HARBOR LIGHT DEVELOPMENT
MU-P REGULATING PLAN

For Lots 1, 2, & 3

Arrowhead Road, Duluth, MN

City of Duluth, MN
Planning Department Submittal
JULY 1, 2020
Final for City Approval
Revised May 5, 2026

This plan has been reviewed and approved by the City of Duluth Land Use Supervisor.

Signed by:
Jennifer LR Moses
978B952DFFDE448...

5/5/2026 | 11:54:09 CDT

Land Use Supervisor Signature | Date

For:
Gospel Tabernacle Church
& Lotus Realty Services

LHB Inc.
21 West Superior Street
Suite 500
Duluth, MN 55802

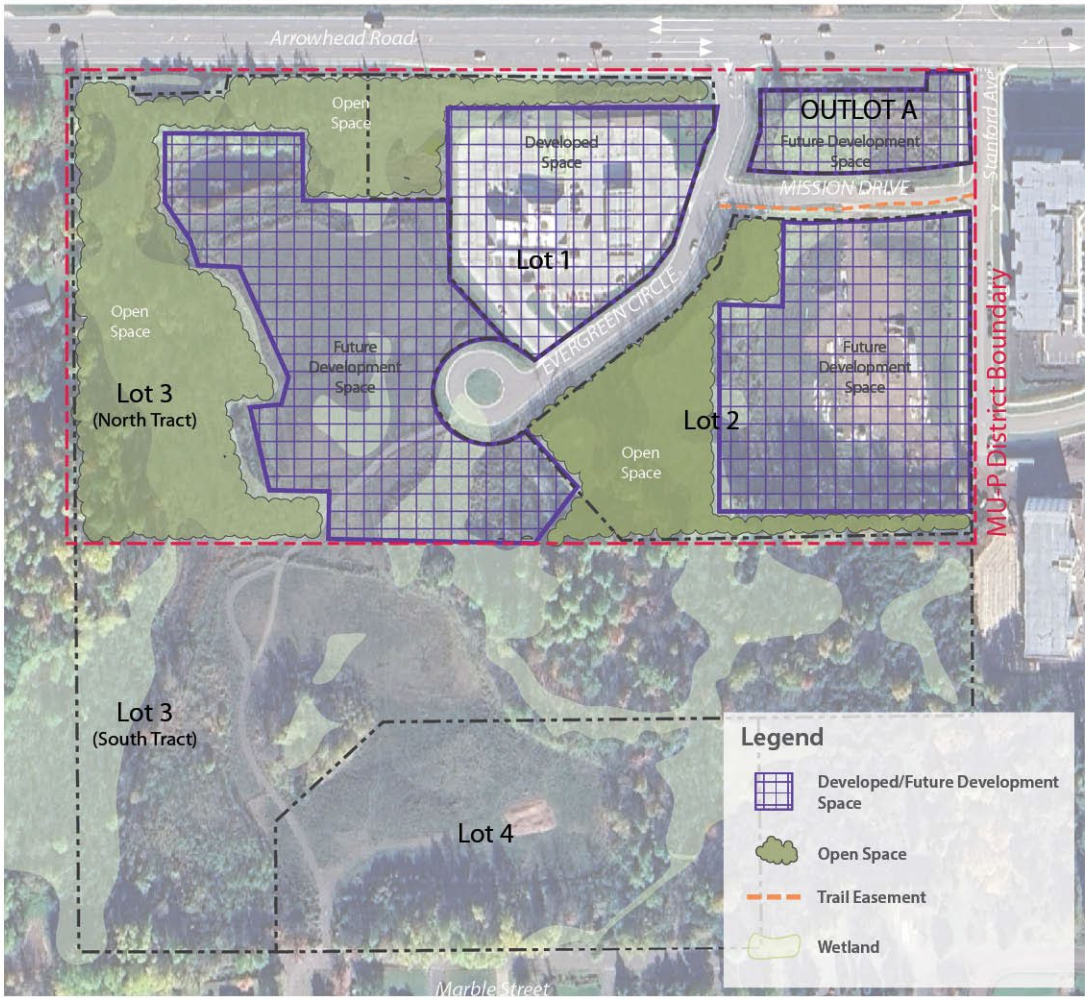
LHB Project #: 260002 (original #150732)

General Layout of Development

a) Below is a master plan illustrating the general layout of development areas and building parcels in relation to the natural features to remain, the proposed road, trail, and bicycle circulation systems.

All regulation and code related items are included in the following pages.

General Layout (Proposed)



Harbor Light Development

0 75' 150' 300'

Dimensional Standards & Lot Allocation

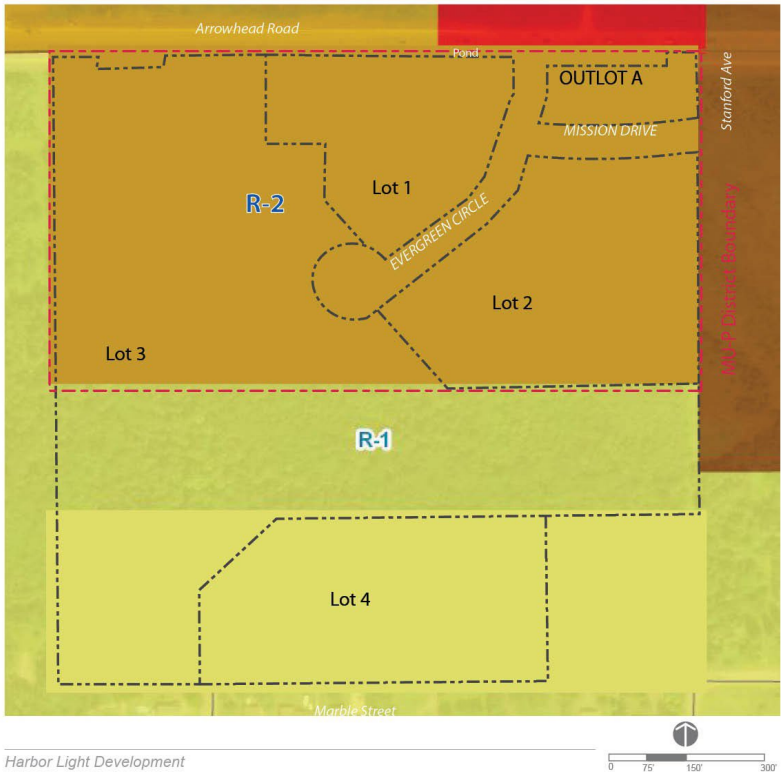
b) Below is a table listing lot sizes, widths, building setbacks, open space, maximum building heights and maximum densities for all proposed development parcels.

Lot	Gross Acres	Open/ Green Space	Net Developed Acres	Permitted Uses *See page 10 for a list of permitted uses.	Maximum Density		Max. Height	Building Setback	
					Type	Lot Standards		Type	Structure Setbacks min.
1	3.00 ac	0.78 ac (26%)	2.22 ac (74%)	Mixed Use/ Commercial	One-family	4,000 sf	45’	Front yard	25’
					Two-family	2,500 sf		Side yard (buildings < 3 stories)	6’
					Multifamily	750 sf		Side yard (buildings > 3 stories)	10’
					Townhouse	2,200 sf		Rear yard	25’
2	5.05 ac	1.96 ac (39%)	3.09 ac (61%)	Mixed Use/ Commercial	One-family	4,000 sf	66’	Front yard	25’
					Two-family	2,500 sf		Side yard (buildings < 3 stories)	6’
					Multifamily	750 sf		Side yard (buildings > 3 stories)	10’
					Townhouse	2,200 sf		Rear yard	25’
3 North Tract	8.16 ac	4.26 ac (52%)	3.9 ac (48%)	Community/ Civic	One-family	4,000 sf	45’	Front yard (min)	25’
					Two-family	2,500 sf		Side yard (buildings < 3 stories)	6’
					Multifamily	750 sf		Side yard (buildings > 3 stories)	10’
					Townhouse	2,200 sf		Rear yard	25’
Outlot A	0.80 ac	n/a	0.80 ac	Stormwater		n/a	n/a	n/a	n/a
R/W	0.95 ac	n/a	0.95 ac	Public Right-of-Way		n/a	n/a	n/a	n/a
Total	**17.96 ac**	**7 ac**	**10.96 ac**	n/a		n/a	n/a	n/a	n/a

Previous Base Zone Districts

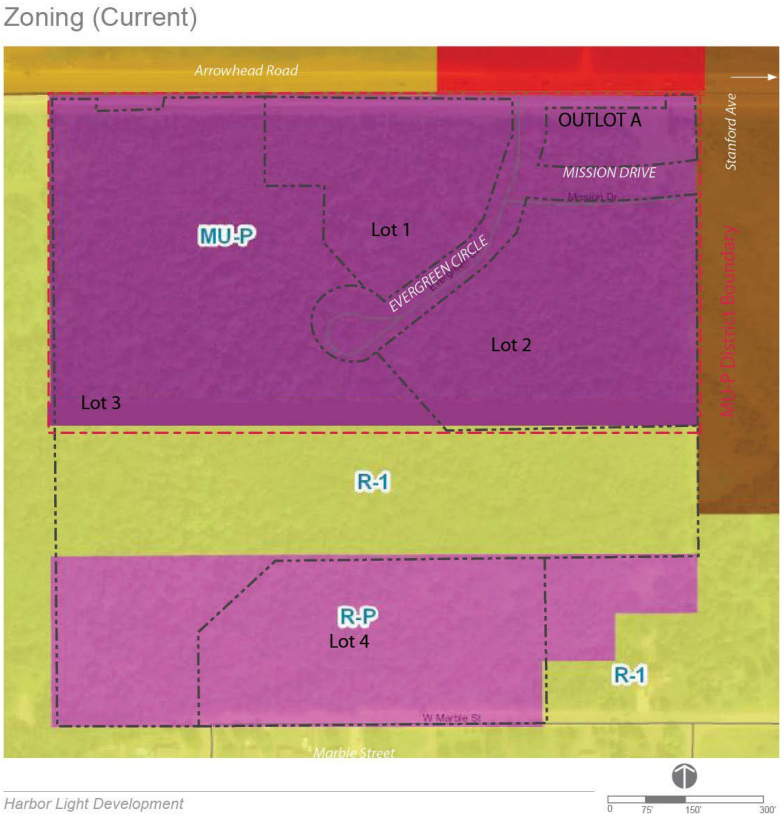
c) To the right is an exhibit showing the parcels previous zone district of R-2 (Residential-Urban).

Previous Base Zone



MU-P ZONE

Below is an exhibit illustrating current zoning of the property, which consists of MU-P zone to the north (shown in purple), and an R-1 zone to the south.



Traffic Impact Analysis

d) A traffic impact study was conducted for the Harbor Light Development by Westwood, Inc. in November of 2016. In addition, a revised trip generation and queuing lengths study was done in March of 2018 to further assess future conditions and address potential design changes for the proposed intersection of Arrowhead Road and Evergreen Circle.

A summary of the traffic impact analysis findings and recommendations are below:

- Although development land uses and sizes are not finalized, the general land use types and sizes can be accommodated from a traffic perspective.
- A single site access onto Arrowhead Road can operate acceptably as a side street in the short term but should be considered for signalization in the long term, depending on the types of land use that are considered.
- Arrowhead Road will need to be re-striped at the intersection with the Harbor Light access road to allow for a westbound left turn lane. (200 feet of storage).
- The Harbor Light access road (now called Evergreen Circle) is recommended to have a dedicated right turn lane and a dedicated left turn lane approaching Arrowhead Road. It is recommended that the right turn lane have a stacking length of 250 feet (for unsignalized condition) and that the left turn lane be a continuation of the northbound approach lane.

- The creation of a southerly connection to Marble Street may relieve some traffic volume approaching Arrowhead Road, as some development traffic may divert to the neighborhood to the south. Conversely, the connection with Marble Street may cause traffic from that southerly neighborhood to use the Harbor Light north-south road to access Arrowhead Road and beyond. Nevertheless, as the Harbor Light development is built out, signalization will likely be warranted at Arrowhead Road.

There will be a natural surface trail for pedestrian traffic only, that will connect from Evergreen Circle to Marble Street to the south. In the future, and once Lots 3 and 4 are fully developed, the public trail will be required to be paved.

A development agreement memorializing understandings about multi-use trails and traffic control solutions for Evergreen Circle and Stanford Avenue intersections with Arrowhead Road has been executed.

Circulation Plan

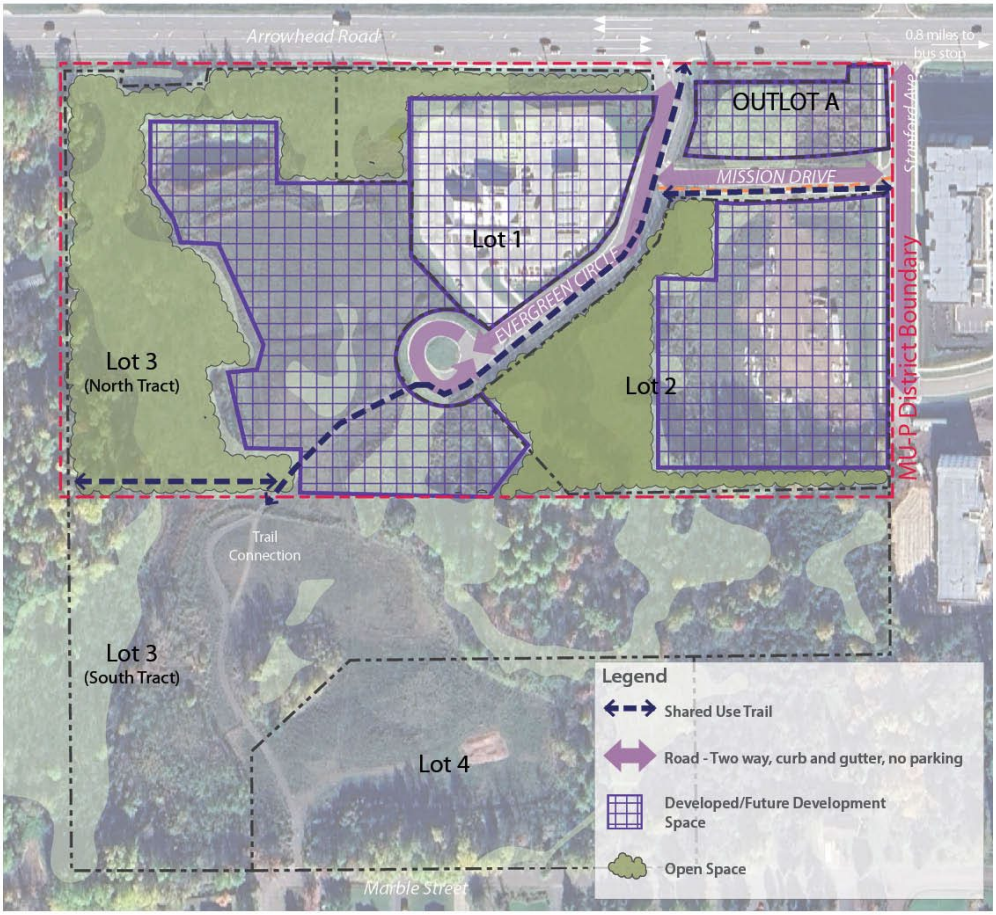
e) Below is a circulation plan overlaid on the general layout plan. The MU-P will include two new public roads; Evergreen Circle and Mission Drive, and a third public road, Stanford Avenue, which resides outside the MU-P boundary. The roads will be asphalt pavement with concrete curb and gutter and maintained by the City.

An 8-foot wide multi-use trail will run along Evergreen Circle and a 5-foot wide sidewalk will run along Mission Drive. The extra wide trail along Evergreen Circle will be a part of a multiuse trail connecting Arrowhead Road and Stanford Avenue to Marble Street. The portion of the trail beyond Evergreen Circle will not be paved until the buildout of Lot 3, and then continue outside the scope of the MU-P. The trail will be a compacted gravel trail until the complete buildout occurs, with the future trail consisting of asphalt. The segments of the trail south of Evergreen Circle cul-de-sac will be privately owned and maintained, but accessible to the public via an easement to be dedicated at time of building permit principal structure on Lot 1. Signage to be installed at both ends of trail identifying trail as open to public usage. The MU-P is 0.8 miles away from a bus stop and it is not proposed to have a new transit stop at this time. There will be an E/W natural surface trail connecting the cul-de-sac at Evergreen Circle with Sonside Park (located to the west) which will be maintained by the owner of Lot 3 but made available to the public via an easement to be dedicated at the time of building permit for the principle structure of Lot 3. Signage to be installed at both ends of the trail. Sidewalks and trails will connect to the main entry of buildings and there will be ample space available near building entries for future bike racks.

Development Guiding Principle 1:
Enhance Connectivity with a New Public Pathway

The public pathway system currently serving the Duluth Heights neighborhood is poor and not very well connected. The MU-P zone will enhance local connectivity by featuring a new pedestrian pathway system, linking together adjacent neighborhoods while also providing enhanced access to Arrowhead Road and surrounding amenities. This new network of pedestrian paths will create additional outdoor recreational opportunities, as well as provide alternative transportation throughout the area by encouraging healthy outdoor activities, while increasing public access to nature.

Circulation Plan



Harbor Light Development

Natural Resources Inventory

f) Approximately 11± acres of the MU-P property are planned for a new public roadway and mixed-use development. A wetland delineation and comprehensive tree survey were conducted to mark these natural resources within the site. The balance of the site (7± acres) will remain in its natural condition, which consists of mature wooded vegetation and wetlands on varied topography. Approximately 80% of the naturally occurring wetlands will be undisturbed, allowing the diverse landscape to continue to act as a rich ecological feature benefiting local wildlife, and the surrounding environment.

Below is the tree preservation plan approved by the city illustrating the wetlands and trees to be protected in a conservation area (illustrated by the light green hatch). The conservation area resides within the common open space boundaries but does not cover the entire common open space. Common open space is defined in the following section g. A contribution was made to the City's tree fund in lieu of tree plantings.

Development Guiding Principle 2:
Celebrate & Maintain the Natural Setting with Sustainable Development

The overall site concept plan has been designed with sustainability in mind; not only have wetlands been avoided when possible, preserving mature trees and natural drainage ways have also been taken into consideration. The placement of buildings has been sited to minimize earth-moving activities and take advantage of certain viewsheds, and climatic conditions (like western exposures for daylighting and heat gain).

Common Open Space

g) The below MU – P Common Open Space Plan is intended to maximize the natural beauty and ecological features of the site while also providing new public amenities to the Duluth Heights and nearby neighborhoods. The areas shown as passive recreational space are considered common open space and total 39% of total land area (this only includes areas outside of the right-of-ways). Protection and maintenance of the open space will be the responsibility of the private landowners, however access to these public spaces will be provided via trail, public road, or parking lot access. Common Open Space is generally not developable and should remain in its natural state, however up to 5% of the common open space (per lot) can be temporarily disturbed for development and then restored back to its natural state.

Lot 1 (3.0 ac) = Total common open space is **.78 acres**
Lot 2 (5.05 ac) = Total common open space is **1.96 acres**
Lot 3 North Tract (8.16 ac) = Total common open space is **4.26 acres**

Development Guiding Principle 3:
Provide an Inclusive Publicly Accessible Mixed-Use Space
The Harbor Light Development mission is built around a welcoming community. On Parcel 3 (the largest of the lots), a new church will be constructed and will be an inclusive space, inviting the public to gather, be active, and enjoy association and fellowship with others. The new church building will feature a sanctuary space, but will also include indoor classrooms, and passive

outdoor recreational spaces for people of all ages. Commercial uses are planned for the two smaller parcels which will add variety to the mixed-use development and will be interconnected via public road and a new pathway system. The entire MU-P zone will be publicly accessible to visitors as well as residents in adjacent neighborhoods. Wetland areas outside the common open space boundary remain subject to permitting and requirements established in the Wetland Conservation Act. This regulating plan does not provide approval for any wetland impacts and any future impacts must be permitted appropriately.

Permitted + Special Uses

h) Below is a list of permitted uses within the MU-P by Lot:

Lots 1 & 2 (Mixed Use/Commercial)

- Dwelling: townhouse, multi-family, live-work, single-family
- Bank
- Office
- Medical or Dental Clinic
- Lodging (Hotel or Motel)
- Restaurant (less than 5,000 sf with or without drive-thru)
- Restaurant (5,000 sf or more with or without drive-thru)
- Retail store less than 10,000 sf
- Filling Station (with or without convenience store)
- Garden Material Sales
- Personal Services or Repair, larger than 10,000 sf
- Personal Services or Repair, smaller than 10,000 sf
- Event Center
- Preschool
- Parking Lot

Lots 3 (Community/Civic)

- Club or lodge (private)
- Park, playground or forest reserve
- Religious assembly, small (less than 50,000 sq. ft.)
- Religious assembly, large (50,000 sq. ft. or more)
- Agriculture, community garden
- Agriculture, farmers market
- Agriculture, urban

Outlot A

- Storm Pond

Maximum Densities

i) Please refer to the Dimensional Standards & Lot Allocation table on page 3 for maximum densities, minimum lot standards, and maximum square footage for non-residential land uses.

Utility Plan

j) Please refer to the City approved utility plans in the appendix for the detailed design of the utility components.

Public utilities, including water, sanitary and storm sewer will be installed under the public road and within the public right-of-way of Evergreen Circle, Mission Drive and Stanford Avenue will be maintained by the City of Duluth, Public Works & Engineering Department. Private utility hook-ups extending from the City mainlines will be installed for each lot and will be designed to meet City engineering standards. Each private utility will be maintained and paid for by the private landowner.

See page 14 for additional information on storm water management.

Buffer Plan

k) The buffering or transitioning between uses of different intensities will be attained with the vegetation provided in the areas put into conservation as outlined in the tree preservation report. The buffering between uses that do not have a conservation area between should follow section 50-25.5 of the Duluth UDC.

Stormwater Collection

l) Storm water runoff from the roadways will be directed to storm water storage basins via storm sewer or direct drainage and will collect into a public stormwater pond on Outlot A. From there, storm water will outlet into the project's receiving waters, the Chester Creek watershed at the required water quality and peak rate controls allowed. A summary of the stormwater requirements is below:

Stormwater Design Requirements

Requirement	Compliance	Comments / Compliance Method
No net increase of TSS/TP from predevelopment conditions.	Yes	This is in compliance by biofiltrating of rainfall from the new impervious.
Peak Discharge Rate Control-Discharging 90% or less of the 2yr storm event and 75% or less of the 10yr & 100yr storm events.	Yes	Peak discharges were controled by limiting the amount of impervious surfaces and the underground storage facility.
Runoff Volume Control	Yes	Runoff volumes were reduced by the maximum extent practicable by the use of structural and non-structural BMP's

Development Guiding Principle 4:
Use Innovative Stormwater Management Design Principles

The Harbor Light Development Stormwater Plan will exceed minimum stormwater requirements on site, through the use of best management practices. Because the project site is in the Chester Creek watershed (a protected trout stream) the stormwater design will be required to achieve a certain rate, water quality and temperature control. Specifically, storm water will drain to new catch basins and be routed via storm sewer to biofiltration basins located near the low areas of the site. The basins will then treat and cool the storm water by filtering it through a sand and compost filter prior to discharging the storm water to existing culverts underneath Arrowhead Road. The storm controls will provide mitigation of increased developed runoff by providing enhanced water quality, rate and volume control, TSS and TP removal, and thermal reduction. The site is sloped with shallow bedrock and low permeable soils, reducing the natural infiltration rates, though infiltration will occur. Individual parcels will use structural stormwater management facilities that meet the goals of this development guiding principle and City stormwater requirements. This development may use both aboveground storage as well as non-structural controls to treat the runoff as efficiently as possible, as it relates to the site grades and local geology.

All future stormwater basins will include tree planting for shading, inception of rainfall and water uptake, and will be planted with native and pollinator species to provide better ecological function to the site and watershed.

In addition, the site has natural occurring wetlands which will be protected and avoided as much possible as well as celebrated for their ecological value. The site will encourage diversity of species and wildlife within the green space, offering not only exclusive habitat, but opportunities for birders and other wildlife watchers.

Off-Street Parking

m) Off-street parking to be provided in driveways, surface lots and garages.

Public Amenities

o) A publicly accessible trail network system will be included in the MU-P, as well as common open space areas. See section d, Circulation Plan for location of the trail and see Section g, Common Open Space for the location of the recreational passive space.

The multi-use trail system throughout the development will provide new connections to the adjoining neighborhoods and streets that have not otherwise existed before. A paved trail will run north – south from Arrowhead Road to Marble Street providing a new pedestrian and bike corridor for the local community. In addition, an informal footpath will link to the adjacent neighborhood to the west. This public amenity totals over 1 mile of new trails.

Figure 1: Example of paved multi-use trail and natural surface trail

The MU-P district will also be providing a public benefit by conserving naturally sensitive areas and allowing community access to 6+ acres of green space that has previously been privately owned. The common open space is comprised of preserved wetlands along with a designated tree conservation area with high-quality woods that include white pine, red pine, maple, birch, aspen and basswood species. The green space areas are home to wildlife habitat and act as buffers from wind as well as provide screening from other developed areas. Additional footpaths and/or walking trails will develop naturally over time and will provide additional access to the community green space.

Figure 2: Example of common open space with informal footpath

Preserving this ample green space will benefit the community in multiple ways, as providing the opportunity to experience

Figure 3: Example of trail signage

nature in a close setting has been shown to be beneficial to human health and wellness by reducing stress, improving general mood and attitude, increasing mental health, improving mindfulness and creativity. It will also provide homeowners with a chance to connect with each other as the presence of trees and landscape has been shown to promote community connections. Lastly, views of green space are linked to greater perceptions of well-being, neighborhood satisfaction and safety.

Architectural Building Standards

p) Proposed buildings will comply with the UDC Chapter 50.30 to implement building design standards.

Suggested exterior building materials include brick, stone, wood clapboard, hardboard, concrete or vinyl siding with complimentary color choices. The MU-P desires durable construction techniques that are ecologically sensitive while also promoting visual harmony throughout the neighborhood. And will need to be submitted to the Land Use Supervisor for review and approval.

Phasing Plan

q) Harbor Light Development will take shape over a 5–10 year timeframe. Phasing of the development is anticipated to be as follows:

PHASE 1: (2017- 2020)

Final Design + Construction of Public Roads (Evergreen Circle, Mission Drive & Stanford Ave), + Convenience Store on Lot 1

PHASE 2: (2026-2028)

Construction of mixed-use buildings + site development of Lot 2

PHASE 3: (2028 and beyond)

Construction of new church + site development of Lot 3

Streetscape

r) Cross sections, similar to those illustrated below, demonstrating the proportions of all proposed buildings and/or pedestrian spaces and their relationship to the streetscape shall be submitted to the Land Use Supervisor for review. These cross sections are required to ensure that appropriate spatial dimensions and desired visual elements contributing to the street's character are achieved.

Urban design best practices, such as siting buildings so that primary entrances are visible and accessible from the street, terracing retaining walls to minimize impacts to streets, providing curb ramps and marked crosswalks for pedestrian safety, and planting street trees for shade and aesthetic beauty, will be incorporated into the site designs. In addition, site furnishings, such as bike racks, trash receptacles and outdoor seating/benches will be considered as well, depending on the types of buildings proposed.

Below are examples of typical cross sections showing spatial dimensions and street character for residential front yards, sidewalks, tree lined boulevards, pedestrian lighting, two-way traffic, on-street parking and commercial uses with off-street parking.

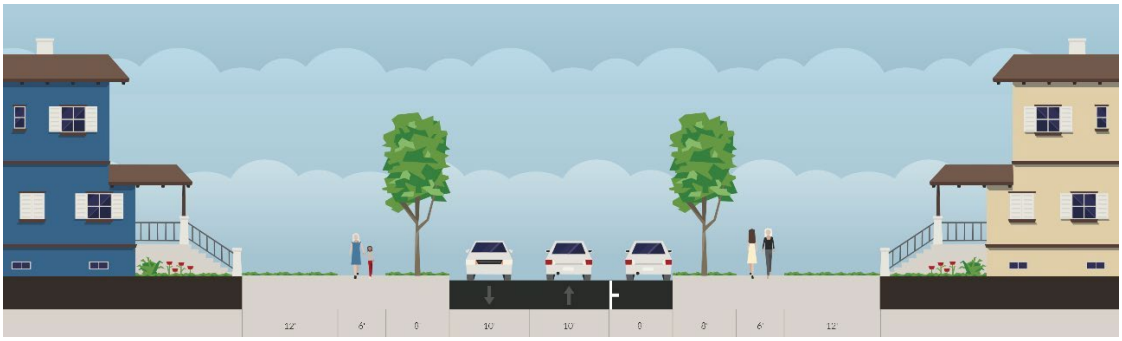


Figure 4: Example of Residential Streetscape

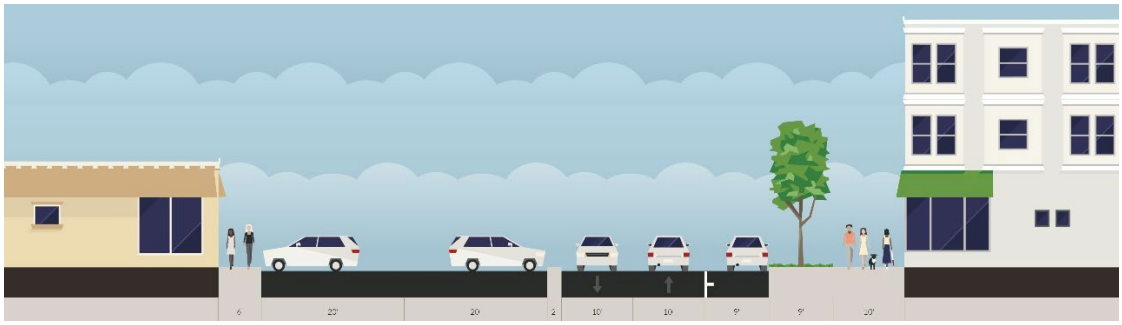


Figure 5: Example of Commercial Streetscape

Appendices

Westwood

7699 Anagram Drive
Eden Prairie, MN 55344

Main (952) 937-5150
Fax (952) 937-5822

westwoodps.com
(888) 937-5150

MEMORANDUM

Date: November 16, 2016

Re: Traffic Impact Study – Harbor Light Development, Duluth, MN
File R0009613.00

To: Brad Johnson, Lotus Realty Services

From: Steve Manhart, P.E. PTOE, PTP

Westwood Professional Services, Inc., has conducted a study to determine the traffic impacts of the proposed Harbor Light development in Duluth, MN (see Figure 1). The 35.59-acre development is proposed on a parcel south of Arrowhead Road (St. Louis County Highway 32) one-quarter to one-half mile west of North Arlington Avenue (CSAH 90).

Existing Conditions

The parcel exists as an undeveloped vacant wooded area of land.

Arrowhead Road is a four-lane minor arterial roadway with a center two-way left turn lane. Posted speed limit of the roadway is 40 mph in this area. Arrowhead Avenue has a daily vehicular volume of approximately 13,100 vehicles/day. Sidewalk exists along the south side of Arrowhead Road.

Arlington Avenue is a two-lane minor arterial roadway with turn lanes as it approaches Arrowhead Road. Posted speed limit of the roadway is 40 mph in this area. Due to heavy right turn demand, a separated westbound right turn lane has been constructed. In this area, Arlington Avenue has a daily vehicular volume of approximately 11,000 vehicles/day. Sidewalk exists along the west side of Arlington Avenue south of Arrowhead Road.

The intersection of Arrowhead Road and Arlington Avenue is controlled by a traffic signal. Left turn movements are controlled by flashing yellow arrow phases. Pedestrian indications exist for the north, south and west legs of the intersection.

No-Build Conditions

In April 2016, SRF Consulting Group, Inc., prepared a traffic study for Duluth Edison High School and apartment complex that was proposed north of Rice Lake Road in Duluth.[1] Included in the study area was the intersection of Arrowhead Avenue and Arlington Road.

The traffic study included turning movement traffic count data that had been collected during the week of October 5, 2015. In addition, the study projected trips for analysis of year 2020 traffic in no-build and build conditions. Because the turning movement volumes presented in the SRF report reflect conditions that will be present with the completion of the sigh school and apartment complex, these were used in the Harbor Light Traffic Study to reflect No-Build Conditions – the traffic conditions onto which the harbor Light traffic can be tested.

Proposed Land Use

The Harbor Light development is proposed to include the following land uses:

- Mixed Use (Parcels B & C to be built in the immediate future)
  - Parcel B (4.36 acres) consisting of a Gas Station/Convenience Store to be constructed in conjunction with the north-south public street;
  - Parcel C (5.0 acres) to be built after Parcel B consisting of light retail mixed use (e.g., coffee shop, etc.);

- Parcel A (15.6 acres) consisting of the Gospel Tabernacle Church projected to be built within the next five years); and

- Residential Use (9.33 acres) to be built at some point in the future.

Proposed North-South Street

One street is proposed to provide vehicular access into the development from an intersection with Arrowhead Road. The road will intersect Arrowhead Road at a point approximately 1,550 feet west of the Arlington Avenue. It is noted that Arrowhead Avenue tapers to an undivided four-lane section without the two-way left turn lane just west of this point.

This north-south street will bisect the property. Right-of-way for this street ends at the cul-de-sac near the proposed church, then becomes a drive aisle into the private church parking lot. This drive aisle will be constructed to allow a possible future access onto

[1] Duluth Edison High School Traffic Study, prepared for Northland consulting Engineers by SRF Consulting Group, April 6, 2016.

Marble Street. (NOTE: The future Marble Street connection will likely be an exit only, and not built immediately.)

At this time, there is no other public roadway access to be connect with Arrowhead, Marble Street or adjacent parcels. Further, it has not been determined whether this street will be a public street or private street. Either way, it will comply with City of Duluth standards for public street right-of-way, fire safety, utilities, etc.

Trip Generation and Distribution

Table 1 illustrates a projection of trip generation by proposed uses on the parcel. Trip rates utilized in these calculations were from the Institute of Transportation Engineers publication, Trip Generation Manual, Ninth Edition (2012).

Table 1 – Potential Trip Generation

		ITE			Weekday		AM peak		PM Peak	
Type	Land Use	Code		Size	Enter	Exit	Enter	Exit	Enter	Exit
Retail	Gas/Service w/ Conv & Wash	946	12	fuel pos.	872	872	71	69	66	63
Retail	Coffee - w/Drive Thru	937	3	k.s.f.	1,168	1,168	153	147	50	50
Retail	Shopping Center	820	9	k.s.f.	675	675	22	14	44	48
Residential	Single Family Housing	210	37	units	200	200	9	27	21	12
Institutional	Church	560	20	k.s.f.	87	87	7	4	4	5
Institutional	Church	560	16	k.s.f.	69	69	6	3	4	5
					3,071	3,071	268	264	189	183
					6,142		532		372	

(Source: Institute of Transportation Engineers Trip Generation Manual, Ninth Edition (2012))

While actual unit counts and square footages are still unknown, estimations have been made based on average sizes of similar land uses. Assumptions in this trip generation calculation included:

- The residential use assumed single family residential units at rate of 4 units per acre.
- Church assumed as 20,000 sq. ft. with a future addition of 16,000 sq. ft. possible.
- Mixed use retail included 3,000 sq. ft. coffee shop with drive-thru, as well as additional 9,000 square feet of neighborhood retail use.
- Gas station assumed with convenience store, car wash and 12 fueling positions.

Pass-by trips were assumed for the gas/service station use and the coffee shop with drive-thru use. These were based on the pass-by reductions found in the ITE publication Trip Generation Handbook, 3rd Edition (2014).

The Harbor Light trips were distributed onto the roadway network using the same distribution pattern identified in the SRF study:

- 20% to and from the west along Arrowhead to the west of the proposed Harbor Light development
- 20% to and from the north along Rice Lake Road to the north of Arrowhead
- 30% to the from the east along Arrowhead to the east of Rice Lake Road
- 20% to and from the southeast along Rice Lake Road south of Arrowhead, and
- 10% to and from the south along Arlington south of Arrowhead.

Therefore, in effect, the trip distribution at the Harbor Lights street intersection will be 20% to and from the west and 80% to and from the east.

Traffic Operation

For analysis purposes, Westwood assumed traffic control at the intersection of the Harbor Light Access and Arrowhead Road would consist of side street stop condition. This means traffic on Arrowhead would remain free-flow, and traffic leaving the development would be controlled by a stop sign.

In addition, it is assumed that the center two-way left turn lane on Arrowhead would be restriped to create a westbound left turn lane for traffic turning into the development. Further, it is assumed that there would two lanes exiting the development – one dedicated left turn lane and one dedicated right turn lane.

For this analysis, it was assumed the intersection of Arrowhead Road and Arlington Avenue would remain signalized and the timings would be optimized for inclusion of Edison High School traffic, as per the SRF study. Also, that study recommended an additional southbound left turn be added at the intersection to handle the projected demand. Therefore, that additional left turn lane has been assumed to be in place for this 2020 analysis.

Westwood utilized the industry-standard traffic operation software package *Synchro/SimTraffic Version 9* to model and analysis conditions before and after development of Harbor Light. This software modeled the performance, the levels of service and the queuing that would result in each scenario tested.

Table 2 shows the traffic operation at the intersection assuming 2020 traffic counts at Arrowhead Road and Arlington Avenue as identified in the SRF study including the impacts of the Edison High School trips. This table also assumes the dual left turns for the southbound approach as well as optimized signal timings for the a.m. and p.m. peak hours. This scenario is called the year 2020 No-Build Scenario. All movements reflect acceptable levels of service and queue lengths are manageable.

Table 2 – Year 2020 No-Build Operational Performance

Intersection	Intersection		Critical Approach		
	Intersection Control Delay (sec)	Overall Intersection LOS	Approach	Lane Group LOS	95th Percentile Queue Length (ft.)
2020 No Build AM Peak Hour					
Arrowhead & Arlington	17.3	LOS-B	EB Left	LOS-C	184
			EB Thru	LOS-C	162
			EB Right	LOS-A	205
			WB Left	LOS-B	99
			WB Thru	LOS-B	225
			WB Right	LOS-A	-
			NB Left	LOS-C	49
			NB Thru	LOS-C	71
			NB Right	LOS-A	46
			SB Left	LOS-C	312
			SB Th/Rt	LOS-B	134
2020 No Build PM Peak Hour					
Arrowhead & Arlington	20.4	LOS-C	EB Left	LOS-C	106
			EB Thru	LOS-C	158
			EB Right	LOS-B	179
			WB Left	LOS-C	50
			WB Thru	LOS-C	240
			WB Right	LOS-A	160
			NB Left	LOS-C	33
			NB Thru	LOS-B	72
			NB Right	LOS-B	84
			SB Left	LOS-C	120
			SB Th/Rt	LOS-C	212

(Source: Westwood Professional Services, 2016)

To test the operation of the system with the Harbor Light development (i.e., the 2020 Build Scenario), Westwood modeled the traffic along Arrowhead Road with the added intersection of the development access. The trips identified in Table 1 were distributed into and out of the development assuming the same directional assignments as identified in the SRF study. Further, because some uses (i.e., gas station/convenience store, coffee shop, etc.) draw trips from the arterial into the development for a short time and then back out, these pass-by trips are also included in the analysis.

Table 3 illustrates the performance of this scenario, which assumes side-street stop control at the Harbor Light access and free-flow conditions along Arrowhead Road. As a result, the northbound access exhibits failing levels of service due to the lack of adequate gaps in the Arrowhead Road traffic stream.

Table 3 – Year 2020 Build Operational Performance

Intersection	Intersection		Critical Approach		
	Intersection Control Delay (sec)	Overall Intersection LOS	Approach	Lane Group LOS	95th Percentile Queue Length (ft.)
2020 Build AM Peak Hour					
Arrowhead & Arlington	24.1	LOS-C	EB Left	LOS-C	196
			EB Thru	LOS-C	166
			EB Right	LOS-B	173
			WB Left	LOS-B	73
			WB Thru	LOS-C	237
			WB Right	LOS-A	153
			NB Left	LOS-B	72
			NB Thru	LOS-B	77
			NB Right	LOS-A	51
			SB Left	LOS-C	262
			SB Th/Rt	LOS-B	186
Harbor Light Access & Arrowhead	16.2	LOS-C	EB Th/Rt	LOS-A	18
			WB Left	LOS-B	122
			WB Thru	LOS-A	11
			NB Left	**LOS-F**	**431**
			NB Right	**LOS-E**	**226**
2020 Build PM Peak Hour					
Arrowhead & Arlington	25.1	LOS-C	EB Left	LOS-C	119
			EB Thru	LOS-C	207
			EB Right	LOS-B	219
			WB Left	LOS-C	96
			WB Thru	LOS-D	289
			WB Right	LOS-A	156
			NB Left	LOS-B	73
			NB Thru	LOS-D	99
			NB Right	LOS-A	55
			SB Left	LOS-C	156
			SB Th/Rt	LOS-D	326
Harbor Light Access & Arrowhead	5.0	LOS-A	EB Th/Rt	LOS-A	-
			WB Left	LOS-B	86
			WB Thru	LOS-A	-
			NB Left	LOS-D	84
			NB Right	LOS-A	57

(Source: Westwood Professional Services, 2016)

Westwood then tested the network assuming the signalization of the Harbor Light access at Arrowhead. Road. Table 4 illustrates the operational performance with the

Harbor Light access signalized, optimized and coordinated with the signal at Arlington. The operational performance of this scenario appears on Table 4.

Table 4 – Year 2020 Build Operational Performance - Signalized

Intersection	Intersection		Critical Approach		
	Intersection Control Delay (sec)	Overall Intersection LOS	Approach	Lane Group LOS	95th Percentile Queue Length (ft.)
2020 Build AM Peak Hour - Signalized					
Arrowhead & Arlington	24.3	LOS-C	EB Left	LOS-C	187
			EB Thru	LOS-C	144
			EB Right	LOS-C	147
			WB Left	LOS-B	64
			WB Thru	LOS-D	266
			WB Right	LOS-A	175
			NB Left	LOS-B	63
			NB Thru	LOS-B	77
			NB Right	LOS-A	43
			SB Left	LOS-C	213
			SB Thru	LOS-C	230
			SB Rght	LOS-B	230
Harbor Light Access & Arrowhead	15.8	LOS-B	EB Thru	LOS-B	178
			EB Right	LOS-B	191
			WB Left	LOS-C	131
			WB Thru	LOS-B	172
			NB Left	LOS-B	135
			NB Right	LOS-A	69
2020 Build PM Peak Hour - Signalized					
Arrowhead & Arlington	33.8	LOS-C	EB Left	LOS-D	194
			EB Thru	LOS-C	258
			EB Right	LOS-C	275
			WB Left	LOS-C	278
			WB Thru	LOS-D	424
			WB Right	LOS-A	264
			NB Left	LOS-C	93
			NB Thru	LOS-D	111
			NB Right	LOS-A	62
			SB Thru	LOS-D	407
			SB Rght	LOS-C	321
Harbor Light Access & Arrowhead	16.8	LOS-B	EB Thru	LOS-B	223
			EB Right	LOS-B	227
			WB Left	LOS-C	189
			WB Thru	LOS-B	313
			NB Left	LOS-B	63
			NB Right	LOS-A	76

(Source: Westwood Professional Services, 2016)

Sensitivity Analysis

Tables 3 and 4 reflect development impacts at total build-out. It is recognized, however, that development will be phased. As stated above, Parcels B and C are anticipated to develop first.

Based on the trip generation shown on Table 1, traffic volumes can be accommodated by side street stop control with the development of Parcel B. When Parcel C is developed, the more intense retail uses such as a coffee shop with a drive-thru lane will generate significantly more traffic demand that will create the need for increased traffic control at the Harbor Light access intersection with Arrowhead.

It should be noted, however, that neighborhood retail uses in Parcel C may not generate trips to the extent of a coffee shop with drive-thru lane. These uses would include hair salon, nail salon, dry cleaner, etc. Even some restaurant uses, such as pizza delivery or sub sandwich shop, may not generate traffic that would necessitate a change in traffic control

Further, the single family housing and the church use do not appear to create the weekday peak hour traffic demand to justify changes in traffic control. However, the additive effect of weekday peak hour traffic demand from the site land uses and the increasing inability to find adequate gaps in the Arrowhead traffic stream will create longer and longer queues of vehicles attempting to leave the development. Driver frustration with having to wait to turn onto Arrowhead may breed unsafe maneuvers and increase the likelihood of crashes.

Therefore, signalization will likely be warranted upon full build-out of Parcel C and the rest of the development. As development occurs, monitoring of the intersection is recommended, and an Intersection Control Evaluation (also known as an ICE Report, as specified by the Minnesota Department of Transportation) will be required to determine if and when signal warrants are met for the intersection.

Conclusions and Recommendations

This study has determined the following:

- Although specific development land uses and sizes are not finalized, the general land use types and sizes can be accommodated from a traffic perspective.
- A single site access onto Arrowhead can operate acceptably as a side-street stop in the short term, but should be considered for signalization in the long-term, depending on the types of land use that are considered.
- Arrowhead Road will need to be restriped at the intersection with the Harbor Light access road to allow for a westbound left turn lane (200 feet of storage).

- The Harbor Light access road is recommended to have a dedicated right turn lane and a dedicated left turn lane approaching Arrowhead Road. It is recommended that the right turn lane have a stacking length of 250 feet (for the unsignalized condition), and that the left turn lane be a continuation of the northbound approach lane.
- The creation of a southerly connection to Marble Street may relieve some traffic volume approaching Arrowhead Road, as some development traffic may divert to the neighborhood to the south. Conversely, the connection with Marble Street may cause traffic from that southerly neighborhood to use the Harbor Light north-south road to access Arrowhead Road and beyond. Nevertheless, as the Harbor Light development is built out, signalization will likely be warranted at Arrowhead Road.

Figures 2 through 5 illustrate the projected turning movements in the year 2020 No-Build and Build scenarios.

The Appendices show the Synchro and SimTraffic output for the year 2020 No-Build, Build (with side street stop condition) and Build (with signalization at the Harbor Light Access).

FIGURES

1. Master Plan (Source: LHB, Inc., 05/29/16)
2. 2020 No-Build A.M. Peak Hour Volumes
3. 2020 No-Build P.M. Peak Hour Volumes
4. 2020 Build A.M. Peak Hour Volumes
5. 2020 Build P.M. Peak Hour Volumes

APPENDICES

- 2020 No-Build A.M. Peak Hour Operational Performance & Queuing
- 2020 No-Build P.M. Peak Hour Operational Performance & Queuing
- 2020 Build A.M. Peak Hour Operational Performance & Queuing (with side street stop at Harbor Light Access)
- 2020 Build P.M. Peak Hour Operational Performance & Queuing (with side street stop at Harbor Light Access)
- 2020 Build A.M. Peak Hour Operational Performance & Queuing (with Signal at Harbor Light Access)
- 2020 Build P.M. Peak Hour Operational Performance & Queuing (with Signal at Harbor Light Access)

FIGURE 1 – HARBOR LIGHT DEVELOPMENT MASTER PLAN

Parcel A = Gospel Tabernacle Church, 15.6 Acres

Parcel B = Commercial (Kwik Trip), 4.36 Acres

Parcel C = Mixed Use, 5.0 Acres

Parcel D = Residential, 9.33 Acres

LEGEND

- Public Road Right of Way (R.O.W.), 1.30 Acres
- Building Footprint
- Stormwater Pond Location
- Trail Easement
- Wetland
- Existing Woods to Remain

Source: LHB, Inc., 05/29/16

Map - Harbor Light Development
Volumes

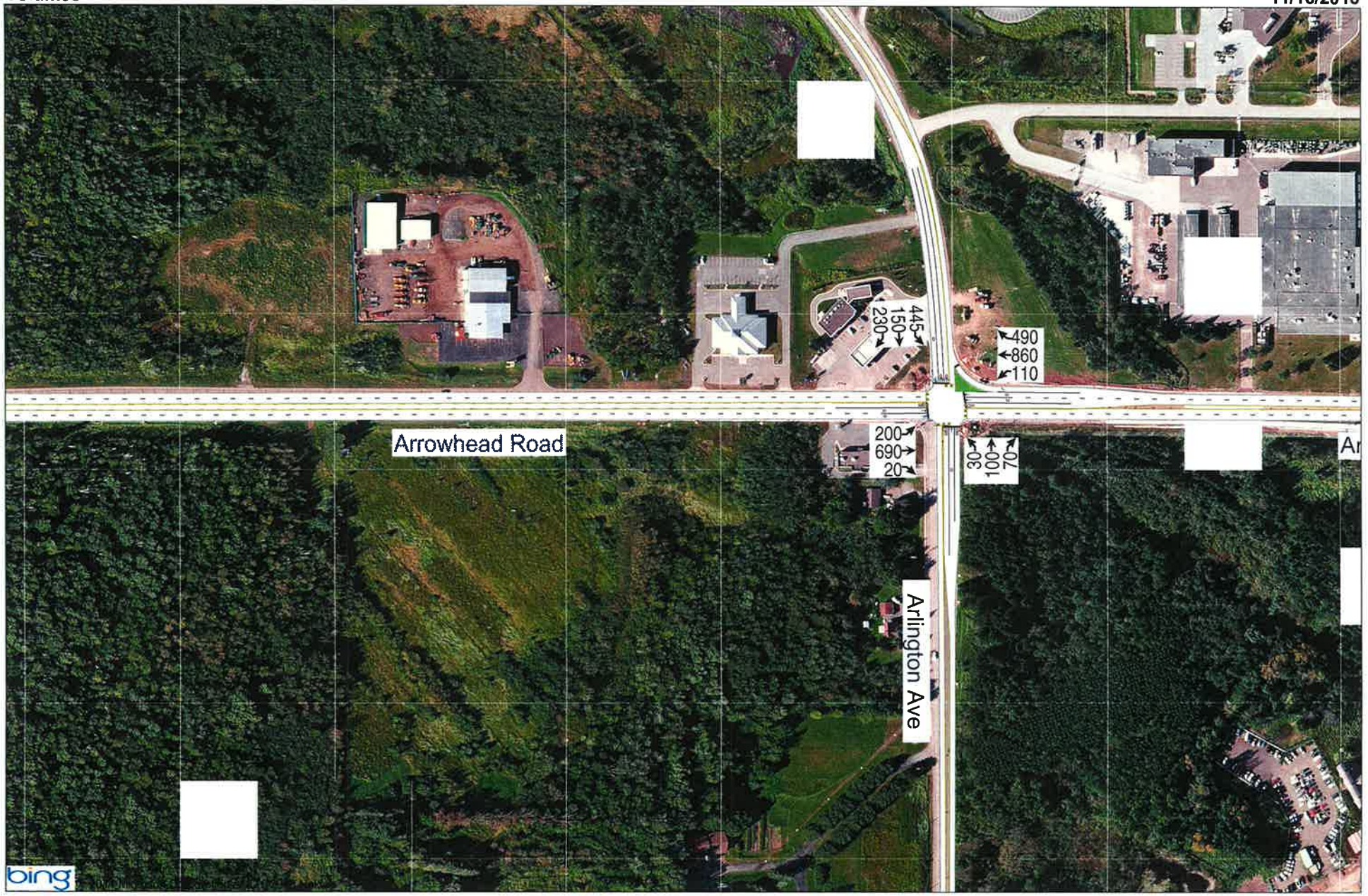
2020 No-Build AM Peak Hour
11/16/2016

Harbor Light Development Year 2020 No-Build Peak Hour

FIGURE 2

Map - Harbor Light Development
Volumes

2020 No-Build PM Peak Hour
11/16/2016



Harbor Light Development Year 2020 No-Build Peak Hour

FIGURE 3

Map - Harbor Light Development
Volumes

2020 Build AM Peak Hour
11/16/2016

Harbor Light Development Year 2020 No-Build Peak Hour

FIGURE 4

Map - Harbor Light Development
Volumes

2020 Build PM Peak Hour
11/16/2016

Harbor Light Development Year 2020 No-Build Peak Hour

FIGURE 5

3: Arlington Ave & Arrowhead Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.1	0.1	1.0	0.3	1.4	1.9	0.1	1.5	2.2	1.3	1.6
Total Del/Veh (s)	25.6	26.9	22.8	22.1	41.2	6.4	14.8	33.3	5.6	20.0	19.1	11.2

3: Arlington Ave & Arrowhead Road Performance by movement

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	23.6

Total Network Performance

Denied Del/Veh (s)	1.0
Total Del/Veh (s)	27.2

Intersection: 3: Arlington Ave & Arrowhead Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	T	L	T	R	L	TR
Maximum Queue (ft)	175	161	194	108	211	192	51	70	48	302	138
Average Queue (ft)	137	100	143	44	173	161	15	54	32	187	85
95th Queue (ft)	184	162	205	99	225	208	49	71	46	312	134
Link Distance (ft)		4059	4059		2027	2027		2117			1942
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	200			230			285		210	485	
Storage Blk Time (%)					0						
Queuing Penalty (veh)					0						

Network Summary

Network wide Queuing Penalty: 0

3: Arlington Ave & Arrowhead Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.2	0.2	0.1	1.3	0.2	1.5	2.6	0.3	1.9	2.4	1.1	1.5
Total Del/Veh (s)	24.4	25.8	21.2	21.0	28.1	5.8	18.5	30.3	7.4	50.3	29.5	19.6

3: Arlington Ave & Arrowhead Road Performance by movement

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	26.8

Total Network Performance

Denied Del/Veh (s)	1.0
Total Del/Veh (s)	30.1

Intersection: 3: Arlington Ave & Arrowhead Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	T	L	T	R	L	TR
Maximum Queue (ft)	126	136	219	66	211	213	29	117	51	497	203
Average Queue (ft)	87	121	166	52	178	181	25	71	36	314	160
95th Queue (ft)	144	133	229	70	232	230	34	125	52	495	217
Link Distance (ft)		4059	4059		2027	2027		2117			1942
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	200			230			285		210	485	
Storage Blk Time (%)					0					4	
Queuing Penalty (veh)					0					15	

Network Summary

Network wide Queuing Penalty: 15

1: Harbor Light Rd. & Arrowhead Road Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	2.5	1.3	12.1	4.2	84.4	17.0	11.7

3: Arlington Ave & Arrowhead Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	1.2	0.4	1.5	2.0	0.3	2.1	2.4	1.4	1.3
Total Del/Veh (s)	29.8	26.0	23.3	24.7	52.3	7.6	20.2	37.5	7.1	94.8	38.8	24.5

3: Arlington Ave & Arrowhead Road Performance by movement

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	42.5

Total Network Performance

Denied Del/Veh (s)	1.0
Total Del/Veh (s)	50.4

Intersection: 1: Harbor Light Rd. & Arrowhead Road

Movement	EB	WB	NB	NB
Directions Served	TR	L	L	R
Maximum Queue (ft)	22	121	354	175
Average Queue (ft)	2	62	167	92
95th Queue (ft)	13	109	323	208
Link Distance (ft)	2383		322	
Upstream Blk Time (%)			1	
Queuing Penalty (veh)			0	
Storage Bay Dist (ft)		180		150
Storage Blk Time (%)			28	0
Queuing Penalty (veh)			29	0

Intersection: 3: Arlington Ave & Arrowhead Road

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	T	R	L	T	R	L	TR
Maximum Queue (ft)	216	210	241	130	384	348	241	72	139	89	670	999
Average Queue (ft)	135	123	137	41	199	178	34	31	43	29	471	359
95th Queue (ft)	206	194	210	85	334	305	150	60	86	62	778	894
Link Distance (ft)		1604	1604		2027	2027			2117			1942
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200			230			250	285		210	485	
Storage Blk Time (%)	0	0			11	8	0				38	3
Queuing Penalty (veh)	1	1			9	39	0				113	18

Network Summary

Network wide Queuing Penalty: 208

1: Harbor Light Rd. & Arrowhead Road Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.2	0.2	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	2.1	1.6	11.6	4.7	38.9	6.0	5.2

3: Arlington Ave & Arrowhead Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	1.7	0.4	1.4	2.3	0.4	2.3	2.1	1.1	1.1
Total Del/Veh (s)	30.2	24.0	21.7	29.8	37.7	7.6	19.7	40.9	7.4	74.4	39.9	27.5

3: Arlington Ave & Arrowhead Road Performance by movement

Movement	All
Denied Del/Veh (s)	0.9
Total Del/Veh (s)	33.3

Total Network Performance

Denied Del/Veh (s)	0.9
Total Del/Veh (s)	39.7

Intersection: 1: Harbor Light Rd. & Arrowhead Road

Movement	EB	WB	NB	NB
Directions Served	TR	L	L	R
Maximum Queue (ft)	22	116	94	55
Average Queue (ft)	2	48	46	36
95th Queue (ft)	11	86	81	53
Link Distance (ft)	2383		322	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		180		150
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Arlington Ave & Arrowhead Road

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	T	R	L	T	R	L	TR
Maximum Queue (ft)	198	247	249	262	320	306	198	96	179	87	659	681
Average Queue (ft)	93	142	155	71	222	210	7	30	74	40	335	244
95th Queue (ft)	157	213	219	154	311	288	67	64	146	69	621	531
Link Distance (ft)		1604	1604		2027	2027			2117			1942
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200			230			250	285		210	485	
Storage Blk Time (%)	0	1			8	3					15	0
Queuing Penalty (veh)	0	2			8	15					61	1

Network Summary

Network wide Queuing Penalty: 88

1: Harbor Light Rd. & Arrowhead Road Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.2	0.2	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	18.6	13.0	21.2	13.3	14.7	5.6	15.8

3: Arlington Ave & Arrowhead Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	1.4	0.4	1.4	1.9	0.4	2.2	2.4	1.5	1.7
Total Del/Veh (s)	28.1	21.7	20.3	18.4	34.1	9.1	18.7	19.7	5.2	30.7	27.9	18.0

3: Arlington Ave & Arrowhead Road Performance by movement

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	24.3

Total Network Performance

Denied Del/Veh (s)	1.0
Total Del/Veh (s)	36.3

Intersection: 1: Harbor Light Rd. & Arrowhead Road

Movement	EB	EB	WB	WB	WB	NB	NB
Directions Served	T	TR	L	T	T	L	R
Maximum Queue (ft)	197	220	156	169	192	159	79
Average Queue (ft)	133	129	82	85	109	70	34
95th Queue (ft)	178	191	131	154	172	135	69
Link Distance (ft)	2383	2383		1597	1597	322	
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			180				150
Storage Blk Time (%)				0		0	
Queuing Penalty (veh)				0		0	

Intersection: 3: Arlington Ave & Arrowhead Road

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	T	R	L	T	R	L	L
Maximum Queue (ft)	222	154	154	70	309	307	210	74	114	52	270	307
Average Queue (ft)	115	92	95	35	162	142	44	37	39	20	125	149
95th Queue (ft)	187	144	147	64	266	247	175	63	77	43	213	230
Link Distance (ft)		1597	1597		2028	2028			2117			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200			230			250	285		210	485	485
Storage Blk Time (%)	2				2	1						
Queuing Penalty (veh)	5				2	5						

Intersection: 3: Arlington Ave & Arrowhead Road

Movement	SB
Directions Served	TR
Maximum Queue (ft)	265
Average Queue (ft)	119
95th Queue (ft)	193
Link Distance (ft)	1942
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 12

1: Harbor Light Rd. & Arrowhead Road Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.2	0.2	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	17.8	14.1	22.5	16.8	11.4	6.4	16.8

3: Arlington Ave & Arrowhead Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	1.4	0.5	1.6	2.1	0.3	2.5	2.2	1.2	1.3
Total Del/Veh (s)	35.9	33.9	30.6	31.0	43.7	7.7	22.6	35.8	8.7	49.0	35.8	25.6

3: Arlington Ave & Arrowhead Road Performance by movement

Movement	All
Denied Del/Veh (s)	0.9
Total Del/Veh (s)	33.8

Total Network Performance

Denied Del/Veh (s)	0.9
Total Del/Veh (s)	47.7

Intersection: 1: Harbor Light Rd. & Arrowhead Road

Movement	EB	EB	WB	WB	WB	NB	NB
Directions Served	T	TR	L	T	T	L	R
Maximum Queue (ft)	236	263	204	307	336	74	96
Average Queue (ft)	139	148	83	164	184	32	39
95th Queue (ft)	223	227	189	313	324	63	76
Link Distance (ft)	2383	2383		1604	1604	322	
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)			180				150
Storage Blk Time (%)				5			
Queuing Penalty (veh)				8			

Intersection: 3: Arlington Ave & Arrowhead Road

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	T	R	L	T	R	L	TR
Maximum Queue (ft)	224	352	283	414	537	524	435	136	151	72	381	440
Average Queue (ft)	112	183	201	91	245	239	45	40	62	33	256	182
95th Queue (ft)	194	258	275	278	424	421	264	93	111	62	407	321
Link Distance (ft)		1604	1604		2027	2027			2117			1942
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200			230			250	285		210	485	
Storage Blk Time (%)	0	5			15	11						
Queuing Penalty (veh)	0	10			16	53						

Network Summary

Network wide Queuing Penalty: 87

Westwood

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MEMORANDUM

Date: March 2, 2018

Re: Revised Trip Generation and Queuing Lengths – Harbor Light, Duluth, MN
File 0009613.00

To: Brad Johnson, Lotus Realty Services

From: Stephen J. Manhart, P.E. PTOE, PTP

We have reviewed your revision of the proposed land uses for your Harbor Light development in Duluth, MN.

In 2016, you had proposed the following land uses:

Mixed Use (Parcels B & C to be built in the immediate future)

- *Parcel B (4.36 acres) consisting of a Gas Station/Convenience Store to be constructed in conjunction with the north-south public street;*
- *Parcel C (5.0 acres) to be built after Parcel B consisting of light retail mixed use (e.g., coffee shop, etc.);*

- *Parcel A (15.6 acres) consisting of the Gospel Tabernacle Church projected to be built within the next five years); and*

- *Residential Use (9.33 acres) to be built at some point in the future.*

You have recently revised your site plan by removing the coffee shop in Parcel C and adding 20,000 square feet of office, fitness club or medical/dental use. You have also stated that the residential will not access Arrowhead Road to the north, but rather gain access to the street on the south side of the development.

Therefore, we have compared the three possible uses for the 20,000 square foot building, and have determined that medical/dental would generate the most trips. Therefore, we have utilized that as a worst case scenario.

Table 1 illustrates the revised trip generation potential. These trip volumes are based on the ITE Trip Generation manual, Tenth Edition (2017). Also listed are the inbound and outbound trip generation by a.m. and p.m. peak hour.

Table 1 – Revised Trip Generation – Harbor Light Development

Group No.	Type	Land Use	ITE Code		Size	Weekday Enter	Weekday Exit	AM peak Enter	AM peak Exit	PM Peak Enter	PM Peak Exit
2	Retail	Gasoline/Service Station w/ Convenience Market	945	12	fuel pos.	1,232	1,232	67	64	86	82
7	Other	Church	560.0	20.0	k.s.f.	70	70	4	3	4	5
7	Other	Church	560.0	16.0	k.s.f.	58	58	3	2	4	5
	Office	Medical-Dental Office Building	720	20.0	k.s.f.	348	348	43	12	20	50
						1,708	1,708	117	81	114	142
						3,416		198		256	

(Source: ITE Trip Generation Manual, Tenth Edition, 2017)

Figure 1 illustrates the revised a.m. and p.m. peak hour volumes proposed for the new land uses generated by the Harbor Light development.

These counts reflect a significant reduction in trips when compared with trip generation forecast in the 2016 scenario. At that time, over 6,000 trips per day were projected, with an a.m. and p.m. peak hour volume of 532 veh/hr and 372 veh/hr respectively.

In addition, Westwood has analyzed the traffic operation and performance of the proposed intersection at Arrowhead Road and the main development access street. Utilizing Synchro/SimTraffic Version 10, Westwood calculated the levels of service at the intersection, as well as the queuing length for each approach. Those results are shown in Table 2 below.

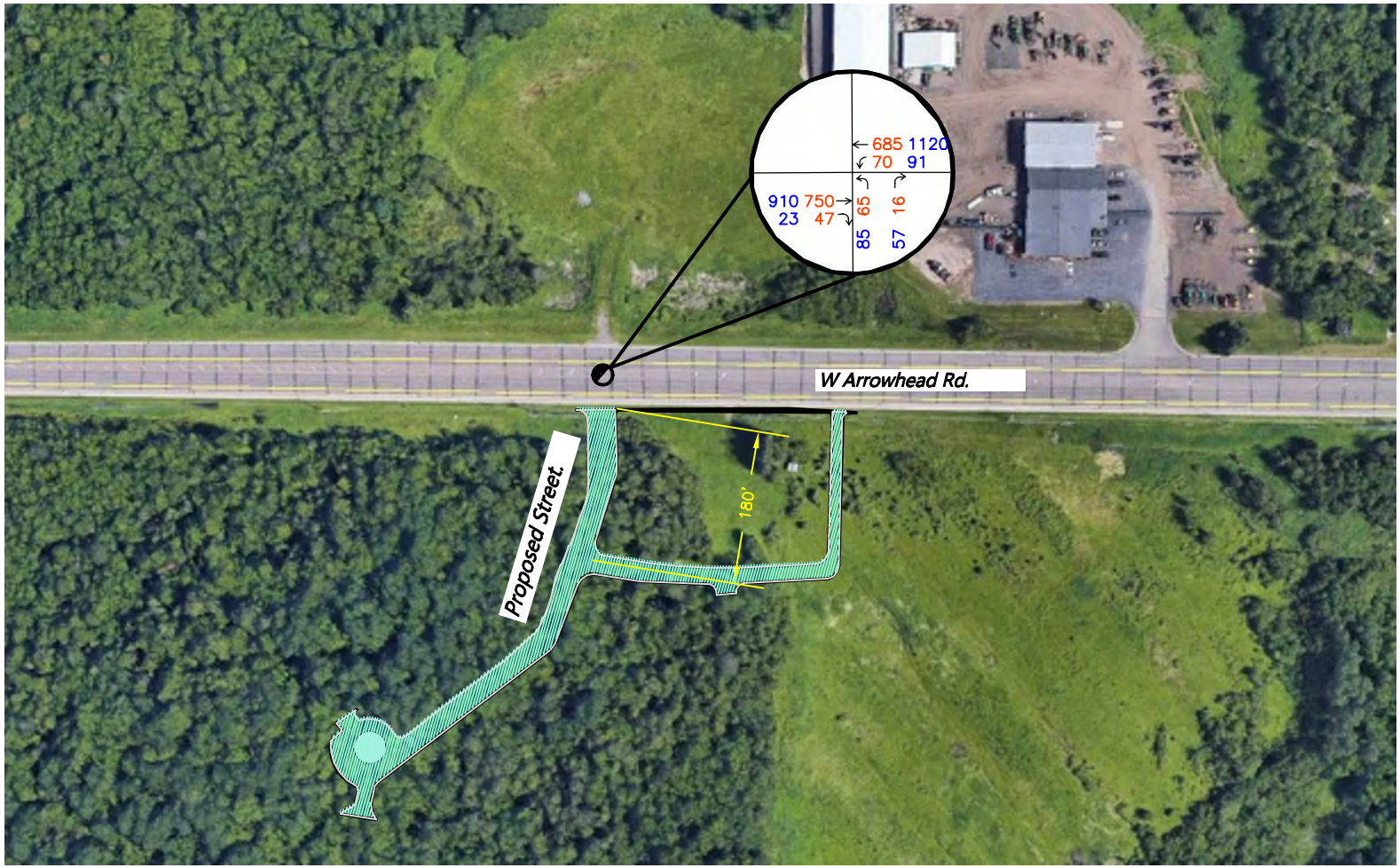
Table 2 – Revised Level of Service and Queue Lengths – Harbor Light Development

Intersection	Lane Assignment	Intersection Traffic Control	2020 BUILD + ADJACENT DEVELOPMENT									
			AM PEAK					PM PEAK				
			Intersection Delay and LOS	Level of Service	Approach Delay (sec)	95th %ile Queue (ft)	Available Queue Length (ft.)	Intersection Delay and LOS	Level of Service	Approach Delay (sec)	95th %ile Queue (ft)	Available Queue Length (ft.)
Arrowhead & Harbor Light Access Road	EB Left	N	LOS A = 3.7 del/veh (s)	-	**0.0**	0	n.a.	LOS A = 3.6 del/veh (s)	-	**0.0**	n.a.	n.a.
	EB Thru			**A**	**2.1**	7	2400		**A**	**2.2**	n.a.	2400
	EB Right			**A**	**2.1**	7	n.a.		**A**	**1.4**	n.a.	n.a.
	WB Left			**A**	**9.6**	56	180		**B**	**10.7**	60	180
	WB Thru			**A**	**3.5**	n.a.	n.a.		**A**	**4.5**	n.a.	n.a.
	NB Left			**C**	**20.2**	80	180		**D**	**28.4**	87	180
	NB Right			**A**	**3.2**	37	180		**A**	**5.2**	55	180

The available stacking distance south of Arrowhead Road is shown now as 180 feet. According to the peak hour queue lengths shown in Table 2, the longest northbound queue will be 87 feet. Therefore, it appears that you will have an adequate queuing distance along your main access road from Arrowhead to your proposed east-west street.

Legend

LANE DIRECETION	⇉
AM PEAK HOUR VOLUME	XX
PM PEAK HOUR VOLUME	XX



Bubble map.dwg

Westwood

Phone (952) 937-5150 12701 Whitewater Drive, Suite #300
Fax (952) 937-5822 Minnetonka, MN 55343
Toll Free (888) 937-5150 westwoodps.com

Westwood Professional Services, Inc.

Prepared for: **Lotus Realty Services/ Big Bear Development**
Kayak Bay, Duluth

Harbor Light
Duluth, MN

Peak Hour Volumes

Date: .

Figure: •

APPENDIX - SimTraffic Results

SimTraffic Performance Report
2020 BUILD

2020 BUILD AM Peak
03/01/2018

1: Harbor Light Rd. & Arrowhead Road Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	2.1	2.1	9.6	3.5	20.2	3.2	3.7

Queuing and Blocking Report
2020 BUILD

2020 BUILD AM Peak
03/01/2018

Intersection: 1: Harbor Light Rd. & Arrowhead Road

Movement	EB	WB	NB	NB
Directions Served	TR	L	L	R
Maximum Queue (ft)	21	54	96	31
Average Queue (ft)	1	30	39	14
95th Queue (ft)	7	56	80	37
Link Distance (ft)	2383		322	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		180		150
Storage Blk Time (%)				
Queuing Penalty (veh)				

SimTraffic Performance Report
2020 build

2020 BUIL PM Peak
03/01/2018

1: Harbor Light Rd. & Arrowhead Road Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	2.2	1.4	10.7	4.5	28.4	5.2	4.7

Queuing and Blocking Report
2020 build

2020 BUIL PM Peak
03/01/2018

Intersection: 1: Harbor Light Rd. & Arrowhead Road

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	72	96	66
Average Queue (ft)	34	50	27
95th Queue (ft)	60	87	55
Link Distance (ft)		322	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	180		150
Storage Blk Time (%)			
Queuing Penalty (veh)			

LEGEND

- BITUMINOUS SURFACE
- BUILDING
- CONCRETE SURFACE
- 5 FOOT CONTOUR
- 1 FOOT CONTOUR
- CURB & GUTTER
- GRAVEL SURFACE
- DELINEATED WETLAND
- RIP-RAP SURFACE
- EASEMENT LINE
- FENCE LINE
- BLOCK LINE
- LOT LINE
- ROAD RIGHT-OF-WAY LINE
- OVERHEAD ELECTRIC
- BURIED ELECTRIC
- BURIED FIBER OPTIC
- BURIED GAS
- BURIED SANITARY SEWER
- BURIED SANITARY SEWER SERVICE
- BURIED STORM
- BURIED STORM CULVERT
- OVERHEAD TELEPHONE
- BURIED TELEPHONE
- BURIED WATER
- BURIED WATER SERVICE
- DITCH FLOW LINE
- BRUSH LINE/ EDGE
- TREE LINE/ EDGE
- YIELD SIGN
- STREET SIGN
- STOP SIGN
- SPEED LIMIT SIGN
- HANDICAP SIGN
- SIGN
- SOIL BORING
- FENCE POST
- FLAG POLE
- BOLLARD
- BENCHMARK
- EXISTING STORM MANHOLE
- EXISTING SANITARY MANHOLE
- EXISTING CATCH BASIN (SQUARE)
- EXISTING CATCH BASIN (ROUND)
- EXISTING CATCH BASIN (SEE-NHE)
- LIGHT POLE
- ELECTRICAL JUNCTION BOX
- GUY POLE
- ELECTRIC PANEL
- ELECTRIC METER
- ELECTRIC BOX
- GUY WIRE OR ANCHOR
- POWER POLE/ LIGHT POLE
- POWER POLE
- TRAFFIC SIGNAL LIGHT
- POWER POLE
- WATER VALVE
- WATER SHUTOFF
- WATER VALVE
- HYDRANT
- TELEPHONE POLE
- GAS VALVE
- GAS METER
- CLEAN OUT
- EVERGREEN TREE
- DECIDUOUS TREE
- FOUND SPIKE
- FOUND STONE
- FOUND REBAR
- FOUND IRON PIPE
- FOUND GRID MONUMENT
- FOUND TEE IRON
- FOUND PK NAIL
- FOUND IRON ROD (ROUND)
- FOUND CAST IRON MONUMENT
- FOUND ALUMINUM CAPPED TUBE
- FOUND ALUMINUM CAPPED TUBE
- SET CHISELED "X"
- SET REBAR
- SET SPIKE/ PK NAIL
- SET IRON PIPE
- HORIZONTAL CONTROL POINT

CITY OF DULUTH

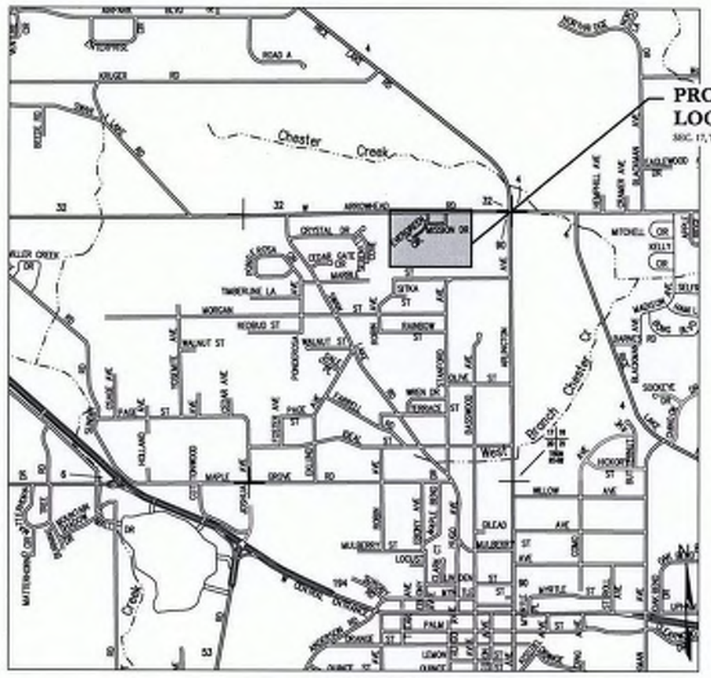
DEPARTMENT OF PUBLIC WORKS AND UTILITIES

ENGINEERING DIVISION

CONSTRUCTION PLANS FOR: STORM SEWER, SANITARY SEWER, WATER AND GAS MAIN CONSTRUCTION AND ROADWAY IMPROVEMENTS.

LOCATED ON: EVERGREEN CIRCLE, MISSION DRIVE, AND STANFORD AVENUE

GROSS LENGTH	-- FEET	--	MILE
BRIDGES–LENGTH	-- FEET	--	MILE
EXCEPTIONS–LENGTH	-- FEET	--	MILE
NET LENGTH	-- FEET	--	MILE



UTILITY NOTE

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

LHB
PERFORMANCE DRIVEN DESIGN.
LHBcorp.com
21 W. Superior St., Ste. 500
Duluth, MN 55802
218.727.8446

SCALES

PLAN	VARIES
PROFILE (HORIZONTAL)	VARIES
PROFILE (VERTICAL)	VARIES
CROSS SECTION	0 10
INDEX MAP	0 1500

WARNING

LOCATION OF UNDERGROUND UTILITIES TO BE VERIFIED BY CONTRACTOR. CALL BEFORE DIGGING. GOPHER STATE ONE CALL 1-800-252-1166 REQUIRED BY LAW

NO	DATE	REVISION	SHEETS

GOVERNING SPECIFICATIONS

THE 2018 EDITION OF THE MINNESOTA DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR CONSTRUCTION" SHALL GOVERN.

THE CITY OF DULUTH PUBLIC WORKS AND UTILITIES DEPARTMENT ENGINEERING DIVISION 2019 EDITION STANDARD CONSTRUCTION SPECIFICATION SHALL APPLY.

ALL TRAFFIC CONTROL DEVICES AND SIGNING SHALL CONFORM TO THE MN MUTCD, INCLUDING THE FIELD MANUAL DATED JANUARY 2018. (AVAILABLE AT: http://www.dot.state.mn.us/trafficeng)

INDEX

THIS PLAN CONTAINS 36 SHEETS

DESIGN DESIGNATION

	2018
PROJECT	
ADT (CURRENT YEAR) 2007	--
ADT (FUTURE YEAR) 2022	--
HCADT (CURRENT)	--
HCADT (FUTURE)	--
STRUCTURE DESIGN	--
SOIL FACTOR	--
DESIGN SPEED	--

BASED ON STOPPING SIGHT DISTANCE
HEIGHT OF EYE = 3.5 FT.
HEIGHT OF OBJECT = 0.5 FT.

I HEREBY CERTIFY THAT THIS PLAN 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 MINNESOTA.

DANIEL SHAW
PROJECT ENGINEER (TYPED OR PRINTED NAME)

Daniel G. Shaw — 11/19/2018 — 41423
PROJECT ENGINEER — DATE — REG. No.

CITY APPROVALS:

APPROVED — CHIEF ENGINEER OF TRANSPORTATION — 12/13/18 DATE

APPROVED — CHIEF ENGINEER OF UTILITIES — 12/13/18 DATE

APPROVED — CITY ENGINEER — 12/13/18 DATE

LHB PROJECT No. 150732

CITY OF DULUTH PROJECT No. 1567

TITLE SHEET — SHEET No. 1 OF 36 SHEETS

CONSTRUCTION NOTES

1. WHENEVER THE PHRASE "MIN." IS USED IN THIS PLAN, IT SHALL MEAN THE WORD MINIMUM.
2. THE CONTRACTOR SHALL PRESERVE ALL LAND AND PROPERTY CORNERS, VERTICAL AND HORIZONTAL CONTROLS AND RIGHT OF WAY MONUMENTS.
3. PLACE ½" BIT FELT (FULL HEIGHT) AT ALL JOINTS WHERE PROPOSED CONCRETE DRIVEWAYS AND WALKS MEET EXISTING CONCRETE DRIVEWAYS, OR SIDEWALKS.
4. ALL AREAS DISTURBED BY THE CONTRACTOR'S EQUIPMENT WHICH ARE OUTSIDE THE PLANNED CONSTRUCTION LIMITS SHALL BE RESTORED, AS APPROVED BY THE ENGINEER, AT THE CONTRACTOR'S EXPENSE. NO DISTURBANCE SHALL BE ALLOWED BEYOND THE DESIGNATED CONSTRUCTION LIMITS BOUNDARIES SHOWN ADJACENT TO WETLANDS.
5. BITUMINOUS SURFACING, CONCRETE ITEMS, ABANDONED UTILITY ITEMS, OR ANY OTHER MATERIAL WHICH MAY BE ENCOUNTERED DURING CONSTRUCTION THAT ARE NOT SUITABLE FOR SALVAGE OR FOR ROADWAY CONSTRUCTION SHALL BE DISPOSED OF BY THE CONTRACTOR AT AN APPROVED OFFSITE DISPOSAL SITE.
6. THE CONTRACTOR SHALL PROVIDE A CONCRETE WASHOUT AND WASHOUT LOCATION AND CONTAINER ON THE PROJECT AND IT SHALL BE APPROVED BY THE ENGINEER PRIOR TO RELATED WORK. THE CONTRACTOR SHALL MAINTAIN THE CONTAINER AND DISPOSE OF ITS CONTENTS OFFSITE AND IN ACCORDANCE WITH MPCA REQUIREMENTS.
7. THE CONTRACTOR IS ADVISED THAT THERE SHALL BE NO STOCKPILE OF MATERIALS ON SITE OUTSIDE THE PROJECT CONSTRUCTION LIMITS, UNLESS OTHERWISE NOTED.
8. PLACE BITUMINOUS MATERIAL FOR TACK COAT (SPEC 2357) IN BETWEEN BITUMINOUS LIFTS AT A RATE OF 0.03–0.05 GAL./SQ. YD. ON PAVED SURFACES.
9. ALL LAYOUT ASSOCIATED WITH THE WORK SHALL BE DONE BY THE CONTRACTOR.

UTILITIES

THE CONTRACTOR IS HEREBY REMINDED OF HIS RESPONSIBILITY UNDER STATE LAW TO CONTACT ALL UTILITIES THAT MAY HAVE FACILITIES IN THE AREA. CONTACT MUST BE MADE THROUGH GOPHER STATE ONE–CALL: 1–800–252–1166.

THE SUBSURFACE UTILITY INFORMATION IN THIS PLAN IS UTILITY QUALITY LEVEL "D". THIS UTILITY QUALITY 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."

THE FOLLOWING UTILITY COMPANIES HAVE FACILITIES WITHIN THE PROJECT LIMITS:

- CITY OF DULUTH (WATER, SANITARY, STORM & GAS)
- MINNESOTA POWER

MnDOT STANDARD PLATES

THE FOLLOWING STANDARD PLATES APPROVED BY FHWA SHALL APPLY ON THIS PROJECT

PLATE NO.	DESCRIPTION
3000L	REINFORCED CONCRETE PIPE (5 SHEETS)
3006G	GASKET JOINT FOR R.C. PIPE (2 SHEETS)
3100G	CONCRETE APRON FOR REINFORCED CONCRETE PIPE
3123J	METAL APRON FOR C.S. PIPE
3133D	RIPRAP FOR RCP OUTLETS
3134D	RIPRAP FOR CSP OUTLETS
4006L	MANHOLE OR CATCH BASIN PRECAST – DESIGNS G & H
7100H	CONCRETE CURB & GUTTER (DESIGN B & V)
7038A	DETECTABLE WARNING SURFACE TRUNCATED DOMES
7111J	INSTALLATION OF CATCH BASIN CASTINGS

EROSION CONTROL NOTES

1. THE CONTRACTOR SHALL REFER TO AND COMPLY WITH THE STORM WATER POLLUTION PREVENTION PLAN PREPARED FOR THIS PROJECT.
2. THE CONTRACTOR IS RESPONSIBLE FOR EROSION CONTROL ON THIS PROJECT. CONSTRUCT EROSION CONTROL DEVICES TO PREVENT THE RUNOFF, TRACKING, OR LOSS OF SOIL MATERIALS FROM DISTURBED AREAS ON THE PROJECT SITE. GRADING OPERATIONS SHALL START WITH THE CONSTRUCTION OF PERIMETER CONTROLS, DITCHING, AND THE CONTAINMENT AREA(S). EXPOSED AREAS SHALL DRAIN TO THE CONTAINMENT AREA(S) OR SILT FENCES.
3. SEDIMENT AND EROSION CONTROL DEVICES SHALL BE FUNCTIONAL BEFORE ANY LAND IS OTHERWISE DISTURBED ON SITE.
4. THE SURFACE OF STRIPPED AREAS SHALL BE PERMANENTLY OR TEMPORARILY PROTECTED FROM SOIL EROSION WITHIN 14 DAYS AFTER FINAL GRADE IS REACHED. STRIPPED AREAS NOT AT FINAL GRADE THAT WILL REMAIN UNDISTURBED FOR MORE THAN 14 DAYS AFTER INITIAL DISTURBANCE SHALL BE PROTECTED FROM EROSION IMMEDIATELY.
5. IF A STOCKPILE IS TO REMAIN IN PLACE FOR MORE THAN 3 DAYS, THEN SEDIMENT AND EROSION CONTROL DEVICES SHALL BE INSTALLED DURING CONSTRUCTION. COVER STOCKPILE AND PROVIDE PERIMETER CONTROLS SUCH AS SANDBAGS AND SILT FENCE.
6. STORM SEWER INLETS SHALL BE PROTECTED WITH SEDIMENT TRAPPING OR FILTER CONTROL DEVICES DURING CONSTRUCTION.
7. WATER PUMPED OR OTHERWISE DISCHARGED DURING CONSTRUCTION DEWATERING SHALL BE FILTERED THROUGH FILTER BAGS. THE CONTRACTOR SHALL CONFORM TO ALL REQUIREMENTS REGARDING CONSTRUCTION SITE DEWATERING CONTAINED IN THE NPDES AND EROSION CONTROL PERMITS ISSUED FOR THIS PROJECT, AND ALL LAWS AND REGULATIONS.

CITY OF DULUTH STANDARD DETAILS

THE FOLLOWING DETAILS ARE APPROVED BY THE CITY OF DULUTH

DETAIL NO.	DESCRIPTION
EX–1	DUCTILE IRON, PE WATERMAIN, PRESSURE SEWER, & FORCEMAIN BEDDING
EX–3	PVC AND CORRUGATED POLYETHYLENE SEWER PIPE BEDDING
EX–4	CONCRETE STORM SEWER BEDDING
SAN–1	SANITARY CASTING DETAIL
SAN–2	TYPICAL SEWER SERVICE CONNECTION
SAN–3	SANITARY MANHOLE NON–PAVED AREAS
SAN–3A	CONCRETE ENCASED CASTING COLLAR FOR SANITARY MH IN ROADWAY, WALKS, & DRIVES
STRM–1	STORM MANHOLE CASTING
STRM–2	CATCH BASIN/CURB BOX CASTINGS
STRM–3	CATCH BASIN CASTINGS
STRM–5A	CONCRETE ENCASED CASTING COLLAR FOR STORM MH IN ROADWAY, WALKS, & DRIVES
STRM–7	GUTTER STAMP
STR–5	DRIVEWAY & ALLEY ENTRANCES
SUR–1	SURVEY MONUMENT
T–2	SIGN INSTALLATION DETAIL
T–3	STREET NAME SIGN FOOTING DETAIL
T–5	E–450 INSTALLATION
W–3	THRUST BLOCKING FOR WATERMAIN
W–4A	FIRE HYDRANT SETTING DETAIL – HDPE
W–5B	4" & LARGER WATER SERVICE – HDPE
W–17A	WATER VALVE BOX – HDPE MAIN
W–18	ANODE CONNECTION
W–19	CONCRETE ENCASED VALVE BOX COVER IN ROADWAY

ALIGNMENT TABULATION – EVERGREEN CIRCLE

POINT	STATION	CIRCULAR CURVE DATA					COORDINATES		AZIMUTH
		DELTA	DEGREE	RADIUS	TANGENT	LENGTH	X	Y	
POT	10+00.00						4835095.239	3355991.670	
PC	12+07.65						4835097.246	3355784.025	S 00° 33' 14" E
PI	12+19.35	20° 24' 30" LT	88° 08' 50.47"	65.000'	11.700'	23.153'	4835097.359	3355772.325	PI
PT	12+30.81						4835093.385	3355761.320	S 19° 51' 17" W
PC	13+92.51						4835038.466	3355609.232	S 19° 51' 17" W
PI	14+27.69	34° 01' 04" LT	49° 49' 21.68"	115.000'	35.178'	68.278'	4835026.519	3355576.145	PI
PT	14+60.78						4834998.105	3355555.404	S 53° 52' 20" W
PC	15+76.78						4834904.411	3355487.012	S 53° 52' 20" W
PI	16+57.13	06° 07' 54" RT	03° 49' 10.99"	1500.000'	80.341'	160.528'	4834839.520	3355439.644	PI
PT	17+37.31						4834780.059	3355385.616	S 47° 44' 26" W
POT	18+01.27						4834732.725	3355342.606	

ALIGNMENT TABULATION – MISSION DRIVE

POINT	STATION	CIRCULAR CURVE DATA					COORDINATES		AZIMUTH
		DELTA	DEGREE	RADIUS	TANGENT	LENGTH	X	Y	
POT	20+00.00						4835032.704	3355700.255	
PC	20+37.30						4835069.743	3355695.846	S 83° 12' 42" E
PI	22+04.22	14° 05' 50" LT	04° 14' 38.87"	1350.000'	166.921'	332.156'	4835235.493	3355676.116	PI
PRC	23+69.46						4835401.058	33555697.352	PRC
PI	23+86.27	06° 59' 51" RT	20° 50' 05.38"	275.000'	16.814'	33.586'	4835417.735	3355699.491	PI
PT	24+03.04						4835434.548	3355699.582	N 89° 41' 19" E
POT	24+55.55						4835487.055	3355699.868	

ALIGNMENT TABULATION – STANFORD AVENUE

POINT	STATION	CIRCULAR CURVE DATA					COORDINATES		AZIMUTH
		DELTA	DEGREE	RADIUS	TANGENT	LENGTH	X	Y	
POT	0+00.00						4835452.143	3355645.663	N 00° 20' 56" W
POT	2+82.13						4835450.426	3355927.788	

LHB PROJECT NO. 150732

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 Minnesota.

DANIEL SHAW — PRINTED NAME

SIGNATURE

11–19–2018 — DATE

41423 — LIC. NO.

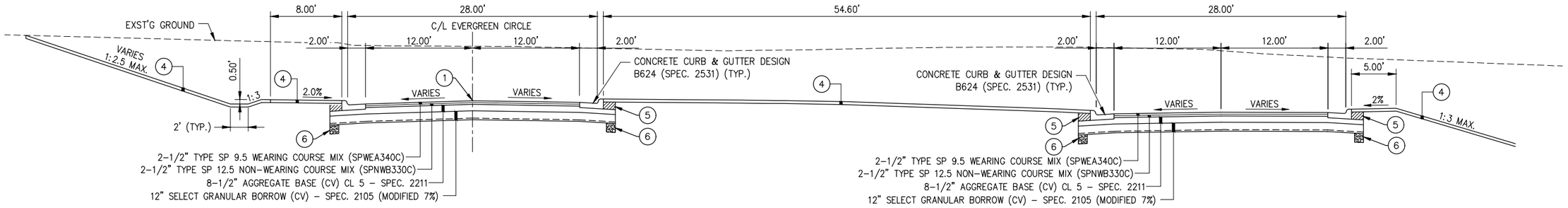
--

CITY PROJECT 1567

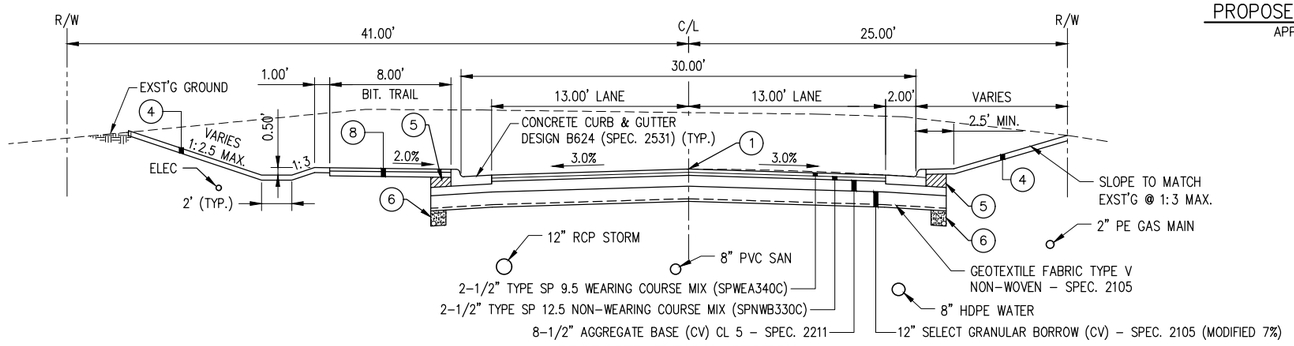
HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

STANDARD PLATES AND NOTES

SHEET NO. 2 OF 36 SHEETS



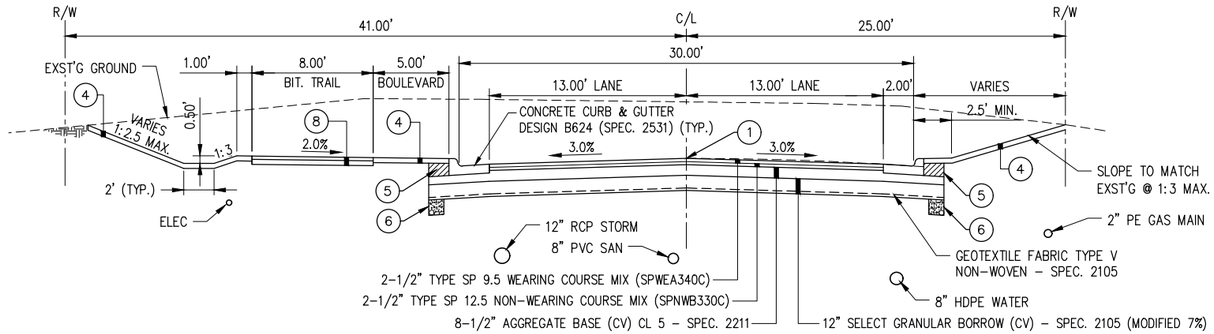
PROPOSED TYPICAL SECTION
APPLIES: CUL DE SAC



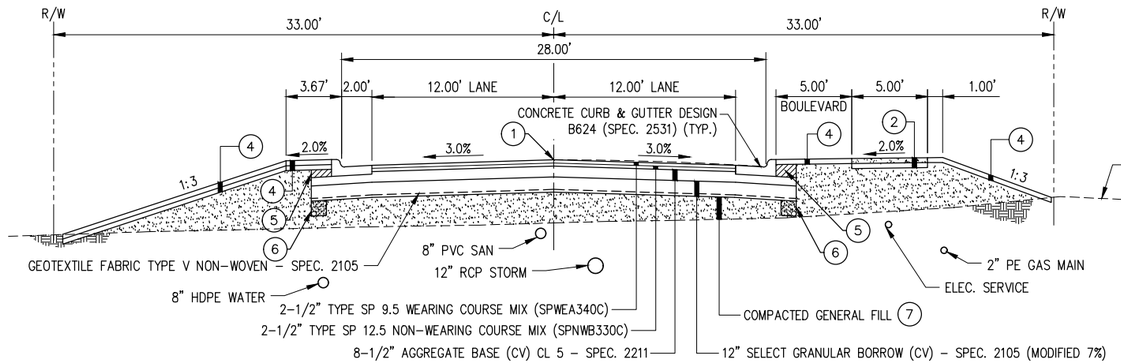
PROPOSED TYPICAL SECTION
APPLIES: EVERGREEN CIRCLE
STA. 14+12.16 TO 16+77.00

KEY NOTES

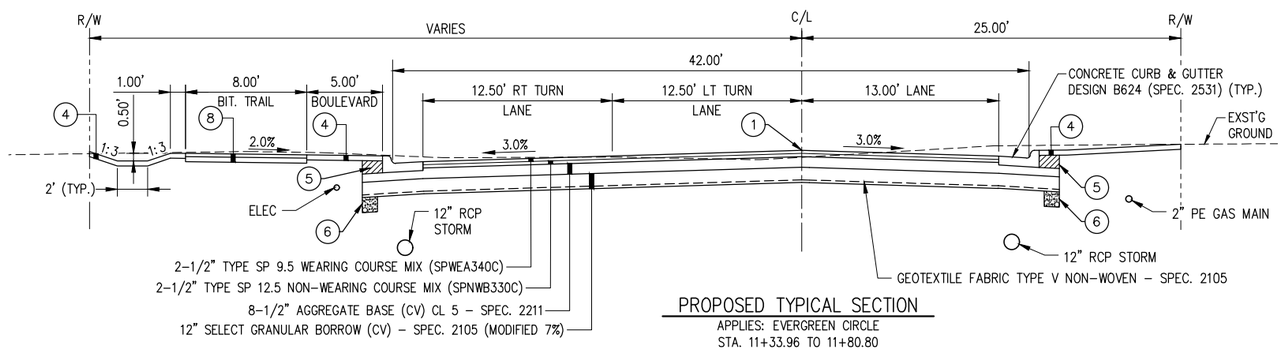
1. PROPOSED PROFILE GRADE TOP OF FINISHED SURFACE.
2. 4" CONCRETE WALK OVER 4" AGGREGATE BASE CL. 5 - SPEC. 2211, OR 8" CONCRETE WALK OVER 8-1/2" AGGREGATE BASE CL. 5 - SPEC. 2211 AT COMMERCIAL DRIVEWAYS
3. NOT USED.
4. 4" TOPSOIL AND SOD.
5. SELECT MATERIAL FROM EXCAVATION.
6. PERFORATED PIPE. SEE DETAIL STR-1 ON SHEET 5.
7. CONTRACTOR SHALL REMOVE ALL ORGANIC SOILS PRIOR TO PLACEMENT OF ANY FILL MATERIALS. EXPOSED SUBGRADE SOILS SHALL BE APPROVED BY GEOTECHNICAL ENGINEER PRIOR TO ANY PLACEMENT OF FILL MATERIALS.
8. 2-1/2" TYPE SP 9.5 WEARING COURSE MIX (SPWEA340C) OVER 6" AGGREGATE BASE CL. 5 - SPEC. 2211, 8" SUBGRADE PREP IF NEEDED.



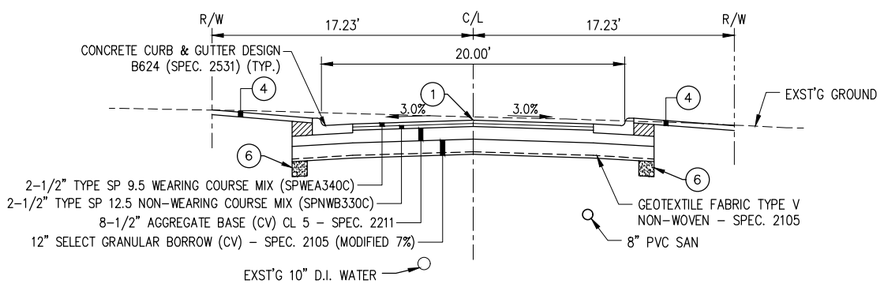
PROPOSED TYPICAL SECTION
APPLIES: EVERGREEN CIRCLE
STA. 12+30.81 TO 14+12.16



PROPOSED TYPICAL SECTION
APPLIES: MISSION DRIVE
STA. 20+69.19 TO 24+00.51



PROPOSED TYPICAL SECTION
APPLIES: EVERGREEN CIRCLE
STA. 11+33.96 TO 11+80.80



PROPOSED TYPICAL SECTION
APPLIES: STANFORD AVENUE
STA. 0+34.84 TO 2+38.24

LHB PROJECT NO. 150732

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 Minnesota.

DANIEL SHAW
PRINTED NAME

SIGNATURE

11-19-2018
DATE

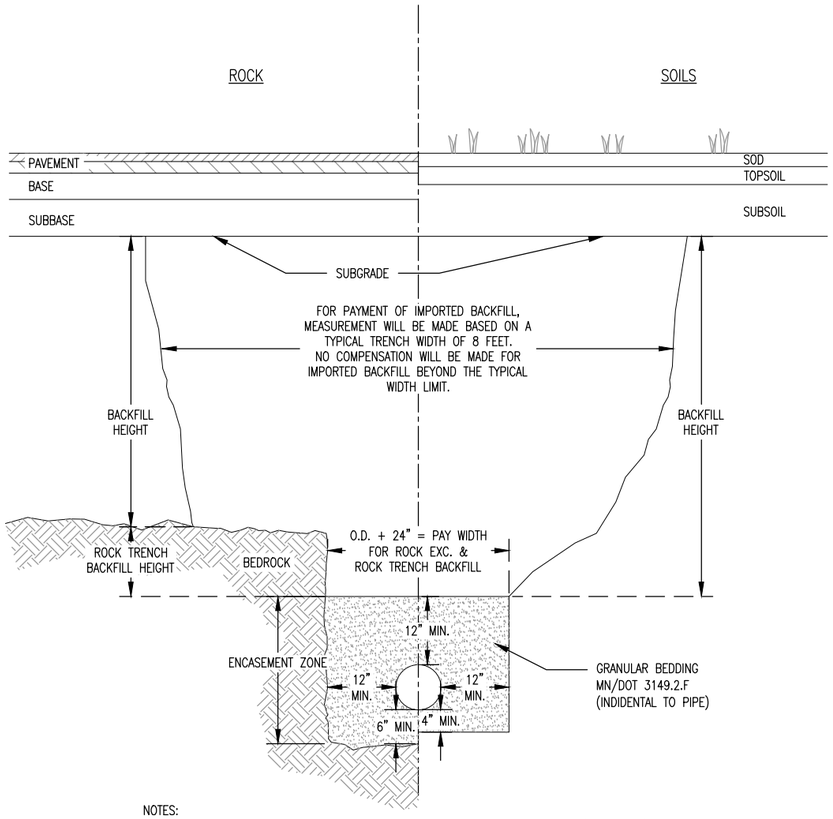
41423
LIC. NO.

--
CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT - PUBLIC UTILITIES AND ROADS

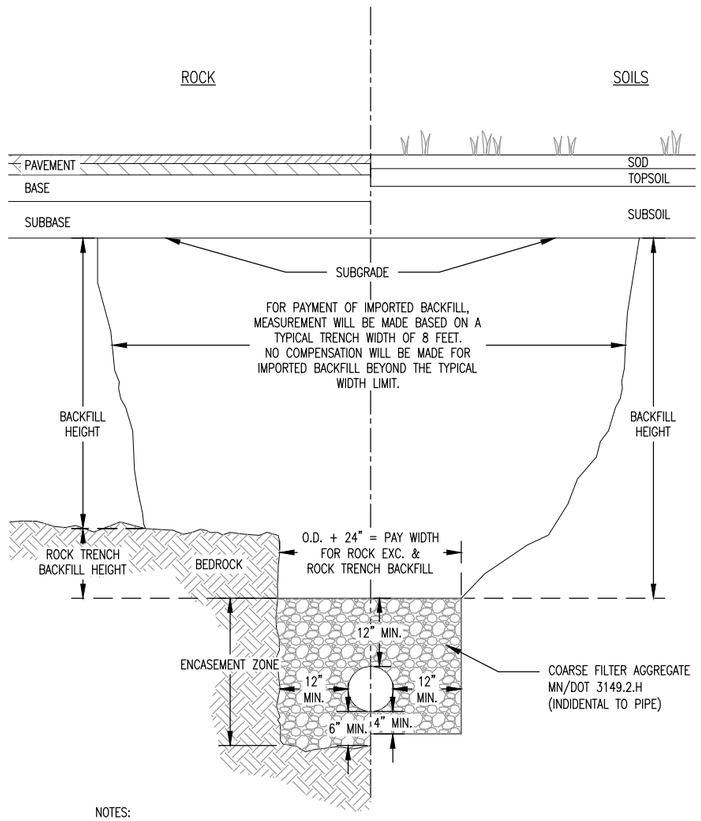
TYPICAL SECTIONS

SHEET NO. 3 OF 36 SHEETS



NOTES:
1. EXCESS EXCAVATION MATERIAL SHALL BE DISPOSED OF OFF PROJECT R.O.W. (INCIDENTAL)
2. PAY WIDTH FOR ROCK EXCAVATION SHALL BE BASED ON OUTSIDE DIAMETER OF PIPE PLUS 24".
3. A MINIMUM OF 1 CUBIC YARD OF STRUCTURE EXCAVATION, CLASS R, WILL BE PAID FOR EVERY 10' OF PIPE WHERE ROCK REMOVAL IS REQUIRED.
4. TRENCH STABILIZATION BEDDING MATERIAL MAY BE USED IN AREAS AS DETERMINED BY THE ENGINEER.
5. ENCASEMENT ZONE MATERIAL SHALL BE COMPACTED TO 95% OF MAXIMUM STANDARD PROCTOR DENSITY.
6. BACKFILL SHALL BE SELECT GRADING MATERIAL FOUND ON-SITE WHEN DEEMED SUITABLE BY THE ENGINEER OR AS OTHERWISE DEFINED IN THE PROJECT SPECIAL PROVISIONS. WHEN ON-SITE MATERIAL IS NOT SUITABLE AND WHEN BACKFILL MATERIAL IS NOT SPECIFIED, IMPORTED MATERIAL MEETING MN/DOT 3149.2.D.1 GRANULAR BACKFILL SHALL BE PROVIDED. USE OF NATIVE ON-SITE MATERIAL IS INCIDENTAL.
7. COMPACT BACKFILL MATERIALS TO 100% OF MAXIMUM STANDARD PROCTOR DENSITY FOR THE UPPER 3' BELOW THE SUBGRADE, AND TO 95% OF MAXIMUM STANDARD PROCTOR DENSITY BELOW THE UPPER 3'.

3 CONCRETE STORM SEWER BEDDING (EX-4)
NOT TO SCALE



NOTES:
1. EXCESS EXCAVATION MATERIAL SHALL BE DISPOSED OF OFF PROJECT R.O.W. (INCIDENTAL)
2. PAY WIDTH FOR ROCK EXCAVATION SHALL BE BASED ON OUTSIDE DIAMETER OF PIPE PLUS 24".
3. A MINIMUM OF 1 CUBIC YARD OF STRUCTURE EXCAVATION, CLASS R, WILL BE PAID FOR EVERY 10' OF PIPE WHERE ROCK REMOVAL IS REQUIRED.
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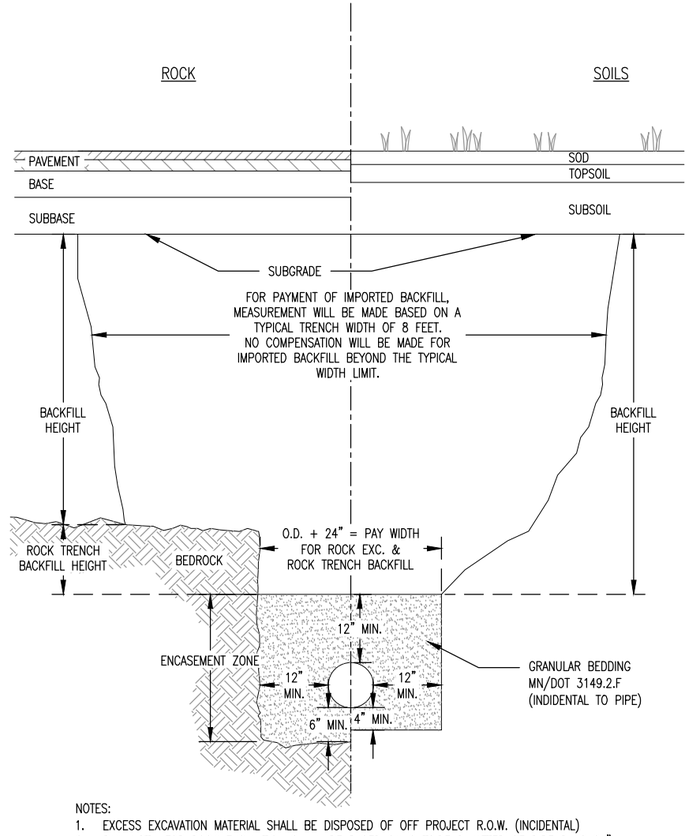
7. COMPACT BACKFILL MATERIALS TO 100% OF MAXIMUM STANDARD PROCTOR DENSITY FOR THE UPPER 3' BELOW THE SUBGRADE, AND TO 95% OF MAXIMUM STANDARD PROCTOR DENSITY BELOW THE UPPER 3'.

2 PVC AND CORRUGATED POLYETHYLENE SEWER PIPE BEDDING DETAIL (EX-3)
NOT TO SCALE



NOTES:
1. EXCESS EXCAVATION MATERIAL SHALL BE DISPOSED OF OFF PROJECT R.O.W. (INCIDENTAL)
2. PAY WIDTH FOR ROCK EXCAVATION SHALL BE BASED ON OUTSIDE DIAMETER OF PIPE PLUS 24".
3. A MINIMUM OF 1 CUBIC YARD OF STRUCTURE EXCAVATION, CLASS R, WILL BE PAID FOR EVERY 10' OF PIPE WHERE ROCK REMOVAL IS REQUIRED.
4. TRENCH STABILIZATION BEDDING MATERIAL MAY BE USED IN AREAS AS DETERMINED BY THE ENGINEER.
5. ENCASEMENT ZONE MATERIAL SHALL BE COMPACTED TO 95% OF MAXIMUM STANDARD PROCTOR DENSITY.
6. BACKFILL SHALL BE SELECT GRADING MATERIAL FOUND ON-SITE WHEN DEEMED SUITABLE BY THE ENGINEER OR AS OTHERWISE DEFINED IN THE PROJECT SPECIAL PROVISIONS. WHEN ON-SITE MATERIAL IS NOT SUITABLE AND WHEN BACKFILL MATERIAL IS NOT SPECIFIED, IMPORTED MATERIAL MEETING MN/DOT 3149.2.D.1 GRANULAR BACKFILL SHALL BE PROVIDED. USE OF NATIVE ON-SITE MATERIAL IS INCIDENTAL.
7. COMPACT BACKFILL MATERIALS TO 100% OF MAXIMUM STANDARD PROCTOR DENSITY FOR THE UPPER 3' BELOW THE SUBGRADE, AND TO 95% OF MAXIMUM STANDARD PROCTOR DENSITY BELOW THE UPPER 3'.

1 DUCTILE IRON, PE WATERMAIN, PRESSURE SEWER, AND FORCEMAIN BEDDING (EX-1)
NOT TO SCALE

LHB PROJECT NO. 150732

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 Minnesota.

DANIEL SHAW
PRINTED NAME

Daniel G Shaw
SIGNATURE

11-19-2018
DATE

41423
LIC. NO.

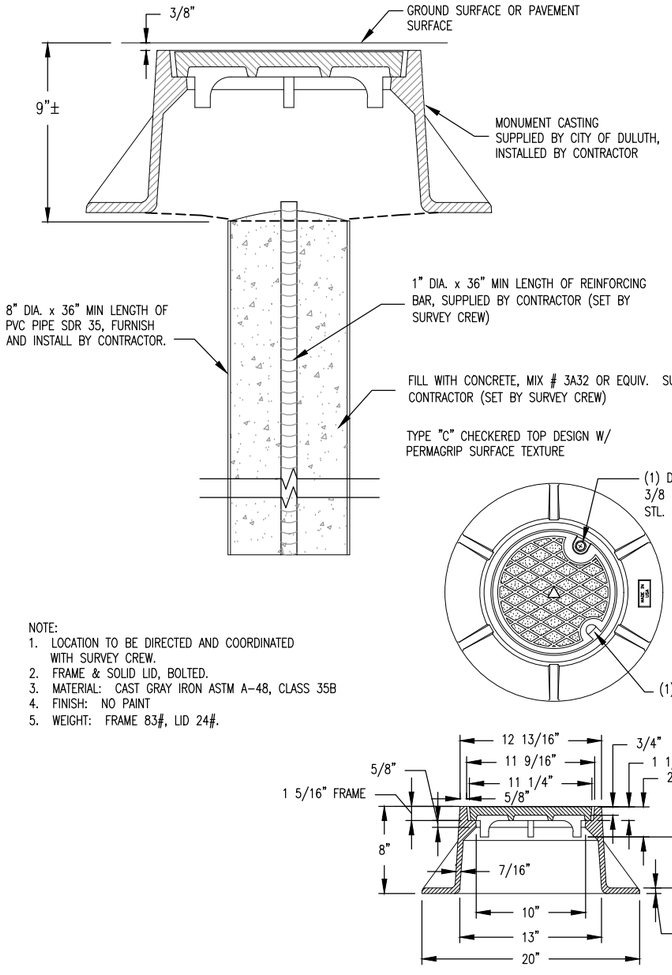
--
CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

CONSTRUCTION DETAILS

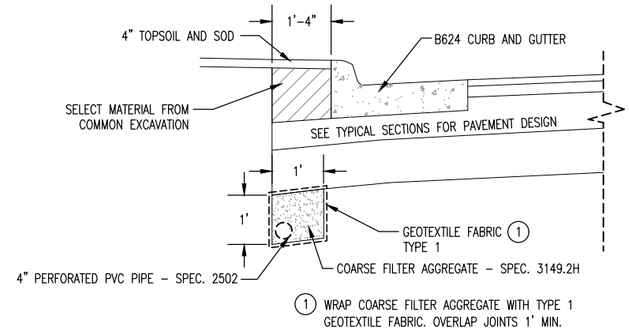
SHEET NO. 4 OF 36 SHEETS

PLOT DATE: 12/11/2018 12:16:16 PM FILE: R:\15Proj\150732\600 Drawings\C\150732 R03.0 Details.dwg

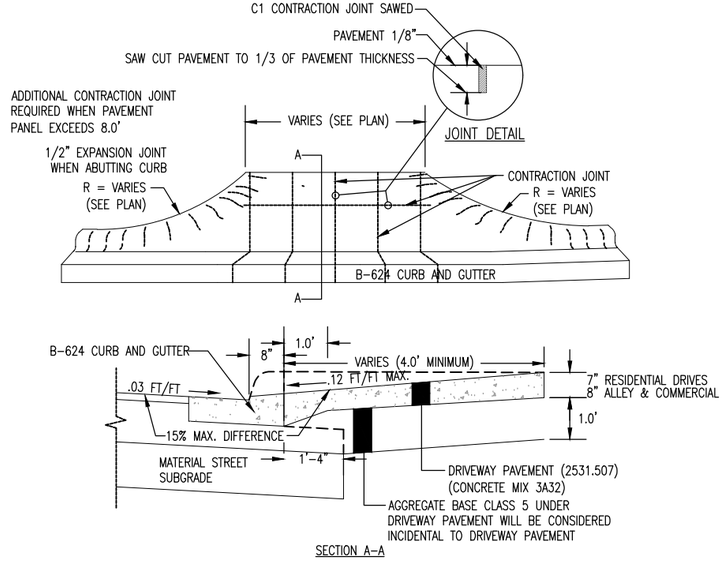


NOTE:
1. LOCATION TO BE DIRECTED AND COORDINATED WITH SURVEY CREW.
2. FRAME & SOLID LID, BOLTED.
3. MATERIAL: CAST GRAY IRON ASTM A-48, CLASS 35B
4. FINISH: NO PAINT
5. WEIGHT: FRAME 83#, LID 24#.

3 CONSTRUCT SURVEY MONUMENT (SUR-1)
NOT TO SCALE

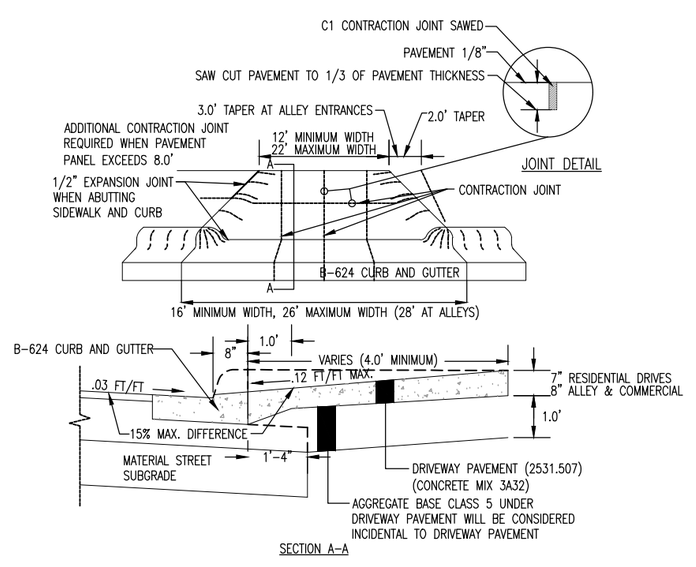


4 STR-1 PERFORATED PIPE DETAIL
NOT TO SCALE



NOTES:
1. WHERE THERE IS NO SIDEWALK OR THERE IS A GRASS BOULEVARD BETWEEN THE SIDEWALK AND THE BACK OF CURB THE CREST OF THE DRIVEWAY MUST BE AT LEAST 6" ABOVE GUTTER TO CONTAIN RUNOFF.
2. WHERE THERE IS SIDEWALK DIRECTLY BEHIND THE CURB, DRIVEWAY PROFILE SLOPE SHALL BE FLATTENED TO MEET ADA ACCESSIBLE ROUTE STANDARDS

2 DRIVEWAY AND ALLEY ENTRANCES (STR-5) (MODIFIED)
NOT TO SCALE



NOTES:
1. WHERE THERE IS NO SIDEWALK OR THERE IS A GRASS BOULEVARD BETWEEN THE SIDEWALK AND THE BACK OF CURB THE CREST OF THE DRIVEWAY MUST BE AT LEAST 6" ABOVE GUTTER TO CONTAIN RUNOFF.
2. WHERE THERE IS SIDEWALK DIRECTLY BEHIND THE CURB, DRIVEWAY PROFILE SLOPE SHALL BE FLATTENED TO MEET ADA ACCESSIBLE ROUTE STANDARDS

1 DRIVEWAY AND ALLEY ENTRANCES (STR-5)
NOT TO SCALE

LHB PROJECT NO. 150732

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DANIEL SHAW
PRINTED NAME

Daniel G Shaw
SIGNATURE

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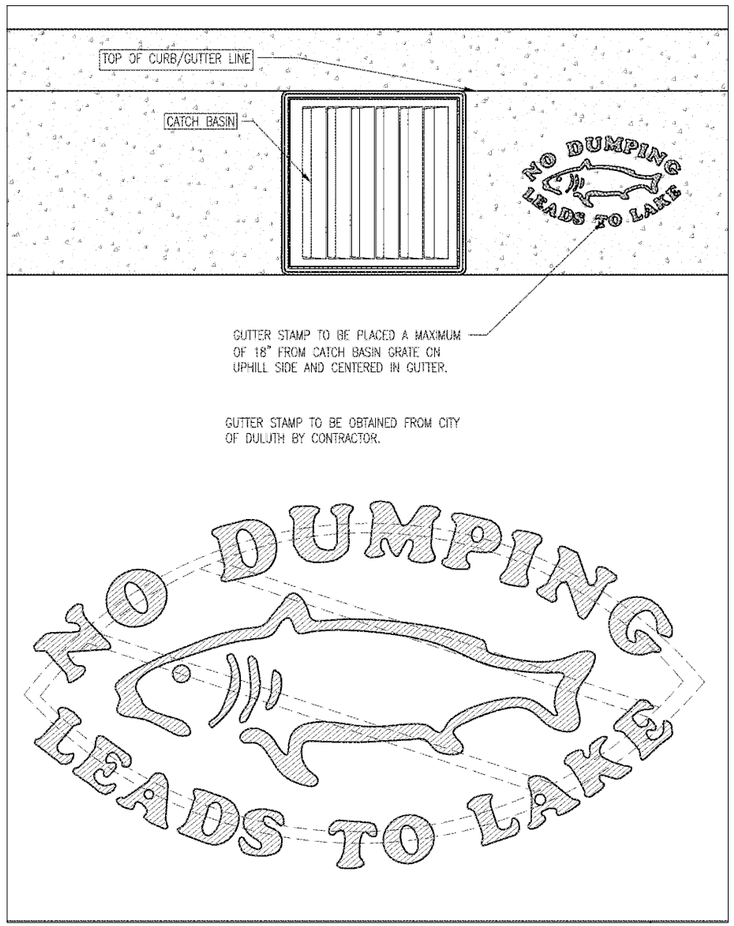
CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

CONSTRUCTION DETAILS

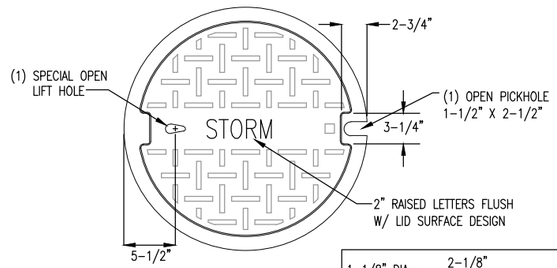
SHEET NO. 5 OF 36 SHEETS



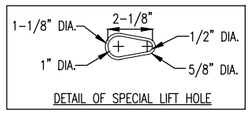
5 GUTTER STAMP (STRM-7)
NOT TO SCALE

WGT. 298 LBS		MATL. GRAY IRON CLASS 35B
WGT. 122 LBS	TOT.WGT. 420 LBS.	SPEC. ASTM A-48-74

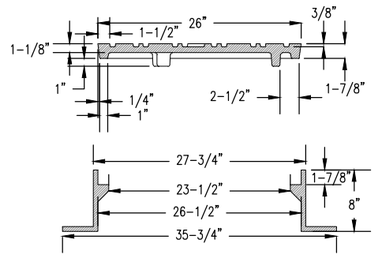
NOTE: SUITABLE FOR HS25 WHEEL LOADS



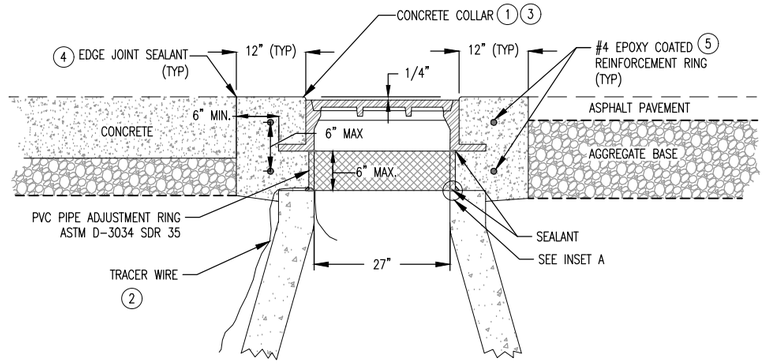
NOTE: T/CAST SHALL BE .03' BELOW FINISHED PAVEMENT SURFACE.



DETAIL OF SPECIAL LIFT HOLE



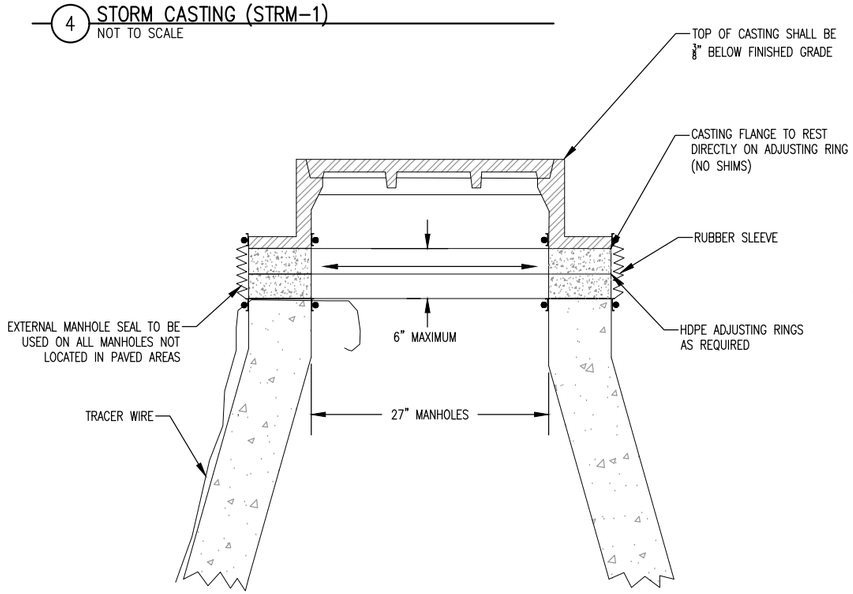
4 STORM CASTING (STRM-1)
NOT TO SCALE



INSET A

NOTES:
1. CONCRETE (MIX NO. 3Y43) COLLAR TO ENCASE CASTING AND ADJUSTMENT RING.
2. TRACER WIRE REQUIRED ON ALL SANITARY SEWER MAINS.
3. CONCRETE COLLAR SHALL BE CIRCULAR LAYOUT. PAVEMENT AND BASE SHALL BE CUT OUT WITH ROTATING CUTTING DEVICE
4. FINISH CONCRETE EDGE WITH 1/4" RADIUS. SEAL JOINT BETWEEN PAVEMENT AND COLLAR.
5. MAINTAIN 3.5" COVER ON REINFORCEMENT.

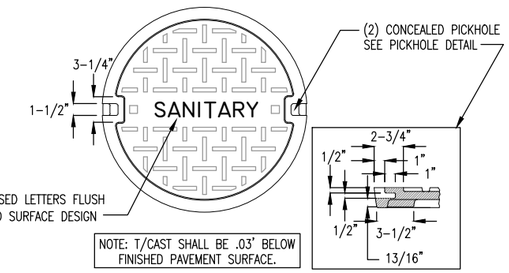
3 CONCRETE ENCASED CASTING COLLAR FOR SANITARY MH IN ROADWAY, WALKS, AND DRIVES (SAN-3A)
NOT TO SCALE



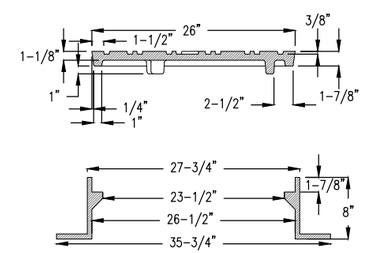
2 SANITARY MANHOLE SEAL (SAN-3)
NOT TO SCALE

WGT. 298 LBS		MATERIAL: GRAY IRON CLASS 35B
WGT. 122 LBS	TOTAL WEIGHT 420 LBS.	SPEC.: ASTM A-48-74

NOTE: SUITABLE FOR HS25 WHEEL LOADS



NOTE: T/CAST SHALL BE .03' BELOW FINISHED PAVEMENT SURFACE.



1 SANITARY CASTING DETAIL (SAN-1)
NOT TO SCALE

LHB PROJECT NO. 150732

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DANIEL SHAW
PRINTED NAME

Daniel J. Shaw
SIGNATURE

11-19-2018
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41423
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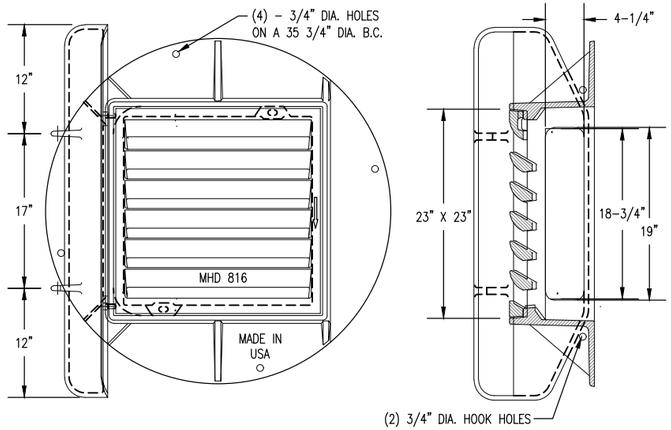
CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

CONSTRUCTION DETAILS

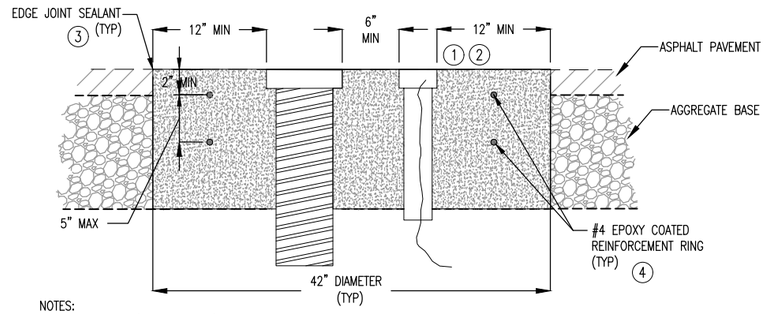
SHEET NO. 6 OF 36 SHEETS

PLOT DATE: 12/11/2018 12:16:37 PM FILE: R:\15Pro\150732\600 Drawings\C\150732 R03.0 Details.dwg



NOTES:
1. COMPONENT NO'S: FRAME 5002, GRATE MHD 816 (STD PLATE 4154B), CURB BOX 823A (STD PLATE 4160D).
2. MATERIAL: CAST GRAY IRON ASTM A–48, CLASS 35B
3. WEIGHT: FRAME APPROX. 257#, GRATE 131#, CURB BOX 105#.
4. ALL GUTTERS UPSTREAM OF CATCH BASINS SHALL BE STAMPED, "NO DUMPING, LEADS TO LAKE" WITH A CITY SUPPLIED STAMP.

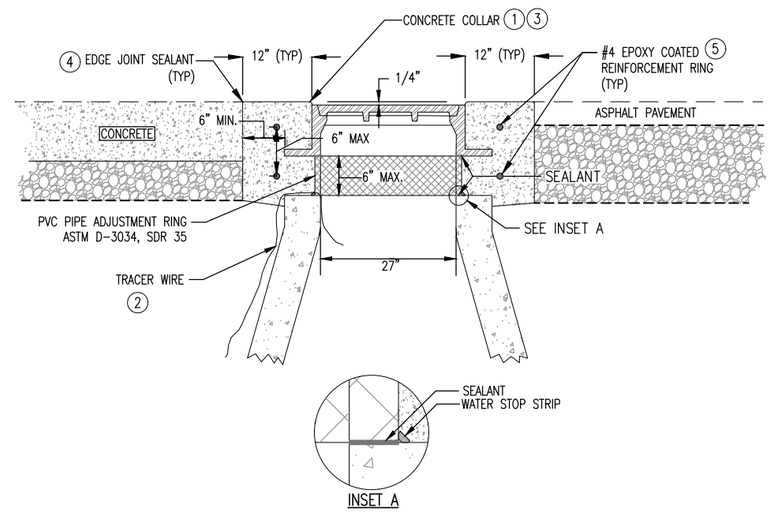
4 CATCH BASIN / CURB BOX CASTING (STRM–2)
NOT TO SCALE



NOTES:
1. CONCRETE (MIX NO. 3Y43) COLLAR TO ENCASE VALVE BOX CASTING.
2. CONCRETE COLLAR SHALL BE CIRCULAR LAYOUT. PAVEMENT AND BASE SHALL BE CUT OUT WITH ROTATING CUTTING DEVICE
3. FINISH CONCRETE EDGE WITH 1/4" RADIUS. SEAL JOINT BETWEEN PAVEMENT AND COLLAR.
4. MAINTAIN 3.5" COVER ON REINFORCEMENT.

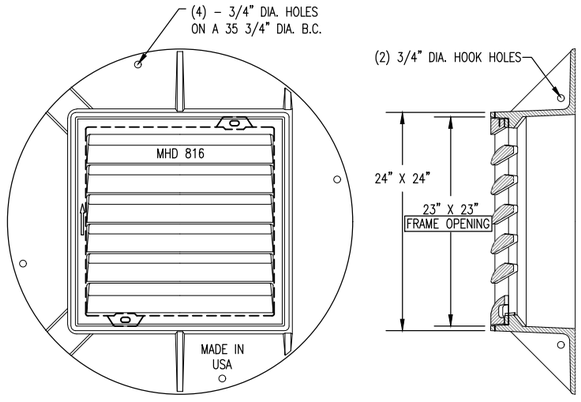
CONCRETE ENCASED WATER VALVE BOX COLLAR W/ TRACER BOX

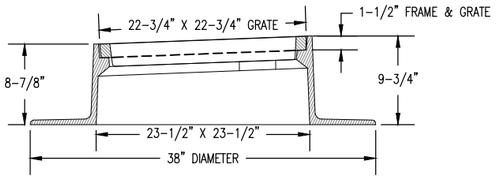
5 CONCRETE ENCASED VALVE BOX COLLAR IN ROADWAY (W–19)
NOT TO SCALE



NOTES:
1. CONCRETE (MIX NO. 3Y43) COLLAR TO ENCASE CASTING AND ADJUSTMENT RING.
2. TRACER WIRE, IF REQUIRED, FOR PLASTIC PIPE ON PROJECT
3. CONCRETE COLLAR SHALL BE CIRCULAR LAYOUT. PAVEMENT AND BASE SHALL BE CUT OUT WITH ROTATING CUTTING DEVICE
4. FINISH CONCRETE EDGE WITH 1/4" RADIUS. SEAL JOINT BETWEEN PAVEMENT AND COLLAR.
5. MAINTAIN 3.5" COVER ON REINFORCEMENT.

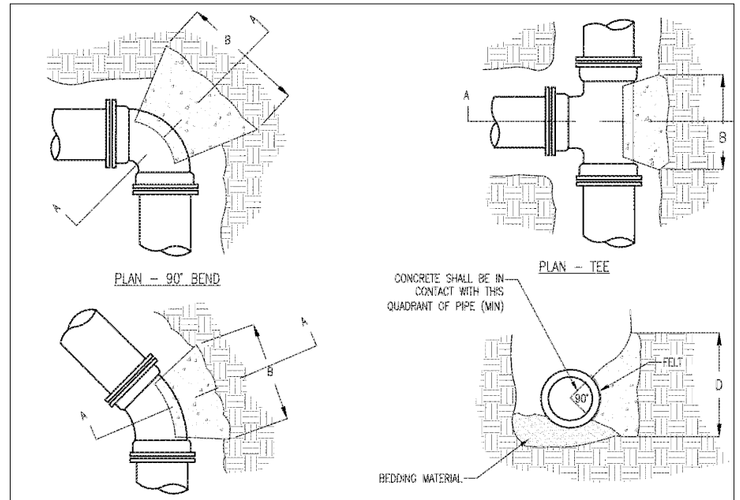
3 CONCRETE ENCASED CASTING COLLAR FOR STORM MH IN ROADWAY, WALKS, AND DRIVES (STRM–5A)
NOT TO SCALE





NOTES:
1. COMPONENT NO'S: FRAME 5005, GRATE 816 (STD PLATE 4154B).
2. MATERIAL: CAST GRAY IRON ASTM A–48, CLASS 35B
3. WEIGHT: FRAME 262#; GRATE 131#
4. ALL GUTTERS UPSTREAM OF CATCH BASINS SHALL BE STAMPED, "NO DUMPING, LEADS TO LAKE" WITH A CITY SUPPLIED STAMP.

2 CB CASTING (STRM–3)
NOT TO SCALE



NOTES
1. DIMENSIONS IN TABLE ARE BASED ON A WATER PRESSURE OF 150 P.S.I. & AN EARTH RESISTANCE OF 2 TONS/S.F.
2. BLOCKING TO BE SET AGAINST UNDISTURBED SOIL
3. CONCRETE SHALL BE MIX 3G52 (MNDOT SPEC. 2461) CONCRETE SHALL NOT INTERFERE WITH MECHANICAL JOINTS
4. POLYETHLYENE SHALL BE USED TO SEPARATE CONCRETE FROM FITTING.
5. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

BLOCKING DIMENSIONS

BEND OR BRANCH SIZE	22–1/2° BENDS		45° BENDS		90° BENDS		TEES	
	B	D	B	D	B	D	B	D
0'–6"	1'–0"	1'–0"	1'–0"	1'–0"	1'–4"	1'–2"	1'–3"	1'–0"
0'–8"	1'–0"	1'–0"	1'–4"	1'–2"	1'–10"	1'–6"	1'–6"	1'–4"
1'–0"	1'–4"	1'–4"	1'–10"	1'–10"	2'–8"	2'–3"	2'–3"	2'–0"
1'–4"	1'–10"	1'–8"	2'–6"	2'–4"	3'–10"	2'–10"	3'–2"	2'–4"
1'–8"	2'–4"	2'–0"	3'–3"	2'–10"	5'–0"	3'–4"	4'–0"	3'–0"
2'–0"	2'–10"	2'–4"	4'–0"	3'–3"	6'–4"	3'–10"	5'–3"	3'–4"
2'–6"	3'–6"	3'–0"	5'–4"	3'–10"	8'–0"	4'–8"	6'–3"	4'–3"

1 THRUST BLOCKING FOR WATER MAIN (W–3)
NOT TO SCALE

LHB PROJECT NO. 150732

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 Minnesota.

DANIEL SHAW
PRINTED NAME

Daniel G Shaw
SIGNATURE

11–19–2018
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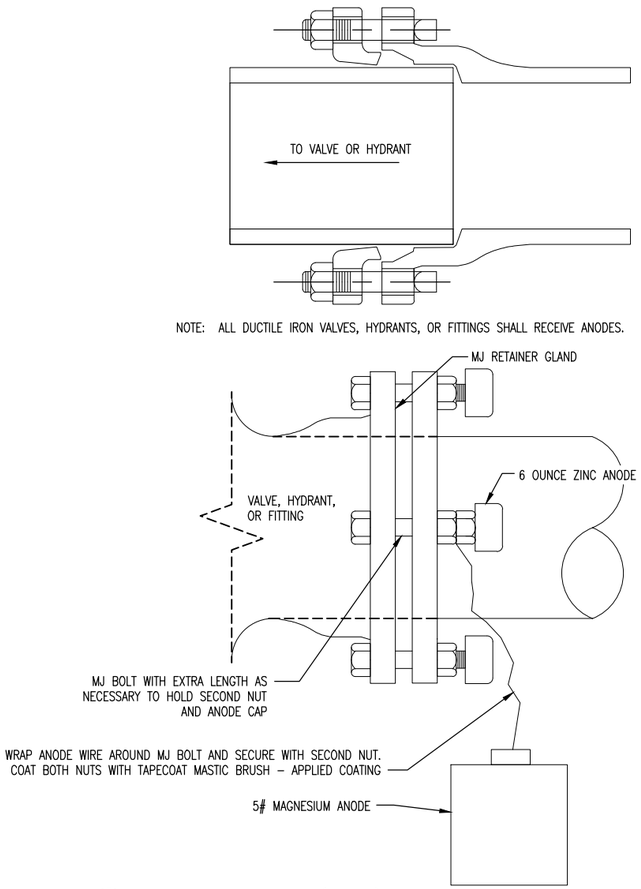
CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

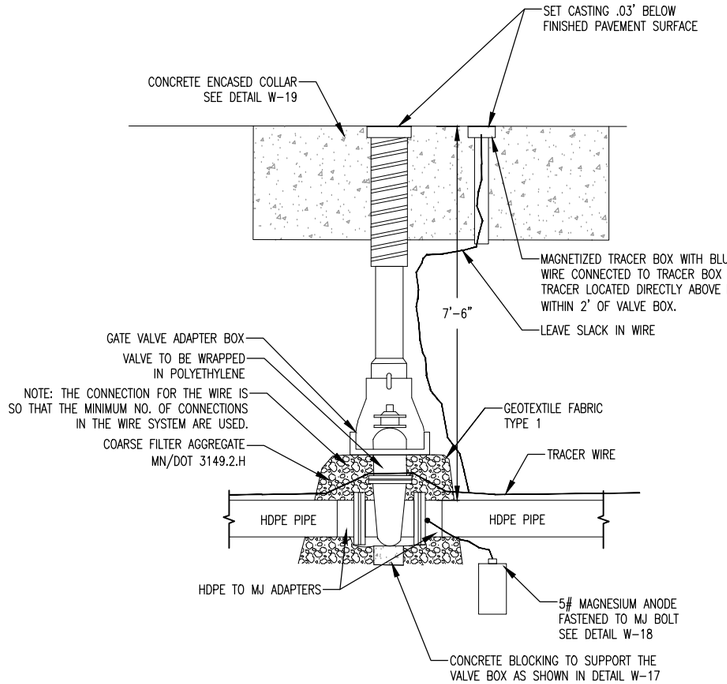
CONSTRUCTION DETAILS

SHEET NO. 7 OF 36 SHEETS



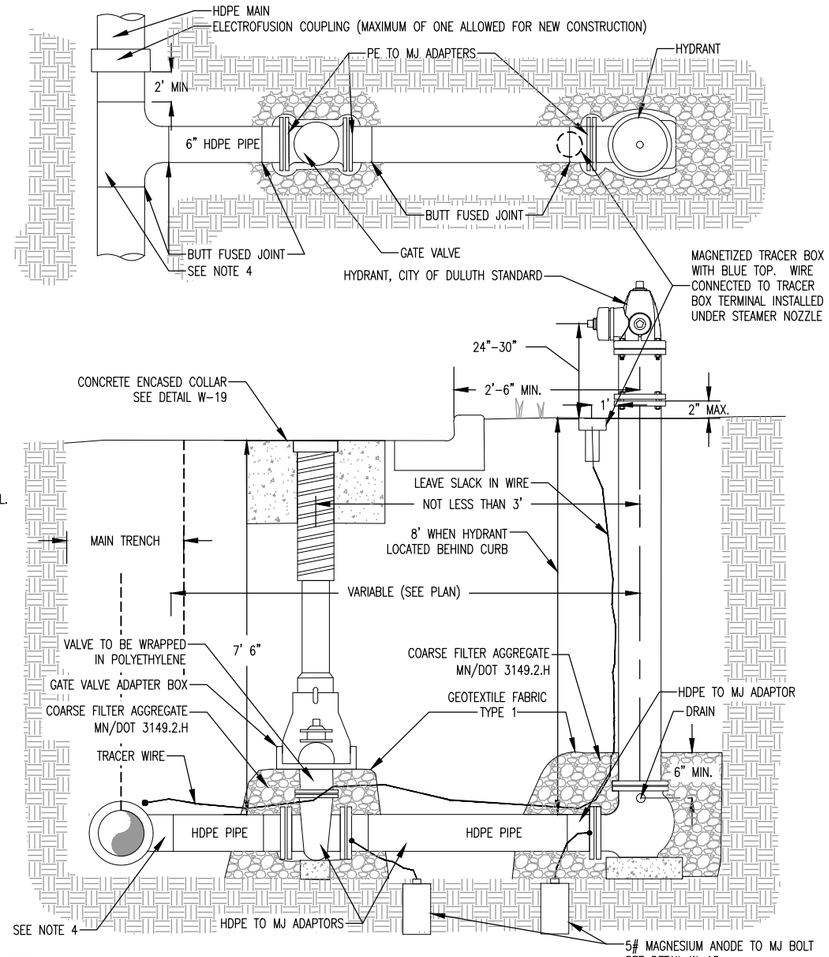
NOTE: ALL DUCTILE IRON VALVES, HYDRANTS, OR FITTINGS SHALL RECEIVE ANODES.

3 ANODE CONNECTION (W–18)
NOT TO SCALE



NOTES:
1. VALVES SHALL BE CONNECTED DIRECTLY TO HDPE WITH HDPE TO MECHANICAL JOINT ADAPTERS.
2. USE EPOXY COATING ON EXTERIOR OF VALVES.
3. ALL BOLTS SHALL BE COR–TEN WITH 6 OUNCE ZINC ANODE CAPS CONFORMING TO ASTM B–418 FOR ALL MECHANICAL JOINT FITTINGS.
4. FOR OPEN CUT PIPE INSTALLATIONS, ELECTROFUSION COUPLINGS ARE NOT ALLOWED FOR CONNECTION OF HDPE TO MJ ADAPTERS. FOR DIRECTIONAL DRILLED INSTALLATIONS, ONE ELECTROFUSION COUPLING MAY BE USED PER VALVE.
5. GATE VALVES WITH HDPE STUBS MAY BE USED IN LIEU OF MJ VALVES. ANODE SHALL BE CONNECTED DIRECTLY TO THE VALVE BONNET BOLTS.

2 WATER VALVE BOX – HDPE MAIN (W–17A)
NOT TO SCALE



NOTES
1. VALVES SHALL BE CONNECTED DIRECTLY TO MECHANICAL JOINT ADAPTORS.
2. USE EPOXY COATING ON VALVE AND HYDRANT BASE
3. ALL BOLTS SHALL BE COR–TEN WITH 6 OUNCE ZINC ANODE CAPS CONFORMING TO ASTM B–418 FOR ALL MECHANICAL JOINT FITTINGS.
4. FOR 8" MAINS, CONTRACTOR SHALL USE AN 8 X 8 TEE WITH A MACHINED 8 X 6 REDUCER OR AN 8 X 6 ELECTROFUSION BRANCH SADDLE. FOR LARGER DIMENSION MAINS A FABRICATED TEE WITH A 6" BRANCH OUTLET MAY BE USED.
5. GATE VALVES WITH HDPE STUBS MAY BE USED IN LIEU OF MJ VALVES. ANODES SHALL BE CONNECTED DIRECTLY TO THE VALVE BONNET BOLTS.

1 FIRE HYDRANT SETTING DETAIL – HDPE (W–4A)
NOT TO SCALE

LHB PROJECT NO. 150732

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DANIEL SHAW
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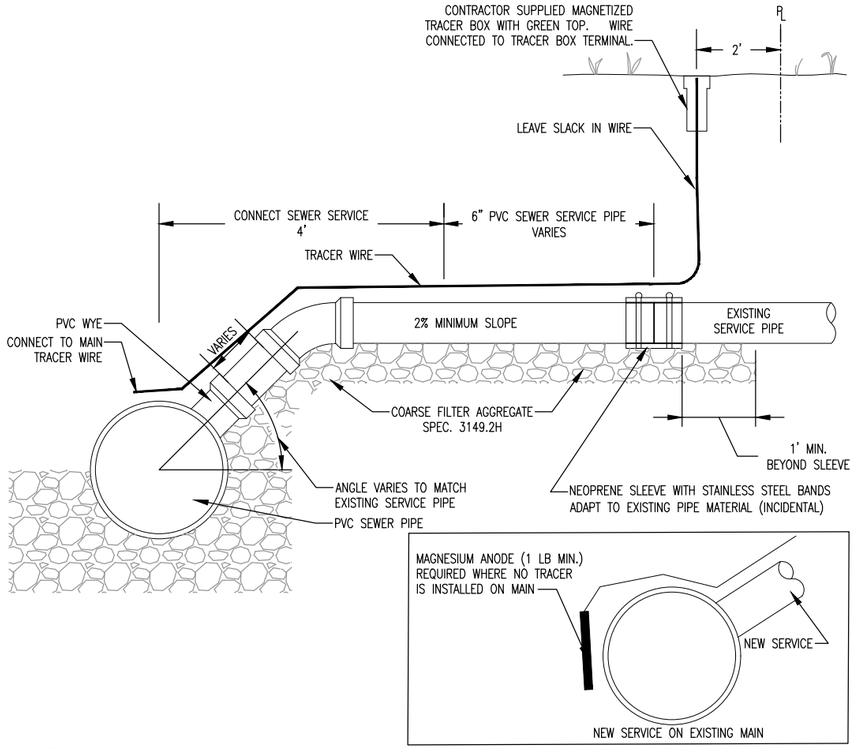
HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

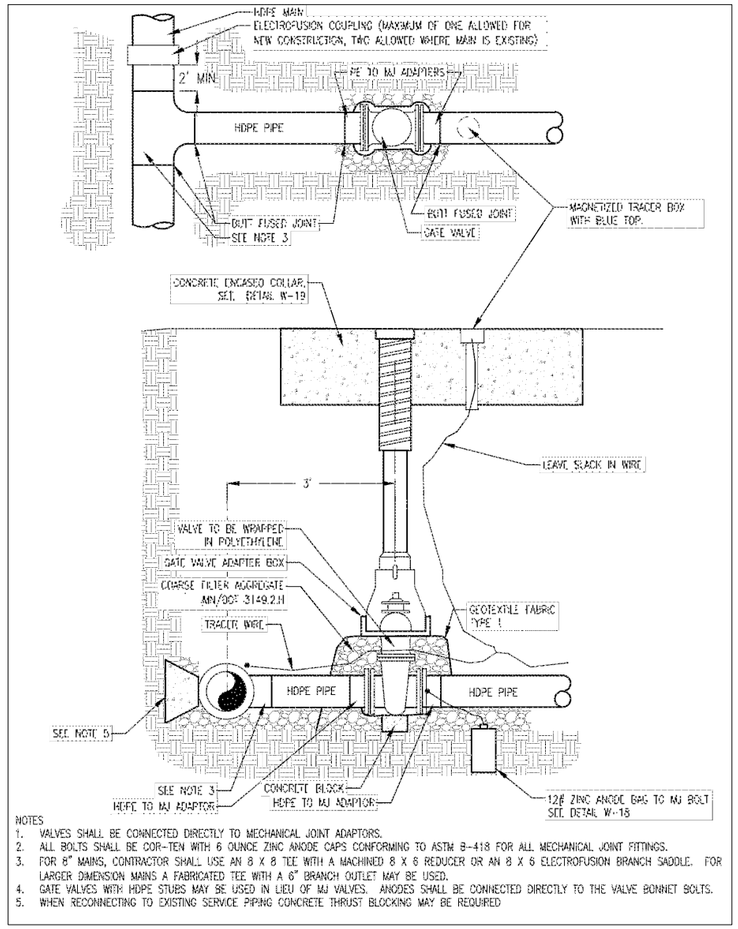
CONSTRUCTION DETAILS

SHEET NO. 8 OF 36 SHEETS



NOTES
1. BID ITEM FOR PVC WYE INCLUDES FURNISHING AND INSTALLING WYE IN SEWER MAIN.
2. CONNECT SEWER SERVICE INCLUDES 6" PVC SEWER SERVICE PIPE (TO 4' FROM C/L) AND ALL FITTINGS
3. 6" PVC SEWER SERVICE PIPE IS INTENDED FOR THE RECONSTRUCTION OF SEWER SERVICES (WHEN FOUND TO BE IN NEED BY THE ENGINEER) COMPLETE IN PLACE FROM 4.0' BEYOND THE C/L OF THE SEWER MAIN TO A POINT DESIGNATED BY THE ENGINEER
4. FOR NEW SERVICES, PIPE TO STOP AT RIGHT OF WAY
5. #12 GAUGE GREEN INSULATED COPPER TRACER WIRE SHALL BE INSTALLED WITH SANITARY SEWER MAINS AND SERVICES. TRACER WIRE TERMINAL BOXES SHALL BE INSTALLED DIRECTLY ABOVE THE SEWER SERVICE OR AS DETERMINED BY THE ENGINEER
6. FOR SERVICES, TRACER WIRE SHALL RUN FROM THE WYE AND TERMINATE IN A FLUSH MOUNTED TRACER BOX WITH A GREEN CAST IRON LOCKABLE TOP.
7. THE TRACER WIRE SHALL REMAIN CONTINUOUS TO THE GREATEST EXTENT POSSIBLE. SPLICES IN THE TRACER WIRE SHOULD BE MADE WITH SPLIT BOLT CONNECTORS. WIRE NUTS SHALL NOT BE USED. A WATER-PROOF CONNECTION IS NECESSARY TO PREVENT CORROSION.

2 TYPICAL SEWER SERVICE CONNECTION (SAN-2)
NOT TO SCALE



NOTES
1. VALVES SHALL BE CONNECTED DIRECTLY TO MECHANICAL JOINT ADAPTORS.
2. ALL BOLTS SHALL BE COR-TEN WITH 6 OUNCE ZINC ANODE CAPS CONFORMING TO ASTM B-418 FOR ALL MECHANICAL JOINT FITTINGS.
3. FOR 8" MAINS, CONTRACTOR SHALL USE AN 8 X 8 TEE WITH A MACHINED 8 X 6 REDUCER OR AN 8 X 6 ELECTROFUSION BRANCH SADDLE. FOR LARGER DIMENSION MAINS A FABRICATED TEE WITH A 6" BRANCH OUTLET MAY BE USED.
4. GATE VALVES WITH HDPE STUBS MAY BE USED IN LIEU OF MJ VALVES. ANODES SHALL BE CONNECTED DIRECTLY TO THE VALVE BONNET BOLTS.
5. WHEN RECONNECTING TO EXISTING SERVICE PIPING CONCRETE THRUST BLOCKING MAY BE REQUIRED

1 4" AND LARGER WATER SERVICE (W-5B)
NOT TO SCALE

LHB PROJECT NO. 150732

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 Minnesota.

DANIEL SHAW
PRINTED NAME

SIGNATURE

11-19-2018
DATE

41423
LIC. NO.

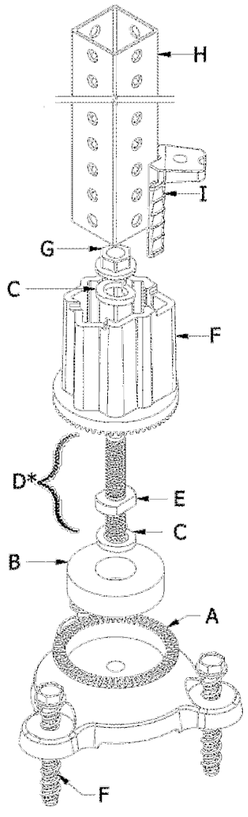
--
CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

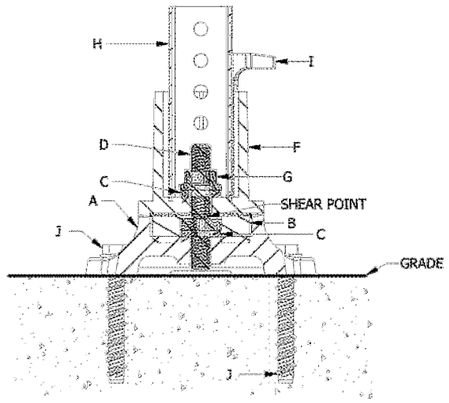
CONSTRUCTION DETAILS

SHEET NO. 9 OF 36 SHEETS

PLOT DATE: 12/11/2018 12:17:07 PM FILE: R:\15Pro\150732\600 Drawings\C\150732 R03.0 Details.dwg



ISOMETRIC VIEW



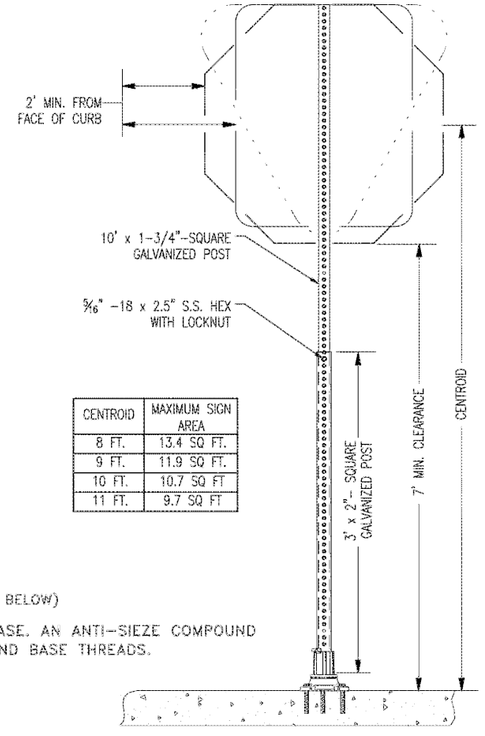
INSTALLED CROSS SECTION VIEW

PARTS LIST

A. SURFACE MOUNT ANCHOR BASE
B. RUBBER BUSHING
C. LOCK WASHER
D. 5/8"-11 X 4" SHEAR BOLT
E. SHOULDER
F. TOP HALF COUPLER
G. 5/8"-11 SERRATED FLANGE NUT
H. SIGN SUPPORT 2"x 2" (12 GAUGE)
I. SIGN SUPPORT LOCKING WEDGE
J. 1/2" X 4" CONCRETE ANCHOR BOLT. (SEE NOTE BELOW)

CENTROID	MAXIMUM SIGN AREA
8 FT.	13.4 SQ FT.
9 FT.	11.9 SQ FT.
10 FT.	10.7 SQ FT
11 FT.	9.7 SQ FT

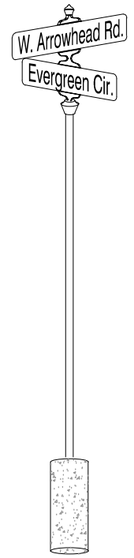
* PRIOR TO THREADING THE SHEAR BOLT INTO ANCHOR BASE, AN ANTI-SIEZE COMPOUND SHALL BE GENEROUSLY APPLIED TO THE SHEAR BOLT AND BASE THREADS.

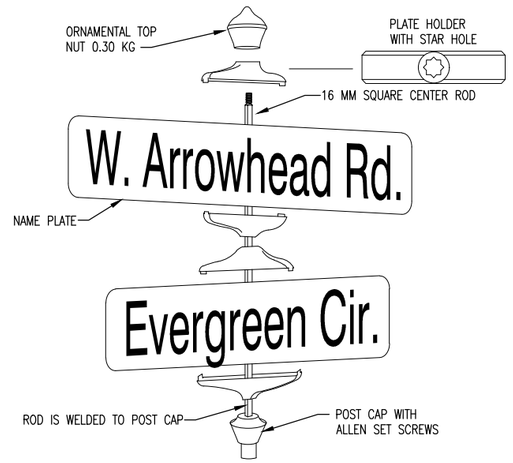


NOTE:
SURFACE MOUNTED UNIT SHALL BE ATTACHED WITH NO LESS THAN (3) CONCRETE ANCHORS WITH A MINIMUM DIAMETER OF 1/2" AND A MINIMUM LENGTH OF 4" LONG. THE EMBEDDED DEPTH SHALL BE A MINIMUM OF 3-5/8". THE ALLOWABLE TENSION LOAD SHALL BE 2,270 LBS WHEN INSTALLED IN NORMAL WEIGHT, 3,000 PSI CONRETE.

SIGN & BREAKAWAY MOUNT INSTALLATION		T-2
REVISED/APPROVED 1/17/2017	CITY OF DULUTH STANDARD DETAIL DEPT. OF PUBLIC WORKS AND UTILITIES	NO SCALE

3 SIGN INSTALLATION DETAIL (T-2)
NOT TO SCALE

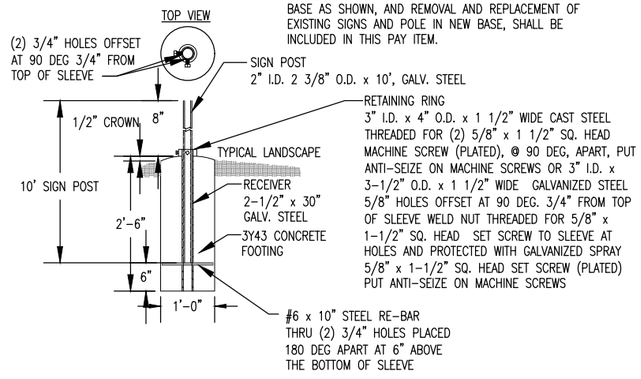




TOTAL WEIGHT OF ROD AND POST CAP = 2.15 kg

NOTE: SEE ASSEMBLY SPECIFICATIONS (S-28)

2 E-450 INSTALLATION (T-5)
NOT TO SCALE



ALL MATERIALS AND LABOR USED TO CONSTRUCT SIGN BASE AS SHOWN, AND REMOVAL AND REPLACEMENT OF EXISTING SIGNS AND POLE IN NEW BASE, SHALL BE INCLUDED IN THIS PAY ITEM.

SPEC. 2564.602, REMOVE AND REINSTALL SIGN, EACH

1 STREET NAME SIGN FOOTING DETAIL (T-3)
NOT TO SCALE

LHB PROJECT NO. 150732

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 Minnesota.

DANIEL SHAW — PRINTED NAME
Daniel G Shaw — SIGNATURE
11-19-2018 — DATE
41423 — LIC. NO.

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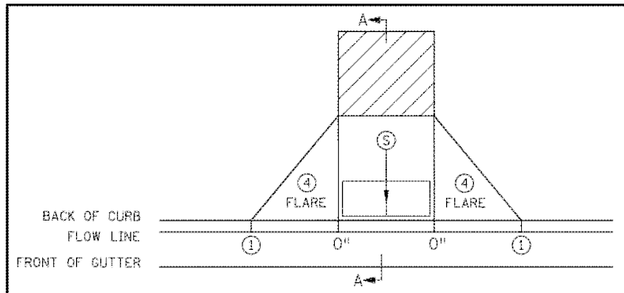
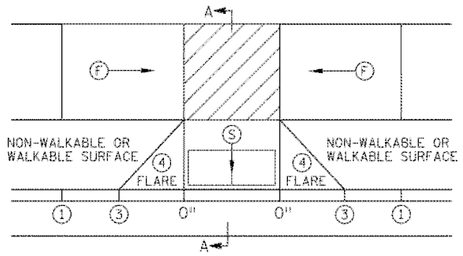
CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

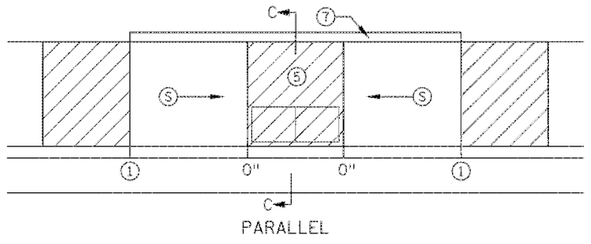
CONSTRUCTION DETAILS
SHEET NO. 10 OF 36 SHEETS



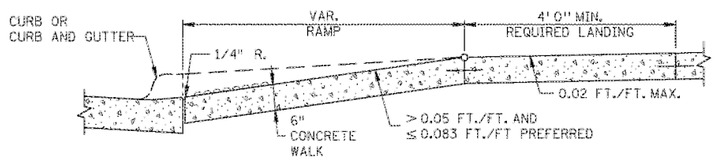
PERPENDICULAR



TIERED PERPENDICULAR

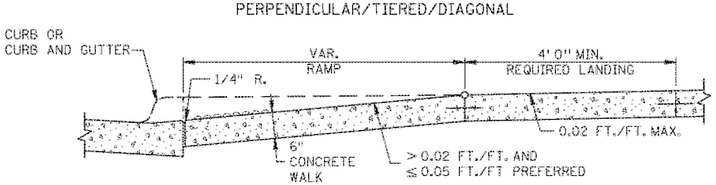


PARALLEL



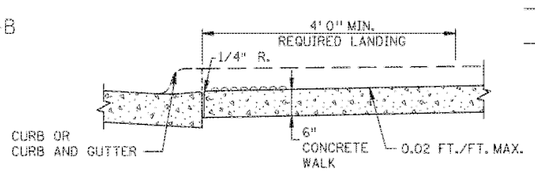
SECTION A-A

PERPENDICULAR/TIERED/DIAGONAL



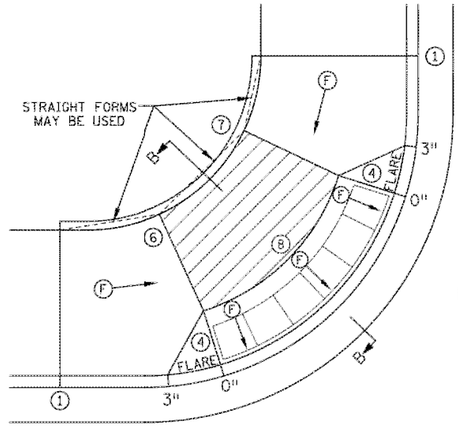
SECTION B-B

FAN

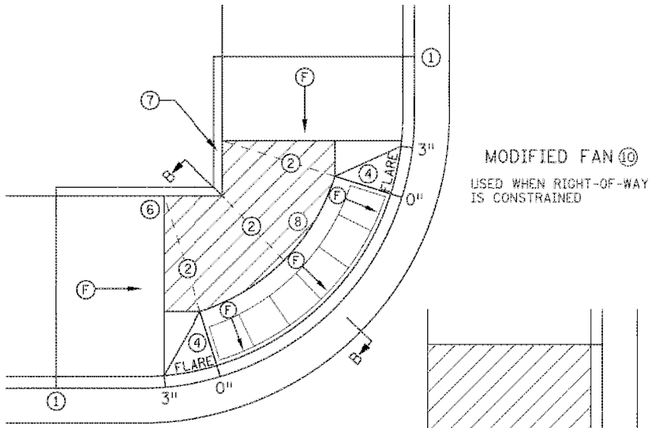


SECTION C-C

PARALLEL/DEPRESSED CORNER

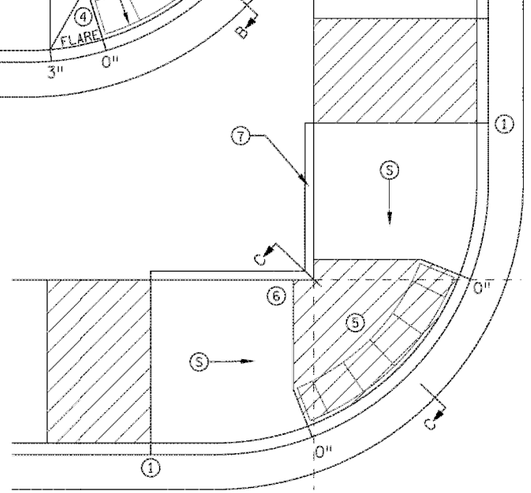


FAN⑩

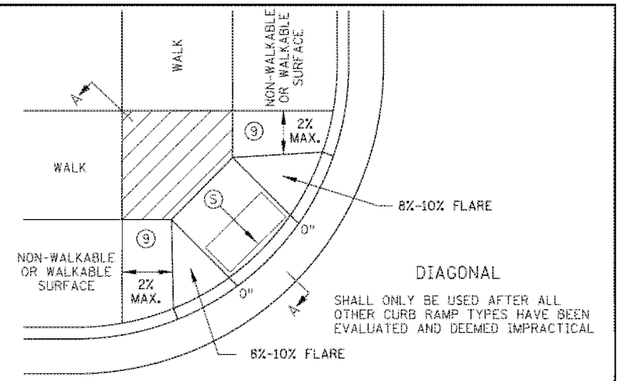


MODIFIED FAN⑩

USED WHEN RIGHT-OF-WAY IS CONSTRAINED



DEPRESSED CORNER



DIAGONAL

SHALL ONLY BE USED AFTER ALL OTHER CURB RAMP TYPES HAVE BEEN EVALUATED AND DEEMED IMPRACTICAL

NOTES:

LANDINGS SHALL BE LOCATED ANYWHERE THE PEDESTRIAN ACCESS ROUTE (PAR) CHANGES DIRECTION, AT THE TOP OF RAMPS THAT HAVE RUNNING SLOPES GREATER THAN 5.0%, AND IF THE APPROACHING WALK IS INVERSE GRADE GREATER THAN 2%.

INITIAL CURB RAMP LANDINGS SHALL BE CONSTRUCTED WITHIN 15' FROM THE BACK OF CURB, WITH 6' FROM THE BACK OF CURB BEING THE PREFERRED DISTANCE, ONLY APPLICABLE WHEN THE INITIAL RAMP RUNNING SLOPE IS OVER 5.0%.

SECONDARY CURB RAMP LANDINGS ARE REQUIRED FOR EVERY 30" OF VERTICAL RISE WHEN THE LONGITUDINAL RUNNING SLOPE IS GREATER THAN 5.0%.

CONTRACTION JOINTS SHALL BE CONSTRUCTED ALONG ALL GRADE BREAKS WITHIN THE PAR. 1/4" DEEP VISUAL JOINTS SHALL BE USED AT THE TOPS OF CONCRETE FLARES ADJACENT TO WALKABLE SURFACES.

ALL GRADE BREAKS WITHIN THE PAR SHALL BE PERPENDICULAR TO THE PATH OF TRAVEL. THUS BOTH SIDES OF A SLOPED WALKING SURFACE MUST BE EQUAL LENGTH. (EXCEPT AS STATED IN ⑥ BELOW.

TO ENSURE INITIAL RAMPS AND INITIAL LANDINGS ARE PROPERLY CONSTRUCTED, LANDINGS SHALL BE CAST SEPARATELY. FOLLOW SIDEWALK REINFORCEMENT DETAILS ON SHEET 6 AND THE ADA SPECIAL PROVISIONS - PROSECUTION OF WORK (ADA).

TOP OF CURB SHALL MATCH PROPOSED ADJACENT WALK GRADE.

WHEN THE BOULEVARD IS 4' WIDE OR LESS, THE TOP OF CURB TAPER SHALL MATCH THE RAMP SLOPES TO REDUCE NEGATIVE BOULEVARD SLOPES FROM THE TOP BACK OF CURB TO THE PAR.

ALL RAMP TYPES SHOULD HAVE A MINIMUM 3' LONG RAMP LENGTH.

4' MINIMUM WIDTH OF DETECTABLE WARNING IS REQUIRED FOR ALL RAMPS. DETECTABLE WARNINGS SHALL CONTINUOUSLY EXTEND FOR A MIN. OF 24" IN THE PATH OF TRAVEL. DETECTABLE WARNING TO COVER ENTIRE WIDTH OF SHARED-USE PATHS AND THE ENTIRE PAR WIDTH OF THE WALK. DETECTABLE WARNING SHOULD BE 6" LESS THAN THE PAR/TRAIL WIDTH. ARC LENGTH OF RADIAL DETECTABLE WARNINGS SHOULD NOT BE GREATER THAN 20 FEET.

RECTANGULAR DETECTABLE WARNINGS SHALL BE SETBACK 3" FROM THE BACK OF CURB. RADIAL DETECTABLE WARNINGS SHALL BE SETBACK 3" MINIMUM TO 6" MAXIMUM FROM THE BACK OF CURB.

① MATCH FULL HEIGHT CURB.
② 4' MINIMUM DEPTH LANDING REQUIRED ACROSS TOP OF RAMP.
③ 3" HIGH CURB WHEN USING A 3' LONG RAMP, 4" HIGH CURB WHEN USING A 4' LONG RAMP.
④ SEE SHEET 4 OF 6, TYPICAL SIDE TREATMENT OPTIONS, FOR DETAILS ON FLARES AND RETURNED CURBS, WHEN INITIAL LANDING IS AT FULL CURB HEIGHT.
⑤ DETECTABLE WARNINGS MAY BE PART OF THE 4' X 4' MIN. LANDING AREA IF IT IS NOT FEASIBLE TO CONSTRUCT THE LANDING OUTSIDE OF THE DETECTABLE WARNING AREA.
⑥ THE GRADE BREAK SHALL BE PERPENDICULAR TO THE BACK OF WALK. THIS WILL ENSURE THAT THE GRADE BREAK IS PERPENDICULAR TO THE DIRECTION OF TRAVEL. (TYPICAL FOR ALL)
⑦ WHEN ADJACENT TO GRASS, GRADING SHALL ALWAYS BE USED WHEN FEASIBLE. V CURB, IF USED, SHALL BE PLACED OUTSIDE THE SIDEWALK LIMITS WHEN RIGHT OF WAY ALLOWS. WHEN ADJACENT TO PARKING LOTS, CONCRETE OR BITUMINOUS TAPERS SHOULD BE USED OVER V CURB TO REDUCE TRIPPING HAZARDS AND FACILITATE SNOW & ICE REMOVAL.
⑧ A 7' MIN TOP RADIUS GRADE BREAK REQUIRED TO BE CONSTRUCTIBLE.
⑨ PAVE FULL WALK WIDTH.
⑩ "S" SLOPES ON FANS SHALL ONLY BE USED WHEN ALL OTHER FEASIBLE OPTIONS HAVE BEEN EVALUATED AND DEEMED IMPRACTICAL.

LEGEND

THESE LONGITUDINAL SLOPE RANGES SHALL BE THE STARTING POINT. IF SITE CONDITIONS WARRANT, LONGITUDINAL SLOPES UP TO 8.3% OR FLATTER ARE ALLOWED.

S — INDICATES PEDESTRIAN RAMP - SLOPE SHALL BE BETWEEN 5.0% MINIMUM AND 8.3% MAXIMUM IN THE DIRECTION SHOWN AND THE CROSS SLOPE SHALL NOT EXCEED 2.0%.

F — INDICATES PEDESTRIAN RAMP - SLOPE SHALL BE GREATER THAN 2.0% AND LESS THAN 5.0% IN THE DIRECTION SHOWN AND CROSS SLOPE SHALL NOT EXCEED 2.0%.

LANDING AREA - 4' X 4' MIN. (5' X 5' MIN. PREFERRED) DIMENSIONS AND MAX 2.0% SLOPE IN ALL DIRECTIONS. LANDING SHALL BE FULL WIDTH OF INCOMING PARS.

X" CURB HEIGHT

REVISION:

APPROVED: JANUARY 23, 2017

OPERATIONS ENGINEER

REVISED:

APPROVED:

STATE DESIGN ENGINEER

1-23-2017

PEDESTRIAN CURB RAMP DETAILS

STANDARD PLAN 5-297.250 | 1 OF 6

LHB PROJECT NO. 150732

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 Minnesota.

PRINTED NAME | SIGNATURE | 11-19-2018 DATE | LIC. NO.

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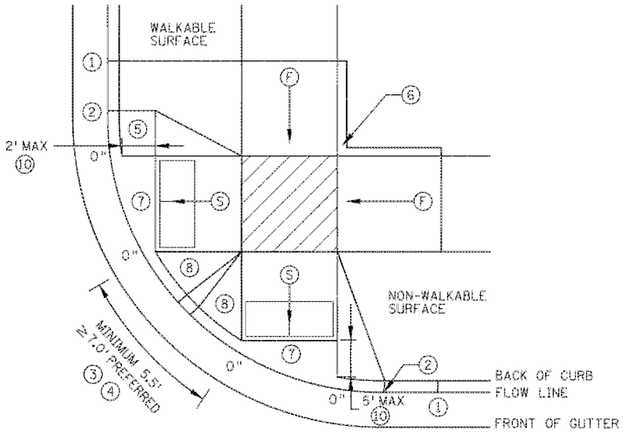
CITY PROJECT 1567

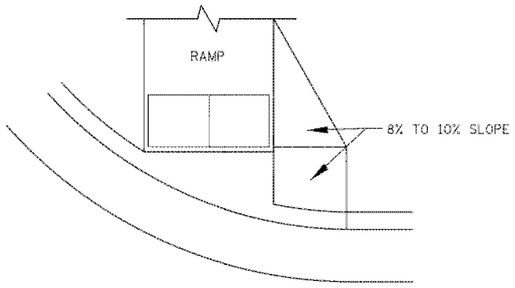
HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

CONSTRUCTION DETAILS

SHEET NO. 11 OF 36 SHEETS



COMBINED DIRECTIONAL ⑨



DIRECTIONAL RAMP WALKABLE FLARE

NOTES:

LANDINGS SHALL BE LOCATED ANYWHERE THE PEDESTRIAN ACCESS ROUTE (PAR) CHANGES DIRECTION, AT THE TOP OF RAMPS THAT HAVE RUNNING SLOPES GREATER THAN 5.0%, AND IF THE APPROACHING WALK IS INVERSE GRADE.

INITIAL CURB RAMP LANDINGS SHALL BE CONSTRUCTED WITHIN 15' FROM THE BACK OF CURB, WITH 6' FROM THE BACK OF CURB BEING THE PREFERRED DISTANCE, ONLY APPLICABLE WHEN THE INITIAL RAMP RUNNING SLOPE IS OVER 5.0%.

SECONDARY CURB RAMP LANDINGS ARE REQUIRED FOR EVERY 30" OF VERTICAL RISE WHEN THE LONGITUDINAL SLOPE IS GREATER THAN 5.0%.

CONTRACTION JOINTS SHALL BE CONSTRUCTED ALONG ALL GRADE BREAKS WITHIN THE PAR. 1/4" DEEP VISUAL JOINTS SHALL BE USED AT THE TOP GRADE BREAK OF CONCRETE FLARES ADJACENT TO WALKABLE SURFACES.

ALL GRADE BREAKS WITHIN THE PAR SHALL BE PERPENDICULAR TO THE PATH OF TRAVEL. THUS BOTH SIDES OF A SLOPED WALKING SURFACE MUST BE EQUAL LENGTH.

TO ENSURE INITIAL RAMPS AND INITIAL LANDINGS ARE PROPERLY CONSTRUCTED, LANDINGS SHALL BE CAST SEPARATELY. FOLLOW SIDEWALK REINFORCEMENT DETAILS ON SHEET 6 AND THE ADA SPECIAL PROVISION (PROSECUTION OF WORK).

TOP OF CURB SHALL MATCH PROPOSED ADJACENT WALK GRADE.

WHEN THE BOULEVARD IS 4' WIDE OR LESS, THE TOP OF CURB TAPER SHALL MATCH THE RAMP SLOPES TO REDUCE NEGATIVE BOULEVARD SLOPES FROM THE TOP BACK OF CURB TO THE PAR.

ALL RAMP TYPES SHOULD HAVE A MINIMUM 3' LONG RAMP LENGTH.

4' MINIMUM WIDTH OF DETECTABLE WARNING IS REQUIRED FOR ALL RAMPS. DETECTABLE WARNINGS SHALL CONTINUOUSLY EXTEND FOR A MIN. OF 24" IN THE PATH OF TRAVEL. DETECTABLE WARNING TO COVER ENTIRE WIDTH OF SHARED-USE PATH AND THE ENTIRE PAR WIDTH OF THE WALK. DETECTABLE WARNING SHOULD BE 6" LESS THAN THE PAR/PATH WIDTH. ARC LENGTH OF RADIAL DETECTABLE WARNINGS SHOULD NOT BE GREATER THAN 20 FEET.

RADIAL DETECTABLE WARNINGS SHALL BE SETBACK 3" MINIMUM TO 6" MAXIMUM FROM THE BACK OF CURB. SEE NOTES ⑩ & ⑪ FOR INFORMATION REGARDING RECTANGULAR DETECTABLE WARNING PLACEMENT.

① MATCH FULL CURB HEIGHT.

② 3" HIGH CURB WHEN USING A 3' LONG RAMP
4" HIGH CURB WHEN USING A 4' LONG RAMP.

③ 3" MINIMUM CURB HEIGHT (5.5' MIN. DISTANCE REQUIRED BETWEEN DOMES)
4" PREFERRED (7' MIN. DISTANCE REQUIRED BETWEEN DOMES).

④ THE "BUMP" IN BETWEEN THE RAMPS SHOULD NOT BE IN THE PATH OF TRAVEL FOR COMBINED DIRECTIONAL RAMPS. IF THIS OCCURS MODIFY THE RAMP LOCATION OR SWITCH RAMP TO A FAN/DEPRESSED CORNER.

⑤ WHEN USING CONCRETE PAVED FLARES ON THE OUTSIDE OF DIRECTIONAL RAMPS, AND ADJACENT TO A WALKABLE SURFACE, DIRECTIONAL RAMP FLARES SHOULD BE USED. SEE THE DETAIL ON THIS SHEET.

⑥ GRADING SHALL ALWAYS BE USED WHEN FEASIBLE. V CURB, IF USED, SHALL BE PLACED OUTSIDE THE SIDEWALK LIMITS WHEN RIGHT OF WAY ALLOWS. WHEN ADJACENT TO PARKING LOTS, CONCRETE OR BITUMINOUS TAPERS SHOULD BE USED OVER V CURB TO REDUCE TRIPPING HAZARDS AND FACILITATE SNOW & ICE REMOVAL.

⑦ MAX. 2.0% SLOPE IN ALL DIRECTIONS IN FRONT OF GRADE BREAK AND DRAIN TO FLOW LINE. SHALL BE CONSTRUCTED INTEGRAL WITH CURB AND GUTTER.

⑧ 8% TO 10% WALKABLE FLARE.

⑨ PLACE DOMES AT THE BACK OF CURB WHEN ALLOWABLE SETBACK CRITERIA IS EXCEEDED.

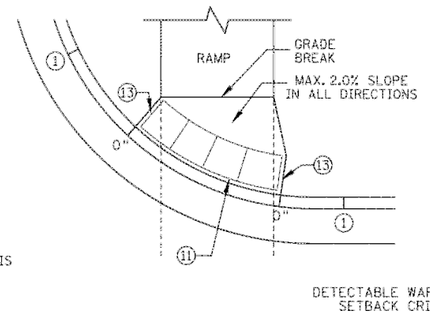
⑩ FRONT EDGE OF DETECTABLE WARNING SHALL BE SET BACK 2' MAXIMUM WHEN ADJACENT TO WALKABLE SURFACE, AND 5' MAXIMUM WHEN ADJACENT TO NON-WALKABLE SURFACE WITH ONE CORNER SET 3" FROM BACK OF CURB. A WALKABLE SURFACE IS DEFINED AS A PAVED SURFACE ADJACENT TO A CURB RAMP WITHOUT RAISED OBSTACLES THAT COULD MISTAKENLY BE TRAVERSED BY A USER WHO IS VISUALLY IMPAIRED.

⑪ RECTANGULAR DETECTABLE WARNINGS MAY BE SETBACK UP TO 9" FROM THE BACK OF CURB WITH CORNERS SET 3" FROM BACK OF CURB. IF 9" SETBACK IS EXCEEDED USE RADIAL DETECTABLE WARNINGS.

⑫ FOR DIRECTIONAL RAMPS WITH THE DETECTABLE WARNINGS PLACED AT THE BACK OF CURB, THE DETECTABLE WARNINGS SHALL COVER THE ENTIRE WIDTH OF THE WALK/PATH. THIS ENSURES A DETECTABLE EDGE AND HELPS ELIMINATE THE CURB TAPER OBSTRUCTING THE PATH OF PEDESTRIAN TRAVEL.

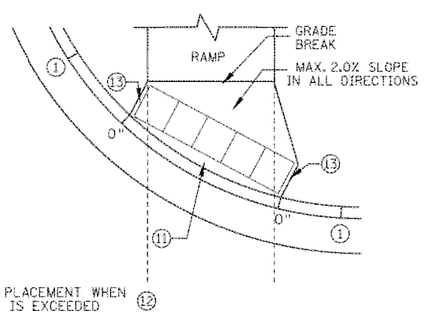
⑬ THE CONCRETE WALK SHALL BE FORMED AND CONSTRUCTED PERPENDICULAR TO THE BACK OF CURB. MAINTAIN 3" BETWEEN EDGE OF DOMES AND EDGE OF CONCRETE.

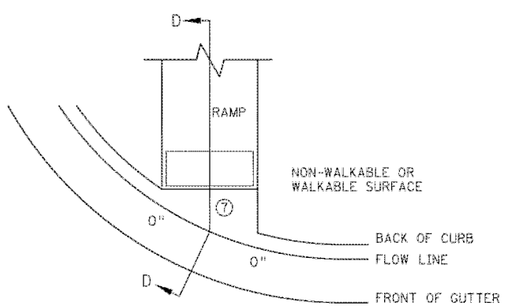
⑭ TO BE USED FOR ALL DIRECTIONAL RAMPS, EXCEPT WHERE DOMES ARE PLACED ALONG THE BACK OF CURB.



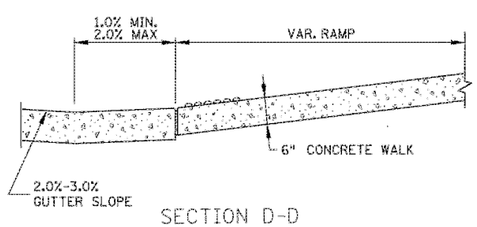
STANDARD ONE-WAY DIRECTIONAL ⑨

ONE-WAY DIRECTIONAL WITH DETECTABLE WARNING AT BACK OF CURB

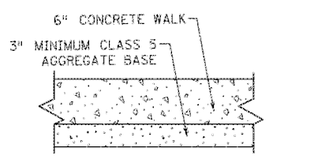




CURB FOR DIRECTIONAL RAMPS ⑭



SECTION D-D



TYPICAL SIDEWALK SECTION WITHIN INTERSECTION CORNER

LEGEND

THESE LONGITUDINAL SLOPE RANGES SHALL BE THE STARTING POINT. IF SITE CONDITIONS WARRANT, LONGITUDINAL SLOPES UP TO 8.3% OR FLATTER ARE ALLOWED.

(S) INDICATES PEDESTRIAN RAMP - SLOPE SHALL BE BETWEEN 5.0% MINIMUM AND 8.3% MAXIMUM IN THE DIRECTION SHOWN AND THE CROSS SLOPE SHALL NOT EXCEED 2.0%.

(F) INDICATES PEDESTRIAN RAMP - SLOPE SHALL BE GREATER THAN 2.0% AND LESS THAN 5.0% IN THE DIRECTION SHOWN AND CROSS SLOPE SHALL NOT EXCEED 2.0%.

LANDING AREA - 4' X 4' MIN. (5' X 5' MIN. PREFERRED) DIMENSIONS AND MAX 2.0% SLOPE IN ALL DIRECTIONS. LANDING SHALL BE FULL WIDTH OF INCOMING PARS.

X" CURB HEIGHT

REVISION:
APPROVED: JANUARY 23, 2017
OPERATIONS ENGINEER

MINNESOTA DEPARTMENT OF TRANSPORTATION

STATE DESIGN ENGINEER

REVISED:

APPROVED: 1-23-2017

PEDESTRIAN CURB RAMP DETAILS

STANDARD PLAN 5-297.250 | 2 OF 6

LHB PROJECT NO. 150732

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 Minnesota.

PRINTED NAME _____ SIGNATURE _____

11-19-2018 DATE

LIC. NO. _____

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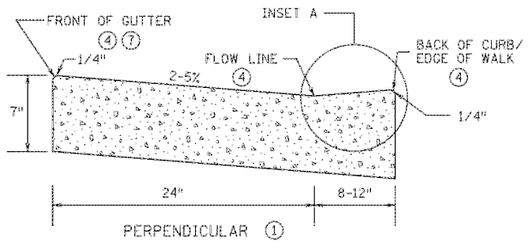
CITY PROJECT 1567

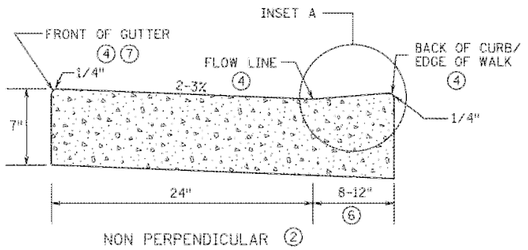
HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

CONSTRUCTION DETAILS

SHEET NO. 12 OF 36 SHEETS

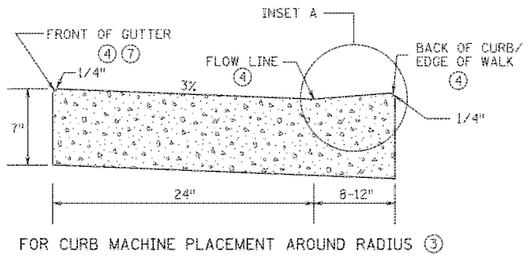


PERPENDICULAR ①

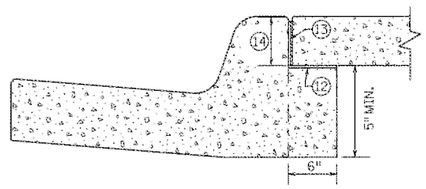


NON PERPENDICULAR ②

PEDESTRIAN ACCESS ROUTE CURB & GUTTER DETAIL

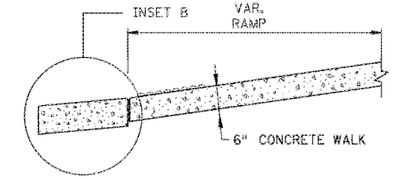


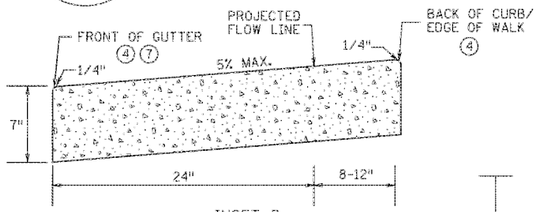
FOR CURB MACHINE PLACEMENT AROUND RADIUS ③
(REGARDLESS OF RAMP TYPE)



OPTIONAL SILL CURB WHEN SIDEWALK
IS AT BACK OF CURB

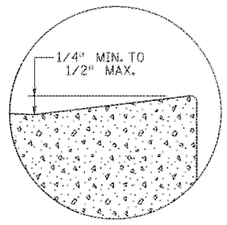
CONCRETE SILL TO BE USED ONLY WHEN
SPECIFIED IN THE PLAN.



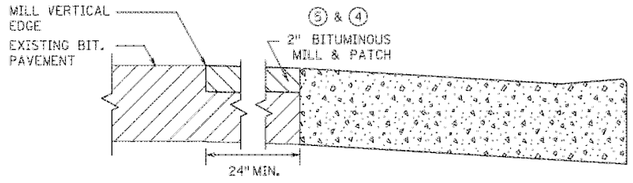


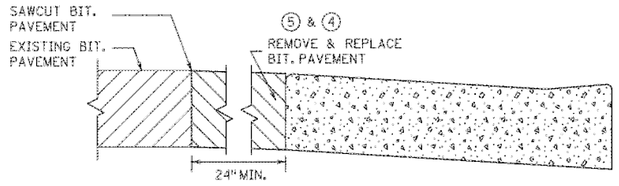
INSET B

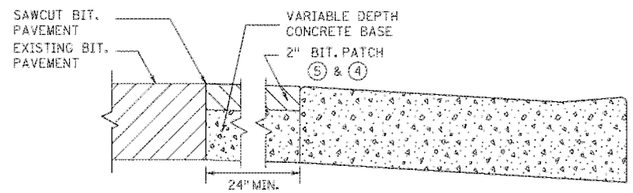
OUTFLOW GUTTER ⑧



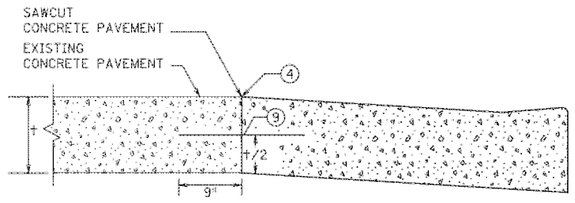
INSET A





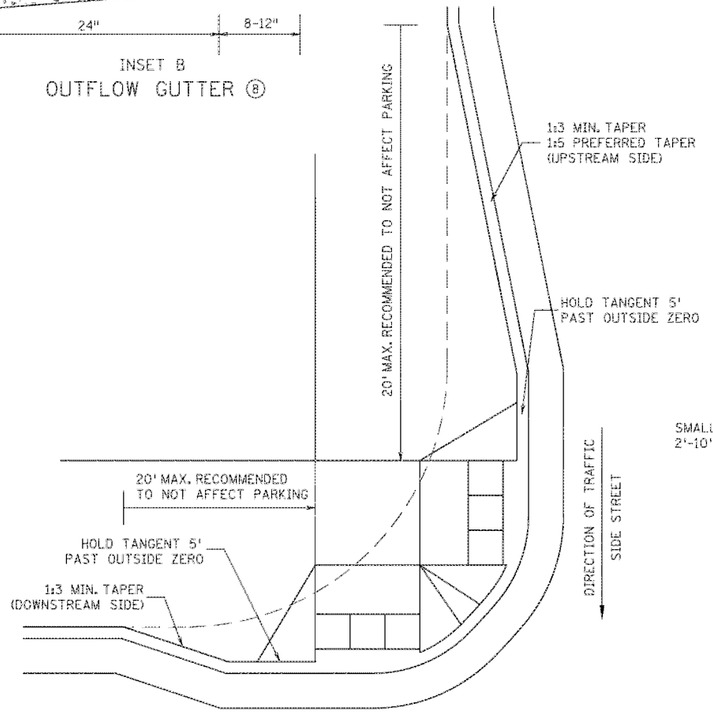


ONLY ALLOWED PER ENGINEER'S APPROVAL

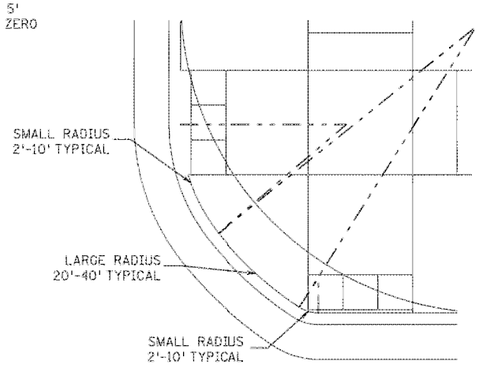


PAVEMENT TREATMENT OPTIONS IN FRONT OF CURB & GUTTER

FOR USE ON CURB RAMP RETROFITS



ADA CURB EXTENSION WITH COMPOUND RADIUS (BUMP OUT) ⑪



COMBINED DIRECTIONAL ⑩
(COMPOUND RADIUS)

NOTES:

POSITIVE FLOW LINE DRAINAGE SHALL BE MAINTAINED THROUGH THE PEDESTRIAN ACCESS ROUTE (PAR) AT A 2% MAXIMUM.

NO PONDING SHALL BE PRESENT IN THE PAR.

ANY VERTICAL LIP THAT OCCURS AT THE FLOW LINE SHALL NOT BE GREATER THAN 1/4 INCH.

① FOR USE AT CURB CUTS WHERE THE PEDESTRIAN'S PATH OF TRAVEL IS ASSUMED PERPENDICULAR TO THE GUTTER FLOW LINE. RAMP TYPES INCLUDE: PERPENDICULAR, TIERED PERPENDICULAR, PARALLEL, AND DIAGONAL RAMPS.

② FOR USE AT CURB RAMPS WHERE THE PEDESTRIAN'S PATH OF TRAVEL IS ASSUMED NON PERPENDICULAR TO THE GUTTER FLOW LINE. RAMP TYPES INCLUDE: FANS & DEPRESSED CORNERS.

③ BEGIN GUTTER SLOPE TRANSITION 10' OUTSIDE OF ALL CURB RAMPS.

④ THERE SHALL BE NO VERTICAL DISCONTINUITIES GREATER THAN 1/4".

⑤ ELEVATION CHANGE TAKES PLACE FROM THE EXISTING TO NEW FRONT OF GUTTER. PATCH IS USED TO MATCH THE NEW GUTTER FACE INTO THE EXISTING ROADWAY.

⑥ VARIABLE WIDTH FOR DIRECTIONAL CURB APPLICATIONS. SEE SHEET 2 FOR DIRECTIONAL CURB SLOPE REQUIREMENTS.

⑦ TOP FRONT OF GUTTER SHALL BE CONSTRUCTED FLUSH WITH PROPOSED ADJACENT PAVEMENT ELEVATION. TOP 1.5" OF THE GUTTER FACE MUST BE A FORMED EDGE. PAR GUTTER SHALL NOT BE OVERLAID.

⑧ SHOULD BE USED AT VERTICALLY CONSTRAINED AREAS WHEN AT A DRAINAGE HIGH POINT OR SUPER ELEVATED ROADWAY SEGMENTS.

⑨ DRILL AND GROUT NO. 4 EPOXY-COATED 18" LONG TIE BARS AT 30" CENTER TO CENTER INTO EXISTING CONCRETE PAVEMENT 1' MINIMUM FROM ALL JOINTS.

⑩ HELPS PROVIDE TWO SEPARATE RAMPS, REDUCES THE DOME SETBACK LENGTH AND MINIMIZES DIRECTIONAL CURB. THIS RADIUS DESIGN CLOSELY FOLLOWS THE TURNING VEHICLE PATH WHILE OPTIMIZING CURB RAMP LENGTH.

⑪ CURB EXTENSIONS SHOULD BE USED IN VERTICALLY CONSTRAINED AREAS, USUALLY IN DOWNTOWN ROADWAY SEGMENTS WHERE ON-STREET PARKING IS AVAILABLE. CURB EXTENSIONS SHOULD BE CONSIDERED FOR APS INTERSECTIONS WHERE SPACE IS LIMITED. PUSH BUTTONS MUST MEET APS CRITERIA AS DESCRIBED IN THE PUSH BUTTON LOCATION DETAIL SHEET.

⑫ PLACE BOND BREAKER BETWEEN WALK AND TOP OF SILL.

⑬ 1/2" PREFORMED JOINT FILLER PER MNDOT SPEC. 3702.

⑭ DIMENSION TO BE SAME AS SIDEWALK THICKNESS, 4" MIN.

REVISION:

APPROVED: JANUARY 23, 2017
OPERATIONS ENGINEER

REVISED:

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PEDESTRIAN CURB RAMP DETAILS

STANDARD PLAN 5-297.250 | 3 OF 6

LHB PROJECT NO. 150732

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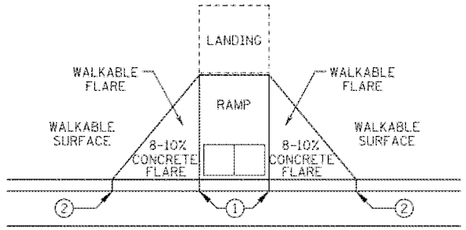
CITY PROJECT 1567

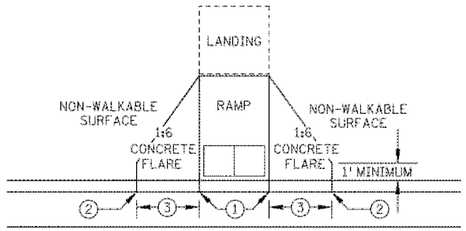
HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

CONSTRUCTION DETAILS

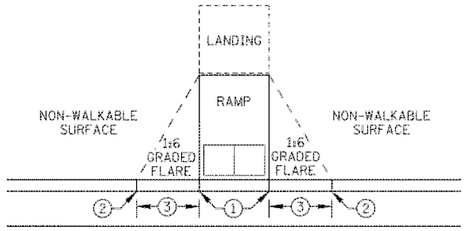
SHEET NO. 13 OF 36 SHEETS



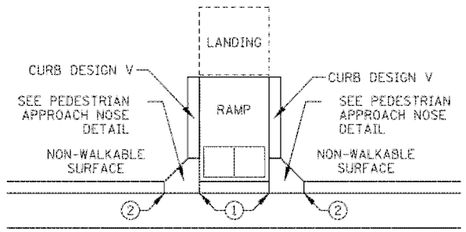
PAVED FLARES
ADJACENT TO WALKABLE SURFACE



PAVED FLARES
ADJACENT TO NON-WALKABLE SURFACE

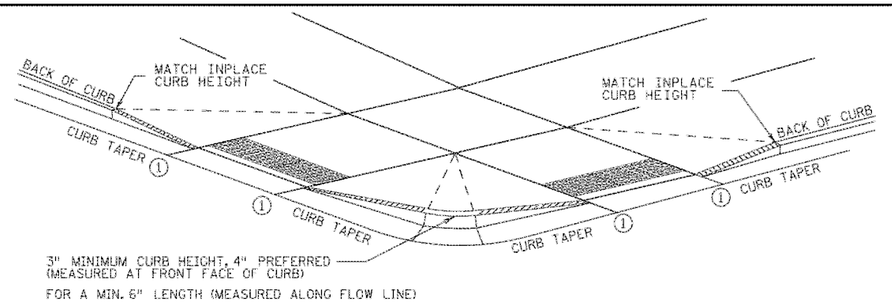


GRADED FLARES

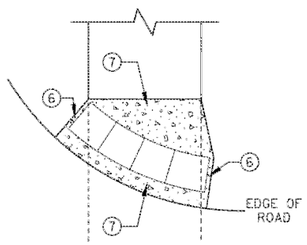


RETURNED CURB ⑤

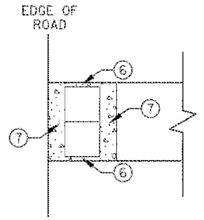
TYPICAL SIDE TREATMENT OPTIONS ④ ⑪



DETECTABLE EDGE WITH ⑧
CURB AND GUTTER

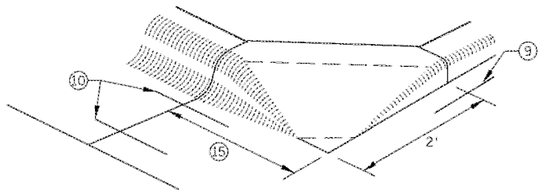


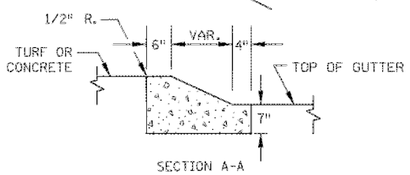
RADIAL DETECTABLE WARNING



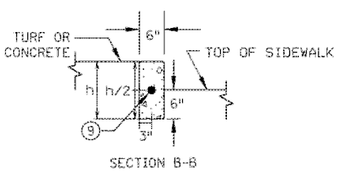
RECTANGULAR DETECTABLE WARNING

DETECTABLE EDGE WITHOUT CURB AND GUTTER

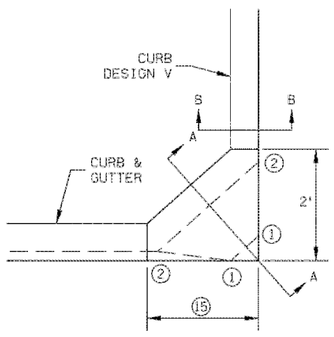




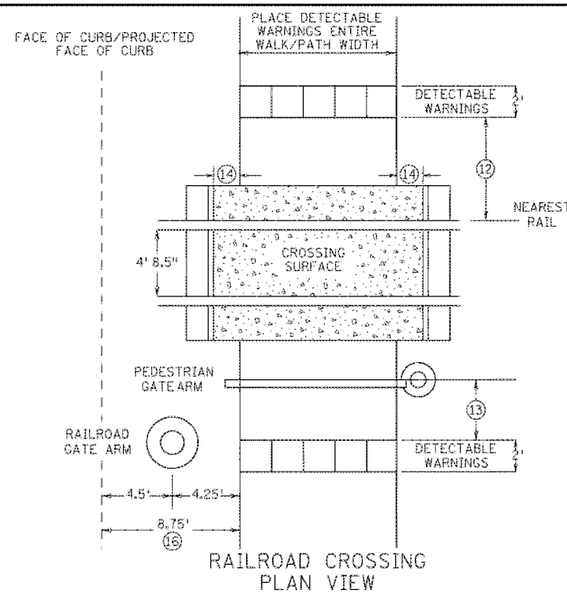
SECTION A-A



SECTION B-B



PEDESTRIAN APPROACH
NOSE DETAIL
(FOR RETURNED CURB
SIDE TREATMENT)



RAILROAD CROSSING
PLAN VIEW

NOTES:

SEE STANDARD PLATE 7038 AND THIS SHEET FOR ADDITIONAL DETAILS ON DETECTABLE WARNING.

A WALKABLE SURFACE IS DEFINED AS A PAVED SURFACE ADJACENT TO A CURB RAMP WITHOUT RAISED OBSTACLES THAT COULD MISTAKENLY BE TRAVERSED BY A USER WHO IS VISUALLY IMPAIRED.

CONCRETE FLARE LENGTHS ADJACENT TO NON-WALKABLE SURFACES SHOULD BE LESS THAN 8' LONG MEASURED ALONG THE RAMPS FROM THE BACK OF CURB.

① 0" CURB HEIGHT.

② FULL CURB HEIGHT.

③ 2' FOR 4" HIGH CURB AND 3' FOR 6" HIGH CURB.

④ SIDE TREATMENTS ARE APPLICABLE TO ALL RAMP TYPES AND SHOULD BE IMPLEMENTED AS NEEDED AS FIELD CONDITIONS DICTATE. THE ENGINEER SHALL DETERMINE THE RAMP SIDE TREATMENTS BASED ON MAINTENANCE OF BOTH ROADWAY AND SIDEWALK, ADJACENT PROPERTY CONSIDERATIONS, AND MITIGATING CONSTRUCTION IMPACTS.

⑤ TYPICALLY USED FOR MEDIANS AND ISLANDS.

⑥ WHEN NO CONCRETE FLARES ARE PROPOSED, THE CONCRETE WALK SHALL BE FORMED AND CONSTRUCTED PERPENDICULAR TO THE EDGE OF ROADWAY. MAINTAIN 3" MAX. BETWEEN EDGE OF DOMES AND EDGE OF CONCRETE.

⑦ IF NO CURB AND GUTTER IS PLACED IN RURAL SECTIONS, DETECTABLE WARNINGS SHALL BE PLACED 1' FROM THE EDGE OF BITUMINOUS ROADWAY AND/OR BITUMINOUS SHARED-USE PATH TO PROVIDE VISUAL CONTRAST.

⑧ ALL CONSTRUCTED CURBS MUST HAVE A CONTINUOUS DETECTABLE EDGE FOR THE VISUALLY IMPAIRED. THIS DETECTABLE EDGE REQUIRES DETECTABLE WARNINGS WHEREVER THERE IS ZERO-INCH HIGH CURB. CURB TAPERS ARE CONSIDERED A DETECTABLE EDGE WHEN THE TAPER STARTS WITHIN 3" OF THE EDGE OF THE DETECTABLE WARNINGS AND UNIFORMLY RISES TO A 3-INCH MINIMUM CURB HEIGHT. ANY CURB NOT PART OF A CURB TAPER AND LESS THAN 3 INCHES IN HEIGHT IS NOT CONSIDERED A DETECTABLE EDGE AND THEREFORE IS NOT COMPLIANT WITH ACCESSIBILITY STANDARDS.

⑨ DRILL AND GROUT 1 - NO. 4 12" LONG REINFORCEMENT BAR (EPOXY COATED) WITH 3" MIN. COVER. REINFORCEMENT BARS ARE NOT NEEDED IF THE APPROACH NOSE IS POURED INTEGRAL WITH THE V CURB.

⑩ DRILL AND GROUT 2 - NO. 4 12" LONG REINFORCEMENT BARS (EPOXY COATED) WITH 3" MIN. COVER. REINFORCEMENT BARS ARE NOT NEEDED IF THE APPROACH NOSE IS POURED INTEGRAL WITH THE CURB AND GUTTER.

⑪ SIDE TREATMENT EXAMPLES SHOWN ARE WHEN THE INITIAL LANDING IS APPROXIMATELY LEVEL WITH THE FULL HEIGHT CURB (I.E. 6' LONG RAMP FOR 6" HIGH CURB). WHEN THE INITIAL LANDING IS MORE THAN 1" BELOW FULL HEIGHT CURB REFER TO SHEETS 1 & 2 TO MODIFY THE CURB HEIGHT TAPERS AND MAINTAIN POSITIVE BOULEVARD DRAINAGE.

⑫ NEAREST EDGE OF DETECTABLE WARNING SURFACES SHALL BE PLACED 12' MINIMUM TO 15' MAXIMUM FROM THE NEAREST RAIL. FOR SKEWED RAILWAYS IN NO INSTANCE SHALL THE DETECTABLE WARNING BE CLOSER THAN 12' MEASURED PERPENDICULAR TO THE NEAREST RAIL.

⑬ WHEN PEDESTRIAN GATES ARE PROVIDED, DETECTABLE WARNING SURFACES SHALL BE PLACED ON THE SIDE OF THE GATES OPPOSITE THE RAIL, 2' FROM THE APPROACHING SIDE OF THE GATE ARM. THIS CRITERIA GOVERNS OVER NOTE ⑫.

⑭ CROSSING SURFACE SHALL EXTEND 2' MINIMUM PAST THE OUTSIDE EDGE OF WALK OR SHARED-USE PATH.

⑮ 3' FOR MEDIANS AND SPLITTER ISLANDS. NOSE CAN BE REDUCED TO 2' ON FREE RIGHT ISLANDS.

⑯ SIDEWALK TO BE PLACED 8.75' MIN. FROM THE FACE OF CURB/PROJECTED FACE OF CURB. THIS ENSURES MIN. CLEARANCE BETWEEN THE SIDEWALK AND GATE ARM COUNTERWEIGHT SUPPORTS.

REVISION:

APPROVED: JANUARY 23, 2017
OPERATIONS ENGINEER

REVISED:

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STATE DESIGN ENGINEER

PEDESTRIAN CURB RAMP DETAILS

STANDARD PLAN 5-297.250 | 4 OF 6

LHB PROJECT NO. 150732

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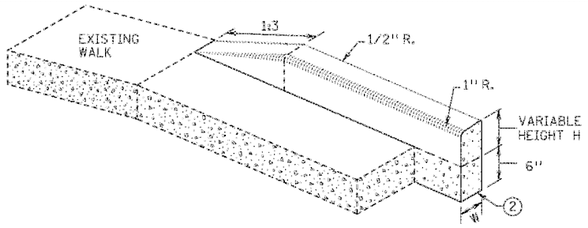
CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

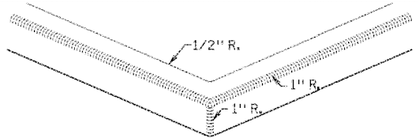
CONSTRUCTION DETAILS

SHEET NO. 14 OF 36 SHEETS

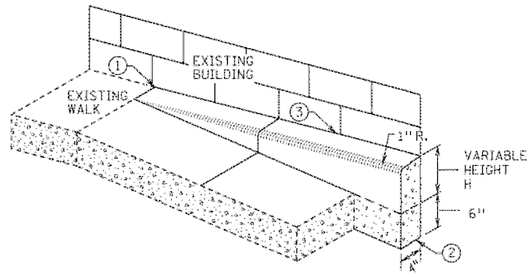


V CURB ADJACENT TO LANDSCAPE

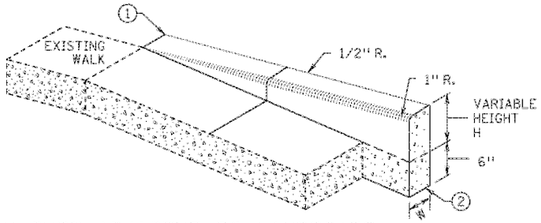
CURB WITHIN SIDEWALK LIMITS



V CURB INTERSECTION



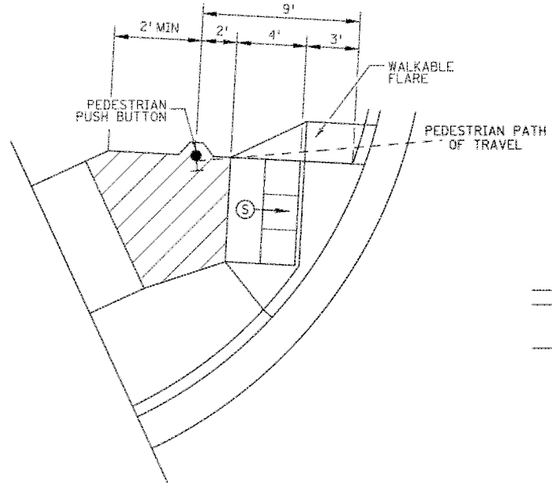
V CURB ADJACENT TO BUILDING OR BARRIER



V CURB ADJACENT TO LANDSCAPE

CURB OUTSIDE SIDEWALK LIMITS

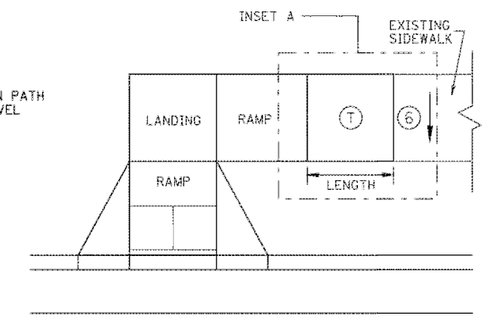
CONCRETE CURB DESIGN V	
CURB HEIGHT H	CURB WIDTH W
≤6"	4"
≥6"	6"

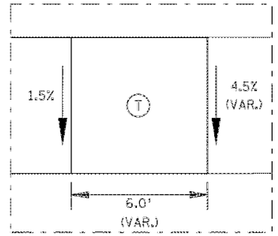


SEMI-DIRECTIONAL RAMP (3,4,9)

3' DOME SETBACK, 4' LONG RAMP AND PUSH BUTTON 9' FROM THE BACK OF CURB

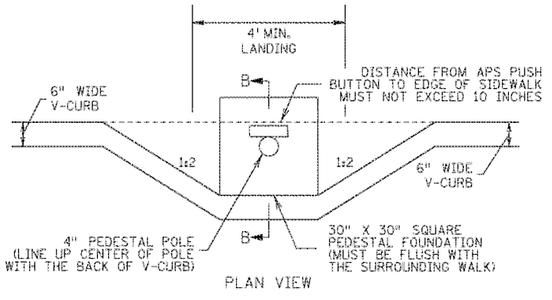
PRIMARILY USED FOR APS APPLICATIONS WHERE THE PAR DOES NOT CONTINUE PAST THE PUSH BUTTON (DEAD-END SIDEWALK)



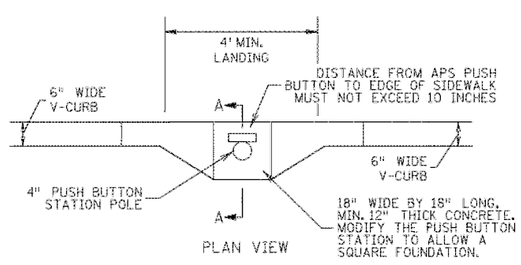


INSET A

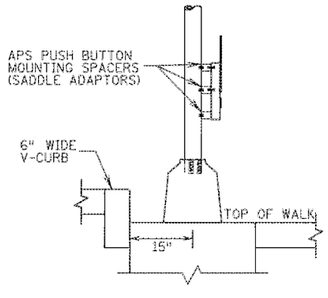
TRANSITION PANEL ④⑤



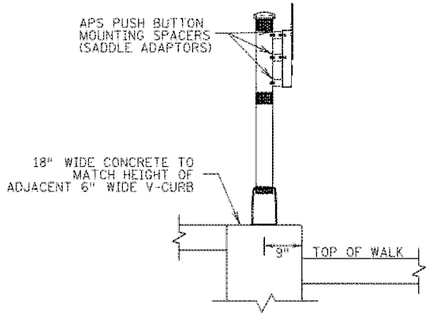
PLAN VIEW



PLAN VIEW



SECTION B-B



SECTION A-A

SIGNAL PEDESTAL & PUSH BUTTON (V-CURB)

PUSH BUTTON STATION (V-CURB)

NOTES:

A WALKABLE FLARE IS AN 8-10% CONCRETE FLARE THAT IS REQUIRED WHEN THE FLARE IS ADJACENT TO A WALKABLE SURFACE, OR WHEN THE PEDESTRIAN PATH OF TRAVEL OF A PUSH BUTTON TRAVERSES THE FLARE.

ALL V CURB CONTRACTION JOINTS SHALL MATCH CONCRETE WALK JOINTS.

WHERE RIGHT-OF-WAY ALLOWS, USE OF V CURB SHOULD BE MINIMIZED. GRADING ADJACENT TURF OR SLOPING ADJACENT PAVEMENT IS PREFERRED.

V CURB SHALL BE PLACED OUTSIDE THE SIDEWALK LIMITS WHEN RIGHT OF WAY ALLOWS.

V CURB NEXT TO BUILDING SHALL BE A 4" WIDTH AND SHALL MATCH PREVIOUS TOP OF SIDEWALK ELEVATIONS.

① END TAPERS AT TRANSITION SECTION SHALL MATCH INPLACE SIDEWALK GRADES.

② ALL V CURB SHALL MATCH BOTTOM OF ADJACENT WALK.

③ EDGE BETWEEN NEW V CURB AND INPLACE STRUCTURE SHALL BE SEALED AND BOND BREAKER SHALL BE USED BETWEEN EXISTING STRUCTURE AND PLACED V-CURB.

④ THE MAX. RATE OF CROSS SLOPE TRANSITIONING IS 1' LINEAR FOOT OF SIDEWALK PER HALF PERCENT CROSS SLOPE. WHEN PAR WIDTH IS GREATER THAN 6' OR THE RUNNING SLOPE IS GREATER THAN 5%, DOUBLE THE CALCULATED TRANSITION LENGTH.

⑤ TRANSITION PANELS ARE TO ONLY BE USED AFTER THE RAMP, OR IF NEEDED, LANDING ARE AT THE FULL CURB HEIGHT (TYPICAL SECTION).

⑥ EXISTING CROSS SLOPE GREATER THAN 2.0%.

LEGEND

THESE LONGITUDINAL SLOPE RANGES SHALL BE THE STARTING POINT. IF SITE CONDITIONS WARRANT, LONGITUDINAL SLOPES UP TO 8.3% OR FLATTER ARE ALLOWED.

Ⓢ INDICATES PEDESTRIAN RAMP - SLOPE SHALL BE BETWEEN 5.0% MINIMUM AND 8.3% MAXIMUM IN THE DIRECTION SHOWN AND THE CROSS SLOPE SHALL NOT EXCEED 2.0%.

LANDING AREA - 4' X 4' MIN. (5' X 5' MIN. PREFERRED) DIMENSIONS AND MAX 2.0% SLOPE IN ALL DIRECTIONS. LANDING SHALL BE FULL WIDTH OF INCOMING PARS.

Ⓣ TRANSITION PANEL(S) - TO BE USED FOR TRANSITIONING THE CROSS-SLOPE OF A RAMP TO THE EXISTING WALK CROSS-SLOPE. RATE OF TRANSITION SHOULD BE 0.5% PER 1 LINEAR FOOT OF WALK. SEE THIS SHEET FOR ADDITIONAL INFORMATION.

REVISION:

APPROVED: JANUARY 23, 2017

OPERATIONS ENGINEER

REVISED:

APPROVED: 1-23-2017

STATE DESIGN ENGINEER

PEDESTRIAN CURB RAMP DETAILS

STANDARD PLAN 5-297.250 | 5 OF 6

LHB PROJECT NO. 150732

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PRINTED NAME | SIGNATURE | 11-19-2018 DATE | LIC. NO.

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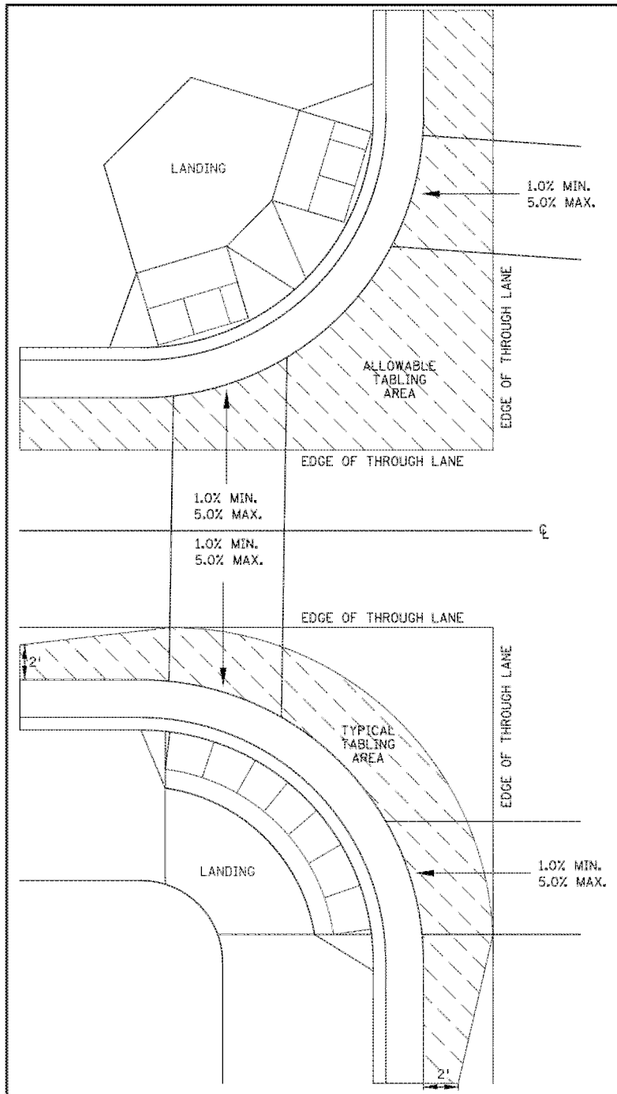
CITY PROJECT 1567

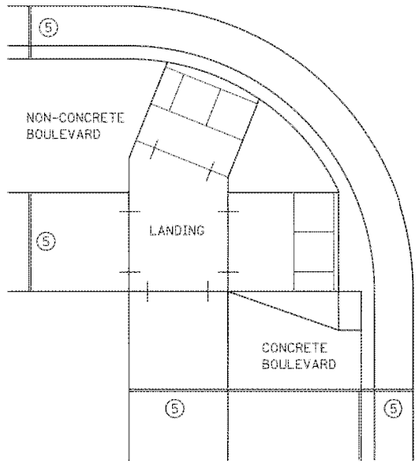
HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

CONSTRUCTION DETAILS

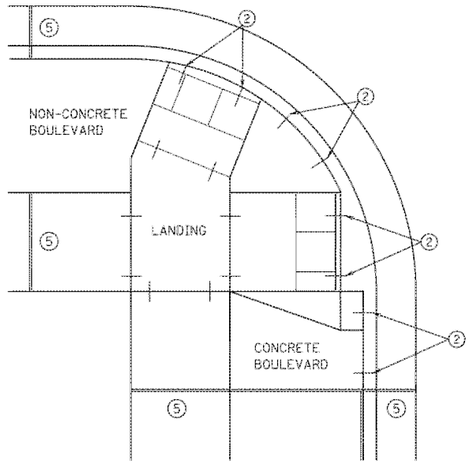
SHEET NO. 15 OF 36 SHEETS



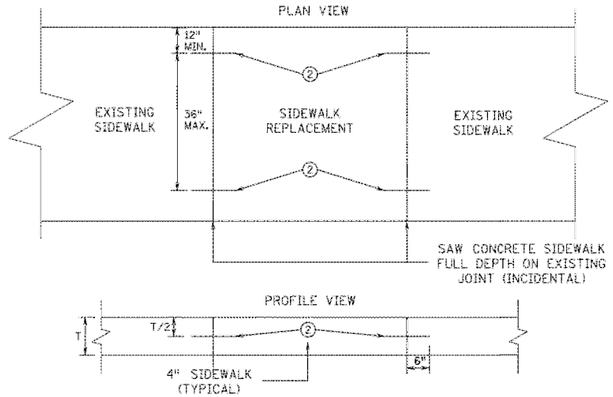
CURB LINE AND ROAD CROSSING ADJUSTMENTS



EXPANSION MATERIAL PLACEMENT FOR CONCRETE AND BITUMINOUS ROADWAYS

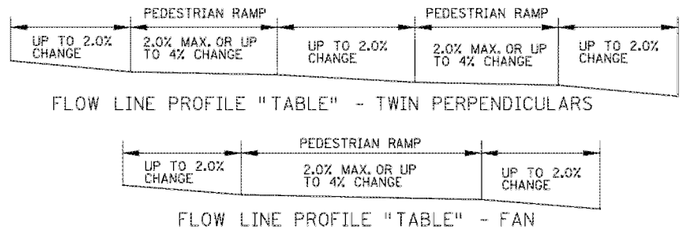


OPTIONAL CURB LINE REINFORCEMENT PLACEMENT ON BITUMINOUS ROADWAYS ④



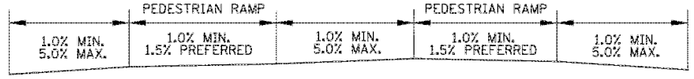
OPTIONAL SIDEWALK REINFORCEMENT

SIDEWALK REINFORCEMENT TO BE USED ONLY WHEN SPECIFIED IN THE PLAN.

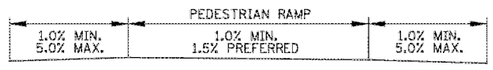


FLOW LINE PROFILE "TABLE" - TWIN PERPENDICULARS

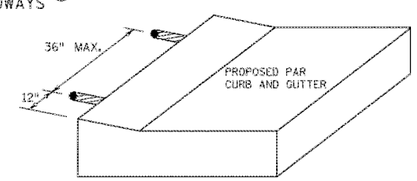
FLOW LINE PROFILE "TABLE" - FAN



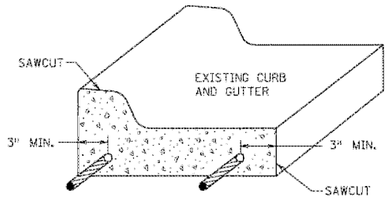
FLOW LINE PROFILE RAISE - TWIN PERPENDICULARS



FLOW LINE PROFILE RAISE - FAN

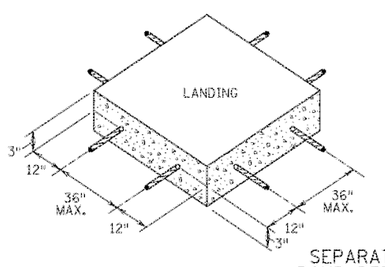


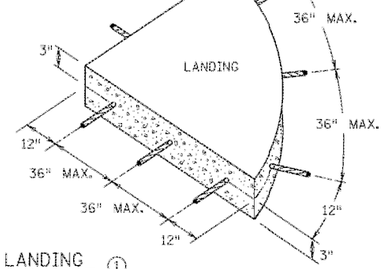
OPTIONAL CURB LINE REINFORCEMENT DETAILS ②④



FOR USE ON CURB RAMP RETROFITS

CURB AND GUTTER REINFORCEMENT ③





SEPARATE LANDING POUR REINFORCEMENT ①

"TABLING" OF CROSSWALKS MEANS MAINTAINING LESS THAN 2% CROSS SLOPE WITHIN A CROSSWALK, IS REQUIRED WHEN A ROADWAY IS IN A STOP OR YIELD CONDITION AND THE PROJECT SCOPE ALLOWS.

RECONSTRUCTION PROJECTS: ON FULL PAVEMENT REPLACEMENT PROJECTS "TABLING" OF ENTIRE CROSSWALK SHALL OCCUR WHEN FEASIBLE.

MILL & OVERLAY PROJECTS: "TABLING" OF FLOW LINES, IN FRONT OF THE PEDESTRIAN RAMP, IS REQUIRED WHEN THE EXISTING FLOW LINE IS GREATER THAN 2% WARPING OF THE BITUMINOUS PAVEMENT CAN NOT EXTEND INTO THE THROUGH LANE. TABLE THE FLOW LINE TO 2% OR AS MUCH AS POSSIBLE WHILE ADHERING TO THE FOLLOWING CRITERIA:
1) 1.0% MIN. CROSS-SLOPE OF THE ROAD
2) 5.0% MAX. CROSS-SLOPE OF THE ROAD
3) "TABLE" FLOW LINE UP TO 4% CHANGE FROM EXISTING SLOPE IN FRONT OF PEDESTRIAN RAMP
4) UP TO 2% CHANGE IN FLOW LINE FROM EXISTING SLOPE BEYOND THE PEDESTRIAN CURB RAMP

STAND-ALONE ADA RETROFITS: FOLLOW MILL & OVERLAY CRITERIA ABOVE HOWEVER ALL PAVEMENT WARPING IS DONE WITH BITUMINOUS PATCHING ON BITUMINOUS ROADWAYS AND FULL-DEPTH APRON REPLACEMENT ON CONCRETE ROADWAYS.

RAISING OF CURB LINES SHOULD OCCUR IN VERTICALLY CONSTRAINED AREAS. RAISE THE CURB LINES ENOUGH TO ALLOW COMPLIANT RAMPS OR AS MUCH AS POSSIBLE WHILE ADHERING TO THE FOLLOWING CRITERIA:
1) 1.0% MIN. AND 5.0% MAXIMUM CROSS-SLOPE OF THE ROAD
2) 1.0% MIN. FLOW LINE (ON EITHER SIDE OF PEDESTRIAN RAMP) TO MAINTAIN POSITIVE DRAINAGE
3) 5.0% RECOMMENDED MAX. FLOW LINE
4) LONGITUDINAL THROUGH LANE ROADWAY TAPERS SHOULD BE 1" VERTICAL PER 15' HORIZONTAL

NOTES:

① TO ENSURE RAMPS AND LANDINGS ARE PROPERLY CONSTRUCTED, ALL INITIAL LANDINGS AT A TOP OF A RAMPED SURFACE (RUNNING SLOPE GREATER THAN 2%) SHALL BE FORMED AND PLACED SEPARATELY IN AN INDEPENDENT CONCRETE POUR. FOLLOW SIDEWALK REINFORCEMENT DETAILS ON THIS SHEET FOR ALL SEPARATELY POURED INITIAL LANDINGS.

② DRILL AND GROUT NO. 4 12" LONG REINFORCEMENT BARS AT 36" MAXIMUM CENTER TO CENTER (EPOXY COATED). BARS TO BE ADJUSTED TO MATCH RAMP GRADE.

③ DRILL AND GROUT 2 - NO. 4 X 12" LONG REINFORCEMENT BARS (EPOXY COATED). REINFORCEMENT REQUIRED FOR ALL CONSTRUCTION JOINTS WITHIN RADIUS.

④ THIS OPTIONAL CURB LINE REINFORCEMENT DETAIL SHOULD ONLY BE USED ON BITUMINOUS ROADWAYS WHEN SPECIFIED IN THE PLAN.

⑤ 1/2 IN. PREFORMED JOINT FILLER MATERIAL PER MNDOT SPEC. 3702.

REVISION:

APPROVED: JANUARY 23, 2017

OPERATIONS ENGINEER

REVISED:

APPROVED: 1-23-2017

STATE DESIGN ENGINEER

PEDESTRIAN CURB RAMP DETAILS

STANDARD PLAN 5-297.250 | 6 OF 6

LHB PROJECT NO. 150732

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PRINTED NAME | SIGNATURE | 11-19-2018 DATE | LIC. NO.

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CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

CONSTRUCTION DETAILS

SHEET NO. 16 OF 36 SHEETS

PLOT DATE: 12/11/2018 12:18:24 PM FILE: R:\15Pro\150732\600 Drawings\C\150732 R03.0 MNDOT Ramp Details.dwg

W ARROWHEAD ROAD

CULVERT 2

CULVERT 3

TURN LANE AND ENTRY BY OTHERS

DRIVEWAY BY OTHERS

CONSTRUCTION LIMITS (TYP.)

FUTURE STORMWATER BASIN

FUTURE STORMWATER BASIN

FUTURE STORMWATER BASIN

STORMWATER BASIN 4

STORMWATER BASIN (BY OTHERS)

REFER TO SHEETS 18 & 19 FOR STORMWATER BASIN CONSTRUCTION DETAILS

STANFORD AVE

MISSION DRIVE

EVERGREEN CIRCLE

OUTLOT A

LOT 1

LOT 2

FUTURE BUILDING PAD

FUTURE BUILDING PAD

FUTURE BUILDING PAD

CONSTRUCTION LIMITS (TYP.)

0 20' 40' 80'

LHB PROJECT NO. 150732

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DANIEL SHAW
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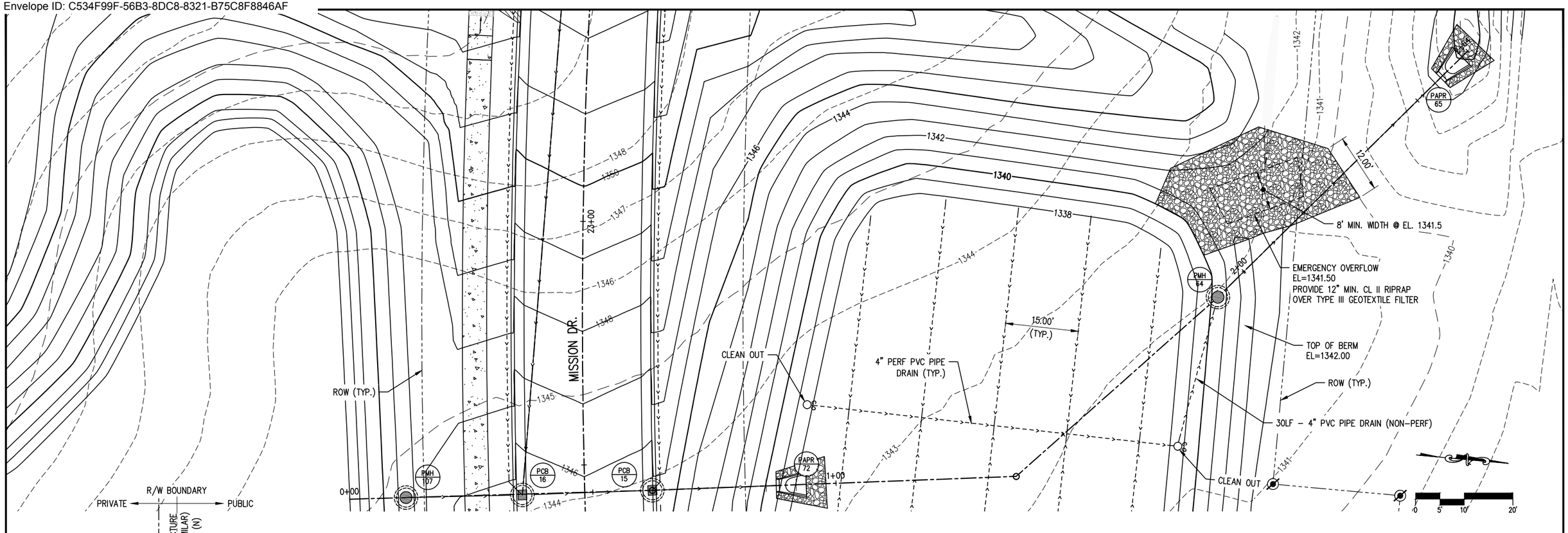
CITY PROJECT 1567

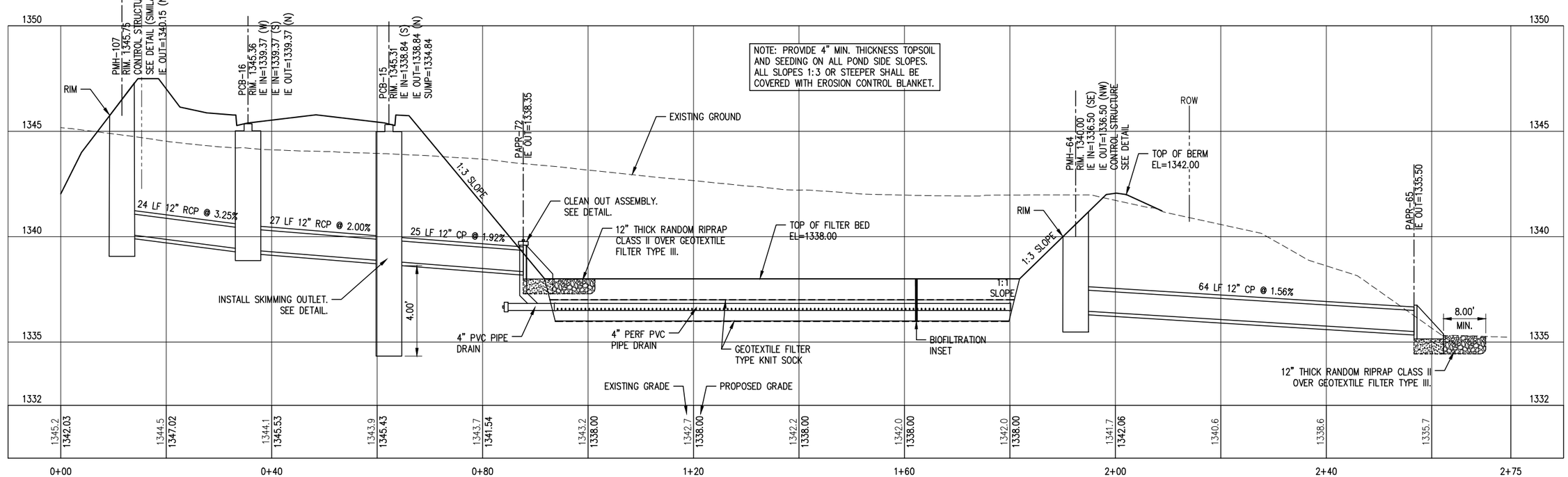
HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

OVERALL PLAN

SHEET NO. 17 OF 36 SHEETS

PLOT DATE: 12/11/2018 12:19:16 PM FILE: R:\15Pro\150732\600 Drawings\C\150732 R03.1 Overall Plan.dwg





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HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

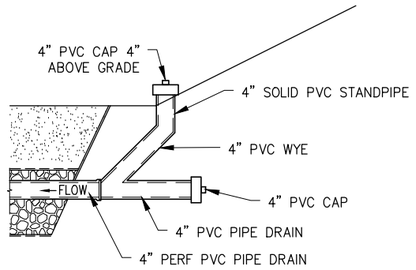
STORMWATER BASIN DETAILS

SHEET NO. 18 OF 36 SHEETS

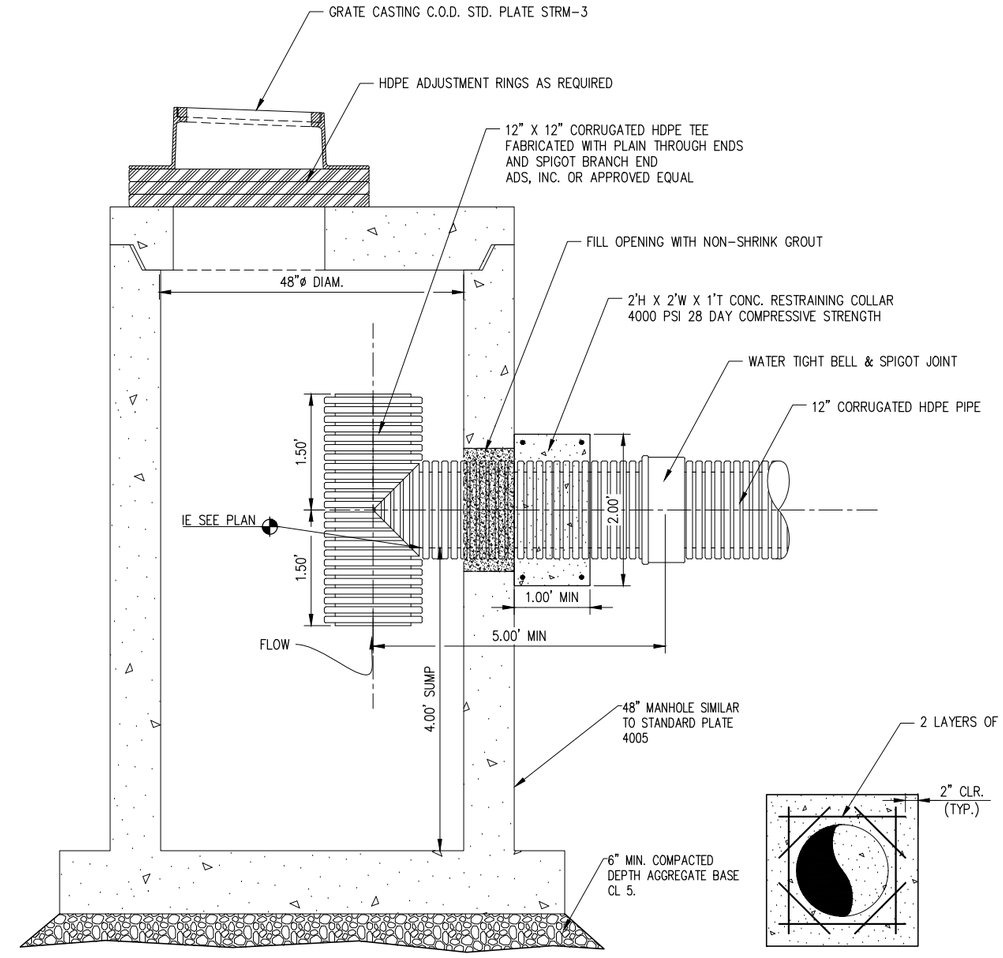
PLOT DATE: 12/11/2018 12:20:05 PM FILE: R:\15Proj\150732\600 Drawings\C\150732 R03.2 Storm Pond Details.dwg

STORM BASIN STORAGE DATA	
BOTTOM OF POND EL = 1338.00'	AREA = 6,419 SF
OVERFLOW EL = 1341.50'	AREA = 9,933 SF
TOTAL POND VOLUME	28,429 CU FT

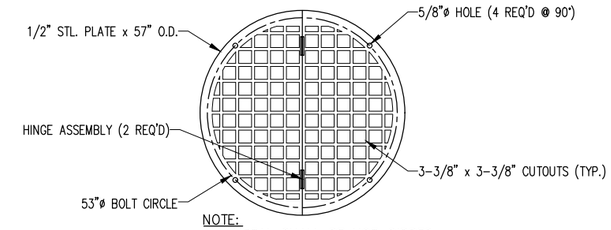
STORM BASIN SUMMARY	ELEV
BASIN SUBDRAIN OUTLET	1336.50
BOTTOM OF COARSE FILTER AGGREGATE	1336.00
BOTTOM OF SAND BED	1337.00



4" CLEAN-OUT ASSEMBLY
NOT TO SCALE

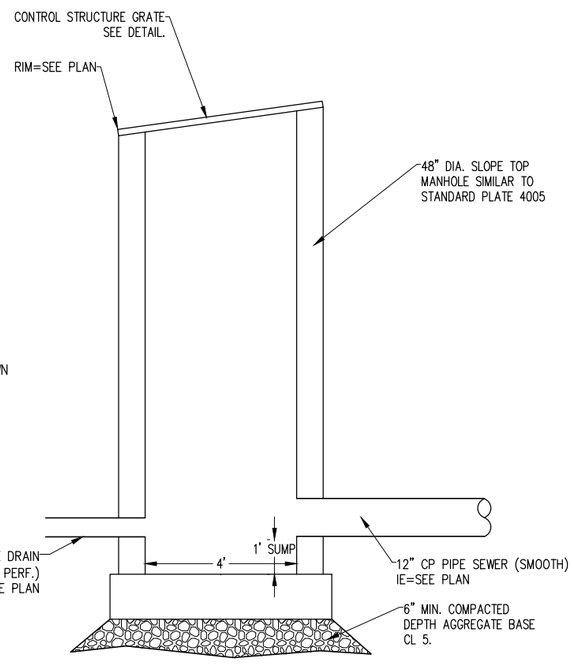


CATCH BASIN WITH SKIMMING OUTLET
NOT TO SCALE



CONTROL STRUCTURE GRATE
NOT TO SCALE

RESTRAINING COLLAR REINFORCEMENT DETAIL
NOT TO SCALE



CONTROL STRUCTURE
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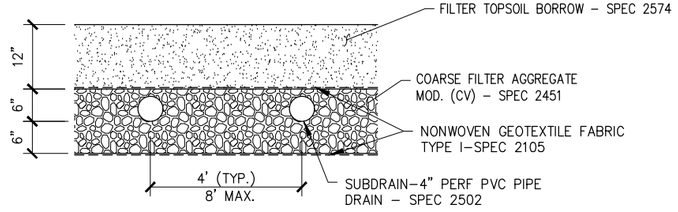

BIOFILTRATION INSET
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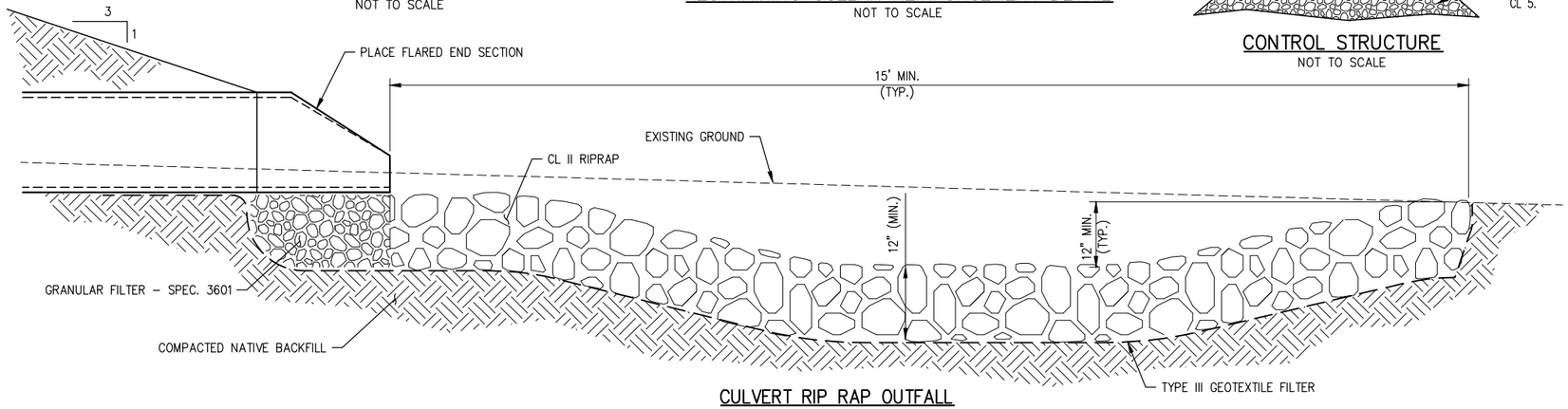

CULVERT RIP RAP OUTFALL
NOT TO SCALE

WARNING
LOCATION OF UNDERGROUND UTILITIES TO BE VERIFIED BY CONTRACTOR. CALL BEFORE DIGGING. GOPHER STATE ONE CALL 1-800-252-1166. REQUIRED BY LAW

LHB PROJECT NO. 150732

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DANIEL SHAW
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11-19-2018
DATE

41423
LIC. NO.

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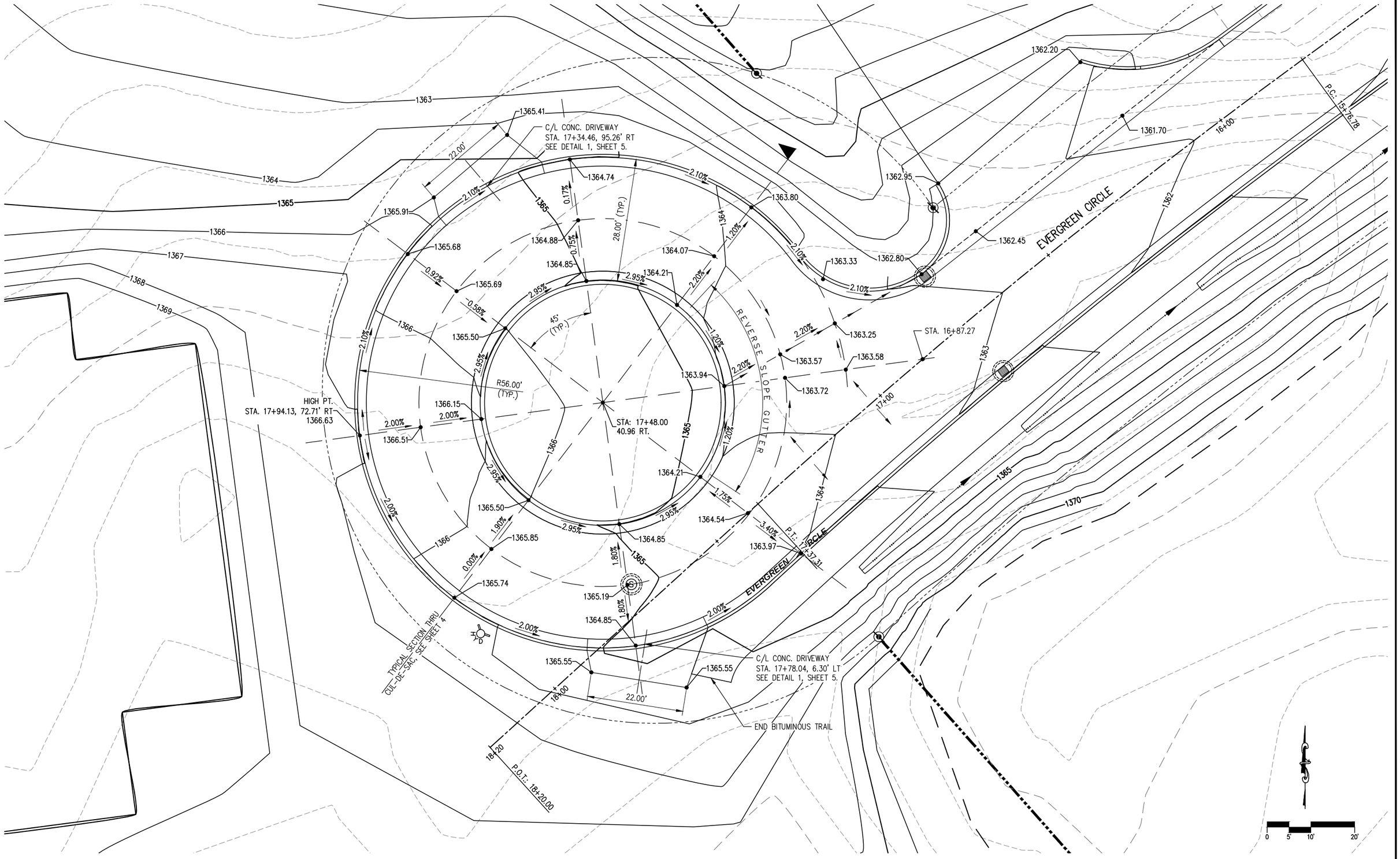
CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT - PUBLIC UTILITIES AND ROADS

STORMWATER BASIN DETAILS

SHEET NO. 19 OF 36 SHEETS



LHB PROJECT NO. 150732

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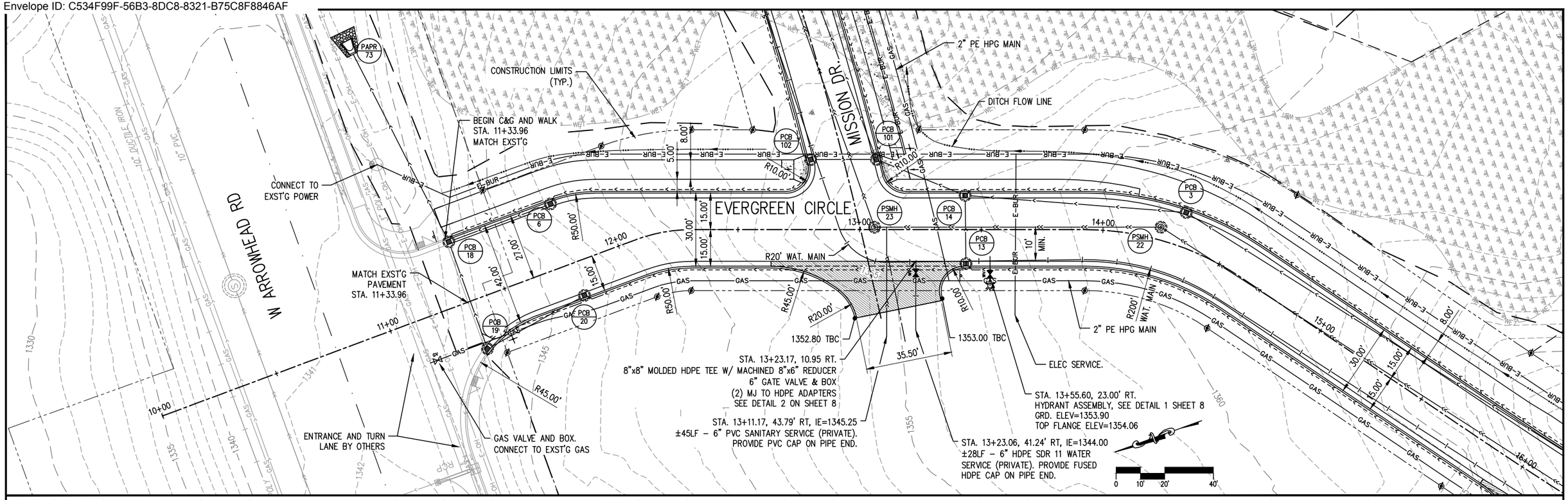
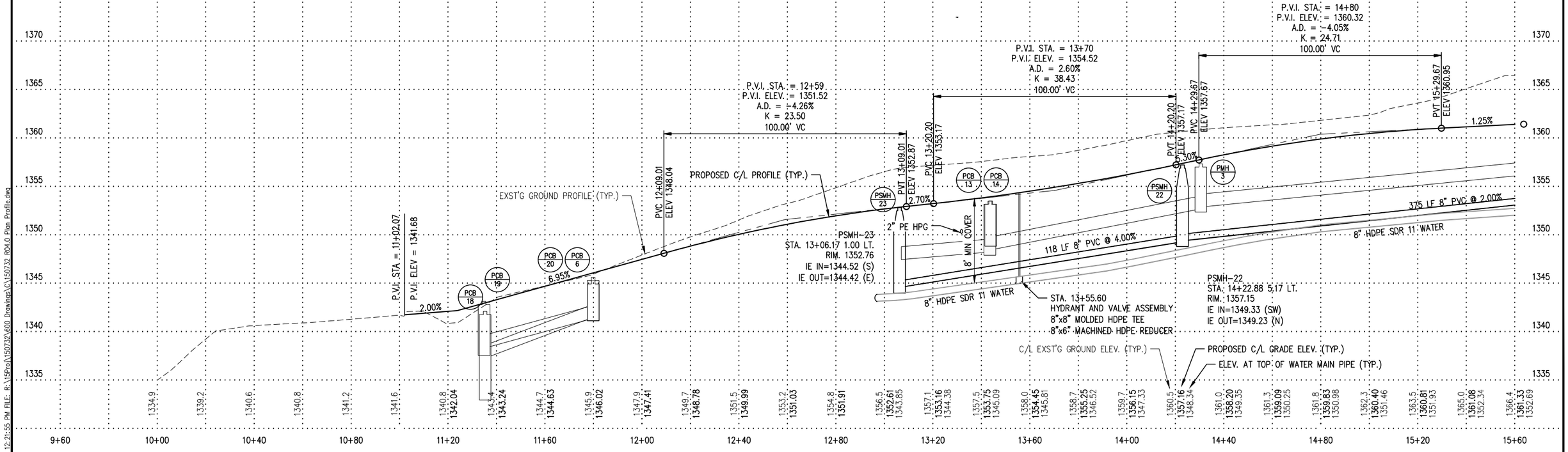
PLOT DATE: 12/11/2018 12:20:54 PM FILE: R:\15Pro\150732\600 Drawings\C\150732 R03.3 Cul-de-sac Detail.dwg





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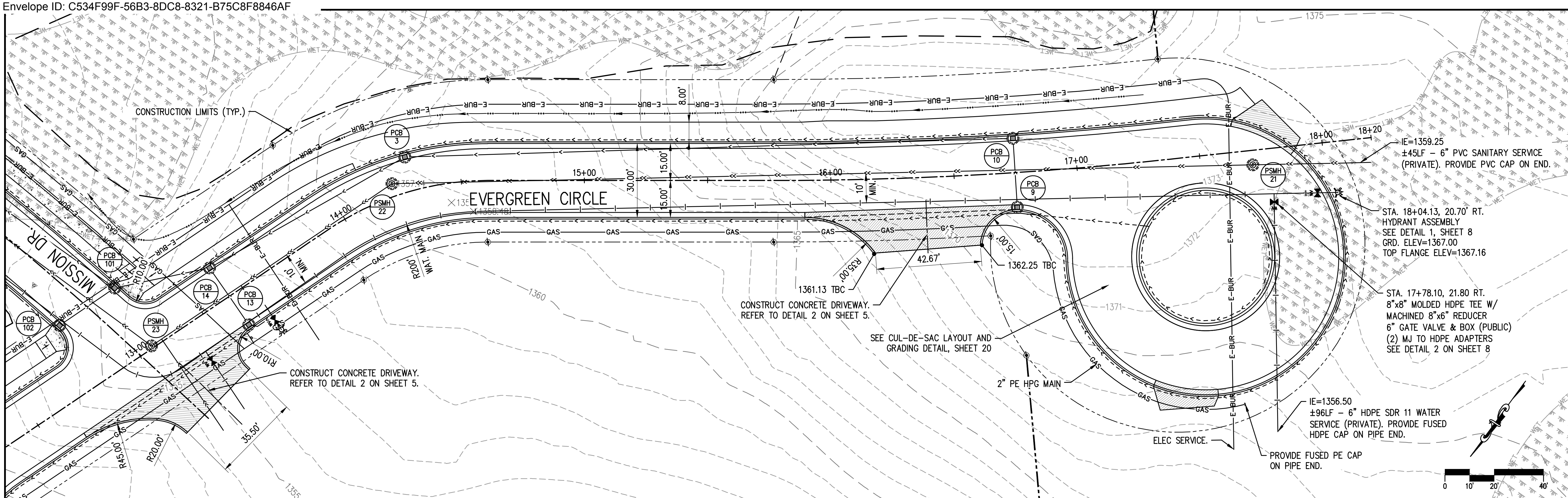
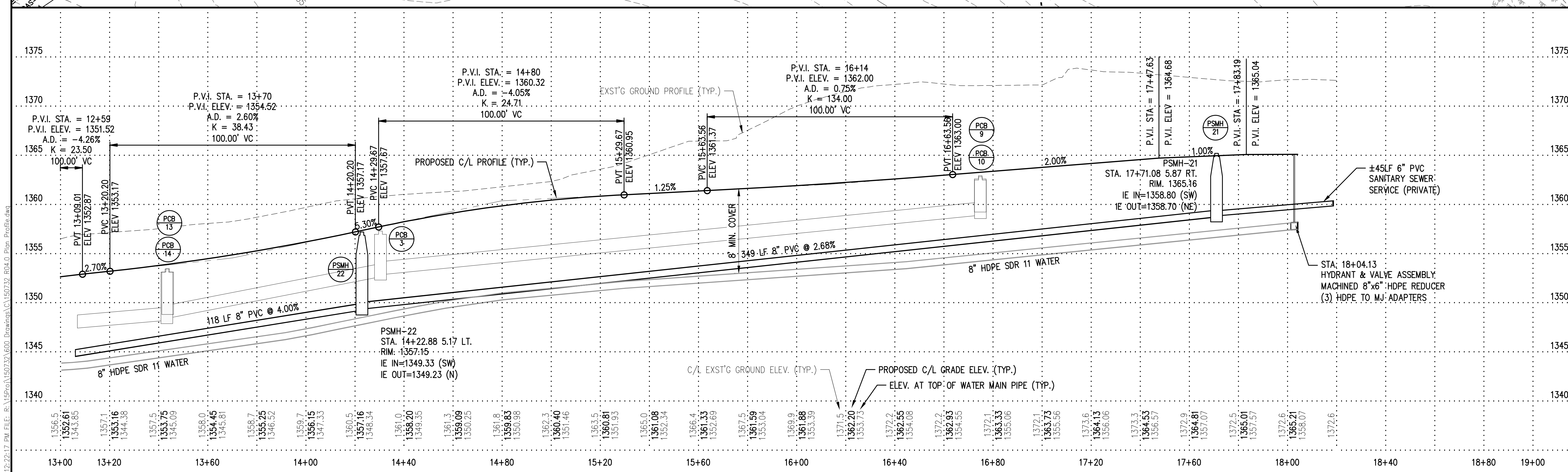
PLOT DATE: 12/11/2018 12:21:55 PM FILE: R:\15Pro\150732\600 Drawings\C\150732 R04.0 Plan Profile.dwg





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41423
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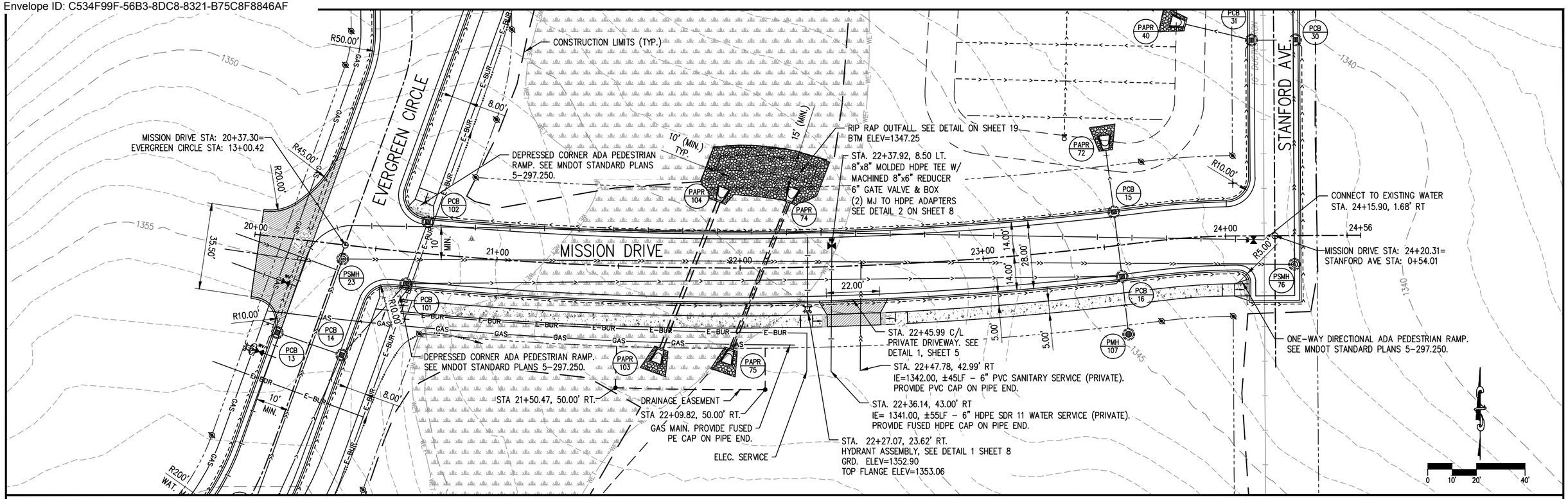
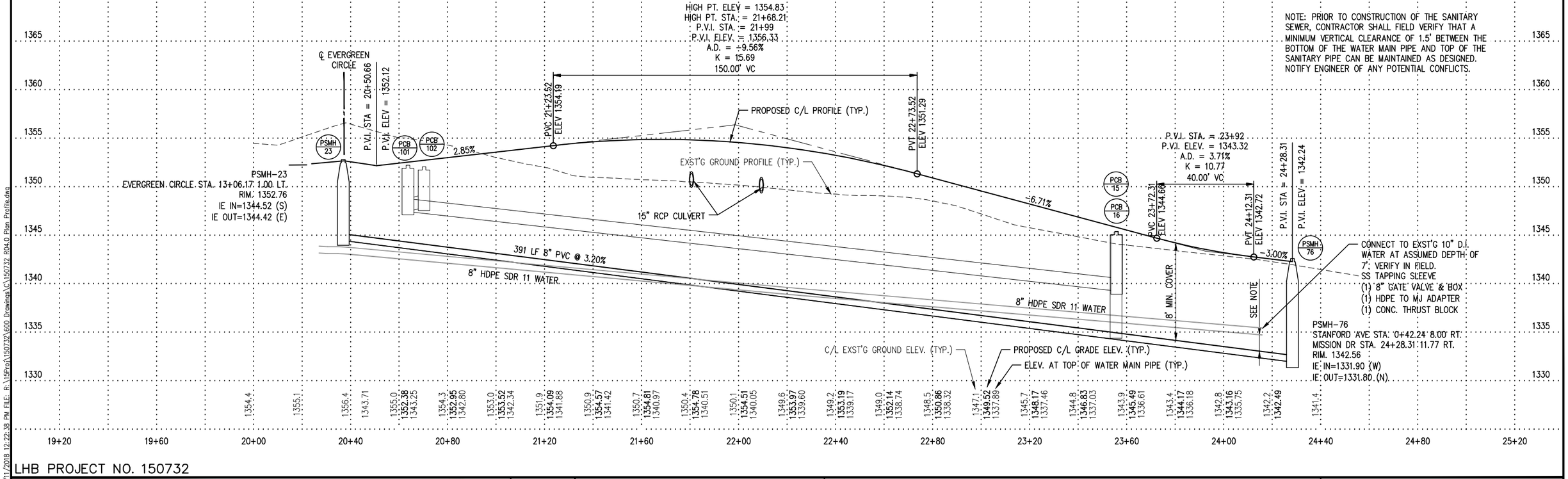
CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

PLAN & PROFILE





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CITY PROJECT 1567

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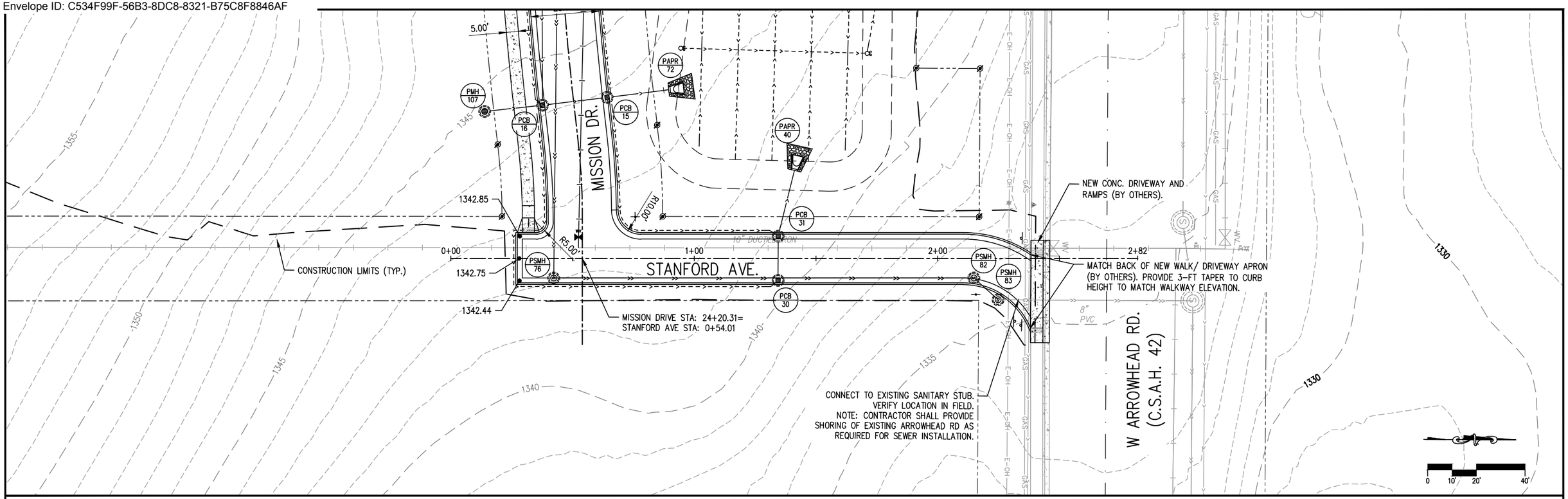

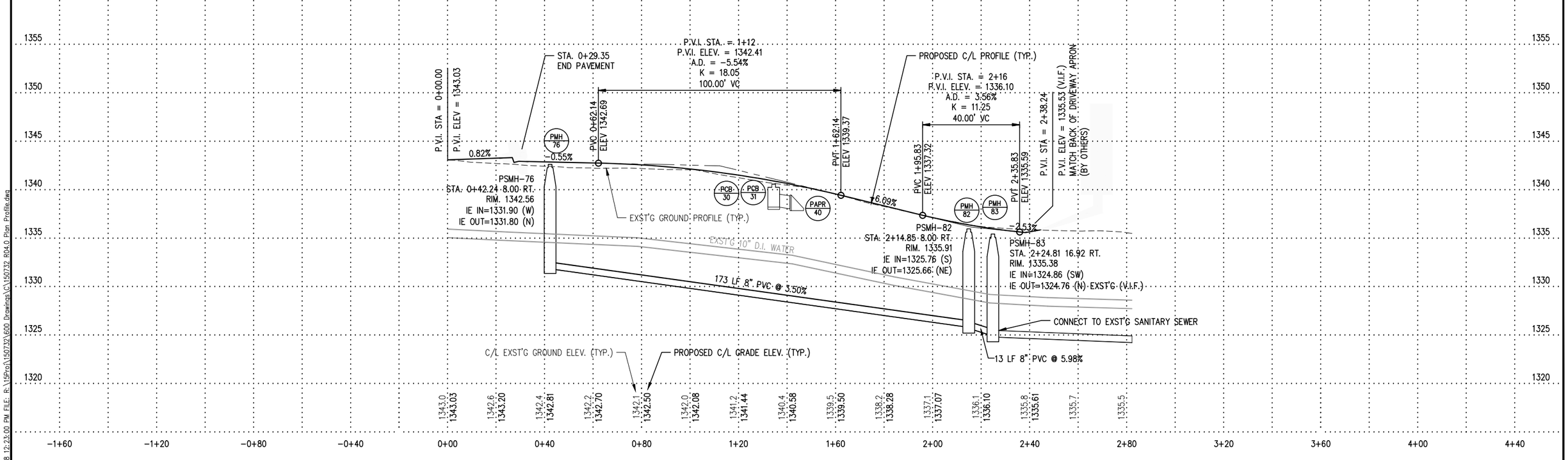

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DANIEL SHAW
PRINTED NAME

Daniel G Shaw
SIGNATURE

11-19-2018
DATE

41423
LIC. NO.

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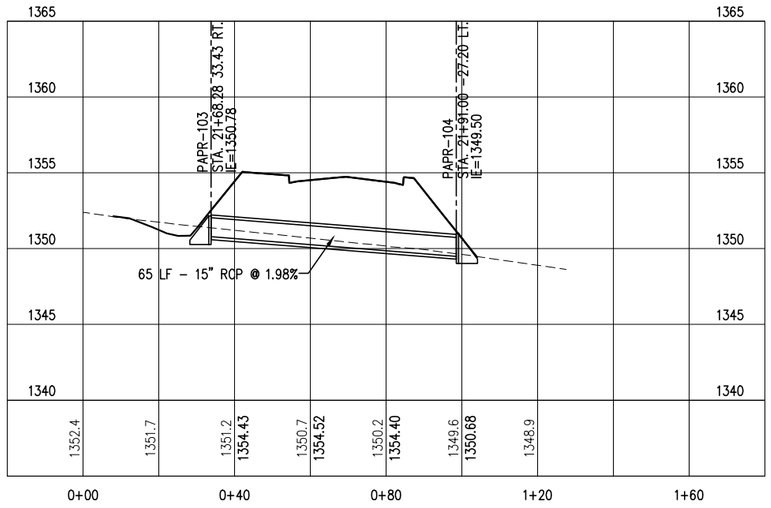
CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

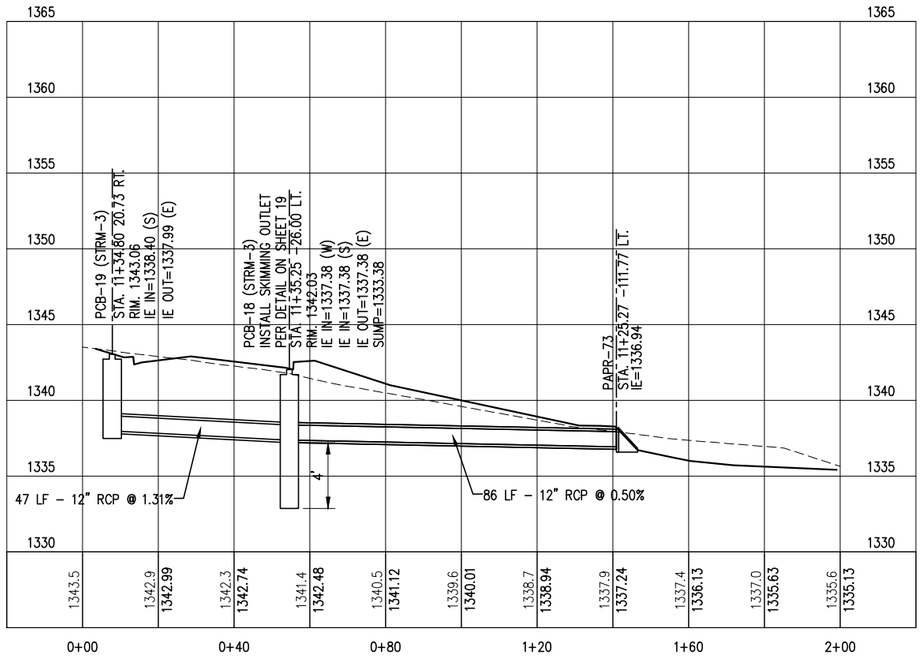
PLAN & PROFILE

SHEET NO. 24 OF 36 SHEETS

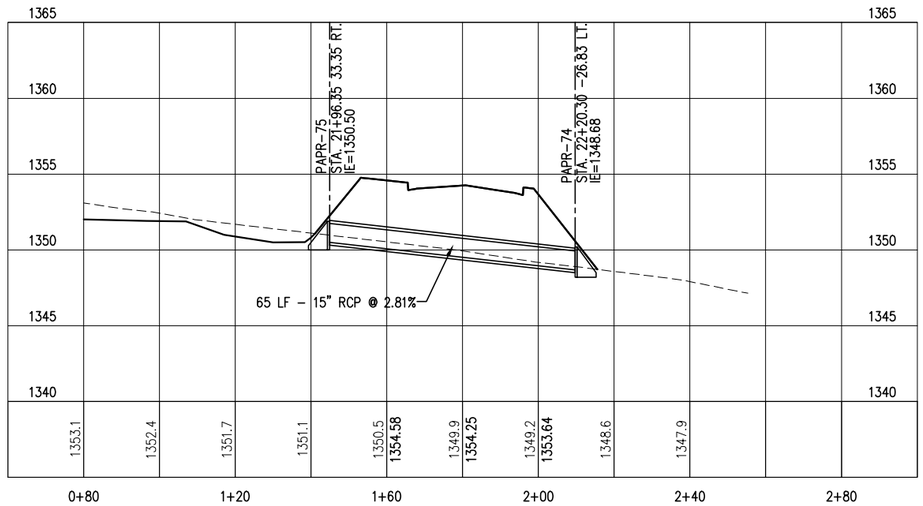
PLOT DATE: 12/11/2018 12:23:00 PM FILE: R:\19Proj\150732\600 Drawings\C\150732 R04.0 Plan Profile.dwg



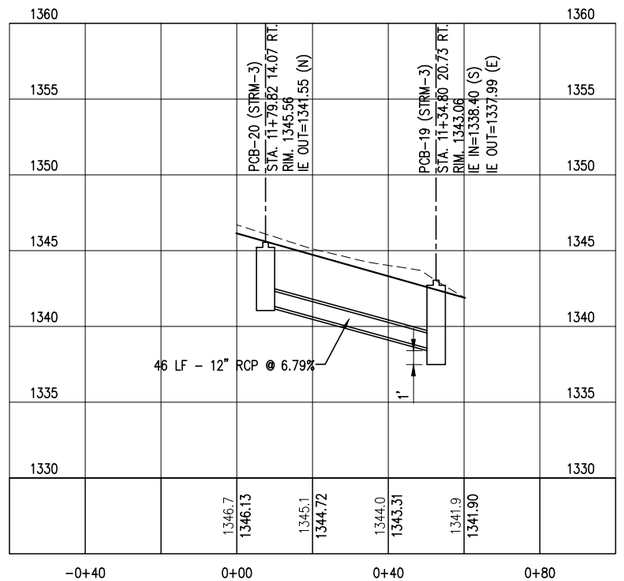
PAPR-103 TO PAPR-104



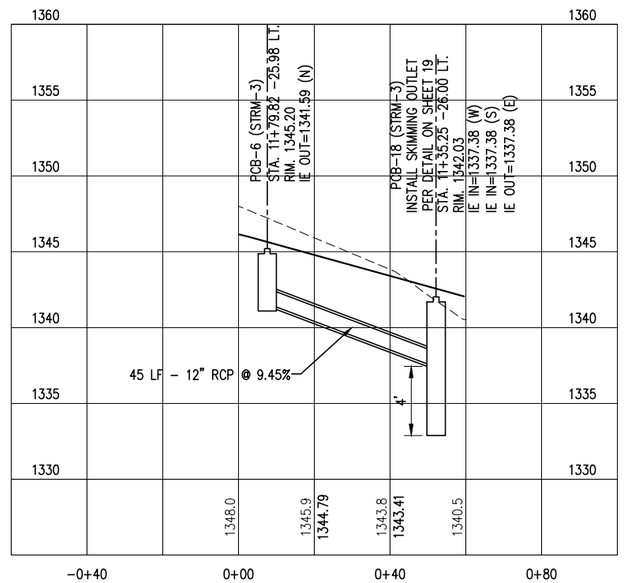
PCB-19 TO PAPR-73



PAPR-75 TO PAPR-74



PCB-20 TO PCB-19



PCB-6 TO PCB-18

LHB PROJECT NO. 150732

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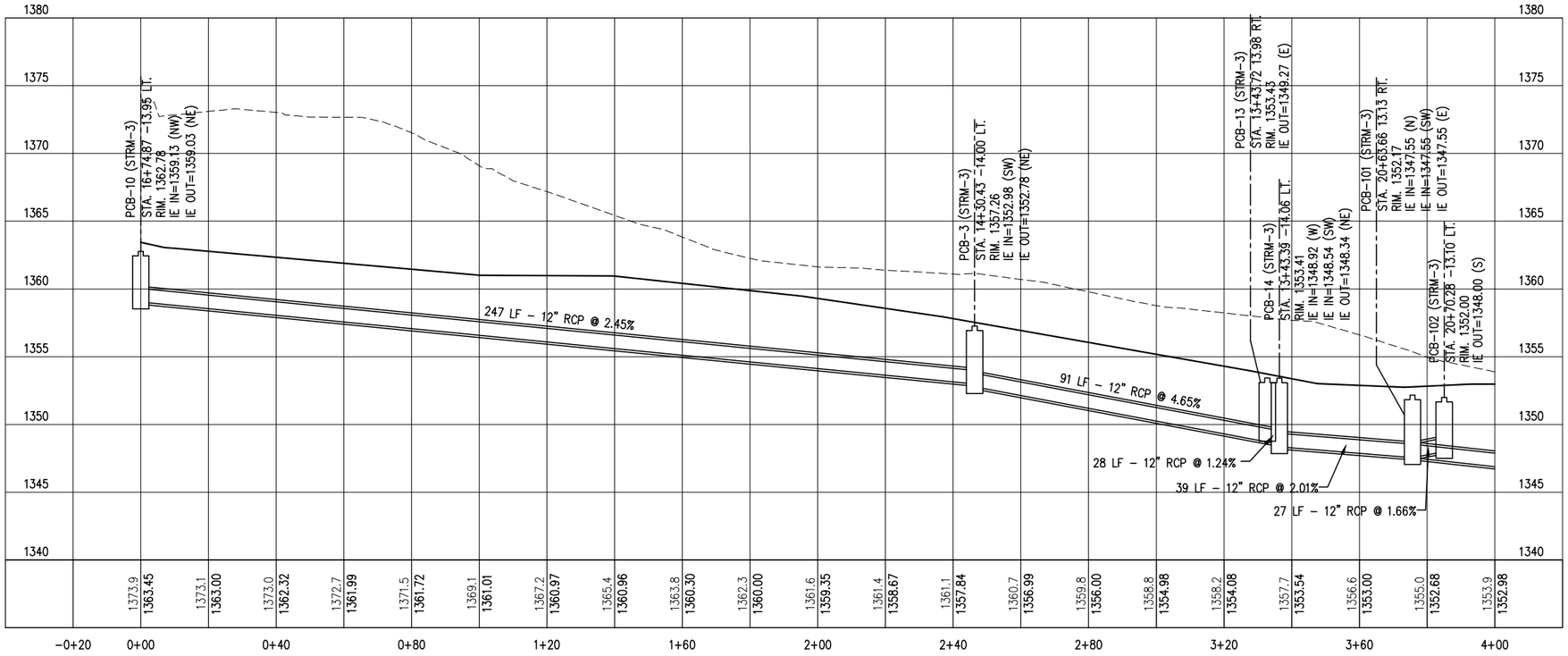
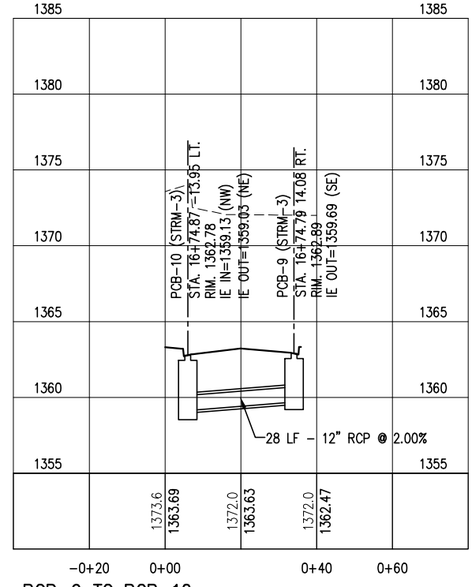
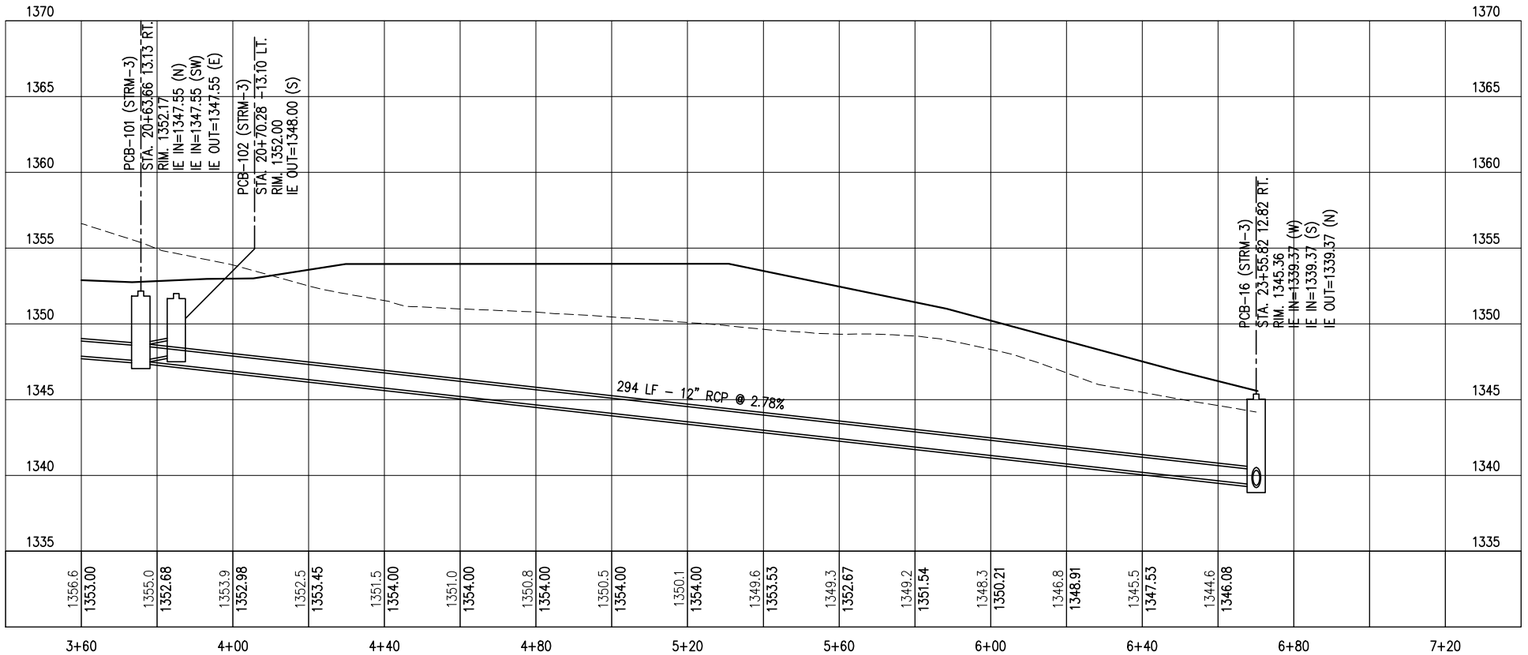


PCB-10 TO PCB-101



PCB-9 TO PCB-10



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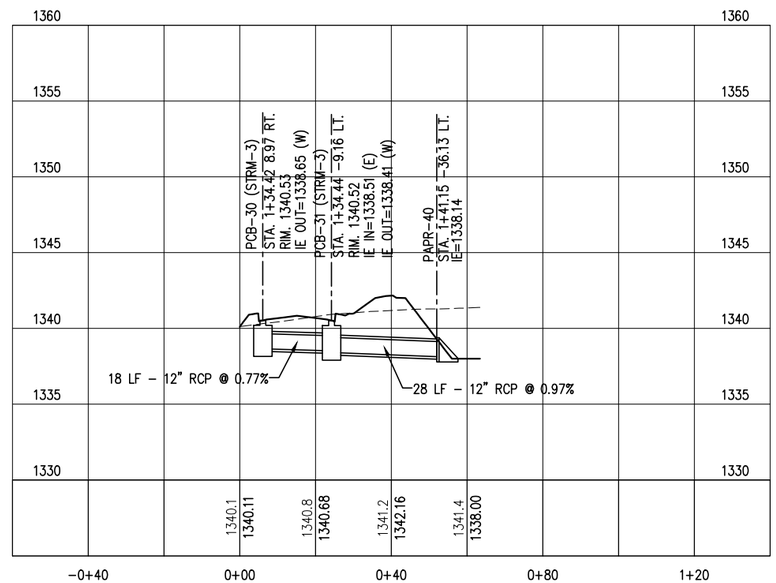

PCB-19 TO PAPR-73

LHB PROJECT NO. 150732

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DANIEL SHAW
PRINTED NAME

Daniel J. Shaw
SIGNATURE

11-19-2018
DATE

41423
LIC. NO.

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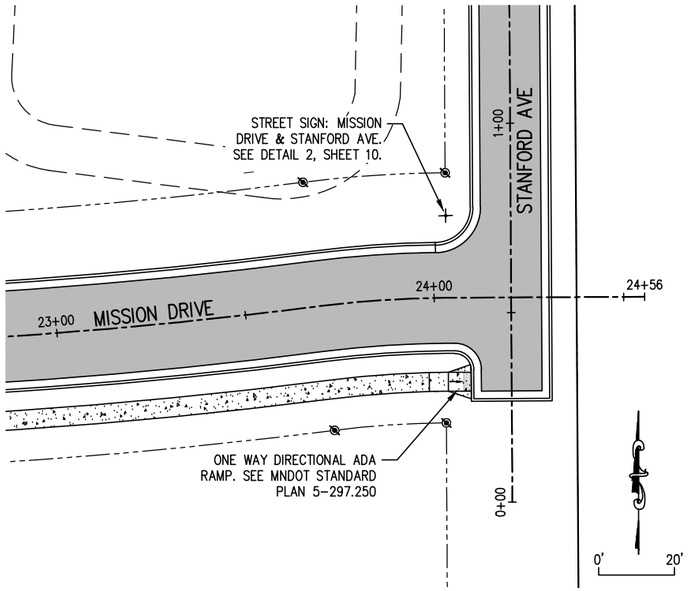
CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

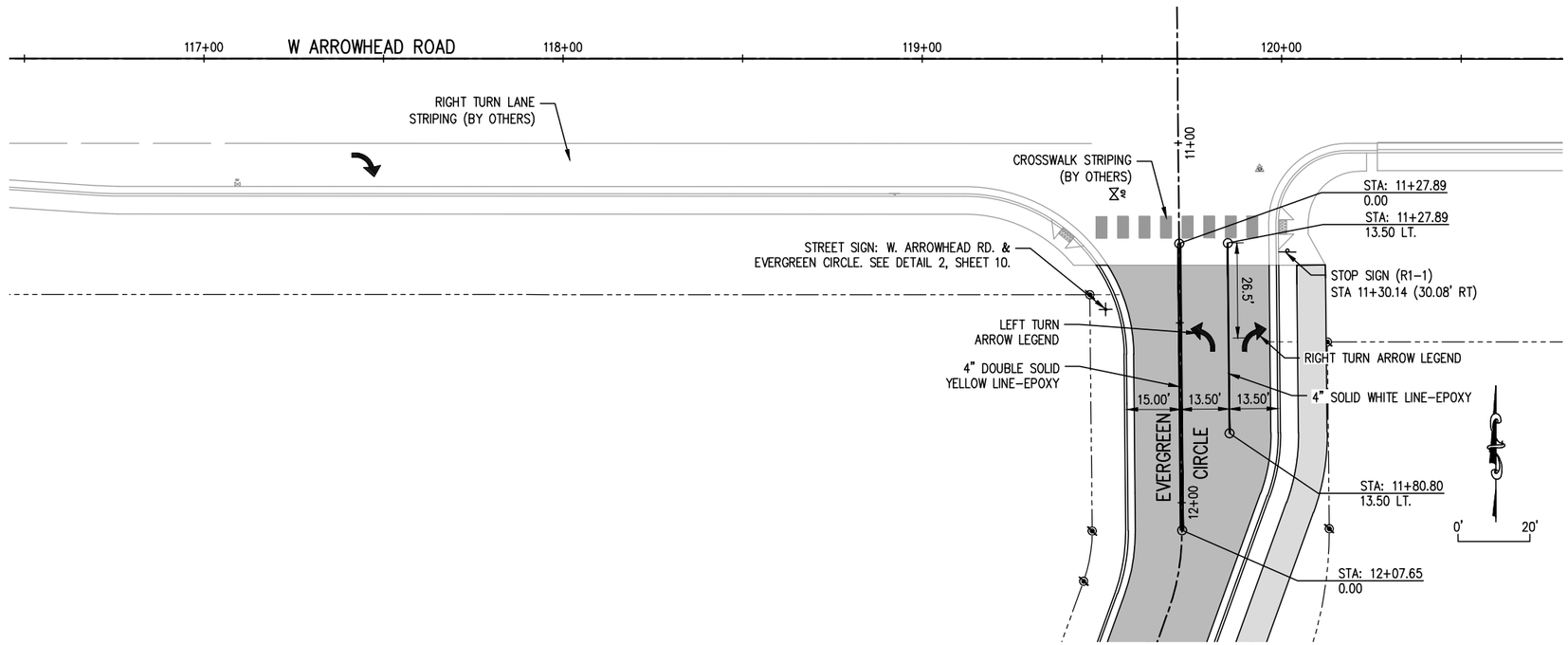
STORM PROFILES

SHEET NO. 26 OF 36 SHEETS

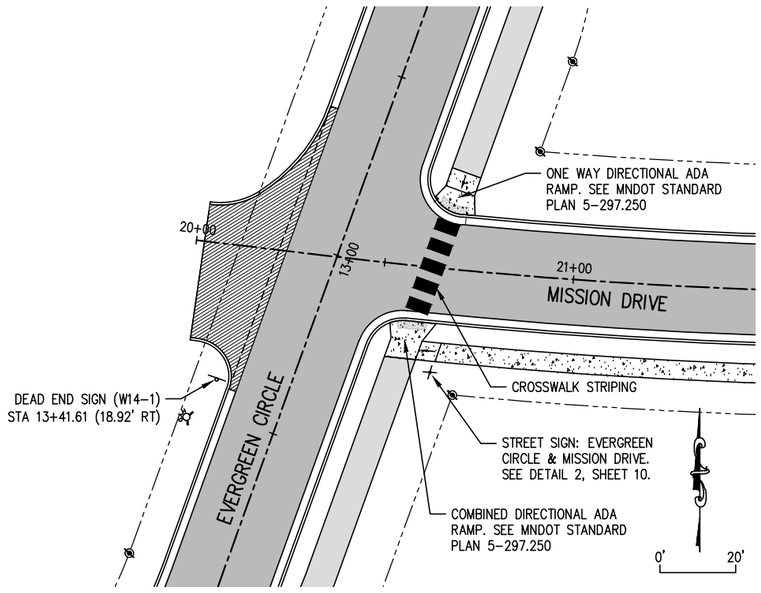
PLOT DATE: 12/11/2018 12:23:47 PM FILE: R:\15Pro\150732\600 Drawings\C\150732 R04.1 Storm Profiles.dwg



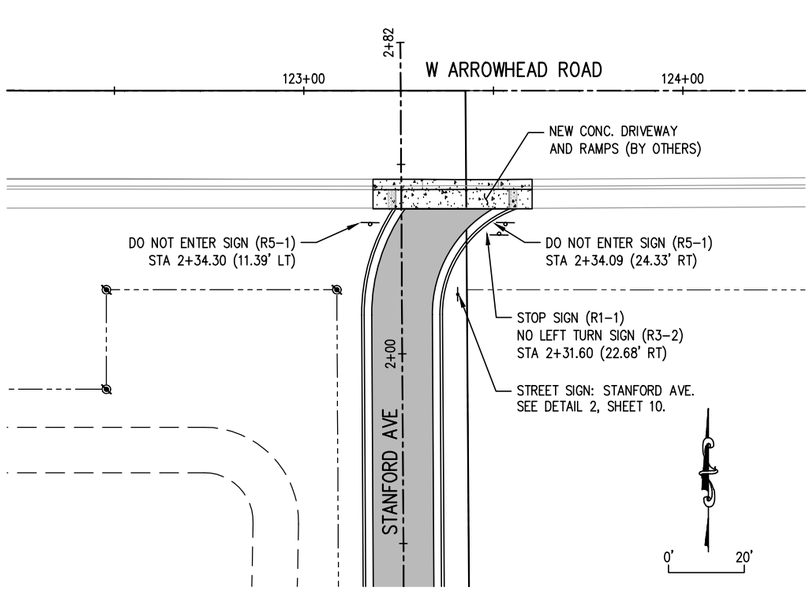
4 MISSION DRIVE & STANFORD AVE INTERSECTION



2 EVERGREEN CIRCLE & W ARROWHEAD ROAD INTERSECTION



3 EVERGREEN CIRCLE & MISSION DRIVE INTERSECTION



1 STANFORD AVE & W ARROWHEAD RD INTERSECTION

LHB PROJECT NO. 150732

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LIC. NO.

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CITY PROJECT 1567

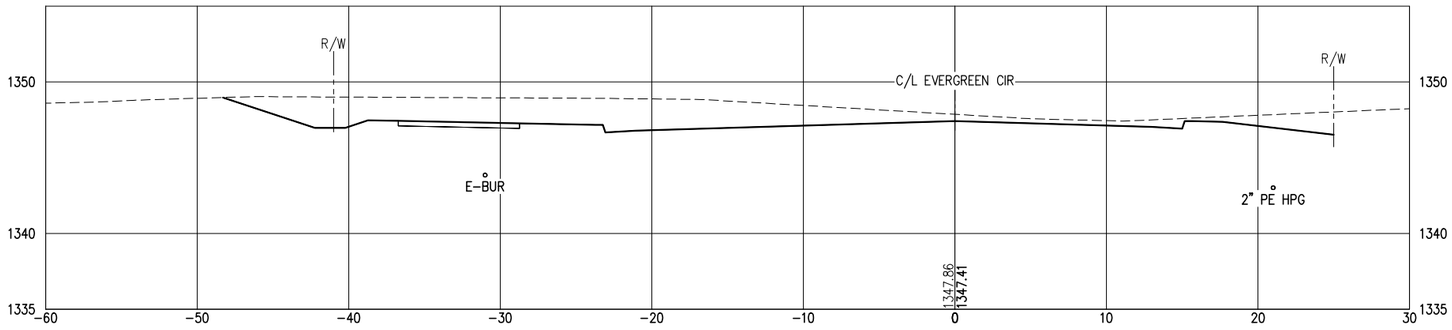
HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

SIGNING AND STRIPING PLAN

SHEET NO. 27 OF 36 SHEETS

PLOT DATE: 12/11/2018 12:24:37 PM FILE: R:\15Proj\150732\600 Drawings\C\150732 R5.0 Signing and Striping.dwg

12+00.00



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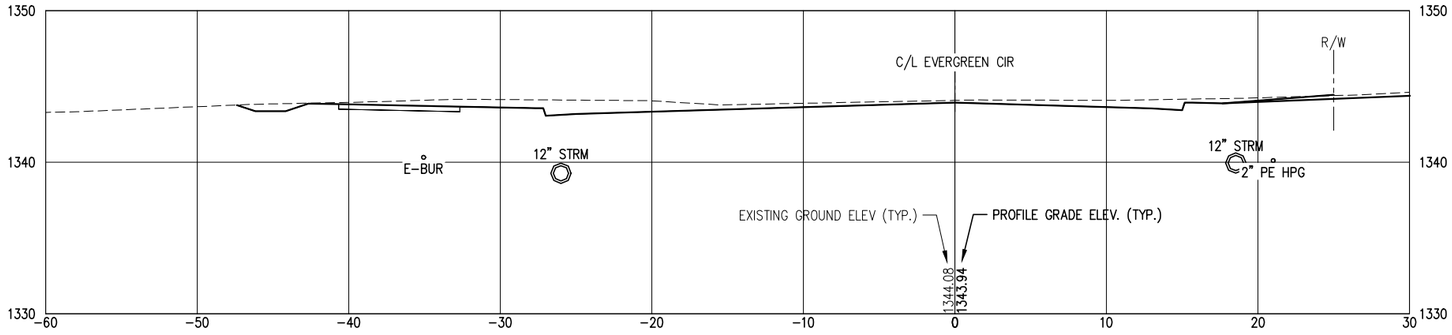

5'
5'

LHB PROJECT NO. 150732

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SIGNATURE

11-19-2018
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LIC. NO.

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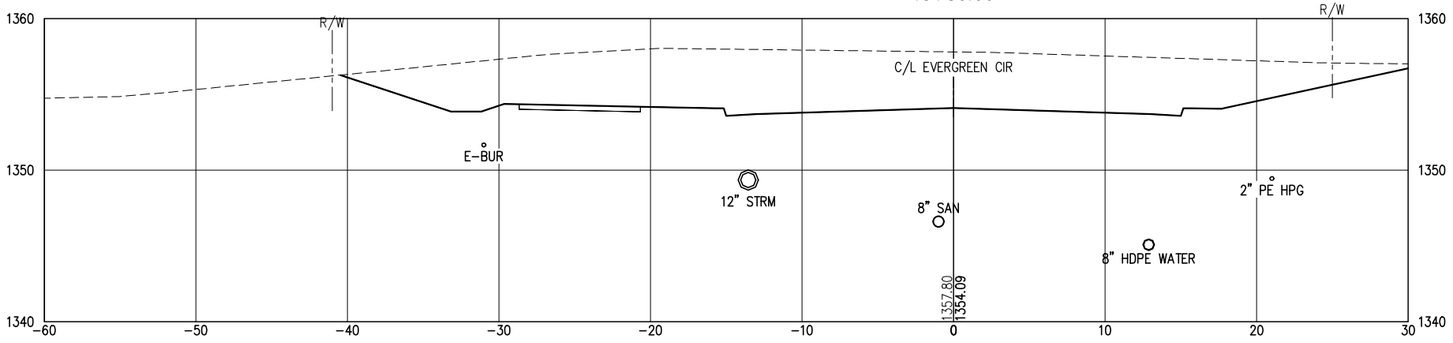
CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

CROSS SECTIONS

SHEET NO. 28 OF 36 SHEETS

13+50.00



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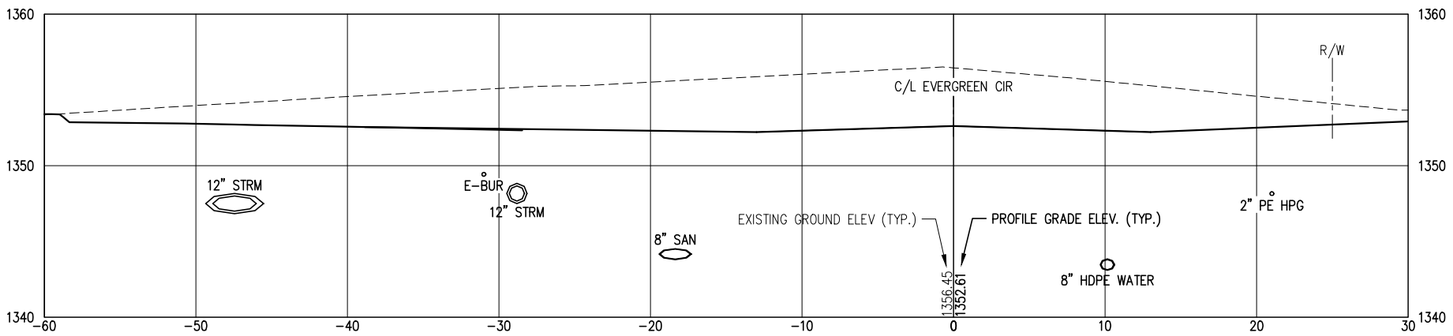

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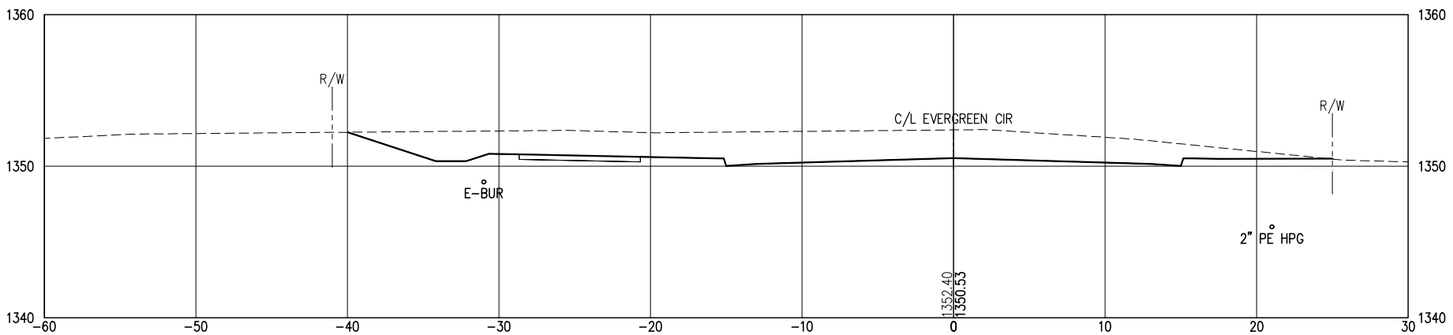

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CITY PROJECT 1567

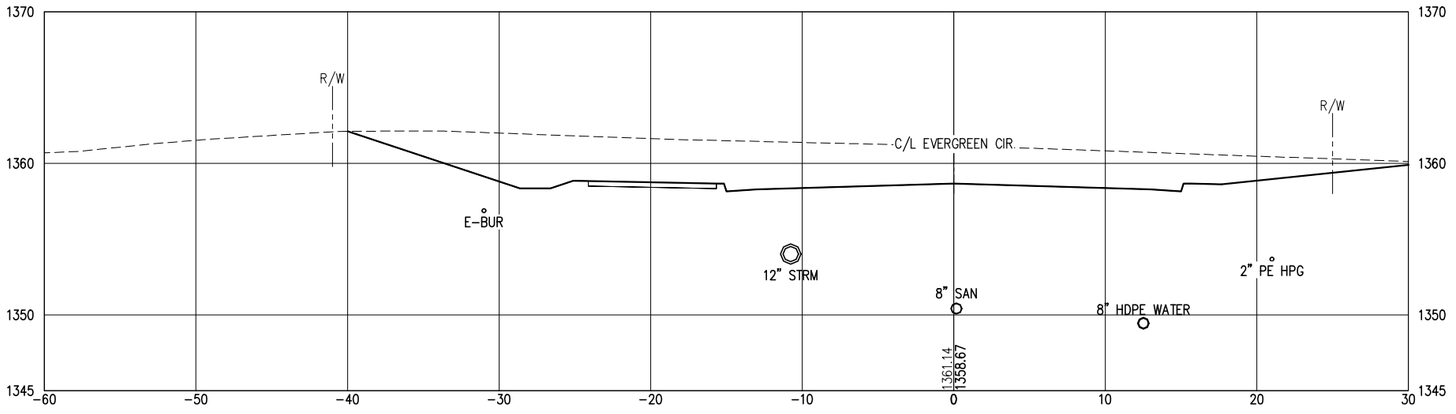
HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

CROSS SECTIONS

SHEET NO. 29 OF 36 SHEETS

PLOT DATE: 11/19/2018 8:59:08 AM FILE: R:\15Pro\150732\600 Drawings\C\150732 R4.2 Cross Sections.dwg

14+50.00



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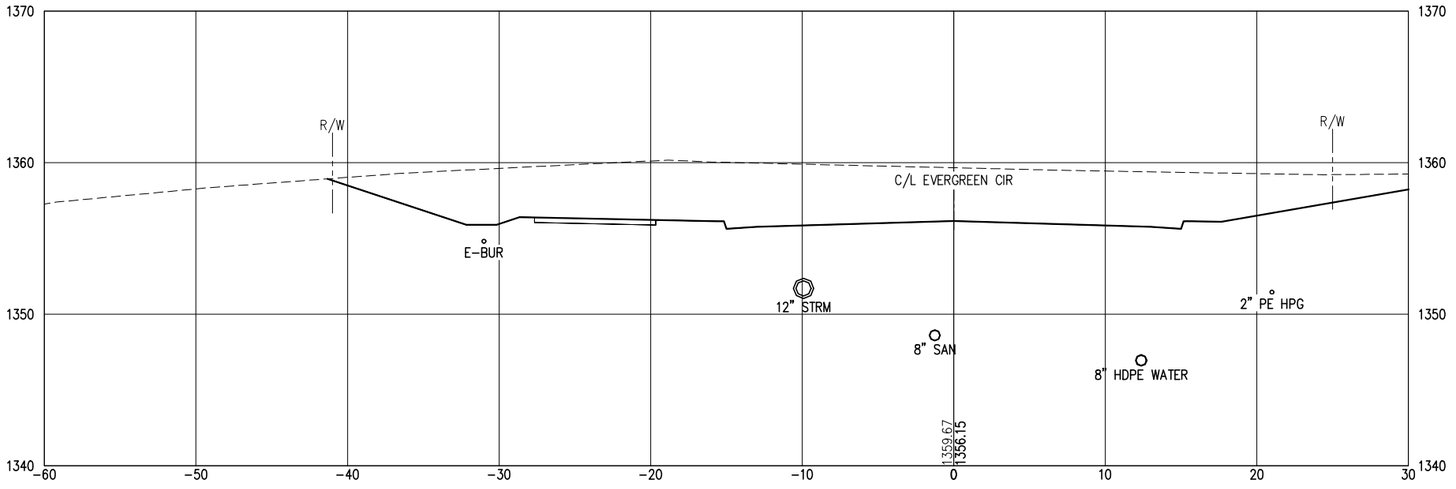

5'
5'

LHB PROJECT NO. 150732

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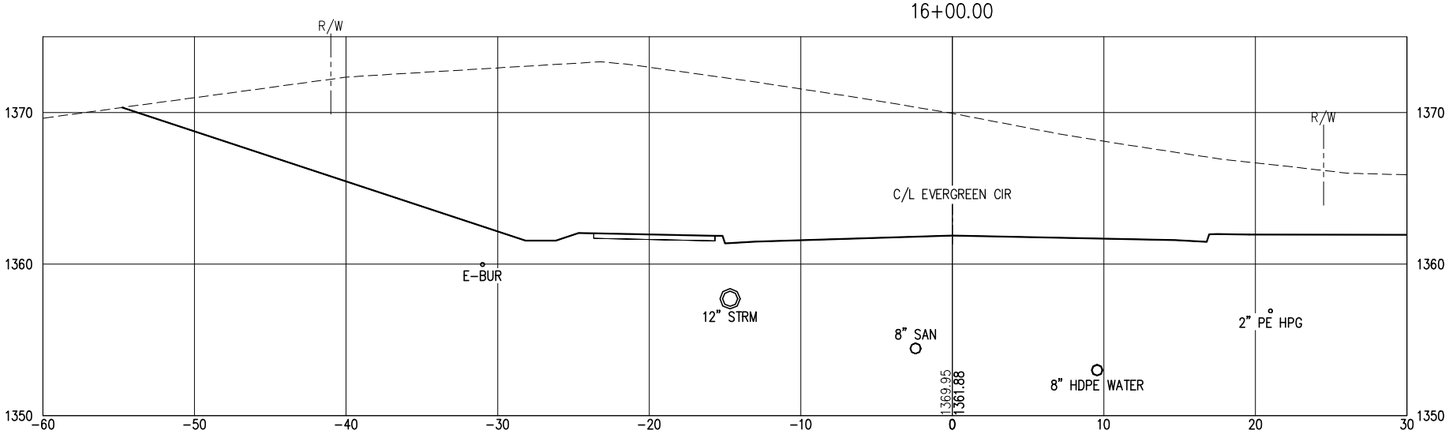
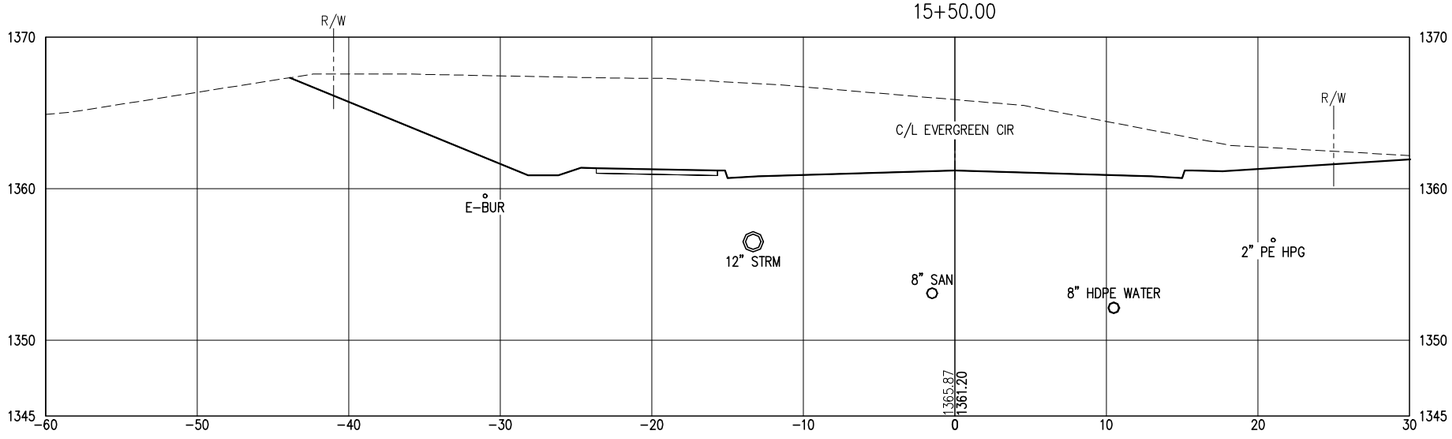
16+00.00



15+50.00



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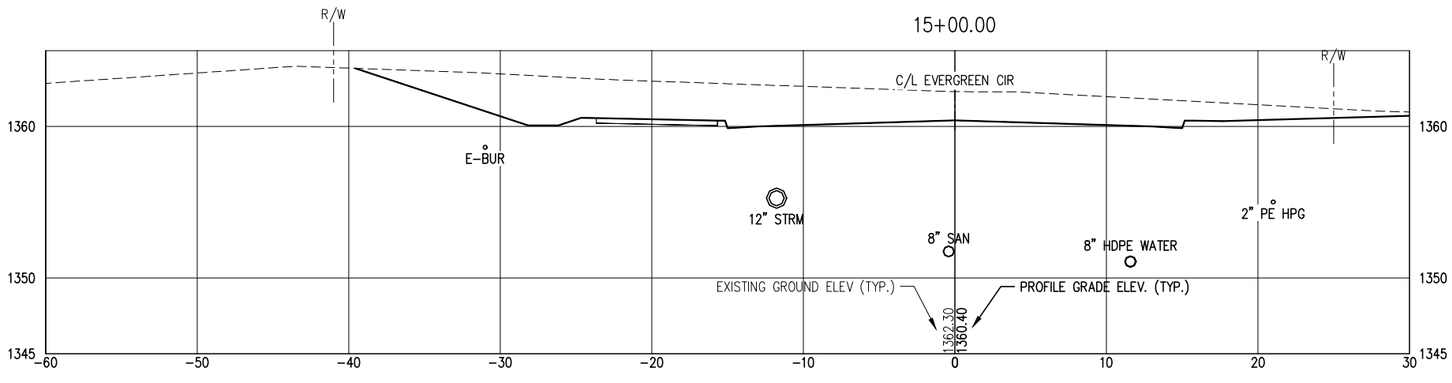

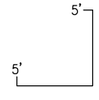

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41423
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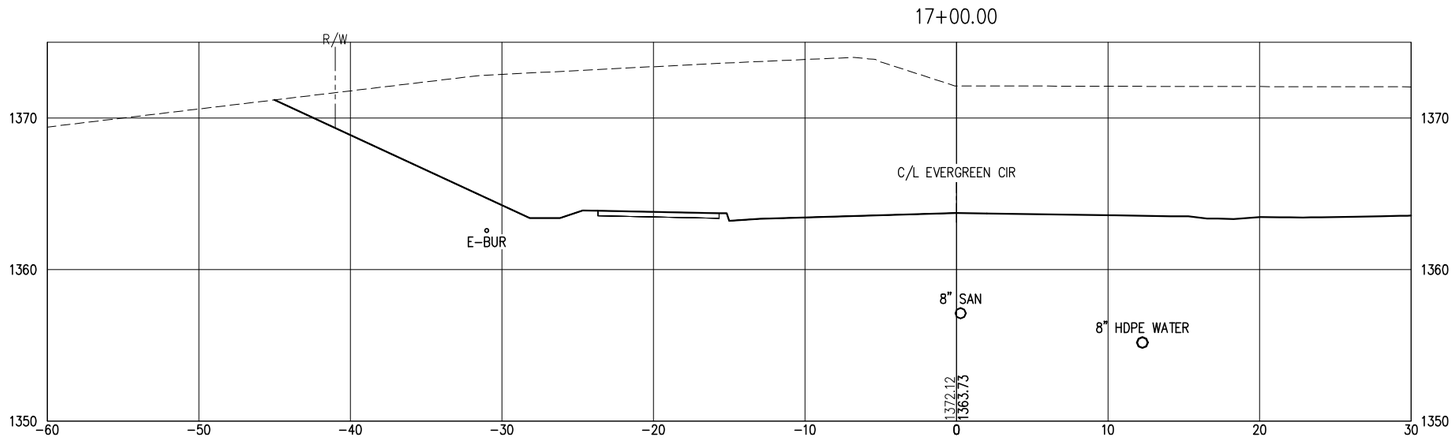
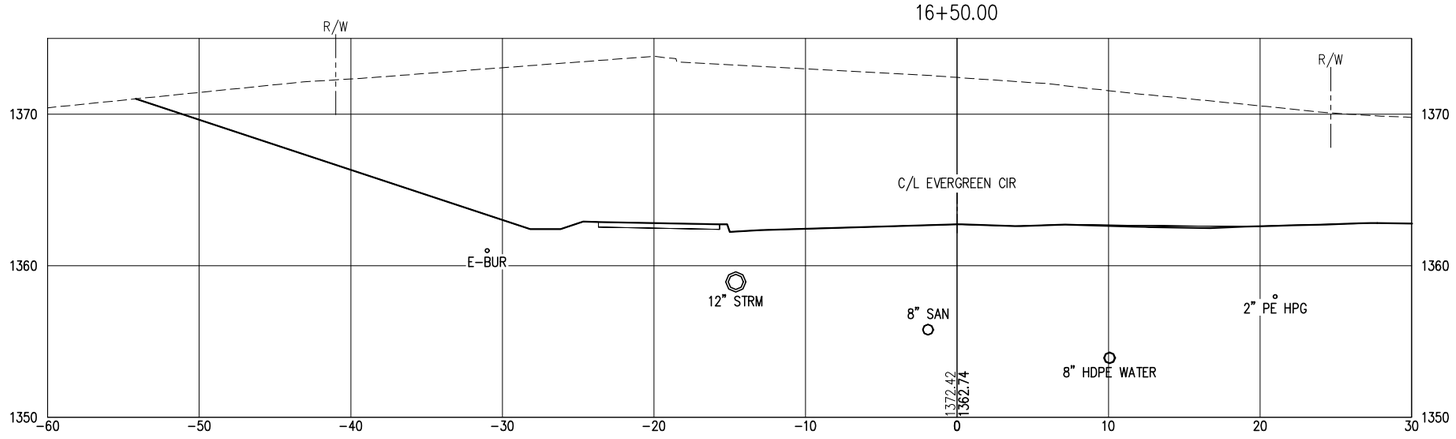
CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

CROSS SECTIONS

SHEET NO. 31 OF 36 SHEETS





5'
5'

LHB PROJECT NO. 150732

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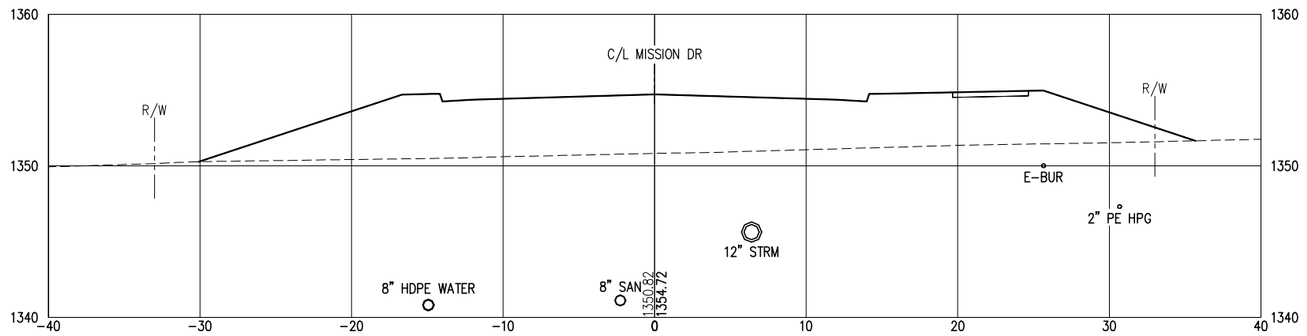
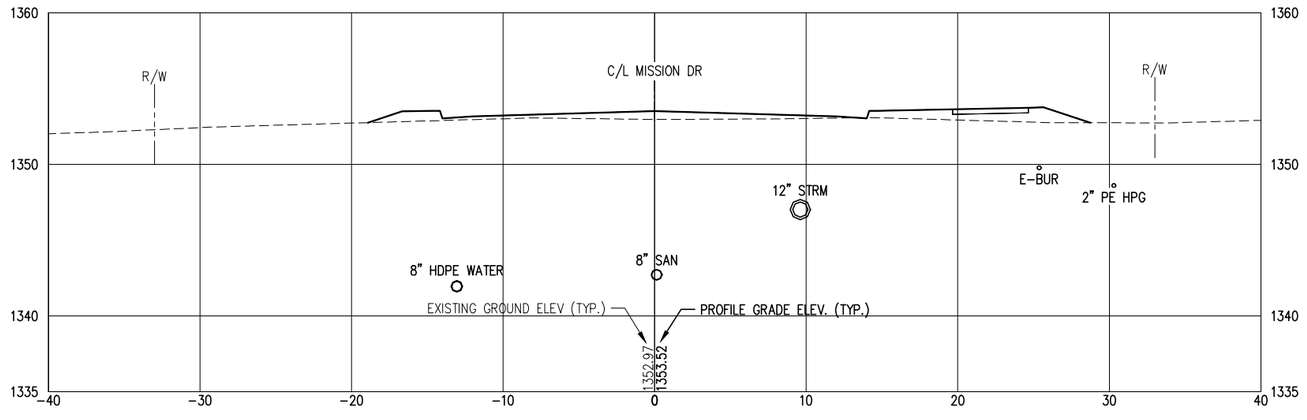
PLOT DATE: 11/19/2018 8:59:44 AM FILE: R:\15Proj\150732\600 Drawings\C\150732 R4.2 Cross Sections.dwg

21+50.00



21+00.00



5'
5'

LHB PROJECT NO. 150732

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11-19-2018
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41423
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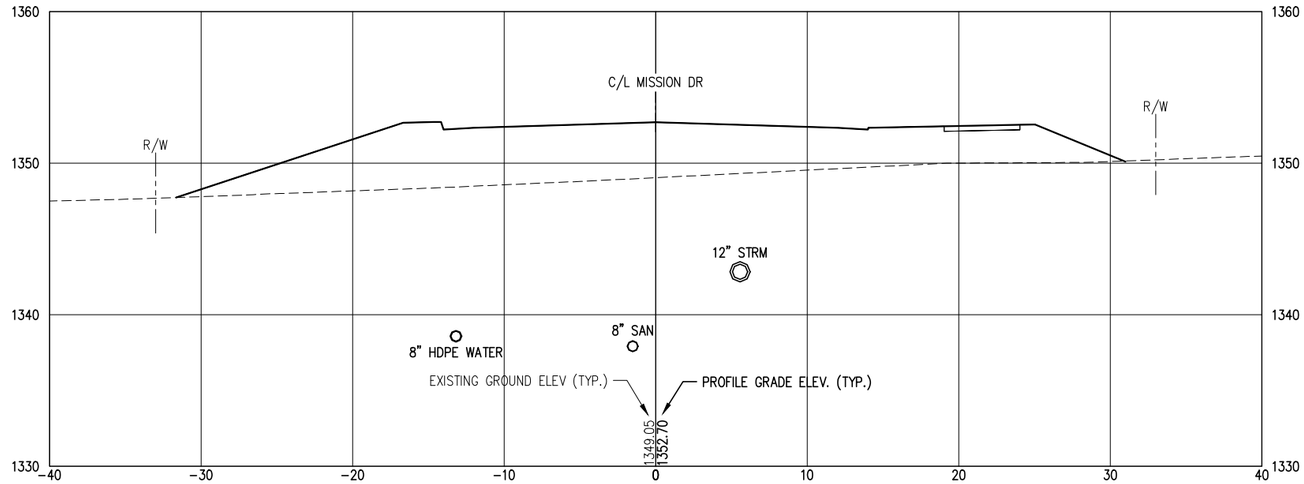
CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

CROSS SECTIONS

SHEET NO. 33 OF 36 SHEETS

22+50.00



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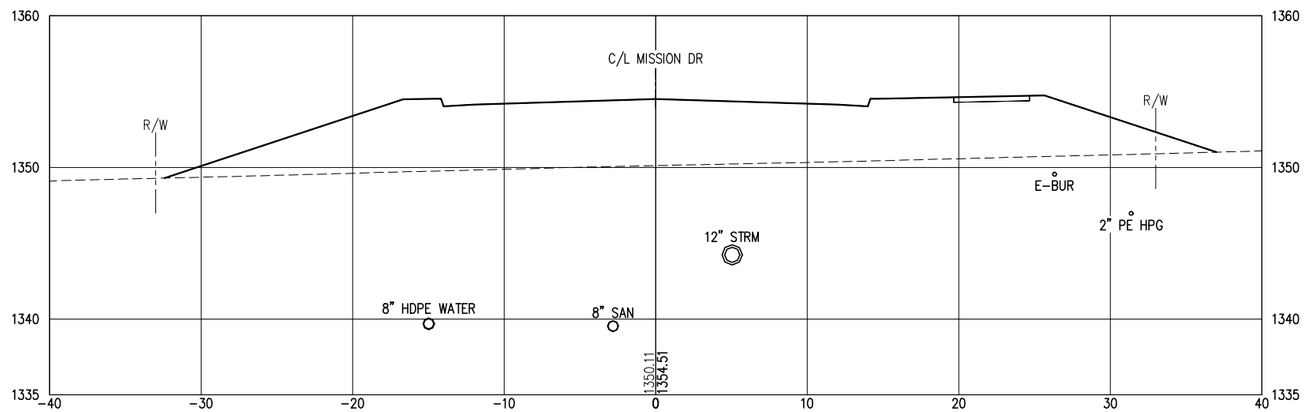

5'
5'

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LIC. NO.

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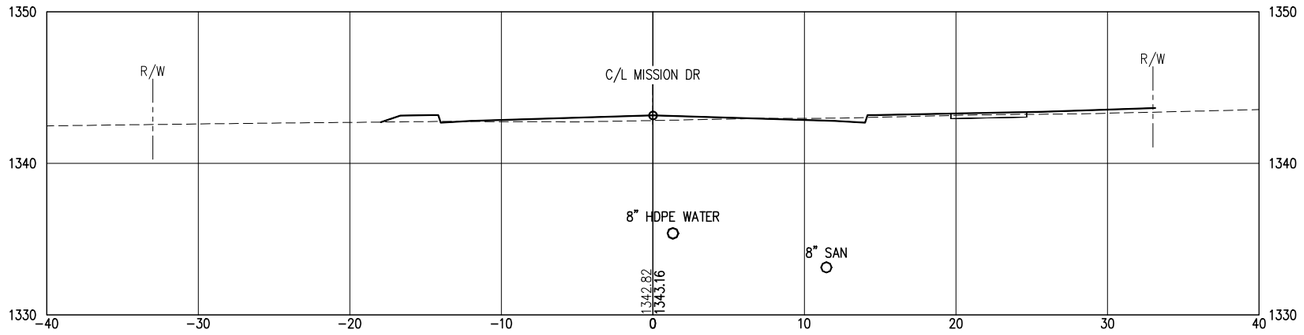
CITY PROJECT 1567

HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

CROSS SECTIONS

SHEET NO. 34 OF 36 SHEETS

24+00.00



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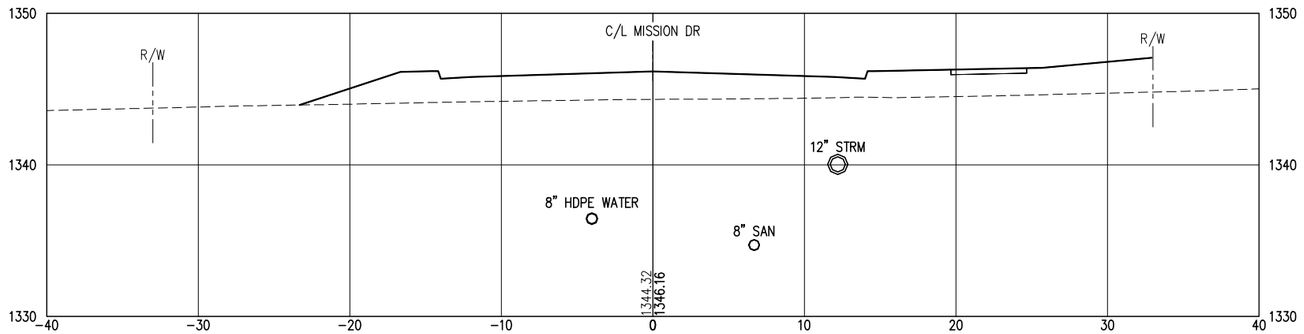

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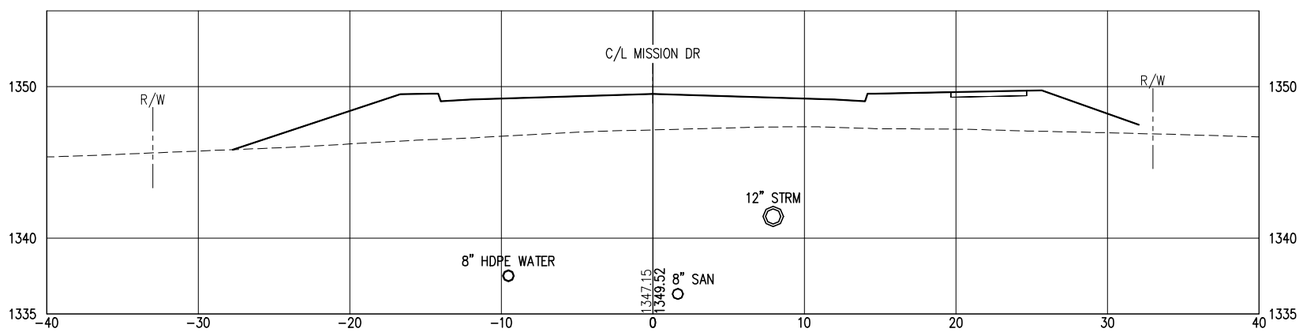

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HARBOR LIGHT DEVELOPMENT – PUBLIC UTILITIES AND ROADS

CROSS SECTIONS

SHEET NO. 35 OF 36 SHEETS

PLOT DATE: 11/19/2018 9:00:19 AM FILE: R:\19Proj\150732\600 Drawings\C\150732 R4.2 Cross Sections.dwg

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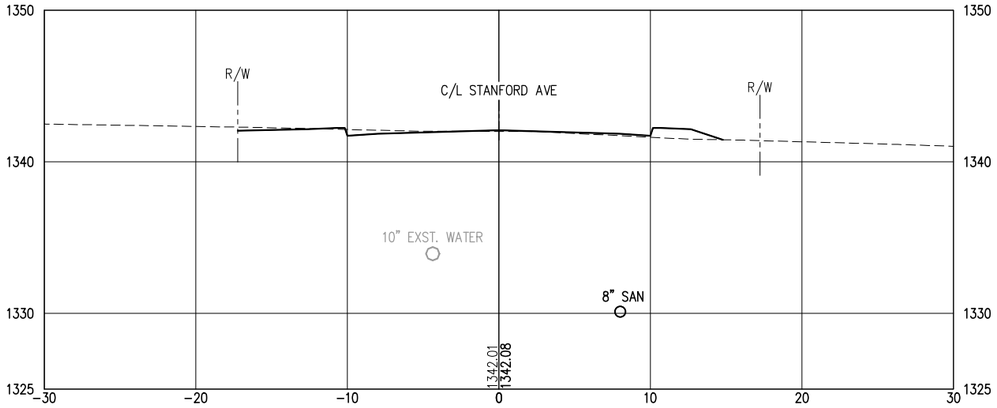

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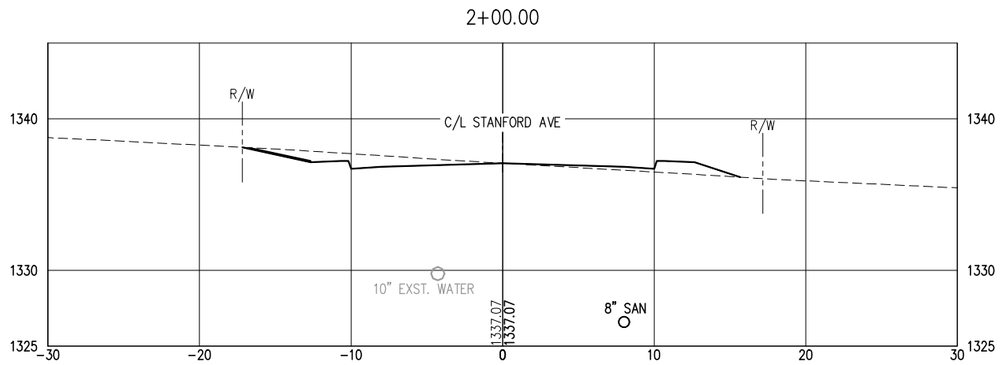

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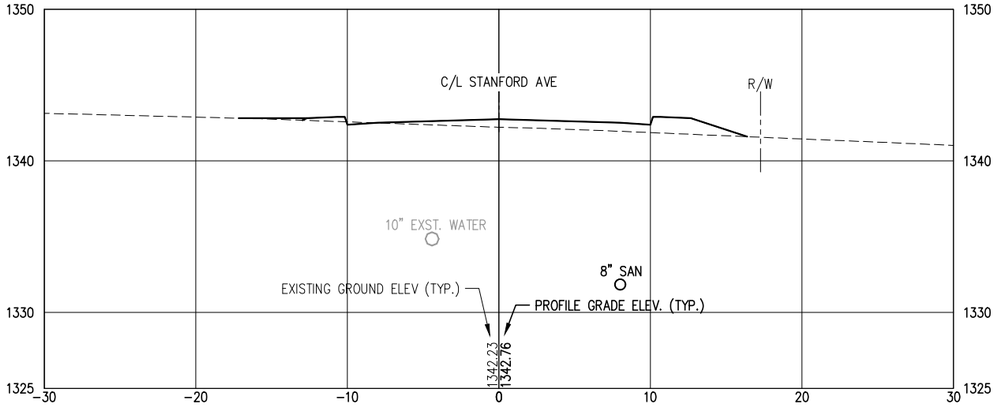

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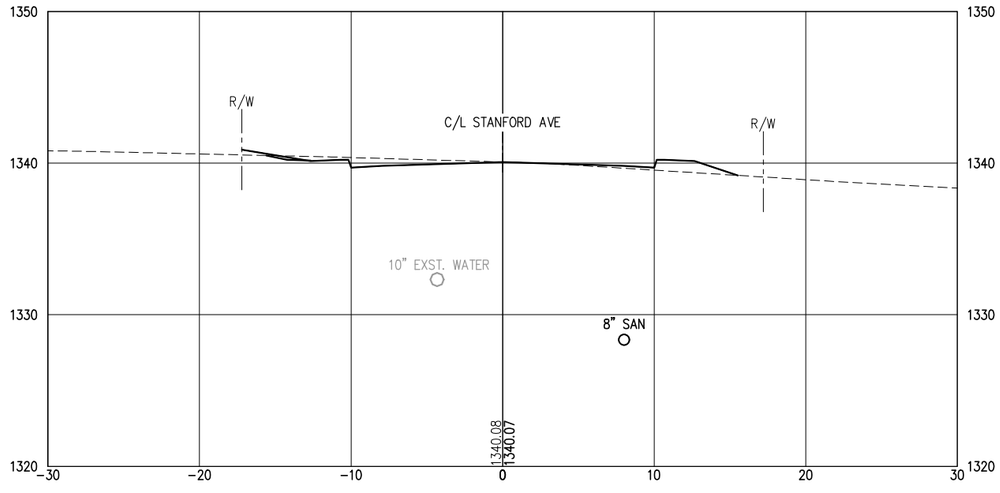

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PLOT DATE: 11/19/2018 9:00:32 AM FILE: R:\15Proj\150732\600 Drawings\C\150732 R4.2 Cross Sections.dwg