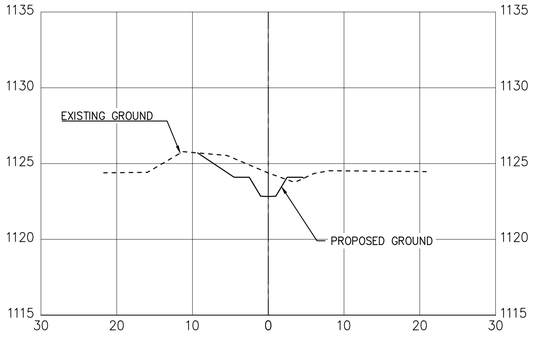

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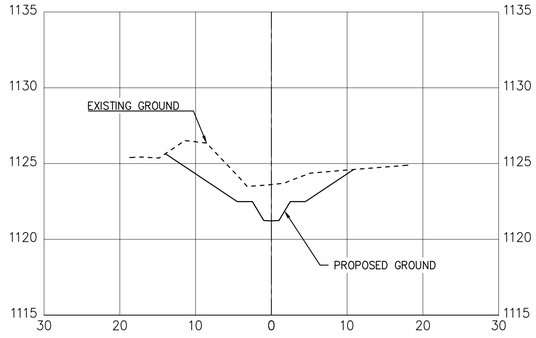

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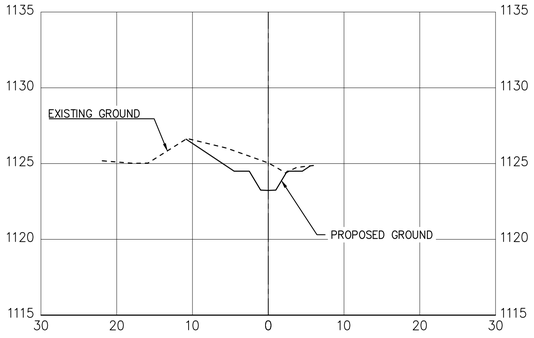

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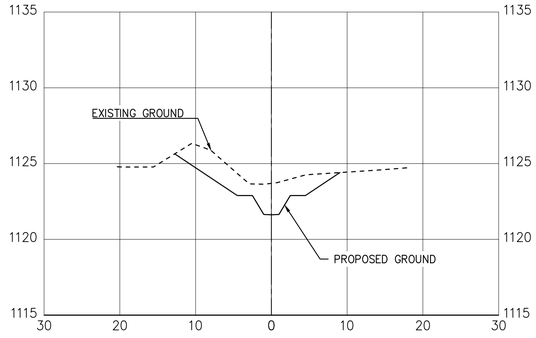

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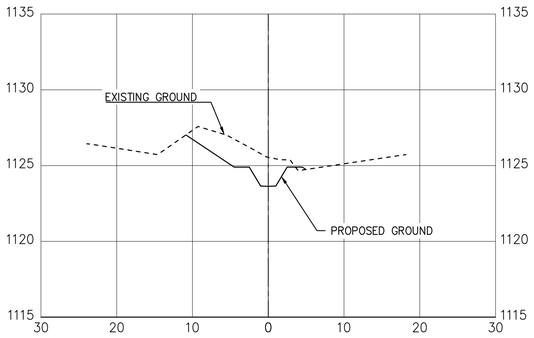

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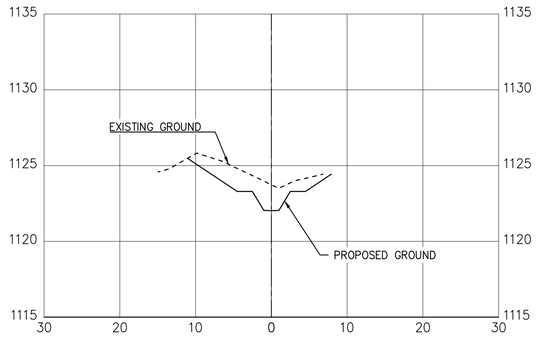

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CONCEPT 1 CROSS SECTIONS

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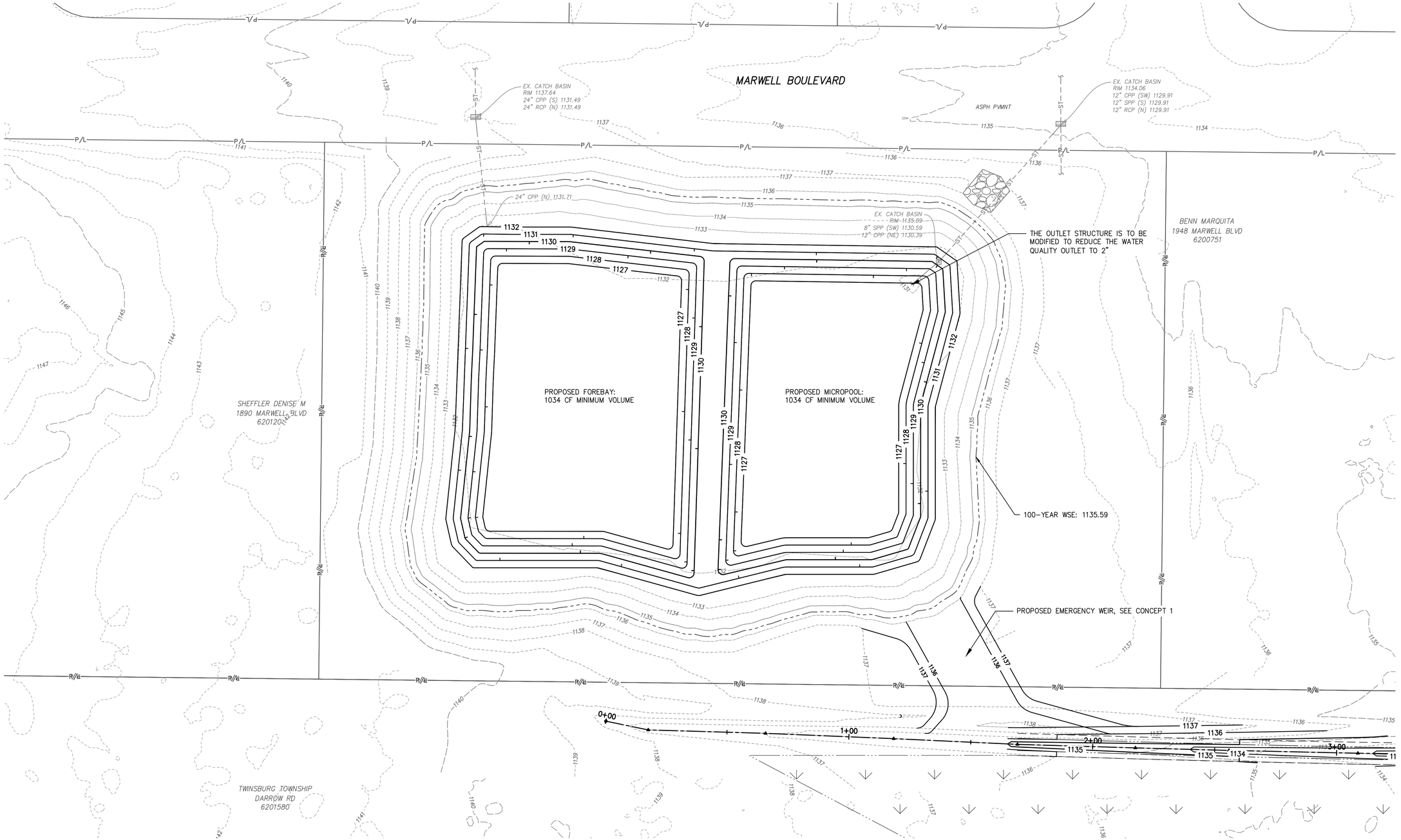

CONCEPT 2: EXISTING BASIN IMPROVEMENTS (MARWELL BASIN)

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GRAPHIC SCALE IN FEET

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Know what's below. Call before you dig.

MARWELL BOULEVARD & DARROW ROAD CONCEPTS

SUMMIT COUNTY

CONCEPT DRAWINGS

DATE: _____

REVISIONS

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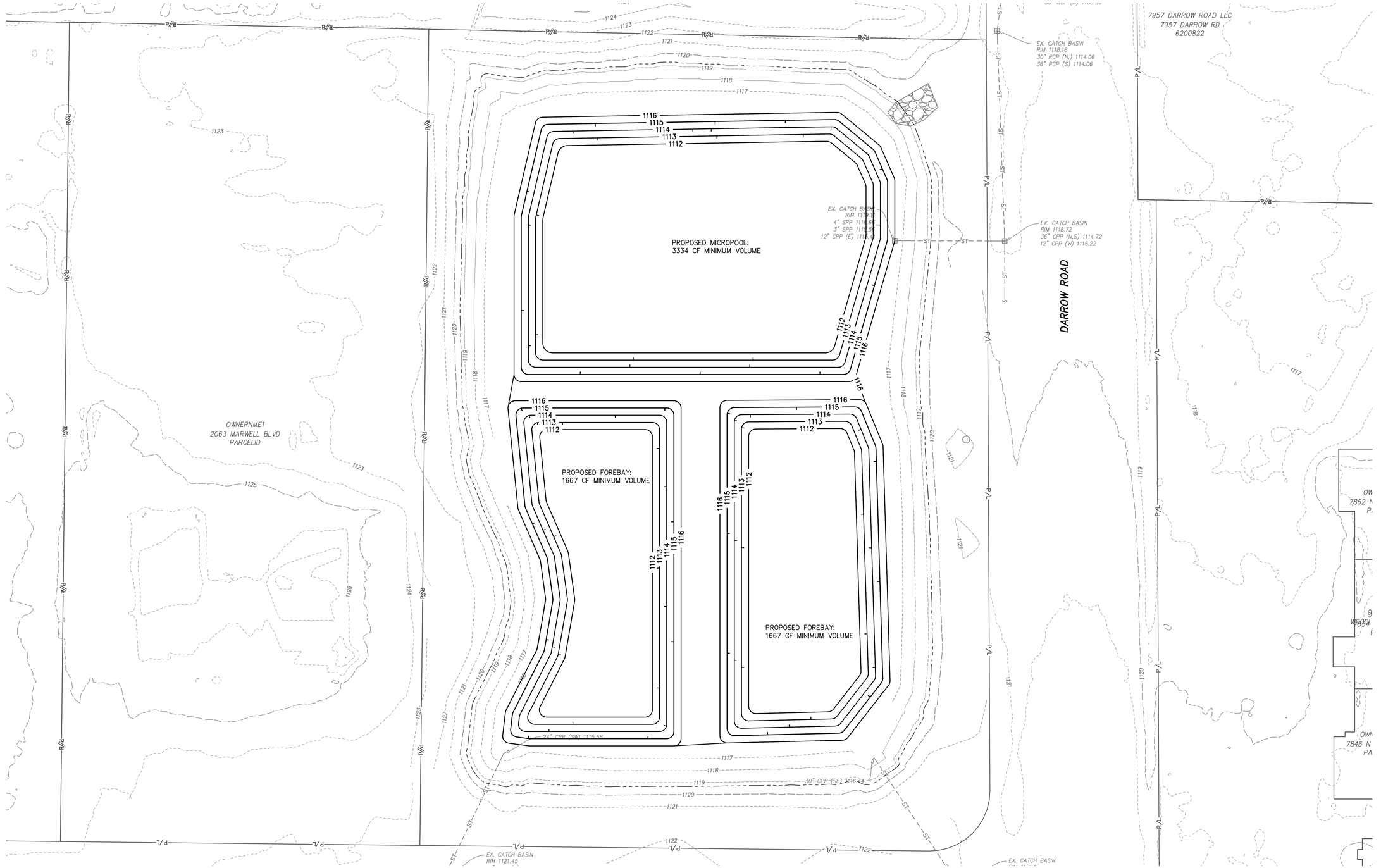
PROJECT NO.:	23-00391-030
DRAWN BY:	SWA
CHECKED BY:	JWO
DATE ISSUED:	JUNE 2025

CONCEPT 2 GRADING PLAN (MARWELL BASIN)

NOT FOR CONSTRUCTION



CONCEPT 2: EXISTING BASIN IMPROVEMENTS (DARROW BASIN)

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MARWELL BOULEVARD & DARROW ROAD CONCEPTS

SUMMIT COUNTY

CONCEPT DRAWINGS

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REVISIONS

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PROJECT NO.:	23-00391-030
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CHECKED BY:	JWO
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CONCEPT 2 GRADING PLAN (DARROW BASIN)

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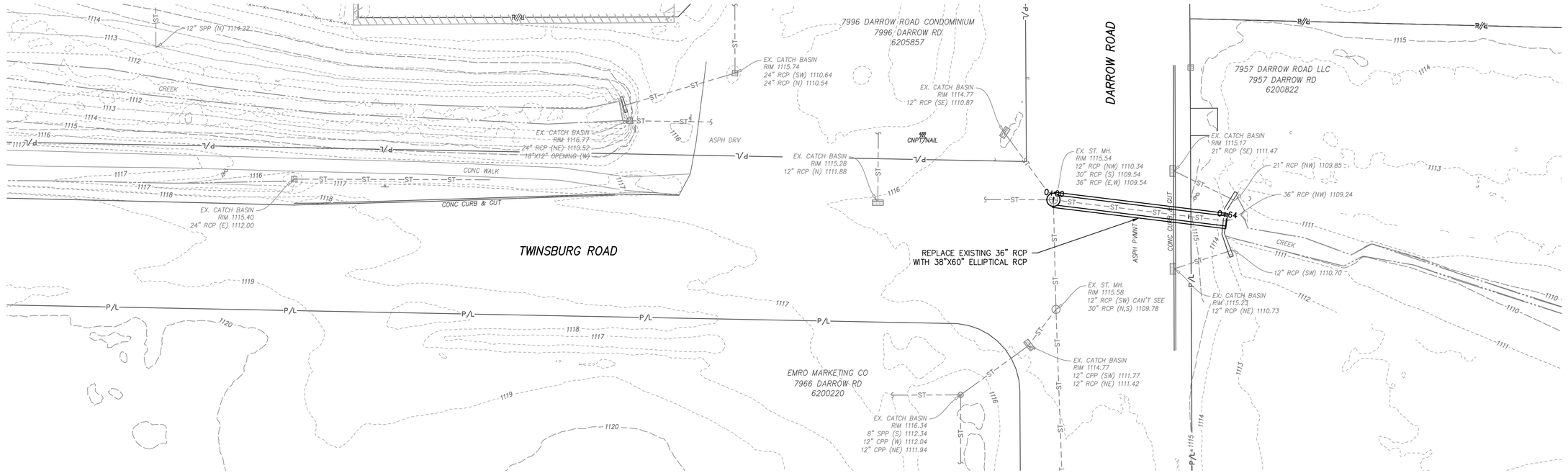

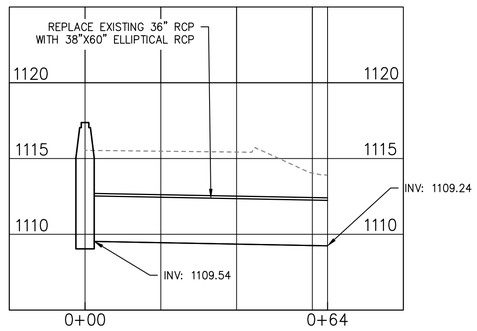

CONCEPT 3: ODOT CULVERT IMPROVEMENTS

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GRAPHIC SCALE IN FEET

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MARWELL BOULEVARD & DARROW ROAD CONCEPTS

SUMMIT COUNTY

CONCEPT DRAWINGS

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CONCEPT 3 PLAN AND PROFILE

16 OF 16

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