INNERARITY ISLAND UTILITIES SYSTEM EVALUATION REPORT

Prepared by:

Kenneth Horne & Associates, Inc.
CIVIL ENGINEERS

Prepared for:
Escambia County

OCTOBER 28, 2015

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BACKGROUND

The Innerarity Island Development Corporation (IIDC) provided water and waste water service to the residents of Innerarity Island in southwestern Escambia County, FL (see Exhibit A for location map). IIDC purchased water from the Emerald Coast Utilities Authority (ECUA) and resold to the residents. Waste water is currently collected in a gravity sewer system and conveyed via a system of lift stations and force mains to ECUA lift station No. 380. Waste water is metered at the discharge of the lift station before leaving the island. The waste water is metered and billed independently of the potable water. Water and sewer services provided in the past by IIDC were subject to regulation by the Public Service Commission of the State of Florida.

IIDC has ceased maintenance and operation of the systems. An agreement in principal has been reached between ECUA and Escambia County regarding future ownership and maintenance of the Innerarity Island Utilities, as well as options for financing mechanisms allowing ECUA to complete design and construction, as necessary, to bring the existing utility systems into compliance with current FDEP and ECUA standards. In an effort to facilitate the transfer of the water & sewer infrastructure to ECUA for ownership, operation and maintenance, Escambia County has commissioned Kenneth Horne & Associates, Inc. (KHA) to refine a previously completed evaluation of the systems and identify any maintenance and capital improvement requirements that would be prerequisite for ECUA acceptance and to prepare a preliminary cost estimate for the improvements deemed necessary. The purpose of this report is to document the results of that effort. The approximate geographic limits of the IIDC franchise area are depicted in Exhibit A.

SUMMARY OF INVESTIGATIVE SERVICES

Initial onsite investigative services of existing conditions were performed throughout the IIDC franchise area to evaluate the existing water and sewer systems. This work was conducted on behalf of and funded by the Innerarity Island Development Corporation. This investigation included the following services:

- Location of existing utility lines

- Survey all right-of-ways, easements, and marked utilities
- Video inspection and cleaning of all gravity sewer lines
- Fire hydrant and dead-end flush valve testing and evaluation
- Manhole and lift station inspections
- Potholing of utilities to determine size and materials of construction
- Evaluation of the existing water and sewer capacity versus anticipated future needs

The results of these investigations were then analyzed to determine where deficiencies in the systems might exist and what remedial action would likely be required for ECUA acceptance. System maps of the water and waste water infrastructure as surveyed by Merrill Parker Shaw, Inc., video inspection reports, and manhole inspection reports are included with this report. While KHA is familiar with ECUA standards and has strived to evaluate the system accordingly, these recommendations are subject to review and concurrence from ECUA staff.

EXECUTIVE SUMMARY

While recognizing that the final authority on what constitutes minimum requirements for ECUA acceptance will rest with the ECUA Board of Directors, KHA, with coordination with ECUA staff, has estimated those requirements and associated costs as follows:

Water system improvements would consist of: a) relatively minor main relocations to remove encroachments of the water facilities from private properties. As an alternative to relocations, easements could be secured with the assistance of the Innerarity Island Homeowners Association (II HOA) to negate the need for the relocations. b) installation of system isolation valves, c) fire hydrant additions, d) modification of dead end water lines to provide either flush valves or circulation loops, e) water service renewals to remove polybutylene tubing and replace meters with ECUA standard meters and f) upgrade approximately 3,000 linear feet of existing 4" water main on North Shore Drive to 6". The estimated cost for water related improvements is approximately $0.59 million.

Sanitary sewer system improvements would consist primarily of the construction of a low pressure sewer system to replace all gravity collection on the island leaving only the relatively new gravity collection in the Russell Bayou development in service. The existing gravity sewer collection system was found to be prone to excessively heavy infiltration/inflow and to have many line segments laid at insufficient slope. Full replacement of the gravity sewer system was eliminated from consideration due to excessive cost. The estimated cost for sewer related improvements is $2.73 million for installation of a low pressure system on the island and upgrade of the existing Russell Bayou lift station.

It is estimated that the development time for these improvements allowing for design, permitting, bidding, and construction could be in the range of eighteen to thirty months.

DETAILED FINDINGS

Water System

The water system provides domestic water to 198 customers via a distribution system consisting of approximately 41,300 linear feet of water main in sizes from 8” down to 2”, see Table 1 below. Water purchased from the ECUA is metered through a 6” meter located at the east end of the causeway to Innerarity Island.

Table 1
Water Distribution System

Water Main	
Size	Total Length (LF)
2 inch	3,484
3 inch	3,332
4 inch	7,356
6 inch	24,208
8 inch	2,919
Total	41,299

There are currently a total of 612 single family detached residential platted lots within the various development phases of Innerarity Island and Russell Bayou. Fifteen (15) of the platted lots are not currently served by the existing water distribution system. These are located in the Seascape Cove area. In addition to the 612 single family detached residential lots, there are 68 Townhome style units on the north side of Innerarity Point Road just across the causeway. Of the 612 single family detached residential lots, approximately 198 are currently developed and approximately 414 are undeveloped. See Exhibit B for graphical depiction.

A summary of the existing and projected water demand for the Island based upon both current water customers and the potential number of customers should all of the lots be built out is provided in Table 2. Minimum design flow rate has been calculated based on ECUA Engineering Manual, Section 556, ”Water Distribution System” paragraph 3.1.1.

Table 2
Domestic Water Demand

	No. of Users	Average Gallons per minute at 1.5 gpm/house and 1.4 gpm/townhome	Usage per month (30 days) Million g/month
Current			
Houses	198	297	12.8
Townhomes	68	95	4.1
Build Out	680	1020	44.1

Given the existing projected and metered flow data to the island, it is the writer's opinion that the existing water distribution infrastructure is sufficient to meet the domestic demand for current and foreseeable short term growth needs. It is possible, that system demands might warrant main size increases to ensure sufficient pressure at peak demand times at some point in time between current development density and buildout density.

The results of fire flow testing for selected fire hydrants within the IIDC franchise are provided in Table 4.

Table 4
Innerarity Island Development Corporation
Fire Hydrant Test Results

Hydrant	Test Date	Nozzle Size	Pitot Reading	GPM	Ref Hydrant	Static B	Residual B	* Projected @ 20 psig
2	7/22/2015	2.5	20	1060	4	70	22	1080
4	7/22/2015	2.5	20	1060	13	75	38	1310
11	7/22/2015	2.5	20	1060	13	75	20	1060
13	7/22/2015	2.5	16	960	16	76	15	915
16	7/22/2015	2.5	16	960	15	76	22	980
20	7/22/2015	2.5	16	960	15	76	20	960
28	7/22/2015	2.5	16	960	30	76	15	915
30	7/22/2015	2.5	20	1060	28	76	20	1060

*Projected value calculated from test data.

Water System Deficiencies and Possible Corrections Identified

1) Deficiency:
Utility Encroachments Beyond Right-of-Way and/or Easement Lines. Exhibit C provides graphic representation of the locations where water distribution and sewer collection lines are installed outside the right-way per the survey. Table 5 below provides a quantitative summary of these encroachments.

Table 5
Quantitative Summary of Water and Sewer Line Encroachments

Mark	Street	Size	Water (LF)	Force Main (LF)	Sewer (LF)	Manholes (EA)	Asphalt (SY)	Private	Developed
1	Shores Circle	4"	60					P	U
2*	Red Cedar Street	3"		150				P	U-D
3*	Red Cedar Street (East)	8" PVC			170	1		P	D
4*	Innerarity Circle	8" Clay			100	2		P	D
5	Innerarity Circle	No Size	100				33	P	D
6	Innerarity Circle	3"	170					P	U-D
7	Greenway	No Size	40					P	D
8*	Innerarity Road	4"		150				P	D
9	Atoll Drive	6"	110					P	U-D
10	Atoll Drive	6"	40					P	U
11	Boca Ciega Drive	8" PVC			210	3		P	U
12	Bocaccio Drive	6"	120					P	U
13	Bocaccio Drive	3"	10					P	U
14	Bocaccio Drive	3"	30					P	U
15	Boca Ciega Drive	6"	60					P	U
16	Boca Ciega Drive	6"	60					P	U
17	Boca Ciega Drive	6"	100					RBHOA	RETENTION
18	Narwhal Drive	6"	60					P	U
19	Narwhal Drive	6"	160					P	U
20	Narwhal Drive	3"	20					RBHOA	POOL
21	Narwhal Drive	6"	250					P	U
22	Narwhal Drive	6"	100					RBHOA	LIFT STAT
23	Tarpon Drive	3"	40					P	U
24	Innerarity Road	8" PVC			70	3		P	D
25	Innerarity Road	8" PVC			200	1		P	U
26	Innerarity Road	6"	30					ITHA	D
27*	North Shore Road	3"		30				P	U
28	Seascape Circle	2"	25					IIDC	U
29	North Shore Road	6"	210					P	U
TOTAL			1795	330	750	10	33		

* Eliminated with installation of the low pressure sewer system
RBHOA – Russell Bayou Home Owners Association
ITHA – Innerarity Town Home Association
IIDC – Innerarity Island Development Corporation

Solution:
The encroachments could be eliminated by removal and replacement of the encroaching utilities to a location within the existing right-of-way. As an alternative to relocation, these encroachments may be mitigated by securing easements allowing the mains to remain in place. This item has been zeroed out of the estimated cost on the assumption the II HOA will assist in securing the necessary easements.

2) Deficiency:
System Isolation/Flushing. ECUA Standard Section 556, "Water Distribution System" specifies that isolation valves shall be provided at a maximum distance of 1,000 feet on main lines for maintenance. The existing water system valve and flush valve installation was evaluated with ECUA staff and was found deficient in a limited number of locations.

Solution:
These deficiencies can be resolved by adding isolation valves at seven locations and flush stands or circulation loops at 17 locations. The proposed valve locations are shown in Exhibit E. The estimated cost of the isolation valve effort ($8,400) is documented in line item 6 in Table 6. The estimated cost of the flush valve/circulation loop ($28,900) is documented in line item 8 in Table 6.

3) Deficiency:
Fire Protection. The Florida Fire Code (2010) requires a minimum of 1,000 gpm fire protection water flow to one and two family dwellings (Section 18.4.5.1.1). This value can be reduced by 50% if dwellings are provided with sprinkler protection and by 25% if the residences are spaced 30 feet apart. Sprinkler protection is not provided to the dwellings, however the residences are generally 30' apart. The desired fire flow at each hydrant is therefore 750gpm. The Ten States Standards for water distribution systems states that the minimum acceptable pressure in the water distribution is 20 psig (Part 8, paragraph 2.1). The Escambia County "Land Development Code" requires a 500 feet maximum distance from a residence to a fire hydrant (Part II, Article 4, Section 4.04.12).

As documented in Table 4 above, the retest of selected fire hydrants with the supply system set up to simulate the system after installation of ECUA residential water meters and removal of the main meter indicate adequate fire flow capacity and associated residual pressure will be met or exceeded at all locations. Exhibit D provides a graphic representation of the areas of the development currently within the required 500 feet of a fire hydrant. Note that there are two areas of current residential development outside the 500 foot radius.

Solution:
Add three fire hydrants to meet the 500 foot radius requirement. The estimated cost of this effort ($10,500) is documented in line item 5 in Table 6.

4) Deficiency:
Material of Residential Water Services. The originally installed water service tubing was determined to be primarily of polybutylene material. This material has since been discovered to have a short life span. Therefore, ECUA and other utility providers have ongoing programs to eliminate its use within distribution systems. While some services within the IIDC franchise area have already been replaced or partially repaired, it is believed that most of the services still contain some segments of polybutylene tubing. ECUA staff has also noted that the meter boxes and meter types must be upgraded to meet their current standard.

Solution:
Replacement of the water services from the main tap through the meter and box will be required for ECUA acceptance. Therefore, line item #3 of Table 6 below includes cost allowances ($76,230) for these replacements. The estimated cost of a new meter at each existing service is $550 and the allowance for the replacement of the service line is an estimated average of $385.

5) Deficiency:
Lack of Water Service to Seascape Cove. This is an area in the heart of the island along Seascape Cove that lacks water service to the existing platted lots.

Solution:
After consultation with Escambia County, this item has been eliminated as none of these lots are currently developed. Should the current owner or a future developer wish to add utility service to these lots, it will be treated as a new and independent development with the developer funding all design and construction costs. Thus, this item is also zeroed out in the cost estimate (Table 6).

6) Deficiency:
4" Water Main on North Shore Drive. The existing 4" water main does not meet the minimum line size for fire hydrant service to the three existing fire hydrants. The length of this line is approximately 3,000 linear feet.

Solution:
Item 10 of Table 6 depicts the estimated cost of replacing the existing 4" water main with a 6" water main.

Table 6
Water System Probable Cost Estimate

Item	Description	Quantity	Unit	Unit Price	Amount
1	WATER MAIN RELOCATES	0*	LF	$45	$0
2	CONNECT TO EXISTING TOWNHOMES	68	EA	$225	$15,300
3	WATER SERVICE RENEWALS	198	EA	$385	$76,230
4	REPLACE WATER METERS	266	EA	$550	$146,300
5	NEW FIRE HYDRANTS	3	EA	$3,500	$10,500
6	INSTALL 7 6" ISOLATION VALVES	7	EA	$1,200	$8,400
7	REPLACE NON-STANDARD PIPE MAIN	100	LF	$50	$5,000
8	INSTALL FLUSH VALVES/CIRCULATION LOOPS	17	EA	$1,700	$28,900
9	WATER SERVICE TO SEASCAPE COVE	0	LF	$40	$0
10	UPGRADE 4" MAIN ON NORTH SHORE DR. TO 6".	3000	LF	$45	$135,000
	SUB TOTAL				$425,630
	CONTINGENCY @ 15%				$63,844
	CONSTRUCTION TOTAL				**$489,475**
		10% ADMINISTRATIVE			$48,947
		8% DESIGN			$39,158
		PREVIOUS EFFORT DESIGN CREDIT			-$6,000
		3.5% CA			$17,132
	PROJECT TOTAL				**$588,712**
NOTE: EACH HOMEOWNER WILL BE REQUIRED TO SIGN SERVICE AGREEMENT AND PAY A $21.50 DEPOSIT.					

* Assuming Innerarity Island HOA can obtain easements to cover the locations with minor encroachments of water mains on private property.

Sewer System

The existing sanitary sewer system provides waste water collection and conveyance to 154 customers via a gravity collection system consisting of approximately 27,600 linear feet of 8" gravity sewer, three secondary lift stations and two primary lift stations, see Table 7 below. The survey, provided separately, documents the location of each system feature including line size and material of construction.

Table #7
Waste Water Collection System

Gravity Sewer			
Size	Material	Total Length (LF)	
8 inch	PVC	25,817	
8 inch	VCP	1,741	
TOTAL		27,558	
Sewer Forcemain			
Size		Total Length (LF)	
2 inch		917	
3 inch		1,636	
4 inch		1,955	
6 inch		3,599	
TOTAL		8,107	
Liftstations			
Sta.	Diameter	Depth	Pump*
Russell Bayou	6'	20.40'	Submersible
1	6'	20.46'	Submersible
2	4'	16.51'	Grinder
3	4'	11.54'	Grinder
4	4'	12.78'	Grinder

* All pumps are duplex.

Russell Bayou Pumps are Hydromatic S-4P 7.5 HP

The two primary lift stations transfer the collected waste water to the existing ECUA lift station at the east end of the island. The ECUA lift station transfers the waste water to the ECUA waste water collection system via an existing eight-inch force main on Innerarity Point Road. This waste water flow is measured by a flow meter located in the discharge line at the ECUA lift station site. Waste water billing is based upon the flow recorded at the waste water meter and is independent of the quantity of potable water purchased from ECUA.

Sewer System Deficiencies and Possible Corrections Identified

The sewer lines were cleaned and camera inspected to determine the condition of each line segment. Visual inspections of all manholes were also completed by KHA in collaboration with ECUA staff. A table summarizing the results of these inspections is attached as Exhibit F. The list below provides a detailed description of the deficiencies noted.

1) *Utility Encroachments Beyond Right-of-Way and/or Easement Lines.* Similar to the water system mentioned above, there are several sewer collection line segments that appear to encroach upon private property according to the survey. Exhibit C provides graphic representation of the locations where sewer system lines, gravity and force mains, are installed outside the right-way. Table 5 provides a quantitative summary of these encroachments.

2) *Insufficient Slopes*. Many of the gravity sewer system segments between manholes do not have adequate slope to support gravity flow in accordance with industry standards. While no history of chronic chokes or clogs exists, the industry standard and ECUA standard both require a minimum of 0.4% slope for 8" gravity lines. Exhibit G shows the location of line segments that do not meet the minimum slope.

3) *Infiltration/Inflow*. A comparison of the 2012 flow data (as estimated from run time reports at the ECUA lift station) to rainfall for the same period indicates two occurrences of distinct correlation between rainfall and run-time spikes. The video reports as completed by SBP and the manhole inspections revealed several infiltration/inflow points in the existing sewer system excluding the newer Russell Bayou system. Some of these may warrant immediate attention as a cost saving measure.

   It was also observed that numerous manholes are constructed at or below surrounding grade and lack inflow seals.

   The Russell Bayou gravity sewer system was checked for infiltration/inflow by flow monitoring the lines to the lift station over a six week period. The study revealed I/I figures of less than 1 GPF of inflow and less than 200 Gallons per inch diameter mile of infiltration. Typically values of 10 GPF or greater and/or 1,500 Gal/inch-mile or greater are considered excessive in most systems. This system would have very negligible I/I by most standards. The monitoring report is attached as Exhibit I.

4) *Lift Stations*: The following are individual evaluations and required corrections for each of the system's lift stations.

a. Russell Bayou Lift Station: The existing lift station was built to meet the ECUA Lift Station Standards in effect at the time of construction. The electrical system does not, however, meet current electrical requirements.

   The following ECUA requirements will need to be completed before this station would be acceptable by ECUA. 1.) Replace electrical control system with a current ECUA design panel and wiring system including the installation of a SCADA system with antenna. New panel to be a minimum of 12" above FEMA flood level. 2.) Install guide rails for pump removal. 3.) Replace the wet well top with a hatch designed for guide rail pump removal. (Raise top of lift station to above FEMA flood level.) 4.) Replace wet well piping with stainless steel and install above grade valve system based on ECUA Standards. 5.) Line wet well for corrosion resistance.

b. Lift Station #1: The existing lift station does not meet ECUA Design Standards.

   The following ECUA requirements would need to be completed before this station would be acceptable by ECUA. 1.) Replace electrical with a current 3 phase ECUA design panel and wiring system including the installation of a SCADA system with antenna. New panel to be a minimum of 12" above FEMA flood level. 2.) Install new 3 phase pumps with guide rails for pump removal. 3.) Replace the wet well top with a hatch designed for guide rail pump removal. 4.) Replace wet well piping with stainless steel and install above grade valve system based on ECUA Standards. 5.) Line wet well for corrosion resistance.

c. Lift Station # 2: The existing lift station utilizes a deep 4' diameter manhole in the roadway for the wet well and a 1 phase duplex grinder pump system. The existing lift station does not meet ECUA Standards.

   The following ECUA requirements would need to be completed before this station would be acceptable by ECUA. 1.) Install a new minimum 6' diameter wet well outside the roadway right-of-way. 2.) Replace electrical with a current 3 phase ECUA design panel and wiring system including the installation of a SCADA system with antenna. New panel to be a minimum of 12" above FEMA flood level. 3.) Install new 3 phase pumps with guide rails for pump removal. Pumps to be at least 5 HP - 3 phase. 3 phase may be accomplished using a VFD system if 3 phase power is unavailable. 4.) The wet well top shall have a hatch designed for guide rail pump removal. (Raise top of lift station to above FEMA flood level.) 5.) Replace wet well piping with stainless steel and install above grade valve system based on ECUA Standards. 6.) Line wet well for corrosion resistance.

d. Lift Station # 3: The existing lift station utilizes a deep 4' diameter manhole in the roadway for the wet well and a 1 phase duplex grinder pump system. The existing lift station does not meet ECUA Standards.

   The following ECUA requirements would need to be completed before this station would be acceptable by ECUA. 1.) Install a new minimum 6' diameter wet well outside the roadway right-of-way. 2.) Replace electrical with a current 3 phase ECUA design panel and wiring system including the installation of a SCADA system with antenna. New panel to be a minimum of 12" above FEMA flood level. 3.) Install new 3 phase pumps with guide rails for pump removal. Pumps to be at least 5 HP - 3 phase. 3 phase may be accomplished using a VFD system if 3 phase power is unavailable. 4.) The wet well top shall have a hatch designed for guide rail pump removal. (Raise top of lift station to above FEMA flood level.) 5.) Replace wet well piping with stainless steel and install above grade valve system based on ECUA Standards. 6.) Line wet well for corrosion resistance.

e. Lift Station # 4: The existing lift station utilizes a deep 4' diameter manhole in the roadway for the wet well and a 1 phase duplex grinder pump system. The existing lift station does not meet ECUA Standards.

The following ECUA requirements would need to be completed before this station would be acceptable by ECUA. 1.) Install a new minimum 6' diameter wet well outside the roadway right-of-way. 2.) Replace electrical with a current 3 phase ECUA design panel and wiring system including the installation of a SCADA system with antenna. New panel to be a minimum of 12" above FEMA flood level. 3.) Install new 3 phase pumps with guide rails for pump removal. Pumps to be at least 5 HP - 3 phase. 3 phase may be accomplished using a VFD system if 3 phase power is unavailable. 4.) The wet well top shall have a hatch designed for guide rail pump removal. (Raise top of lift station to above FEMA flood level.) 5.) Replace wet well piping with stainless steel and install above grade valve system based on ECUA Standards. 6.) Line wet well for corrosion resistance.

5) *System Capacity*: The gravity sewer system comprised of 8" gravity sewer line segments, manholes and lift stations have adequate capacity for the current population and potential future growth with the following limitations. 1) The gravity lines, although sufficient in placement and size, have many segments of inadequate slope for proper operation. 2) The lift stations transferring the waste water from the community are adequate in size for the current population but do not meet all FDEP and ECUA guidelines.

6) *Lack of Sewer Service to North Shore Drive Area*: There are 45 residences and 53 platted lots on North Shore Drive that currently served by septic tank due to the absence of a sewage collection system.

Solution: The low pressure system design and cost estimate includes providing low pressure sewer service infrastructure to this area. The costs of septic tank abandonment and grinder pump installation for these lots is not included in the estimate as the current assumption is these residents will determine if and when they connect to the low pressure sewer system.

Proposed Solution to Sanitary Sewer System Issues:

The repair of the sewer system by replacement of lift stations and low slope lines has been determined to be cost prohibitive. Replacement of the bulk of the collection system on the island with a low pressure system provides a more cost effective solution (see Exhibit H for graphical depiction of low pressure system). Note there could be substantial resistance from the existing customer base to the low pressure alternative. Having had gravity sewer service for many years, the customers may be averse to the reliability and aesthetic issues associated with individual grinder stations.

The proposed low pressure sewer system was conceptually designed for compliance with Florida Department of Environmental Protection Low Pressure Sewer Guidelines. The design was based on the use of Environmental One Corporation grinder pump stations and utilized the eONE design software. The design data file or printout of the design results is available for review.

A conceptual cost estimate for the alternate is presented below. See Table 9.

Table 9
Low Pressure Sewer System Probable Cost Estimate

Item	Description	Quantity	Unit	Unit Price	Amount
1	MH REMOVAL & STREET PATCH	96	EA	$1,500	$144,000
2	GROUT EXISTING. SANITARY SEWER	20,500	LF	$5	$102,500
3	1.5" PVC FORCE MAIN	1,000	LF	$11	$11,000
4	2" PVC FORCE MAIN	7,200	LF	$13	$93,600
5	3" PVC FORCE MAIN	15,200	LF	$15	$228,000
6	4" PVC FORCE MAIN	2,000	LF	$18	$36,000
7	6" PVC FORCE MAIN	3,000	LF	$20	$60,000
8	2" GATE VALVE	7	EA	$350	$2,450
9	3" GATE VALVE	20	EA	$650	$13,000
10	4" GATE VALVE	4	EA	$660	$2,640
11	6" GATE VALVE	4	EA	$820	$3,280
12	STREET CUT & PATCH FOR FM	960	SY	$55	$52,800
13	SERVICE CONNECTIONS	121	EA	$1,100	$133,100
14	GRINDER INSTALLATION	121	EA	$6,500	$786,500
15	RUSSELL BAYOU LS IMPROVEMENTS	1	LS	$255,000	$255,000
16	INSERTS FOR RUSSELL BAYOU MHS	26	EA	$175	$4,550
17	RUSSELL BAYOU SWR MH (116-118)	451	LF	$125	$56,375
	SUBTOTAL				$1,984,795
	CONTINGENCY AT 15%				$297,719
	CONSTRUCTION TOTAL				**$2,282,514**
		10% ADMINISTRATIVE			$228,251
		6.6% DESIGN			$150,646
		PREVIOUS EFFORT DESIGN CREDIT			-$9,750
		3.5% CA			$79,888
	PROJECT TOTAL				**$2,731,550**

CONCLUSION

Assuming ECUA concurrence with the remedial measures recommended herein, the estimated cost for rehabilitation of the water system is $0.59 million and the estimated cost for rehabilitation of the sewer collection system is $2.73 million. Therefore, the total estimated cost for completion of these remedial measures is $3.32 million with the low pressure sewer alternative. It is estimated that once initiated, the design-permitting-bidding phase for the recommended improvements would be eight to twelve months and construction could take twelve to eighteen months. Therefore, total time from commencement to completion is estimated to be in the range of eighteen to thirty months.

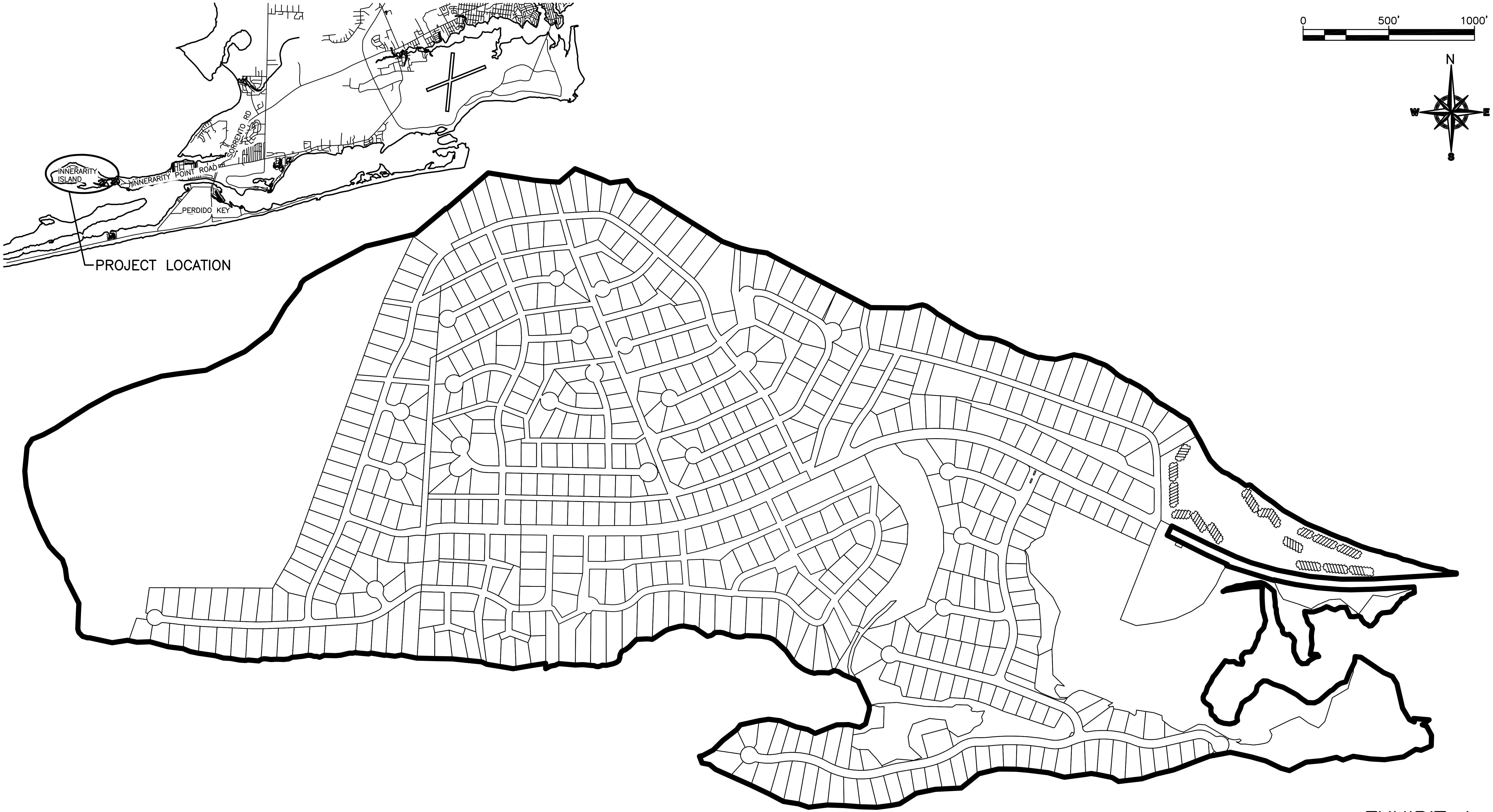
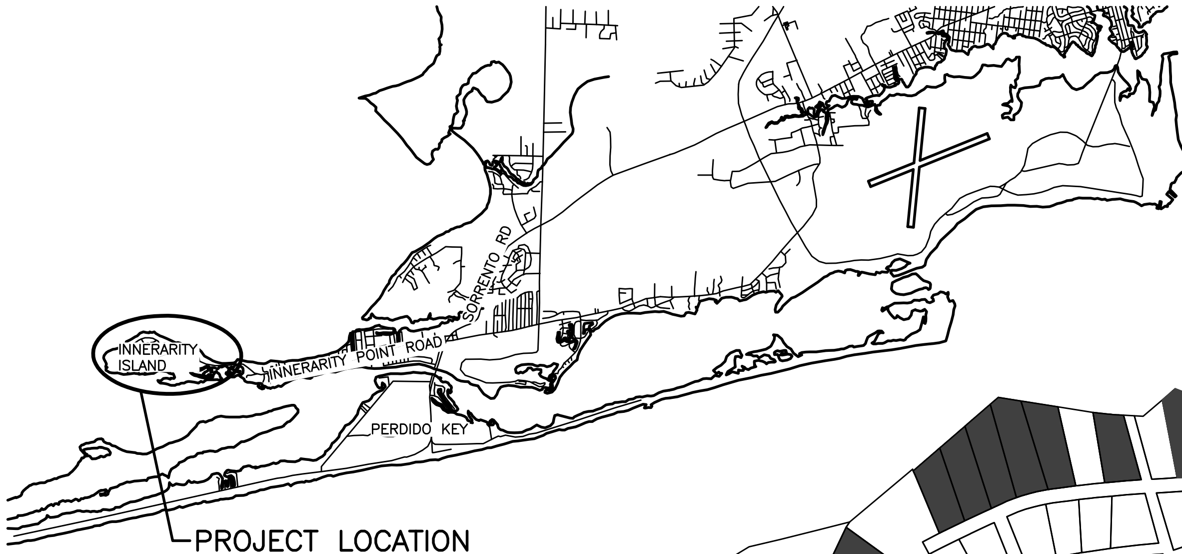


EXHIBIT A

Kenneth Horne & Associates, Inc.
CIVIL ENGINEERS
PO BOX 10669, PENSACOLA, FLORIDA 32524
7201 NORTH 9th, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

NO.	REVISIONS	APPROVED BY	DATE
1			
2			
3			
4			
5			

PROJECT NAME: II UTILITY TRANSFER
IIDC FRANCHISE AREA
PROJECT NO.: 2015-24
BY: DIC DATE: AUG 2015
SHEET 1 OF 1



0 500' 1000'

N W E S

LEGEND

- DEVELOPED RESIDENTIAL
- UNDEVELOPED RESIDENTIAL
- COMMON AREA–DEVELOPED

PARCEL COUNT:

UNDEVELOPED RESIDENTIAL:	412
DEVELOPED RESIDENTIAL:	190
COMMON AREA–DEVELOPED:	1
TOTAL	603

EXHIBIT B

KH&A Kenneth Horne & Associates, Inc.
CIVIL ENGINEERS
PO BOX 10669, PENSACOLA, FLORIDA 32524
7201 NORTH 9th, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471–9005 INFO@KH–A.COM FAX (850) 471–0093

NO.	REVISIONS	APPROVED BY	DATE
1			
2			
3			
4			
5			

PROJECT NAME: II UTILITY TRANSFER
DEVELOPED PARCELS
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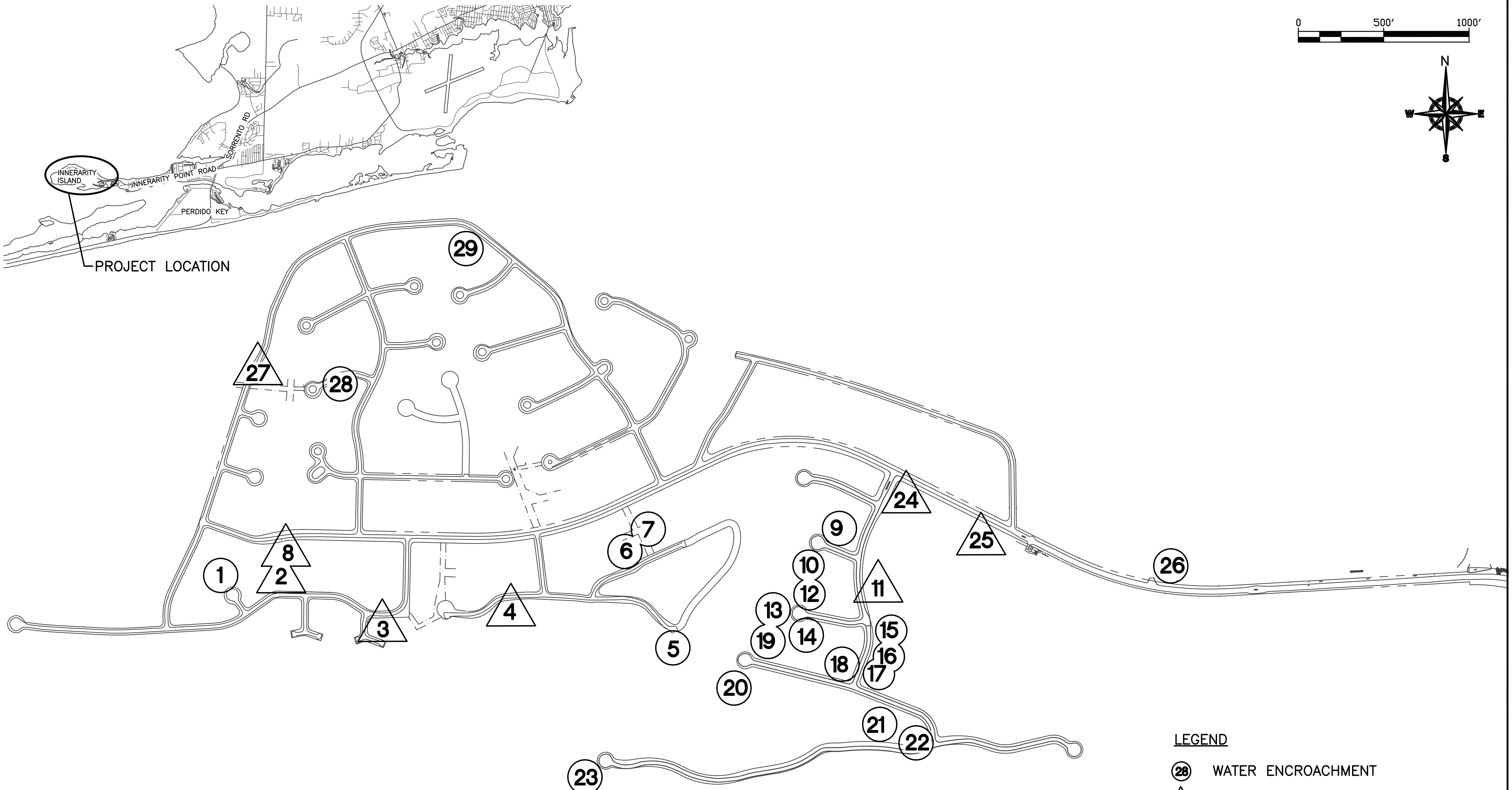
BY: DIC DATE: AUG 2015
SHEET 1 OF 1



LEGEND

(28) WATER ENCROACHMENT

△5 SEWER ENCROACHMENT

EXHIBIT C

KH&A Kenneth Horne & Associates, Inc.

CIVIL ENGINEERS

PO BOX 10669, PENSACOLA, FLORIDA 32524
7201 NORTH 9th, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

NO.	REVISIONS	APPROVED BY	DATE
1			
2			
3			
4			
5			

PROJECT NAME: II UTILITY TRANSFER

UTILITY ENCROACHMENT-KEY SHEET

PROJECT NO.: 2015-24

BY: DIC DATE: AUG 2015

SHEET 1 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION

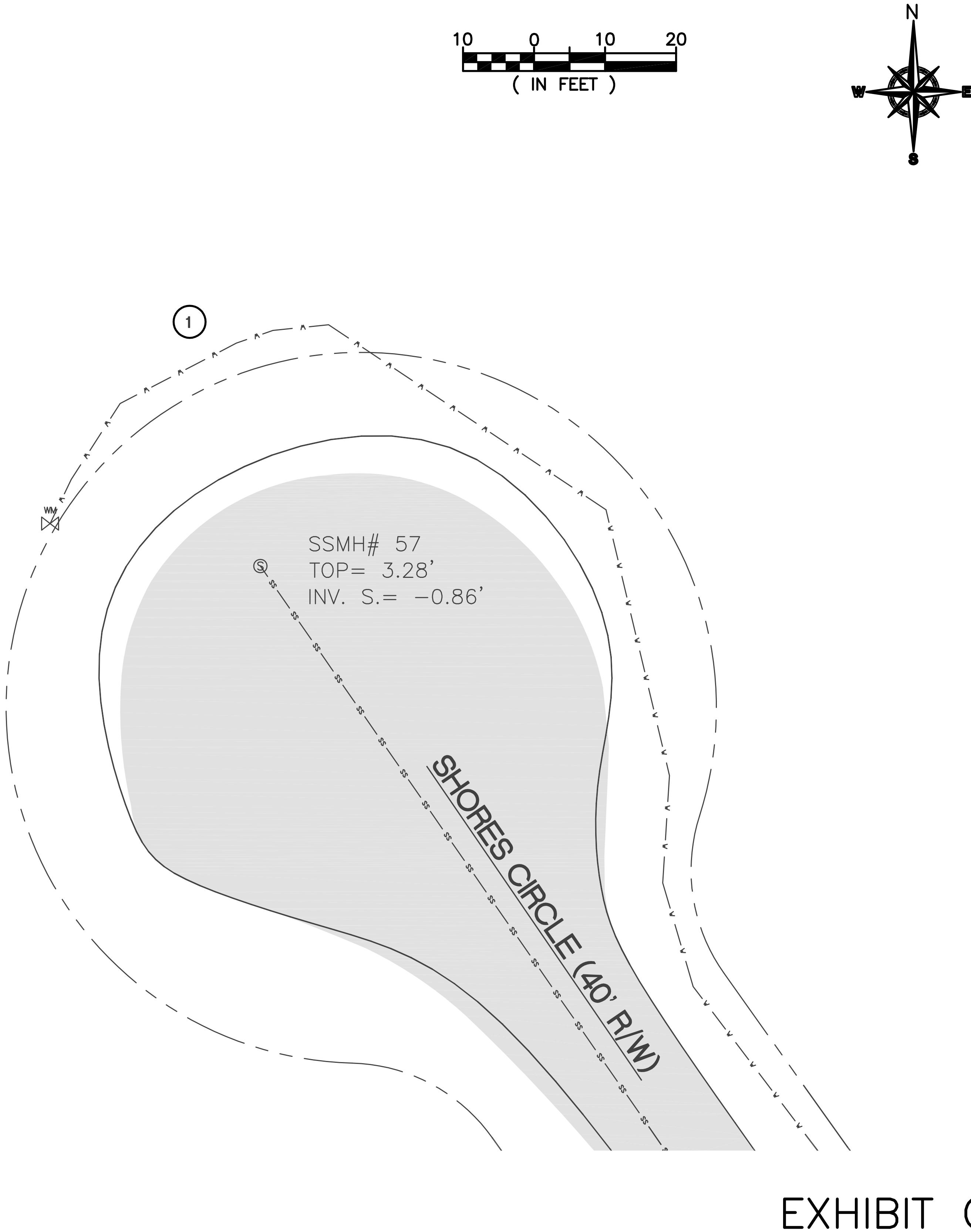


EXHIBIT C

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CIVIL ENGINEERS
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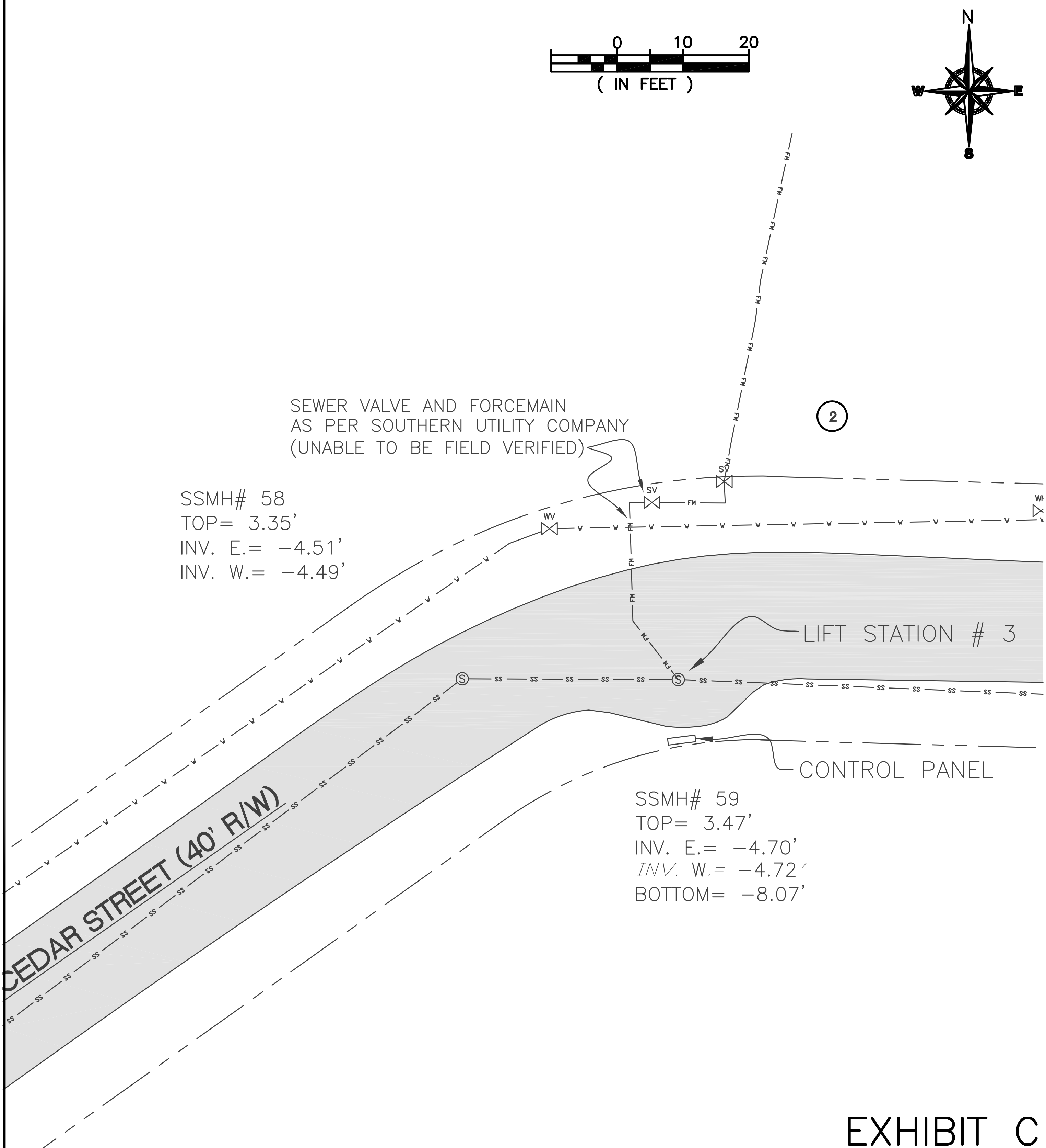
7201 NORTH 9TH AVENUE, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 1	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	2 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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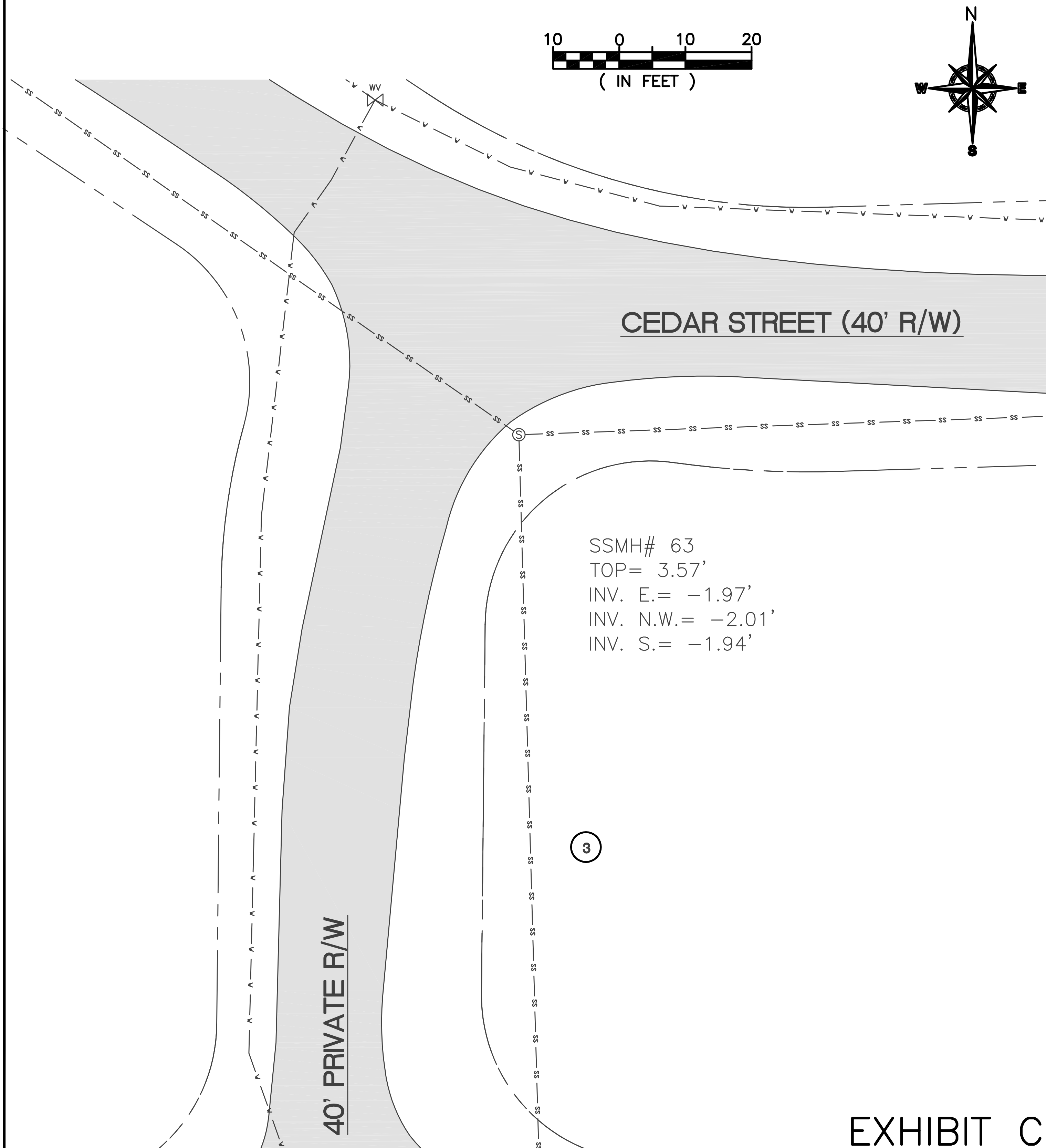
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 2	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	3 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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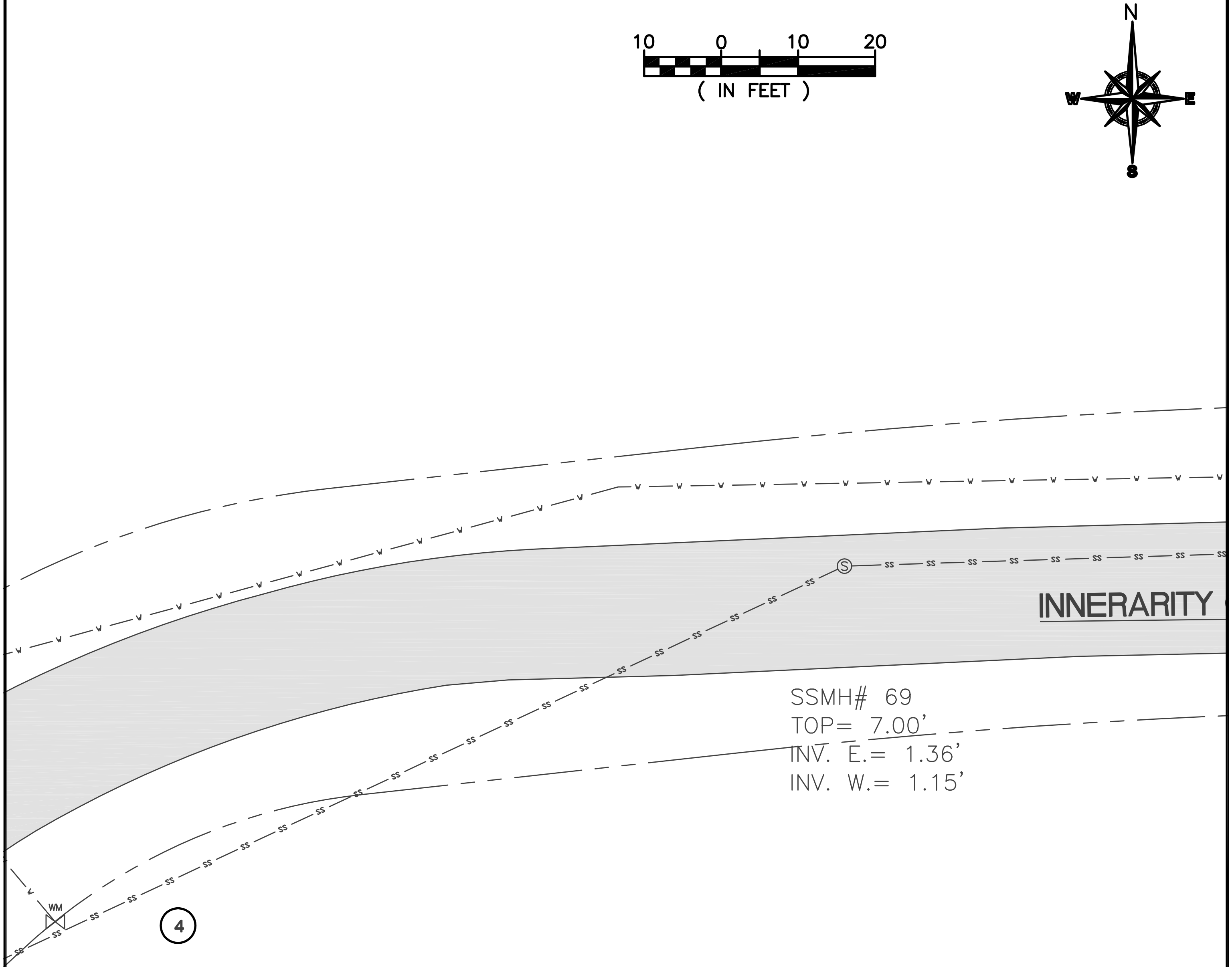
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 3	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	4 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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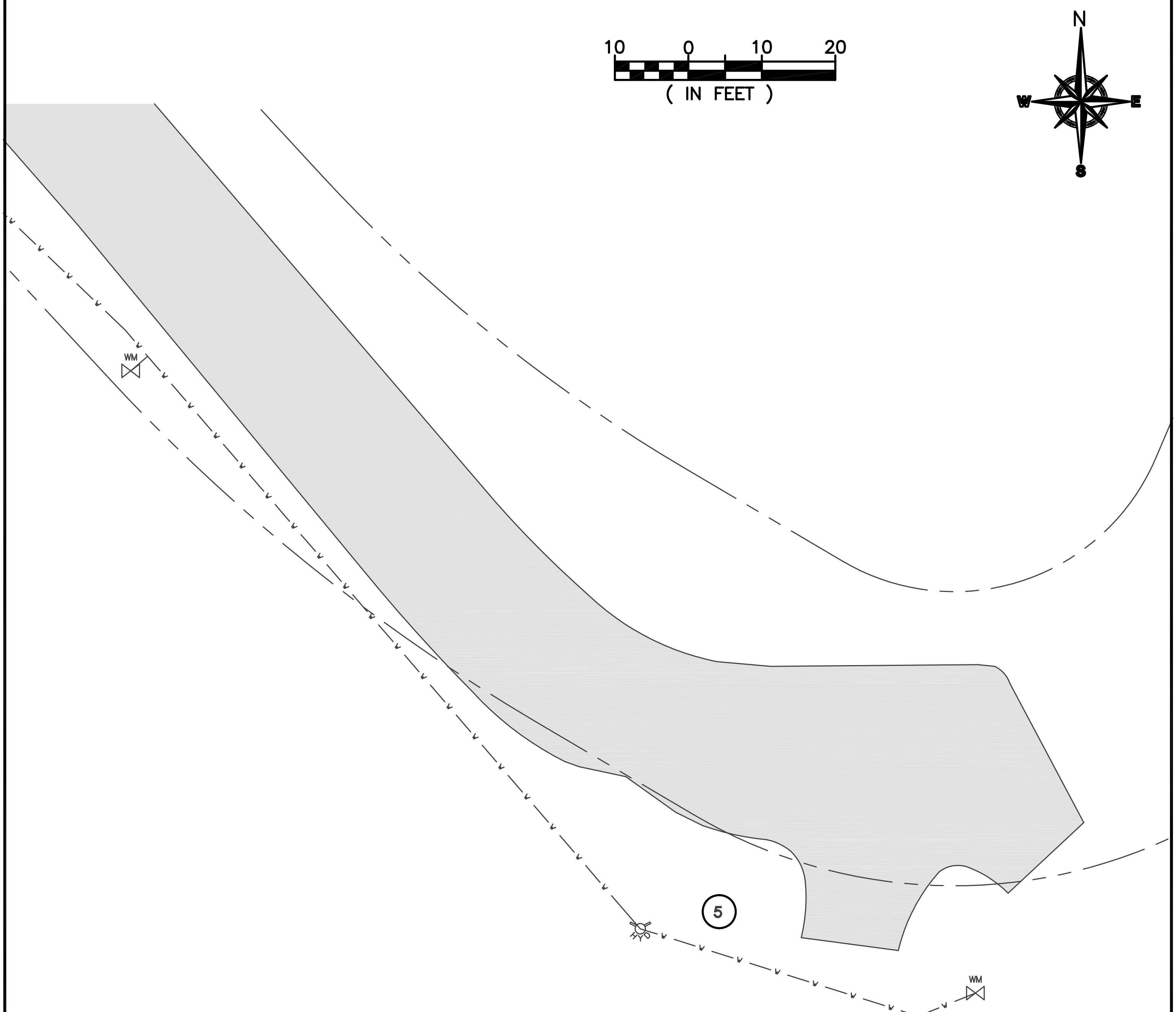
7201 NORTH 9TH AVENUE, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME: II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 4
PROJECT NO.: 2013-11
BY: DIC DATE: DEC 2013
SHEET: 5 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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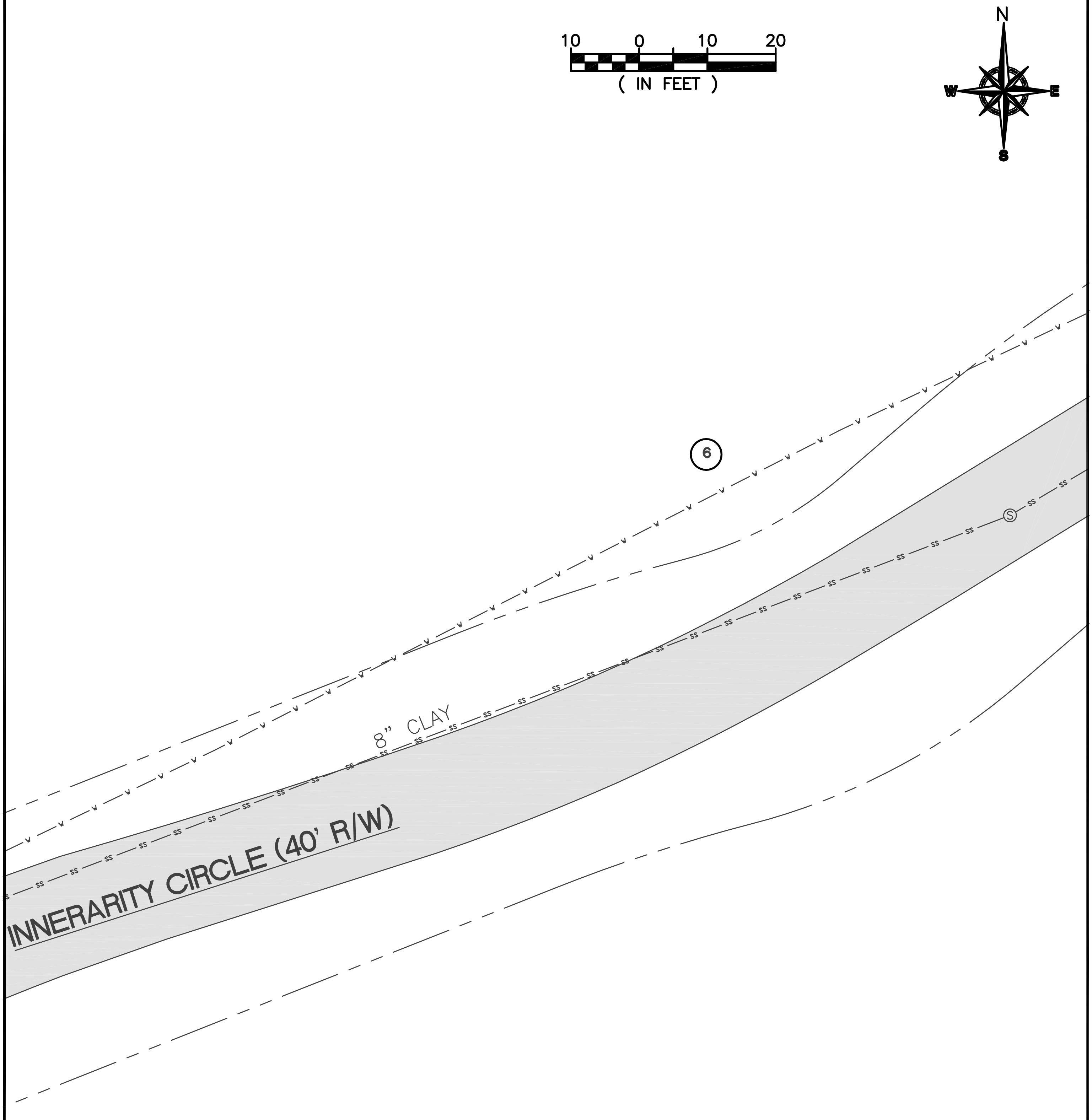
7201 NORTH 9TH AVENUE, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 5	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	6 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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7201 NORTH 9TH AVENUE, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 6	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	7 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION

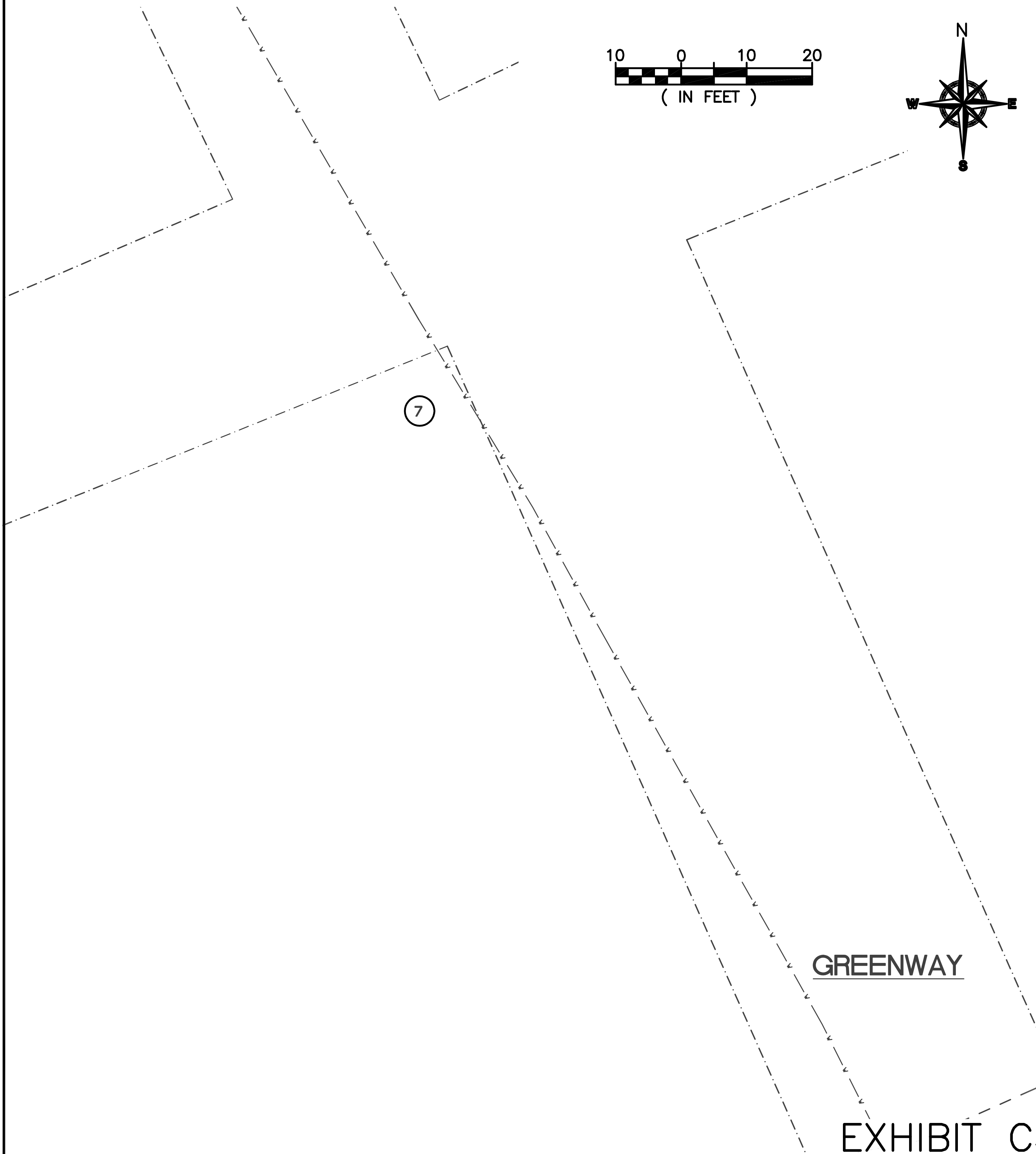
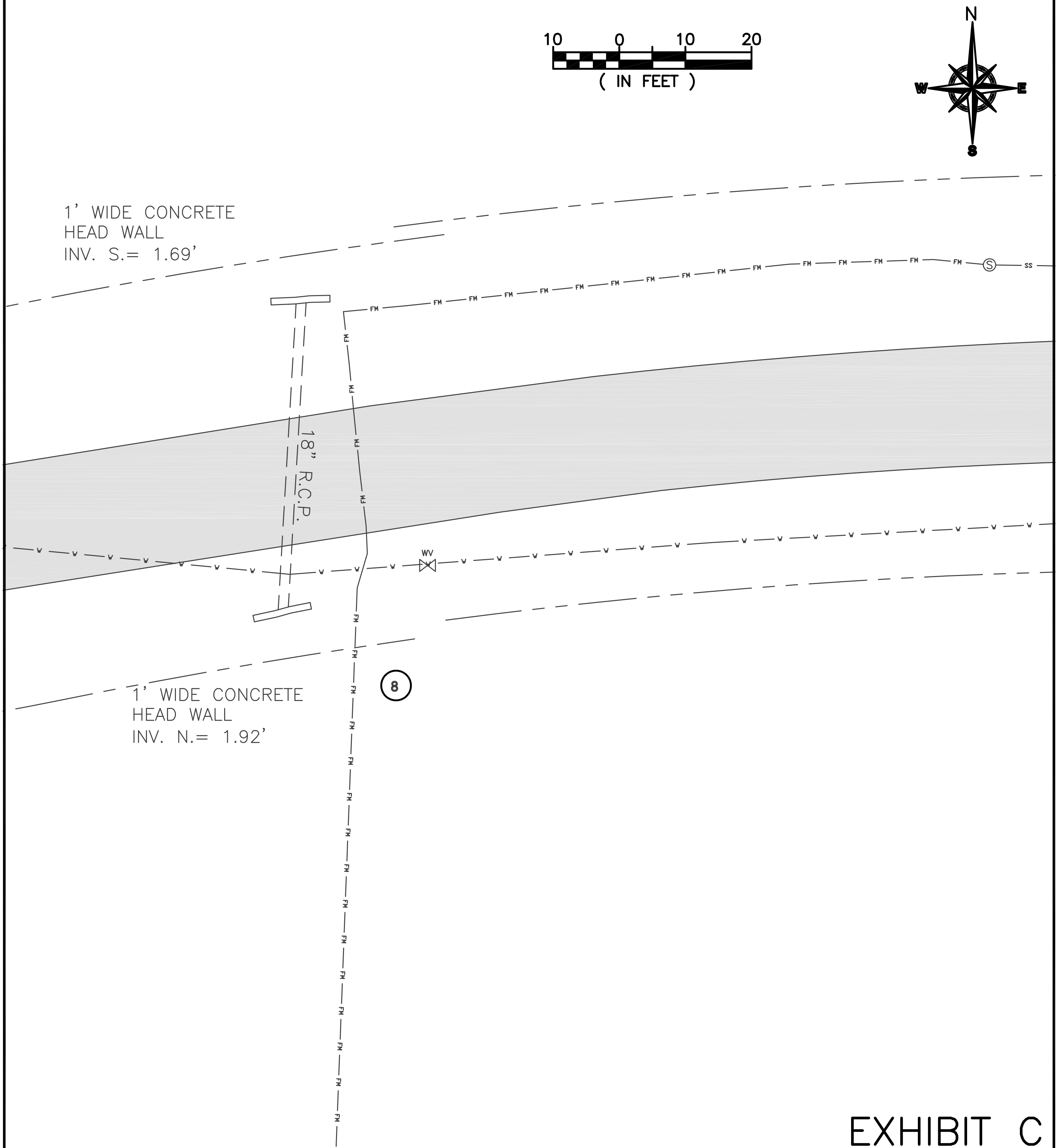


EXHIBIT C

Kenneth Horne & Associates, Inc. CIVIL ENGINEERS	PROJECT NAME: II UTILITY TRANSFER
PO BOX 10669, PENSACOLA, FLORIDA 32524	UTILITY ENCROACHMENT DETAIL 7
7201 NORTH 9TH AVENUE, SUITE 6, PENSACOLA, FLORIDA 32504	PROJECT NO.: 2013–11
(850) 471–9005 INFO@KH–A.COM FAX (850) 471–0093	BY: DIC DATE: DEC 2013
	SHEET: 8 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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CIVIL ENGINEERS

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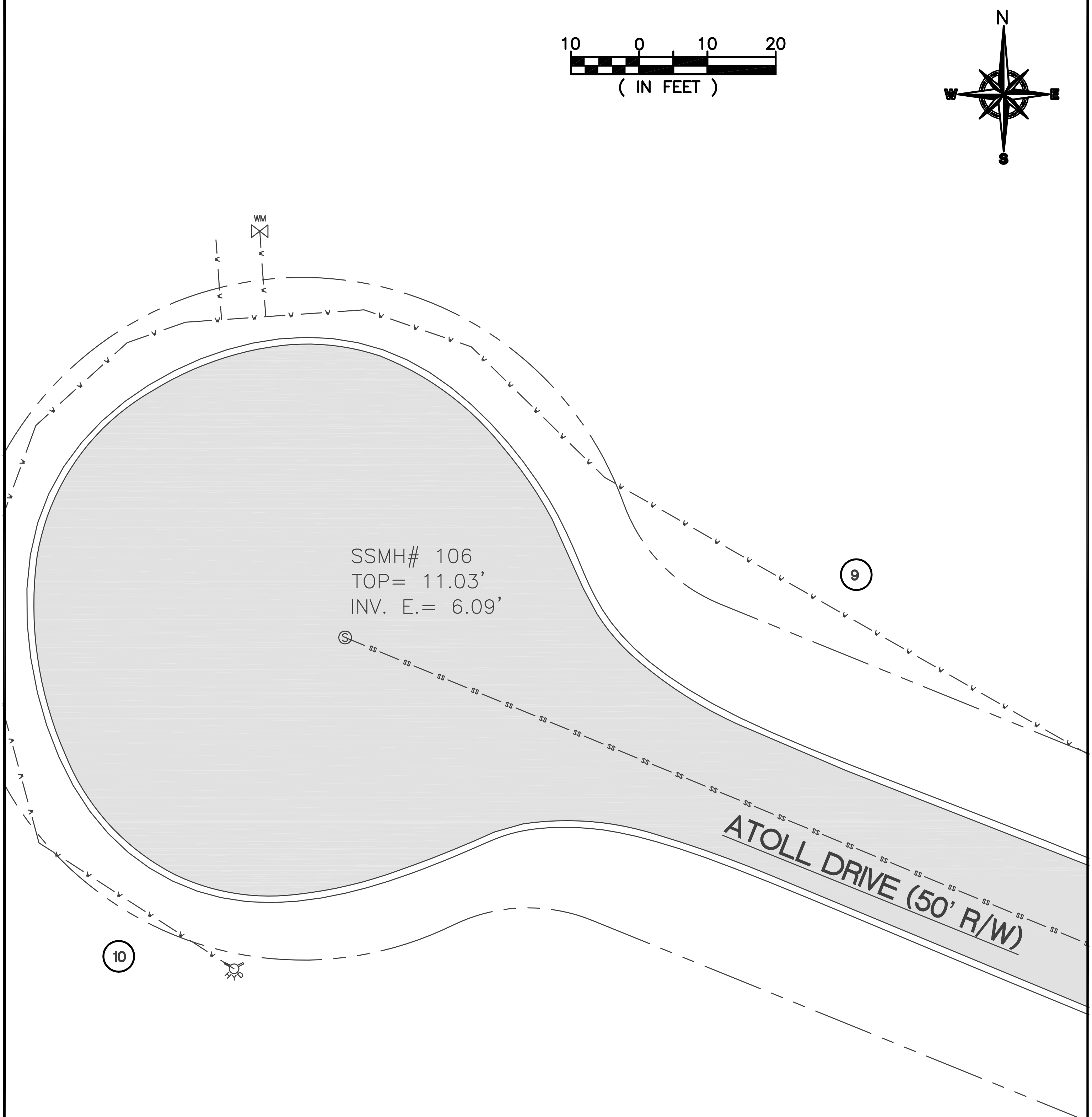
7201 NORTH 9TH AVENUE, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 8	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	9 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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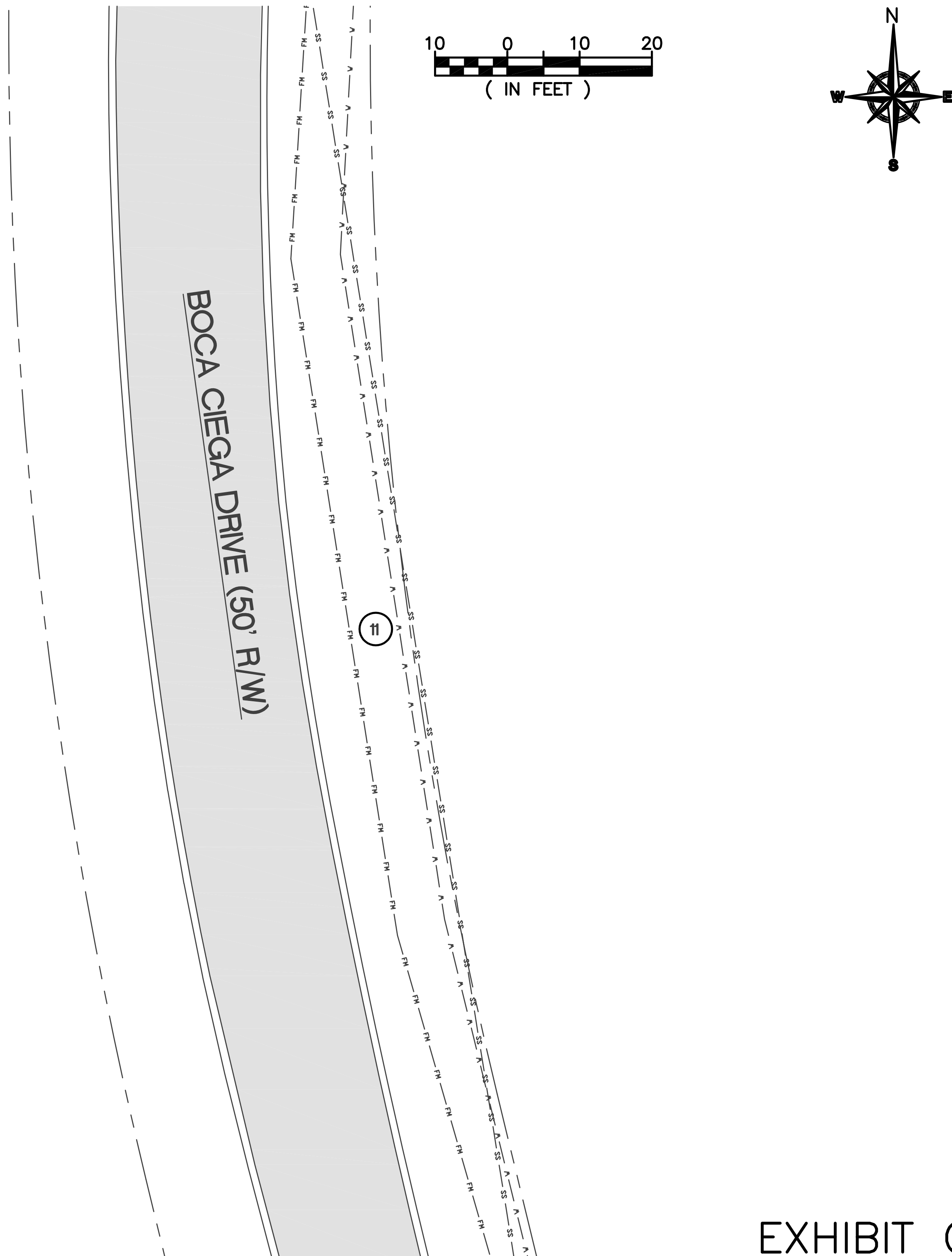
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAILS 9&10	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	10 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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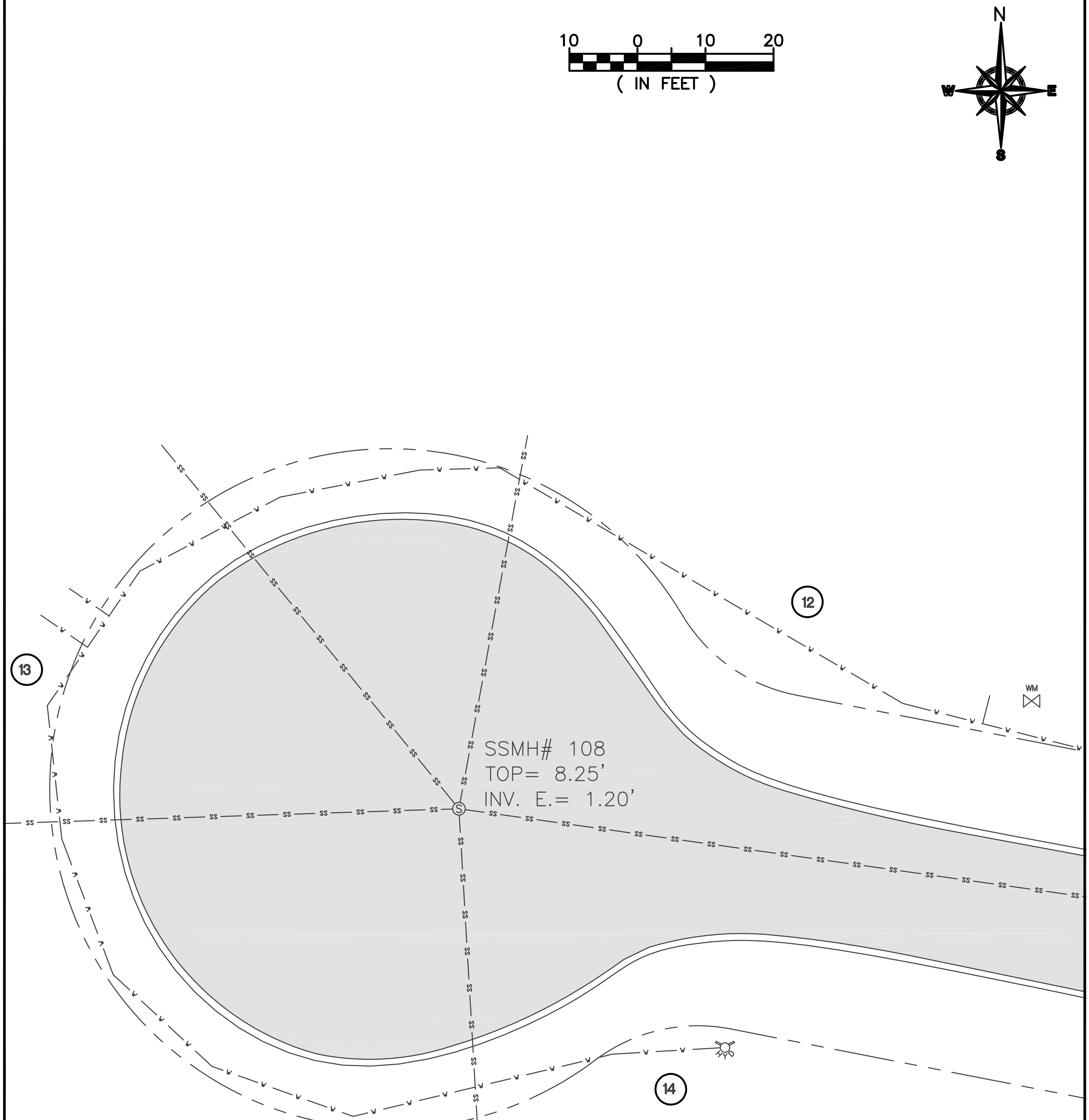
7201 NORTH 9TH AVENUE, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 11	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	11 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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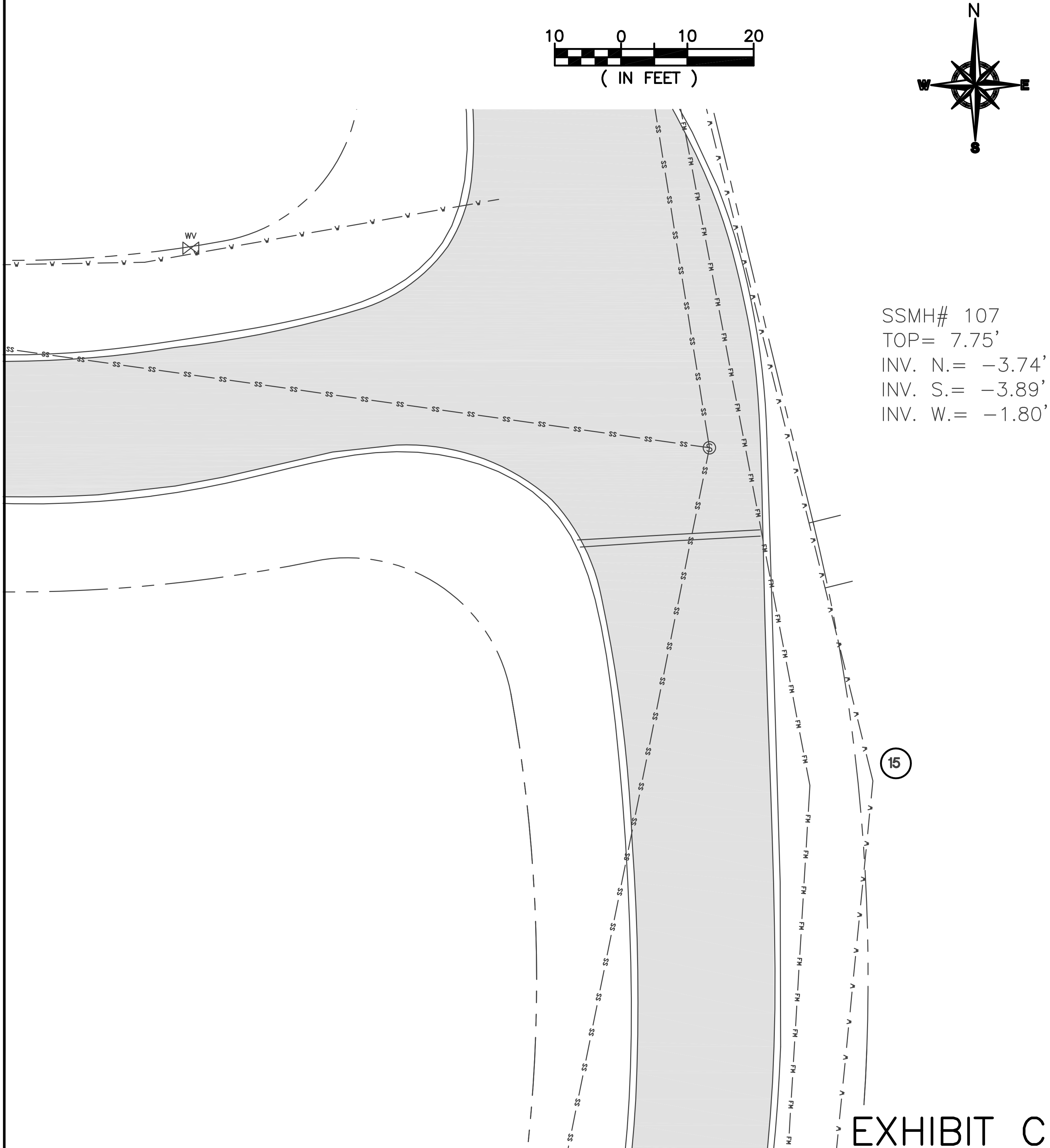
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAILS 12,13,&14	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	12 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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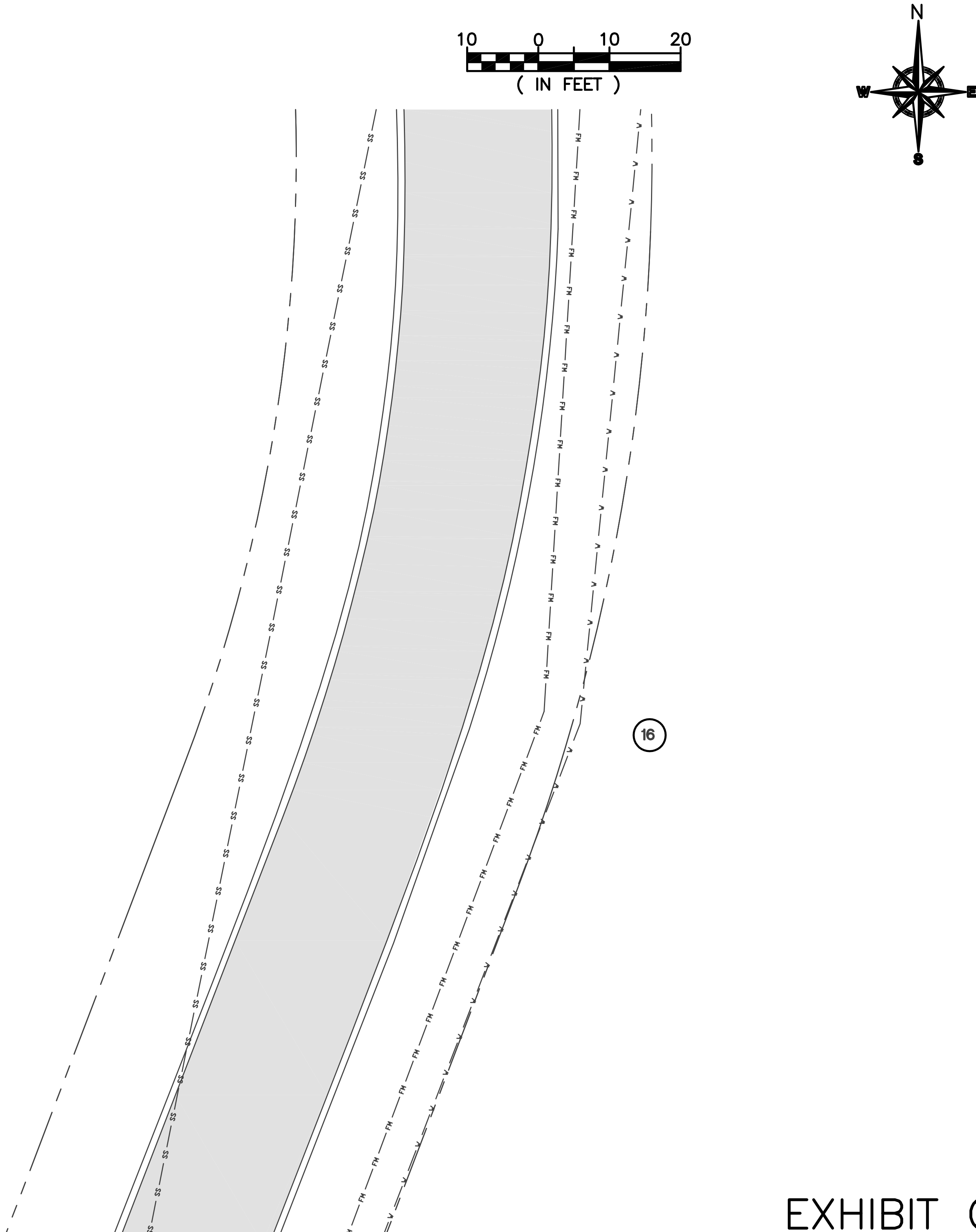
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 15	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	13 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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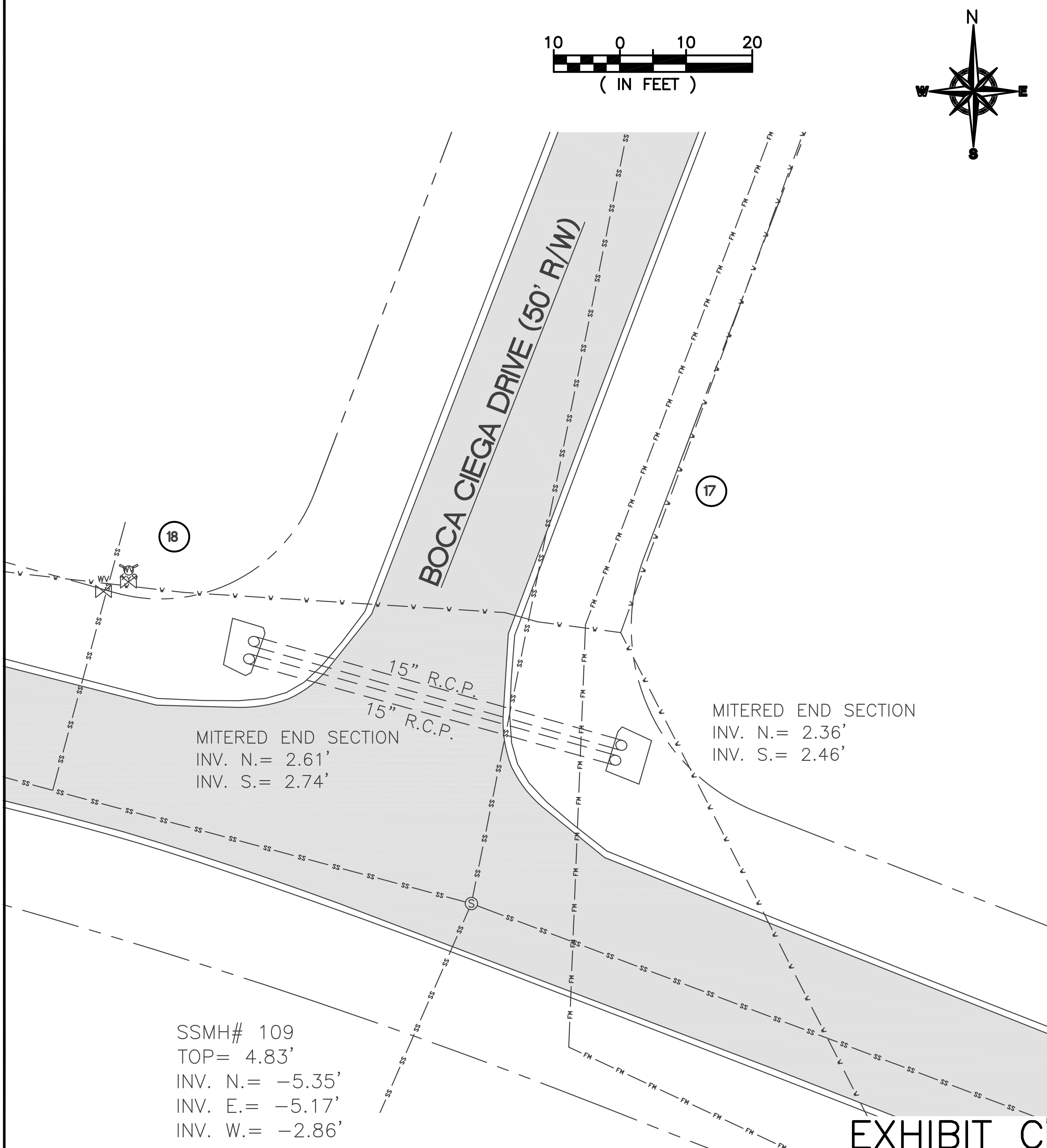
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 16	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	14 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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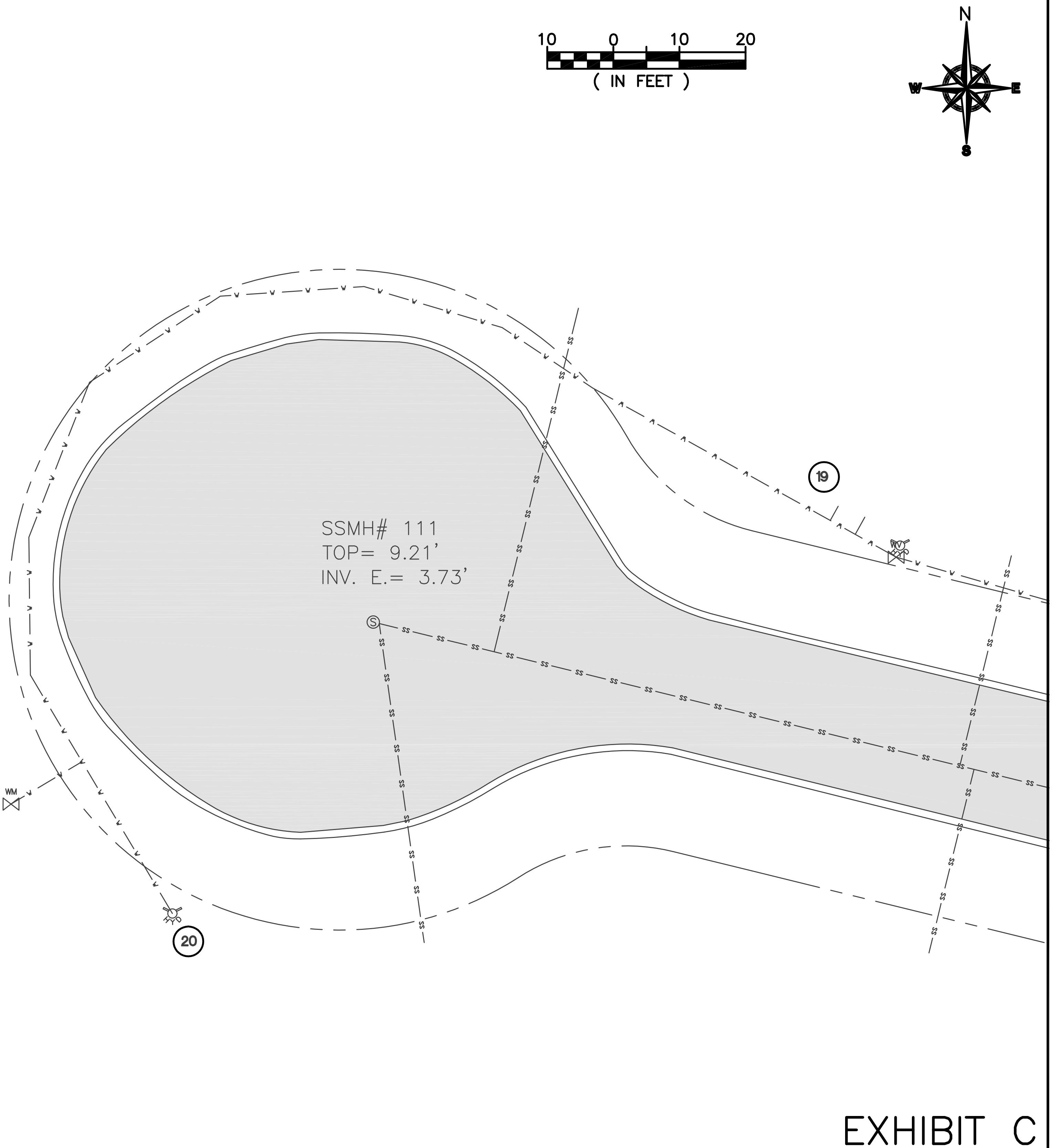
7201 NORTH 9TH AVENUE, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAILS 17&18	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	15 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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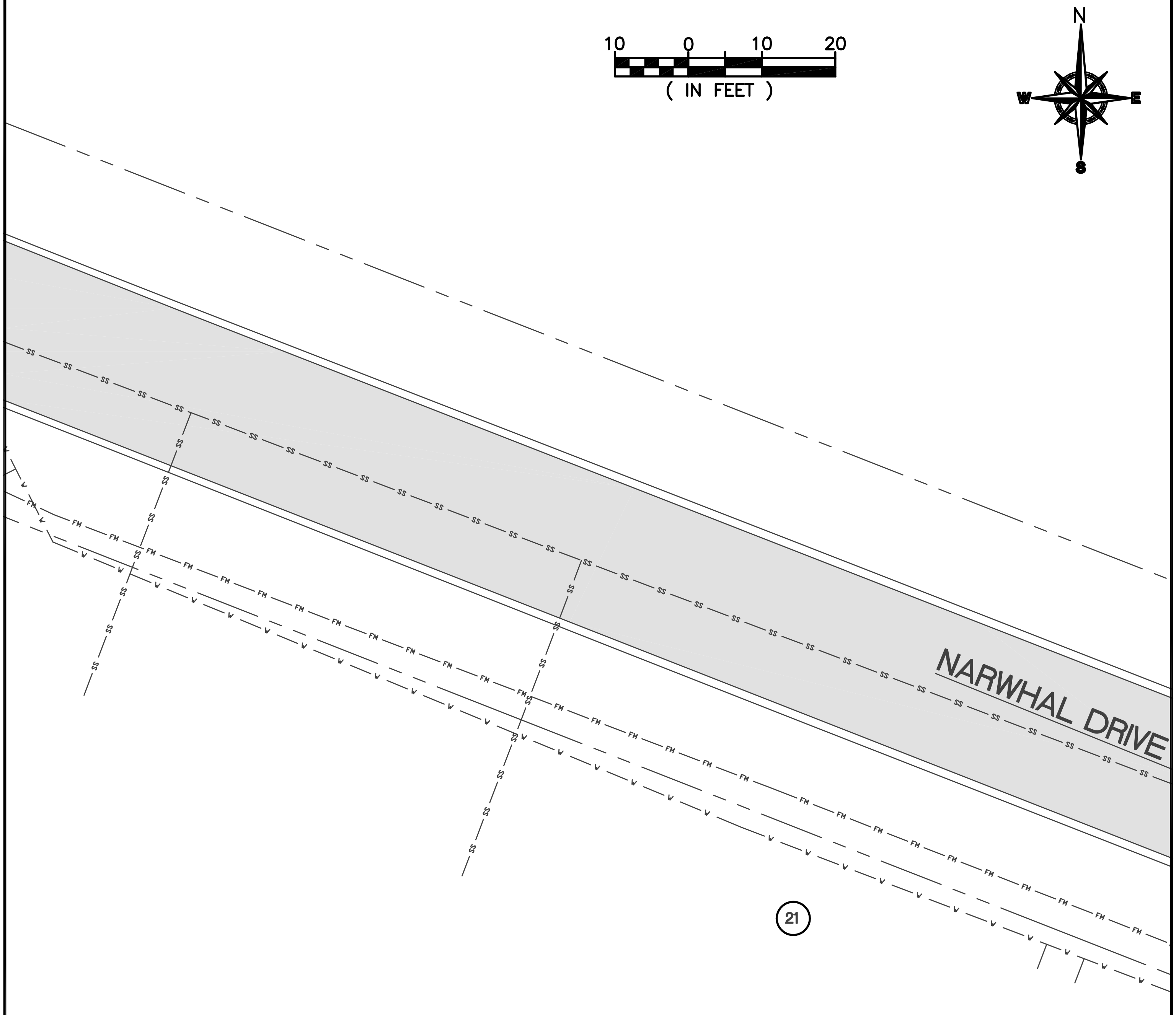
7201 NORTH 9TH AVENUE, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAILS 19&20	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	16 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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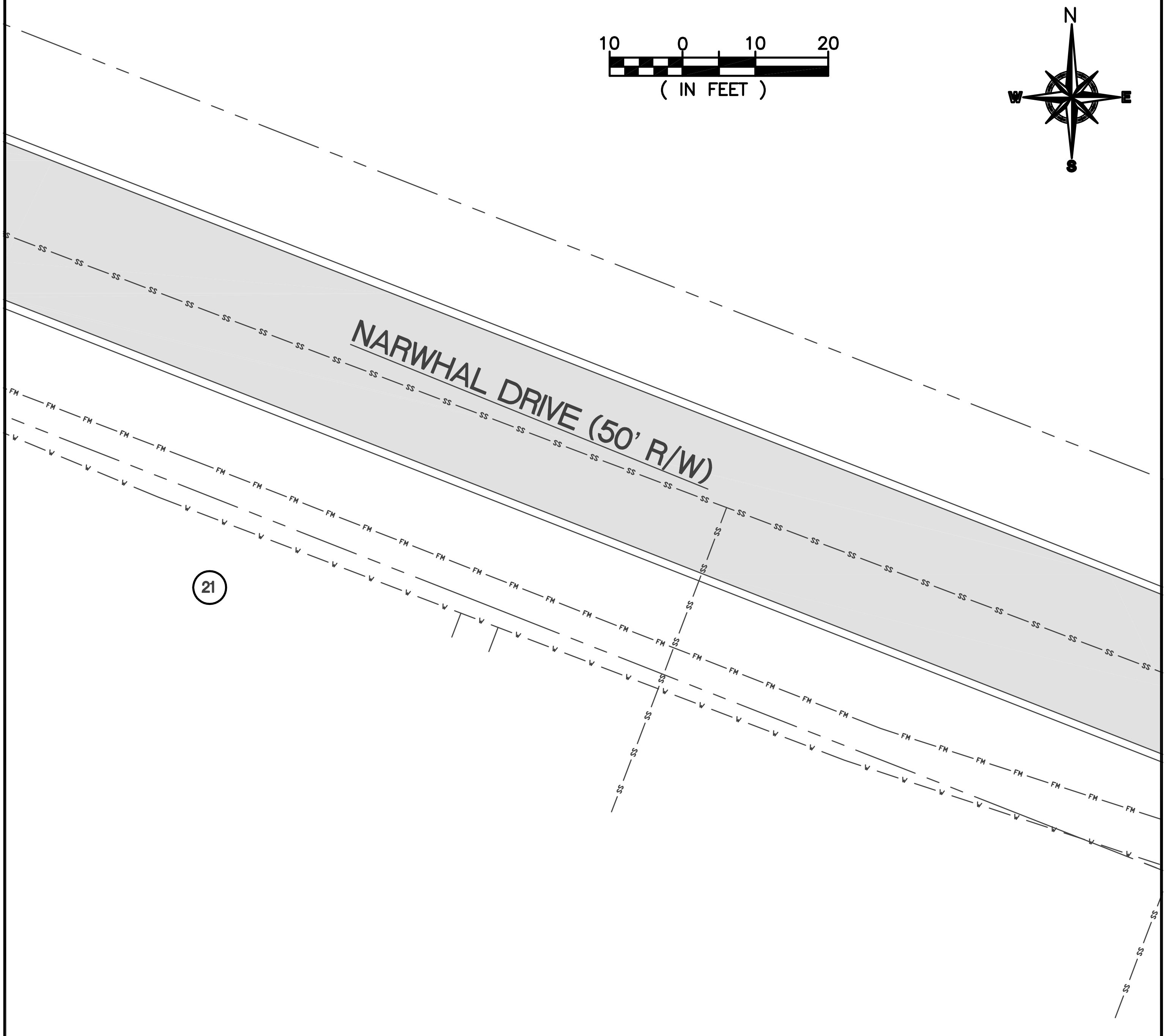
7201 NORTH 9TH AVENUE, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 21-1	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	17 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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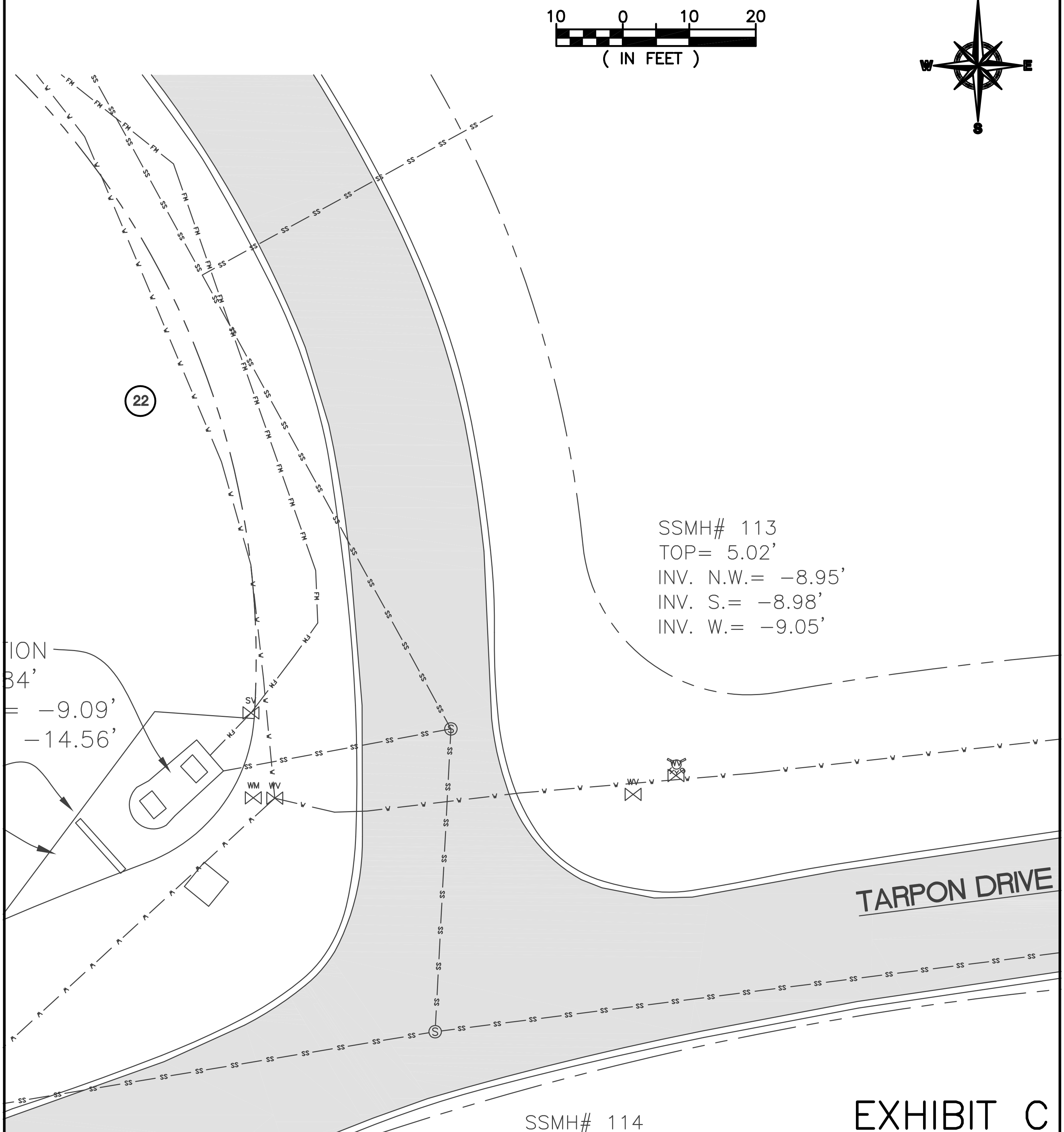
7201 NORTH 9TH AVENUE, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 21-2	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	18 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAILS 22	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	19 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION

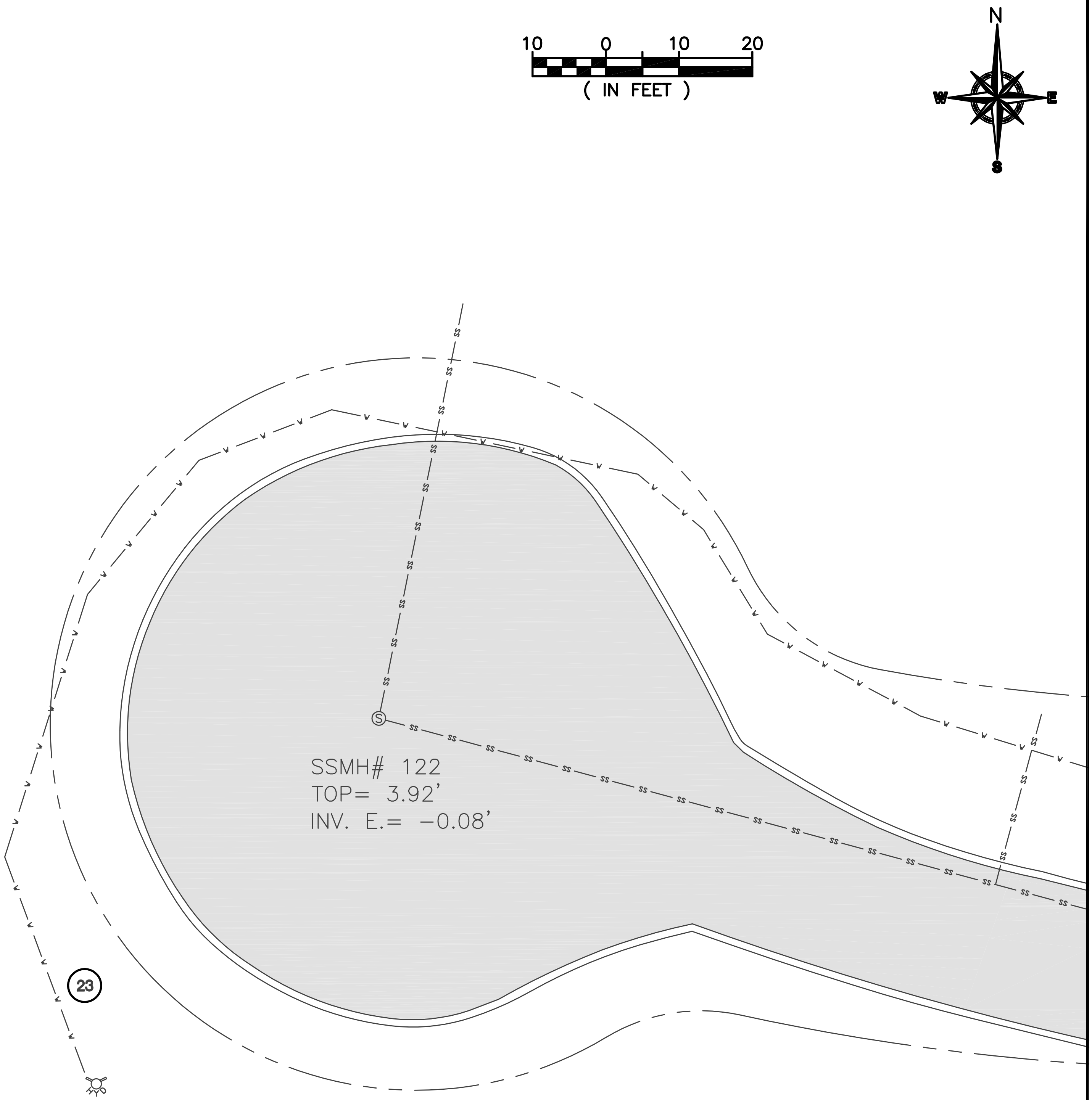

EXHIBIT C

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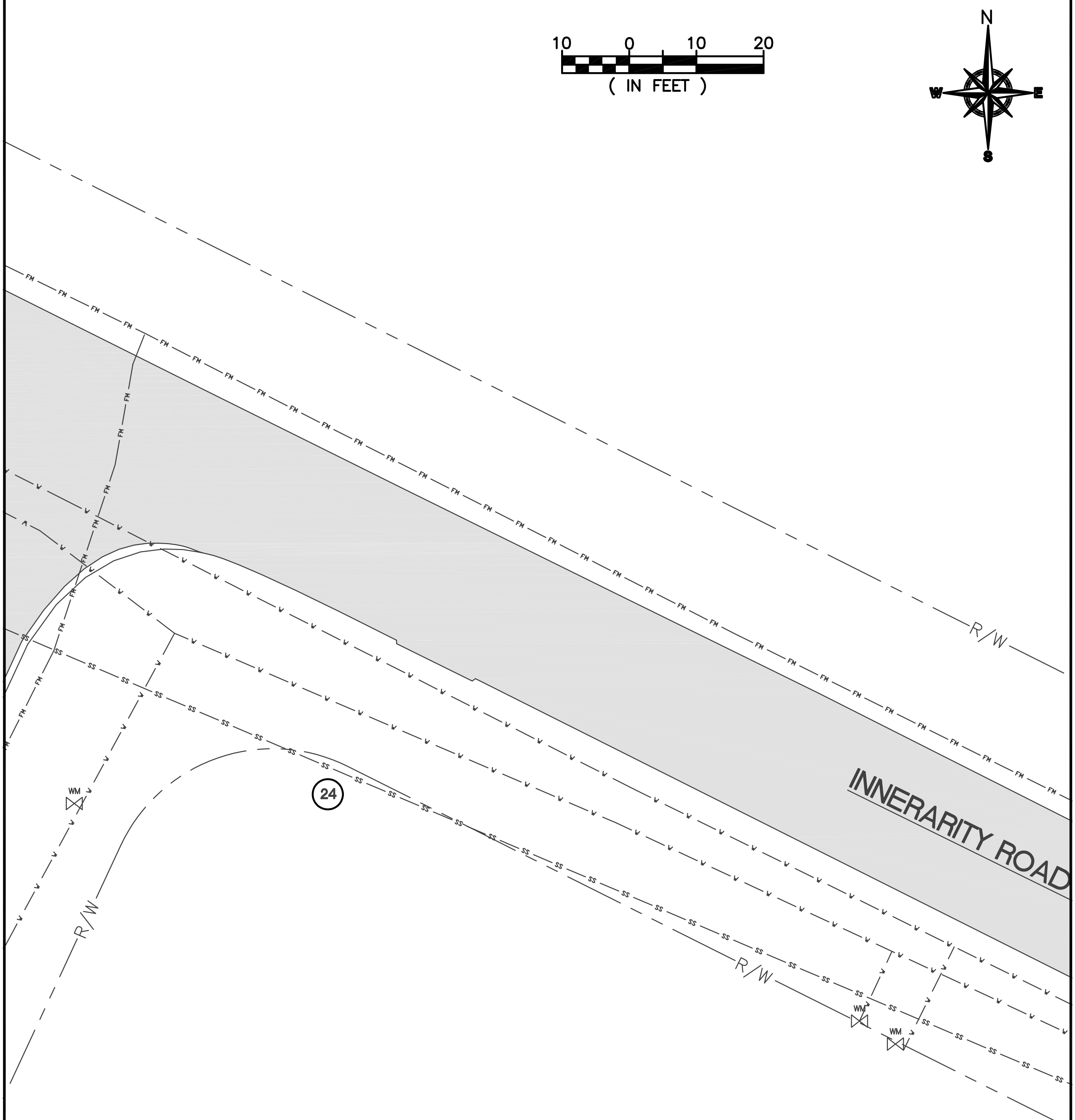
PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 23	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	20 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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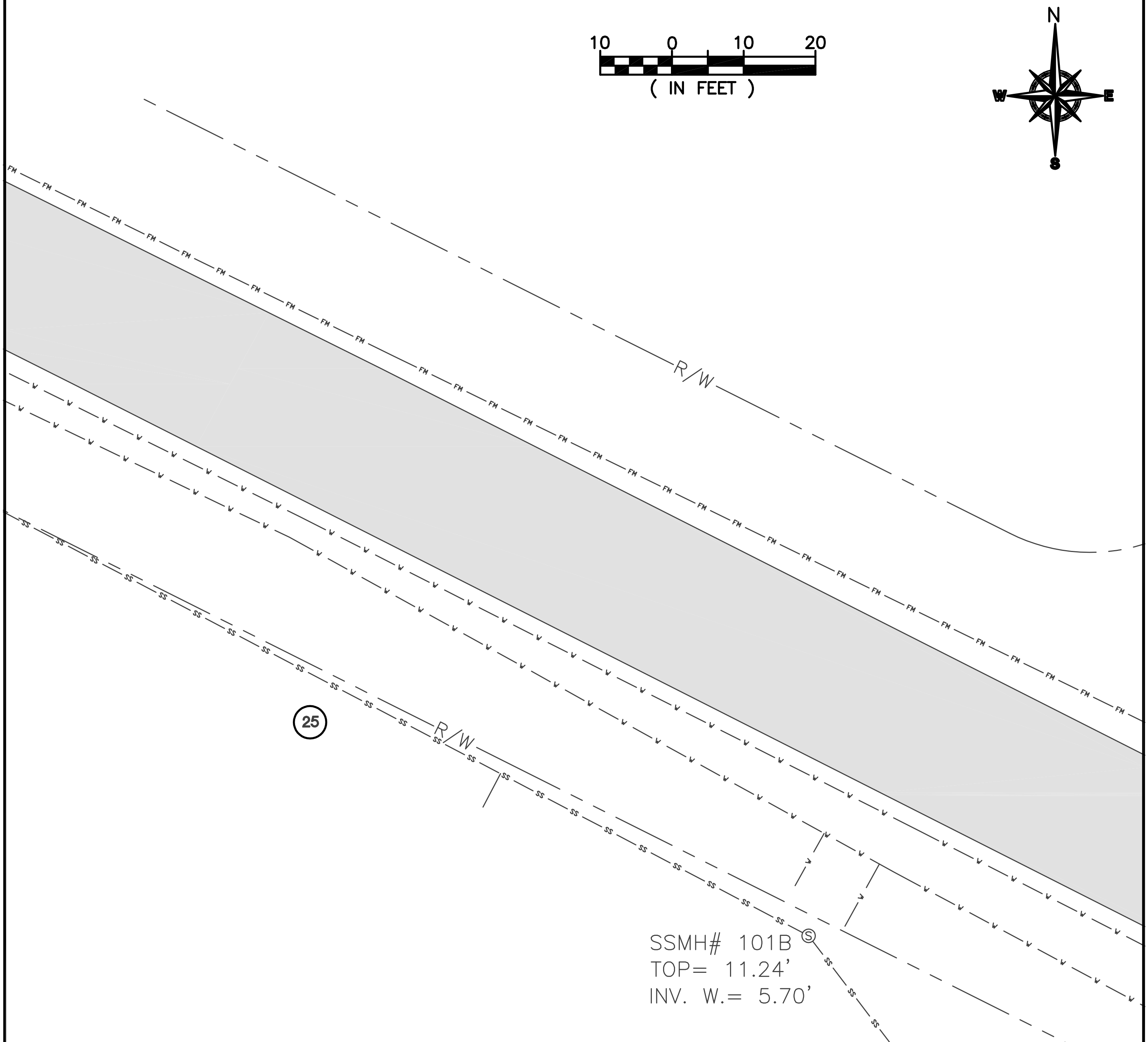
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 24	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	21 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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7201 NORTH 9TH AVENUE, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME: II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 25
PROJECT NO.: 2013-11
BY: DIC DATE: DEC 2013
SHEET: 22 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION

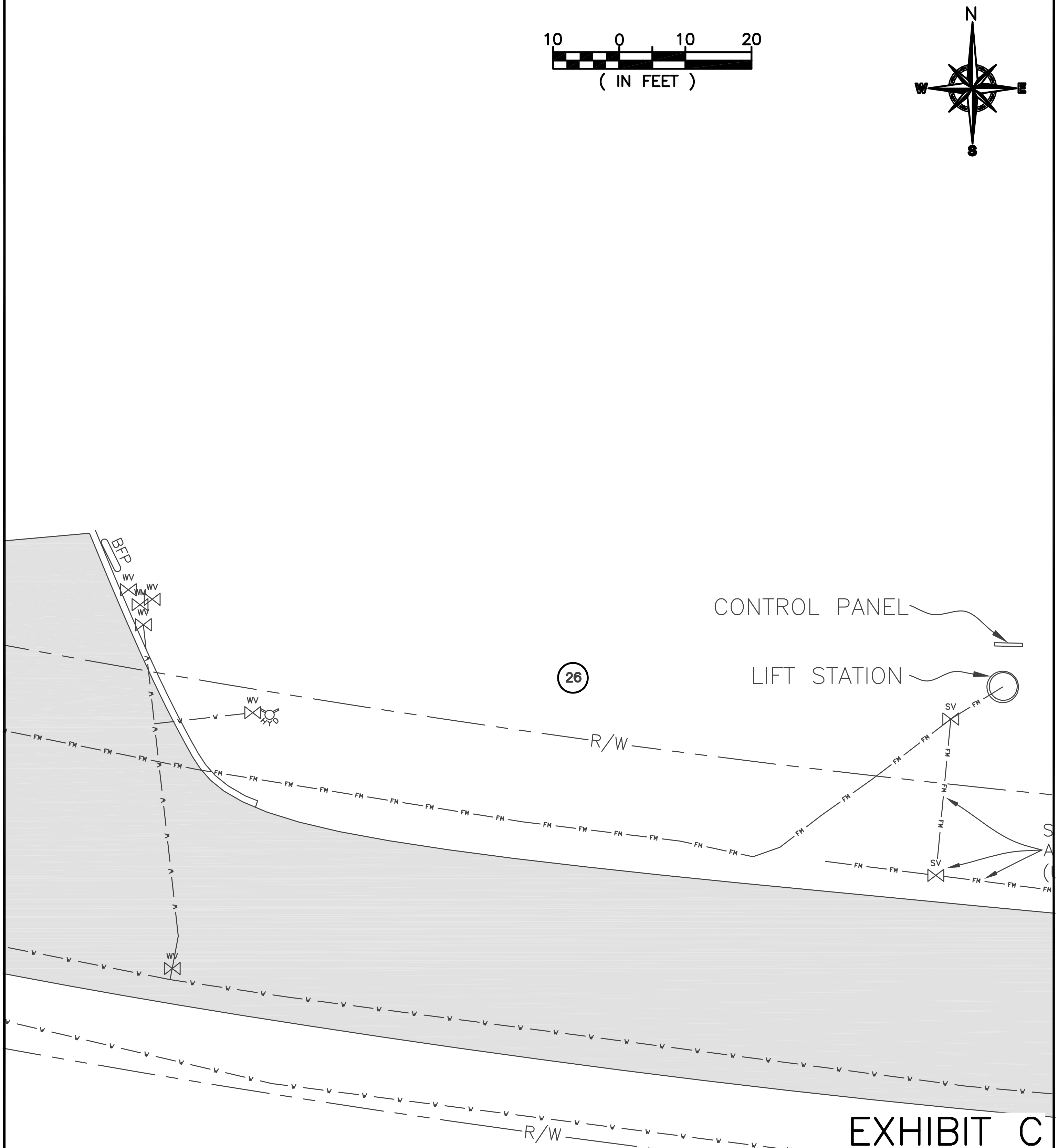

EXHIBIT C

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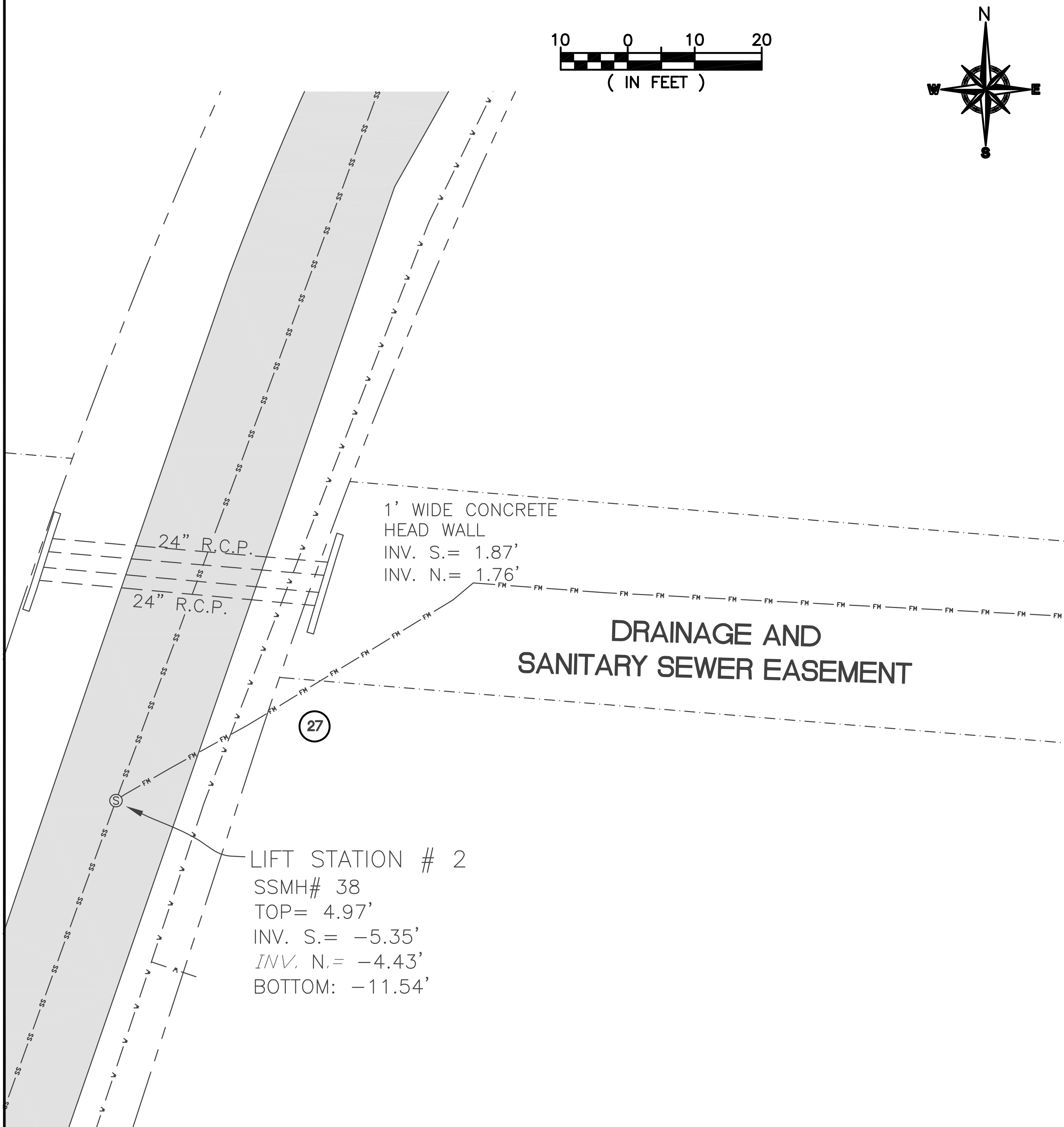
PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 26	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	23 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION



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PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 27	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	24 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION

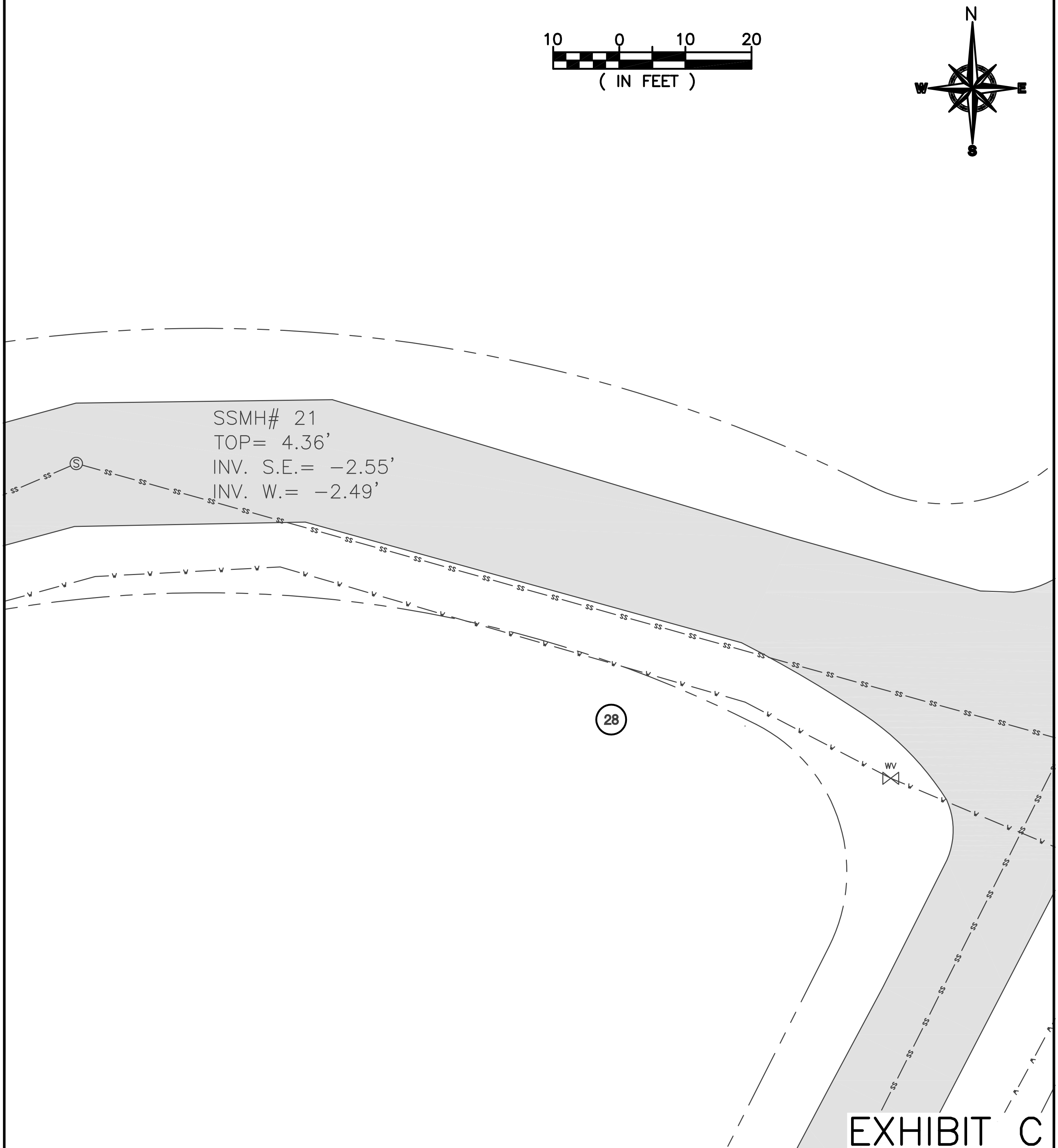

EXHIBIT C

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PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 28	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	25 OF 26

NOTE:
SEE KEY SHEET FOR ADDITIONAL INFORMATION

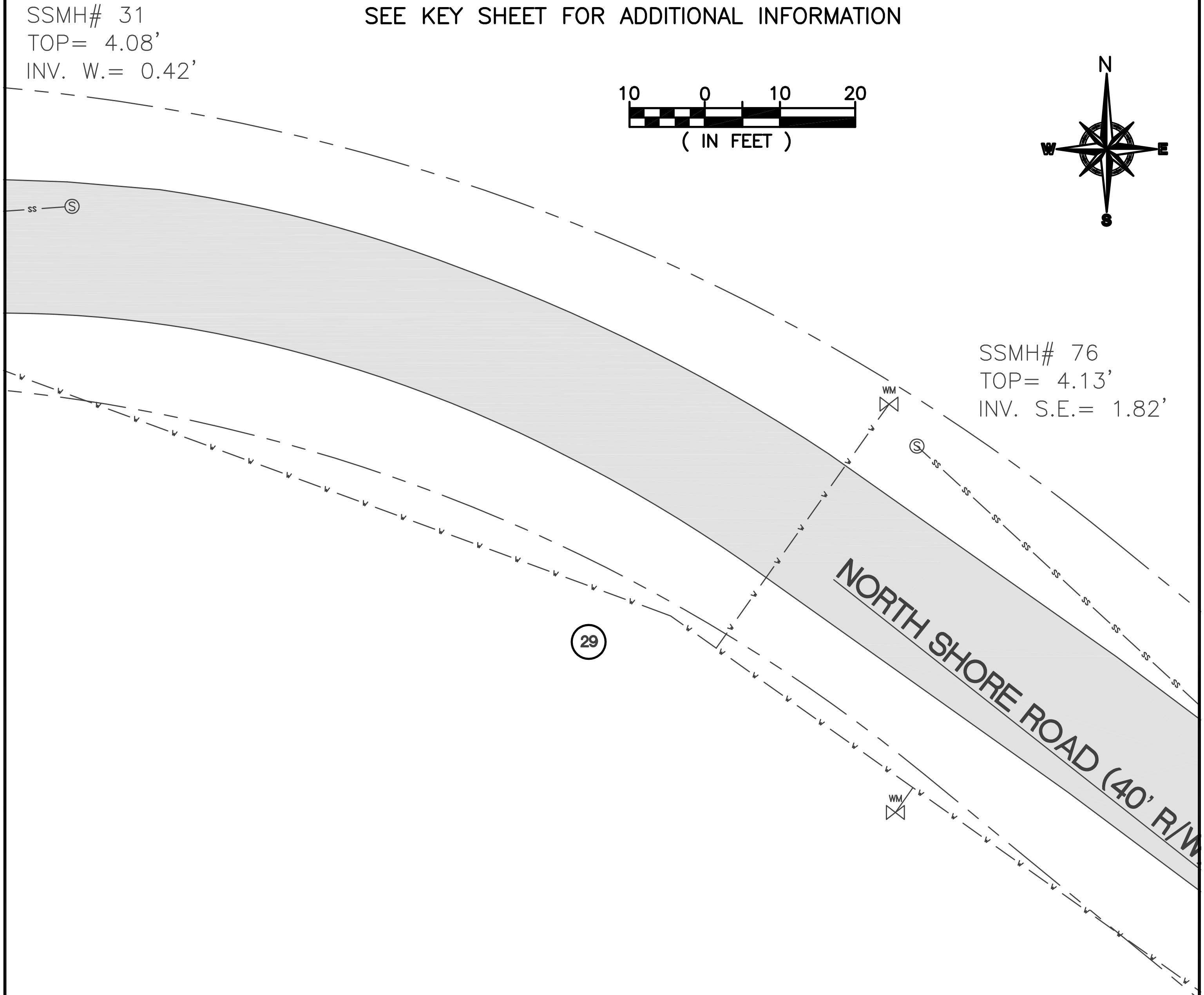

EXHIBIT C

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(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

PROJECT NAME:	II UTILITY TRANSFER
UTILITY ENCROACHMENT DETAIL 29	
PROJECT NO.:	2013-11
BY: DIC	DATE: DEC 2013
SHEET:	26 OF 26

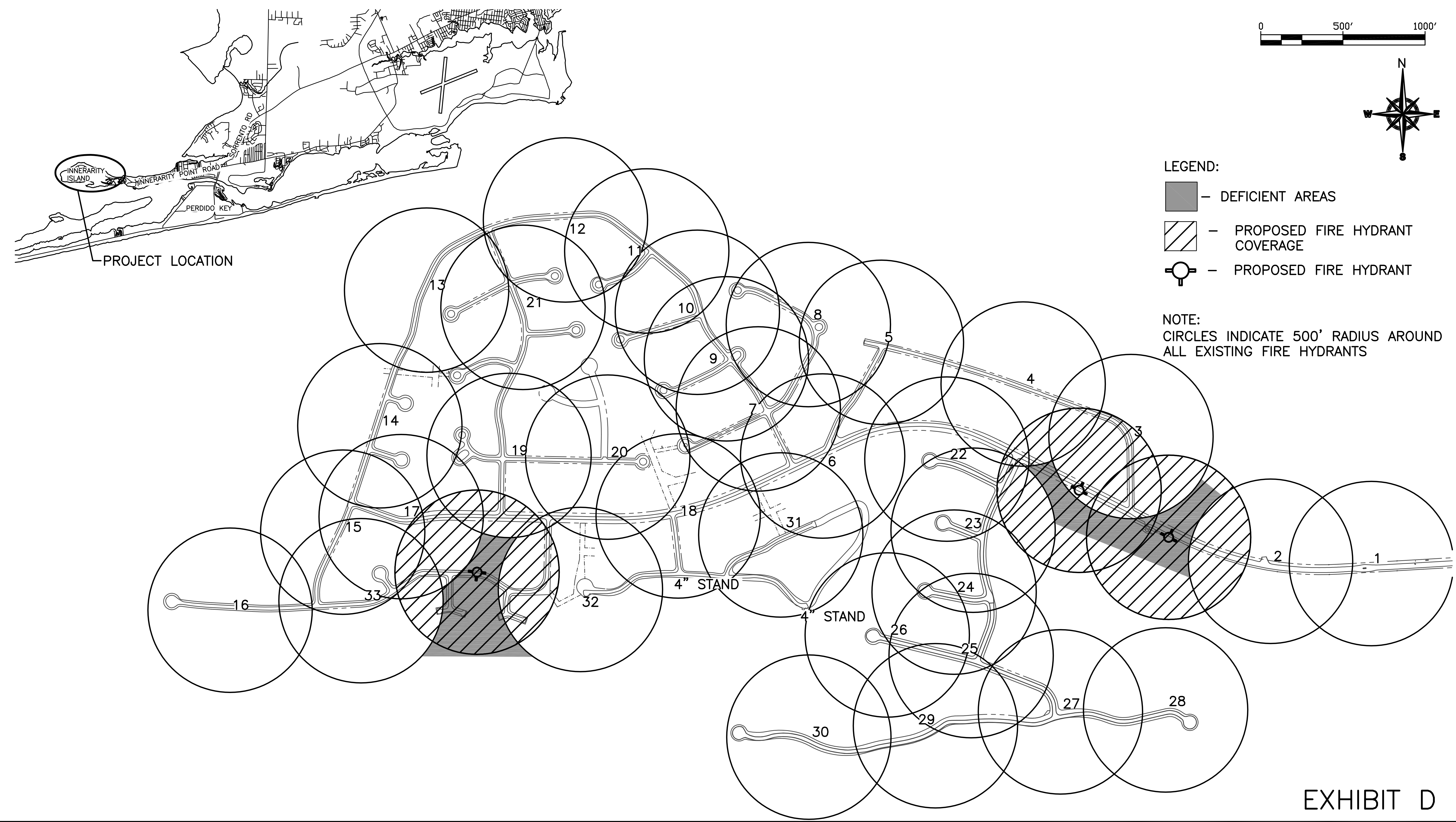

EXHIBIT D

Kenneth Horne & Associates, Inc.
CIVIL ENGINEERS
PO BOX 10669, PENSACOLA, FLORIDA 32524
7201 NORTH 9th, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

NO.	REVISIONS	APPROVED BY	DATE
1			
2			
3			
4			
5			

PROJECT NAME: II UTILITY TRANSFER

FIRE HYDRANT LOCATIONS

PROJECT NO.: 2015-24

BY: DIC DATE: AUG 2015

SHEET 1 OF 1

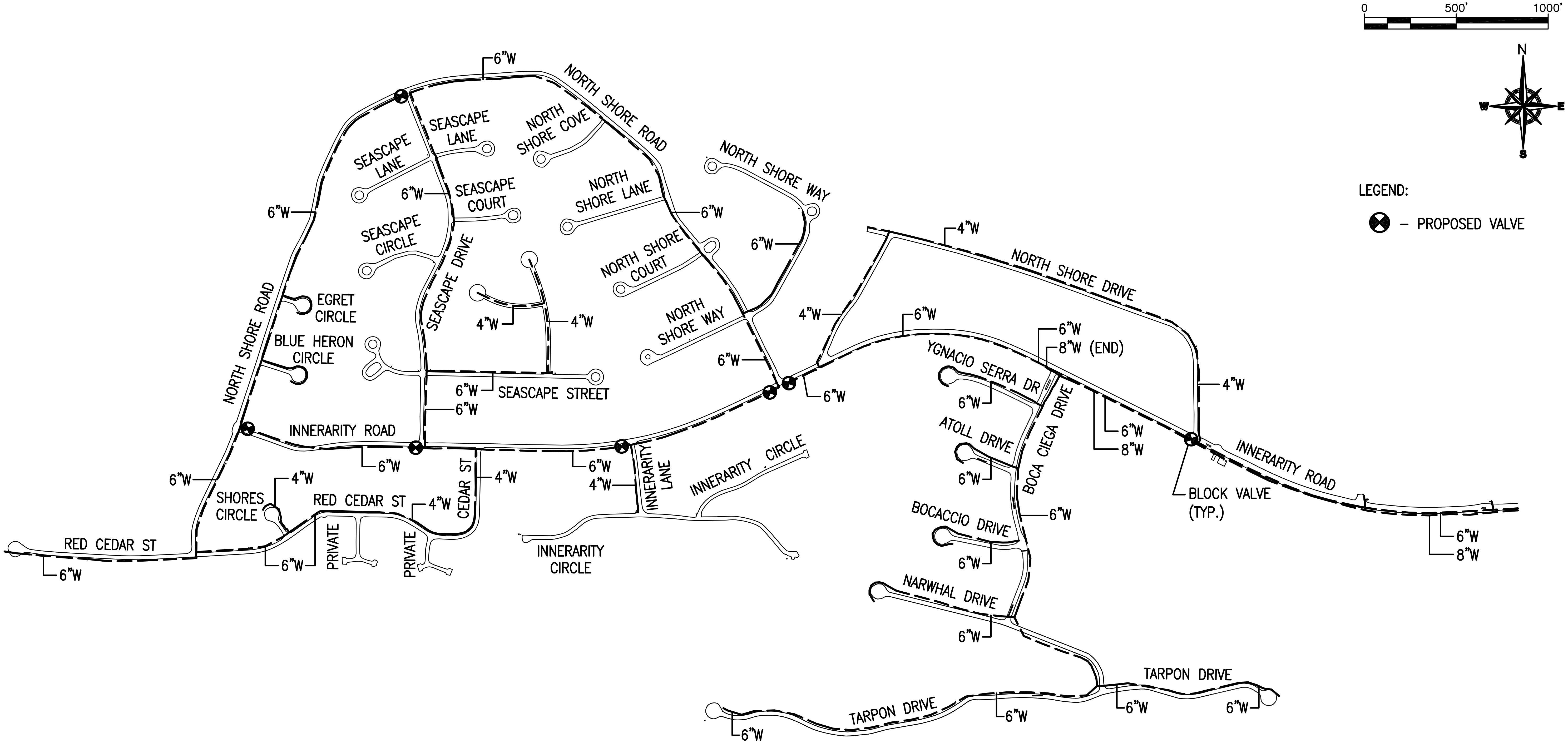

EXHIBIT E

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(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

NO.	REVISIONS	APPROVED BY	DATE
1			
2			
3			
4			
5			

PROJECT NAME: INNERARITY ISLAND
UTILITY TRANSFER
EXISTING WATER LAYOUT
PROJECT NO.: 2015-24
BY: RT DATE: AUG 2015
SHEET 1 OF 1

Upstream MH		Downstream MH		Distance	Slope	Connecting Pipe		ECUA	ECUA	ECUA	Deficiency Comments from SBP Reports	Comment on Survey	Drop Across
No.	Invert El.	No.	Invert El.			Size	Material	Depth	Condition	Comments			Manhole
54A		54	-3.33	217.62		8	PVC					Lamphole-No Invert	
54	-3.24	53	-4.31	228.49	0.47%	8	PVC	5'-8"	Good			To Lift Station #4	0.09
52	-1.61	53	-2.78	157.05	0.74%	8	PVC	4'-0"	Good			To Lift Station #4	
Bottom El.		*-10.01*		*Top El*		*2.77*				*Manhole Lift Station (53)*		*Lift Station #4 Data*	
51	-0.36	50	-1.32	207.32	0.46%	8	PVC	3'6"	Good				
50	-1.37	55	-2.94	336.73	0.47%	8	PVC	5'-6"	Good				0.05
55	-2.89	56	-3.66	139.97	0.55%	8	PVC	5'-4"	Good				0.05
57	-0.86	56	-2.39	163.52	0.94%	8	PVC	4'-2"	Good		Broken Pipe - Soil Visible		
56	-3.76	58	-4.49	182.4	0.40%	8	PVC	6'-2"	Good				1.37
58	-4.51	59	-4.72	32.79	0.64%	8	PVC	7'10"	Good			To Lift Station #3	0.02
59-Inserted							PVC	11'-6"	Good				0.02
60	-3.48	59	-4.70	179.61	0.68%	8	PVC	6'-0"	Good			To Lift Station #3	0.60
Bottom El.		*-8.07*		*Top El.*		*3.47*				*Manhole Lift Station (59)*		*Lift Station #3 Data*	
61	-1.98	60	-2.88	216.2	0.42%	8	PVC	5'-5"	Fair	Signs of I&I around top of cone			0.13
61A		61	-1.86			8	PVC					LH 61A	
61B		61	-1.85	81.66		8	PVC					LH 61B	
62	-2.61	60	-3.33	201.84	0.36%	8	PVC	6'-3"	Good				0.05
63	-2.01	62	-2.56	190.48	0.29%	8	PVC	5'-6"	Good				0.07
64	-1.43	63	-1.94	139.83	0.36%	8	PVC	5'-7"	Fair	Signs of I&I and roots			0.10
64A		64	-1.36			8	PVC					LH 64A	
64B		64	-1.33			8	PVC					LH 64B	
65	-1.07	63	-1.97	236.45	0.38%	8	PVC	4'-3"	Good				0.48
66	-0.12	65	-0.92	241.19	0.33%	8	PVC	4'-2"	Good		Line Broken		
49	-0.68	50	-1.34	128.38	0.51%	8	PVC	4'-0"	Good				0.05
48	-0.03	49	-0.63	126.81	0.47%	8	PVC	3'-10"	Good				
47	0.29	43	-1.30	305.18	0.52%	8	PVC	3'-8"	Good				1.19
44	0.16	43	-1.24	299.87	0.47%	8	PVC	3'-5"	Good				0.07
45	0.61	44	0.23	79.99	0.48%	8	PVC	3'-5"	Fair	Needs to be cleaned			
12	0.3	13	-1.94	357.6	0.63%	8	PVC	3'-9"	Bad	Aggregate showing on walls, 2" force main #3			2.17
13-Inserted						8	PVC	7'-0"	Good				0.02
14	-0.3	13	-1.96	384.41	0.43%	8	PVC	5'-0"	Good				0.14
15	1.14	14	-0.16	283.55	0.46%	8	PVC	5'-2"	Good				0.08
16	2.14	15	1.22	260.5	0.35%	8	PVC	3'-9"	Good				0.04
17	3.4	16	2.18	240.43	0.51%	8	PVC	3'-9"	Good				0.05
18	3.91	17	3.35	161.24	0.35%	8	PVC	3'-5"	Good				0.06
18A	5.42	18	3.97	345.25	0.42%	8	PVC	4'-0"	Poor	Roots inside MH	Large Joint Offset, Line Broken		0.02
19	6.15	18A	5.44	172.58	0.41%	8	PVC	5'-0"	Fair	Needs to be cleaned			
67A	-0.15	65	-0.59	80.33	0.55%	8	PVC	4'-1"	Good				0.06
67	0.38	67A	-0.09	152.83	0.31%	8	PVC	4'-3"	Good				0.16
68	0.3	67	0.22	173.11	0.05%	8	VCP	3'-5"	Poor	Roots around top of manhole	Longitudinal Crack		0.01
69	1.15	68	0.29	290.49	0.30%	8	VCP	5'-10"	Good		Circumferential Fracture, Infiltration Gusher, Long. Fract.		0.21
70	1.92	69	1.36	190.09	0.29%	8	VCP	6'-0"	Good		Line Broken, Circumferential Fracture, Infiltration Gusher		0.07
71	2.79	70	1.99	255.1	0.31%	8	VCP	4'-9"	Poor	Signs of I&I and roots around bottom and sides of MH			0.08
73	3.27	71	2.75	143.05	0.36%	8	VCP	4'-2"	Good		Longitudinal Crack		0.05
74	4.14	73	3.32	201.51	0.41%	8	VCP	4'-8"	Fair	Signs of I&I and roots around top of MH			0.13
75	4.52	74	4.27	99.36	0.25%	8	VCP	4'-2"	Fair	Signs of I&I and roots around top of MH	Longitudinal Fracture		
72	3.75	71	2.83	257.17	0.36%	8	VCP	5'-2"	Poor	Signs of I&I and roots around bottom of MH	Hole Void Visible, Line Brk., Defective Rpr., Inf. Gusher		0.03
43	-1.81	41	-3.03	347.76	0.35%	8	PVC	6'-0"	Good		Circumferential Crack		0.57
42	0.24	41	-1.39	236.66	0.69%	8	PVC	4'-0"	Good				
41	-3.1	39	-4.80	336.05	0.51%	8	PVC	8'-0"	Fair	Needs to be cleaned			1.71
40	0.08	39	-4.83	150.34	3.27%	8	PVC	4'-0"	Good				
39	-4.78	38	-5.35	123.47	0.46%	8	PVC	9'-5"	Good			To Lift Station #2	0.05
38-Inserted							PVC	15'-0"	Good				0.92
37	-3.8	38	-4.43	134.57	0.47%	8	RCP	8'-0"	Good			To Lift Station #2	0.20
Bottom El.		*-11.54*		*Top El.*		*4.97*				*Manhole Lift Station (38)*		*Lift Station #2 Data*	
36	-3.01	37	-3.60	138.92	0.42%	8	PVC	7'-0"	Good				0.02
35	-2.16	36	-3.03	196.66	0.44%	8	PVC	6'-5"	Good				0.15
34	-0.93	35	-2.01	226.25	0.48%	8	PVC	4'-0"	Good				0.07
33	-0.33	34	-0.86	99.07	0.53%	8	PVC	3'-5"	Good				0.03
32	0.21	33	-0.30	100.48	0.51%	8	PVC	4'-0"	Good			Possible Bust or Ponding in MH 32	0.38
32	-0.17	29	-0.77	244.77	0.25%	8	PVC	4'-0"	Good			Possible Bust or Ponding in MH 32	0.38
29	-0.65	26	-1.65	363.07	0.28%	6	PVC	5'-5"	Good				0.12
28	-0.74	26	-1.69	403.94	0.24%	8	PVC	4'-5"	Poor	Needs to be wipe in or walls			
27	-1.27	26	-1.92	275.96	0.24%	6	PVC	5'-0"	Poor	Needs to be wipe in around pipes & wall	Line Broken, Infiltration Gusher, Root Ball in Lateral		
26	-1.95	25	-2.06	160.4	0.07%	8	PVC	6'-0"	Good				0.30
25	-2.08	23	-2.68	160.01	0.37%	8	PVC	5'-0"	Poor	Walls leaking/Needs to be wipe in			0.02
24	-2.72	23	-2.63	317.74	-0.03%	6	PVC	5'-0"	Bad	Walls leaking badly/Needs to be wipe in		Slopes Wrong Direction-Ponding or Bust	

EXHIBIT F

Kenneth Horne & Associates, Inc.
CIVIL ENGINEERS
PO BOX 10669, PENSACOLA, FLORIDA 32524
7201 NORTH 9th, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

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5			

PROJECT NAME: II UTILITY TRANSFER
SEWER DATA TABULATION
AND INSPECTION RESULTS
PROJECT NO.: 2015-24
BY: EEB DATE: AUG 2015
SHEET 1 OF 2

Upstream MH		Downstream MH		Distance	Slope	Connecting Pipe		ECUA	ECUA	ECUA	Deficiency Comments from SBP Reports	Comment on Survey	Drop Across
No.	Invert El.	No.	Invert El.			Size	Material	Depth	Condition	Comments			Manhole
23	-2.69	20	-2.99	210.98	0.14%	6	PVC	6'-0"	Poor	Walls leaking/Needs to be wipe in			0.06
21	-2.55	20	-3.09	155.63	0.35%	8	PVC	6'-5"	Good				0.06
22	-1.92	21	-2.49	255.75	0.22%	6	PVC	6'-0"	Good				
20	-3.12	9	-4.13	273.62	0.37%	8	PVC	7'-5"	Good				0.13
9	-4.21	8	-4.95	316.58	0.23%	8	PVC	9'-0"	Good				0.08
10	-2.8	8	-3.79	233.33	0.42%	8	PVC	7'-6"	Good				0.12
11	-2.33	10	-2.68	119.4	0.29%	8	PVC	7'-2"	Fair	Signs of I&I			
8	-5.02	7	-5.32	304.67	0.10%	8	PVC	10'-5"	Good				1.50
7	-5.35	2	-5.90	314.25	0.18%	8	PVC	10'-3"	Good				0.03
2	-5.87	1	-6.37	237.92	0.21%	8	PVC	10'-2"	Good		Line Broken, Infiltration Gusher		0.03
1	-6.32	LS1	-6.57	72.1	0.35%	8	PVC	11'-8"	Good				0.05
Bottom El.		*-13.89*		*Top El.*		*6.57*				*Lift station #1*		*Lift Station #1 Data*	
13	-2.03	8	-3.52	328	0.45%	8	PVC	4'-0"	Good				0.09
30	-0.08	29	-0.70	291.11	0.21%	8	PVC	4'-0"	Good				0.01
31	0.42	30	-0.09	371.67	0.14%	8	PVC	3'-0"	Good				
76	1.82	77	1.24	293.39	0.20%	8	PVC	2'-0"	Good		Large Joint Offset, Defective Repair Patch, Fine Roots		
78	1.72	77	1.25	220.23	0.21%	8	PVC	2'-0"	Good		Large Joint Offset, Defective Repair		0.06
78A		78	1.78	162.56		8	PVC					Lamphole-No Invert	
77	1.19	80	0.39	344.14	0.23%	8	PVC	3'-5"	Good				0.05
80	0.33	81	-0.10	175.8	0.24%	8	PVC	4'-0"	Good				0.06
82	0.53	81	-0.14	259.09	0.26%	8	PVC	4'-0"	Good				0.10
82A		82	0.43	254.89		8	PVC					Lamphole-No Invert	
81	-0.11	84	-1.05	324.61	0.29%	8	PVC	5'-0"	Poor	Grease in main-needs to be cleaned	Large Joint Offset, Loose Sealing Ring		0.04
84A		84	0.17	51.02		8	PVC					Lamphole-No Invert	
85	0.68	84	0.36	336.84	0.10%	8	PVC	4'-0"	Poor	Walls leaking/Needs to be cleaned/Grease in main			0.10
86	1	85	0.78	116.7	0.19%	8	PVC	5'-0"	Good				
84	-1.12	87	-1.64	210.5	0.25%	8	PVC	7'-0"	Good				1.48
87	-1.7	88	-2.54	174.97	0.48%	8	PVC	7'-0"	Good				0.06
88	-2.62	99	-3.04	400.58	0.10%	8	PVC	8'-5"	Poor	Needs to be cleaned			0.16
99	-3.11	100	-3.33	140.48	0.16%	8	PVC	8'-5"	Good				0.07
100	-3.65	LS1	-4.66	209.04	0.48%	8	PVC	9'-0"	Good				0.32
91	-1.79	88	-2.46	174.03	0.38%	8	PVC	7'-0"	Poor	Walls leaking/Needs to be wipe in			0.00
92	-1.03	91	-1.79	289.06	0.26%	8	PVC	5'-5"	Good				0.09
93	-0.5	92	-0.94	162.5	0.27%	8	PVC	5'-5"	Good				0.03
94	0.44	93	-0.47	395.96	0.23%	8	PVC	5'-0"	Good				0.06
94A		94	0.50	153.55		8	PVC				Large Joint Offset, Defective Repair, Loose Sealing Ring	Lamphole-No Invert	
122	-0.08	121	-0.60	139.31	0.37%	8	PVC	3'-10"	Good				
121	-0.68	120	-1.82	257.31	0.44%	8	PVC	5'-3"	Fair	Conc. broken around ring/cover			0.08
120	-1.93	119	-3.52	286.3	0.56%	8	PVC	7'-3"	Good				0.11
119	-3.53	118	-5.13	398.45	0.40%	8	PVC	7'-10"	Fair	Conc. broken around ring/cover			0.01
118	-5.21	117	-5.97	271.73	0.28%	8	PVC	9'-9"	Good				0.08
117	-6.14	116	-6.66	178.72	0.29%	8	PVC	10'-10"	Fair				0.17
116	-6.65	115	-7.70	255.65	0.41%	8	PVC	11'-1"	Fair	Conc. broken around ring/cover			0.01
115	-7.73	114	-8.51	190.95	0.41%	8	PVC	12'-1"	Fair	Conc. broken around ring/cover			0.03
123	-6.03	114	-6.97	224.24	0.42%	8	PVC	10'-2"	Good		Infiltration Weeper, Water Level Sags		0.11
124	-3.36	123	-5.92	271.45	0.94%	8	PVC	8'-5"	Good				0.08
125	-0.68	124	-3.28	252.43	1.03%	8	PVC	4'-10"	Good		Infiltration Dripper		0.02
126	-0.23	125	-0.66	96.07	0.45%	8	PVC	4'-3"	Good				
114	-8.74	113	-8.98	45.57	0.53%	8	PVC	13'-3"	Fair	East Pipe 1' higher than rollout			1.77
113	-9.05	RB LS	-9.09	34.8	0.11%	8	PVC	13'-7"	Good			To Russell Bayou Lift Station	0.10
Bottom El.		*-14.56*		*Top El.*		*5.84*						*Russell Bayou LS Data*	
112	-8.33	113	-8.95	163.25	0.38%	8	PVC	12'-4"	Fair	Conc. broken around ring/cover	Deformed Pipe		0.06
109	-5.17	112	-8.27	405.9	0.76%	8	PVC	8'-11"	Fair	Needs Rollout for north pipe			2.49
110	0.27	109	-2.86	274.73	1.14%	8	PVC	13'-0"	Good		Infiltration Dripper		0.21
111	3.73	110	0.48	387.99	0.84%	8	PVC	5'-3"	Fair	Conc. broken around ring/cover			
107	-3.89	109	-5.35	391.55	0.37%	8	PVC	11'-4"	Fair	Needs Rollout for west pipe			2.09
108	1.2	107	-1.80	403.18	0.74%	8	PVC	6'-10"	Good				
105	-2.17	107	-3.74	378.86	0.41%	8	PVC	11'-8"	Good				0.13
106	6.09	105	-2.19	252.55	3.28%	8	PVC	4'-8"	Good		Large Joint Offset, Loose Sealing Ring		
102	-0.28	105	-2.06	340.67	0.52%	8	PVC	5'-10"	Fair	Needs Rollout for west pipe			1.87
104	5.66	103	4.66	247.35	0.40%	8	PVC	4'-3"	Good				
103	4.5	102	1.59	216.43	1.34%	8	PVC	7'-11"	Good				0.16
101	2.1	102	-0.22	181.03	1.28%	8	PVC	13'-7"	Good				0.30
101A	3.36	101	2.40	204.11	0.47%	8	PVC	12'-3"	Fair	Conc. Debris in MH			0.40
101B	5.7	101A	3.76	494.81	0.39%	8	PVC	5'-3"	Poor	Needs new lid	Longitudinal Fracture		

EXHIBIT F

KH&A Kenneth Horne & Associates, Inc.
CIVIL ENGINEERS
PO BOX 10669, PENSACOLA, FLORIDA 32524
7201 NORTH 9th, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

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PROJECT NAME: II UTILITY TRANSFER
SEWER DATA TABULATION
AND INSPECTION RESULTS
PROJECT NO.: 2015-24
BY: EEB DATE: AUG 2015
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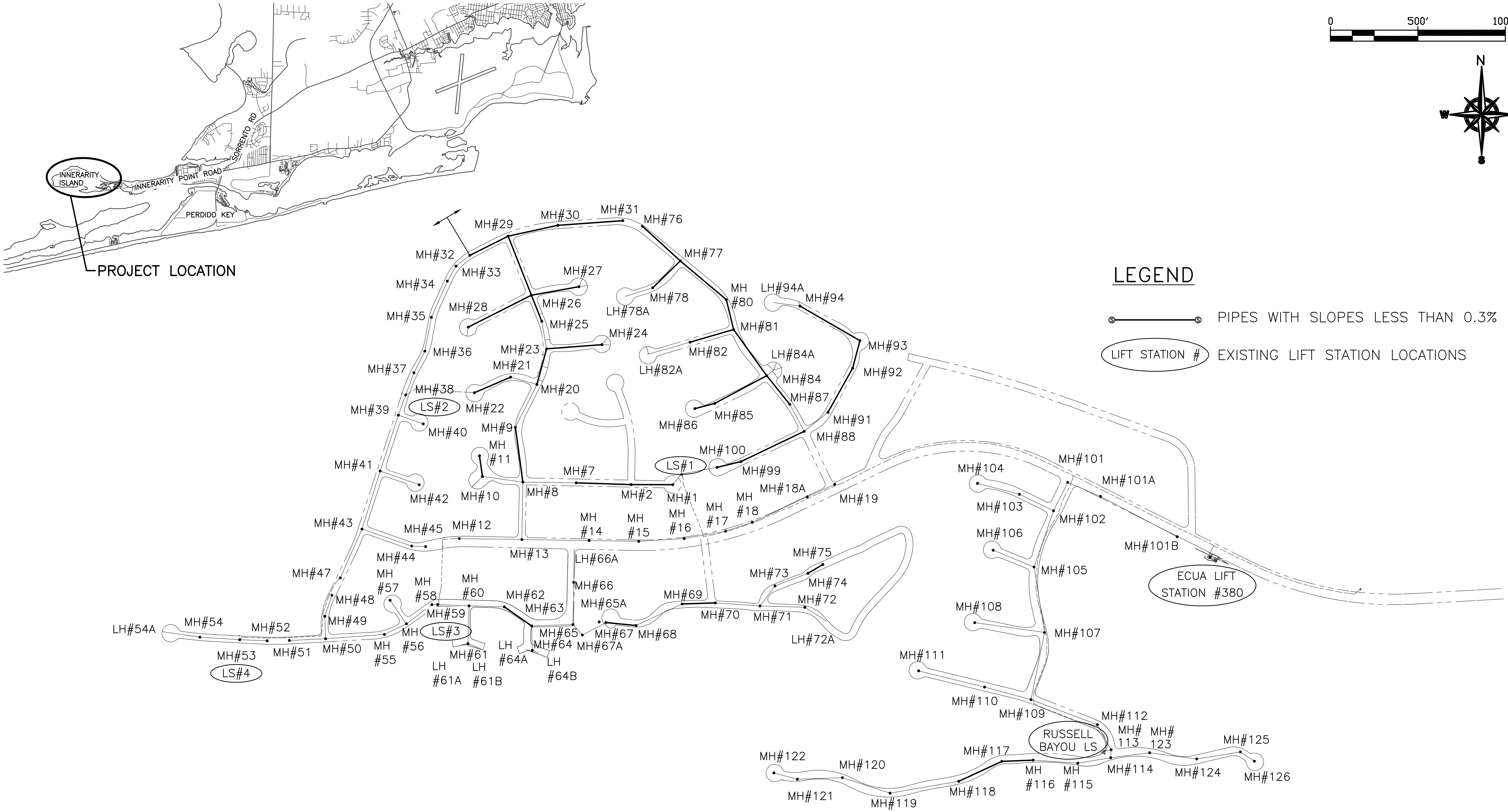

EXHIBIT G

KH&A Kenneth Horne & Associates, Inc.

CIVIL ENGINEERS

PO BOX 10669, PENSACOLA, FLORIDA 32524
7201 NORTH 9th, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

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PROJECT NO.: 2015-24

BY: DIC DATE: AUG 2015

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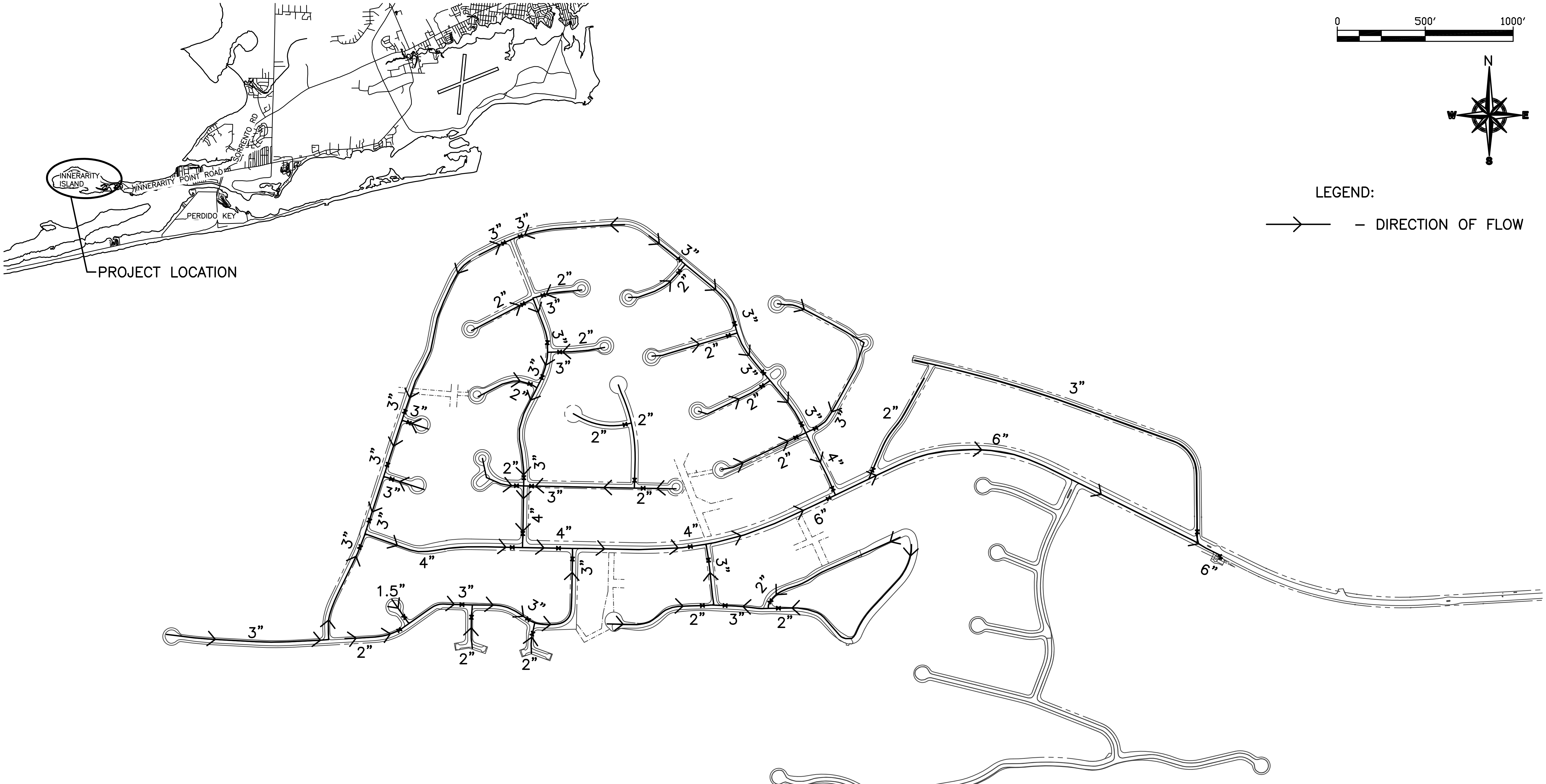

EXHIBIT H

Kenneth Horne & Associates, Inc.
CIVIL ENGINEERS
PO BOX 10669, PENSACOLA, FLORIDA 32524
7201 NORTH 9th, SUITE 6, PENSACOLA, FLORIDA 32504
(850) 471-9005 INFO@KH-A.COM FAX (850) 471-0093

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PROJECT NAME: II UTILITY TRANSFER

LOW PRESURE SEWER EXHIBIT

PROJECT NO.: 2015-24

BY: DIC DATE: AUG 2015

SHEET 1 OF 1

EXHIBIT I

Temporary Flow Monitoring Study

Russell Bayou Subdivision

Innerarity Island

August 19, 2015

PROJECT NUMBER 25175.11

Temporary Flow Monitoring Study

Russell Bayou Subdivision

PREPARED FOR

Kenneth Horne & Associates, Inc.
7201 North 9th Avenue, Suite 6
Pensacola, FL 32504

SUBMITTED

August 19, 2015

ADS ENVIRONMENTAL SERVICES®

1300 Meridian Street, Suite 3000 // Huntsville, AL 35801 // www.adsenv.com

Table of Contents

CD-ROM with electronic copy of report and associated data accompanies this report.

Introduction

ADS Environmental Services (ADS) was retained by Kenneth Horne & Associates, Inc. (Engineer) to gather and evaluate sanitary sewer flow monitor data obtained from the Russell Bayou Subdivision on Innerarity Island in Pensacola, Florida. The scope of this study is to observe and characterize flow conditions in this subdivision prior to a proposed transfer of these sewers from a private developer to the Emerald Coast Utility Authority (ECUA).

Methodology

Flow conditions within the existing sewers were observed by installing sewer flow monitors at three locations. Existing flow conditions were characterized, and the results are provided in this report. A description of the flow monitor locations, equipment, study period, and data format are detailed in the following sections.

Flow Monitor Locations

Preliminary flow monitor locations were selected by the Engineer, and final locations were determined by ADS, in consultation with the Engineer, based on observed flow conditions, site access, and site safety considerations. Brief descriptions of each flow monitor location are provided in Table 1, and flow monitor locations are depicted on the map provided in Figure 1.

TABLE 1: Flow Monitor Locations

Monitor	Latitude (degrees)	Longitude (degrees)	Diameter (inches)	MH Depth (inches)
RB01	30.31158	-87.47968	8	169.2
RB02	30.31140	-87.47958	8	165.6
RB03	30.31140	-87.47958	8	165.6

FIGURE 1: Flow Monitor Locations

All three flow monitors measure wastewater flow conveyed to a sewer pump station located near the intersection of Norwhal Drive and Tarpon Drive. Flow Monitor RB01 measures wastewater flow from residences located to the north of the pump station. Flow Monitor RB02 measures wastewater flow from residences located on Tarpon Drive east of the intersection with Norwhal Drive, while Flow Monitor RB03 measures wastewater flow from residences located on Tarpon Drive west of the intersection with Norhal Drive. Site installation photographs for each flow monitor are provided in the attached appendices.

Flow Monitor Equipment

Sewer flow monitoring was performed using FlowShark® Triton area-velocity flow monitors manufactured, installed, and maintained by ADS. Each flow monitor was mounted near the top of a manhole and was connected to flow depth and velocity sensors positioned in an incoming sewer. Detailed specifications of the flow monitor equipment used for this project are provided in the attached appendices.

Flow Monitor Study Period

The temporary flow monitors were installed on May 6, 2015. The study period was commissioned on May 9, 2015 and continued through July 21, 2015 for a total duration of 74 days.

Flow Monitor Data Format

Flow depth (d), flow velocity (v), and flow rate (Q) data from each sewer flow monitor, as well as associated rainfall depth data are provided in hydrograph and scattergraph formats in the attached appendices. An electronic copy of the flow monitor and rain gauge data is provided in Microsoft Excel format on a CD-ROM accompanying this report.

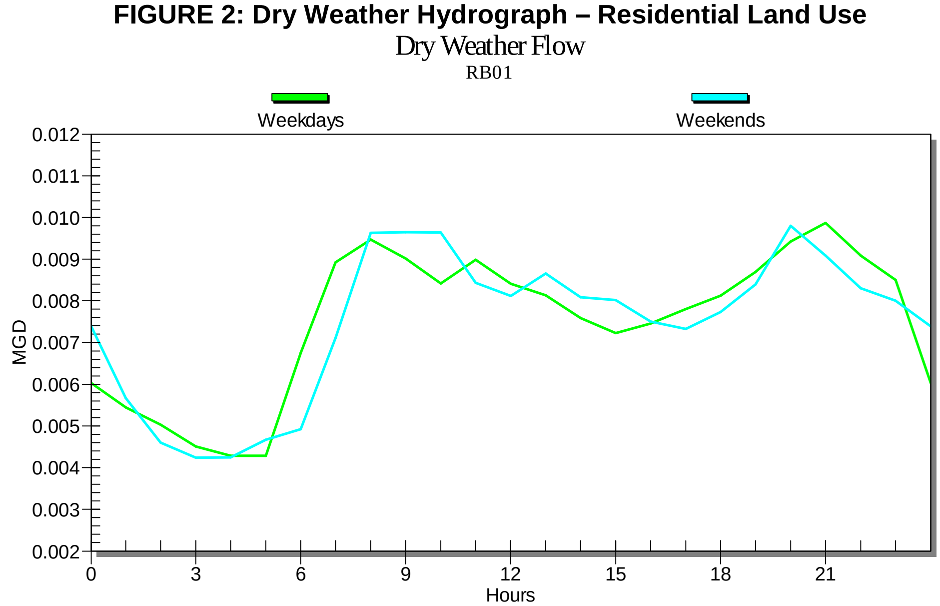
Results

Flow monitor data provide insight into sewer performance – revealing important information about how the existing sewer system accommodates observed flow rates. The following sections evaluate the observed flow monitor data using a variety of key performance indicators (KPIs).

Flow Rates and Peaking Factors

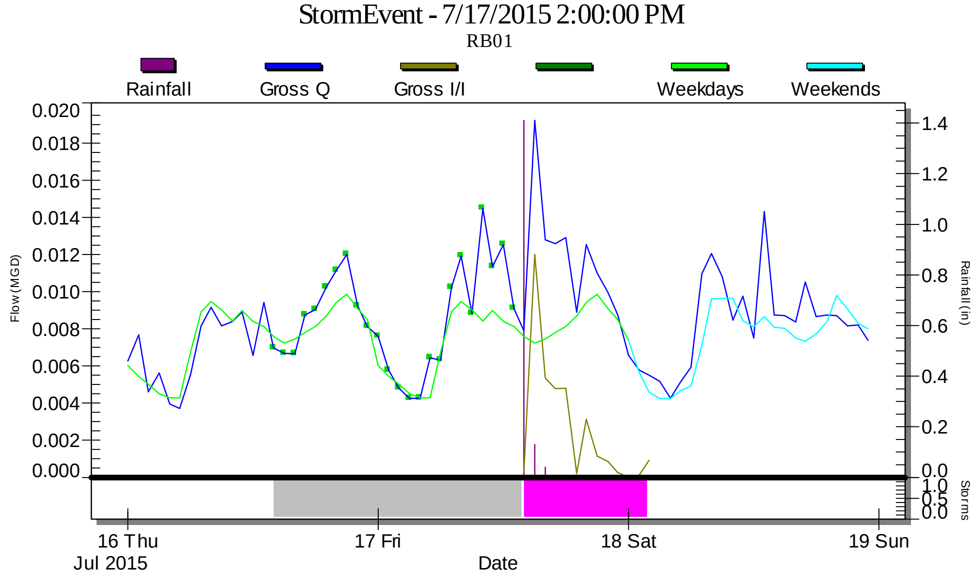
Dry weather flow conditions are characterized by evaluating flow monitor data observed during normal conditions, excluding wet weather events and the periods associated with the recovery from these events. The average dry day pattern is identified as a diurnal pattern and results from the collective sewer use of residential users located upstream from a given flow monitor. Land use within a particular area affects the shape of the diurnal pattern. An example of a representative diurnal pattern observed during this study period is shown in Figure 2.

FIGURE 2: Dry Weather Hydrograph – Residential Land Use



Wet weather flow conditions are characterized by evaluating flow monitor data observed during significant storm events that occurred during the study period. An example of a representative wet weather storm decomposition hydrograph observed during the study period is provided in Figure 3 and shows the observed flow rate during a storm event compared to the average dry day diurnal pattern. The difference between the two is the rain-dependent inflow and infiltration (RDII) measured by the flow monitor. The storm event is depicted by the purple bands, and a precompensation period prior to the storm is depicted by the light gray band. Precompensation is used when needed to adjust the average dry day diurnal pattern to more closely match observed conditions prior to each storm event for proper RDII analysis.

FIGURE 3: Wet Weather Storm Decomposition Hydrograph



The minimum, average, and maximum dry weather flow rates (Q_{min-D}, Q_{avg-D}, and Q_{max-D}) are determined from the dry weather diurnal pattern for each flow monitor location and are provided in Table 2, along with the resulting dry weather peaking factor (PF_D). The maximum wet weather flow rate (Q_{max-W}) determined for each flow monitor location is also provided, along with the resulting wet weather peaking factor (PF_W).

TABLE 2: Dry and Wet Weather Flow Rates and Peaking Factors

Monitor	Q_{min-D} (MGD)	Q_{avg-D} (MGD)	Q_{max-D} (MGD)	Q_{max-W} (MGD)	Peaking Factor PF_D	Peaking Factor PF_W
RB01	0.004	0.007	0.010	0.021	1.43	2.38
RB02	0.000	0.000	0.000	0.009	—	—
RB03	0.000	0.001	0.003	0.022	3.99	22.00

Note that while intermittent wastewater flow is present at Flow Monitor RB02 during dry weather conditions, it is below the detection limit of standard area-velocity flow monitor equipment. Therefore, dry weather flow rates for Flow Monitor RB02 are reported as 0.000 MGD in Table 2, and no corresponding peaking factors are calculated. Observed maximum wet weather flow rates indicate the presence of some RDII at each flow monitor location, with short-term maximum hourly average flow rates of up to 0.022 MGD.

Depth-to-Diameter Ratios

Once dry weather and wet weather flow rates are characterized, the hydraulic conditions under which they occur are evaluated. The maximum flow depth observed during dry weather (d_{max-D}) and wet weather (d_{max-W}) and their corresponding flow depth-to-diameter (d/D) ratios observed during the study period are provided in Table 3. The maximum dry weather flow depth is the flow depth associated with the maximum dry weather flow rate and is the maximum flow depth that is consistently observed each day during normal dry weather conditions. The maximum wet weather flow depth may or may not be directly associated with the maximum wet weather flow rate, depending on the hydraulic conditions observed at a given flow monitor location.

TABLE 3: Dry and Wet Weather Depth-to-Diameter Ratios

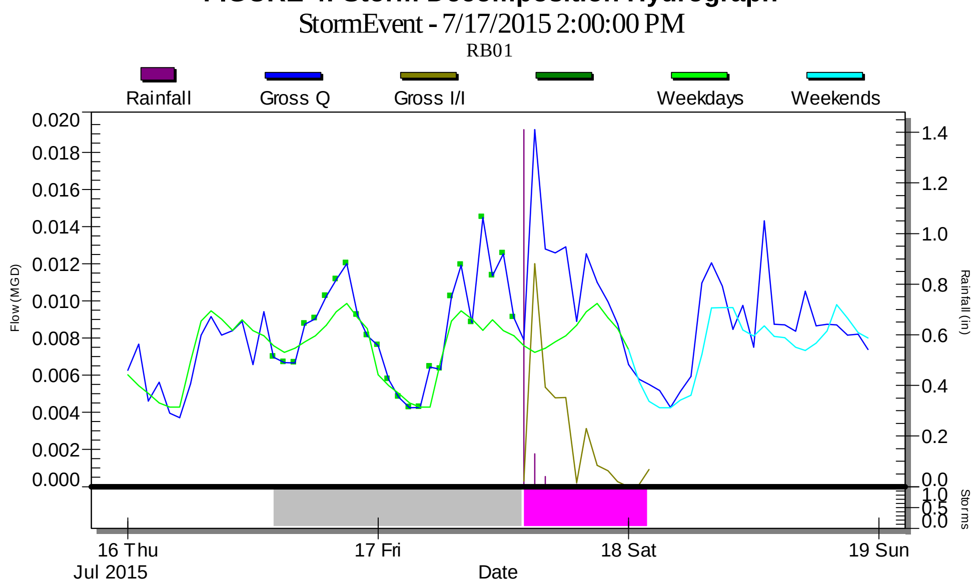
Monitor	D (inches)	d_{max-D} (inches)	d_{max-D} / D (%)	d_{max-W} (inches)	d_{max-W} / D (%)
RB01	8	1.31	16%	1.63	20%
RB02	8	0.00	0%	0.58	7%
RB03	8	0.31	4%	0.90	11%

The d/D ratio is a performance indicator used to assess sewer capacity. Sewers are often designed to flow under open channel flow conditions with some reserve capacity. As a result, ASCE and WEF recommend that sewers with diameters up to 15 inches be designed to flow with dry weather d/D ratios of 50%. Sewers are not generally designed to operate under surcharge conditions with wet weather d/D ratios greater than 100%. During both dry weather and wet weather conditions, all of the observed d/D ratios are well within design criteria recommended by ASCE and WEF, indicating that there is sufficient capacity to accommodate observed dry weather and wet weather flows at these locations.

Rain-Dependent Inflow and Infiltration

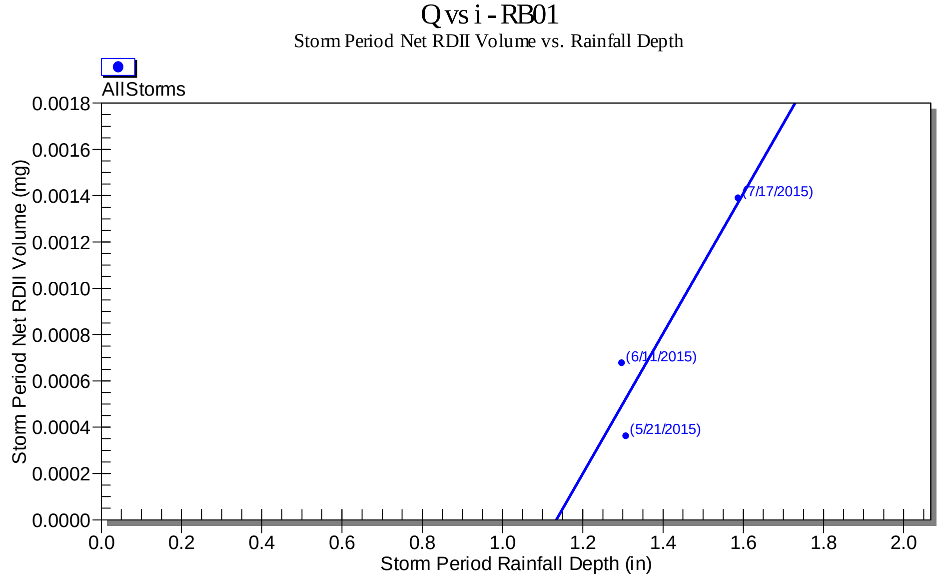
During wet weather events, significant amounts of extraneous water can enter a sewer system, resulting in sanitary sewer overflows (SSOs), basement backups, and/or problems at the wastewater treatment plant (WWTP). A comparison of flow monitor data from dry weather and wet weather periods provides a quantification of rain-dependent inflow and infiltration (RDII), which is calculated by subtracting the measured flow during a rainfall event from the flow during an average dry day. A wet weather storm decomposition hydrograph from a storm event that occurred during the study period is provided in Figure 4.

FIGURE 4: Storm Decomposition Hydrograph



Up to six storm events of interest were observed, but resulted in little to no RDII response in the sewer system. RDII responses from three storm events were disregarded, since they were generally indistinguishable from typical dry weather flow. RDII results from the remaining three storm events are plotted as a function of rainfall total. An example is shown in Figure 5 in which the relationship between the Storm Period RDII (MG) is plotted with respect to the Storm Period rainfall (inches). These relationships can then be used to evaluate the consistency of rainfall responses within the sanitary sewer system and estimate the RDII response for various rainfall amounts.

FIGURE 5: RDII Response vs. Rainfall Depth



Based on the results obtained during the study, Net RDII are reported for each basin for a projected 1.5-inch storm event and are summarized in Table 4. Normalized Net RDII is then calculated by dividing the net RDII volume by the associated basin size.

TABLE 4: Estimated RDII for a Projected 1.5-inch Storm

Basin	Net RDII (gal)	Length (LF)	Net RDII (gpd/LF)	Ranking
RB01	1,100	3,858	0.29	1
RB02	0	843	0.00	3
RB03	500	1,979	0.25	2

Based on this analysis, little to no RDII was detected at any of the three flow monitor locations.

Conclusions

ADS performed temporary sewer flow monitoring at three locations in the Russell Bayou Subdivision located on Innerarity Island in Pensacola, Florida to provide information on existing flow conditions prior to a proposed transfer of these sewers from a private developer to ECUA. Dry weather flow rates were measured and are conveyed at flow depth-to-diameter ratios of 16% or less. Wet weather flow rates were also measured and demonstrated little to no evidence of RDII.

Definitions

Depth-to-Diameter (d/D) Ratio – a ratio of maximum flow depth to sewer diameter. d/D ratios are often calculated to describe both dry weather and wet weather periods and are one measure used to assess sewer capacity utilization. In this study, d/D ratios are computed using hourly average data.

Infiltration – water that enters a sanitary sewer system from the ground through defective system components including, but not limited to, defective sewers, manholes, service connections, or other system appurtenances. Infiltration is primarily dependent upon groundwater elevations, but may also be influenced by storm events and leaking water mains.

Inflow – storm water runoff that enters a sanitary sewer system from direct connections including, but not limited to, building downspouts, clean-outs, foundation drains, sump pumps, basement and area drains, and cross connections with storm sewer systems.

Peaking Factor (PF) – a ratio of maximum flow rate to average flow rate. Peaking factors are often calculated to describe both dry weather and wet weather periods, where maximum flow rates are compared to average dry weather flow rates. In this study, peaking factors are computed using hourly average data.

Rain-Dependent Inflow and Infiltration (RDII) – the collective inflow and infiltration that enter a sewer system as a direct result of rainfall.

References

1. Bizier, Paul, Editor (2007). *Gravity Sanitary Sewer Design and Construction*, ASCE Manuals and Reports on Engineering Practice No. 60, American Society of Civil Engineers: Reston, VA.

Appendix A – Flow Monitor Site Installation Details

Flow Monitor RB01 – General Area

Flow Monitor RB01 – Manhole Interior and Pipe Installation

Flow Monitor RB02 – General Area

Flow Monitor RB02 – Manhole Interior and Pipe Installation

Flow Monitor RB03 – General Area

Flow Monitor RB03 – Manhole Interior and Pipe Installation

Appendix B – Flow Monitor Equipment Specifications

HARDWARE

FLOWSHARK TRITON

The new FlowShark® Triton from ADS is a "Fit-for-Purpose" open channel flow monitor for use in sanitary, combined, and storm sewers. It is designed to be the most adaptable and versatile flow monitoring device available for collection systems. It is a single pipe or dual pipe flow measurement system and is certified to the highest level of Intrinsic Safety.

FlowShark Triton

This multiple technology flow monitor will power almost every available sensor technology that is used in wastewater applications today. It is the most versatile and competitively-priced, multiple-technology flow monitor on the market. The three multiple technology sensor options available in the FlowShark Triton include a Peak Combo Sensor, a Surface Combo Sensor, and an Ultrasonic Level Sensor (*see inside for technology and specifications*). This array of monitoring technologies provides a fit-for-purpose monitoring platform.

The FlowShark Triton is also adaptable to a wide range of customer applications and budgets. It can be configured as an economical single sensor monitor or dual sensor monitor. It offers a longer battery life and fewer parts for a more reliable system. This provides a lower purchase price and a lower lifetime ownership cost. The FlowShark Triton has the lowest power cost per data sample of any Intrinsically Safe flow monitor available.

About ADS

A leading technology and service provider, ADS Environmental Services® has established the industry standard for open channel flow monitoring and has the only ETV-verified flow monitoring technology for wastewater collection systems. These battery-powered monitors are specially designed to operate with reliability, durability, and accuracy in sewer environments.

FlowShark Triton Features

- Versatile and durable multiple technology sensors
- Two sensor ports supporting 3 interchangeable sensors providing up to 6 sensor readings at a time
- Single or dual pipe/monitoring point measurement capabilities
- Wireless or serial communication for field versatility
- Industry-leading battery life with a GSM/GPRS wireless connection providing up to 15 months at the standard 15-minute sample rate (*varies with sensor configuration*)
- External power option available with an ADS External Modem Unit (EMU) or External Modem Unit/Multiplexer (EMUX) and 12-volt DC power supply
- Modbus protocol enabling Telog® RU-33 units and RTUs, such as those supporting SCADA systems, to obtain available data
- Monitor-Level Intelligence (MLI®) to improve accuracy and allow the FlowShark Triton to operate in a wide range of hydraulic conditions
- Superior noise reduction design for maximizing acoustic signal detection from depth and velocity sensors
- Five software packages for accessing flow information: Q*start*™ (configuration and activation); Profile® (configuration, data collection, analysis, and reporting); IntelliServe® (web-based alarming); Sliicer.com® (I/I analysis); and FlowView Portal® (online data presentation and reporting)
- Intrinsically-Safe (IS) certification by IECEx for use in Zone 0/Class I, Division 1, Groups C & D, ATEX Zone 0, and CSA Class 2258 03
- Thick, seamless, high-impact, ABS plastic canister with aluminum end cap (meets IP68 standard)
- Protective dome for circuit board to limit exposure of electronics when opening the canister or changing the battery

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A Division of ADS LLC

Multiple Technology Sensors

The FlowShark Triton features three depths and two velocities with three sensor options. Each sensor provides multiple technologies for continuous running of comparisons.

Peak Combo Sensor

Dimensions: 6.76 inches (172 mm) long x 1.23 inches (31 mm) wide x 0.83 inches (21 mm) high

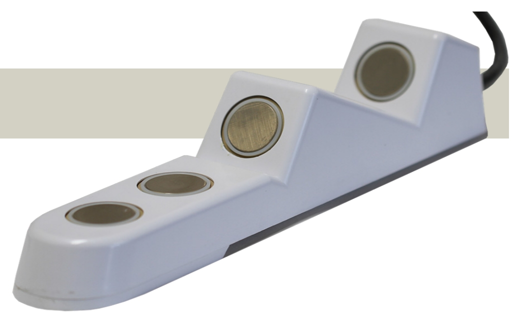
This versatile and economical sensor includes three measurement technologies in a single housing: ADS-patented continuous wave peak velocity, uplooking ultrasonic depth, and pressure depth.

Continuous Wave Velocity
Range: -30 feet per second (-9.1 m/s) to +30 ft/sec (9.1 m/s)
Resolution: 0.01 feet per second (0.003 m/s)
Accuracy: +/- 0.2 feet per second (0.06 m/s) or 4% of actual peak velocity (whichever is greater) in flow velocities between -5 and 20 ft/sec (-1.52 and 6.10 m/s)

Uplooking Ultrasonic Depth
Performs with rotation of up to 15 degrees from the center of the invert; up to 30 degrees rotation with Silt Mount Adapter
Operating Range: 1.0 inch (25 mm) to 5 feet (152 cm)
Resolution: 0.01 inches (0.254 mm)
Accuracy: 0.5% of reading or 0.125 inches (3.2 mm), whichever is greater

Pressure Depth
Range: 0-5 PSI up to 11.5 feet (3.5 m); 0-15 PSI up to 34.5 feet (10.5 m); or 0-30 PSI up to 69 feet (21.0 m)
Accuracy: +/-1.0% of full scale
Resolution: 0.01 inches (0.25 mm)

Surface Combo Sensor



Dimensions: 10.61 inches (269 mm) long x 2.03 inches (52 mm) wide x 2.45 inches (62 mm) high

This revolutionary new sensor features four technologies including surface velocity, ultrasonic depth, surcharge continuous wave velocity, and pressure depth.

Surface Velocity *
Minimum air range: 3 inches (76 mm) from the bottom of the rear, descended portion of the sensor
Maximum air range: 42 inches (107 cm)
Range: 1.00 to 15 feet per second (0.30 to 4.57 m/s)
Resolution: 0.01 feet per second (0.003 m/s)
Accuracy: +/-0.25 feet per second (0.08 m/s) or 5% of actual reading (whichever is greater) in flow velocities between 1.00 and 15 ft/sec (0.30 and 4.57 m/s)

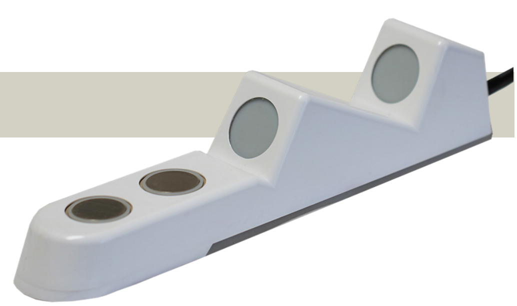
** The flow conditions existing in some applications may prevent the surface velocity technology from being used.*

Ultrasonic Depth
(*Does not require electronic offsets*)
Minimum dead band: 1.0 inches (25.4 mm) from the face of the sensor or 5% of the maximum range, whichever is greater
Maximum operating air range: 10 feet (3.05 m)
Resolution: 0.01 inches (0.25 mm)
Accuracy: +/- 0.125 inches (3.2 mm) with 0.0 inches (0 mm) drift, compensating for variations in air temperature

Surcharge Continuous Wave Velocity (*Under submerged conditions, this technology provides the same accuracy and range as* **Continuous Wave Velocity** *for Peak Combo Sensors*)

Surcharge Pressure Depth (*Under submerged conditions, this technology provides the same accuracy and range as* **Pressure Depth** *for Peak Combo Sensors*)

Ultrasonic Level Sensor



Dimensions: 10.61 inches (269 mm) long x 2.03 inches (52 mm) wide x 2.45 inches (62 mm) high

This non-intrusive, zero-drift sensing method results in a stable, accurate, and reliable flow depth calculation. Two independent ultrasonic transducers allow for independent cross-checking.

Ultrasonic Depth (*See* **Ultrasonic Depth** *Specifications Above*)

Product Specifications

Connectors
U.S. Military specification MIL-C 26482 series 1, for environmental sealing, with gold-plated contacts

Communications Options
- Quad band GSM/GPRS wireless modem
- Direct connection to PC using serial communication cable

Monitor Interfaces
Supports simultaneous interfaces with up to two combo sensors

Power
Internal - Battery life with a GPRS modem:
- Over 15 months at a 15-minute sample rate*
- Over 6 months at a 5-minute sample rate*

External - Optional external power available with ADS External Modem Unit (EMU) or External Multiplexer (EMUX) with an ADS- or customer-supplied 12-volt DC power supply

** Rate based on collecting data once a day and varies according to sensor configuration*

Operating and Storage Temperature
-4 degrees to 140 degrees F (-20 degrees to 60 degrees C)

Connectivity
- Modbus ASCII
- Modbus RTU
- Telog RU-33

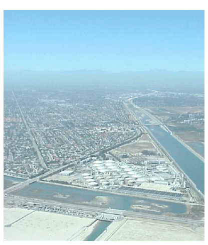
Intrinsic Safety Certification
- Certified under the ATEX European Intrinsic Safety standards for Zone 0 rated hazardous areas
- Certified under IECEx (International Electrotechnical Commission Explosion Proof) Intrinsic Safety standards for use in Zone 0/Class I, Division 1, Groups C&D rated hazardous areas
- CSA Certified to CLASS 2258 03 - Process Control Equipment, Intrinsically Safe and Non-Incendive Systems - For Hazardous Locations, Ex ia IIB T4 Ga

Other Certifications/Compliances
- FCC Part 15 and Part 68 compliant
- Carries the EU CE mark
- ROHS (lead-free) compliant
- Canada IC CS-03 compliant

ADS FLOW MONITORING APPLICATIONS

- Billing
- Inflow/Infiltration
- Model Calibration
- Combined Sewer Overflows (CSOs)
- Stormwater Monitoring
- Capacity Analysis
- Spill Notification

Examples of Return on Investment Using ADS Products and Services



Orange County, California

Investing $5.5 million in an updated strategic plan based on comprehensive flow and rainfall monitoring saved OCSD $46.5 million, a net savings of $41 million. The savings resulted from an improved flow monitoring plan that, acknowledging the impact of RDII, involved locating 150 flow monitors in equivalent-sized basins with proper hydraulic isolation.

Saved $41 million using a strategic monitoring plan

City of Los Angeles, California

Investing $4.5 million calibrating its hydraulic model during wet weather and then recalibrating during dry weather flow conditions saved the city $498 million in capital project eliminations and deferments, generating a 100-fold return on investment.

Saved $498 million in capital project eliminations and deferments costs

Belmont North, Indianapolis, Indiana

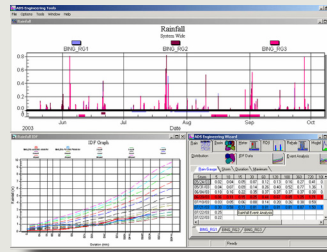
Investing approximately $650,000 in flow monitoring and $1 million in rehabilitation saved Indianapolis over $7 million in proposed relief line construction costs. This also reduced the contract period by 3 years and virtually eliminated basement floodings.

Saved $7 million in proposed relief line construction costs

ADS Flow Monitoring Software

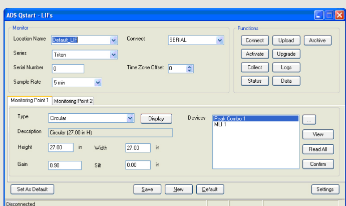
IntelliServe is web-hosted software providing real-time operational intelligence on the status of flow activity throughout the wastewater collection system. IntelliServe utilizes dynamic (or smart) alarming to inform clients about the occurrence of rain events, flow performance abnormalities, and data anomalies at the flow monitoring locations.

Sliicer.com is web-hosted software providing a powerful set of engineering tools designed for both the consulting and municipal engineer. Sliicer.com's inflow and infiltration tools examine wastewater collection system dry and wet weather flow data and provide rigorous performance measurements in one-tenth the time of other analysis tools.



FlowView Portal is web-hosted software providing robust report delivery, enabling the user to manage data, customize reports, and select viewing parameters. FlowView Portal has a virtually unlimited database for storing and accessing historical data, using data for comparison and trend analysis purposes, and sharing information electronically.

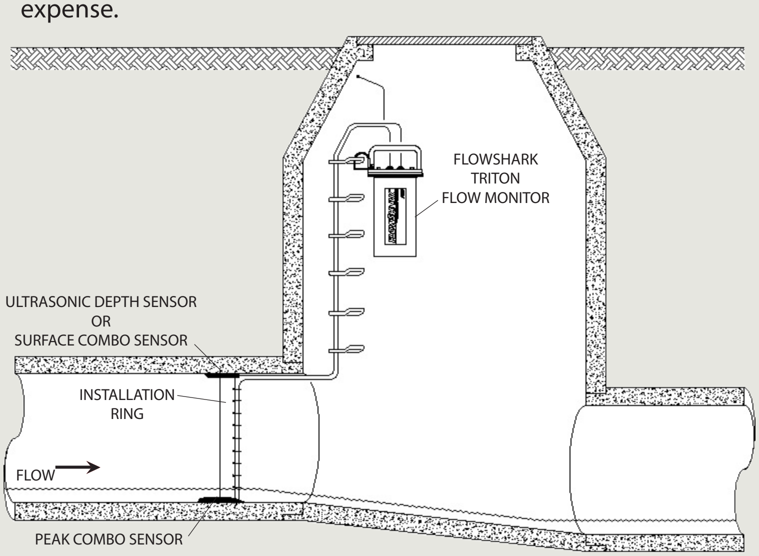
Profile is desktop software providing the industry's best data analysis tools, from basic flow monitoring data to complex hydraulic analysis. Profile is intuitive software that saves time and improves data quality by compiling project data into one location for analysis and reporting.



Q*start* is desktop software providing field crews with a simple, easy-to-use tool for quickly activating and configuring ADS flow monitors. Q*start* enables the user to collect and review the monitor's depth and velocity data in hydrograph and tabular views simultaneously.

Comprehensive Flow Monitoring from ADS

Comprehensive flow monitoring involves subdividing a sewershed into small and uniformly-sized meter basins to facilitate RDII volume and sewer operational capacity measurement at each metering point. This allows for distinguishing the causes from the symptoms. If the basin size is small enough, RDII in collection systems can follow Pareto's 80/20 principle. This principle indicates that 80% of the total volume of RDII entering a collection system will enter into just 20% of the system. Therefore, rehabilitation can be performed on a smaller portion of the system, saving time and expense.



All ADS sensors are mounted within the pipe section where depth and velocity are uniform as the flow passes the sensors. This ensures accurate flow quantification.

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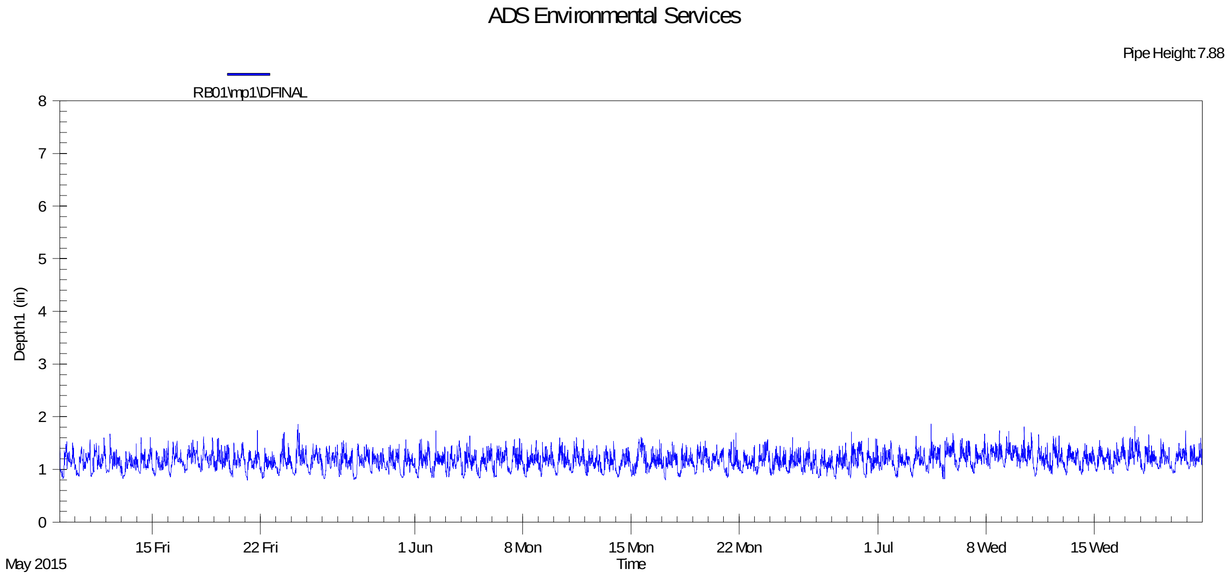
1300 Meridian Street, Suite 3000 - Huntsville, AL 35801
Phone: 256.430.3366/ Fax: 256.430.6633
Toll Free: 1.800.633.7246

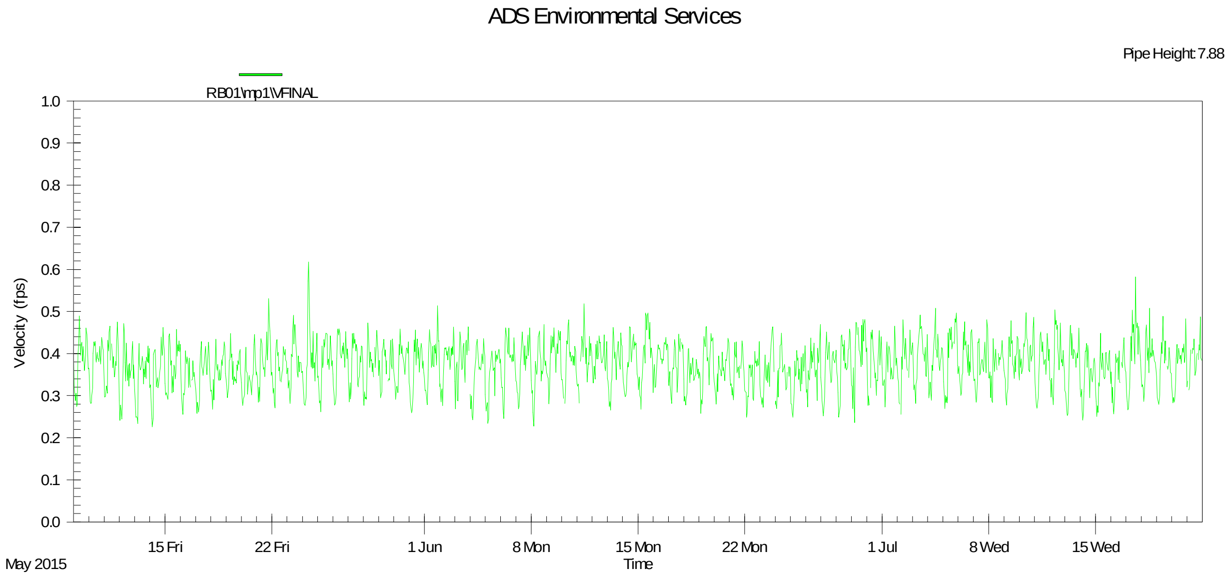
 Specifications subject to change without notice. DS-TRIT-03-26-14

Appendix C – Flow Monitor Data

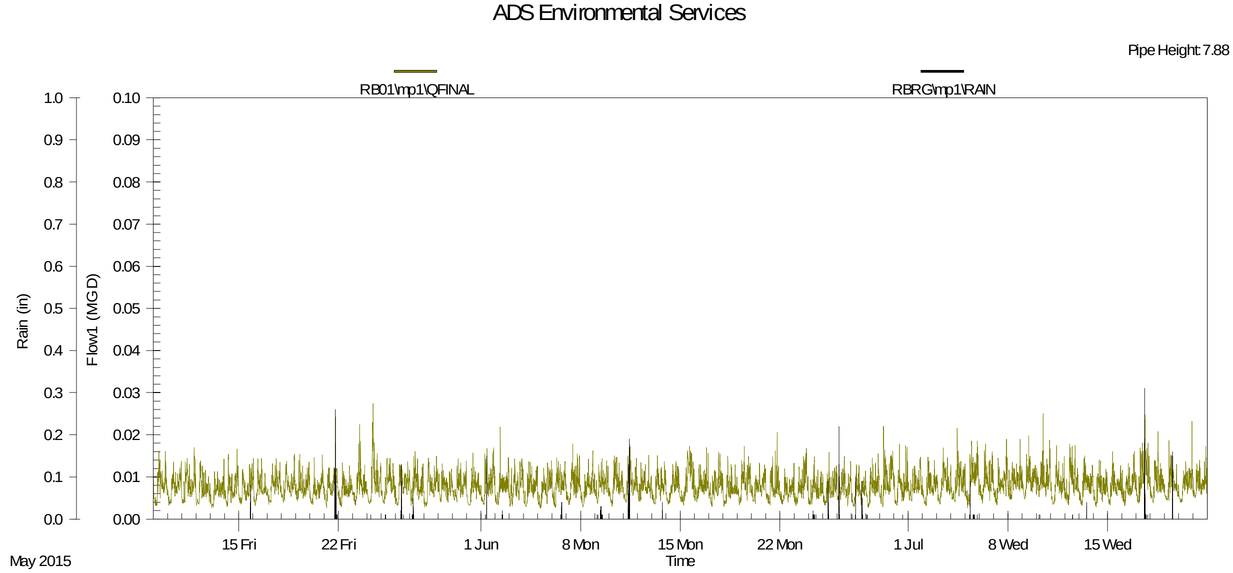
Flow Monitor RB01 – Flow Depth



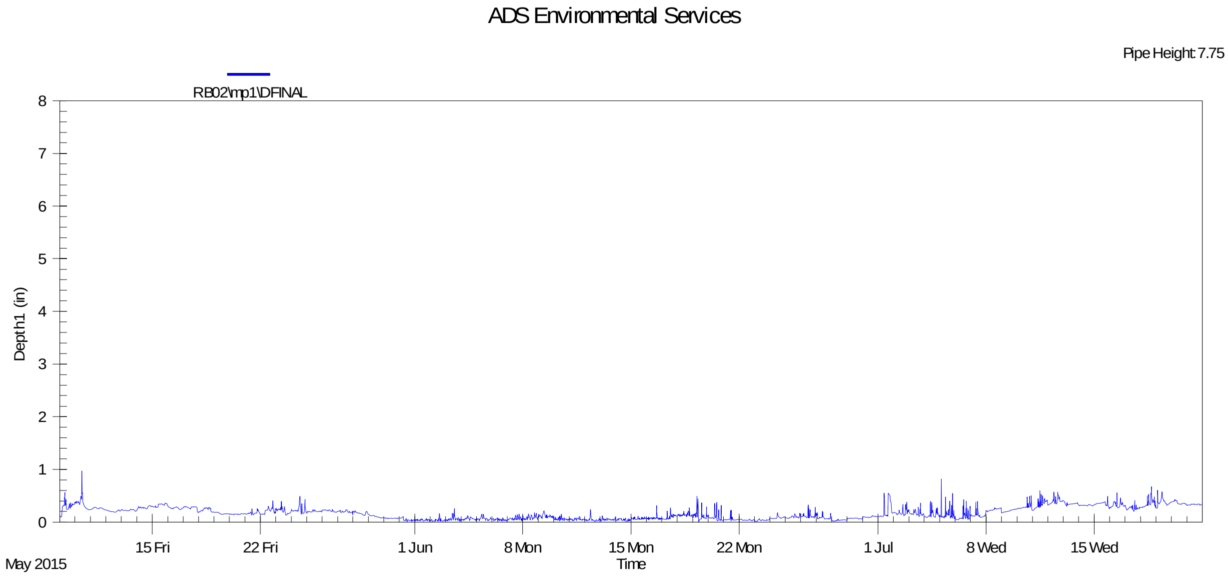
Flow Monitor RB01 – Flow Velocity



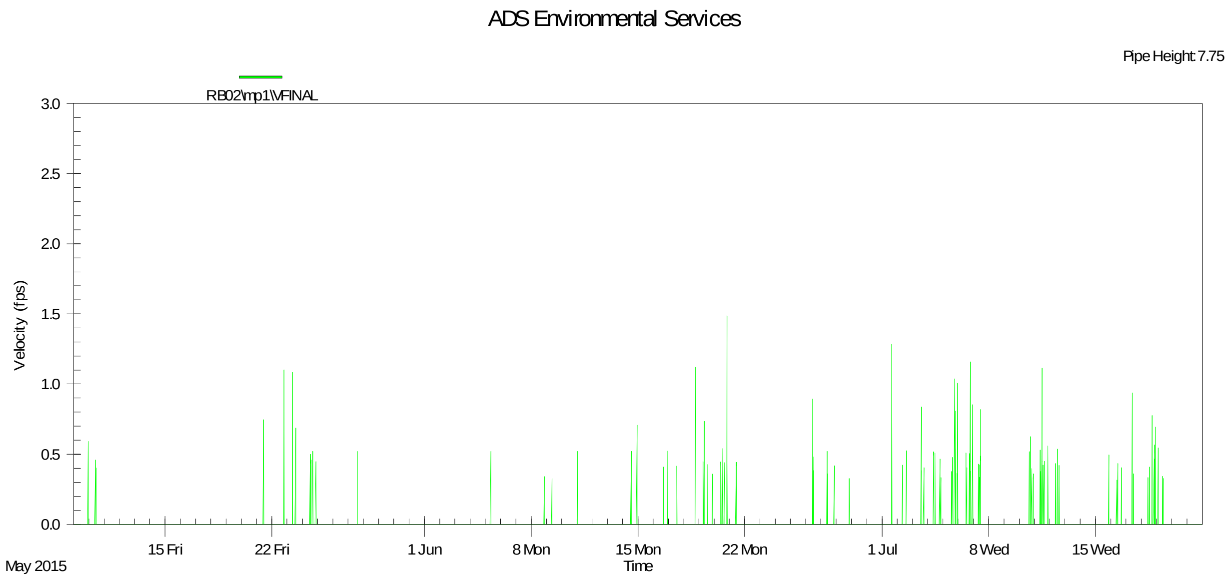
Flow Monitor RB01 – Flow Rate and Rainfall



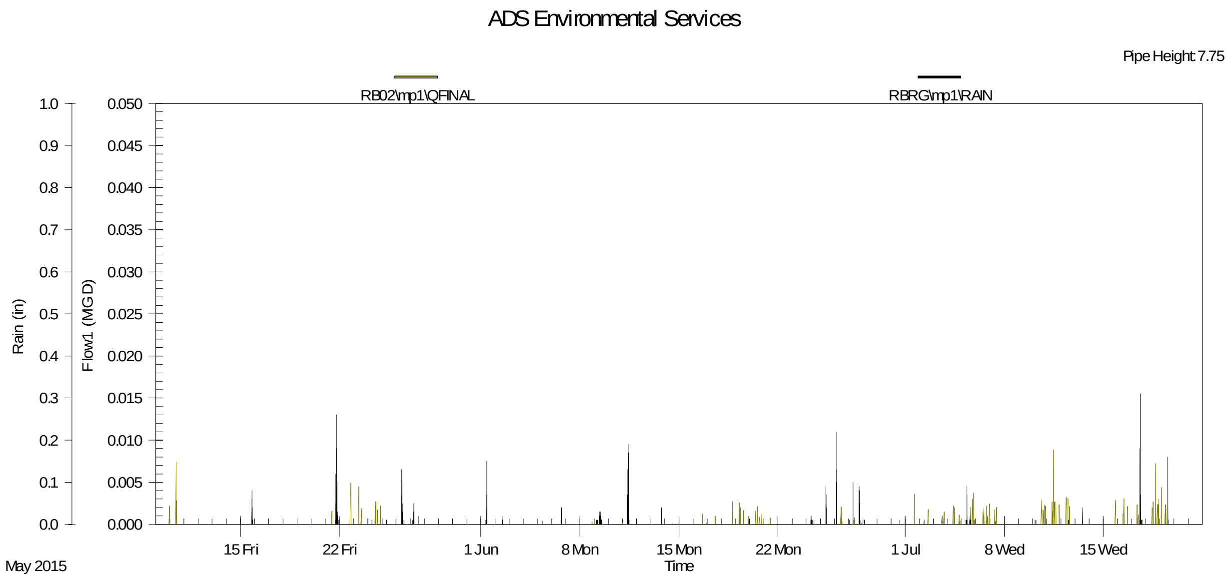
Flow Monitor RB02 – Flow Depth



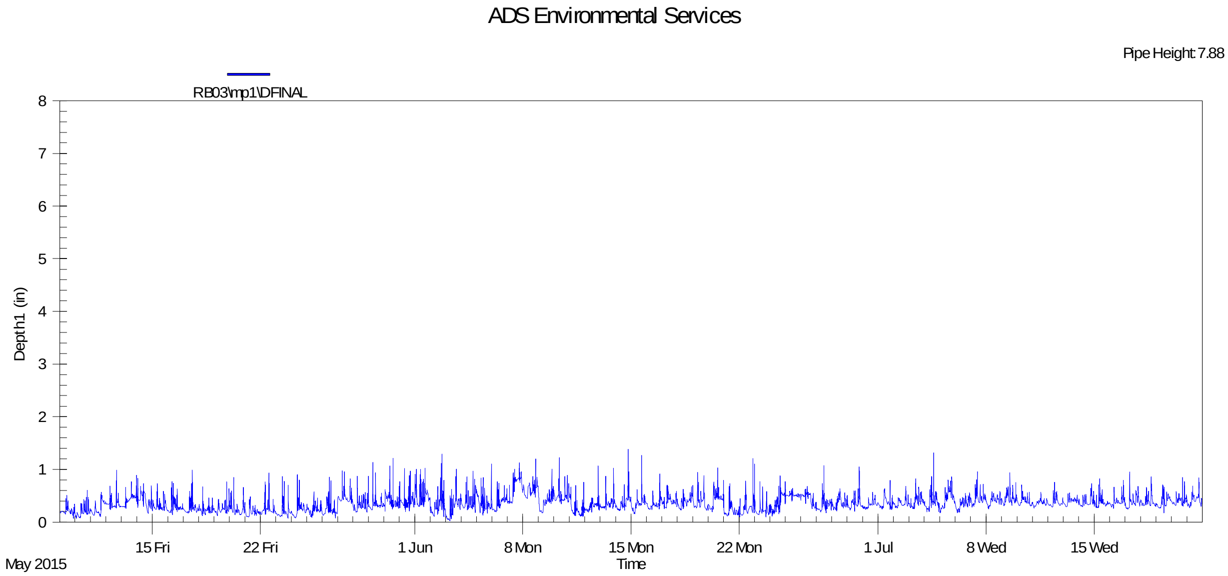
Flow Monitor RB02 – Flow Velocity



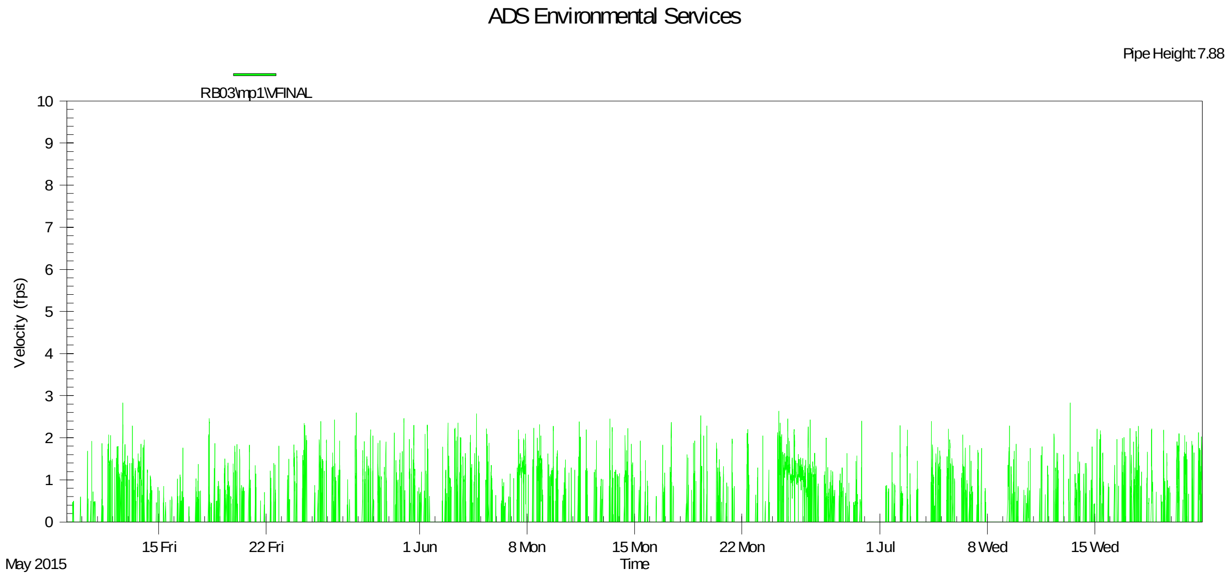
Flow Monitor RB02 – Flow Rate and Rainfall



Flow Monitor RB03 – Flow Depth



Flow Monitor RB03 – Flow Velocity



Flow Monitor RB03 – Flow Rate and Rainfall