

GROUNDWATER MONITORING PLAN
COMMENT/RESPONSE REPORT
LENA ROAD LANDFILL
PERMIT NUMBER 5041-211176
BRADENTON, MANATEE COUNTY, FLORIDA
PSI PROJECT NO. 378-4L015

RECEIVED
MAR 14 1995

Department of Environmental Protection
SOUTHWEST DISTRICT
BY _____



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MAR 7 - 1995
SOLID WASTE



Professional Service Industries, Inc.
Environmental & Analytical Division

February 21, 1995

Manatee County Public Works/Utilities
Solid Waste Management Division
3333 Lena Road
Bradenton, Florida 34202

Attention: Mr. Greg Yekaitis

D.E.P.

MAR 14 1995

SOUTHWEST DISTRICT
— TAMPA

Re: Groundwater Monitoring Plan
Comment/Response Addendum Report
Lena Road Landfill
Permit Number 5041-211176
Bradenton, Manatee County, Florida
PSI Project Number: 378-4L015

Dear Mr. Yekaitis:

In compliance with your instructions, Professional Service Industries, Inc. (PSI) has prepared a Comment/Response Addendum for the above-referenced project. The results of the addition evaluation are found in the accompanying report.

PSI appreciates the opportunity to be of service. Should you have any questions, please do not hesitate to contact us.

Respectfully submitted,

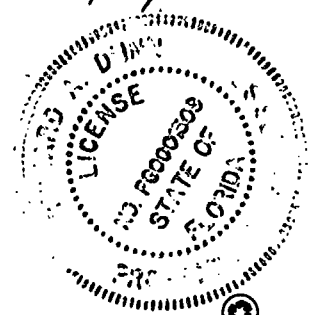
PROFESSIONAL SERVICE INDUSTRIES, INC.

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Project Manager
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(1) Copy to: Lynn Bramble, Public Services Director
Daniel Gray, Utility Operations Manager
Gus DiFonzo, Solid Waste Manager

**GROUNDWATER MONITORING PLAN
COMMENT/RESPONSE ADDENDUM REPORT
LENA ROAD LANDFILL
PERMIT NUMBER 5041-211176
BRADENTON, MANATEE COUNTY, FLORIDA**

**PREPARED FOR
MANATEE COUNTY PUBLIC WORKS/UTILITIES
SOLID WASTE MANAGEMENT DIVISION
3333 LENA ROAD LANDFILL
BRADENTON, FLORIDA 34202**

**PREPARED BY
PROFESSIONAL SERVICE INDUSTRIES, INC.**

FEBRUARY 21, 1995

PSI NUMBER: 378-4L015



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INTRODUCTION

General

This report represents the results of additional data evaluation to address the Florida Department of Environmental Protection (FDEP) comment letter dated January 26, 1995 for the Groundwater Monitoring Plan for Lena Road Landfill located in Bradenton, Manatee County, Florida. The additional study was conducted for Manatee County Public Works/Utilities - Solid Waste Management Facility.

SITE DESCRIPTION

Site Location

The Manatee County Solid Waste Management Facility, known as Lena Road Landfill, is located in east-central Manatee County within Section 1, Township 35 South, Range 18 East, Section 6 and 7, Township 35 South, Range 19 East, and Section 31, Township 34 South, Range 19 East. The north boundary of the site approximately runs along State Road 64.

Sources of Data

The Revised Groundwater Monitoring Plan and subsequent addendums were performed by Ardaman & Associates, Inc. These reports discuss the history, hydrogeological setting and groundwater conditions of the subject site and have been used as reference material in preparing the Annual Evaluation.

In addition, the Manatee County Solid Waste Department has provided PSI with copies of the 1992 and 1993 quarterly water quality results for the monitoring well network, quarterly piezometer water table measurements, and the current permit for the subject site.

Site History and Previous Investigations

The Lena Road Landfill is constructed of three (3) stages. Stage I is the existing landfill area. Stage II is the additional landfill located to the north of Stage I. Stage III is the Gun Club landfill that is located to the west of the Stage I area. No refuse is located in the Stage II area. Refuse from a currently inactive landfill is located within the Stage III area.

As part of a seepage control system, a slurry wall system was installed around the three (3) stages of the Lena Road Landfill between August 29, 1985 and September 22, 1989. Stage I construction was completed between August 29, 1985 and November 14, 1985. Stage II was completed between August 20, 1989 and September 22, 1989. The leachate collection system was installed as a part of Stages I and III. Stage II will have a leachate system

installed prior to its use as an active landfill area (Ardaman & Associates, Inc., January 1990).

P.E. LaMoraux and Associates, Inc. (PELA) performed analytical testing on samples collected from the on-site compliance monitoring wells. The sampling is a requirement by the Florida Department of Environmental Protection (FDEP) in order to evaluate the operations of the Lena Road Landfill site.

Based on the PELA analytical results from the groundwater sampling events at monitoring well location GC-1 on July 13, 1993 and August 18, 1993, one constituent (benzene) slightly exceeds the maximum contaminant level (MCL) according to Florida Drinking Water Standards in Chapter 17-550 Florida Administrative Code (FAC). A benzene concentration of 1.39 micrograms per liter (ug/l) was detected at GC-1 on July 13, 1993 and a concentration of 1.29 ug/l on August 18, 1993, which exceeds the MCL for benzene at 1.0 ug/l.

GC-1 is reported as a compliance monitor well for the water table aquifer at the landfill site and was installed on October 25, 1988. Based on the review of the concentration details for GC-1 and water level readings at this location, it appears this well does not accurately monitor the groundwater of the water table aquifer. The screened interval of the well is approximately from 10 feet below land surface (BLS) to 19.5 feet BLS and the reported water table depth on December 14, 1988 was at 1.06 feet BLS. Therefore, the screened portion of the well is approximately 9.0 feet below the surface of the water table aquifer. Based on the information referenced above, it appears that the analytical results from monitoring well GC-1 may not be representative of the water table aquifer.

Additionally, monitoring well CW-5 was destroyed in 1993 during construction activities at this location. Monitoring well CW-5 is a compliance well for Lena Road Landfill and needs to be replaced.

Two (2) permanent monitoring wells, GC-1 (A) and replacement CW-5, were installed on August 19, 1994 by PSI at the subject property. One (1) pre-existing monitoring well, CW-5, was damaged during construction activities on-site in 1993. CW-5 was abandoned in place by PSI on August 19, 1994 using the tremie pipe method. A Portland cement mix was pumped through the tremie pipe which was placed to the bottom of the well. The Portland cement mix was pumped into the monitoring well from bottom to top (ground surface).

REVIEW COMMENTS AND RESPONSES

The FDEP provided comments on the Groundwater Monitoring Plan Annual Evaluation on January 26, 1995, which are included in Appendix A of this report. The response to each of the FDEP comments is outlined throughout this report.

Groundwater Monitoring Plan Annual Evaluation Comments

FDEP Comment No. 1 (January 26, 1995)

The permit was issued in April 1993, and required that the groundwater monitoring plan evaluation (Specific Condition No. 41) be submitted annually. The plan submitted evaluated the groundwater data collected from January 1992 through December 1993. Why wasn't recent data included in the report? The objective of the evaluation is to study trends over the past year (or two) to see if the current conditions adequately monitor the landfill.

Consultant Response No. 1

It is PSI's understanding that the Annual Evaluation was to cover the years 1992 and 1993, and that the next Annual Evaluation would encompass 1994 and 1995. Mr. Greg Yekaitis, Manatee County Solid Waste Administrator, will coordinate this comment with the FDEP directly.

FDEP Comment No. 2 (January 26, 1995)

In the Executive Summary, the Groundwater Elevation Map Analysis, and the Conclusions of the report, it is stated that the groundwater mounds along the slurry wall; groundwater outside of the slurry wall flows away from the slurry wall, while groundwater (leachate) within the slurry wall flows toward the center of the landfill. Please provide the data to support this statement. Water elevations collected and shown on the groundwater flow maps show only one line of wells outside the slurry wall and one line of wells inside the slurry wall. With the slurry wall acting as a hydraulic barrier, additional wells in the interior of the landfill and away from the landfill would be necessary to support this statement. Also, the leachate collection/removal system along the interior of the slurry wall is designed to draw water down along the slurry wall in order to maintain an inward gradient. How would this promote flow toward the center of the landfill? When evaluating flow conditions at a large slurry wall landfill, the Department believes that the regional groundwater/surface water flow patterns and the leachate collection/removal systems need to be reviewed to help in the evaluation of flow around/across the hydraulic barrier of the slurry wall.

The Department intends to modify the landfill operating permit to include water elevation measurements in the leachate and stormwater ponds. These monitoring points will help to maintain the inward gradient across the slurry wall, as the water elevations in these ponds can be manipulated. The Department requests that the permittee survey the existing staff gauges, and begin collecting elevations immediately, on at least a monthly frequency. Please provide the staff gauge designations (i.e., SG-1, SG-2...) and surveyed elevations, and map showing the gauge locations.

Consultant Response No. 2

PSI used available data to determine the general behavior of the shallow water table in the vicinity of the Lena Road Landfill slurry wall. The available data is limited to wells that border the landfill slurry wall or are in the inner border of the slurry wall inside the landfill area. The available data appeared to show a trend indicating the groundwater mounds along the outer slurry wall; groundwater outside the slurry walls flows away from the slurry wall; while groundwater (leachate) levels within the slurry wall indicated a groundwater mound along the slurry wall.

However, due to the limited number of data points within the landfill area, it is difficult to ascertain the exact behavior of the groundwater (leachate) within the slurry wall system. Therefore, no conclusive trend can be asserted within the slurry wall system. Hydrologic conditions have been interpreted using local knowledge and basic hydrology concepts. To evaluate the true nature of the groundwater (leachate) within the slurry wall, additional piezometers or monitoring wells would be helpful.

FDEP Comment No. 3 (January 26, 1995)

Graph 17 of Appendix B shows the groundwater elevation in monitoring well GC-6 dropping about 23 feet in the Fourth Quarter 1993. Figure 7 of Appendix A shows that groundwater elevations were not measured that quarter. Please correct this discrepancy.

Consultant Response No. 3

The groundwater elevations in monitoring well GC-6 is reported in the Quarter 4 - 1993 Groundwater Report as dropping 23 feet from the previous quarter. This value is shown in Graph 17 - Monitoring Well Hydrograph for Shallow Well GC-6 for completeness in reported data. However, upon applying this value to Figure 7 - Quarter 4 , 1993 - Groundwater Elevation Map, it became apparent that this value did not agree with general trend of the groundwater elevation in the other wells at the Lena Road Landfill. Therefore, this data point was eliminated from the Groundwater Elevation Map as an "outlier" and not representative of the general groundwater patterns at the Lena Road Landfill.

FDEP Comment No. 4 (January 26, 1995)

Appendix C uses a "*" in the results column for the EPA 601 and 602 parameters. Please explain what this symbol represents.

Consultant Response No. 4

The "*" symbol indicates that the each EPA Test Method represents a variety of chemical compounds. EPA Method 601 detects purgeable halocarbons (i.e. industrial solvents) and EPA Method 602 detects purgeable aromatics (i.e. gasoline characteristics). None of the

compounds represented by EPA Methods 601 and 602 were detected during the sampling and analysis of groundwater at the Lena Road Landfill during the period covered by the Annual Evaluation.

FDEP Comment No. 5 (January 26, 1995)

Appendix C, Table 10 contains some apparent typographical errors. During the Fourth Quarter 1993, pH is recorded as 505 units and chromium as 189 mg/l. Please check these values and correct the table.

Consultant Response No. 5

Comment noted and errors, where applicable, have been corrected. An updated Table 10 is provided in Appendix B of this report. The pH value has been changed from 505 S.U. to 5.5 S.U. However, the chlorides value of 189 mg/l is the correct value as reported in the Quarter 4 - 1993 Groundwater Report.

FDEP Comment No. 6 (January 26, 1995)

The information provided does indicate that there is no apparent groundwater contamination detected at the landfill in either the surficial or deep aquifers. However, in order to fully evaluate the adequacy of the groundwater monitoring system, the following information is required:

- Map with the location of the deep wells.
- Groundwater flow in the deep aquifer.
- Vertical gradient at the site.
- Map showing the location of all the filled areas inside, and outside of the slurry wall. From discussions with Greg Yekaitis, Manatee County Solid Waste Administrator, there are old waste-filled areas outside of the slurry wall that may impact the current facility's groundwater monitoring program.
- In addition, a base map showing the location of all wells would be useful.

The next groundwater monitoring plan evaluation shall be submitted by October 31, 1996, in accordance with Specific Condition No. 41 of the landfill operating permit. This report should include evaluation of the data collected through the third quarter of 1996.

Consultant Response No. 6

- A map with the location of the deep wells is provided in Appendix C, Figure 2, of this report.
- PSI has evaluated the data concerning the deep wells at the Lena Road Landfill and interpret the direction of groundwater flow to be to the north-northwest. There is a general trend for the high point to be in the vicinity of deep monitoring well SA-5, and for the low points to be in the area of deep monitoring wells SA-4, SA-7, and SA-8. The data is limited to the six (6) similarly constructed wells and is meant to give a rough estimate of groundwater flow direction. This data does correlate well with the regional trend of groundwater flow published by Southwest Florida Water Management District. Groundwater contour maps for the deep monitoring wells are provided in Appendix C, Figures 8-15 of this report.

The screen depths and lengths of SA-2 and SA-3 vary distinctly from the other deep wells and are not used as data points in the determination of groundwater flow direction. The following table lists the screen elevations for all of the deep wells:

TABLE 1 LENA ROAD LANDFILL DEEP MONITORING WELL SCREEN DEPTHS		
Deep Monitoring Well	Top of Screen Elevation, Ft., NGVD	Bottom of Screen Elevation, Ft., NGVD
SMR-2	-63.9 50' open	-113.9
SA-2	-15.0 100' open	-115.0
SA-3	-17.9 110' open	-127.9
SA-4	-72.5 40' open	-112.5
SA-5	-65.1 50' open	-115.1
SA-6	-67.0 50' open	-117.0
SA-8	-68.9 50' open	-118.9

- The vertical hydraulic gradient for the Lena Road Landfill was calculated using data over the following six (6) pairs of wells:

TABLE 2 LENA ROAD LANDFILL MONITORING WELL PAIRS	
Deep Monitoring Well	Shallow Monitoring Well
SMR-2	SMR-1
SA-4	GC-1
SA-5	LRII-1
SA-6	LRII-2
SA-7	LRII-3
SA-8	LRII-4

The deep monitoring wells SA-2 and SA-3 were not considered because their screens extend from the shallow aquifer to the Floridan Aquifer. The following equation was used to calculate the vertical hydraulic gradient:

$$i = \frac{Dh}{Dl}$$

Where: i = Vertical hydraulic gradient
 h = Head (Groundwater Elevation), feet
 l = Thickness of confining layer, feet

The groundwater elevation values used in this calculation were obtained from the quarterly groundwater reports. The thickness of the confining layer used for this calculation was taken from the Revised Groundwater Monitoring Plan (Ardaman & Associates, Inc., January 11, 1990) to be approximately 125 feet.

The general trend observed at the Lena Road Landfill is for the vertical gradient to be from the shallow aquifer to the deeper aquifer. The following table is a summary of the values calculated for the representative well pairs SA-4/GC-1, SA-5/LRII-2, and SA-8/LRII-4.

TABLE 3 VERTICAL HYDRAULIC GRADIENT, i (FT/FT)			
Quarters	Well Pair SA-4/GC-1	Well Pair SA-5/LR11-2	Well Pair SA-8/LR11-4
Q1-92	0.14	0.14	0.11
Q2-92	0.14	0.14	0.10
Q3-92	0.08	0.11	0.08
Q4-92	0.07	0.09	0.08
Q1-93	0.08	0.11	0.09
Q2-93	0.06	0.09	0.07
Q3-93	0.10	0.12	0.10
Q4-93	0.06	0.10	0.07
Average	0.09	0.11	0.09

- It is PSI's understanding that a map showing the location of all the filled areas inside and outside of the slurry wall will be provided to the FDEP by Mr. Greg Yekaitis, Manatee County Solid Waste Administrator.
- A base map showing the location of all wells and piezometers is provided in Appendix C, Figure 2, of this report.

Installation of Monitoring Wells Comments

FDEP Comment No. 1 (January 26, 1995)

The monitoring well installation construction details approved by the FDEP for wells GC-1A and CW-5A were for an 8-inch borehole diameter. The boring log/well construction diagrams show a 4-inch borehole for each well, constructed by a 4.25-inch inside diameter hollow-stem auger. Please correct this discrepancy.

Consultant Response No. 1

Comment noted; changes have been made (Appendix D).

FDEP Comment No. 2 (January 26, 1995)

Please provide the Southwest Florida Water Management District well abandonment record for monitoring well CW-5.

Consultant Response No. 2

A well abandonment record letter, dated February 22, 1995, has been submitted to the SWFWMD and is provided in Appendix E.

FDEP Comment No. 3 (January 26, 1995)

Is well GC-1 to be continued in the landfill monitoring program? If it is not, then the well must be abandoned in accordance with Specific Condition No. 34 of the landfill operating permit, or a written request to keep the well, including the purpose for keeping the well, must be submitted.

Consultant Response No. 3

Comment noted. Manatee County will determine if GC-1 will be continued in the landfill monitoring program.

FDEP Comment No. 4 (January 26, 1995)

As required by Specific Condition No. 33, please provide the SWFWMD well permit numbers for wells GC-1A and CW-5A.

Consultant Response No. 4

Comment noted. This information is also provided in the well abandonment record letter in Appendix E.

b:reports6\lena.cmt

APPENDICES



APPENDIX A
FDEP COMMENT LETTER





Department of Environmental Protection

Lawton Chiles
Governor

Southwest District
3804 Coconut Palm Drive
Tampa, Florida 33619

Virginia B. Wetherell
Secretary

January 26, 1995

Mr. Gus DiFonzo
Manatee County Public Works/Utilities
Solid Waste Management Division
4410 66th Street West
Bradenton, Florida 34206

Subject: Lena Road Landfill, Groundwater Monitoring Plan
Permit No. SO41-211176, Manatee County

Dear Mr. DiFonzo:

The Solid Waste Section of the FDEP has reviewed the Groundwater Monitoring Plan Annual Evaluation submitted October 27, 1994 by Professional Service Industries, Inc. (PSI); the September 19, 1994 PSI report on Installation of Monitoring Wells (received by the FDEP on November 15, 1994); and also the operating permit conditions relating to groundwater, gas and leachate management/monitoring. The following comments are separated by report.

Groundwater Monitoring Plan Annual Evaluation

1. The permit was issued in April 1993, and required that the groundwater monitoring plan evaluation (Specific Condition No. 41) be submitted annually. The plan submitted evaluated the groundwater data collected from January 1992 through December 1993. Why wasn't recent data included in the report? The objective of the evaluation is to study trends over the past year (or two) to see if the current conditions adequately monitor the landfill.
2. In the Executive Summary, the Groundwater Elevation Map Analysis, and the Conclusions of the report, it is stated that the groundwater mounds along the slurry wall; groundwater outside of the slurry wall flows away from the slurry wall, while groundwater (leachate) within the slurry wall flows toward the center of the landfill. Please provide the data to support this statement. Water elevations collected and shown on the groundwater flow maps show only one line of wells outside the slurry wall and one line of wells inside the slurry wall. With the slurry wall acting as a hydraulic barrier, additional wells in the interior of the landfill and away from the landfill would be necessary to support this statement. Also, the leachate collection/removal system along the interior of the slurry wall is designed to draw water down along the slurry wall in order to maintain an inward gradient. How would this promote flow toward the center of the landfill? When evaluating flow conditions at a large slurry wall landfill, the Department believes that the regional groundwater/surface water flow patterns and the leachate collection/removal systems need to be reviewed to help in the evaluation of flow around/across the hydraulic barrier of the slurry wall.

The Department intends to modify the landfill operating permit to include water elevation measurements in the leachate and stormwater ponds. These monitoring points will help to maintain the inward gradient across the slurry wall, as the water elevations in these ponds can be manipulated. The Department requests that the permittee survey the existing staff gauges, and begin collecting elevations immediately on at least a monthly frequency. Please provide the staff gauge designations (i.e., SG-1, SG-2...) and surveyed elevations, and map showing the gauge locations.

3. Graph 17 of Appendix B shows the groundwater elevation in monitoring well GC-6 dropping about 23 feet in the Fourth Quarter 1993. Figure 7 of Appendix A shows that groundwater elevations were not measured that quarter. Please correct this discrepancy.
4. Appendix C uses a "*" in the results column for the EPA 601 and 602 parameters. Please explain what this symbol represents.
5. Appendix C, Table 10 contains some apparent typographical errors. During the Fourth Quarter 1993, pH is recorded as 505 units and chromium as 189 mg/l. Please check these values and correct the table.
6. The information provided does indicate that there is no apparent groundwater contamination detected at the landfill in either the surficial or deep aquifers. However, in order to fully evaluate the adequacy of the groundwater monitoring system, the following information is required:
 - Map with the location of the deep wells.
 - Groundwater flow in the deep aquifer.
 - Vertical gradient at the site.
 - Map showing the location of all the filled areas inside, and outside of the slurry wall. From discussions with Greg Yekaitis, Manatee County Solid Waste Administrator, there are old waste-filled areas outside of the slurry wall that may impact the current facility's groundwater monitoring program.
 - In addition, a base map showing the location of all wells would be useful.

The next groundwater monitoring plan evaluation shall be submitted by October 31, 1996, in accordance with Specific Condition No. 41 of the landfill operating permit. This report should include evaluation of the data collected through the third quarter of 1996.

Installation of Monitoring Wells

1. The monitoring well installation construction details approved by the FDEP for wells GC-1A and CW-5A were for an 8-inch borehole diameter. The boring log/well construction diagrams show a 4-inch borehole for each well, constructed by a 4.25-inch inside diameter hollow-stem auger. Please correct this discrepancy.
2. Please provide the Southwest Florida Water Management District well abandonment record for monitoring well CW-5.
3. Is well GC-1 to be continued in the landfill monitoring program? If it is not, then the well must be abandoned in accordance with Specific Condition No. 34 of the landfill operating permit, or a written request to keep the well, including the purpose for keeping the well, must be submitted.
4. As required by Specific Condition No. 33, please provide the SWFWMD well permit numbers for wells GC-1A and CW-5A.

Leachate and Groundwater Monitoring Permit Conditions

Upon review of the leachate and groundwater monitoring permit conditions, the following information has not been provided:

Mr. Gus DiFonzo
January 26, 1995
Page 3

Specific Condition No. 14 requires quarterly measurement and submittal of gas monitoring results. The results for the Fourth Quarter 1994 were due to the FDEP on January 15, 1995. A site inspection on January 25, 1995 discovered that the gas monitoring wells have not yet been installed. Please provide an update for activities to date leading toward the installation of these wells. With that update, include a schedule for installation of these wells. The wells should be installed in time to measure the gas concentrations for the second quarter of 1995, which ends June 30, 1995.

Specific Condition No. 29 requires monthly measurement and submittal of groundwater elevations inside and outside of the slurry wall. The FDEP is missing the months of April - July and November 1994. The data for October and December were received January 26, 1995. Please submit this data as soon as possible. This data is required monthly in order to correct any occasions of outward gradient in a timely manner.

Specific Condition No. 30 requires documentation of an approved Quality Assurance Plan to be submitted with the first groundwater report of the year. Manatee County Solid Waste has respectfully informed the FDEP that the January 15th groundwater report will be submitted one month late (February 15th). Please include this documentation with that report.

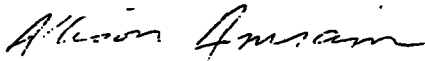
Specific Condition No. 31 requires submittal by January 15th of the leachate monitoring results. As these results have not yet been received, the FDEP will expect them to be submitted by February 15th along with the groundwater report.

Specific Condition No. 32 requires initial groundwater sampling results for new monitoring wells to be submitted within 90 days of well installation. New monitoring wells GC-1A and CW-5A were installed in August, but the initial sampling results have not been received. Please provide these results as soon as possible.

The Department requires timely compliance with all permit conditions. If timely compliance is not achieved, enforcement actions may follow to bring the facility into compliance. Please submit all past-due reports as soon as possible to correct these omissions.

Please submit your response to the non-permit issues of this letter by March 1, 1995. If you have any questions, please contact me at 813/744-6100, ext. 336.

Sincerely,



Allison Amram, P.G.
Solid Waste Section

cc: Greg Yekaitis, Manatee County Solid Waste
Bud Bell, Manatee County Solid Waste
Lenox Bramble, Manatee County Solid Waste
Laura A. Rector, PSI
Richard A. Dunn, P.G., PSI
Adel M. Blassy, PSI
Robert Butera, P.E., FDEP
Kim Ford, P.E., FDEP
Steve Morgan, FDEP
Brad Bailey, FDEP

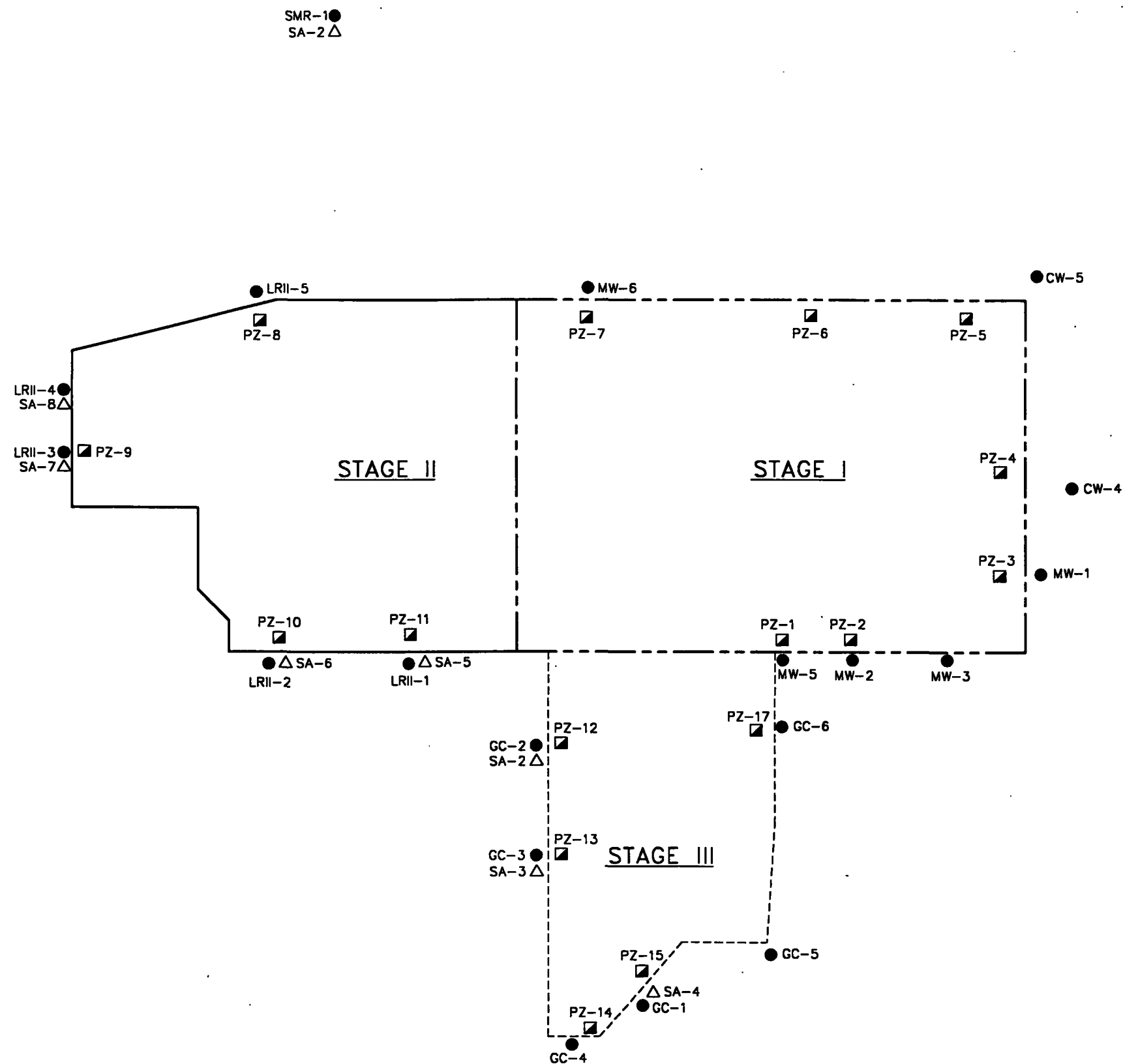
APPENDIX B

TABLE 10

Table 10

LENA ROAD LANDFILL QUARTERLY GROUNDWATER INDICATOR PARAMETERS Shallow Monitoring Well: MW-6								
	Q1-92	Q2-92	Q3-92	Q4-92	Q1-93	Q2-93	Q3-93	Q4-93
Field Parameters								
NGVD - Static Water Level (ft)	33.19	32.82	33.82	33.32	33.53	33.16	33.94	30.57
Conductivity (umho/cm)	245	355	285	210	170	130	300	150
pH (S.U.)	5.2	5.1	5.1	5.5	5.5	5.6	5.4	5.5
DO (mg/l)	NA	NA	NA	NA	NA	NA	NA	0
Turbidity (NTU)	8.4	15	11	8	14	40	NA	13.6
Temperature (C)	22.3	23.1	27.5	25	23.5	22.5	24	24.8
Color/Sheen (C.U.)	20	60	60	70	400	200	NA	NA
Laboratory Parameters								
Ammonium (mg/l)	NA	NA	NA	NA	NA	NA	NA	1.2
Arsenic (mg/l)	NA	NA	NA	NA	NA	NA	BDL	BDL
Bicarbonate (mgCaCO3)	21	13	19	16.8	21.5	17.2	6.7	21.4
Cadmium (mg/l)	NA	NA	NA	NA	NA	NA	BDL	BDL
Chlorides (mg/l)	20.8	38.5	11	24.8	13.1	7.02	11.9	189
Chromium (mg/l)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Iron (mg/l)	NA	11.6	4.64	9.1	5.32	4.75	4.59	6.09
Lead (mg/l)	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Mercury (mg/l)	NA	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nitrate (as N mg/l)	BDL	0.02	0.01	BDL	BDL	BDL	BDL	BDL
Sodium (mg/l)	NA	22.2	9.7	14.4	9.7	6.36	8.62	16.2
TDS (mg/l)	199	244	131	166	136	142	131	148
TOC (mg/l)	17	10.5	25.2	15.6	14.4	15.6	1.5	14.5
EPA 601	*	NA	*	NA	*	NA	*	BDL
EPA 602	*	NA	*	NA	*	NA	*	BDL

APPENDIX C
FIGURES 2, 8 - 15



LEGEND

- EXISTING STAGE I SLURRY WALL
- EXISTING STAGE II SLURRY WALL
- EXISTING STAGE III SLURRY WALL
- APPROXIMATE SURFICIAL AQUIFER WELL LOCATION
- ▣ APPROXIMATE SURFICIAL AQUIFER PIEZOMETER LOCATION
- △ APPROXIMATE ARTESIAN AQUIFER WELL LOCATION

MONITOR WELL LOCATIONS



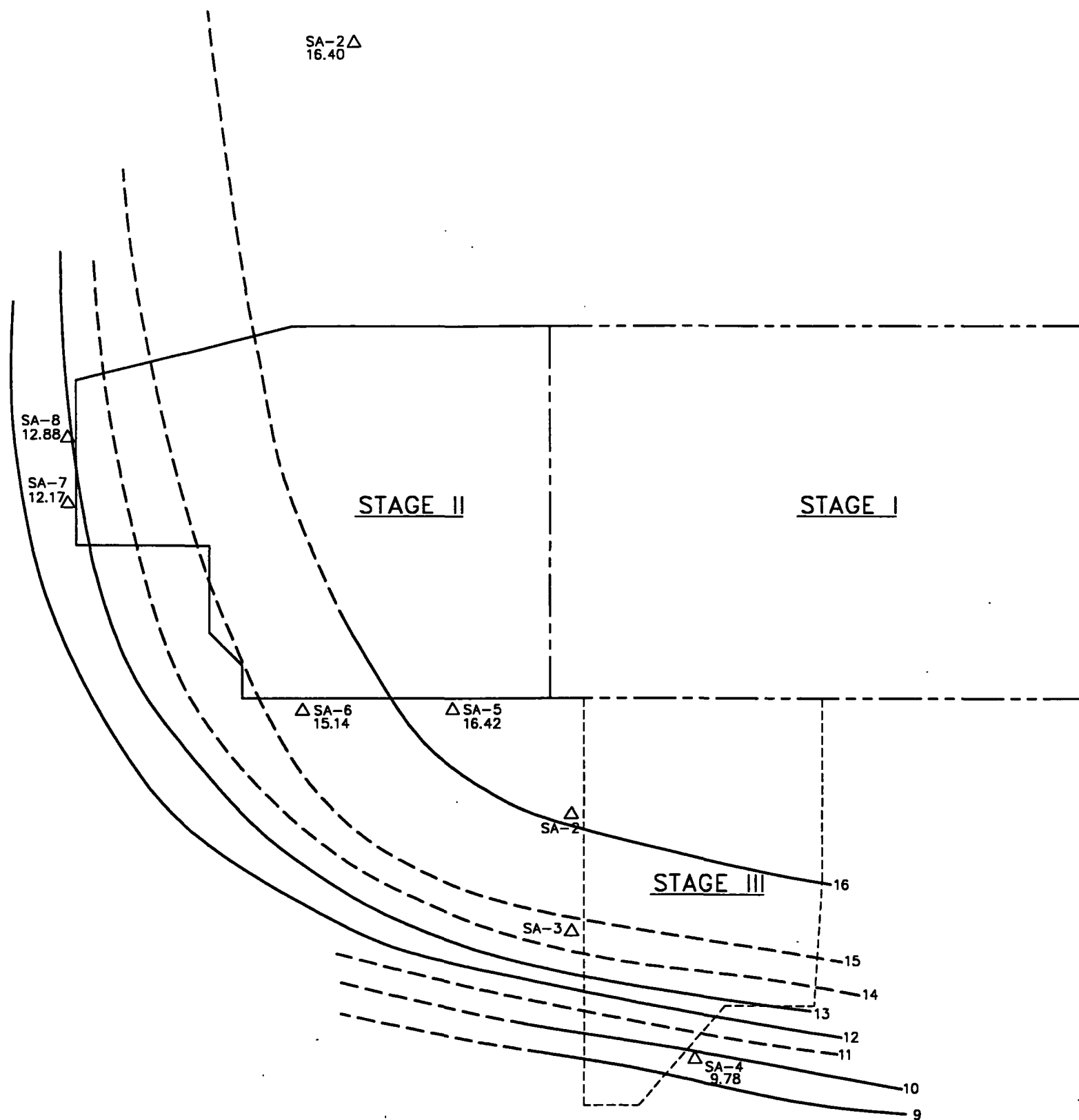
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PLAN SCALE

DRAWN	KT
CHECKED	LAR
APPROVED	AB
DATE	NOTED

GROUNDWATER MONITORING ANNUAL EVALUATION
LENA ROAD LANDFILL
MANATEE COUNTY, FLORIDA

psi ENVIRONMENTAL
GEOTECHNICAL
CONSTRUCTION

DATE FEB 95 PROJ. NO. 378-4L015 FIGURE 2



LEGEND

- EXISTING STAGE I SLURRY WALL
- EXISTING STAGE II SLURRY WALL
- EXISTING STAGE III SLURRY WALL
- GROUNDWATER ELEVATION
- - - INFERRED GROUNDWATER ELEVATION
- △ APPROXIMATE ARTESIAN AQUIFER WELL LOCATION

0 400 800
PLAN SCALE

QUARTER 1, 1992 - GROUNDWATER ELEVATION MAP

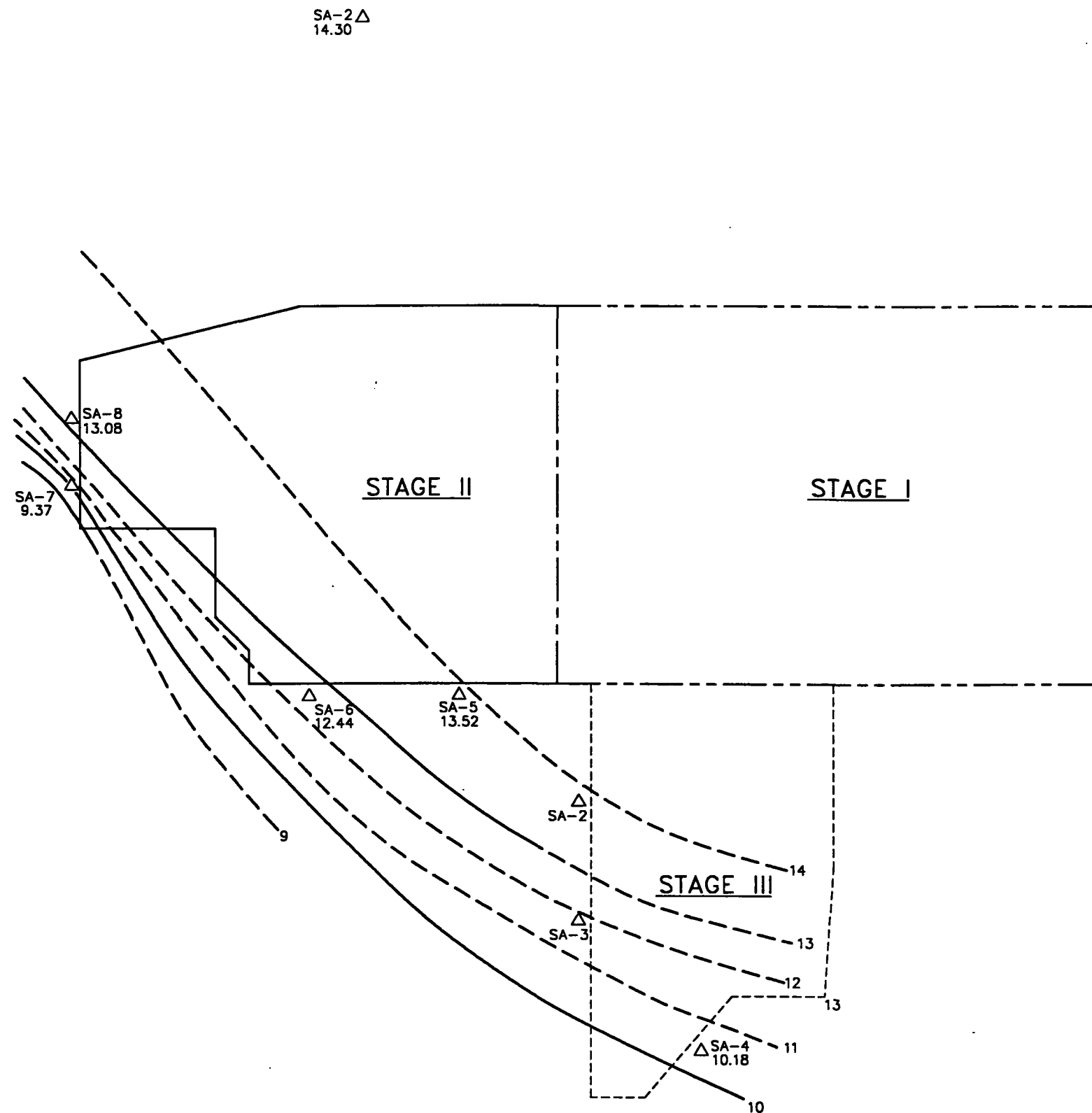


DRAWN	KT
CHECKED	LAR
APPROVED	AB
SCALE	NOTED

GROUNDWATER MONITORING ANNUAL EVALUATION
LENA ROAD LANDFILL
MANATEE COUNTY, FLORIDA

psi ENVIRONMENTAL
GEOTECHNICAL
CONSTRUCTION

DATE FEB 95 PROJ. NO. 378-4L015 FIGURE 8



LEGEND

- EXISTING STAGE I SLURRY WALL
- EXISTING STAGE II SLURRY WALL
- EXISTING STAGE III SLURRY WALL
- GROUNDWATER ELEVATION
- - - INFERRED GROUNDWATER ELEVATION
- △ APPROXIMATE ARTESIAN AQUIFER WELL LOCATION

0 400 800
PLAN SCALE

QUARTER 2, 1992 - GROUNDWATER ELEVATION MAP

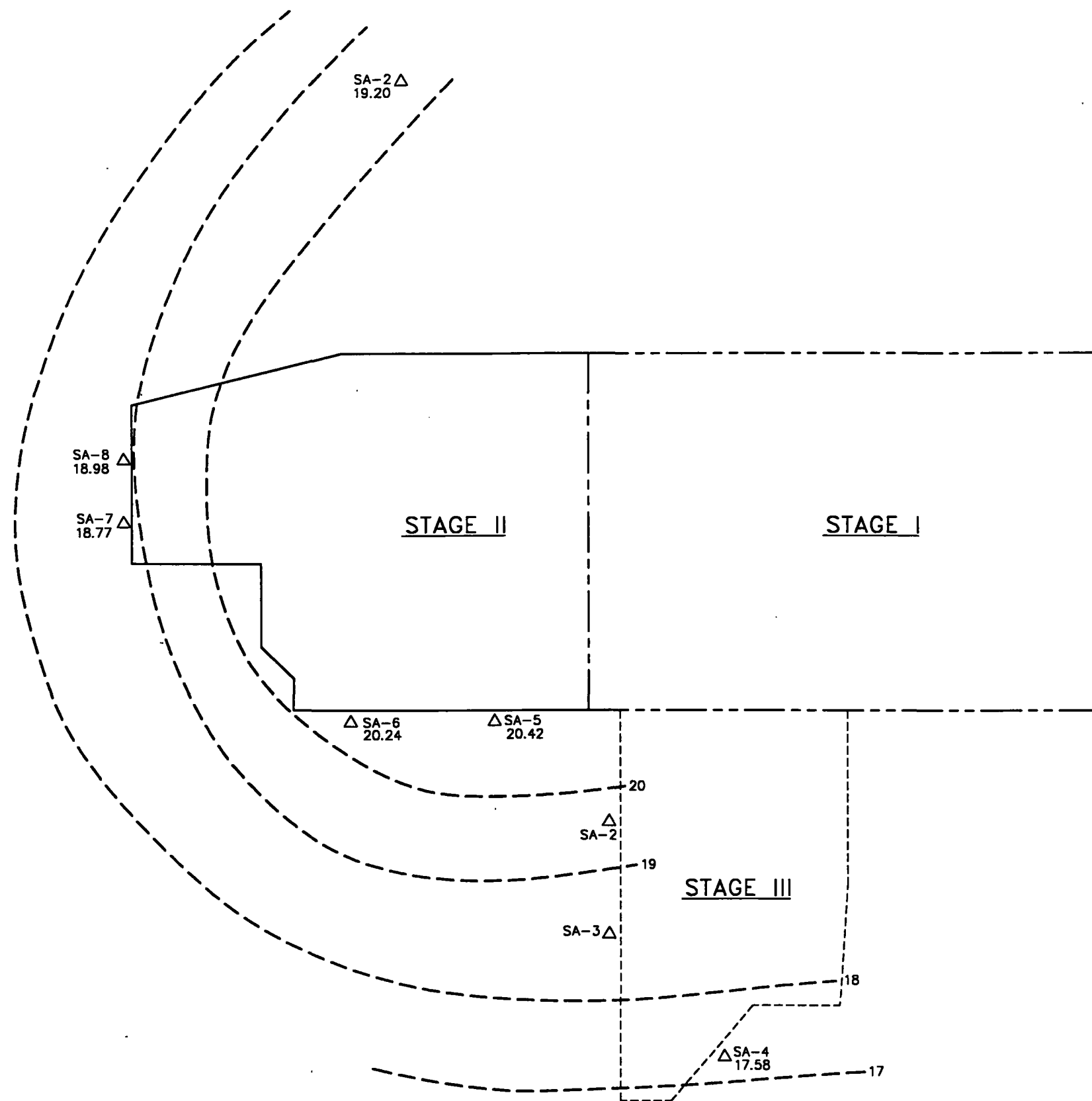


DRAWN	KT
CHECKED	LAR
APPROVED	AB
SCALE	NOTED

GROUNDWATER MONITORING ANNUAL EVALUATION
LENA ROAD LANDFILL
MANATEE COUNTY, FLORIDA

psi ENVIRONMENTAL
GEOTECHNICAL
CONSTRUCTION

DATE FEB 95 PROJ. NO. 378-4L015 FIGURE 9



LEGEND

- EXISTING STAGE I SLURRY WALL
- EXISTING STAGE II SLURRY WALL
- EXISTING STAGE III SLURRY WALL
- 17 GROUNDWATER ELEVATION
- INFERRED GROUNDWATER ELEVATION
- △ APPROXIMATE ARTESIAN AQUIFER WELL LOCATION

QUARTER 3, 1992 - GROUNDWATER ELEVATION MAP

0 400 800
PLAN SCALE

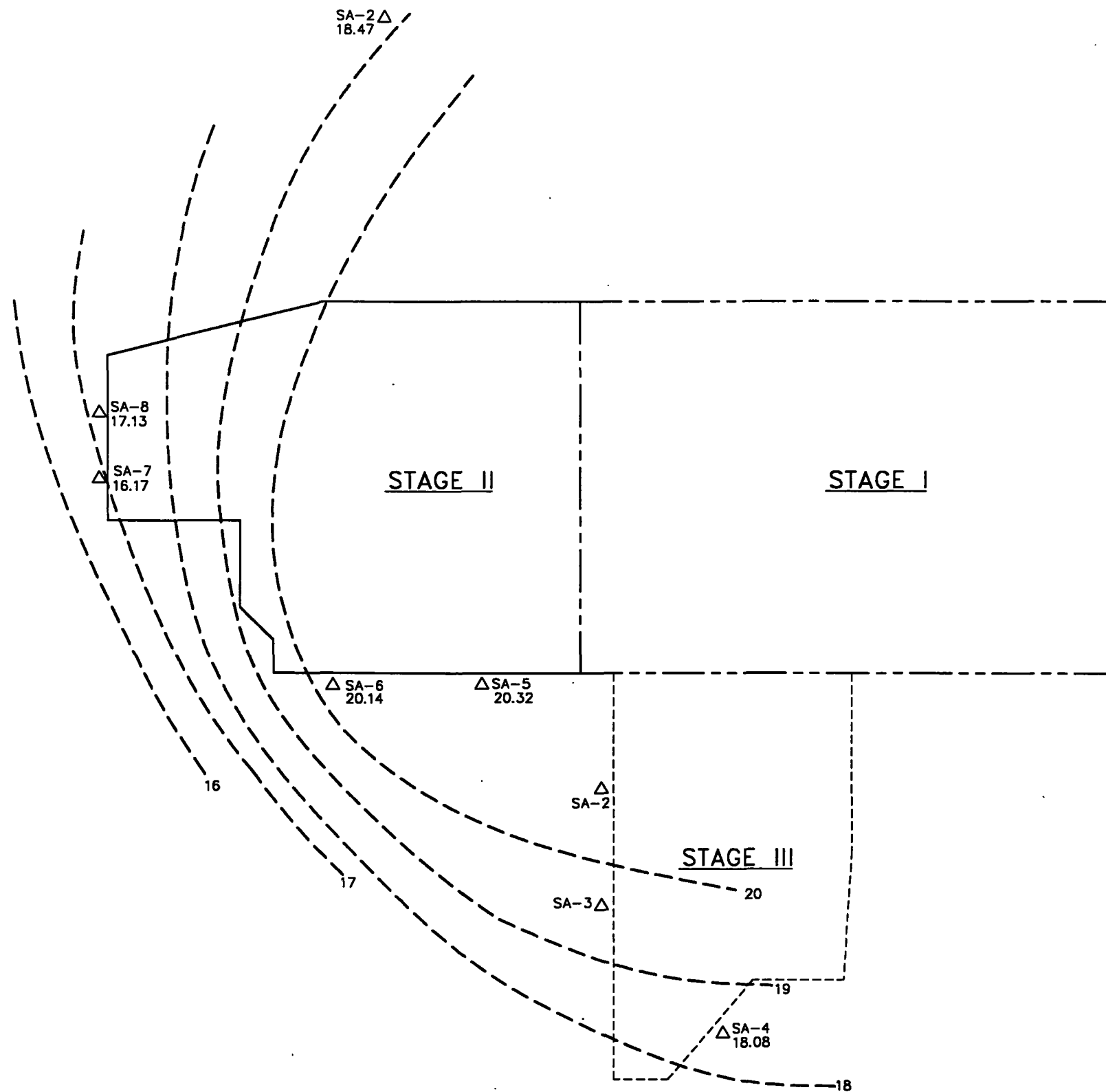


DRAWN	KT
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APPROVED	AB
SCALE	NOTED

GROUNDWATER MONITORING ANNUAL EVALUATION
LENA ROAD LANDFILL
MANATEE COUNTY, FLORIDA

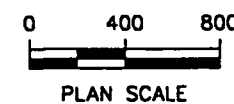


DATE FEB 95 PROJ. NO. 378-4L015 FIGURE 10



LEGEND

- EXISTING STAGE I SLURRY WALL
- EXISTING STAGE II SLURRY WALL
- EXISTING STAGE III SLURRY WALL
- GROUNDWATER ELEVATION
- INFERRED GROUNDWATER ELEVATION
- △ APPROXIMATE ARTESIAN AQUIFER WELL LOCATION



QUARTER 4, 1992 - GROUNDWATER ELEVATION MAP

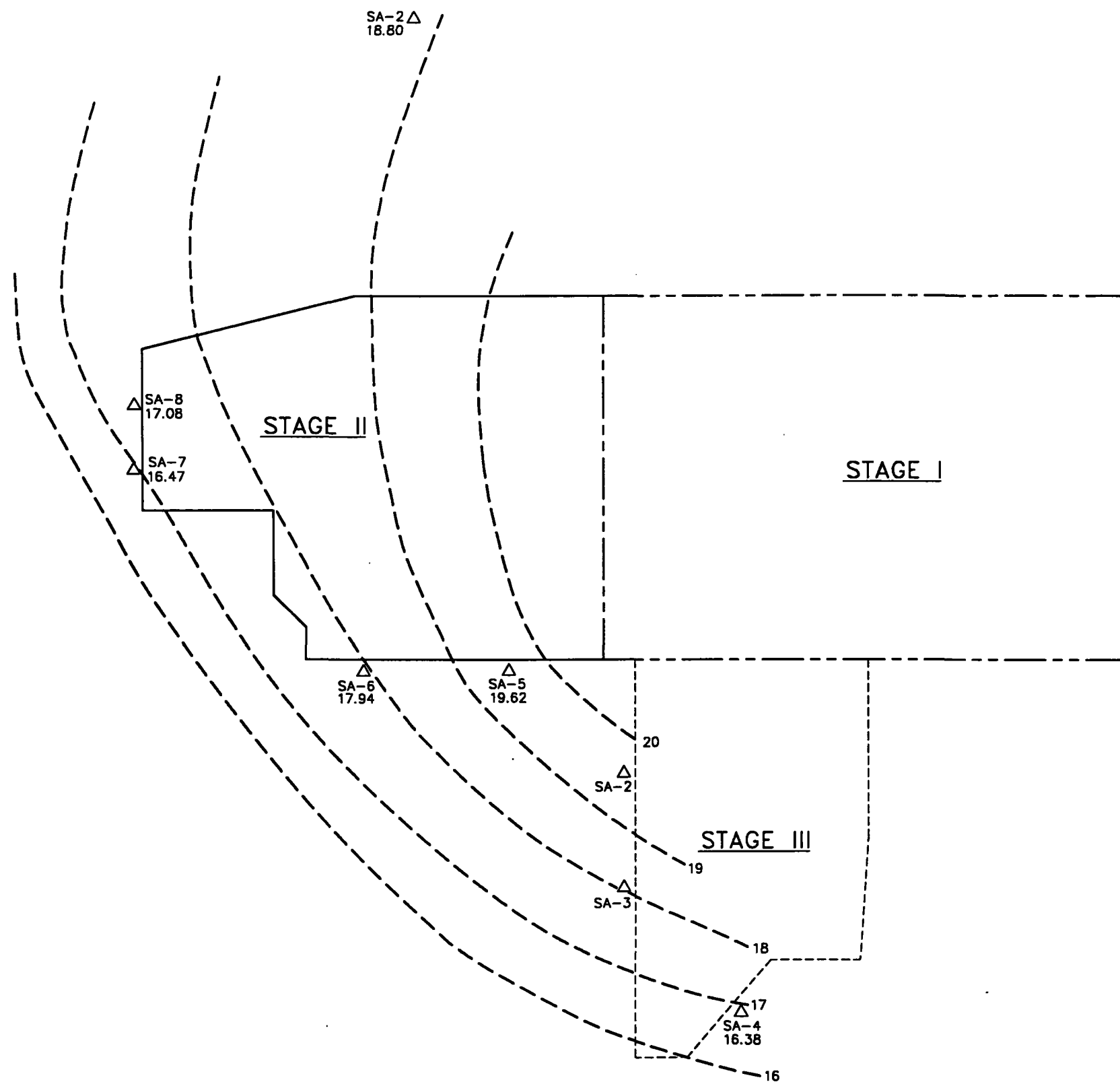


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CHECKED	LAR
APPROVED	AB
SCALE	NOTED

GROUNDWATER MONITORING ANNUAL EVALUATION
LENA ROAD LANDFILL
MANATEE COUNTY, FLORIDA

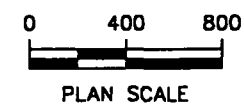


DATE FEB 95 PROJ. NO. 378-4L015 FIGURE 11



LEGEND

- EXISTING STAGE I SLURRY WALL
- EXISTING STAGE II SLURRY WALL
- EXISTING STAGE III SLURRY WALL
- - - INFERRED GROUNDWATER ELEVATION
- Δ APPROXIMATE ARTESIAN AQUIFER WELL LOCATION



QUARTER 1, 1993 - GROUNDWATER ELEVATION MAP

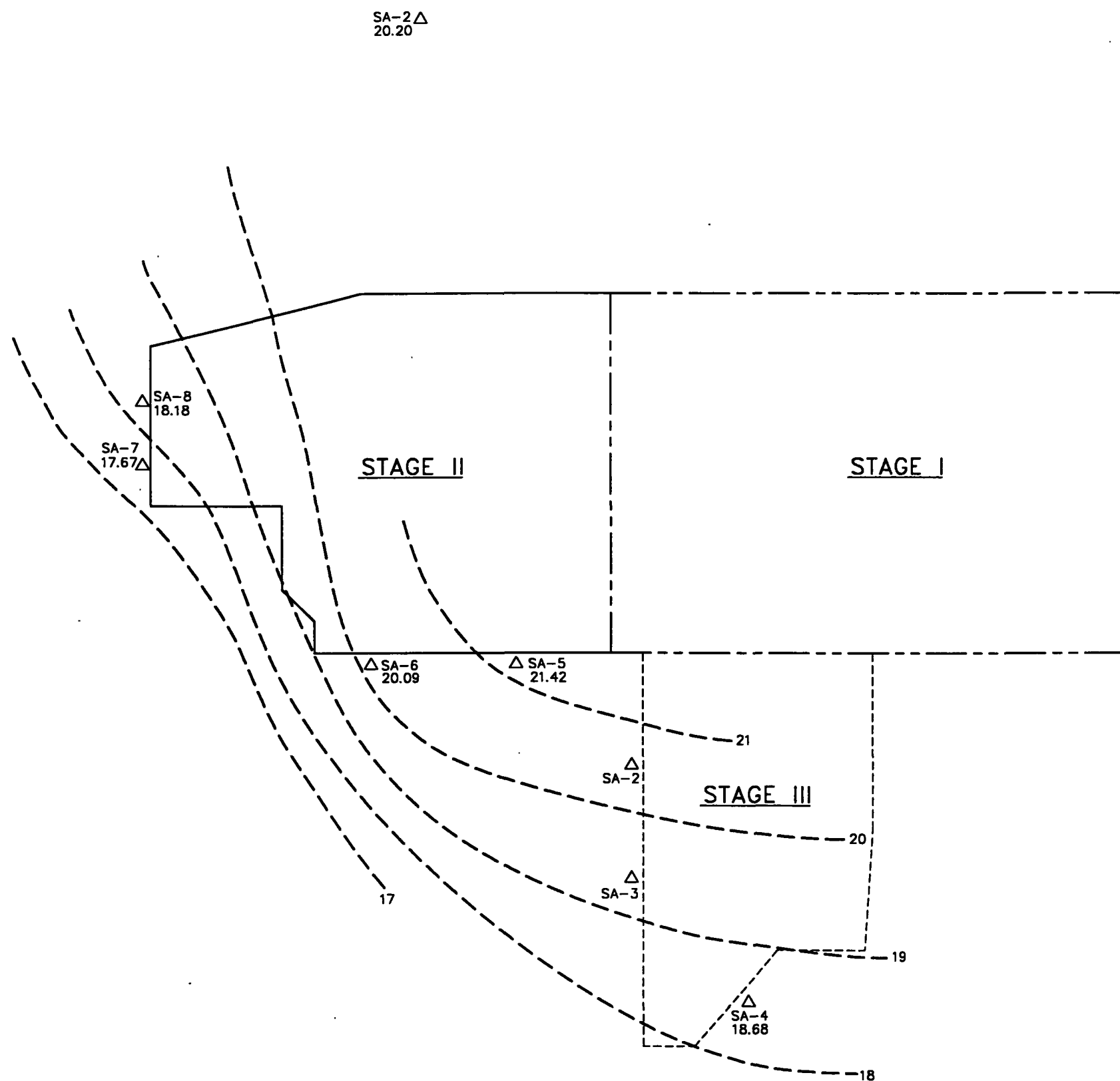


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APPROVED	AB
SCALE	NOTED

GROUNDWATER MONITORING ANNUAL EVALUATION
LENA ROAD LANDFILL
 MANATEE COUNTY, FLORIDA



DATE FEB 95 PROJ. NO. 378-4L015 FIGURE 12



LEGEND

- EXISTING STAGE I SLURRY WALL
- EXISTING STAGE II SLURRY WALL
- EXISTING STAGE III SLURRY WALL
- - - INFERRED GROUNDWATER ELEVATION
- Δ APPROXIMATE ARTESIAN AQUIFER WELL LOCATION

0 400 800
PLAN SCALE

QUARTER 2, 1993 - GROUNDWATER ELEVATION MAP

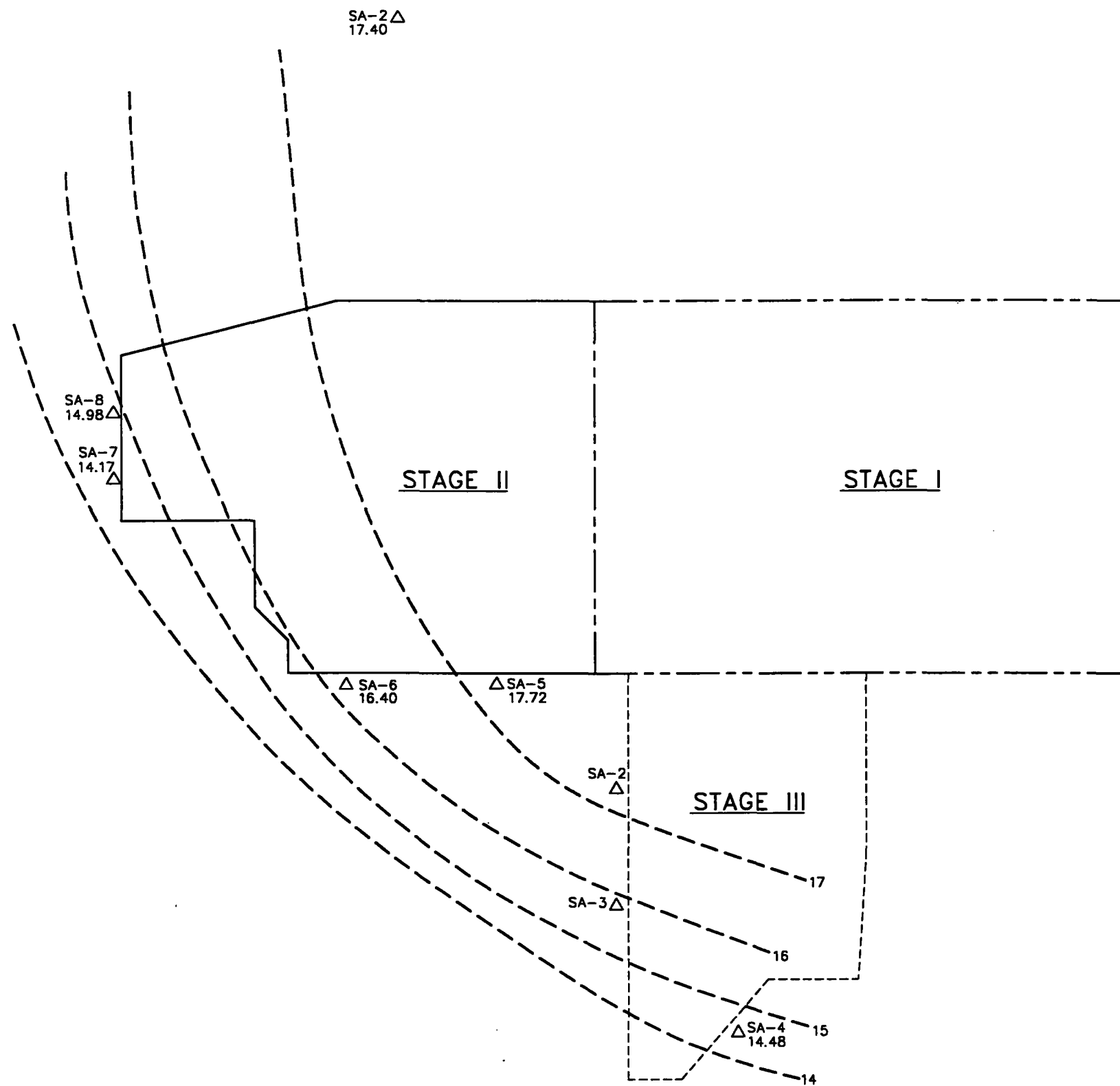


DRAWN	KT
CHECKED	LAR
APPROVED	AB
SCALE	NOTED

GROUNDWATER MONITORING ANNUAL EVALUATION
LENA ROAD LANDFILL
- MANATEE COUNTY, FLORIDA

psi ENVIRONMENTAL
GEOTECHNICAL
CONSTRUCTION

DATE FEB 95 PROJ. NO. 378-4L015 FIGURE 13



LEGEND

- EXISTING STAGE I SLURRY WALL
- EXISTING STAGE II SLURRY WALL
- EXISTING STAGE III SLURRY WALL
- INFERRED GROUNDWATER ELEVATION
- △ APPROXIMATE ARTESIAN AQUIFER WELL LOCATION

0 400 800
PLAN SCALE

QUARTER 3, 1993 - GROUNDWATER ELEVATION MAP

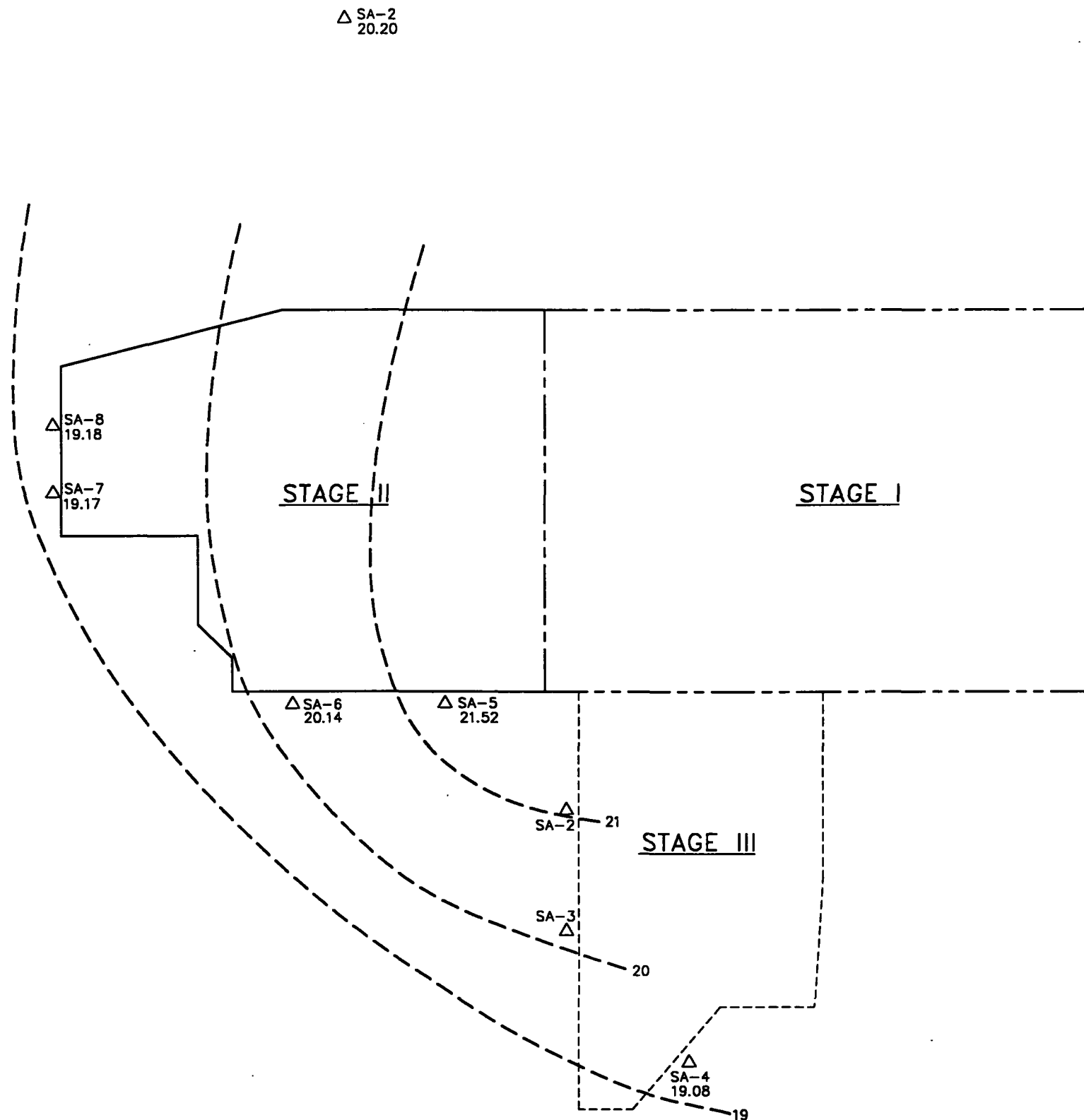


DRAWN	KT
CHECKED	LAR
APPROVED	AB
SCALE	NOTED

GROUNDWATER MONITORING ANNUAL EVALUATION
LENA ROAD LANDFILL
MANATEE COUNTY, FLORIDA

psi ENVIRONMENTAL
GEOTECHNICAL
CONSTRUCTION

DATE FEB 95 PROJ. NO. 378-4L015 FIGURE 14



LEGEND

- EXISTING STAGE I SLURRY WALL
- EXISTING STAGE II SLURRY WALL
- EXISTING STAGE III SLURRY WALL
- - - INFERRED GROUNDWATER ELEVATION
- △ APPROXIMATE ARTESIAN AQUIFER WELL LOCATION

0 400 800
PLAN SCALE

QUARTER 4, 1993 - GROUNDWATER ELEVATION MAP



DRAWN	KT
CHECKED	LAR
APPROVED	AB
SCALE	NOTED

GROUNDWATER MONITORING ANNUAL EVALUATION
LENA ROAD LANDFILL
MANATEE COUNTY, FLORIDA

psi ENVIRONMENTAL
GEOTECHNICAL
CONSTRUCTION

DATE	FEB 95	PROJ. NO.	378-4L015	FIGURE 15
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APPENDIX D

**MONITORING WELL CONSTRUCTION DETAILS
FOR GC-1A AND CW-5A**



SITE LOCATION: LENA ROAD LANDFILL

PROJECT NO: 378-3I067

BORING NO: CW-05

PAGE 1 OF 1

DATE BEGAN: 8-19-94

DATE FINISHED: 8-19-94

GEOLOGIST: R. Dunn

DRILLER: Robert Shoey

SECTION: 6

CHECKED BY: S.S.P.

GROUND SURFACE, ELEV.: 42 feet

TOWNSHIP: 35 S

GWL DEPTH: 9.0'

DRILLING METHOD: 1.25" I.D. Hollow Stem Auger

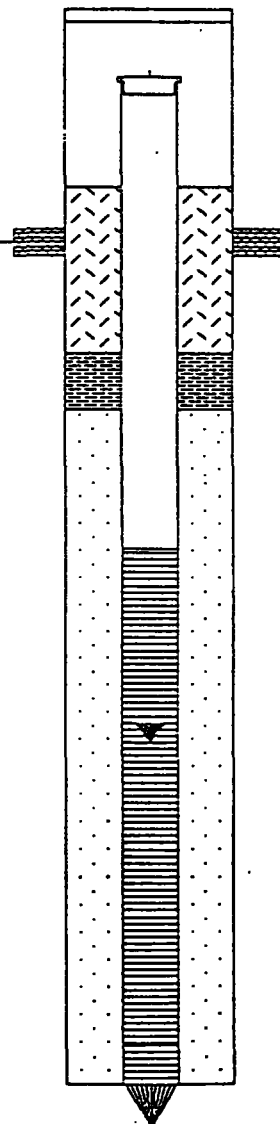
RANGE: 19 E

DRILL EQUIP: CME-75

CONTRACTOR: PSI

GWL-DATE/TIME: 8-19-94

WATER TABLE	DEPTH (FT)	SAMPLE TYPE AND NO.	ASTM (IN)	P R O F I L E	DESCRIPTION	VOLATILE ORGANIC VAPORS (ppm)		WELL CONSTRUCTION	
						FID	PID	MONITOR WELL NO.: <u>CW-05</u>	BOREHOLE DIAMETER: <u>8-INCH</u>
								SURFACE CASING: <u>2-INCH PVC</u>	
								SCREEN LENGTH: <u>10 FT (10.01' SLOT)</u>	
								SEAL TYPE: <u>BENTONITE</u>	
								DEVELOPMENT TIME: <u>30-MIN.</u>	
	5.00								
	0.00				SAND: grey to dark grey, fine grained.				
					SILTY SAND: tan to orange brown, fine grained.				
	-5.00				SILTY SAND: grey, fine grained, slight clay content.				
	-10.00				CLAYEY SAND: grey to greenish grey, cohesive; phosphate fragments.				
	-15.00				BOTTOM OF BORING AT 15.0 FT.				



SITE LOCATION: LENA ROAD LANDFILL

PROJECT NO: 378-3I067

BORING-NO: GC-1A

PAGE 1 OF 1

DATE BEGAN: 8-19-94

DATE FINISHED: 8-19-94

GEOLOGIST: R. Dunn

DRILLER: Robert Shuey

SECTION: 6

CHECKED BY: S.S.P.

GROUND SURFACE ELEV.: 31 feet

TOWNSHIP: 35 S

GWL DEPTH: 2.0'

DRILLING METHOD: 4.25" I.D. Hollow Stem Auger

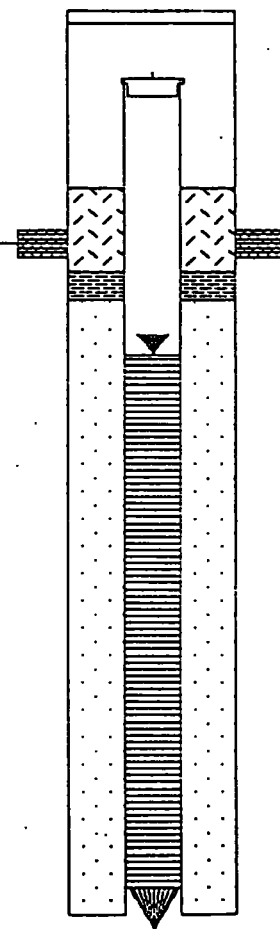
RANGE: 18 E

DRILL EQUIP: CHE-75

CONTRACTOR: PSI

GWL-DATE/TIME: 8-19-94

WATER TABLE	DEPTH (FT)	SAMPLE TYPE AND NO.	ASTM (IN)	P R O F I L E	DESCRIPTION	VOLATILE ORGANIC VAPORS (ppm)		WELL CONSTRUCTION MONITOR WELL NO.: <u>GC-1A</u> BORE-HOLE DIAMETER: <u>8-INCH</u> SURFACE CASING: <u>2-INCH PVC</u> SCREEN LENGTH: <u>9.5 FT (0.01' SLOTS)</u> SEAL TYPE: <u>BENTONITE</u> DEVELOPMENT TIME: <u>30-MIN.</u>
						FID	PID	
	5.00							
	0.00				SAND: grey to dark grey, fine grained.			
					SILTY SAND: tan to orange brown, fine grained.			
	-5.00				SILTY SAND: grey, fine grained, slight clay content.			
	-10.00							
	-15.00				BOTTOM OF BORING AT 12.0 FT.			



APPENDIX E

WELL ABANDONMENT RECORD LETTER





Professional Service Industries, Inc.
Environmental & Analytical Division

Southwest Florida Water
Management District
2379 Broad Street
Brooksville, Florida 34609

February 22, 1995

Attention: Mr. Jim Marshall

Re: Well Abandonment
Lena Road Landfill
3333 Lena Road
Bradenton, Manatee County, Florida
PSI Project No. 378-34067


Dear Mr. Marshall:


This letter is to inform the Southwest Florida Water Management District of a monitoring well abandonment at the referenced site. The well is designated CW-5. This well was abandoned by the tremie pipe method of grout placement. A tremie pipe was inserted to the total depth of the well and a neat Portland cement grout was pumped until grout returns were observed at the surface. This activity was performed on August 19, 1994 in conjunction with the monitoring well construction activities (installation). These activities specifically included the replacement of monitoring well CW-5 with CW-5 (A) and installation of monitoring well GC-1 (A) in the vicinity of existing monitoring well GC-1 (SWFWMD Permit No. 94-463-556708.02).

If you have any questions, please do not hesitate to contact the undersigned at your convenience.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES, INC.


Laura A. Rector
Staff Engineer


Richard A. Dunn, P.G.
Project Manager

LAR/RAD:tms