DRAFT

HANDEX OF MARYLAND, INC., 1350 Blair Drive, Suite H, Odenton, MD 21113

August 13, 1996

Mr. Steven Coladonato
Project Engineer
Sun Company, Inc.
Ten Penn Center, 9th Floor
1801 Market Street
Philadelphia, Pennsylvania 19103-1699

RE: Short Pier Initial Investigation Report
SUN Philadelphia Refinery
Pt. Breeze Processing Area

Dear Mr. Coladonato,

Handex of Maryland, Inc. is pleased to submit this Initial Investigation Report for the Short Pier area of the SUN Philadelphia Refinery, Pt. Breeze Processing Area. This investigation was conducted because product sheens have been detected on the water surface of the Schuylkill River near the Short Pier. This report presents the investigative methods and results, a recommendation for further investigation and interim product remediation, and a conceptual design for long term product remediation.

SUMMARY

A subsurface investigation was performed at the Short Pier in the South Yard of the Pt. Breeze Processing Area, because product sheens were detected on the Schuylkill River. The Short Pier is located along the river, and is constructed of a concrete and steel bulkhead and a subsurface wood decking. There are numerous product sources in the area.

In July 1996, six monitoring wells were installed and gauged, and product samples were collected for analysis. The well installation involved continuous split-spoon sampling. The subsurface geology consists of clay, silt, sand, and gravel indicative of fill material, underlain by a silty clay. Wood decking was located at two of the wells. Ground water flows to the west towards the river, with tidal fluctuations affecting the area within 50 feet of the river.

Liquid phase and residual hydrocarbons were identified during the investigation. The liquid phase hydrocarbons were a mix of product types derived from the multiple product sources located to the east of the Short Pier. In addition, product may be migrating from the south along the river because the steel sheet piling impedes flow to the river. The product may be migrating into the river at openings in the bulkhead. In addition, product that accumulate in the void space below the decking may be released into the river during low tide when the river level is below the concrete facing. Product accumulates in the void space below the decking by seepage through the decking during low tide or by migrating on the water table east of the decking.

The remedial goal for the Short Pier is to prevent product from migrating into the Schuylkill River. This will require an additional investigation of the hydraulics in the area of the decking by installing a test trench to the top of the decking and determining the areal extent of the decking using ground penetrating radar (GPR). In the interim, product remediation at the Short Pier should include weekly bailing of product from the wells and recovery of any product detected in the test trench. Based on the current data, two conceptual remedial designs have been developed:

1. Installation of a recovery well upgradient of the decking to capture the product prior to the decking area, and a trench type recovery system on top of the decking near the shoreline to prevent product migration into the river.

2. Installation of a hanging wall onto the concrete facing to retain product in the void space below the decking, and installation of a recovery system to remove the product retained below the decking.

AREA DESCRIPTION

The Short Pier is located along the eastern shore of the Schuylkill River in the South Yard of the Pt. Breeze Processing Area as shown on Figure 1. A detailed site plan of the Short Pier is presented as Figure 2. The Short Pier area is currently utilized for the transfer of product employing barges that dock south of the investigation area. The area between the river and the product (above and below ground) piping, and the area east of River Road are both relatively level. There is a moderate upward slope from west to east in the area of the above and below ground product piping.

The bulkhead along the river is constructed of either steel sheet piling which extends to the river bottom or a concrete facing that extends to a few feet above the river's low tide level. There is a wood decking at the Short Pier, although maps depicting the precise location are not available. A schematic of the decking in the area of the concrete facing, including approximate river levels, is shown on Figure 3. This shows the

hydraulic connection between the river and the void space beneath the decking in the area where the concrete facing is present. The steel and concrete bulkheads meet at a notch that is not thoroughly sealed.

There are several product sources at the Short Pier area. Steel piping that transports product below the Schuylkill River emerges at the pipeline box (Figure 2). These pipes along with a numerous other product pipes are located above and below ground about 45 feet from the river. Additionally, there is a product processing area east of River Road, approximately 200 feet from the river.

INVESTIGATIVE METHODS

The initial investigation of the Short Pier area involved installation of six monitoring wells to determine hydrogeological conditions and evaluate for the presence and extent of product. Split-spoon samples were collected to evaluate the subsurface conditions. The investigation included gauging the wells for fluid levels and analysis of product samples collected from two wells.

Monitoring Well Installation

Six monitoring wells were installed at the Short Pier area on July 10 and 11, 1996, for subsurface hydrogeological and product data (Figure 2). Four wells (S-105 to S-108) are located along a line parallel to the Schuylkill River for evaluation of the area between the river and the product sources located to the east. Well S-109 is located about seven feet from the notch where the steel and concrete bulkheads connect. Product is suspected to be seeping into the river at this location; this area is referred to as the "seep" on Figure 2. The final well (S-110) is located at a sharp bend in the concrete wall that parallels the river along River Road. It is speculated that the wall, which extends at least 14 feet deep, serves as a barrier directing ground water and product parallel to the river until the bend in the wall where well S-110 is located. The wells were specified for installation to a total depth of ten feet below the water table. However, wells S-105 and S-109 were installed at shallower depths of 10 feet due to refusal on the wood decking at an elevation of approximately -2 feet.

The boreholes were drilled using hollow-stem augers operated from a mobile drill rig. The wells are constructed of 2-inch diameter, schedule 40, 0.020 slotted polyvinyl chloride (PVC) screen and 2-inch diameter, schedule 40, PVC casing. The annular space adjacent to the well screen was completed with #1 well gravel. The annular space above the well screen was sealed with hydrated granular bentonite. The remaining annulus was filled with a cement/bentonite grout. All of the wells were completed with a PVC stick-up and a protective casing, except S-109 which was completed flush to grade. Boring logs

depicting well construction details are provided in Appendix A.

Soil samples were collected from the boreholes at wells S-105 through S-109 for geologic logging, hydrogeologic and product data, and possible grain size analysis. The sampling interval started at a depth of 5 feet and continued to the total depth of the borehole using a 2-foot long spilt-spoon sampler. Split-spoon samples could not be collected from well S-110, because of overhead utilities which prevented raising the drill rig mast. One or more soil samples were collected from each spilt-spoon and placed in a 16-ounce sealed glass jar. These samples have been retained and may be submitted for grain size analyses if the data is necessary for remedial design.

Product Sampling

Product samples were collected from wells S-109 and S-110 using a disposable, teflon bailer on July 15, 1996. The samples were submitted to the Philadelphia Refinery's on-site laboratory for API gravity and boiling point distillation analyses. The laboratory report is attached in Appendix B.

Monitoring Well Gauging

The depth to fluid in the six monitoring wells (S-105 through S-110) were gauged several times from July 11 through August 9, 1996. The data was collected using an audible electronic oil/water interface probe. On July 11 and August 8, the wells were gauged during consecutive high and low tides. The gauging data is presented on Table 1. The water table elevations for those wells with product are corrected using a specific gravity of 0.75.

INVESTIGATIVE RESULTS

The geologic conditions at the Short Pier consist of interbedded clay, silt, sand, and gravel (probably fill material), underlain by a silty clay. The wood decking was identified at two of the wells. Ground water occurs under water table conditions and flows west towards the river. The wells near the river are affected by tidal fluctuations. Liquid phase and soil residual hydrocarbons were identified in the wells at the Short Pier. The product migrates to the Short Pier area from the product sources located to the east. The pathways for the product to reach the river include openings in the bulkhead or access to the void space below the decking which drains into the river at low tide. Product reaches the void space below the decking by seepage through the decking or migration on the water table east of the decking.

Geology

The subsurface geology was determined from the soil samples collected during well installation. Details regarding the geology at each well are presented on the boring logs (Appendix A). A geologic cross section parallel to the river (wells S-105 through S-108) is presented as Figure 4.

The geology in the area near the river is a mixture of clay, silt, sand, and gravel. The area has undergone significant construction disturbance, therefore much of the geology is probably fill material, although the precise depth of the fill material was not determined. The upper five to eight feet is a mixture of clay, silt, and sand that is indicative of fill material. This is underlain by sand and gravel with lesser interbedded clay to an elevation of -4 feet; this may also be fill material. The deepest layer identified is a silty clay with lesser interbedded sand that was logged to a an elevation of -9 feet. The exception to this silty clay layer is at well S-107 where coarse sediments (sand and gravel) continued to an elevation of -9 feet at which point the well was completed due to refusal on wood. None of the wells were installed beyond an elevation of -9 feet.

The subsurface wood decking was definitively identified at wells S-105 and S-109 at an elevation of approximately -2 feet. The wood decking was confirmed by at least two borings at each location and the elevation corresponded with the limited construction plans available for the area. A cross-sectional schematic of the decking is presented as Figure 4. Wood was also detected at well locations S-106, S-107, and S-108, but none of these cases were confirmed to be part of the wood decking. At well S-106, a 2-inch thick piece of wood was logged at an elevation of -3 feet, but the well was installed without refusal. Well S-107 was completed at an elevation of -9 feet due to wood refusal that may have been one of the stabilizing tie-backs; a second boring was not attempted. Wood was detected at well S-108 at an elevation of 0 feet; however, wood was not detected during the second boring.

The geology at well S-110 was not accurately identified, because neither spilt-spoon samples nor drill cuttings were available. According to the driller, the sediments from the surface to an elevation of 6 feet were loose and coarse indicative of fill material. The underlying material was also coarse, but seemed firmer.

Hydrogeology

Ground water at the Short Pier area is present as water table conditions in the unconsolidated sediments. Ground water flow is westerly toward the river. The topographically level area between the river and the product piping is impacted by the river's tidal fluctuations. The ground water gauging data is presented on Table 1.

The ground water elevation in the wells near the river (S-105 through S-109) ranges from 2 to -2 feet, and fluctuates in correspondence to the tidal variability of the river. The tidal fluctuation in these wells varies from 0.6 to 2.2 feet, and may be greater because wells S-105 and S-109 are often dry at low tide. The tidal fluctuation for each well on August 8 is presented as Figure 5.

At well S-110, the ground water elevation is 13 feet; this well is not impacted by tidal fluctuations. The ground water elevation in well S-110 is slightly higher than the ground surface on the other side of the wall, where water was seeping through cracks at the bottom of this wall. Although not noted on Table 1, the ground water elevation in well S-110 is about 7 feet higher than at wells S-70 and S-71 (located abut 120 feet to the east). Several explanations are possible, including ground water mounding at well S-110 caused by the wall retarding ground water flow, perched ground water at well S-110, or an easterly ground water flow component (0.06 ft/ft gradient).

The river stage near well S-109 varied about 5 feet on August 8, from an elevation of -5.1 feet at low tide to an elevation of -0.1 feet at high tide. The low tide elevation was below the concrete facing of the bulkhead.

Ground water flow at the Short Pier area is generally to the west towards the river, with a slight southwestern component to the flow near the river. The ground water serves as a recharge source to the river during both high and low tides. The water table gradient is approximately 0.08 feet per foot (ft/ft) at high tide and 0.10 ft/ft at low tide. Contoured ground water elevation maps for high and low tide on August 8 are presented as Figures 6 & 7.

Hydrocarbons

Liquid phase and residual soil hydrocarbons were detected during well installation and well gauging. The liquid phase hydrocarbons were comprised of mixed product types from the are numerous product sources located hydraulically upgradient of the Short Pier area. The product migrates from the product sources to the east to the Short Pier along the westerly ground water flow direction. In addition, product may migrate to the Short Pier area from the south parallel to the river because the sheet piling impedes ground water and product flow into the river.

Based on the data collected and knowledge of the subsurface, the product seems to migrate into the river by two pathways. During high tide, product is detected on the water table above the wood decking as evidenced by well S-109. The product seeps into the river during high tide through openings in the steel or concrete facing. A seep has been visually detected at the contact between the steel and concrete bulkheads, because

this contact is not completely sealed (noted as "seep" on Figure 2). Other seeps may be present, but have not been specifically identified.

As the river level recedes, the water level below the wood decking where the concrete bulkhead is present also recedes because it is hydraulically connected with the river. This creates a void space below the wood decking, where product may accumulate. When the river level recedes below the concrete facing, the product drains into the river. There are two possible pathways for the product to migrate into the void space below the decking:

- Product may seep through the decking. During low tide, the ground water elevation in well S-109 is at a similar elevation as the decking, therefore allowing the product to reach the decking. In turn, a void space within the decking or the void space below the decking may allow the product to drain from the well, evidenced by no product detected in the well S-109 at low tide.

- Product may migrate into the void space through the unconsolidated sediments east of the decking. This would require the ground water elevation east of the decking to be lower than the elevation of the decking. Because the location of the decking is uncertain, this pathway can not be confirmed.

Product has been detected in wells S-106, S-107, S-109, and S-110. The product data is presented in Table 1. A distribution map of the product thickness on August 8 at high and low tide is presented as Figure 8. The apparent product thickness in well S-106 has never been greater than 0.01 feet; residual hydrocarbons were detected during well installation from 0 to -5 feet.

At S-107, the maximum apparent product thickness was initially 0.01 feet (July 11-15), however, by August 8 the apparent product thickness reached a maximum of 1.56 feet. The product thickness in S-107 increases as the water level drops during low tide, indicative of product trapped between the soil pores. Residual hydrocarbons were detected during well installation at an elevation of -2 to -7 feet.

Product is consistently detected in well S-109 at high tide with an apparent product thickness of 0.41 to 1.87 feet. During low tide, the well is either dry (July 11) or product is not present in the well even though there is about 1 foot of water in the well (August 8 and 9). This is probably caused by the product draining into a highly porous void in the decking or the void below the decking. As the water level rises during high tide, the product is forced upward into the lower permeability material of the unconsolidated sediments, which forces the product to move into the well. Residual hydrocarbon were detected in the top eight inches of the wood, but were not detected in the formation.

Product has been consistently detected in well S-110 at an apparent thickness ranging from less than 0.01 feet to 0.47 feet; this well is not affected by tidal fluctuations. The fluid level in this well is at a similar elevation as the product seeps detected at the bottom of the wall adjacent to the well.

Product has not been detected in wells S-105 and S-108; however, residual hydrocarbon were detected in well S-108 from an elevation of -2 to -4 feet. Although product has not been detected at wells S-70 and S-71 since December 1995, the screened interval of these wells is unknown, so the water table may be above the well screen which would prevent product from entering the well.

The product samples collected from wells S-109 and S-110 exhibited different types of product. The laboratory analytical data is presented in Appendix B. Well S-107 was not sampled because sufficient volumes of product were not detected in the well until August 8; a product sample will be collected in the near future. The API gravity for well S-109 was 38.4 degrees API as compared to 47.4 degrees API for the sample from S-110. The boiling point distillation curves are presented in graphical format on Figures 9a and 9b, and compared to the crude oil distillation curve. The product distribution for each sample are presented in Table 2. The product sample from well S-109 is a mixture of product types, whereas, the product sample from well S-110 is predominantly lighter end product types (gasoline and naphtha). The mixture of product types at well S-109 would be expected because it is located hydraulically downgradient of multiple product sources.

RECOMMENDATIONS

Further Investigation

The hydrogeologic system in the area of well S-109 requires additional investigation to determine the following:

* The hydraulic connection between the unconsolidated sediments, the wood decking, and the void space below the decking
* The migration of product during low tide
* The lateral and vertical extent of the product

A test trench located directly north of well S-109 and parallel to the river is recommended to visually evaluate the top of the decking. The trench will be approximately 2-feet wide by 6-8 feet long, and excavated to the top of the decking (approximately 10 feet deep). This trench can then be utilized for interim product recovery. Within the trench, ground water and product levels can be evaluated during tidal fluctuations, and the status of the product during low tide can be investigated. The

areal extent of the wood deck will be investigated using ground penetrating radar (GPR) methodology.

Interim Remediation

In the interim, during which the further investigations will proceed, the following product remediation is suggested:

- Manually bail product from wells S-107, S-109, and S-110 weekly
- Recover product from the test trench using sorbents or a vacuum recovery truck

Future Remediation

The initial and proposed investigations will be evaluated to determine the most efficient and cost effective method to prevent product from reaching the Schuylkill River. Two possible remedial techniques are presented below as conceptual designs, with additional options possible based on the further investigations and the interim remediation results:

Option #1

- Analyze the soils from well S-107 for grain size to design a recovery well
- Install a recovery well at the location of well S-107
- Install a ground water pump in the recovery well to control product migration from the east towards the river
- Install a product pump in the recovery well to recover the product captured by the ground water cone of depression
- Install a product skimmer system in the test trench and recover the product using the following options: sorbent, vacuum truck, or pump

Option #2

- Install a hanging wall along the concrete bulkhead from the "seep" to the southern boundary of the pipeline box, and along the southern boundary of the pipeline box. The hanging wall would extend below the level of low tide to retain product in the void space below the decking.
- Create one or more apertures in the decking to allow the product to freely drain into this contained void space
- Install an automated oil mop at the fluctuating water surface below the decking to recover the retained product.

Option #2 will prevent product movement into the river more quickly than Option #1; however, installation of a hanging wall may be the most expensive task presented above.

DRAFT

If you have any questions about this report of the project, please feel free to contact either of the undersigned at (410) 674-3200.

Sincerely,

Arsin M. Sahba
Senior Hydrogeologist

Glen Somes
Director,
Industrial & Non-Retail Environmental Services

AMS/GS:bw

Attachment

(...\sahba\sun-ptbz\shrtpier.rpt)

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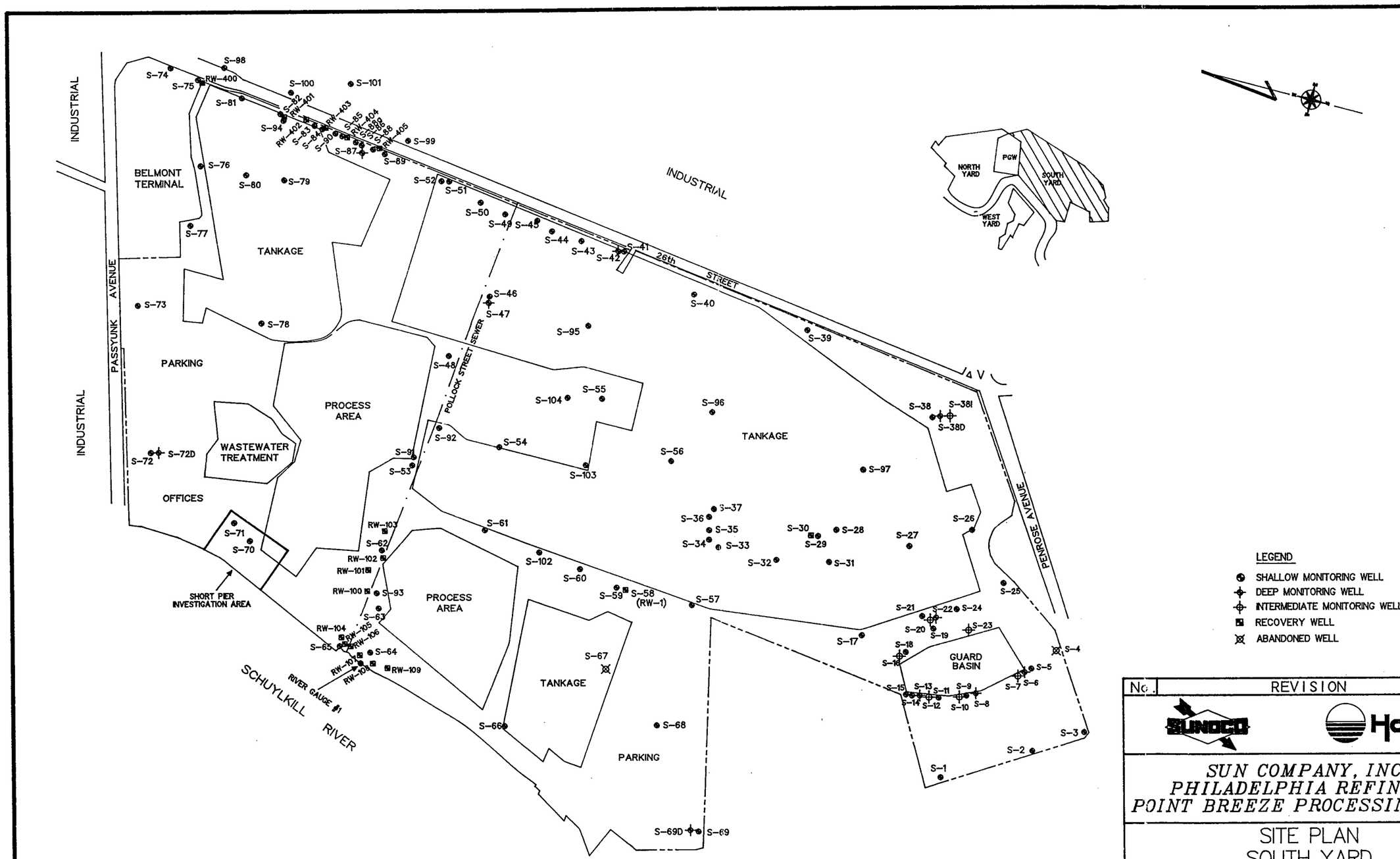
FIGURES

Handex®



NOTE: RW-401 WAS FORMERLY S-94
RW-403 WAS FORMERLY S-90

LEGEND

- SHALLOW MONITORING WELL
- DEEP MONITORING WELL
- INTERMEDIATE MONITORING WELL
- RECOVERY WELL
- ABANDONED WELL

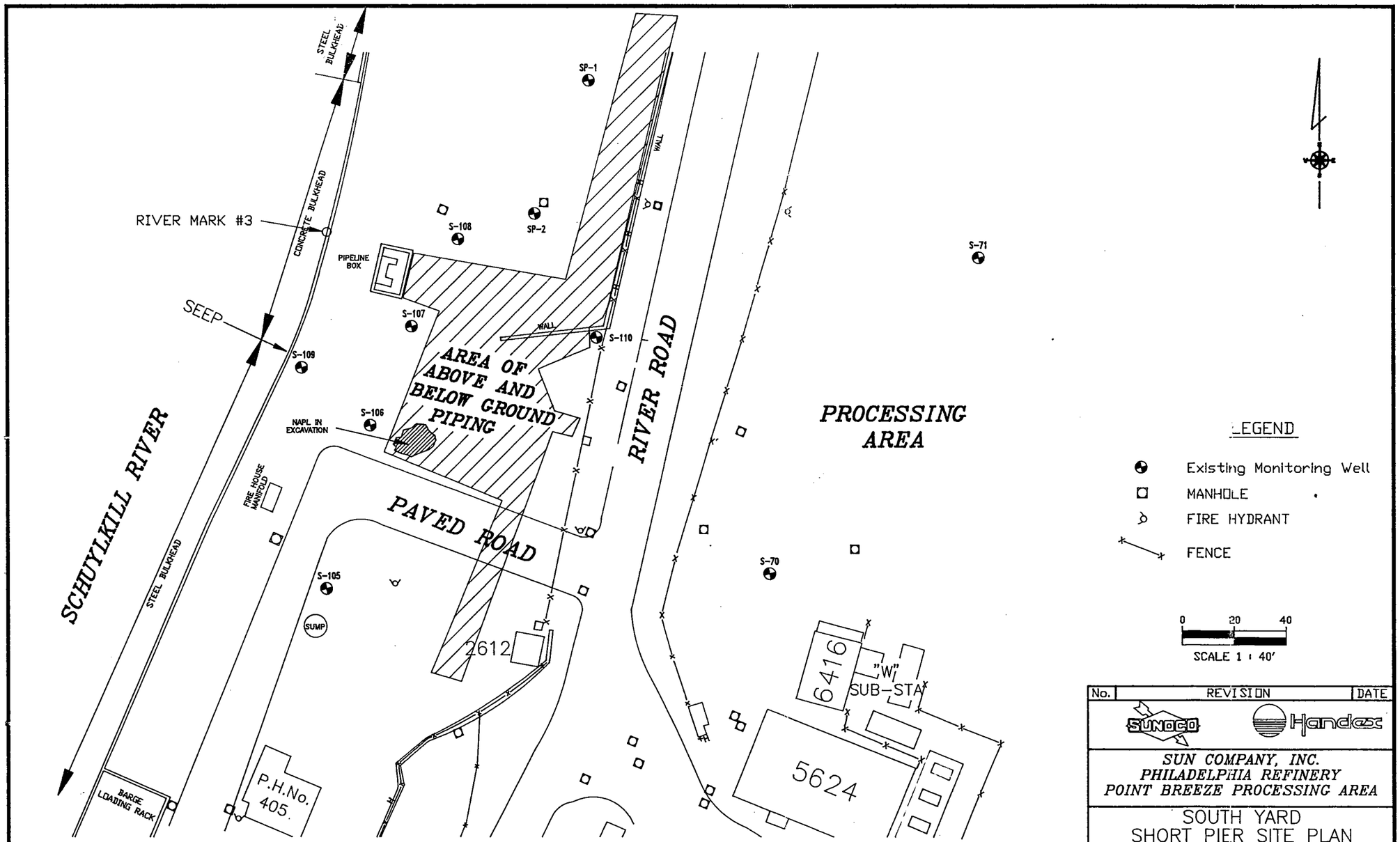
No.	REVISION	DATE

SUNOCO Handex

SUN COMPANY, INC.
PHILADELPHIA REFINERY
POINT BREEZE PROCESSING AREA

SITE PLAN
SOUTH YARD

SCALE – 1" = 600'	JOB No. – 110535-01
DRAWN BY – J. Gurry	REV BY. – JMG 8/12/96
CHECKED BY –	DWG. NAME – 110535SY
DATE – 04/09/96	DWG. No. –



No.	REVISION	DATE

SUNOCO Handex

SUN COMPANY, INC.
PHILADELPHIA REFINERY
POINT BREEZE PROCESSING AREA

SOUTH YARD SHORT PIER SITE PLAN

SCALE - 1" = 40'	JOB No. - 110535-13
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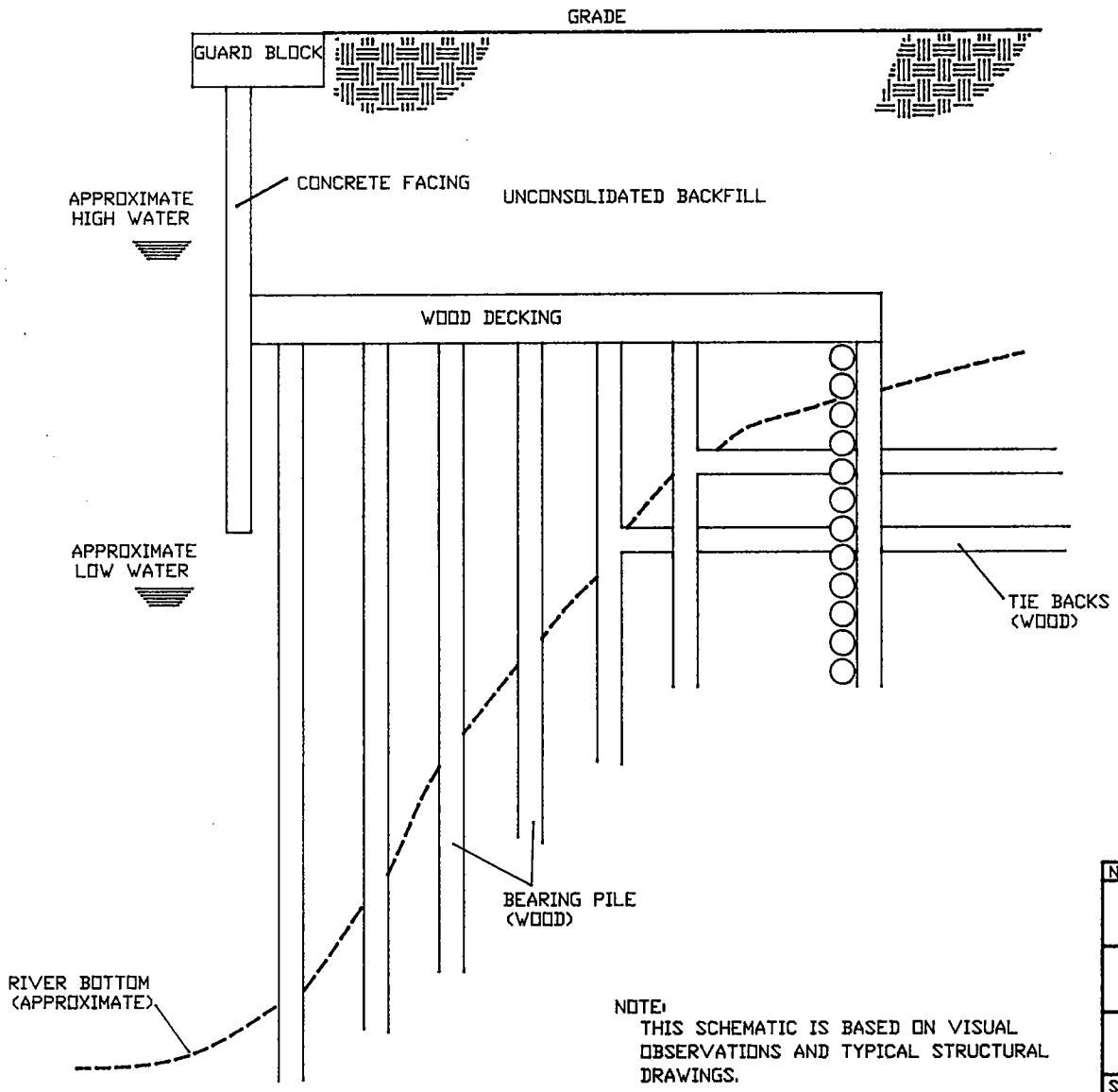
CHECKED BY -	DWG. NAME -PB_SP_05
DATE - 07/24/96	DWG. No. -



NOTE:
THIS SCHEMATIC IS BASED ON VISUAL OBSERVATIONS AND TYPICAL STRUCTURAL DRAWINGS.

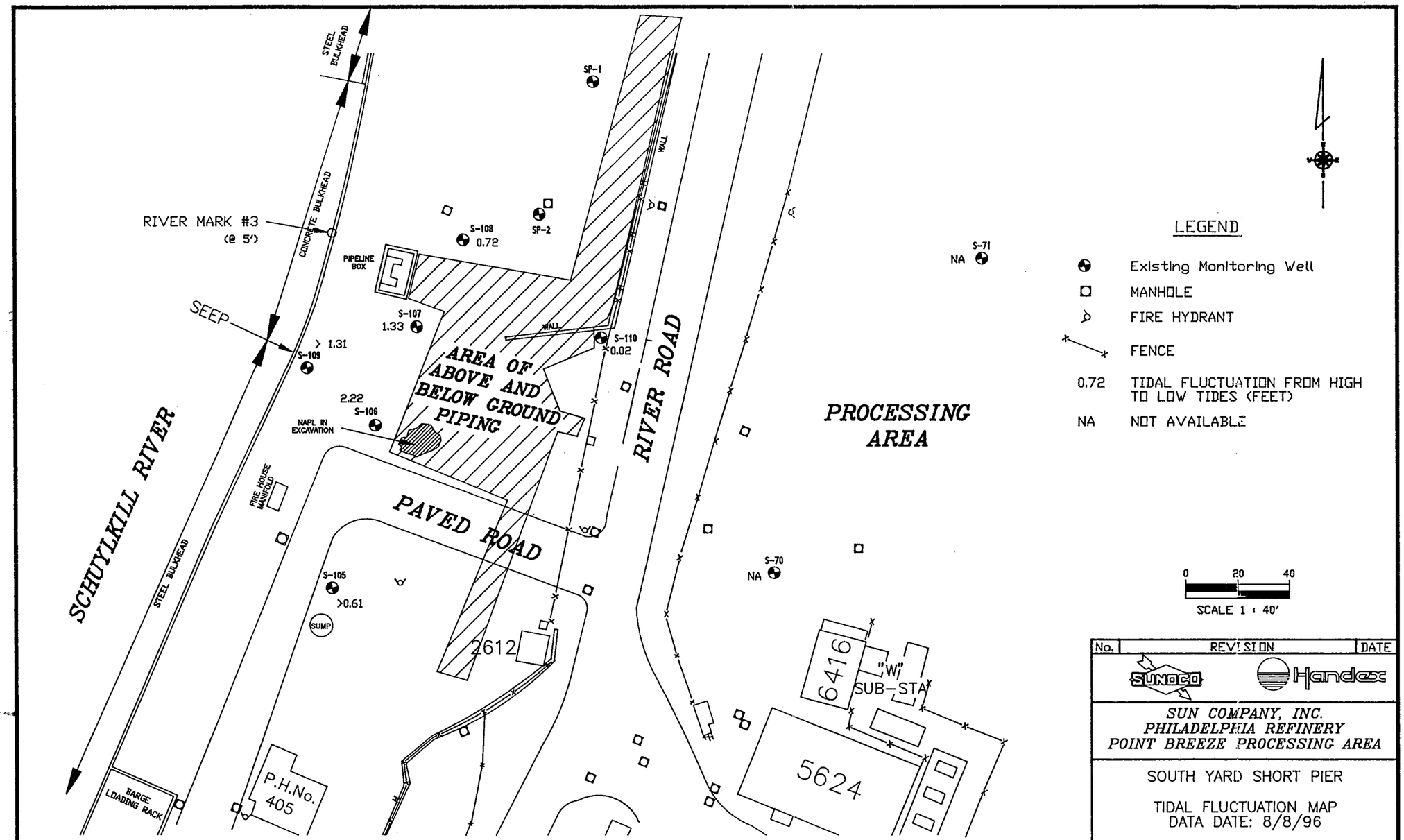
No.	REVISION	DATE

SUNOCO Handex

SUN COMPANY, INC.
PHILADELPHIA REFINERY
POINT BREEZE PROCESSING AREA

SOUTH YARD – SHORT PIER
SCHEMATIC CROSS-SECTION OF
DECKING CONSTRUCTION

SCALE -NOT TO SCALE	JOB No. - 110535-13
DRAWN BY - A. Taylor	REV BY. -
CHECKED BY -	DWG. NAME - PB_SP_XS
DATE - 08/08/96	DWG. No. -



LEGEND

- Existing Monitoring Well
- MANHOLE
- FIRE HYDRANT
- FENCE
- 0.72 TIDAL FLUCTUATION FROM HIGH TO LOW TIDES (FEET)
- NA NOT AVAILABLE

0 20 40

SCALE 1 : 40'

No.	REVISION	DATE

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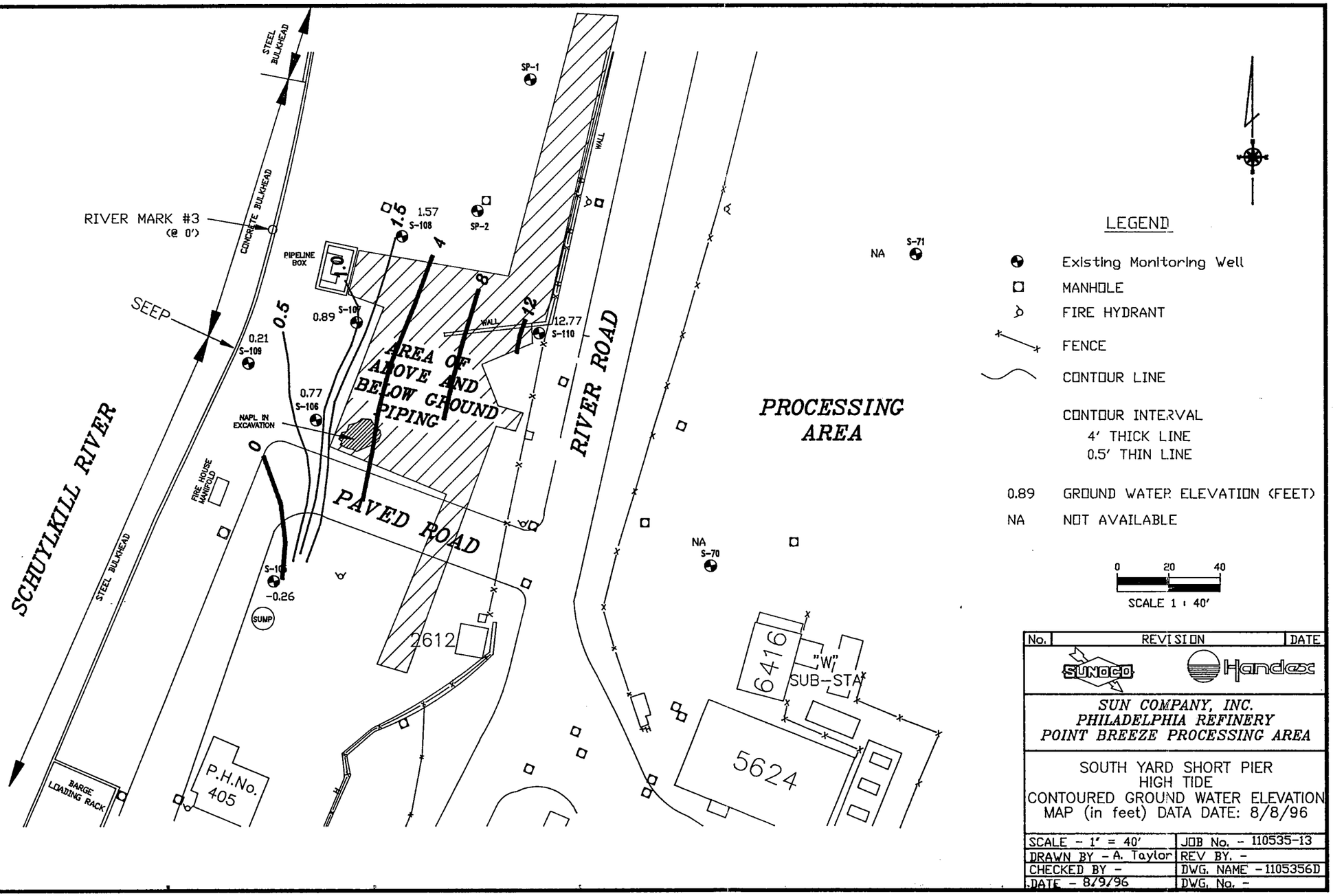
SUN COMPANY, INC.
PHILADELPHIA REFINERY
POINT BREEZE PROCESSING AREA

SOUTH YARD SHORT PIER

TIDAL FLUCTUATION MAP
DATA DATE: 8/8/96

SCALE - 1' = 40'	JOB No. - 110535-13
DRAWN BY - A. Taylor	REV BY. -
CHECKED BY -	DWG. NAME - 110535T1
DATE - 8/9/96	DWG. No. -



No.	REVISION	DATE

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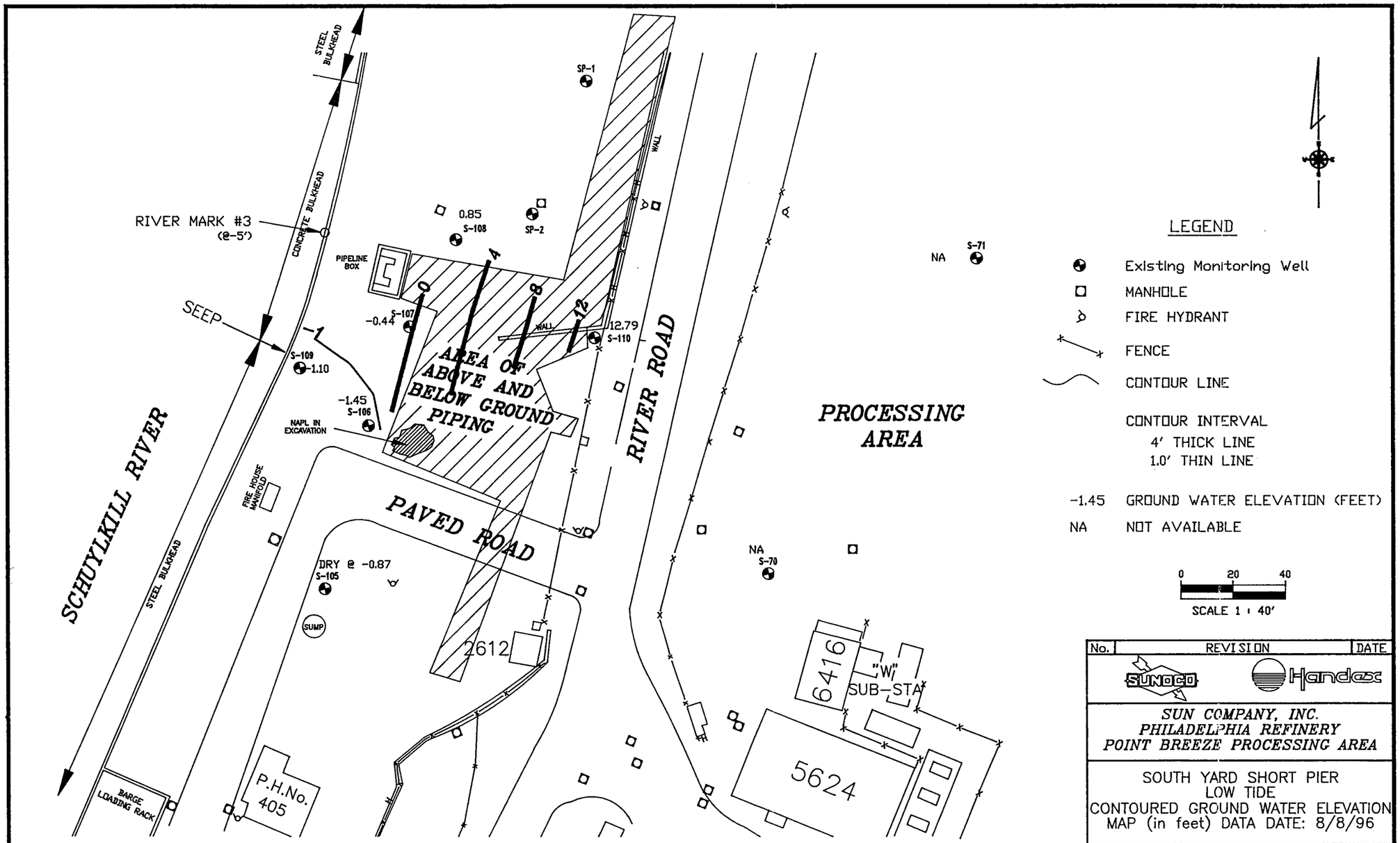
PHILADELPHIA REFINERY
POINT BREEZE PROCESSING AREA

SOUTH YARD SHORT PIER
HIGH TIDE
CONTOURED GROUND WATER ELEVATION
MAP (in feet) DATA DATE: 8/8/96

SCALE - 1' = 40'	JOB No. - 110535-13
DRAWN BY - A. Taylor	REV BY. -
CHECKED BY -	DWG. NAME - 1105356D
DATE - 8/9/96	DWG. No. -



LEGEND

- Existing Monitoring Well
- MANHOLE
- FIRE HYDRANT
- FENCE
- CONTOUR LINE

CONTOUR INTERVAL
4' THICK LINE
1.0' THIN LINE

-1.45 GROUND WATER ELEVATION (FEET)

NA NOT AVAILABLE

0 20 40
SCALE 1 : 40'

No.	REVISION	DATE

SUNOCO Handex

SUN COMPANY, INC.
PHILADELPHIA REFINERY
POINT BREEZE PROCESSING AREA

SOUTH YARD SHORT PIER
LOW TIDE
CONTOURED GROUND WATER ELEVATION
MAP (in feet) DATA DATE: 8/8/96

SCALE - 1' = 40'	JOB No. - 110535-13
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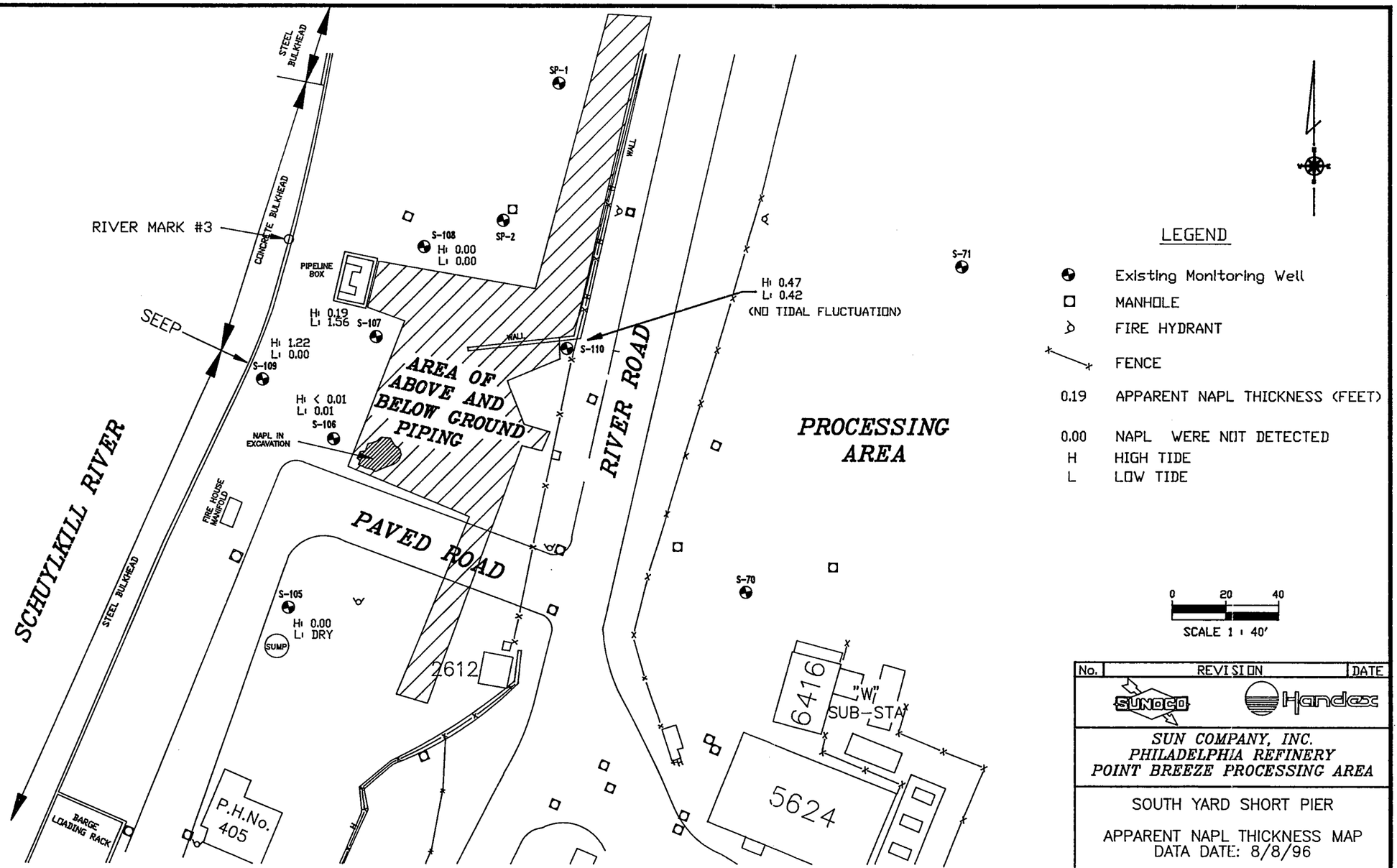
CHECKED BY -	DWG. NAME - 1105356C
DATE - 8/9/96	DWG. No: -



No.	REVISION	DATE

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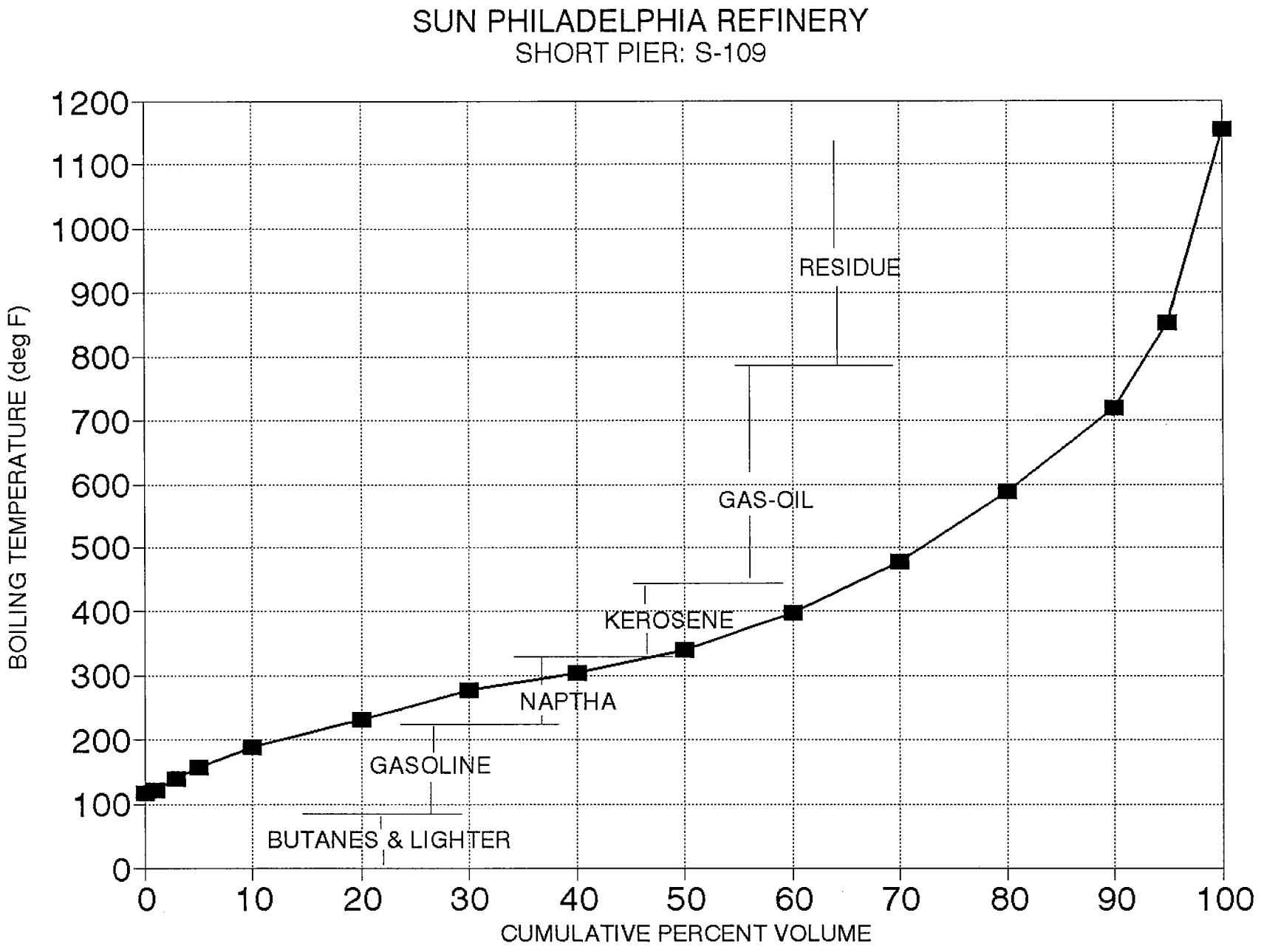
SUN COMPANY, INC.
PHILADELPHIA REFINERY
POINT BREEZE PROCESSING AREA

SOUTH YARD SHORT PIER

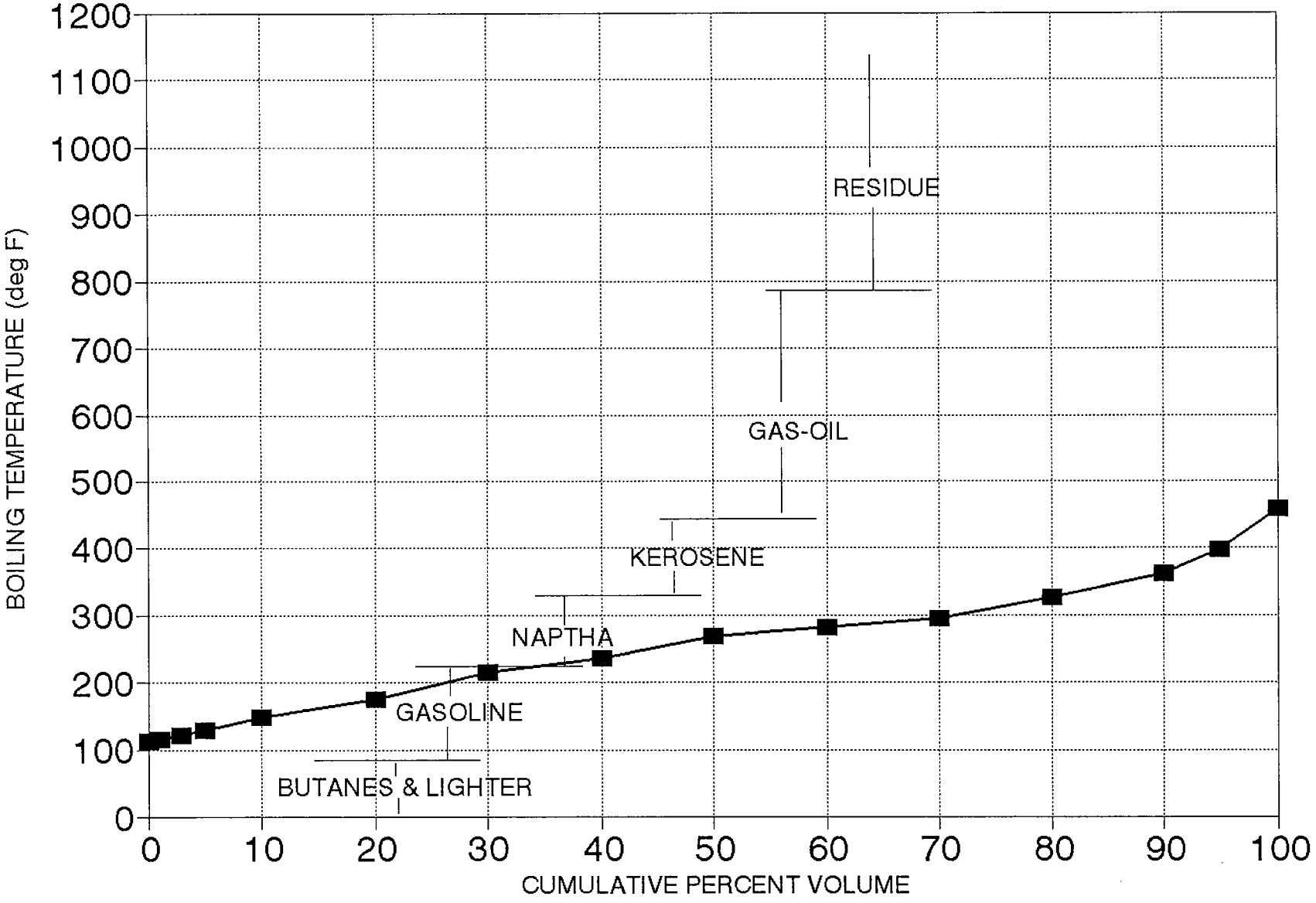
APPARENT NAPL THICKNESS MAP
DATA DATE: 8/8/96

SCALE - 1' = 40'	JOB No. - 110535-13
DRAWN BY - A. Taylor	REV BY. -
CHECKED BY -	DWG. NAME - 110535N1
DATE - 8/9/96	DWG. No. -


SUN PHILADELPHIA REFINERY
SHORT PIER: S-109
BOILING TEMPERATURE (deg F)
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
RESIDUE
GAS-OIL
KEROSENE
NAPTHA
GASOLINE
BUTANES & LIGHTER
0
10
20
30
40
50
60
70
80
90
100
CUMULATIVE PERCENT VOLUME

SUN PHILADELPHIA REFINERY

SHORT PIER: S-110



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TABLES

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TABLE 1
GAUGING DATA
SUN - PHILADELPHIA REFINERY
PT. BREEZE PROCESSING AREA
SOUTH YARD - SHORT PIER

DATE	WELL #	TIDE	NAPL DEPTH (feet)	WATER DEPTH (feet)	NAPL THICKNESS (feet)	NAPL ELEVATION (feet)	WATER ELEVATION (feet)	CORRECTED WATER ELEVATION (feet)	COMMENTS
11-Jul-96	S-105	HIGH		10.54			0.14	0.14	
11-Jul-96	S-105	LOW		DRY			DRY	DRY	DRY @ -0.94 ft
12-Jul-96	S-105	HIGH		10.36			0.32	0.32	
15-Jul-96	S-105	HIGH		10.14			0.54	0.54	
08-Aug-96	S-105	HIGH		10.94			-0.26	-0.26	
08-Aug-96	S-105	LOW		DRY			DRY	DRY	DRY @ -0.87 ft
11-Jul-96	S-106	HIGH	10.95	10.95	<0.01	0.51	0.51	0.51	
11-Jul-96	S-106	LOW	12.93	12.93	<0.01	-1.47	-1.47	-1.47	
12-Jul-96	S-106	HIGH		10.83			0.63	0.63	
15-Jul-96	S-106	HIGH		10.29			1.17	1.17	
08-Aug-96	S-106	HIGH	10.69	10.69	<0.01	0.77	0.77	0.77	
08-Aug-96	S-106	LOW	12.91	12.92	0.01	-1.45	-1.46	-1.45	
11-Jul-96	S-107	HIGH	8.78	8.78	<0.01	0.68	0.68	0.68	
11-Jul-96	S-107	LOW	9.87	9.88	0.01	-0.41	-0.42	-0.41	
12-Jul-96	S-107	HIGH		8.71			0.75	0.75	
15-Jul-96	S-107	HIGH		8.38			1.08	1.08	
08-Aug-96	S-107	HIGH	8.52	8.71	0.19	0.94	0.75	0.89	
08-Aug-96	S-107	LOW	9.51	11.07	1.56	-0.05	-1.61	-0.44	
11-Jul-96	S-108	HIGH		7.61			1.27	1.27	
11-Jul-96	S-108	LOW		8.20			0.68	0.68	
12-Jul-96	S-108	HIGH		7.53			1.35	1.35	
15-Jul-96	S-108	HIGH		7.27			1.61	1.61	
08-Aug-96	S-108	HIGH		7.31			1.57	1.57	
08-Aug-96	S-108	LOW		8.03			0.85	0.85	
11-Jul-96	S-109	HIGH	8.03	8.44	0.41	-0.62	-1.03	-0.72	
11-Jul-96	S-109	LOW		DRY			DRY	DRY	DRY @ -2.03 ft
12-Jul-96	S-109	HIGH	7.13	8.45	1.32	0.28	-1.04	-0.05	
15-Jul-96	S-109	HIGH	6.57	8.44	1.87	0.84	-1.03	0.37	
08-Aug-96	S-109	HIGH	6.90	8.12	1.22	0.51	-0.71	0.21	
08-Aug-96	S-109	LOW		8.51			-1.10	-1.10	
09-Aug-96	S-109	LOW		8.62			-1.21	-1.21	
11-Jul-96	S-110	HIGH	14.50	14.52	0.02	13.13	13.11	13.13	
11-Jul-96	S-110	LOW	14.50	14.50	<0.01	13.13	13.13	13.13	
12-Jul-96	S-110	HIGH	14.67	14.81	0.14	12.96	12.82	12.93	
15-Jul-96	S-110	HIGH	14.63	14.99	0.36	13.00	12.64	12.91	
08-Aug-96	S-110	HIGH	14.74	15.21	0.47	12.89	12.42	12.77	
08-Aug-96	S-110	LOW	14.74	15.16	0.42	12.89	12.47	12.79	
08-Aug-96	RIVER	HIGH		7.50			-0.10	-0.10	Approx. Value
08-Aug-96	RIVER	LOW		12.50			-5.10	-5.10	Approx. Value
09-Aug-96	RIVER	LOW		12.40			-5.00	-5.00	Approx. Value

TABLE 2

SHORT PIER: CUMULATIVE PERCENTAGE OF PRODUCT TYPES BASED ON THE CRUDE OIL DISTILLATION CURVE

SUN - PHILADELPHIA REFINERY
PT. BREEZE PROCESSING AREA

PRODUCT TYPE	S-109	S-110
Butanes & Lighter	0%	0%
Gasoline	18%	35%
Naphtha	28%	46%
Kerosene	20%	17%
Gas - Oil	26%	2%
Residue	8%	0%

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APPENDIX A

BORING LOGS

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APPENDIX B

PRODUCT ANALYTICAL DATA

Handex®

Sample ID: 200244913 User Sample ID: SPCL SHORT PIER S109
Date Logged: 08/05/96 10:13 Sample Type: XXXXXX UNDEFINED PRODUCT
Tag Date: Material Name: MISC. UNDEFINED PRODUCT
Assoc'd ID: Material Type: PLANT SAMPLE
Status: COMPLETE Condition: APPROVED
Comments: OIL SAMPLES FROM WEL Batch:

Component	Units	Result	MinSpec	MaxSpec
API GRAVITY	deg API	38.4		
INITIAL BOILING POINT (GC)	deg F	117		
01 % (GC)	deg F	121		
03 % (GC)	deg F	140		
05 % (GC)	deg F	157		
10 % (GC)	deg F	189		
20 % (GC)	deg F	231		
30 % (GC)	deg F	277		
40 % (GC)	deg F	305		
50 % (GC)	deg F	341		
60 % (GC)	deg F	398		
70 % (GC)	deg F	479		
80 % (GC)	deg F	588		
90 % (GC)	deg F	720		
95 % (GC)	deg F	853		
END POINT (GC)	deg F	1154		

Sample ID: 200244915 User Sample ID: SPCL SHORT PIER S110
Date Logged: 08/05/96 10:18 Sample Type: XXXXXX UNDEFINED PRODUCT
Tag Date: Material Name: MISC. UNDEFINED PRODUCT
Assoc'd ID: Material Type: PLANT SAMPLE
Status: COMPLETE Condition: APPROVED
Comments: OIL SAMPLE FROM WELL Batch:

Component	Units	Result	MinSpec	MaxSpec
API GRAVITY	deg API	47.5		
INITIAL BOILING POINT (GC)	deg F	113		
01 % (GC)	deg F	114		
03 % (GC)	deg F	122		
05 % (GC)	deg F	129		
10 % (GC)	deg F	148		
20 % (GC)	deg F	174		
30 % (GC)	deg F	216		
40 % (GC)	deg F	235		
50 % (GC)	deg F	268		
60 % (GC)	deg F	283		
70 % (GC)	deg F	295		
80 % (GC)	deg F	327		
90 % (GC)	deg F	363		
95 % (GC)	deg F	399		
END POINT (GC)	deg F	458		