APPENDIX I

Field Monitoring

APPENDIX I.1

Subgrade Inspection Forms

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 6/20/94

Project Name: Industri - Plex

Site Name: West Hide Pile

Location of Subgrade Surface to be Lined: Twenty feet inside of the break in grade

SURVEY CUTSHEET ATTACHED: Yes ____ No X

HMM stated that the top of West Hide Pile was to grade,

I hereby certify that the above area is suitable for the installation of geosynthetics, and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): William Spedding Date: 6/20/94

Title: QC Engineer

Representing: RUST Remedial Services

Signature: William Spedding

Acknowledged by:

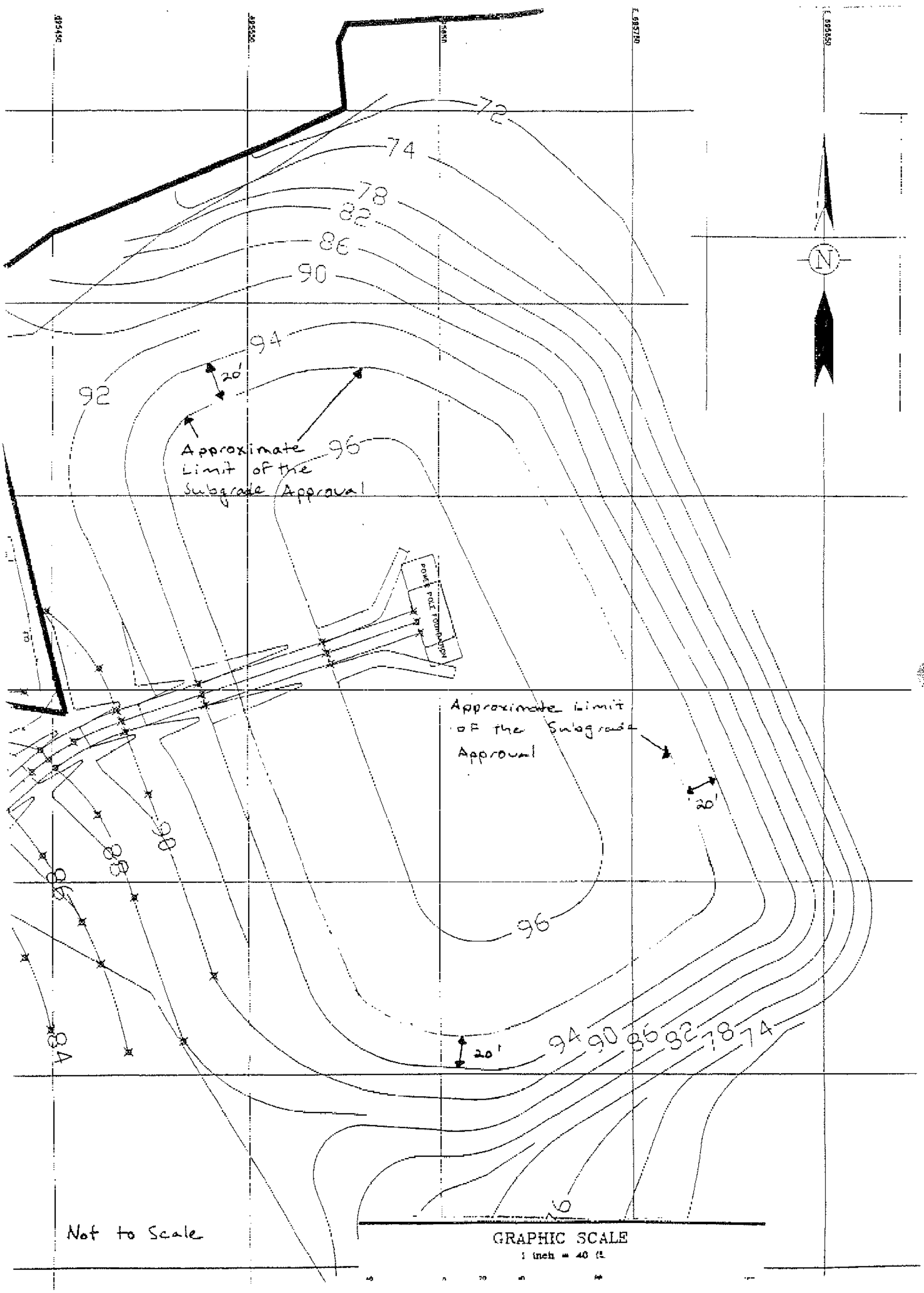
GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

Name (print): Alfred A. Tawey Date: 6/20/94

Title: Geotechnical Engineer

Representing: Golder Associates Inc.

Signature: Alfred A. Tawey


72
74
78
82
86
90
94
92
96
20'
Approximate Limit of the Subgrade Approval
POWER POLE FOUNDATION
Approximate Limit of the Subgrade Approval
20'
90
88
86
84
96
20'
94
90
86
82
78
74
N
Not to Scale
GRAPHIC SCALE
1 inch = 40 ft.

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 09-03-94

Project Name: I-Plex

Site Name: W.H.P. S.E. Slope.

Location of Subgrade Surface to be Lined: From the crest (94 contour) to the toe (72 contour) of slope. Between Point #'s 333 & 115.

I hereby certify that the above area is suitable for the installation of geosynthetics, and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): Mike Tanner Date: 09-03-94

Title: RUST REMEDIAL QC ENGINEERING STAFF

Representing: RUST E & I

Signature: Mike Tanner

Acknowledged by:

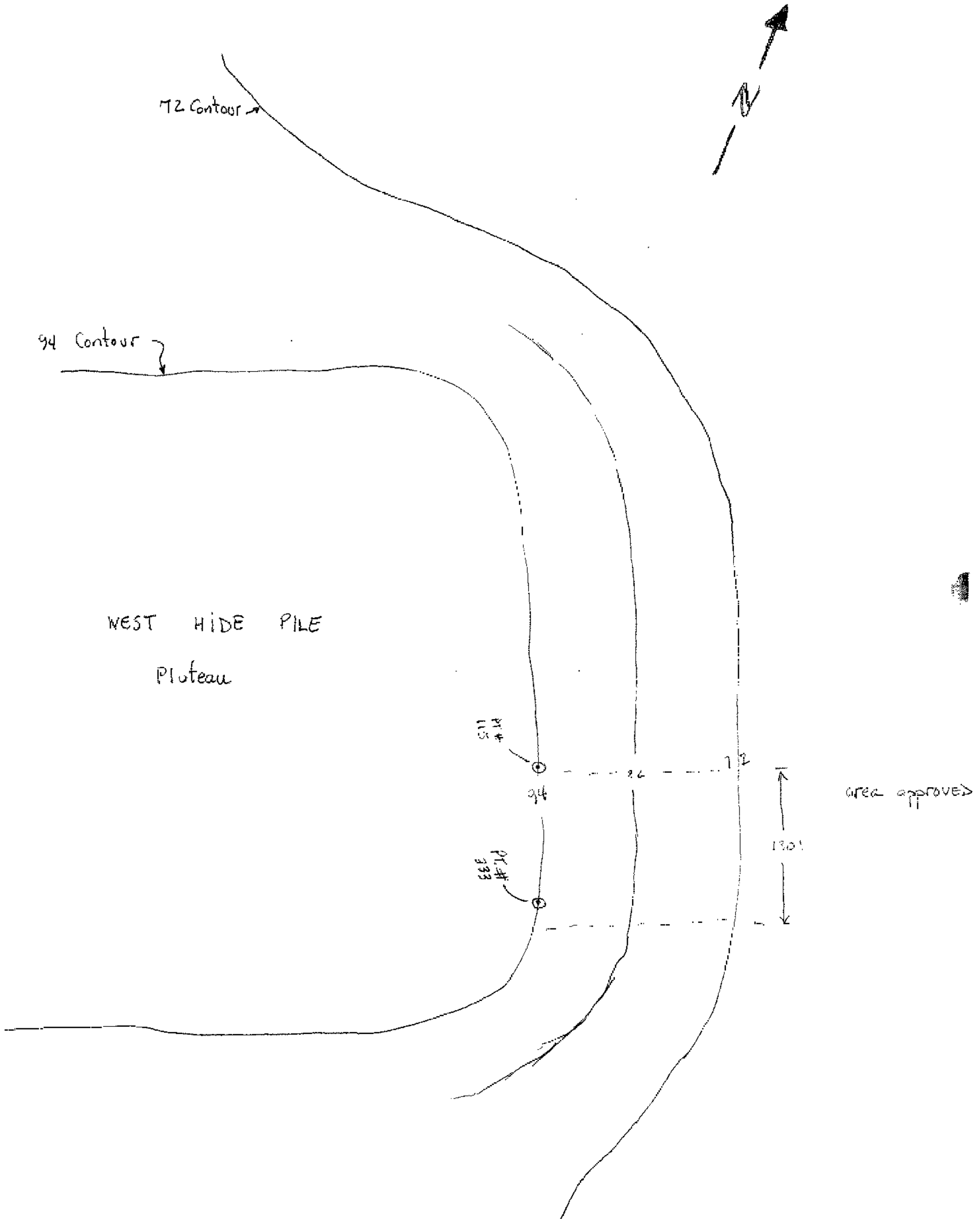
GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

Name (print): Alfred A. Tancy Date: 09/03/94

Title: Geotechnical Engineer

Representing: Golder Associates, Inc.

Signature: Alfred A. Tancy



N
72 Contour
94 Contour
WEST HIDE PILE
Pluteau
PT # 115
PT # 333
94
86
72
130'
area approved

N.T.S.

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 09-07-94

Project Name: I-Plex

Site Name: West Hide Pile.

Location of Subgrade Surface to be Lined: East Slope see sketch

I hereby certify that the above area is suitable for the installation of geosynthetics, and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): Mike Tanner Date: 09-07-94

Title: RUST QC ENGINEERING STAFF

Representing: RUST E & I

Signature: Mike Tanner

Acknowledged by:

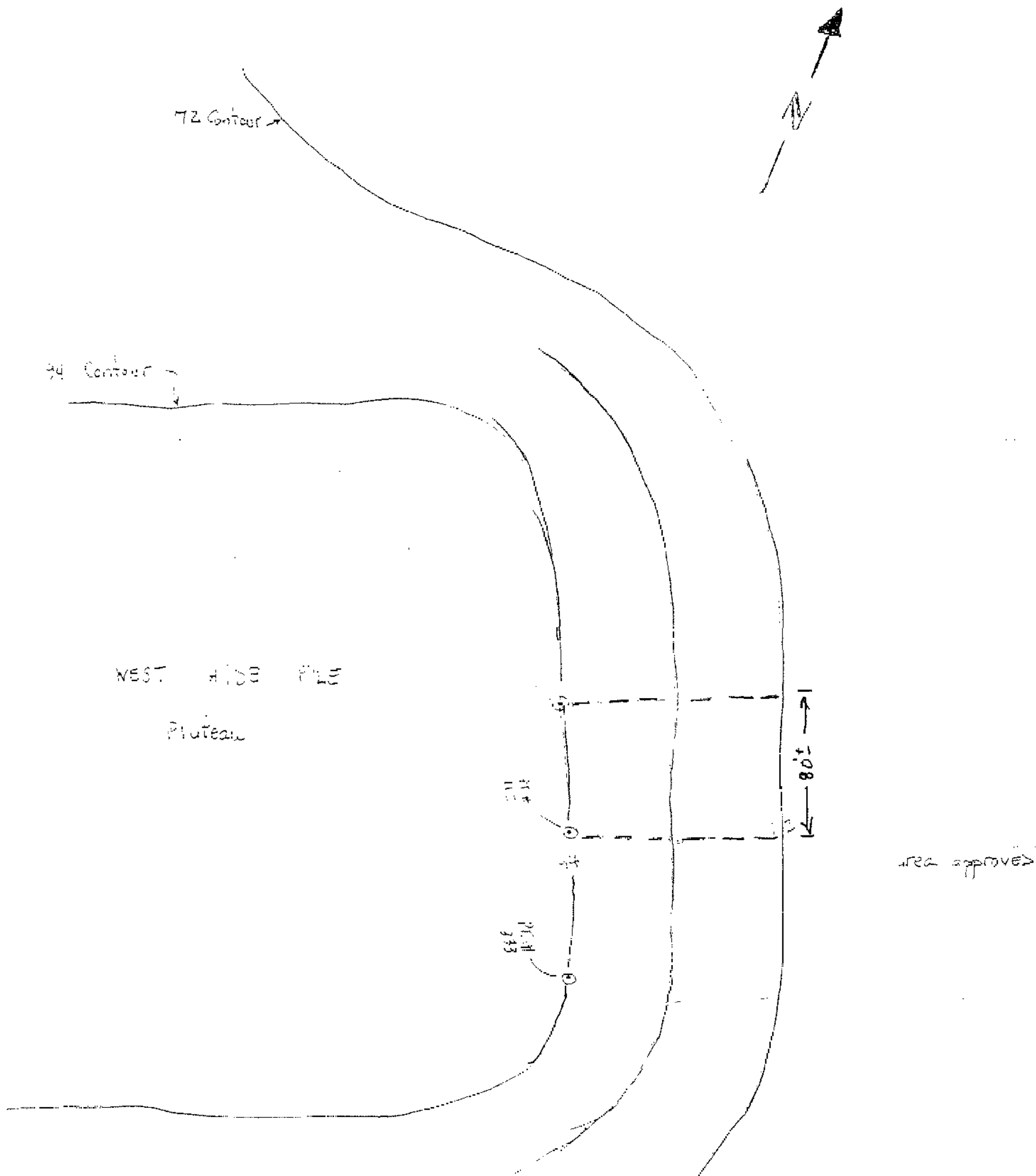
GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

Name (print): Alfred A. Taney Date: 09/07/94

Title: Geotechnical Engineer

Representing: Golder Associates Inc.

Signature: Alfred A. Taney


72 Contour
94 Contour
Plateau
area approved
N.T.S.

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 09-15-94

Project Name: I-Plex

Site Name: West Hide Pile

Location of Subgrade Surface to be Lined: eastern slope of the hide pile. See sketch on back of form. Area B. Survey [illegible] See sketch from survey M. Tanner

I hereby certify that the above area is suitable for the installation of geosynthetics, and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): Mike Tanner Date: 09-15-94

Title: RUST QC ENGINEERING STAFF

Representing: RUST E & I

Signature: Mike Tanner

Acknowledged by:

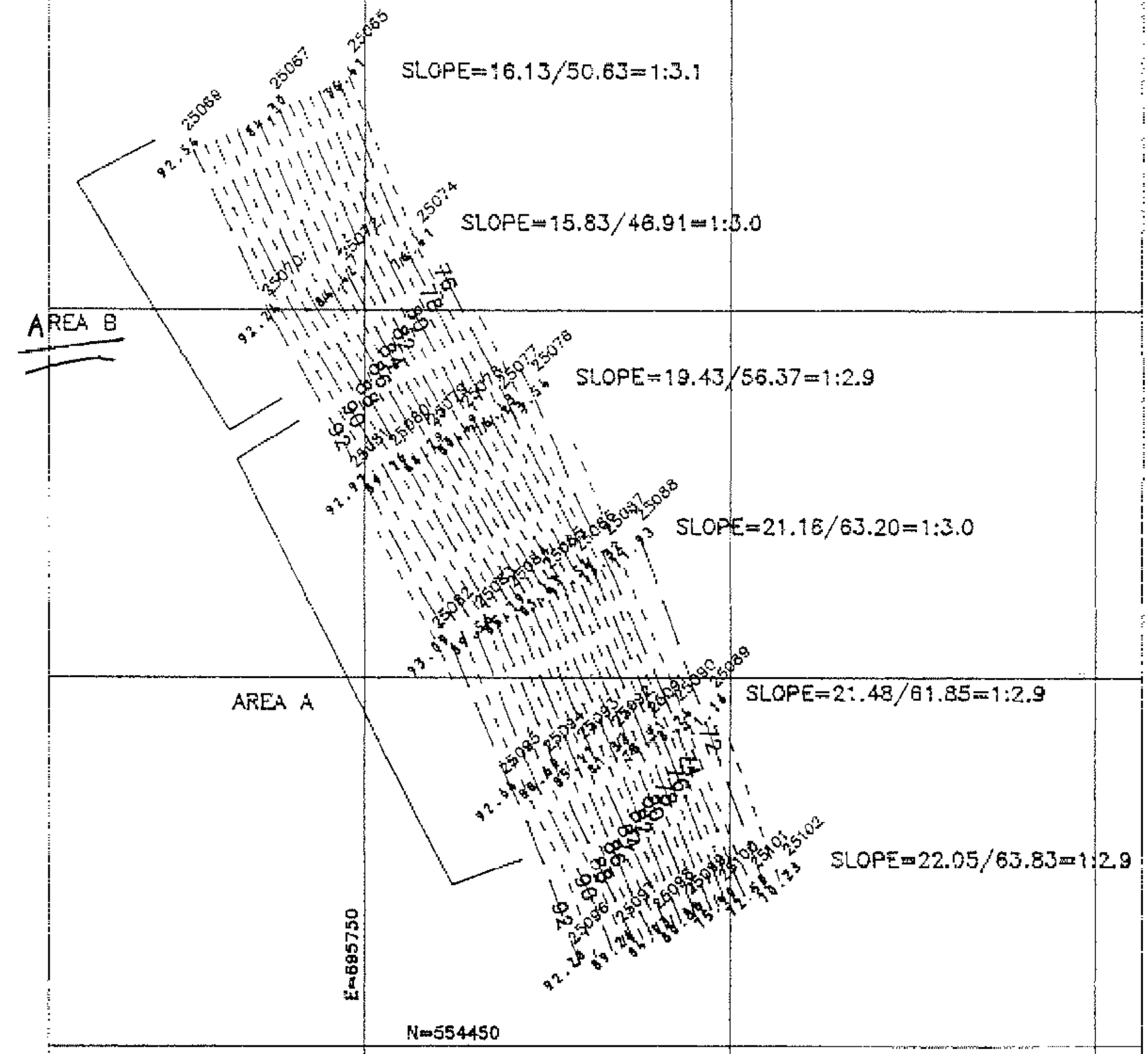
GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

Name (print): ANTHONY E. CRUPI Date: 09-15-94

Title: SENIOR FIELD INSPECTOR

Representing: PSI

Signature: Anthony E Crupi



TOPOGRAPHIC WORKSHEET

I.S.R.T.

W.H.P.- SUBGRADE SLOPES

SCALE: 1" = 50' SEPTEMBER 15, 1994

FILE NO. 22S.DWG	PROJECT NO. 597.22	SHEET NO. 1 OF 1

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 09/21/94

Project Name: I-Plex

Site Name: W.H.P. Penisular @ the east slope

Location of Subgrade Surface to be Lined: ______________________

____

SURVEY CUTSHEET ATTACHED YES ____ NO ✓

I hereby certify that the above area is suitable for the installation of geosynthetics, and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): Mike Tanner Date: 9/21/94

Title: RUST QC ENGINEERING STAFF

Representing: RUST E & I

Signature: Mike Tanner

Acknowledged by:

GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

Name (print): ANTHONY CRUPI Date: 9-21-94

Title: SENIOR FIELD INSPECTOR

Representing: PSI

Signature: Anthony E Crupi


WHP Plateau
East slope
WETLAND 1-C

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 9-27-94

Project Name: INDUSTRI-PLEX

Site Name: WEST HIDE PILE

Location of Subgrade Surface to be Lined: EAST SLOPE WASHOUT AT AREA "B", PANEL #16.

SURVEY CUTSHEET ATTACHED YES NO

REPAIR PERFORMED FOR PREVIOUS APPROVED SUBGRADE.

I hereby certify that the above area is suitable for the installation of geosynthetics, and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): SEAN O'HEARN Date: 9/27/94

Title: FIELD ENGINEER

Representing: RUST E&I

Signature: [signature]

Acknowledged by:

GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

Name (print): ANTHONY CRUM Date: 9/27/94

Title: SENIOR FIELD INSPECTOR

Representing: PSI

Signature: Anthony E Cruz

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 09-29-94

Project Name: I-Plex

Site Name: W.H.A

Location of Subgrade Surface to be Lined: See sketch, Area "C"

SURVEY CUTSHEET ATTACHED YES NO Observed

I hereby certify that the above area is suitable for the installation of geosynthetics and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): Mike Tanner Date: 09-29-94

Title: RUST Field QC STAFF

Representing: RUST E & I

Signature: Mike Tanner

Acknowledged by:

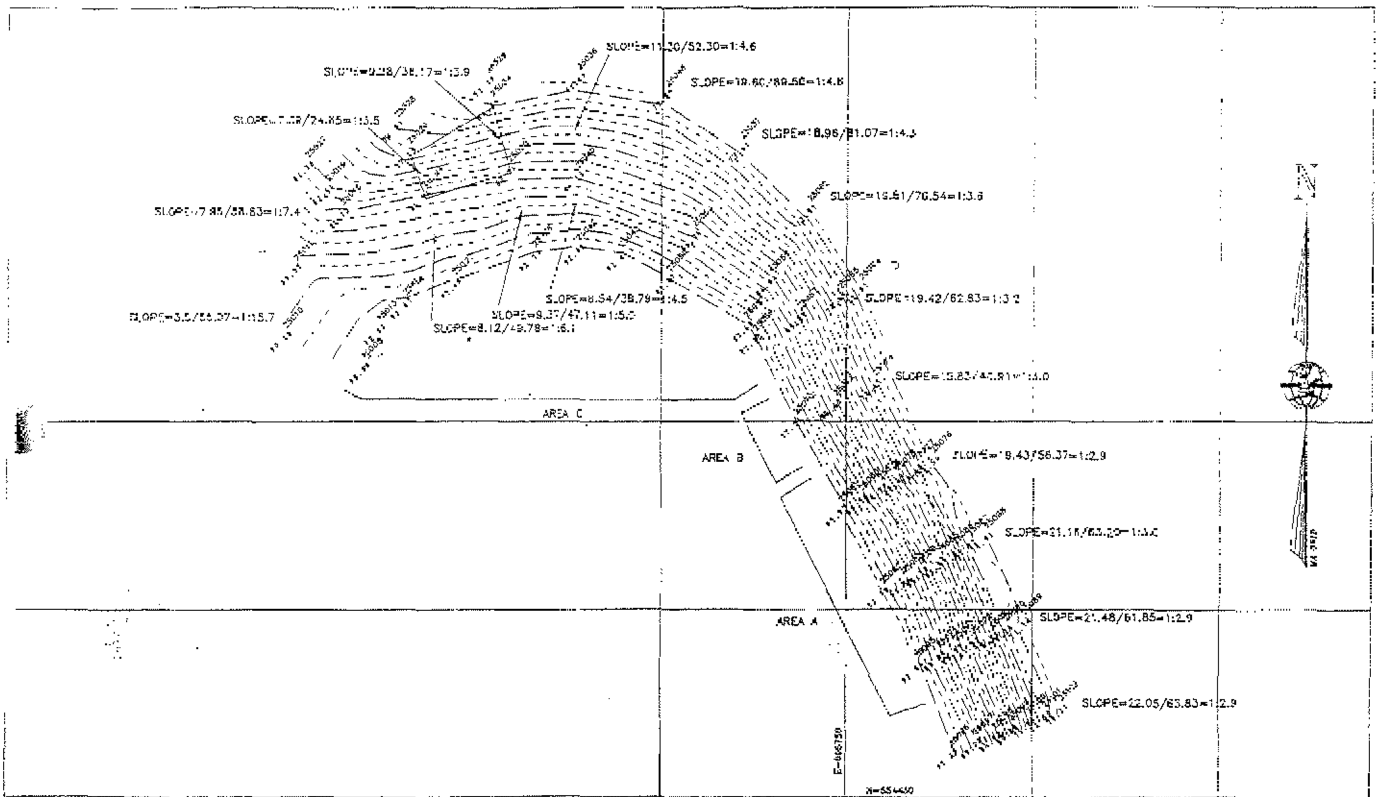
GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

Name (print): Alfred A. Toney Date: 09/29/94

Title: Field Engineer

Representing: Golder Associates Inc.

Signature: Alfred A. Toney



REV.	DATE	DESCRIPTION	C/C	DR	CK

GRAPHIC SCALE

50 25 0 50 100 150

SUBGRADE SLOPE ANALYSIS

I.S.R.T.

WEST HIDE PILE

SCALE: 1" = 50' SEPTEMBER 30, 1994

FILE NO. 2256 | PROJECT NO. 597.22 | SHEET NO. 1 OF 1

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 10-06-94

Project Name: ~~WM~~ Z-Flex

Site Name: W.H.P.

Location of Subgrade Surface to be Lined: Pipe corridor @ the Beco Access Rd.

SURVEY CUTSHEET ATTACHED YES NO

I hereby certify that the above area is suitable for the installation of geosynthetics, and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): Mike Tanner Date: 10/06/94

Title: RUST QC STAFF

Representing: RUST E & I

Signature: Mike Tanner

Acknowledged by:

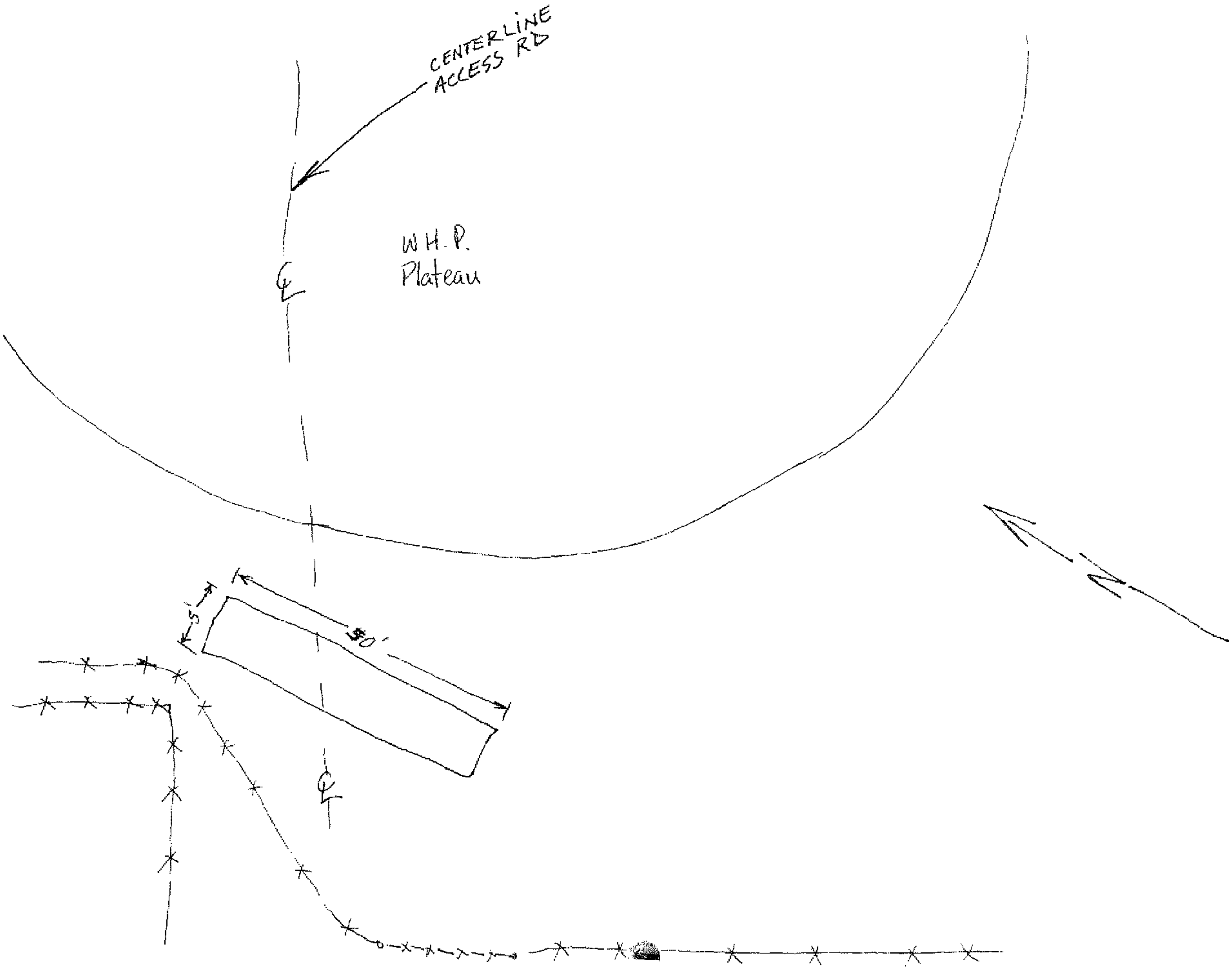
GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

Name (print): Alfred N. Tracy Date: 10/06/94

Title: Geotechnical Engineer

Representing: Golder Associates Inc.

Signature: Alfred N. Tracy


CENTERLINE
ACCESS RD
W.H.P.
Plateau
50'
5'
N

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 10/13/94

Project Name: I-Plex

Site Name: W.H.P

Location of Subgrade Surface to be Lined: SEE SKETCH

SURVEY CUTSHEET ATTACHED YES NO

I hereby certify that the above area is suitable for the installation of geosynthetics and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): Mike Tanner Date: 10/13/94

Title: RUST QC STAFF

Representing: RUST E&I

Signature: M. Tanner

Acknowledged by:

GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

Name (print): Alfred A. Tung Date: 10/13/94

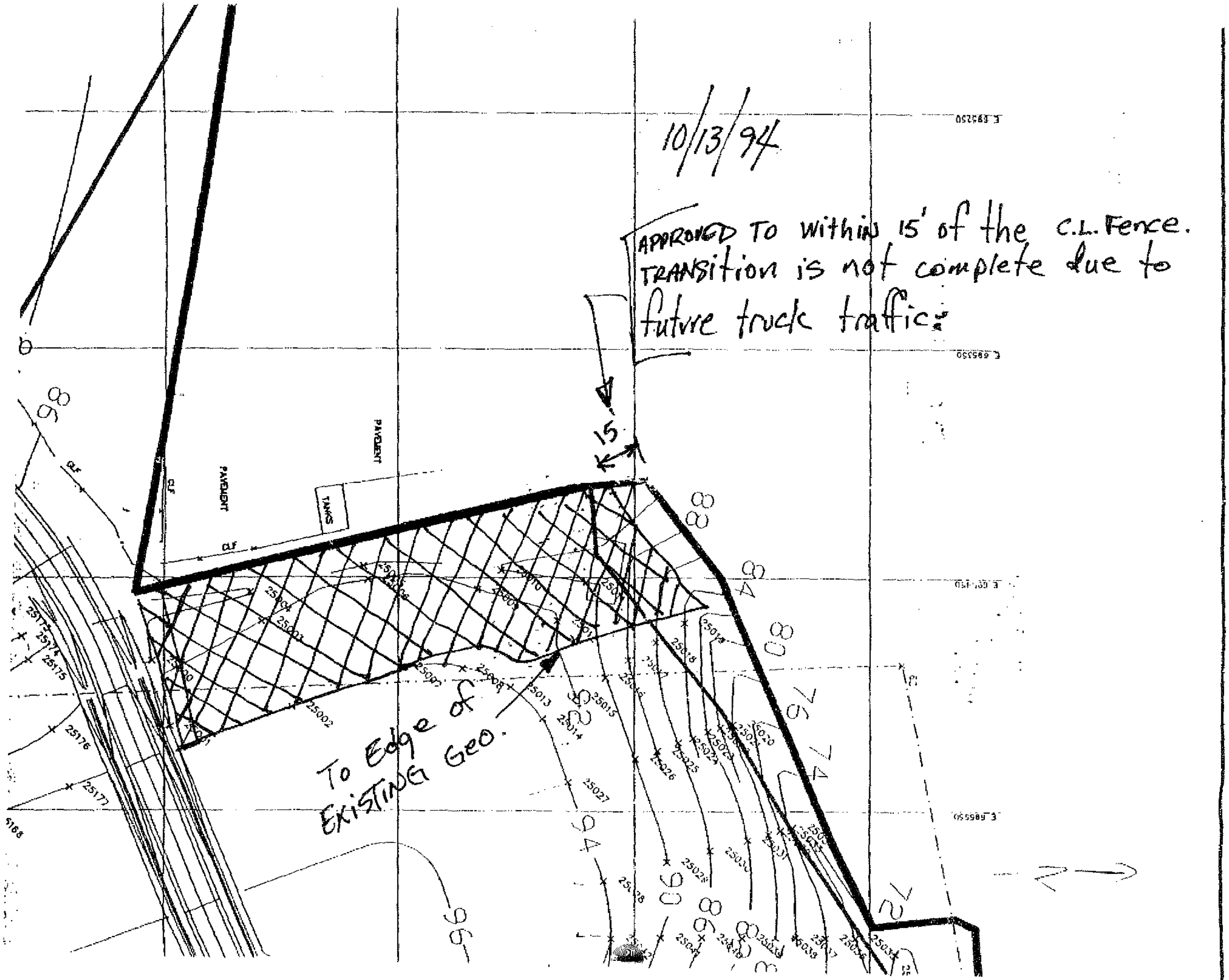
Title: Geotechnical Engineer

Representing: Golder Associates Inc.

Signature: Alfred A. Tung

©WMNA

June 15, 1990


10/13/94
APPROVED TO within 15' of the C.L. Fence.
TRANSITION is not complete due to
future truck traffic.
15'
To Edge of
EXISTING GEO.
PAVEMENT
PAVEMENT
TANKS
CLF
CLF

CERTIFICATE OF COMPLETION
OF SOIL SUBGRADE SURFACE

Date: 10/14/94

Project Name: I - PLEX

Site Name: WEST HIDE PILE

Location of Subgrade Surface to be Lined: SEE SKETCH

SURVEY CUTSHEET ATTACHED YES NO VERBAL OK VIA MIKE Q.C DAVE RUST STEVE RUST

I hereby certify that the above area is suitable for the installation of geosynthetics, and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): Mike TANNER Date: 10/14/94

Title: RUST QC STAFF

Representing: RUST E & I

Signature: Mike Tanner

Acknowledged by:

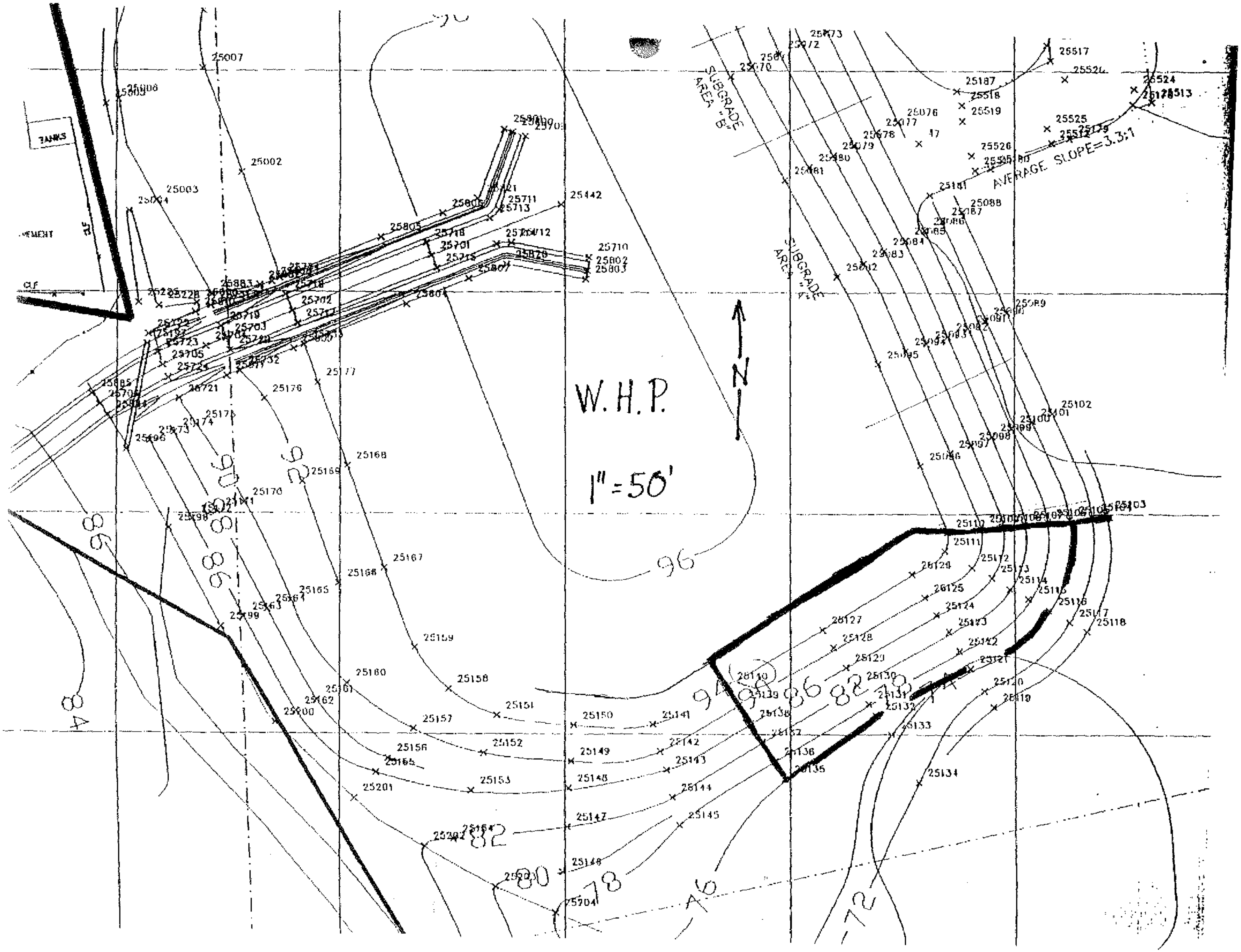
GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

Name (print): ANTHONY CRUPI Date: 10/14/94

Title: SENIOR FIELD INSPECTOR

Representing: PSI

Signature: Anthony E Crupi


W.H.P.
1"=50'
N
SUBGRADE AREA "B"
SUBGRADE AREA "A"
AVERAGE SLOPE=3.3:1
TANKS

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 10/17/94

Project Name: I-Plex

Site Name: W.H.P

Location of Subgrade Surface to be Lined: SEE SKETCH

SURVEY CUTSHEET ATTACHED YES NO Survey verbal ok
Tom B.

I hereby certify that the above area is suitable for the installation of geosynthetics, and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): MIKE TANNER Date: 10/17/94

Title: RUST QC STAFF

Representing: RUST E & I

Signature: Mike Tanner

Acknowledged by:

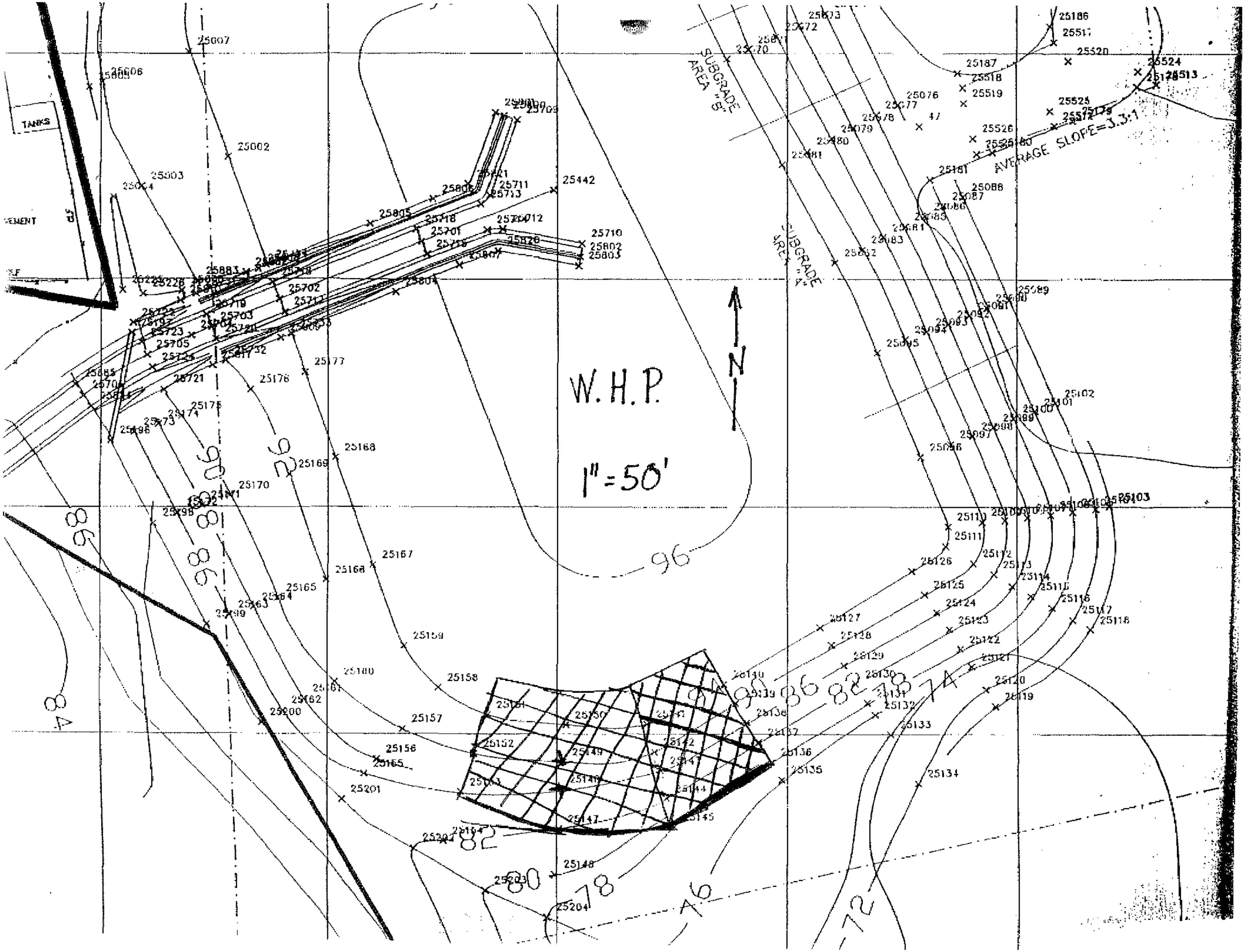
GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

Name (print): Alfred A. Taney Date: 10/17/94

Title: Geotechnical Engineer

Representing: Golder Associates Inc.

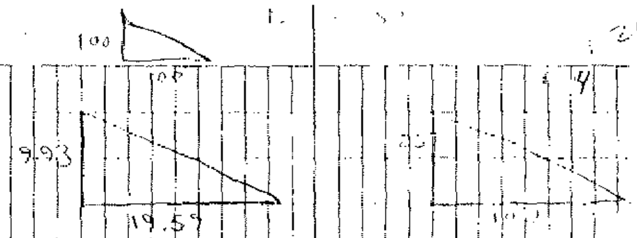
Signature: Alfred A. Taney



TANKS
SUBGRADE AREA "B"
SUBGRADE AREA "A"
AVERAGE SLOPE=3.3:1
N
W.H.P.
1"=50'

25140	→ 25138	94.59 - 84.66 =	9.93/19.59	1:1.97
25138	→ 25135	84.66 - 74.56 =	10.10/29.37	1:2.91
25141	→ 25143	92.45 - 84.59	7.86/21.31	1:2.71
25143	→ 25145	84.59 - 76.60	7.99/25.39	1:3.17
25150	→ 25148	92.62 - 85.51	7.11/28.41	1:3.99
25148	→ 25147	85.51 - 82.15	3.36/17.19	1:5.11
25147	→ 25146	82.15 - 78.61	3.54/19.92	1:5.63
25151	→ 25153	92.66 - 84.76	7.90/35.70	1:4.53
25153	→ 25154	84.76 - 80.62	4.14/22.92	1:5.54

SLOPE ANALYSIS
FIELD CALCULATED SLOPES 10/17
FOR USE IN CALCULATING
LIMITS [illegible]



SLOPE $\frac{RISE}{RUN}$ .5069
50.69% SLOPE

.22 .25 1.5

(24)

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 10/19/94

Project Name: I-Plex

Site Name: W.H.P.

Location of Subgrade Surface to be Lined: SEE SKETCH

SURVEY CUTSHEET ATTACHED YES NO Verbal from foreman WHO STATED KELLY F. APPROVED

I hereby certify that the above area is suitable for the installation of geosynthetics, and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): MIKE Tanner Date: 10/19/94

Title: RUST QC STAFF

Representing: RUST E&I

Signature: Mike Tanner

Acknowledged by:

GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

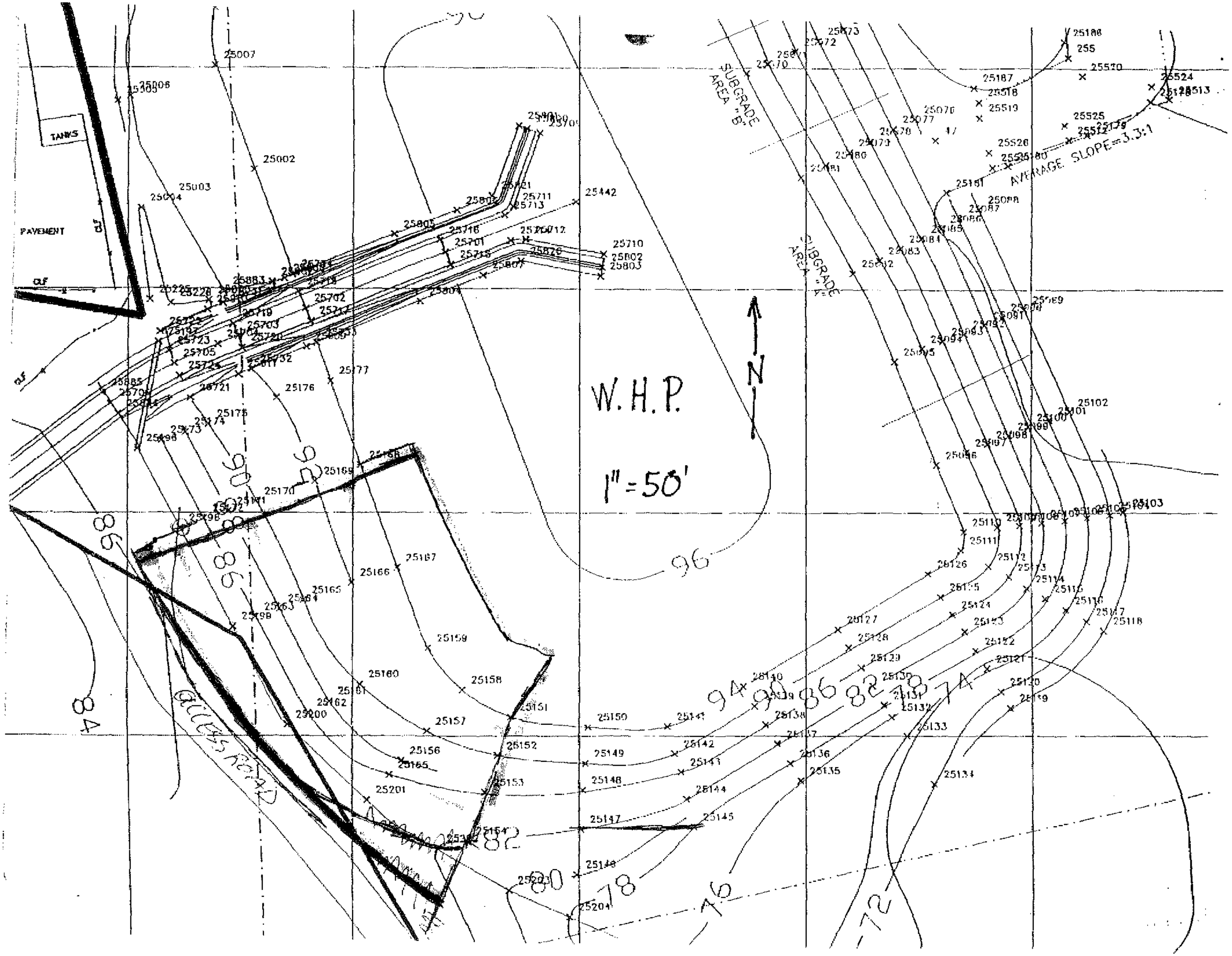
Name (print): Alfred A. Taney Date: 10/19/94

Title: Geotechnical Engineer

Representing: Golder Associates Inc.

Signature: Alfred A. Taney

©WMNA
June 15, 1990



W.H.P.
1" = 50'
N
TANKS
PAVEMENT
SUBGRADE AREA 'B'
SUBGRADE AREA 'A'
AVERAGE SLOPE=3.3:1
ACCESS ROAD

SOIL SUBGRADE SURFACE FOR GEOSYNTHETIC INSTALLATION
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY WEST HIDE PILE
4-7-95 WORK

LOCATION SOUTH BASE OF WEST HIDE PILE
INCLUDING TOE AREA

THICKNESS VERIFICATION

Survey Cut Sheet attached ____ Yes X No

If no verbal by whom: TOM HEASLEY

Subgrade within design tolerance X Yes ____ No *

Check one:

____ Sloped areas, greater than 8H:1V, are within -0.5' to + 0.3' of design elevation and not steeper than max. design slope.

X Flat areas, less than 8H:1V, are within -0.5' to 0.0' of design elevation.

Area indicated above is suitable for the installation of geosynthetics; in accordance with the project specifications.

Comments:

John F. Kiley
CWM/RUST QC Rep

General Foreman
Title

4/14/95
Date

Peter Neumann
QA Inspector

Resident Engr.
Title

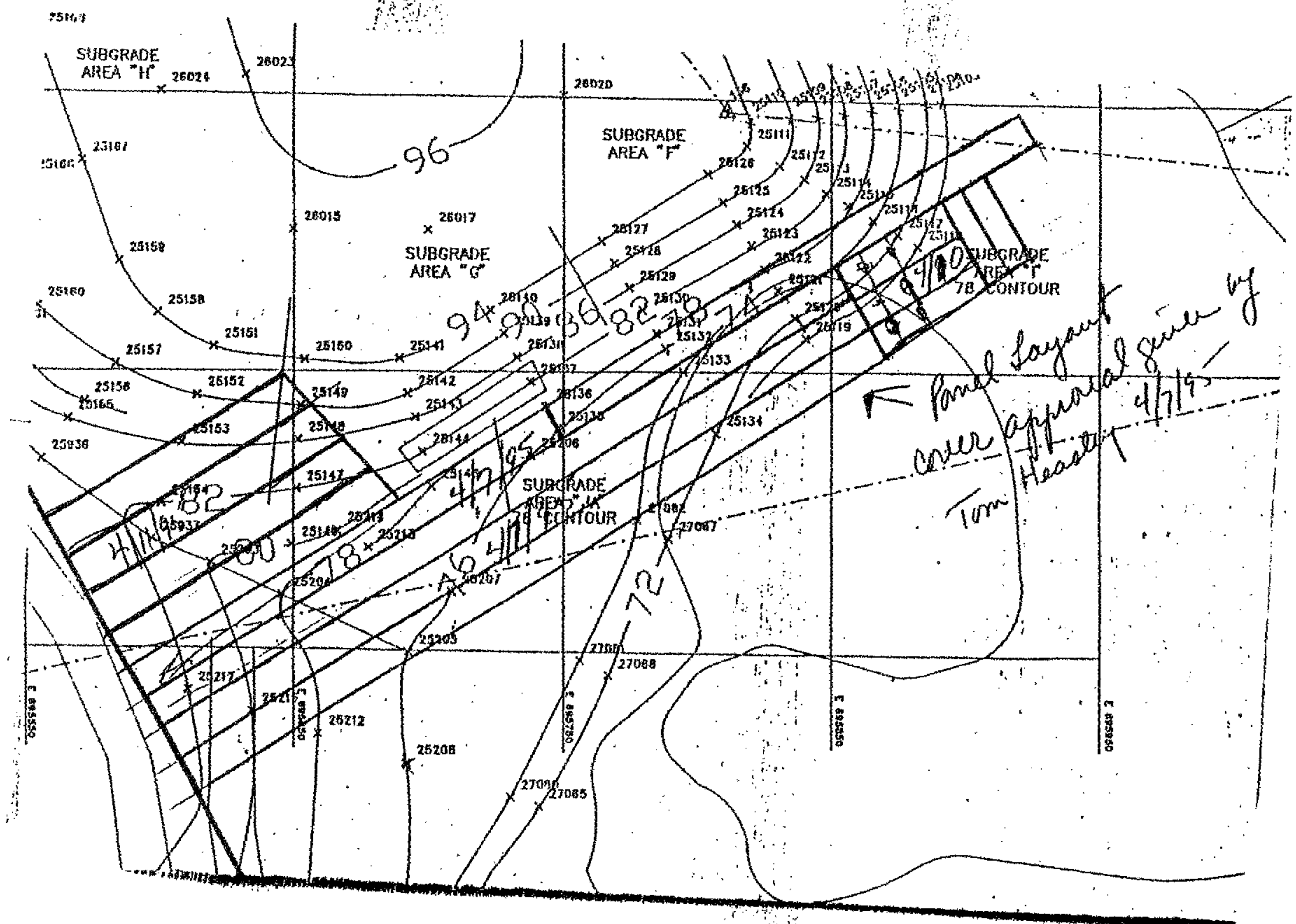
4/14/95
Date

---

* If "NO" then engineering approval needed:

RRS Engineer ____________ Signature ____________ Date

Resident Engineer or designated representative ____________ Signature ____________ Date


SUBGRADE AREA "H"
SUBGRADE AREA "G"
SUBGRADE AREA "F"
SUBGRADE AREA "I" 78' CONTOUR
SUBGRADE AREA "J" 78' CONTOUR
Panel Layout cover approval given by Tom Heasty 4/7/95

SOIL SUBGRADE SURFACE FOR GEOSYNTHETIC INSTALLATION
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY WEST Hide Pile

LOCATION EAST of ENhANCED, WEST of 1C South

THICKNESS VERIFICATION

Survey Cut Sheet attached ____ Yes X No

If no verbal by whom: Tom

Subgrade within design tolerance ✓ Yes ____ No *

Check one:

____ Sloped areas, greater than 8H:1V, are within -0.5' to + 0.3' of design elevation and not steeper than max. design slope.

✓ Flat areas, less than 8H:1V, are within -0.5' to 0.0' of design elevation.

Area indicated above is suitable for the installation of geosynthetics; in accordance with the project specifications.

Comments:

John F. Kiley	Gen Foreman	4/26/95
CWM/RUST QC Rep	Title	Date
[signature]	Res. Engr.	4/26/95
QA Inspector	Title	Date

* If "NO" then engineering approval needed:

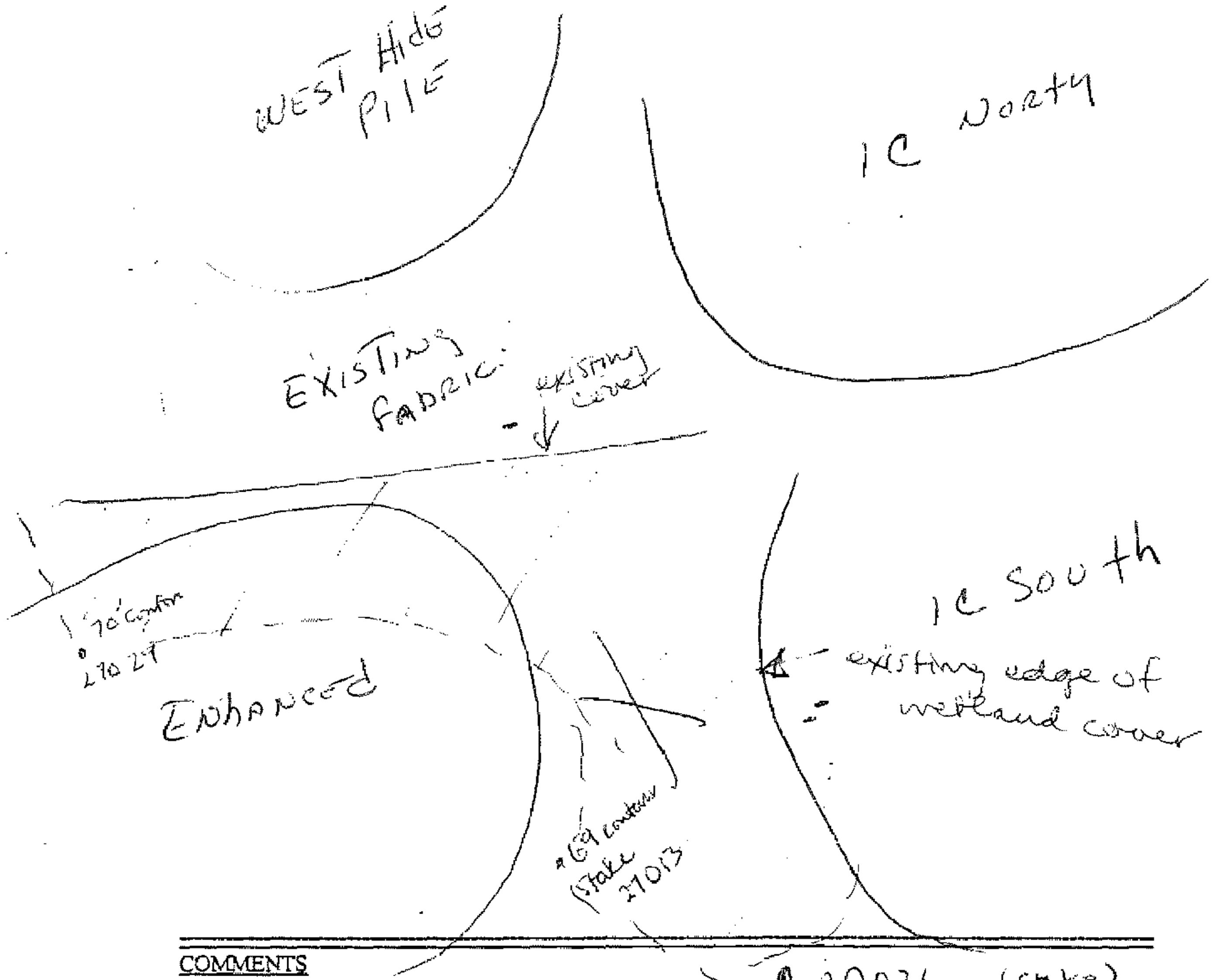
RRS Engineer ____ Signature ____ Date

Resident Engineer or designated representative ____ Signature ____ Date

SHEET ____ OF ____

SUBGRADE FOR FILL FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH



COMMENTS

27036 (stake)
70 contour stake
(farthest south & east)

SOIL SUBGRADE SURFACE FOR GEOSYNTHETIC INSTALLATION
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY N.W. Corner of West Hide Pile

LOCATION Area adjacent to Beco Road south to existing fabric on slope of West Hide pile

THICKNESS VERIFICATION

Survey Cut Sheet attached ____ Yes ✓ No

If no verbal by whom: Tom B.

Subgrade within design tolerance ✓ Yes ____ No *

Check one:

✓ Sloped areas, greater than 8H:1V, are within -0.5' to + 0.3' of design elevation and not steeper than max. design slope.

____ Flat areas, less than 8H:1V, are within -0.5' to 0.0' of design elevation.

Area indicated above is suitable for the installation of geosynthetics; in accordance with the project specifications.

Comments:

John F. Kiley	Sen Foreman	5/10/95
CWM/RUST QC Rep	Title	Date
[signature]	Staff Engineer	05/10/95
QA Inspector	Title	Date

* If "NO" then engineering approval needed:

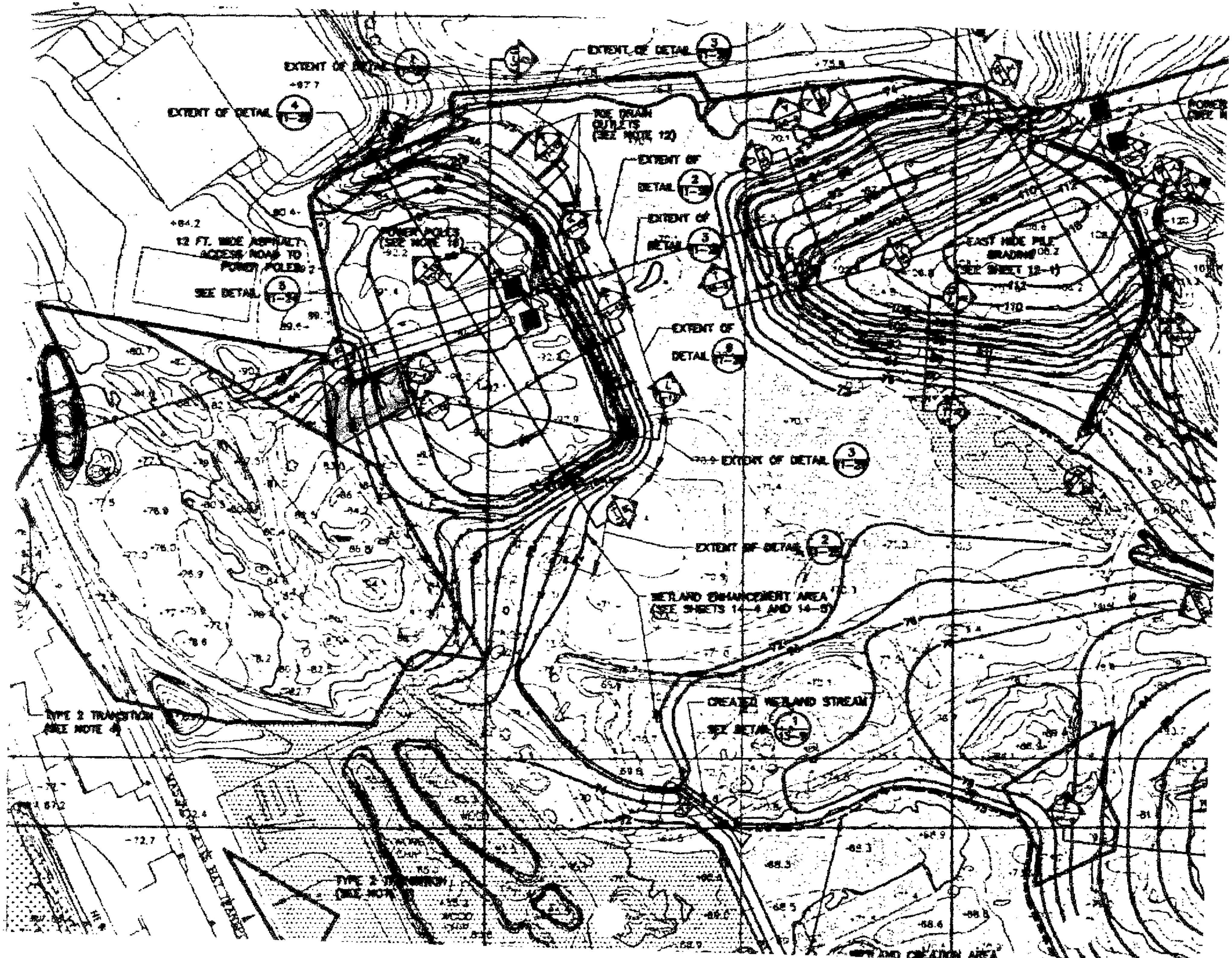
RRS Engineer ____________ Signature ____________ Date

Resident Engineer or designated representative ____________ Signature ____________ Date

SUBGRADE FOR FILL FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH

COMMENTS



EXTENT OF DETAIL 3 11-38
EXTENT OF DETAIL 4 11-38
TOE DRAIN OUTLETS (SEE NOTE 12)
EXTENT OF DETAIL 2 11-38
EXTENT OF DETAIL 3 11-38
POWER POLES (SEE NOTE 16)
12 FT. WIDE ASPHALT ACCESS ROAD TO POWER POLES
SEE DETAIL 5 11-38
EAST HIDE PILE GRADING (SEE SHEET 12-1)
EXTENT OF DETAIL 6 11-38
EXTENT OF DETAIL 3 11-38
EXTENT OF DETAIL 2 11-38
WETLAND ENHANCEMENT AREA (SEE SHEETS 14-4 AND 14-5)
CREATED WETLAND STREAM
SEE DETAIL 1 15-8
TYPE 2 TRANSITION (SEE NOTE 4)
WETLAND CREATION AREA

SOIL SUBGRADE SURFACE FOR GEOSYNTHETIC INSTALLATION
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY West Hide Pile

LOCATION NW Corner of Hide Pile - Bordered by 315 New Boston St.

THICKNESS VERIFICATION

Survey Cut Sheet attached ____ Yes ✓ No

If no verbal by whom: ____________

Subgrade within design tolerance ____ Yes ____ No * See Below

Check one:

N/A Sloped areas, greater than 8H:1V, are within -0.5' to + 0.3' of design elevation and not steeper than max. design slope.

N/A Flat areas, less than 8H:1V, are within -0.5' to 0.0' of design elevation.

Area indicated above is suitable for the installation of geosynthetics; in accordance with the project specifications.

Comments:

John F. Kiley	Gen Foreman	5/12/95
CWM/RUST QC Rep	Title	Date
Alfred G. Laney	Staff Engineer	05/12/95
QA Inspector	Title	Date

* If "NO" then engineering approval needed:

RRS Engineer	Signature	Date
Resident Engineer or designated representative	Signature	Date

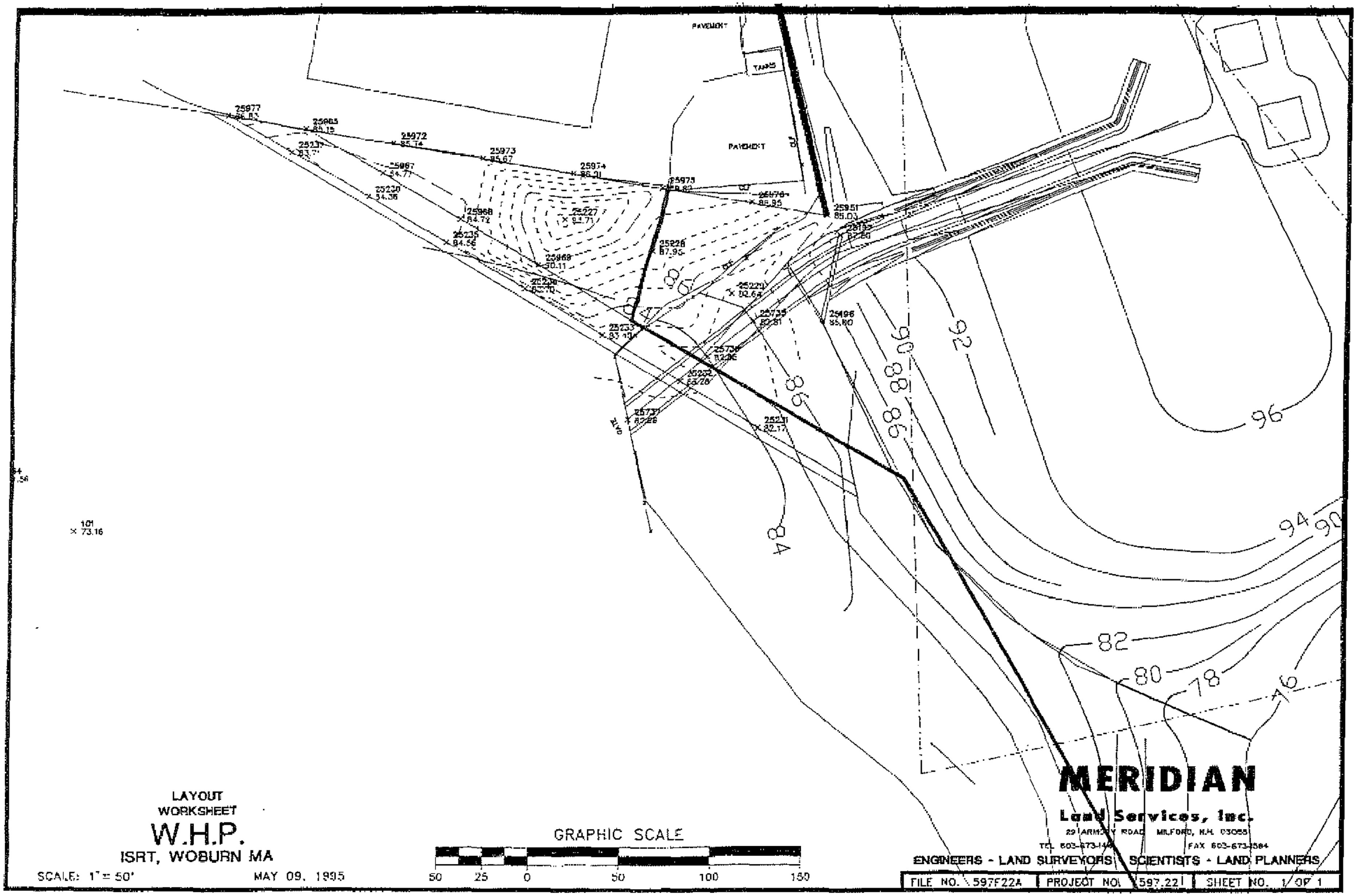
* Survey will collect subgrade elevations on top of fabric because it is a field fit.

SHEET ____ OF ____

SUBGRADE FOR FILL FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH

COMMENTS


PAVEMENT
TANKS
PAVEMENT
92
96
90
88
86
86
84
94
90
82
80
78
76
101
73.16
MERIDIAN
Land Services, Inc.
ENGINEERS - LAND SURVEYORS - SCIENTISTS - LAND PLANNERS
FILE NO. 597F22A
PROJECT NO. 597.22
SHEET NO. 1 OF 1
LAYOUT
WORKSHEET
W.H.P.
ISRT, WOBURN MA
SCALE: 1" = 50'
MAY 09, 1995
GRAPHIC SCALE
50 25 0 50 100 150

SOIL SUBGRADE SURFACE FOR GEOSYNTHETIC INSTALL...ON
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY ~~East~~ West Hide Pile

LOCATION NW Corner of West Hide Pile remaining subgrade to existing fabric on hide pile

THICKNESS VERIFICATION

Survey Cut Sheet attached ____ Yes X No

If no verbal by whom: See Below

Subgrade within design tolerance ____ Yes ____ No *

Check one:

N/A Sloped areas, greater than 8H:1V, are within -0.5' to + 0.3' of design elevation and not steeper than max. design slope.

N/A Flat areas, less than 8H:1V, are within -0.5' to 0.0' of design elevation.

Area indicated above is suitable for the installation of geosynthetics; in accordance with the project specifications.

Comments:

Joel F. Kiley	Gen Foreman	5/15/95
CWM/RUST QC Rep	Title	Date
[illegible]	Field Engineer	05/15/95
QA Inspector	Title	Date

* If "NO" then engineering approval needed:

RRS Engineer	Signature	Date
Resident Engineer or designated representative	Signature	Date

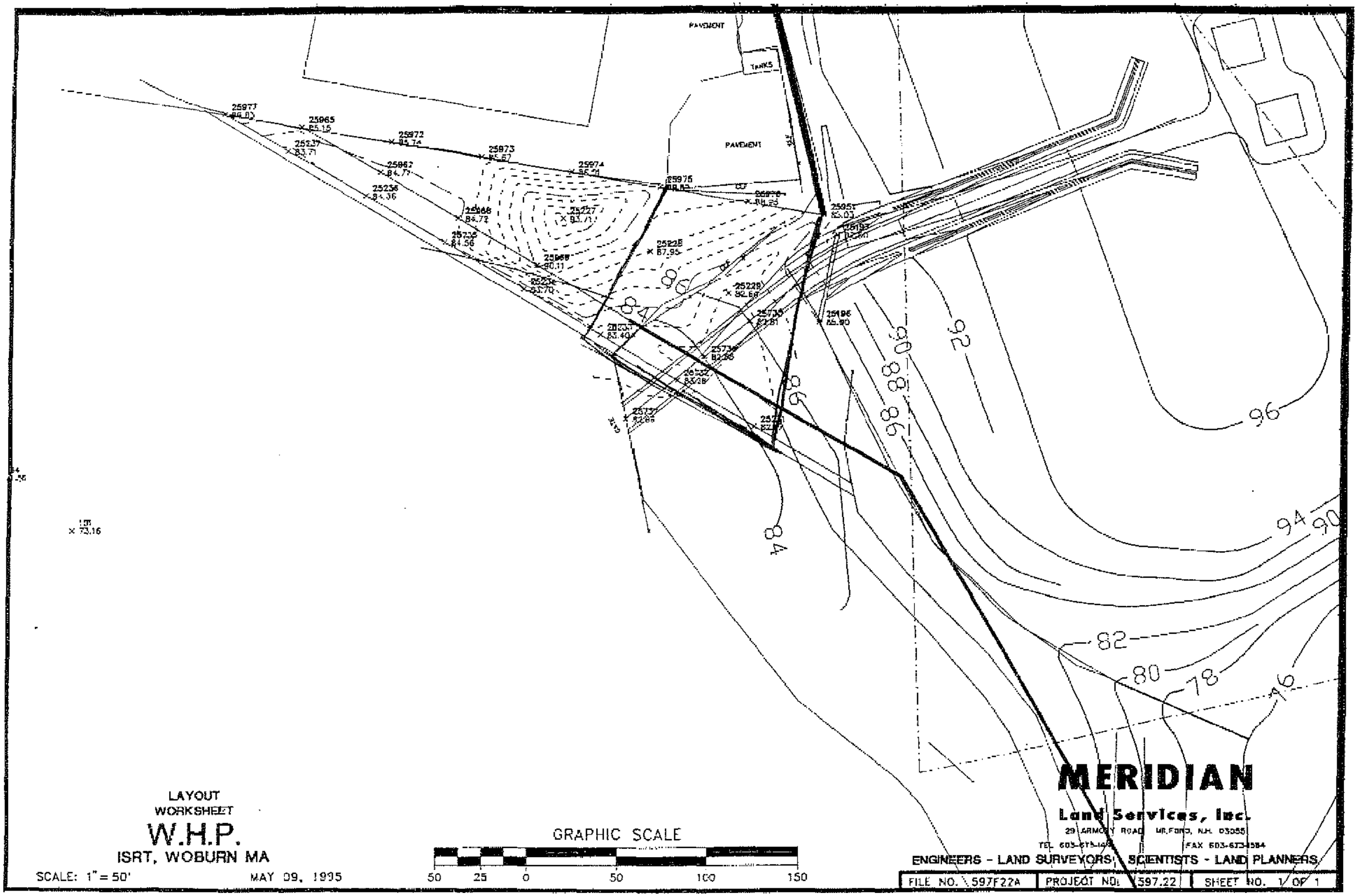
Elevations to be collected. Area is an asbuilt

SHEET ____ OF ____

SUBGRADE FOR FILL FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH

COMMENTS


PAVEMENT
TANKS
PAVEMENT
92
90
88
86
84
96
94
90
82
80
78
76
LAYOUT
WORKSHEET
W.H.P.
ISRT, WOBURN MA
SCALE: 1" = 50'
MAY 09, 1995
GRAPHIC SCALE
50 25 0 50 100 150
MERIDIAN
Land Services, Inc.
ENGINEERS - LAND SURVEYORS - SCIENTISTS - LAND PLANNERS
FILE NO. 597F22A
PROJECT NO. 597.22
SHEET NO. 1 OF 1

SOIL SUBGRADE SURFACE FOR GEOSYNTHETIC INSTALLATION
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY [illegible]

LOCATION [illegible]

THICKNESS VERIFICATION

Survey Cut Sheet attached ____ Yes __ No

If no verbal by whom: [illegible]

Subgrade within design tolerance ____ Yes [illegible] No *

Check one:

____ Sloped areas, greater than 8H:1V, are within -0.5' to + 0.3' of design elevation and not steeper than max. design slope.

[illegible] Flat areas, less than 8H:1V, are within -0.5' to 0.0' of design elevation.

Area indicated above is suitable for the installation of geosynthetics; in accordance with the project specifications.

Comments: [illegible]

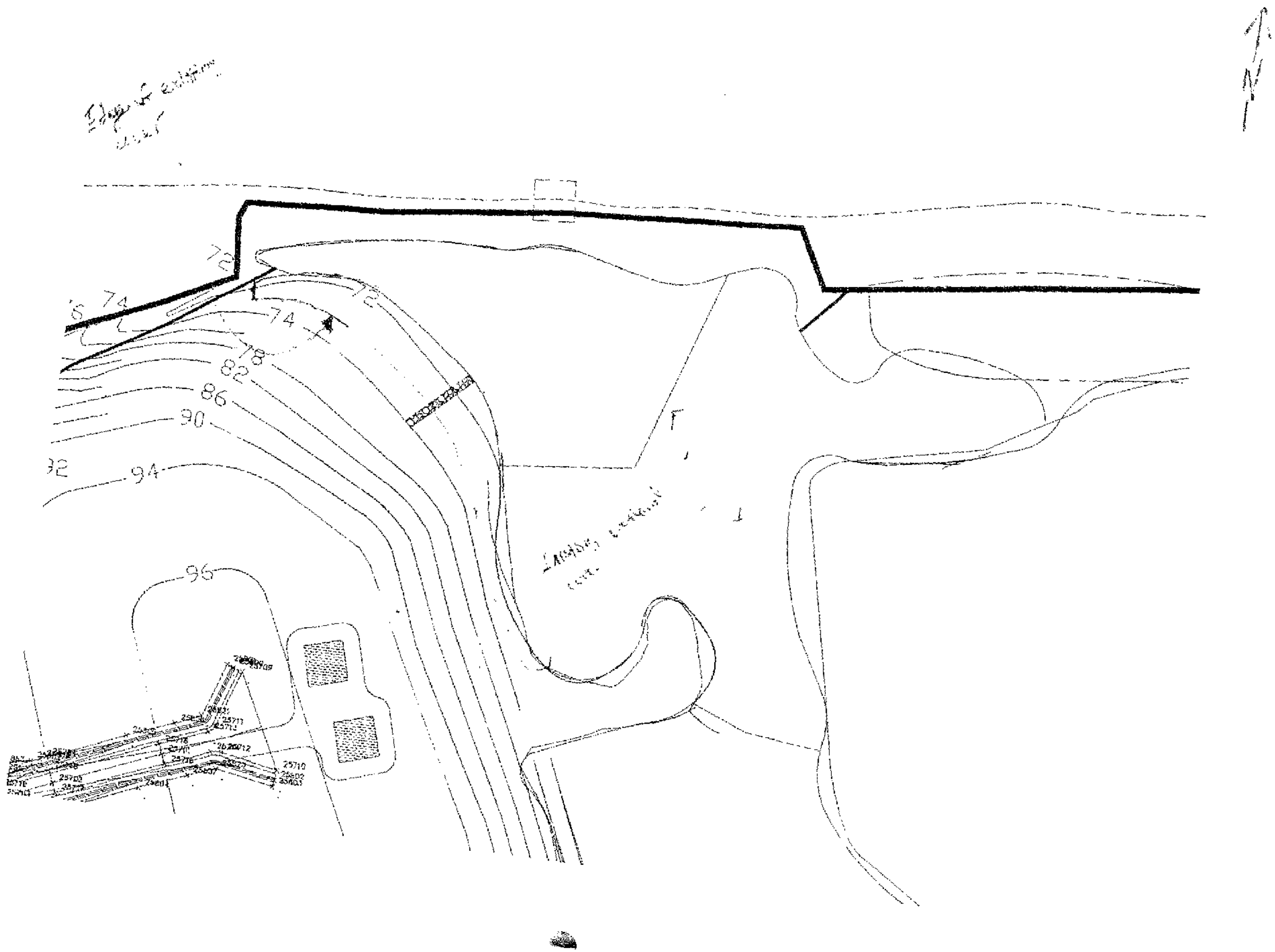
[illegible signature] Glen Foreman 8/1/95
CWM/RUST QC Rep Title Date

[illegible signature] Field Engineer [illegible]
QA Inspector Title Date

* If "NO" then engineering approval needed:

RRS Engineer
Signature Date

Resident Engineer or designated representative
Signature Date



N
72
74
78
82
86
90
94
96

SOIL SUBGRADE SURFACE FOR GEOSYNTHETIC INSTALLATION
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY West Hide Pile

LOCATION North side along Fence

THICKNESS VERIFICATION

Survey Cut Sheet attached ____ Yes X No

If no verbal by whom: Tom B

Subgrade within design tolerance ____ Yes N/A No * Field Fit

Check one:

____ Sloped areas, greater than 8H:1V, are within -0.5' to + 0.3' of design elevation and not steeper than max. design slope.

N/A Flat areas, less than 8H:1V, are within -0.5' to 0.0' of design elevation.

Area indicated above is suitable for the installation of geosynthetics; in accordance with the project specifications.

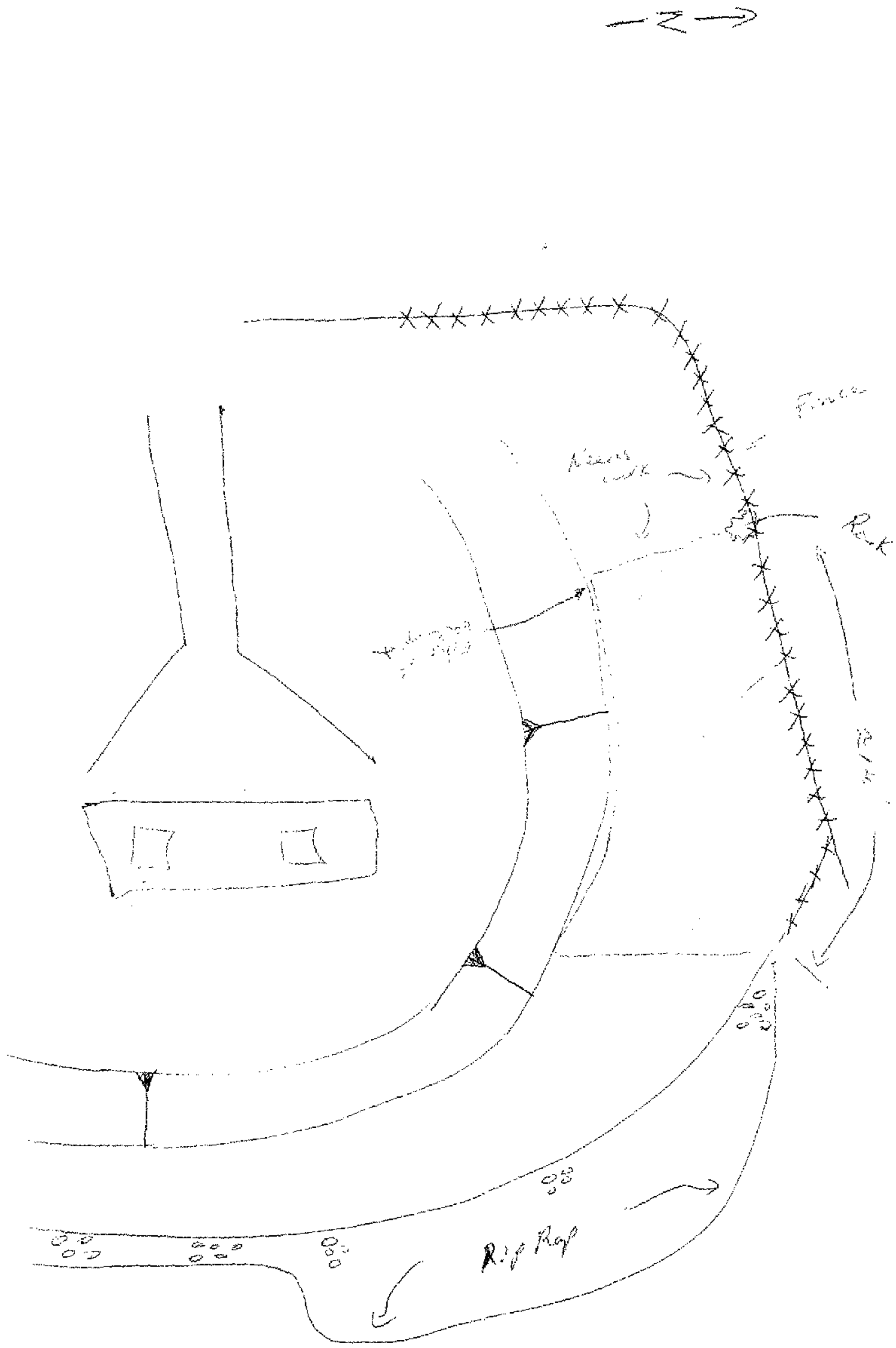
Comments:

[signature]	Foreman	8/18/95
CWM/RUST QC Rep	Title	Date
[signature]	Field Engineer	08/18/95
QA Inspector	Title	Date

---

* If "NO" then engineering approval needed:

RRS Engineer	Signature	Date
Resident Engineer or designated representative	Signature	Date


N
Fence
Rock
Rip Rap

SOIL SUBGRADE SURFACE FOR GEOSYNTHETIC INSTALLATION
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY WEST HIDE PILE

LOCATION NORTH WEST CORNER ALONG FENCE

THICKNESS VERIFICATION

Survey Cut Sheet attached ____ Yes X No

If no verbal by whom: TOM BENIMCT (FIELD FIT AREA)

Subgrade within design tolerance X Yes ____ No *

Check one:

X Sloped areas, greater than 8H:1V, are within -0.5' to + 0.3' of design elevation and not steeper than max. design slope.

____ Flat areas, less than 8H:1V, are within -0.5' to 0.0' of design elevation.

Area indicated above is suitable for the installation of geosynthetics; in accordance with the project specifications.

Comments: AREA IS A FIELD FIT WITH THE SWALE HAVING BEEN REMOVED FROM THE DESIGN BY SAM TAYLOR OF GCS.

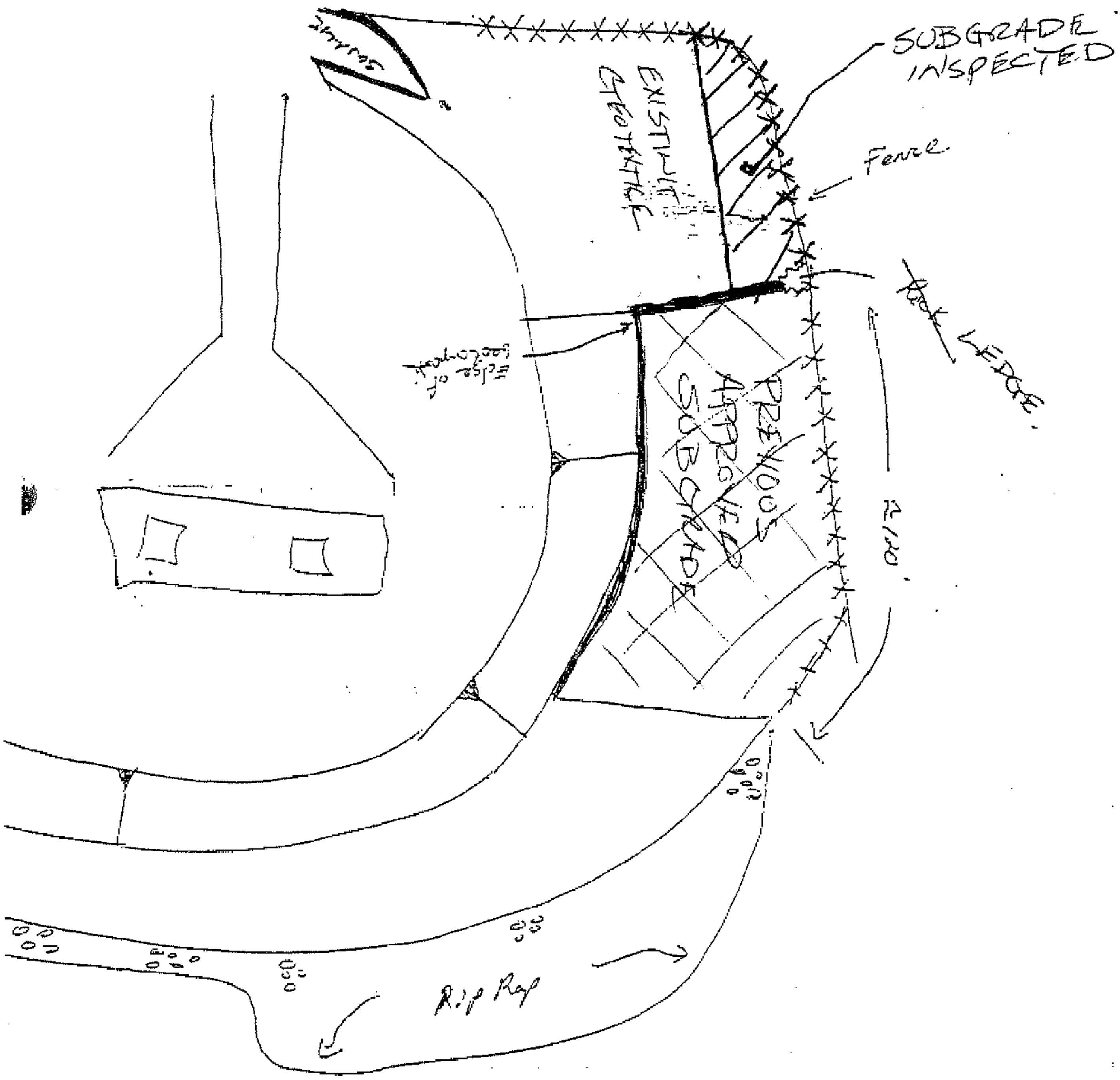
John F. Kiley | Gen Foreman | 8/21/95
CWM/RUST QC Rep | Title | Date

[signature] | SENIOR FIELD INSP. | 8/21/95
QA Inspector | Title | Date

* If "NO" then engineering approval needed:

RRS Engineer ____ Signature ____ Date

Resident Engineer or designated representative ____ Signature ____ Date


SUBGRADE INSPECTED
Fence
Rock LEDGE.
PREVIOUS APPROVED SUBGRADE
EXISTING GEOTEXTILE
Rip Rap

SOIL SUBGRADE SURFACE FOR GEOSYNTHETIC INSTALLATION
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY West Hide Pile

LOCATION

THICKNESS VERIFICATION

Survey Cut Sheet attached ____ Yes X No

If no verbal by whom:

Subgrade within design tolerance ____ Yes n/a No *

Check one:

n/A Sloped areas, greater than 8H:1V, are within -0.5' to + 0.3' of design elevation and not steeper than max. design slope.

n/A Flat areas, less than 8H:1V, are within -0.5' to 0.0' of design elevation.

Area indicated above is suitable for the installation of geosynthetics; in accordance with the project specifications.

Comments:

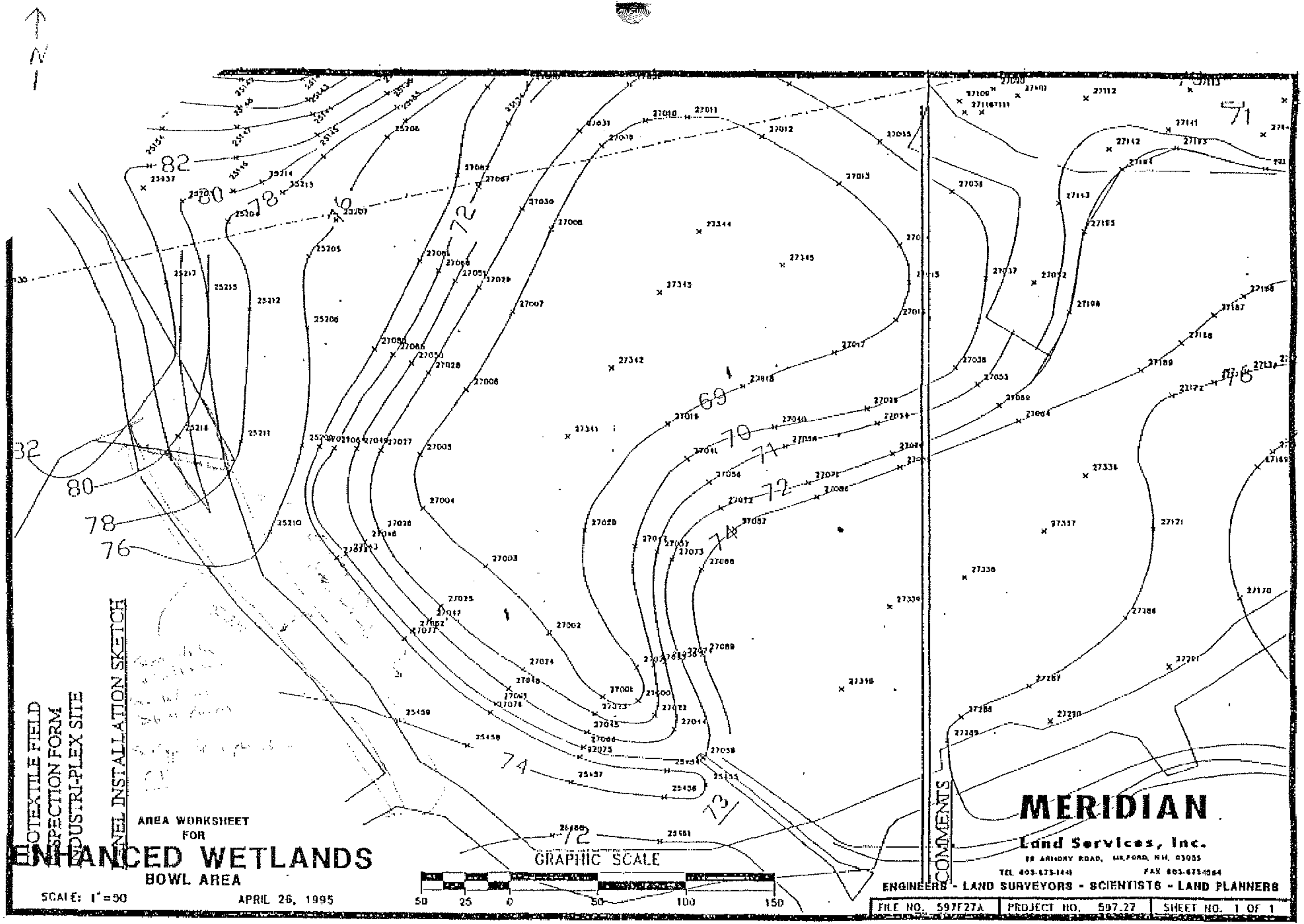
CWM/RUST QC Rep | Title | Date 9-7-95

QA Inspector | Title | Date

* If "NO" then engineering approval needed:

RRS Engineer
Signature | Date

Resident Engineer or designated representative
Signature | Date



AREA WORKSHEET
FOR
ENHANCED WETLANDS
BOWL AREA
SCALE: 1"=50
APRIL 26, 1995
GRAPHIC SCALE
50 25 0 50 100 150
MERIDIAN
Land Services, Inc.
ENGINEERS - LAND SURVEYORS - SCIENTISTS - LAND PLANNERS
FILE NO. 597F27A
PROJECT NO. 597.27
SHEET NO. 1 OF 1
COMMENTS
OTEXTILE FIELD
SPECTION FORM
DUSTRI-PLEX SITE
NEL INSTALLATION SKETCH
N

SUBGRADE FOR FILL
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY West Hide Pile

LOCATION Top of Pile

Erosion and Sediment Controls are in place. ____ Yes X No

In accordance with the specifications Section 02110 3.02 materials have been cleared, grubbed, and removed from the construction areas to the satisfaction of the Trustee Representative including but not limited to trees, stumps roots, brush, trash, organic matter, paving miscellaneous structures, debris and abandoned utilities. On Hide Piles stumps have been cut off at ground surface. Holes or cavities which extend below the subgrade elevation of the proposed work shall be filled with crushed rock or other suitable material to the satisfaction of the Trustee Representative. Surface rocks or boulders have been grubbed from the soil to the satisfaction of the Trustee Representative.

SUBGRADE INSPECTION COMMENTS

N/A Grubbed

Yes Cleared

Mike Tanner
CWM/RUST QC Officer

05-10-94
Date

Alfred A. Loney
QA Engineer

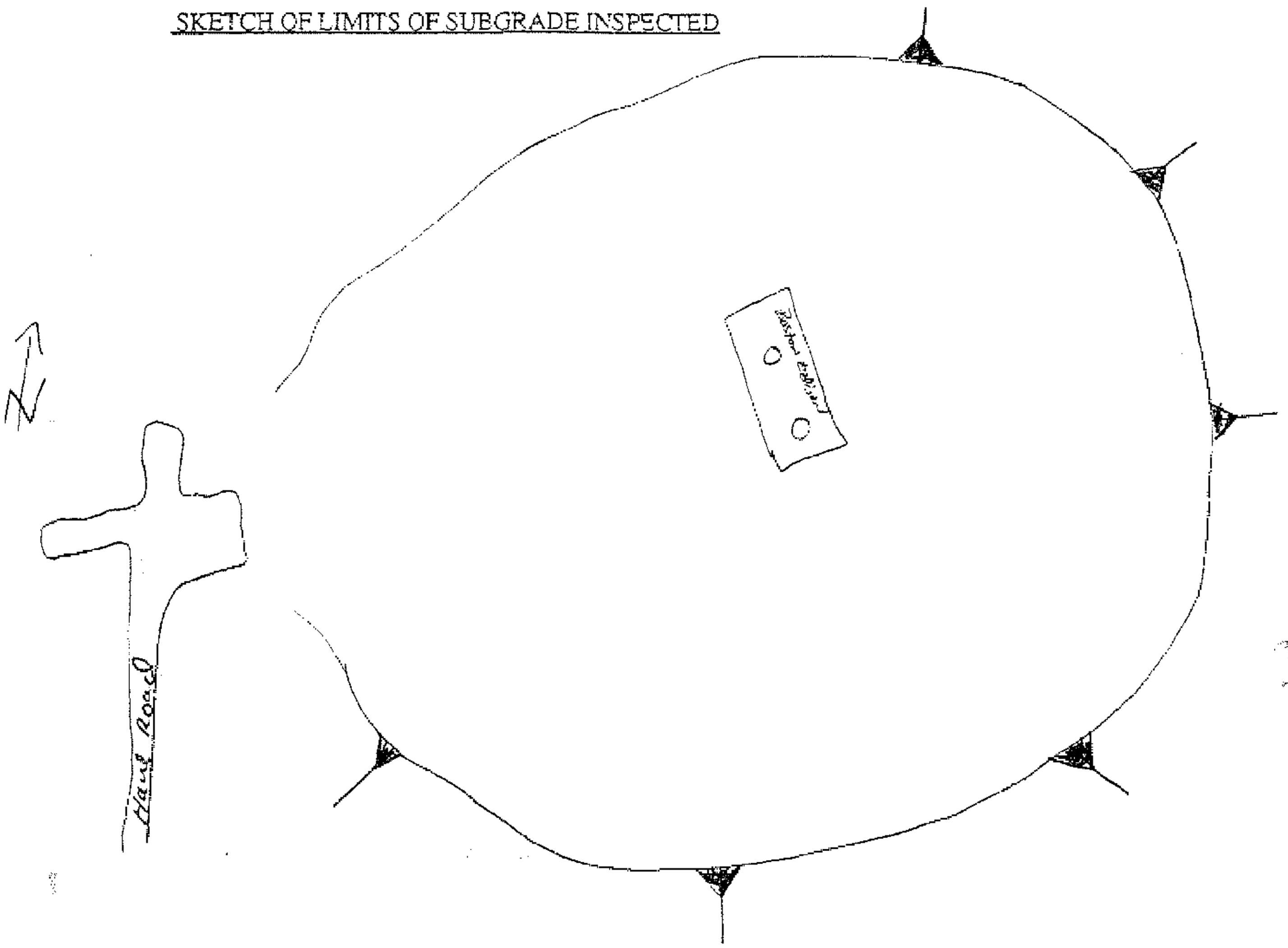
05/10/94
Date

REV 05/94

FILL SUBGRADE INSPECTION
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET OF

SKETCH OF LIMITS OF SUBGRADE INSPECTED



NTS

COMMENTS

Proof rolling will not be performed in areas of Ponded water. these areas will be filled w/ crush & run to a thickness that will allow rolling.

REV 05/94

SUBGRADE FOR FILL
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF ■

PROPERTY EAST HIDE PILE

LOCATION THE WESTERN TOE. WETLAND BUTTERESS FM.

Erosion and Sediment Controls are in place. ___ Yes ✓ No *

In accordance with the specifications Section 02110 3.02 materials have been cleared, grubbed, and removed from the construction areas to the satisfaction of the Trustee Representative including but not limited to trees, stumps roots, brush, trash, organic matter, paving miscellaneous structures, debris and abandoned utilities. On Hide Piles stumps have been cut off at ground surface. Holes or cavities which extend below the subgrade elevation of the proposed work shall be filled with crushed rock or other suitable material to the satisfaction of the Trustee Representative. Surface rocks or boulders have been grubbed from the soil to the satisfaction of the Trustee Representative.

SUBGRADE INSPECTION COMMENTS

___ Grubbed

✓ Cleared

The area around the northwest corner and western toe of the existing hide pile is ready to place the butteress fill. See sketch on the back of this form.
M.T.

• THE UNDERSIGNED QA TECHNICIAN & THE UNDERSIGNE RUST QC OFFICER AGREED THAT STABILIZATION FABRIC & #57 STONE IS REQUIRED @ NON-STABLE AREAS (SEE REVERSE SIDE).

* WETLAND SILT BOOM NOT IN PLACE.

M. Tanner
CWM/RUST QC Officer

08-12-94
Date

T. [signature]
QA ~~Engineer~~ TECHNICIAN (PSI)

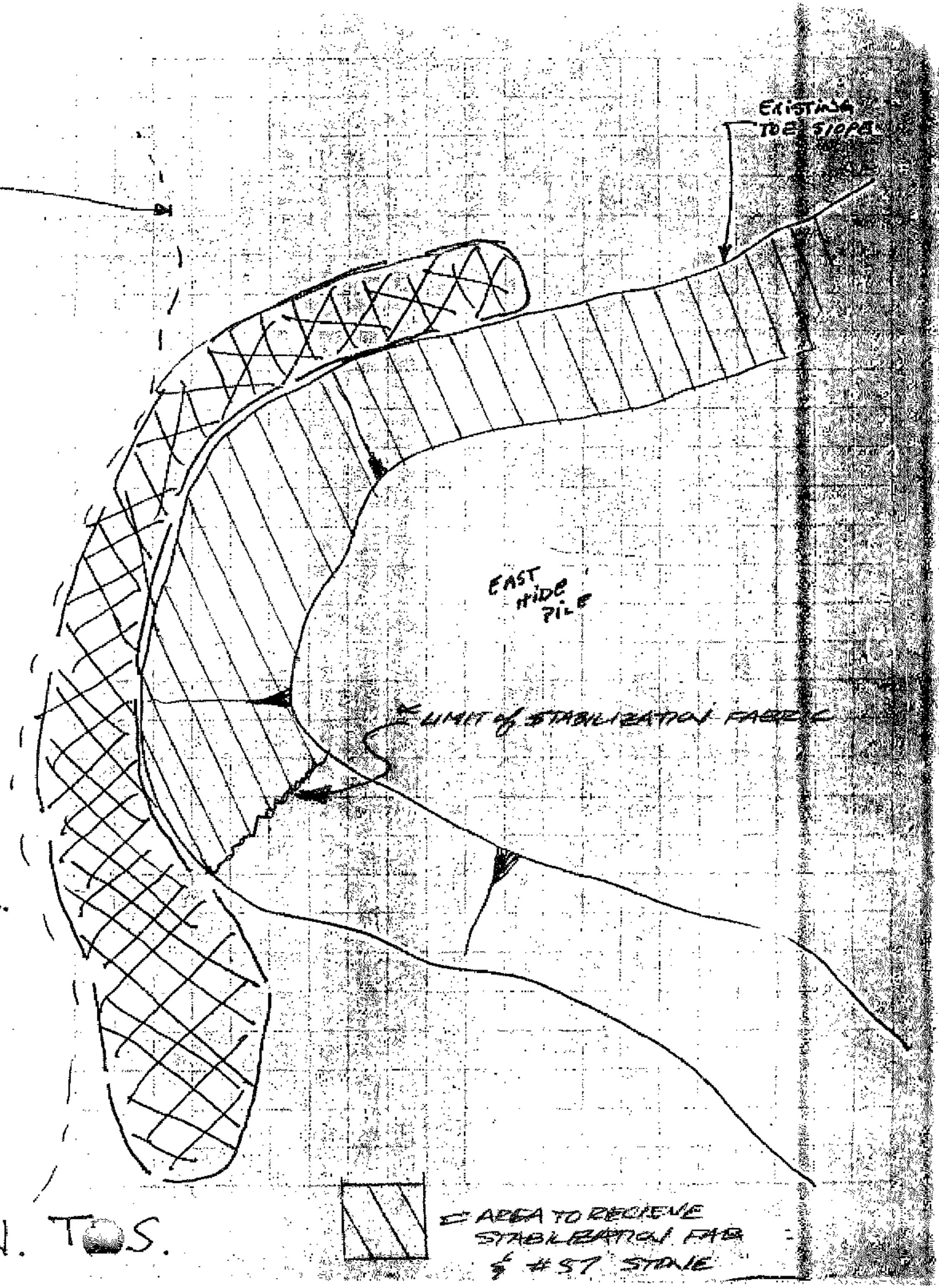
8-12-94
Date

REV 05/94

RUST ENVIRONMENT & INFRASTRUCTURE

CALCULATION SHEET

PAGE ____ OF ____
PROJECT NO. 38012
CLIENT RUST REMEDIAL
SUBJECT CLEARING
PROJECT I-PLEX EAST HIDE PILE
Prepared By MT Date 8/12/94
Reviewed By ____ Date ____
Approved By ____ Date ____



NOTE:

1). HATCHED AREA APPROVED FOR Clearing.

2). Surveyors to stake contours.

SUBGRADE FOR FILL
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY EAST HIDE PILE (E.H.P.)

LOCATION THE NORTHER HALF OF THE E.H.P.
SEE SKETCH ON THE BACK OF THIS FORM

Erosion and Sediment Controls are in place. (X) Yes ____ No

In accordance with the specifications Section 02110 3.02 materials have been cleared, grubbed, and removed from the construction areas to the satisfaction of the Trustee Representative, including but not limited to trees, stumps roots, brush, trash, organic matter, paving miscellaneous structures, debris and abandoned utilities. On Hide Piles stumps have been cut off at ground surface. Holes or cavities which extend below the subgrade elevation of the proposed work shall be filled with crushed rock or other suitable material to the satisfaction of the Trustee Representative. Surface rocks or boulders have been grubbed from the soil to the satisfaction of the Trustee Representative.

SUBGRADE INSPECTION COMMENTS

____ Grubbed

__X__ Cleared

(X) → E+S is installed on the South and West side. The Buttress fill is considered a soil berm. No E+S on the East or North side.

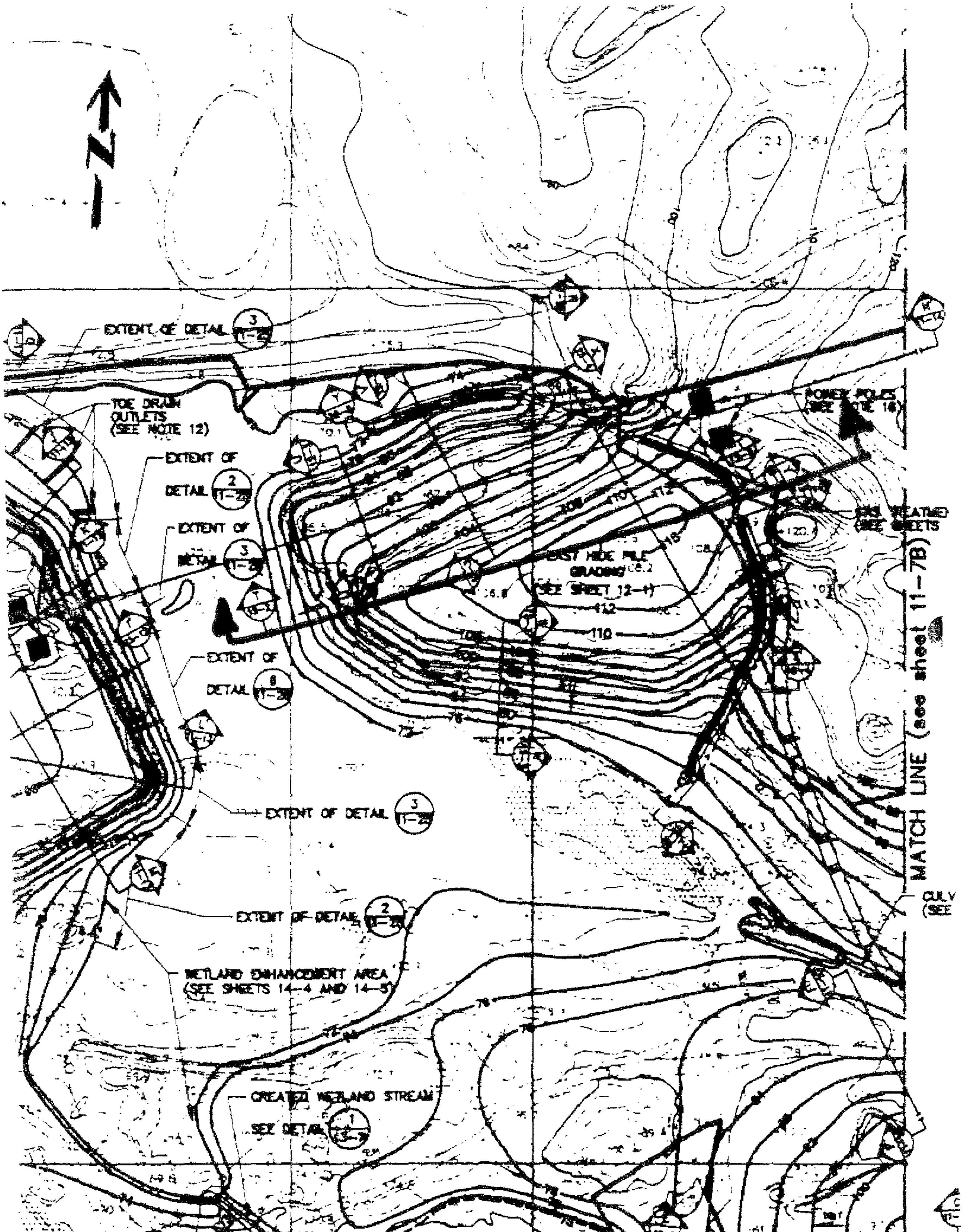
Mike Tanner
CWM/RUST QC Officer

10/01/94
Date

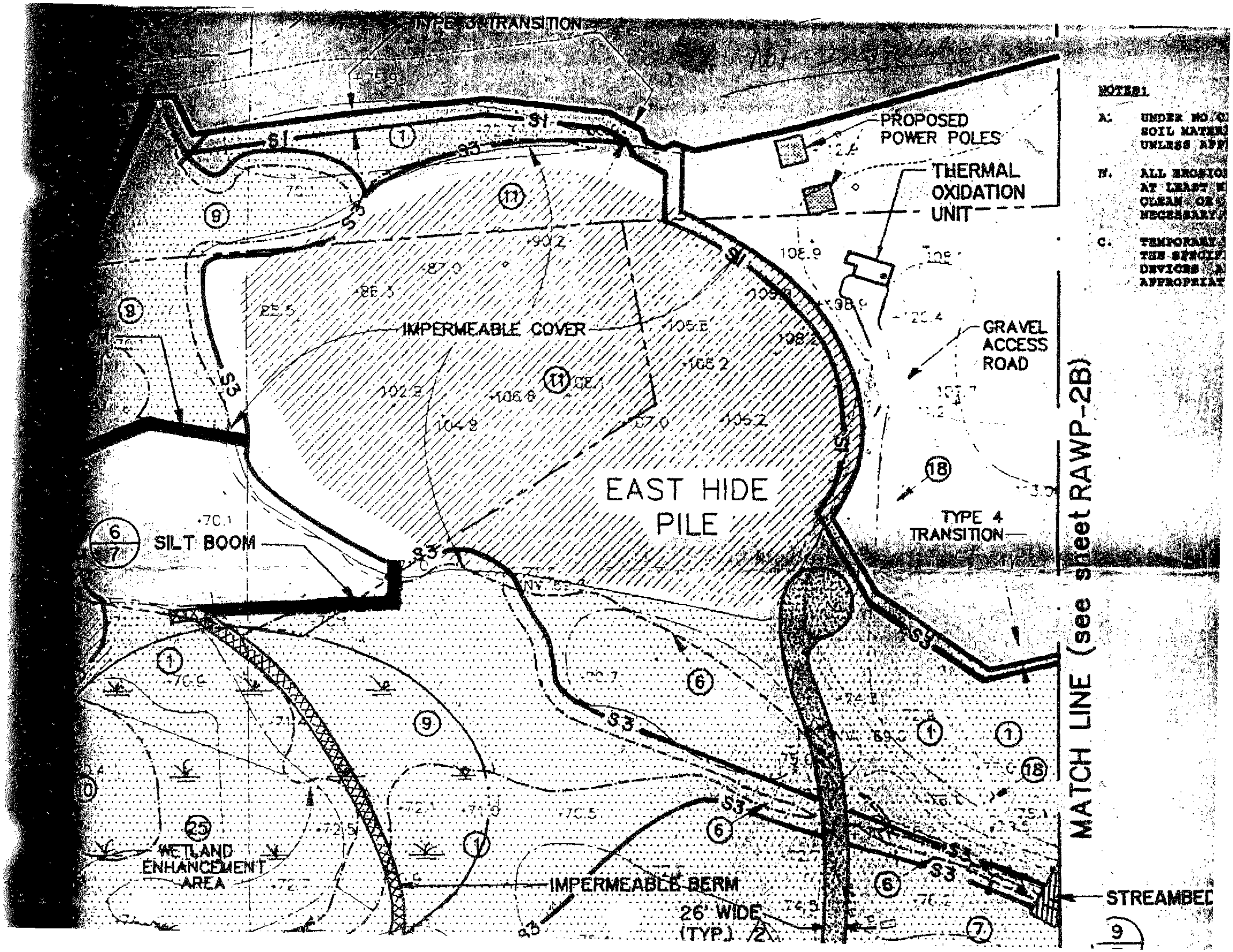
[signature]
QA Engineer

11/01/94
Date

REV 05/94



N
EXTENT OF DETAIL 3 11-28
TOE DRAIN OUTLETS (SEE NOTE 12)
EXTENT OF DETAIL 2 11-28
EXTENT OF DETAIL 3 11-28
EXTENT OF DETAIL 6 11-28
EXTENT OF DETAIL 3 11-28
EXTENT OF DETAIL 2 11-28
POWER POLES (SEE NOTE 14)
EAST HIDE PILE GRADING (SEE SHEET 12-1)
112
110
WETLAND ENHANCEMENT AREA (SEE SHEETS 14-4 AND 14-5)
CREATED WETLAND STREAM SEE DETAIL 1 13-7
MATCH LINE (see sheet 11-7B)
CULV (SEE



TYPE 3 TRANSITION
PROPOSED POWER POLES
THERMAL OXIDATION UNIT
NOTES:
IMPERMEABLE COVER
GRAVEL ACCESS ROAD
EAST HIDE PILE
SILT BOOM
TYPE 4 TRANSITION
MATCH LINE (see sheet RAWP-2B)
WETLAND ENHANCEMENT AREA
IMPERMEABLE BERM
26' WIDE (TYP.)
STREAMBED

CERTIFICATE OF COMPLETION
OF SOIL SUBGRADE SURFACE

Date: 11/3/94

Project Name: I-Plex

Site Name: E.H.P. Northern area.

Location of Subgrade Surface to be Lined: SEE SKETCH.

Survey cut sheet Attached Yes NO
Verbal O.K. on work from KAF.

I hereby certify that the above area is suitable for the installation of geosynthetics, and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): Mike Tanner Date: 11/3/94

Title: RUST QC FIELD STAFF

Representing: RUST E&I

Signature: M Tanner

Acknowledged by:

GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

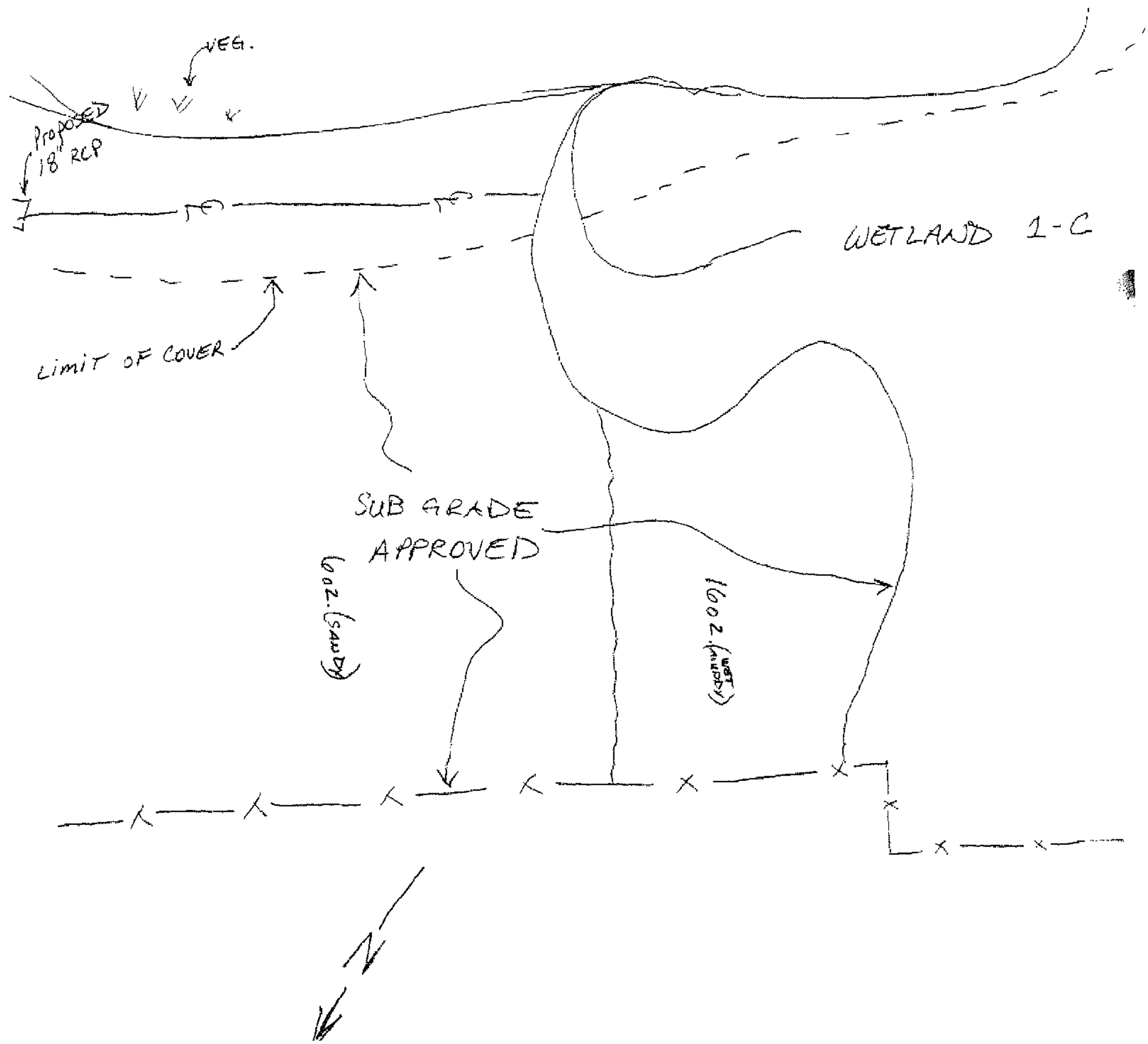
Name (print): Alfred A. Taney Date: 11/03/94

Title: Geotechnical Engineer

Representing: Golder ~~Associates Inc.~~

Signature: alfred a. taney

Cast Hide Pile



SOIL SUBGRADE SURFACE FOR GEOSYNTHETIC INSTALLATION
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY EAST HIDE PILE
4-10-95 WORK

LOCATION SOUTH SIDE SWALE CONSTRUCTION

THICKNESS VERIFICATION

Survey Cut Sheet attached ____ Yes X No

If no verbal by whom: TOM

Subgrade within design tolerance X Yes ____ No *

Check one:

X <u>Sloped areas</u>, greater than 8H:1V, are within -0.5' to + 0.3' of design elevation and not steeper than max. design slope.

____ <u>Flat areas</u>, less than 8H:1V, are within -0.5' to 0.0' of design elevation.

Area indicated above is suitable for the installation of geosynthetics; in accordance with the project specifications.

Comments:

Doug Compton	Cm Foreman	4-14-95
CWM/RUST QC Rep	Title	Date
Peter Neumann	Resident Engr.	4/14/95
QA Inspector	Title	Date

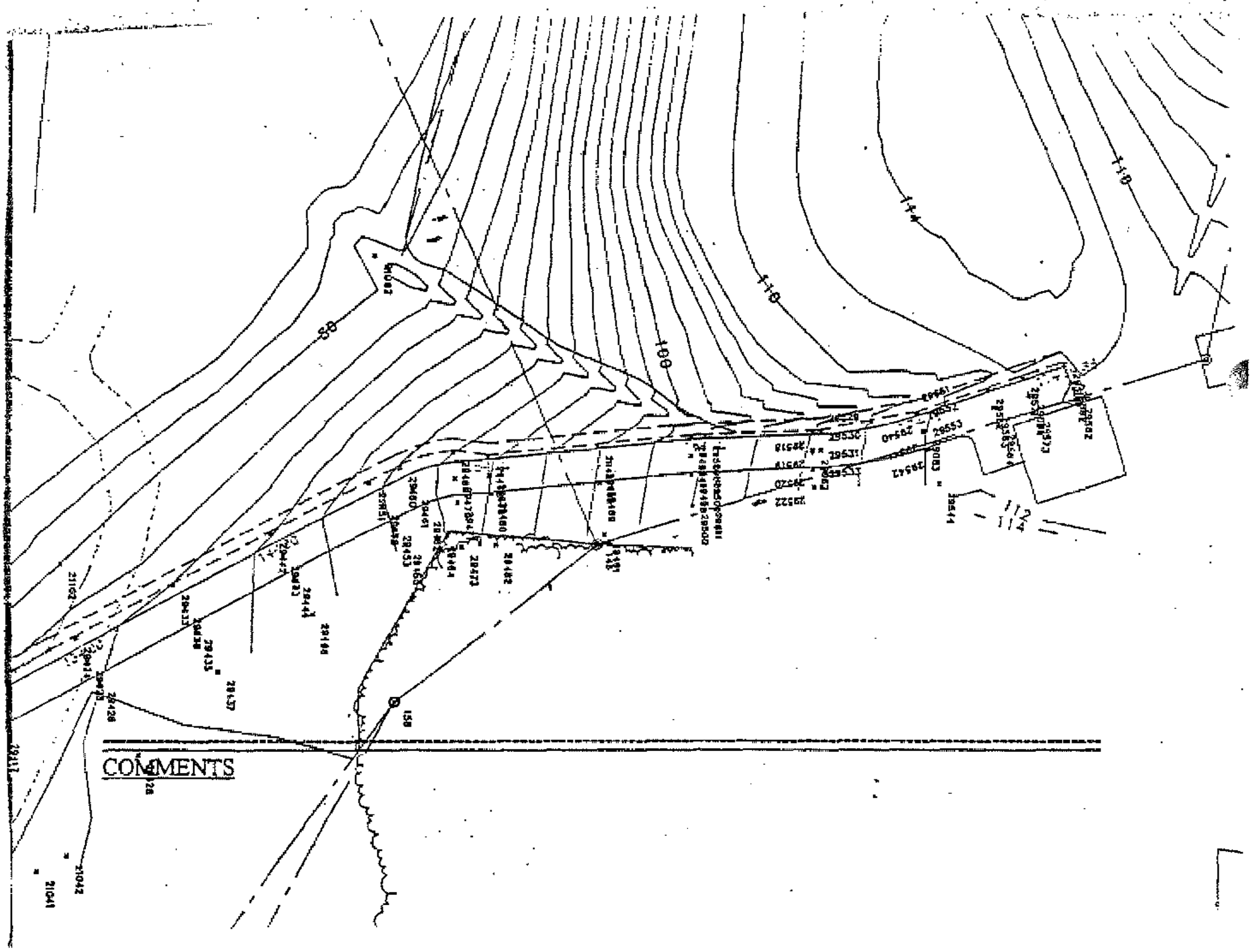
* If "NO" then engineering approval needed:

RRS Engineer	~~Douglas Compton~~	~~4-14-95~~
	Signature	Date
Resident Engineer or designated representative		
	Signature	Date

SHEET ___ OF ___

SUBGRADE FOR FILL FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH



COMMENTS

SOIL SUBGRADE SURFACE FOR GEOSYNTHETIC INSTALLATION
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY E.H.P

LOCATION Toe of Southeast Slope
From Existing Fabric on EHP to 76 contour

THICKNESS VERIFICATION

Survey Cut Sheet attached ___ Yes ✓ No

If no verbal by whom: Kelly Fagan

Subgrade within design tolerance ✓ Yes ___ No *

Check one:

✓ Sloped areas, greater than 8H:1V, are within -0.5' to + 0.3' of design elevation and not steeper than max. design slope.

✓ Flat areas, less than 8H:1V, are within -0.5' to 0.0' of design elevation.

Area indicated above is suitable for the installation of geosynthetics; in accordance with the project specifications.

Comments:

Dave Campbell	General Foreman	4-20-95
CWM/RUST QC Rep	Title	Date
Anthony E C...	SENIOR FIELD INSP.	4-20-95
QA Inspector	Title	Date

* If "NO" then engineering approval needed:

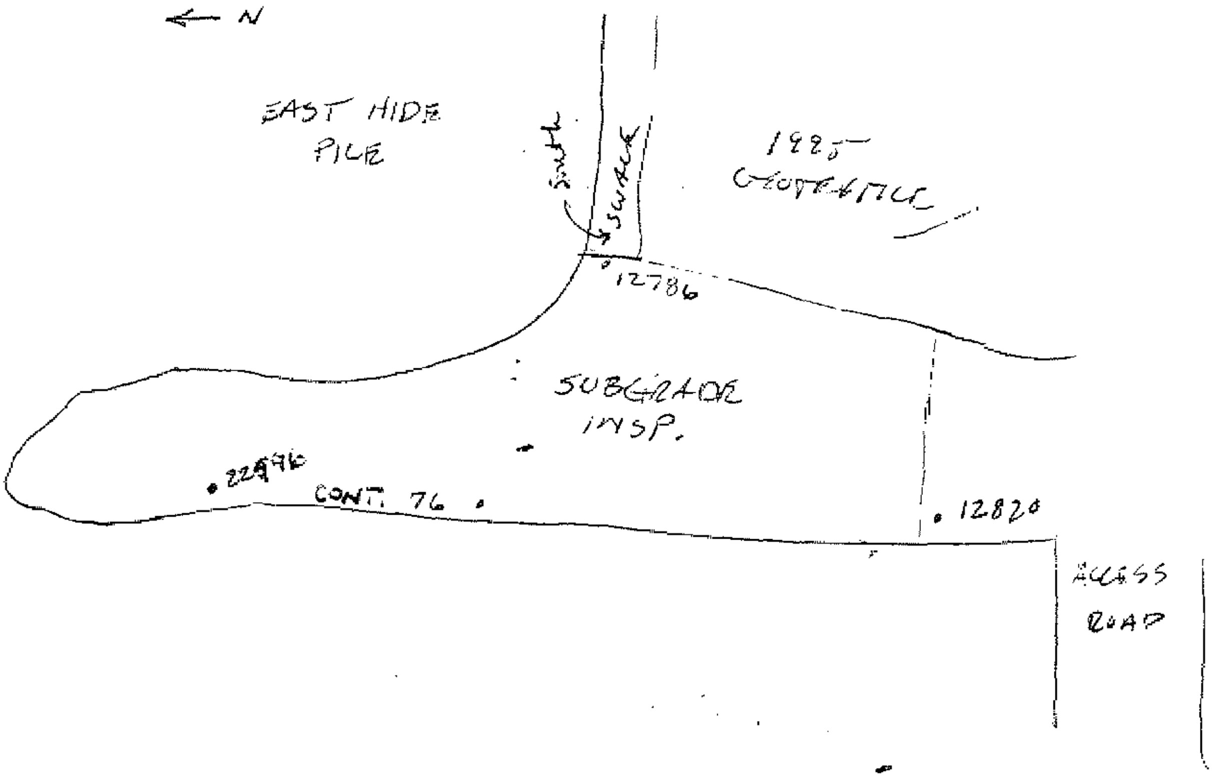
RRS Engineer ____________ Signature ____________ Date

Resident Engineer or designated representative ____________ Signature ____________ Date

SHEET ____ OF ____

SUBGRADE FOR FILL FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH



COMMENTS

REMEDY COVER THICKNESS
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY E.H.P.

LOCATION Top of Slope to 76 contour on South west side of East Hide Pile

MATERIAL TYPE

✓ 12" SAND COVER,

____ 4" TOPSOIL,

____ 13" ROAD STRUCTURAL FILL,

____ 3" DENSE GRADED AGGREGATE,

____ 16" RIP RAP/COBBLE STONE

____ OTHER ____________________

THICKNESS VERIFICATION

Survey Cut Sheet attached ✓ Yes ~~✓~~ No WS

If no verbal by whom: ____________________

Thickness within tolerance (0.0 to + 0.3') ____ Yes ✓ No *

Comments:
Cover is thick in this area. Be w/ Slope & grading Aol'n.

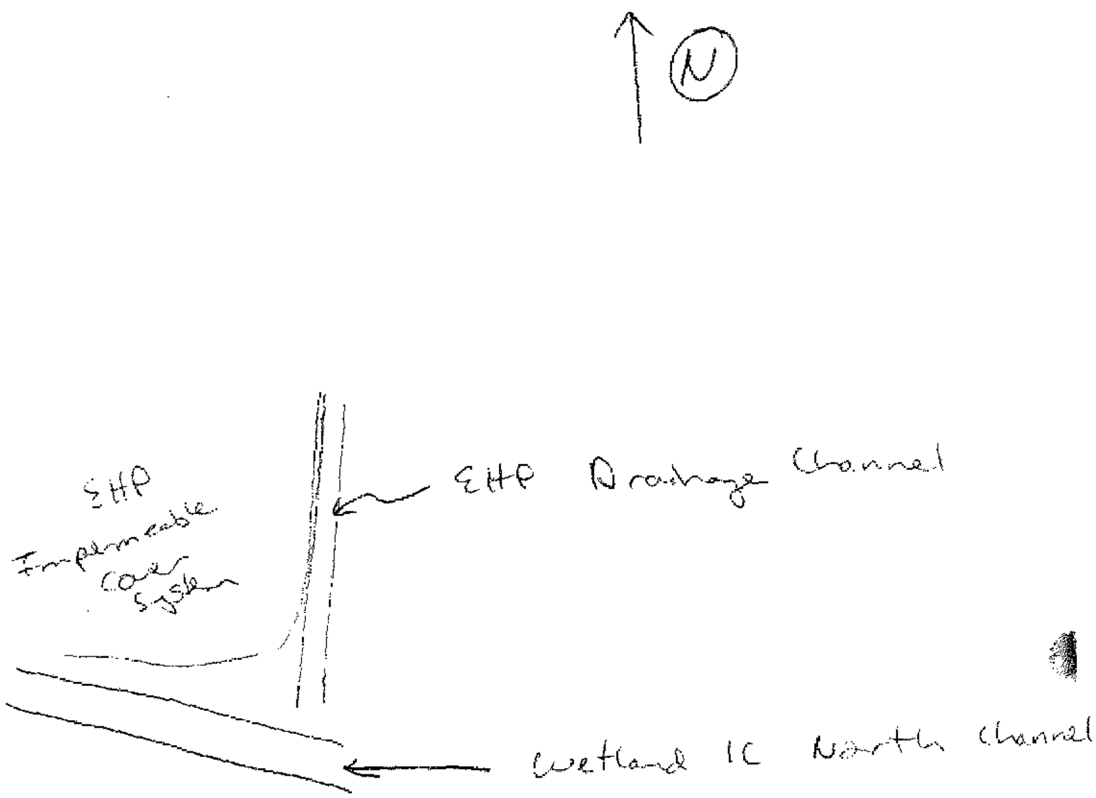
Doug Campbell	Genl Foreman	4-24-95
CWM/RUST QC Rep	Title	Date
QA Inspector	Title	Date

---

* If "NO" then engineering approval needed:

CWM/RRS Engineer Signature [signature] Date 4-24-95

Resident Engineer or designated representative Signature [signature] Date 24 Apr 95


N
EHP Impermeable Cover System
EHP Drainage Channel
Wetland 1C North Channel

Path: B:\597.12\DESIGN.COV\ASBUILT.L\AREAJ\R042195
File: CUTFILL .RPT 14,094 .a.. 4-22-95 Page 1

CUTFILL REPORT FOR COVER AREA (J) E.H.P. SOUTH OF RD

Lay Out Data Sheet

TIME :6:29 DATE:4/22/1995
JOB NAME :C:\TOPCON\DATA\12CJ.L

PT#00158 DESC:AKA151

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554452.5832	696662.1403	105.4298	
COLLECT:	554452.5782	696662.1440	105.4339	
Difference:	0.0050	-0.0037	-0.0041	-0.00
Inverse:	Az: 143-32-02	Dist: 0.0062		CONTROL

PT#12811 DESC:E.FABRIC

	NORTH	EAST	ELEVATION	FILL
DESIGN:	554543.7153	696526.0774	96.3317	
COLLECT:	554543.6529	696526.1827	95.4159	
Difference:	0.0624	-0.1053	0.9158	0.92 @
Inverse:	Az: 120-38-16	Dist: 0.1224		ON FABRIC @ TRANSITION of E.Z

PT#29609 DESC:DTCH-COV

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554533.7696	696519.8051	94.3046	
COLLECT:	554533.8089	696520.1180	94.4971	
Difference:	-0.0393	-0.3129	-0.1925	-0.19
Inverse:	Az: 082-50-10	Dist: 0.3154		ON RIPRAP. OK

PT#29602 DESC:DTCH-COV

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554489.5374	696496.2354	86.8279	
COLLECT:	554489.8306	696495.8881	87.1041	
Difference:	-0.2931	0.3473	-0.2762	-0.28
Inverse:	Az: 310-10-08	Dist: 0.4545		ON RIPRAP. OK

PT#29595 DESC:DTCH-COV

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554454.3074	696477.5697	81.5030	
COLLECT:	554454.5094	696477.7889	82.7531	*
Difference:	-0.2020	-0.2192	-1.2501	-1.25
Inverse:	Az: 047-19-53	Dist: 0.2981		ON RIPRAP. T.O.B. S. DITCH

APPEARS S.G. ~~[illegible]~~ WAS ALTERED AFTER VERIFICATION.

PT#12812 DESC:E.FABRIC

	NORTH	EAST	ELEVATION	FILL
DESIGN:	554444.0574	696471.6774	81.3807	
COLLECT:	554444.1181	696471.7434	80.4744	
Difference:	-0.0607	-0.0660	0.9063	0.91

ON FABRIC @ TRANSITION T.O.B. S. DITCH

Path: B:\597.12\DESIGN.COV\ASBUILT.L\AREAJ\R042195
File: CUTFILL .RPT 14,094 .a.. 4-22-95

Inverse: Az: 047-23-09 Dist: 0.0897

PT#29588 DESC:DTCH-COV

	NORTH	EAST	ELEVATION	FILL
DESIGN:	554445.5470	696472.9417	81.3451	
COLLECT:	554445.5122	696472.9053	81.0412	
Difference:	0.0348	0.0364	0.3040	0.30
Inverse:	Az: 226-17-09	Dist: 0.0504		

ON FABRIC @ TRANSITION T.O.B. S.D. DITCH.

PT#00146 DESC:D.H.(s)

	NORTH	EAST	ELEVATION	FILL
DESIGN:	554542.2125	696590.0246	99.9044	
COLLECT:	554542.2204	696590.0187	99.9018	
Difference:	-0.0078	0.0059	0.0026	0.00
Inverse:	Az: 322-55-56	Dist: 0.0098		CONTROL

PT#12806 DESC:E.FABRIC

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554406.7690	696685.8859	95.8822	
COLLECT:	554406.9216	696685.8110	96.4063	
Difference:	-0.1525	0.0749	-0.5241	-0.52
Inverse:	Az: 333-51-31	Dist: 0.1699		

@ TRANSITION 1993/19
COVER

PT#12805 DESC:E.FABRIC

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554356.1279	696674.1554	84.8863	
COLLECT:	554356.1296	696674.1528	85.1973	
Difference:	-0.0017	0.0026	-0.3110	-0.31
Inverse:	Az: 303-19-57	Dist: 0.0031		

PT#12804 DESC:E.FABRIC

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554322.0646	696663.2806	81.4954	
COLLECT:	554321.8479	696663.2730	82.9525	
Difference:	0.2167	0.0076	-1.4571	-1.46
Inverse:	Az: 182-01-08	Dist: 0.2169		

PT#12803 DESC:E.FABRIC

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554311.3033	696659.7407	82.9947	
COLLECT:	554311.4244	696659.7496	83.0012	
Difference:	-0.1210	-0.0089	-0.0065	-0.01
Inverse:	Az: 004-12-18	Dist: 0.1214		

OK

PT#14001 DESC:R

	NORTH	EAST	ELEVATION	CUT

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554459.9974	696402.9970	76.6207	
COLLECT:	554459.9895	696402.9791	77.5845	
Difference:	0.0079	0.0179	-0.9638	-0.96
Inverse:	Az: 246-12-47	Dist: 0.0196		

@ COVER TYPE CHANGE TRANSITION GTS COLLECTIONS VS. UPLAND COVER.

PT#14002 DESC:R

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554483.8730	696345.9653	77.0026	
COLLECT:	554483.8937	696346.0519	77.6785	
Difference:	-0.0207	-0.0866	-0.6759	-0.68
Inverse:	Az: 076-32-16	Dist: 0.0891		

PT#23302 DESC:GRID-COV

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554400.1374	696550.0349	82.8987	
COLLECT:	554400.0252	696550.0070	83.1659	
Difference:	0.1122	0.0279	-0.2672	-0.27
Inverse:	Az: 193-57-55	Dist: 0.1156		

GRID OK

PT#23301 DESC:GRID-COV

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554399.8142	696499.8804	78.0636	
COLLECT:	554400.0251	696500.0188	78.2996	
Difference:	-0.2109	-0.1384	-0.2360	-0.24
Inverse:	Az: 033-16-00	Dist: 0.2523		

GRID OK

PT#23306 DESC:GRID-COV

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554450.1430	696500.1359	82.6977	
COLLECT:	554450.0703	696500.0649	82.8213	
Difference:	0.0727	0.0710	-0.1236	-0.12
Inverse:	Az: 224-18-23	Dist: 0.1016		

GRID OK

PT#23307 DESC:GRID-COV

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554450.0352	696550.0202	88.8056	
COLLECT:	554450.1049	696550.0478	89.0409	
Difference:	-0.0697	-0.0276	-0.2353	-0.24
Inverse:	Az: 021-36-56	Dist: 0.0750		

GRID OK

PT#12820 DESC:

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554350.0000	696521.1061	75.6300	
COLLECT:	554350.3517	696521.2309	75.6568	
Difference:	-0.3517	-0.1248	-0.0268	-0.03

@ LIMIT FABRIC OK

Inverse: Az: 019-32-17 Dist: 0.3732

PT#12819 DESC:

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554369.5204	696507.4257	75.6500	
COLLECT:	554369.4964	696507.4088	75.7089	
Difference:	0.0240	0.0169	-0.0589	-0.06

Inverse: Az: 215-08-20 Dist: 0.0294

@ LIMIT FABRIC OK

PT#12818 DESC:

	NORTH	EAST	ELEVATION	CUT
DESIGN:	554400.0000	696471.8553	75.5800	
COLLECT:	554400.1417	696471.9785	75.6215	
Difference:	-0.1417	-0.1232	-0.0415	-0.04

Inverse: Az: 041-01-19 Dist: 0.1878

@ LIMIT FABRIC OK

REMEDY COVER THICKNESS
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY North Slope Near THE E HP

LOCATION West of the Access Road Leading
To the T.O.W.

MATERIAL TYPE

✓ 12" SAND COVER,

____4" TOPSOIL,

____13" ROAD STRUCTURAL FILL,

____3" DENSE GRADED AGGREGATE.

____16" RIP RAP/COBBLE STONE

____OTHER ____________________

THICKNESS VERIFICATION

Survey Cut Sheet attached ____Yes ✓ No

If no verbal by whom: Mike Ploof (Meridian)

Thickness within tolerance (0.0 to + 0.3') ✓ Yes ____No *

Comments:

[signature] Construction Manager 4/21/95
CWM/RUST QC Rep Title Date

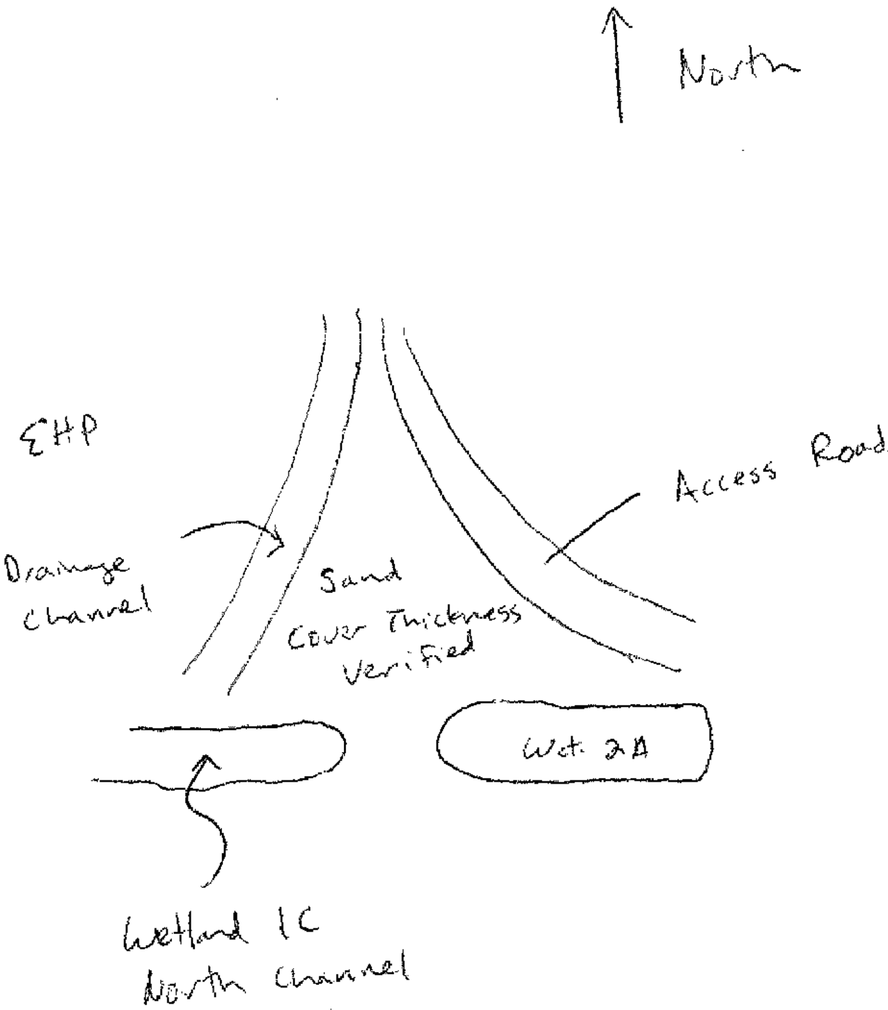
[signature] Staff Engineer 04/21/95
QA Inspector Title Date

---

* If "NO" then engineering approval needed:

CWM/RRS Engineer ____________ ____________
Signature Date

Resident Engineer or designated representative ____________ ____________
Signature Date


North
EHP
Access Road
Drainage channel
Sand
Cover Thickness Verified
Wet. 2A
Wetland 1C
North Channel

SOIL SUBGRADE SURFACE FOR GEOSYNTHETIC INSTALLATION
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY East Hide Pile

LOCATION North Channel

THICKNESS VERIFICATION

Survey Cut Sheet attached ___ Yes ✓ No

If no verbal by whom: Tom Benidict

Subgrade within design tolerance ✓ Yes ___ No *

Check one:

✓ Sloped areas, greater than 8H:1V, are within -0.5' to + 0.3' of design elevation and not steeper than max. design slope.

___ Flat areas, less than 8H:1V, are within -0.5' to 0.0' of design elevation.

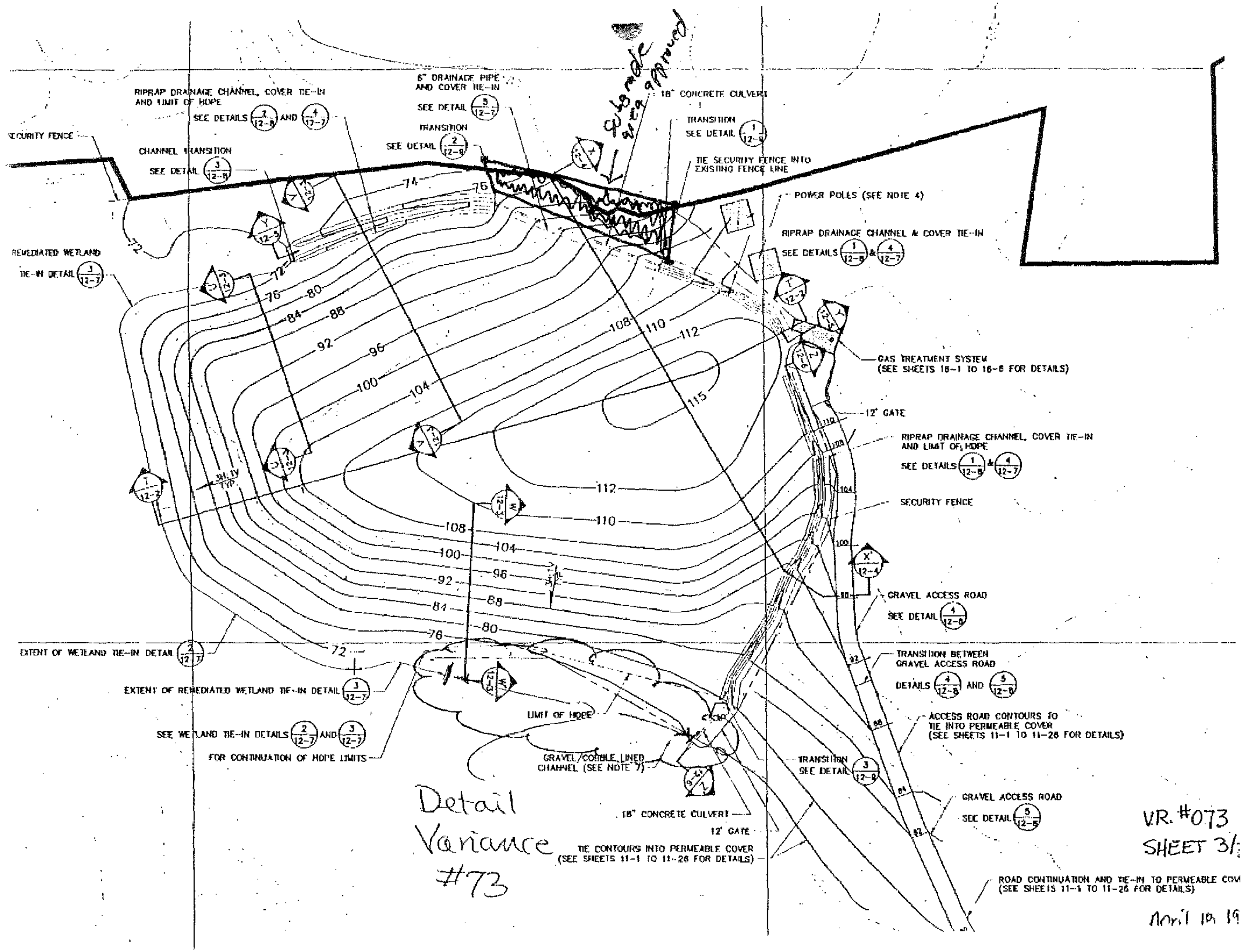
Area indicated above is suitable for the installation of geosynthetics in accordance with the project specifications.

Comments:

Doug Campbell	General Foreman	4-28-95
CWM/RUST QC Rep	Title	Date
[signature]	Staff Engineer	04/28/95
QA Inspector	Title	Date

* If "NO" then engineering approval needed:

RRS Engineer	Signature	Date
Resident Engineer or designated representative	Signature	Date



Subgrade area approved
RIPRAP DRAINAGE CHANNEL, COVER TIE-IN AND LIMIT OF HDPE SEE DETAILS 3/12-8 AND 4/12-7
6" DRAINAGE PIPE AND COVER TIE-IN SEE DETAIL 5/12-7
18" CONCRETE CULVERT
TRANSITION SEE DETAIL 1/12-8
TRANSITION SEE DETAIL 2/12-8
SECURITY FENCE
CHANNEL TRANSITION SEE DETAIL 3/12-8
TIE SECURITY FENCE INTO EXISTING FENCE LINE
POWER POLES (SEE NOTE 4)
RIPRAP DRAINAGE CHANNEL & COVER TIE-IN SEE DETAILS 1/12-8 & 4/12-7
REMEDIATED WETLAND TIE-IN DETAIL 3/12-7
GAS TREATMENT SYSTEM (SEE SHEETS 16-1 TO 16-6 FOR DETAILS)
12' GATE
RIPRAP DRAINAGE CHANNEL, COVER TIE-IN AND LIMIT OF HDPE SEE DETAILS 1/12-8 & 4/12-7
SECURITY FENCE
3H:1V TYP.
GRAVEL ACCESS ROAD SEE DETAIL 4/12-8
EXTENT OF WETLAND TIE-IN DETAIL 2/12-7
TRANSITION BETWEEN GRAVEL ACCESS ROAD DETAILS 4/12-8 AND 5/12-8
EXTENT OF REMEDIATED WETLAND TIE-IN DETAIL 3/12-7
LIMIT OF HDPE
ACCESS ROAD CONTOURS TO TIE INTO PERMEABLE COVER (SEE SHEETS 11-1 TO 11-26 FOR DETAILS)
SEE WETLAND TIE-IN DETAILS 2/12-7 AND 3/12-7
FOR CONTINUATION OF HDPE LIMITS
GRAVEL/COBBLE LINED CHANNEL (SEE NOTE 7)
TRANSITION SEE DETAIL 3/12-8
GRAVEL ACCESS ROAD SEE DETAIL 5/12-8
Detail Variance #73
18" CONCRETE CULVERT
12' GATE
VR. #073 SHEET 3/
TIE CONTOURS INTO PERMEABLE COVER (SEE SHEETS 11-1 TO 11-26 FOR DETAILS)
ROAD CONTINUATION AND TIE-IN TO PERMEABLE COV
(SEE SHEETS 11-1 TO 11-26 FOR DETAILS)
April 10 19

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 11/3/94

Project Name: I-Plex

Site Name: E.H.P. Northern area.

Location of Subgrade Surface to be Lined: SEE SKETCH.

Survey cut sheet Attached Yes NO
Verbal O.K. on grade from KAF.

I hereby certify that the above area is suitable for the installation of geosynthetics, and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): Mike Tanner Date: 11/3/94

Title: RUST QC FIELD STAFF

Representing: RUST E&I

Signature: M Tanner

Acknowledged by:

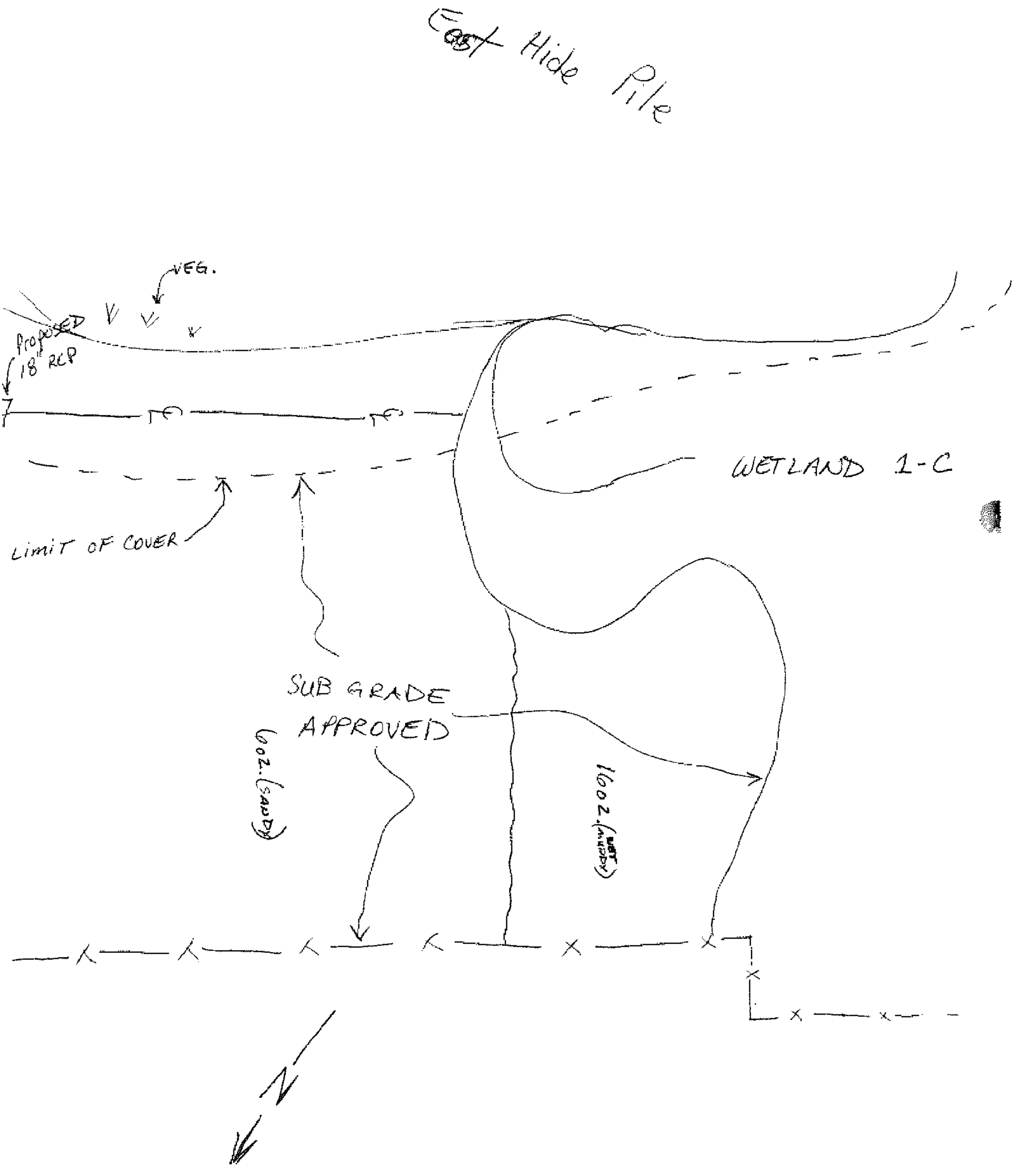
GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

Name (print): Alfred A. Taney Date: 11/03/94

Title: Geotechnical Engineer

Representing: Golder ~~Associates Inc.~~

Signature: alfred a. taney


Cast Hide Pile
VEG.
Proposed 18" RCP
WETLAND 1-C
LIMIT OF COVER
SUB GRADE APPROVED
6oz. (SANDY)
16oz. (WET MUDDY)
N

SOIL SUBGRADE SURFACE FOR GEOSYNTHETIC INSTALLATION
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY Cast Hide Pile

LOCATION 1-C Channel (between) 2A + 1-C
Upland Cover

THICKNESS VERIFICATION

Survey Cut Sheet attached ___ Yes ✓ No

If no verbal by whom: Tom B.

Subgrade within design tolerance ✓ Yes ___ No *

Check one:

___ Sloped areas, greater than 8H:1V, are within -0.5' to + 0.3' of design elevation and not steeper than max. design slope.

✓ Flat areas, less than 8H:1V, are within -0.5' to 0.0' of design elevation.

Area indicated above is suitable for the installation of geosynthetics; in accordance with the project specifications.

Comments: ABOVE GRADE COVER NO GRADE PLAN

Joel F. Kiley	Fen Foreman	6/27/95
CWM/RUST QC Rep	Title	Date
Alfred A. Toney	Field Engineer	06/28/95
QA Inspector	Title	Date

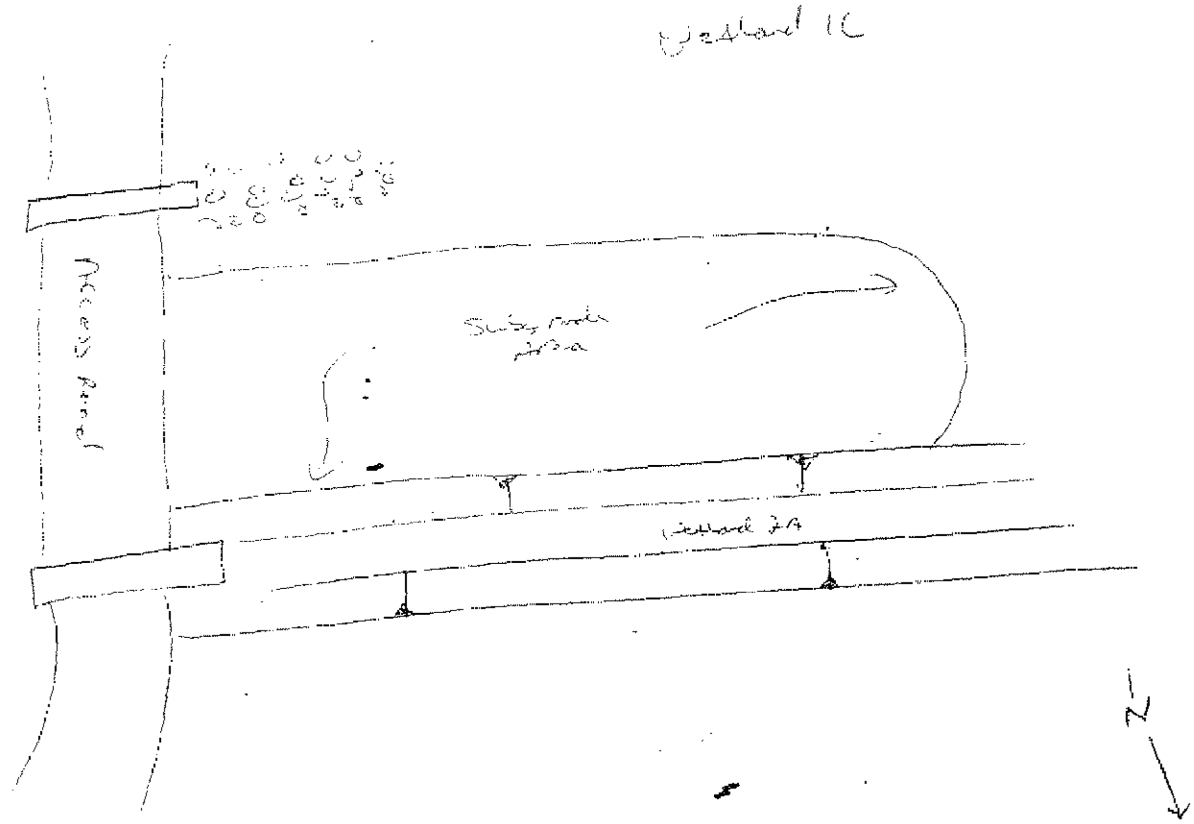
* If "NO" then engineering approval needed:

RRS Engineer	Signature	Date
Resident Engineer or designated representative	Signature	Date

SHEET ___ OF ___

SUBGRADE FOR FILL FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH



COMMENTS

SOIL SUBGRADE SURFACE FOR GEOSYNTHETIC INSTALLATION
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY Wetland 1C / Wetland 3A

LOCATION South of East Hide Pile @ Toe

THICKNESS VERIFICATION

Survey Cut Sheet attached ____ Yes X No

If no verbal by whom: No Survey Done.

Subgrade within design tolerance ____ Yes ____ No *

Check one:

____ Sloped areas, greater than 8H:1V, are within -0.5' to + 0.3' of design elevation and not steeper than max. design slope.

____ Flat areas, less than 8H:1V, are within -0.5' to 0.0' of design elevation.

Area indicated above is suitable for the installation of geosynthetics; in accordance with the project specifications.

Comments: RRS) is proceeding at their own Risk. they are deploying geotextile w/o survey support.

Joe F. Kl... Gen Foreman 6-12-95

CWM/RUST QC Rep Title Date

... Q. ... Field Engineer 06/12/95

QA Inspector Title Date

---

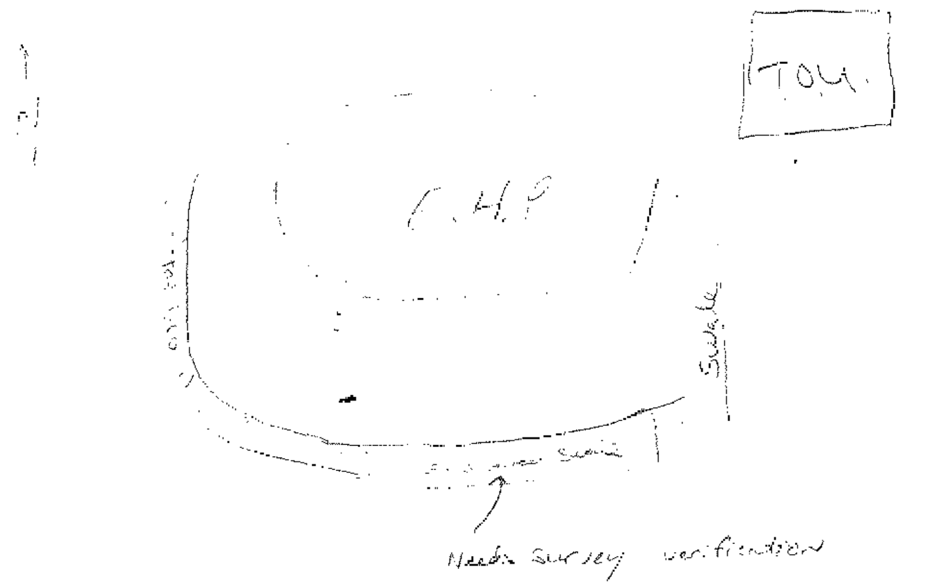
* If "NO" then engineering approval needed:

RRS Engineer ____ Signature ____ Date

Resident Engineer or designated representative ____ Signature ____ Date

SUBGRADE FOR FILL FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH



COMMENTS

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 12/8/94

Project Name: I-Plex

Site Name: Wetland 1-C south

Location of Subgrade Surface to be Lined: Area to be covered by panels 16 to 33, The remainder will need final subgrade approval once sandbags and hose ~~for~~ the Pump around are removed. Subgrade elev. is high @ the southern end of 1-C. survey to return, Subgrade approved for debris only.

I hereby certify that the above area is suitable for the installation of geosynthetics and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): Mike Tanner Date: 12/8/94

Title: RUST QC Staff

Representing: RUST E & I

Signature: Mike Tanner

Acknowledged by:

GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

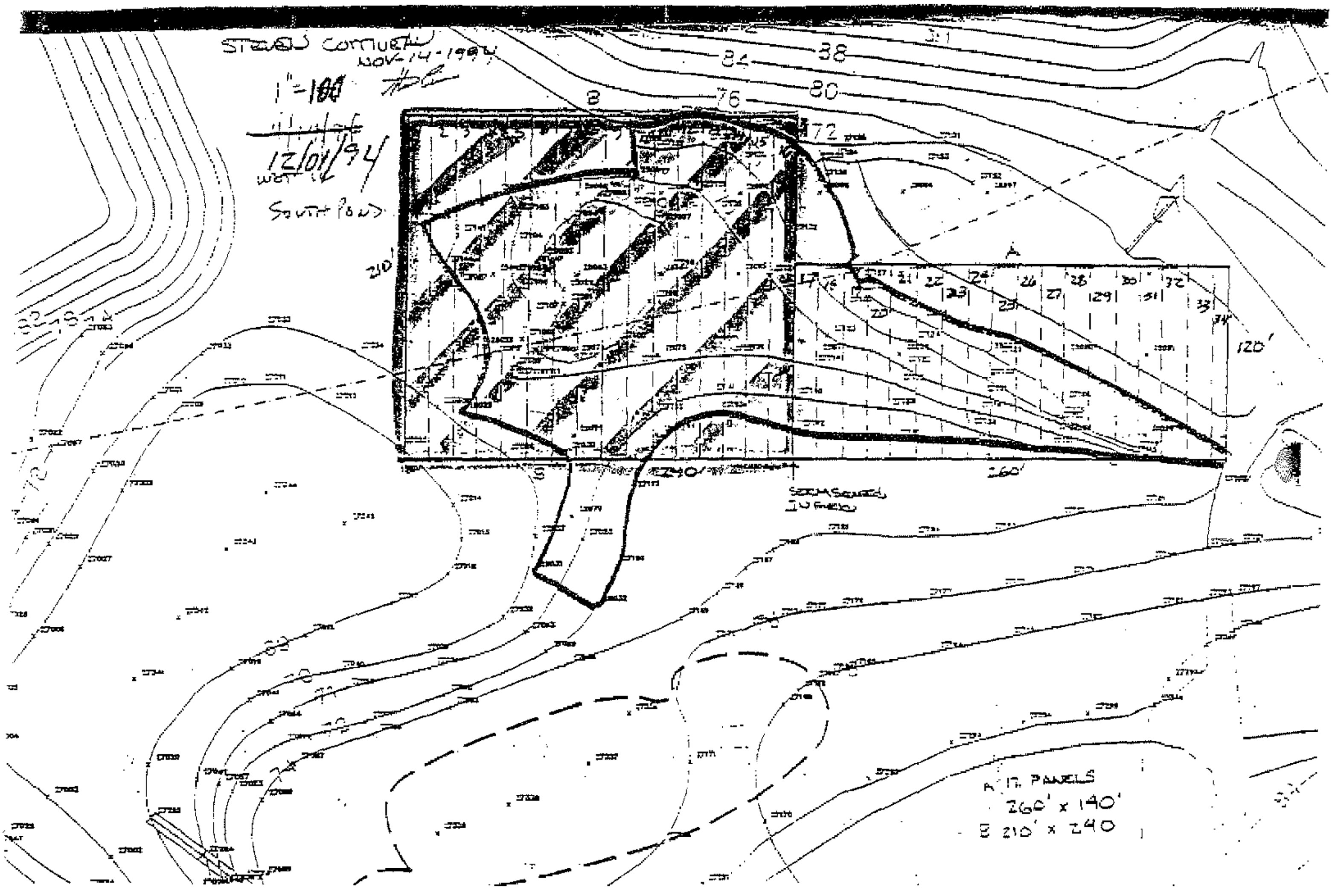
Name (print): Alfred A. Taney Date: 12/08/94

Title: Geotechnical Engineer

Representing: Golder Associates Inc

Signature: Alfred A. Taney

(A) The Trust gave permission to deploy geotextile on Frozen subgrade.



area That will be covered by panels
one (1) to SIXTEEN (16)

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 12-5-94

Project Name: I-Plex

Site Name: Wetland 1-C

Location of Subgrade Surface to be Lined: The southern section of 1-C. See sketch on the back of form.

I hereby certify that the above area is suitable for the installation of geosynthetics and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): Mike Tanner Date: 12-5-94

Title: RUST QC STAFF

Representing: RUST E & I

Signature: Mike Tanner

Acknowledged by:

GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

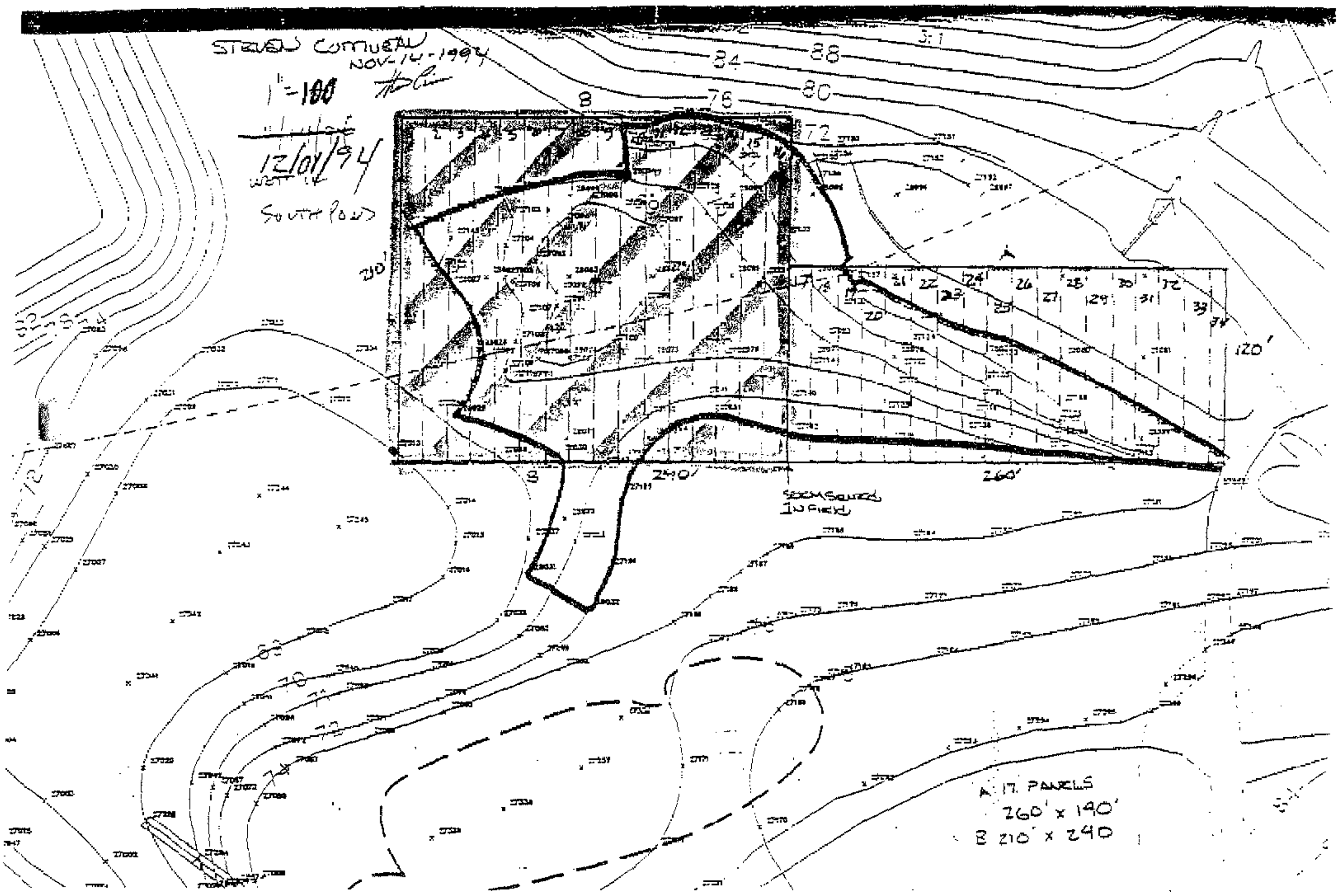
Name (print): Alfred A. Tarey Date: 12/05/94

Title: Geotechnical Engineer

Representing: Bader Associates Inc.

Signature: Alfred A. Tarey

©WMNA
June 15, 1990



area that will be covered by panels one(1) to SIXTEEN(16)

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 11/9/94

Project Name: I-Plex

Site Name: WETLAND 1-C (NORTH)

Location of Subgrade Surface to be Lined: SEE SKETCH

I hereby certify that the above area is suitable for the installation of geosynthetics, and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): Mike Tanner Date: 11/9/94

Title: RUST QC STAFF

Representing: RUST E&I

Signature: Mike Tanner

Acknowledged by:

GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

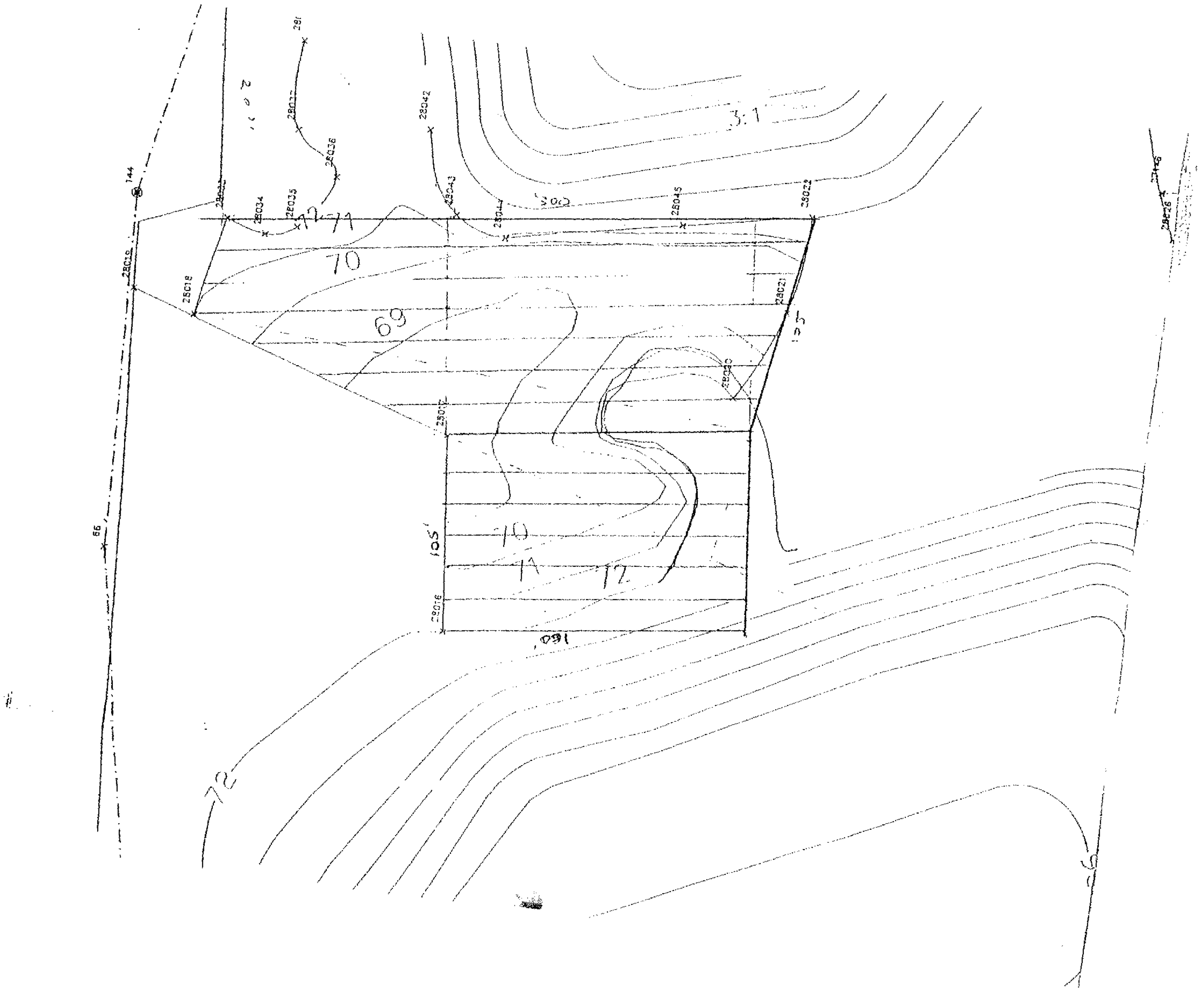
Name (print): Alfred A. Taney Date: 11/09/94

Title: Geotechnical engineer

Representing: Golder Associates Inc.

Signature: Alfred A. Taney

©WMNA
June 15, 1990


3:1
71
70
69
10
11
12
105'
160'
72
28018
28034
28035
28036
28042
28045
28022
28021
144

APPENDIX I.2

Geotextile Inspection Forms

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY: I-C South drainway

LOCATION: Area between I-C South drain and 2A drain (teardrop area)

☒ Panel layout on back or ☐ Attached

SUBGRADE INSPECTION
Subgrade inspected ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION
Visual inspection ✓ Acceptable ___ Unacceptable
Comments:

Weight inspection ✓ 6-oz. ___ 10 oz. ___ 16-oz.

SEAM INSPECTION
Sewing machine number: A-2

Total seam length: 1293'

Edge to seam limit ✓ Acceptable ___ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

Location (s): N/A

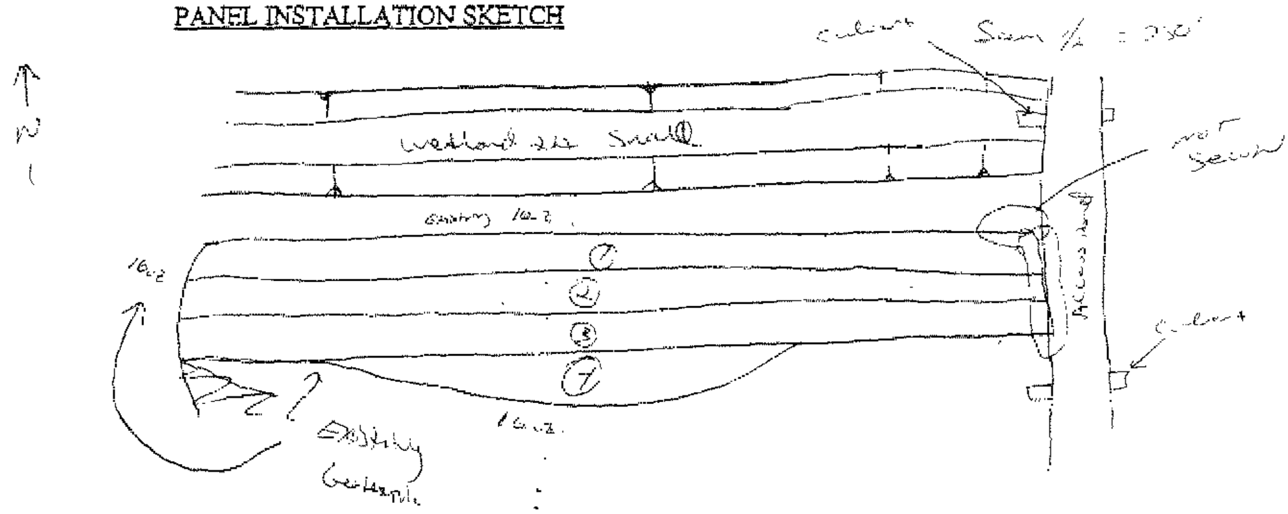
Patch Size (s): N/A

Comments:

Jack F Kiley	Foreman	6/28/95
CWM/RUST QC Rep	Title	Date
[signature]	Field Engineer	06/28/95
QA Inspector	Title	Date

GEOTEXTILE FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH



COMMENTS

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY I Plex LOCATION Wetland 1-C South

SUBGRADE INSPECTION

-SUBGRADE INSPECTED X Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION X Acceptable ___ Unacceptable
Comments:

-WEIGHT INSPECTION ___ 6oz. ___ 10 oz. X 16 oz

-ROLL NUMBERS USED SEE GEOTEXTILE FORM DATE 12/6/94

PANEL LAYOUT SUBMITTAL X Met ___ Revised. See Comments
* No official submittal made

SEAM INSPECTION

-SEWING MACHINE NUMBER A-8

-TOTAL SEAM LENGTH ≈ 600'

-EDGE TO SEAM LIMIT X Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS

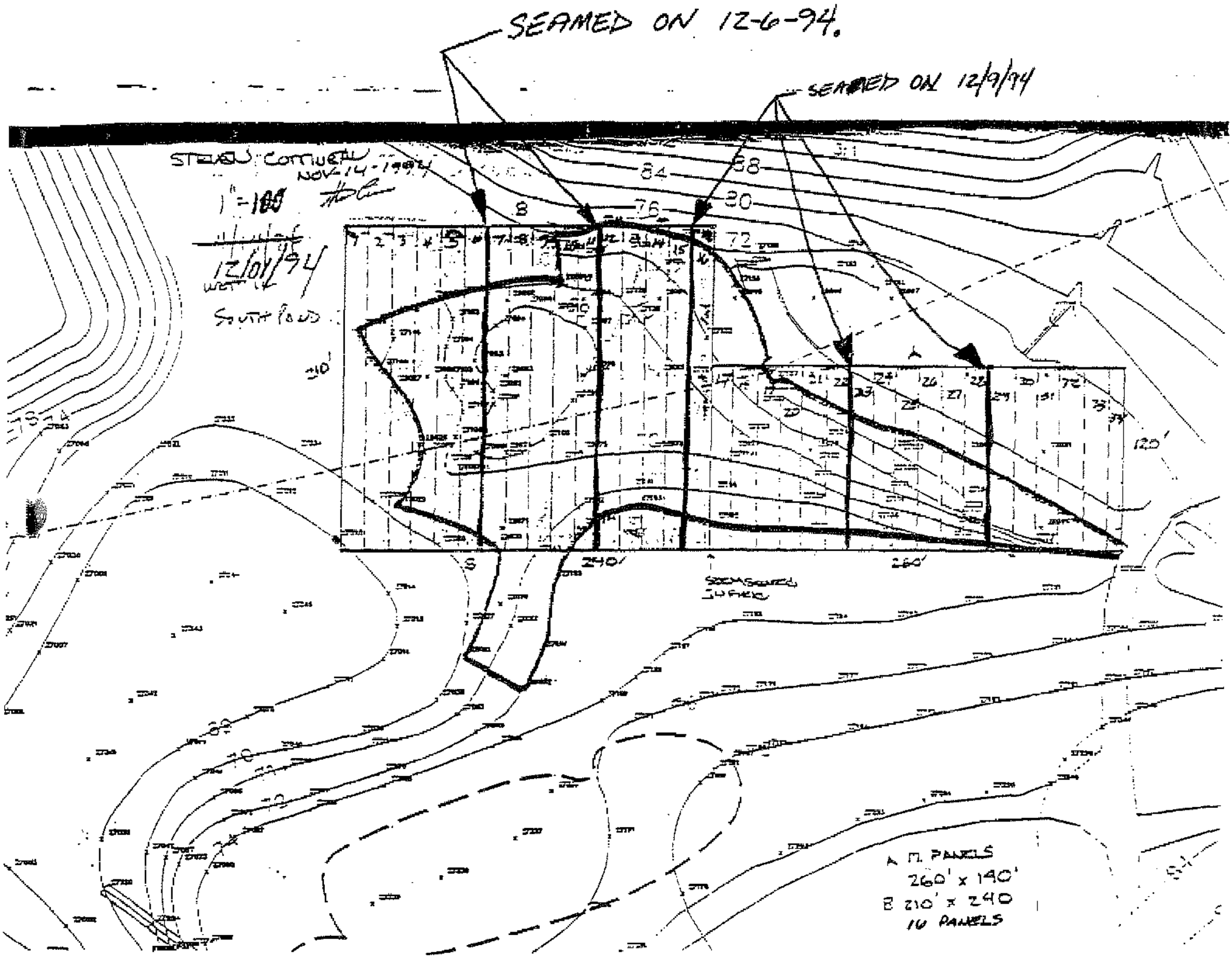
Mike Tanner 12/9/94
CWM/RUST QC Officer Date

Alfred A. Taney 12/09/94
QA Inspector Date

REV 05/94

Note.

TWO SECTIONS OF PREFABRICATED 16oz. ① Six panels & ② five panels deployed on 12-6-94. all prefab. seams were inspected as they were fabricated.



GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY I-Plex   LOCATION WETLAND 1-C SOUTH

SUBGRADE INSPECTION

-SUBGRADE INSPECTED X Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION X Acceptable ___ Unacceptable
Comments: Prefab. for 1-C SOUTH.

-WEIGHT INSPECTION ___ 6oz. ___ 10 oz. X 16 oz

-ROLL NUMBERS USED 37842, 36859, 36856, 36689, 36744, 37782, 37848, 37747, 37731, 37741, 36748, 36693, 36750, 37837, 36754, 36694, 36672, 36747, 37750, 37753, 37817, 37834, 37814, 37825, 3782

PANEL LAYOUT SUBMITTAL ___ Met X Revised. See Comments

SEAM INSPECTION

-SEWING MACHINE NUMBER A-8

-TOTAL SEAM LENGTH ≈ 2640'

-EDGE TO SEAM LIMIT X Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS No panel layout submitted.

Mike Tanner 12/6/94
CWM/RUST QC Officer Date

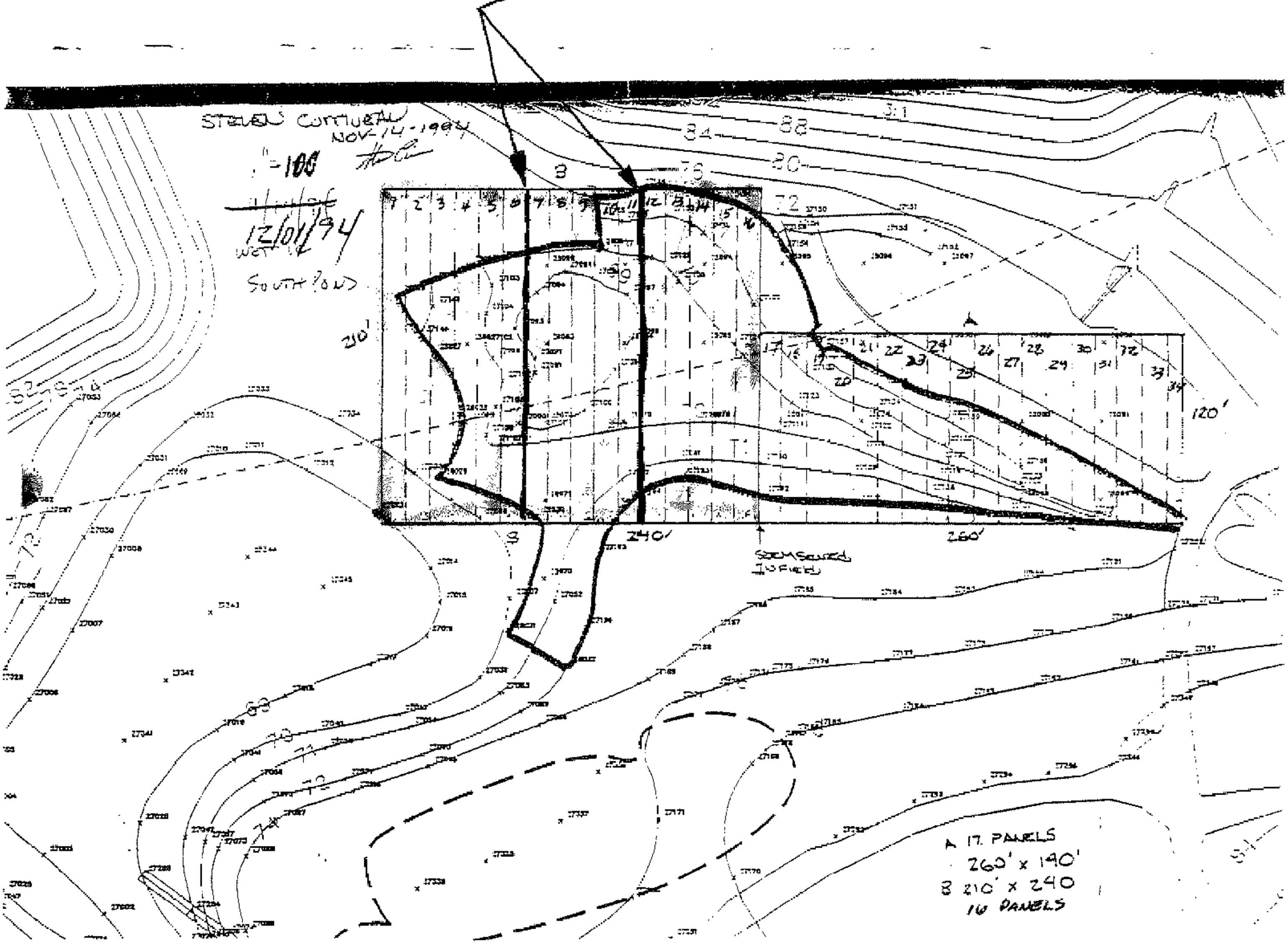
Alfred A. Toney 12/06/94
QA Inspector Date

REV 05/94

Note.

TWO SECTIONS OF PREFABRICATED 16oz. ① Six panels & ② five panels deployed on 12-6-94. all prefab. seams were inspected as they were fabricated.

SEAMED ON 12-6-94.



GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY I-Plex LOCATION WETLAND 1-C

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
Comments:

-WEIGHT INSPECTION ___ 6oz. ___ 10 oz. X 16 oz

-ROLL NUMBERS USED

PANEL LAYOUT SUBMITTAL

___ Met ✓ Revised. See Comments

SEAM INSPECTION

-SEWING MACHINE NUMBER n-8

-TOTAL SEAM LENGTH ≈ 200'

-EDGE TO SEAM LIMIT X Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS

Mike Tauner
CWM/RUST QC Officer

11/15/94
Date

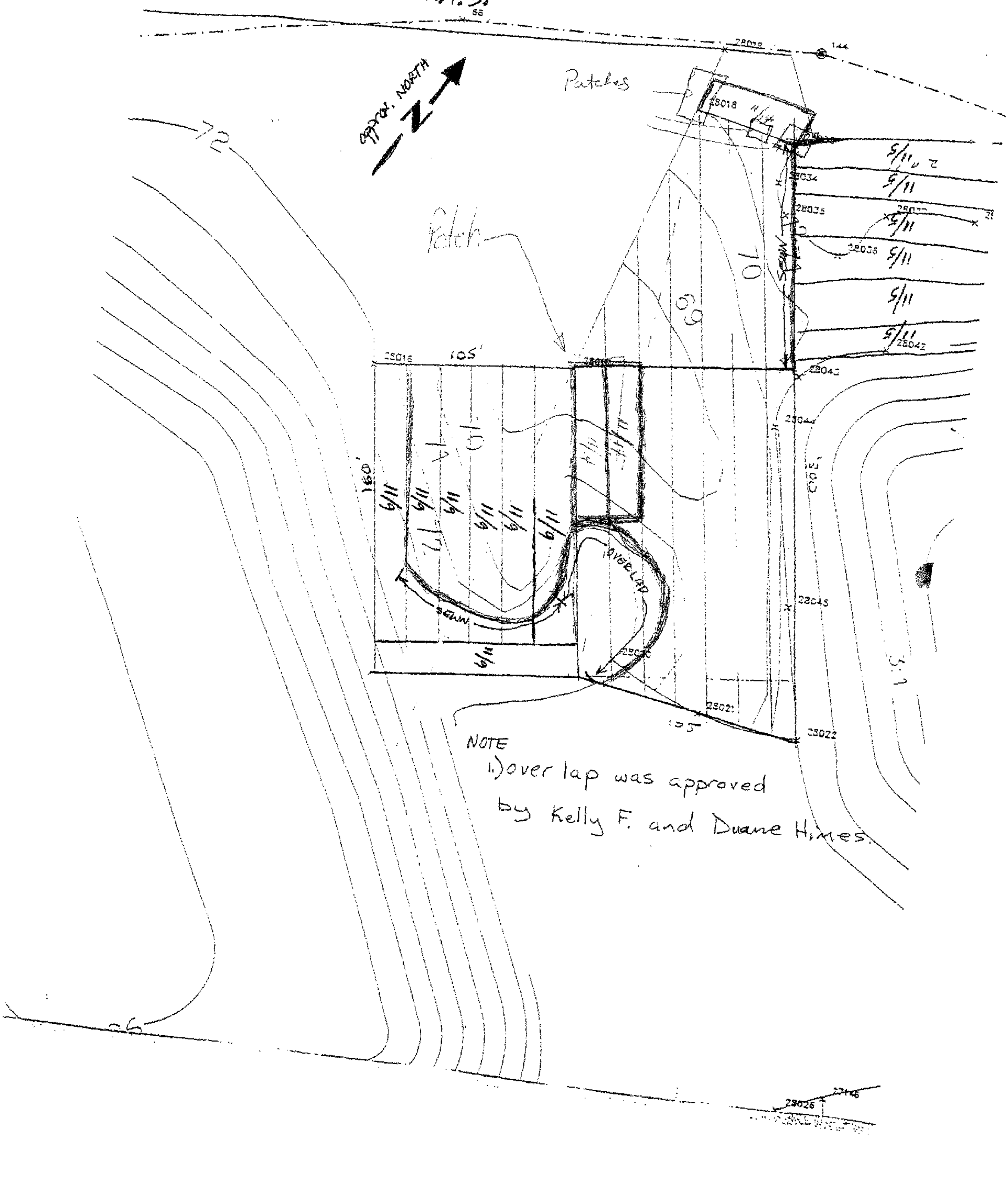
QA Inspector

11/15/94
Date

REV 05/94

WETLAND 1-C (NORTH)

N.T.S.



NOTE

1.) over lap was approved by Kelly F. and Duane Himes.

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY I-Plex

LOCATION Wetland 1-C (Northeast)

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
Comments: Prefab. inspection

-WEIGHT INSPECTION ___ 6oz. ___ 10 oz. X 16 oz

-ROLL NUMBERS USED 36689, 36744, 36627, 36623, 36724, 37810, 36728, 36730

PANEL LAYOUT SUBMITTAL ___ Met ✓ Revised. See Comments

SEAM INSPECTION

-SEWING MACHINE NUMBER A3

-TOTAL SEAM LENGTH ≈ 300'

-EDGE TO SEAM LIMIT ✓ Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS See sketch on back.

Mike Tanner
CWM/RUST QC Officer

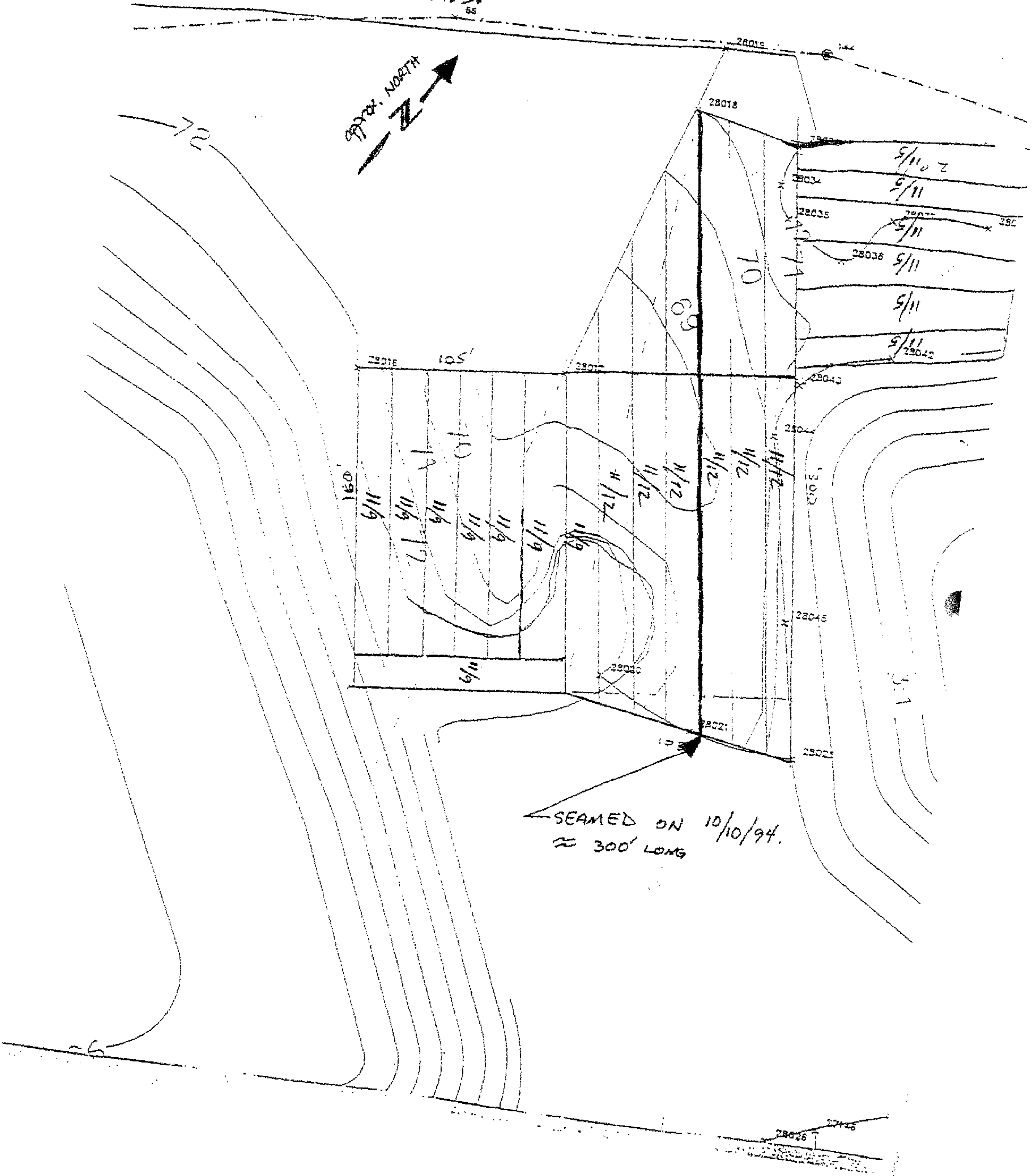
11/12/94
Date

[signature]
QA Inspector

11/12/94
Date

REV 05/94

WETLAND 1-C (NORTH)
N.T.S.



GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET OF

PROPERTY I-Plex

LOCATION Wetland 1-C (NORTH)

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ___ Unacceptable

Comments: Prefab. inspection

-WEIGHT INSPECTION ___ 6oz. ___ 10 oz. ✓ 16 oz

-ROLL NUMBERS USED 36689, 36744, 36627, 36623, 36724, 37810, 36728, 367 36730

PANEL LAYOUT SUBMITTAL ___ Met ✓ Revised. See Comments

SEAM INSPECTION

-SEWING MACHINE NUMBER A-3

-TOTAL SEAM LENGTH ≈ 2900'

-EDGE TO SEAM LIMIT ✓ Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS

Mike Tanner
CWM/RUST QC Officer

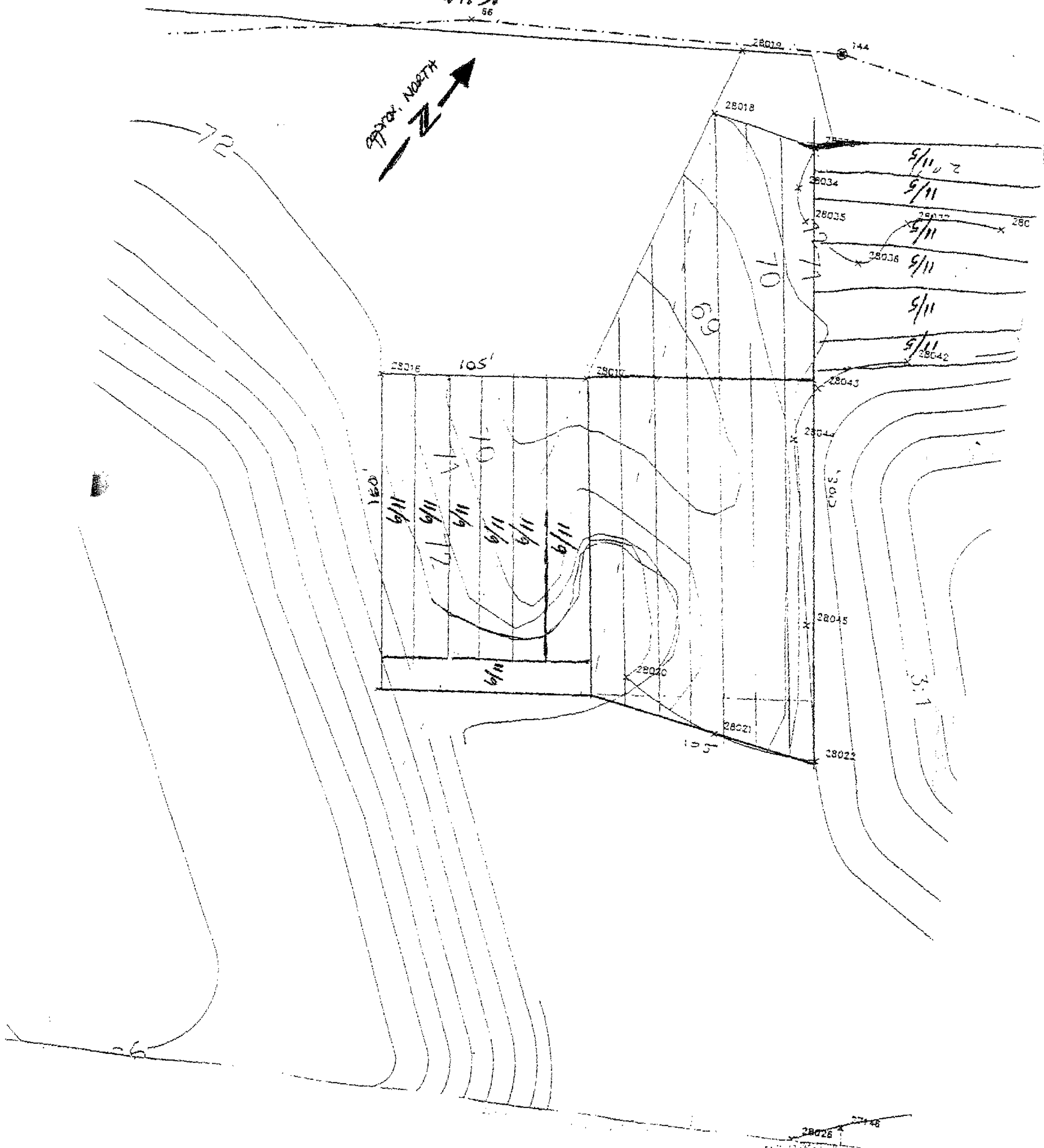
11/9/94
Date

Alfred G. Tomy
QA Inspector

11/09/94
Date

REV 05/94

WETLAND 1-C (NORTH)
N.T.S.



GEOTEXTILE
DAILY INSPECTION FORM

SHEET 1 OF

PROPERTY Custodial Trust LOCATION [illegible]

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
Comments:

-WEIGHT INSPECTION ✓ 6oz. ___ 10 oz. ___ 16 oz

-ROLL NUMBERS USED 942 and [illegible]

SEAM INSPECTION

-SEWING MACHINE NUMBER N/A

-TOTAL SEAM LENGTH 2572 lf.

-FOLDED OVERLAP BEFORE BACKFILL ✓ Acceptable ___ Unacceptable
(Measured appr. 10 feet; 6-inch min.) 1/2 ok @ 1140 2/3 @ 1145 3/4 @ [illegible] 4/5 ok @ 1200 5/6 @ 1200 6/7 [illegible]

-EDGE TO SEAM LIMIT ✓ Acceptable ___ Unacceptable
(Minimum 3 inches minus 1 inch) [illegible] 10/9, 12/10, 11/10, 13/12, 14/13, 19/14, 20/14, [illegible] 16/15, 18/16, 21/13, 17/7

DAMAGE/REPAIR INSPECTION

-LOCATION (S) NONE.
-PATCH SIZE (S)

COMMENTS

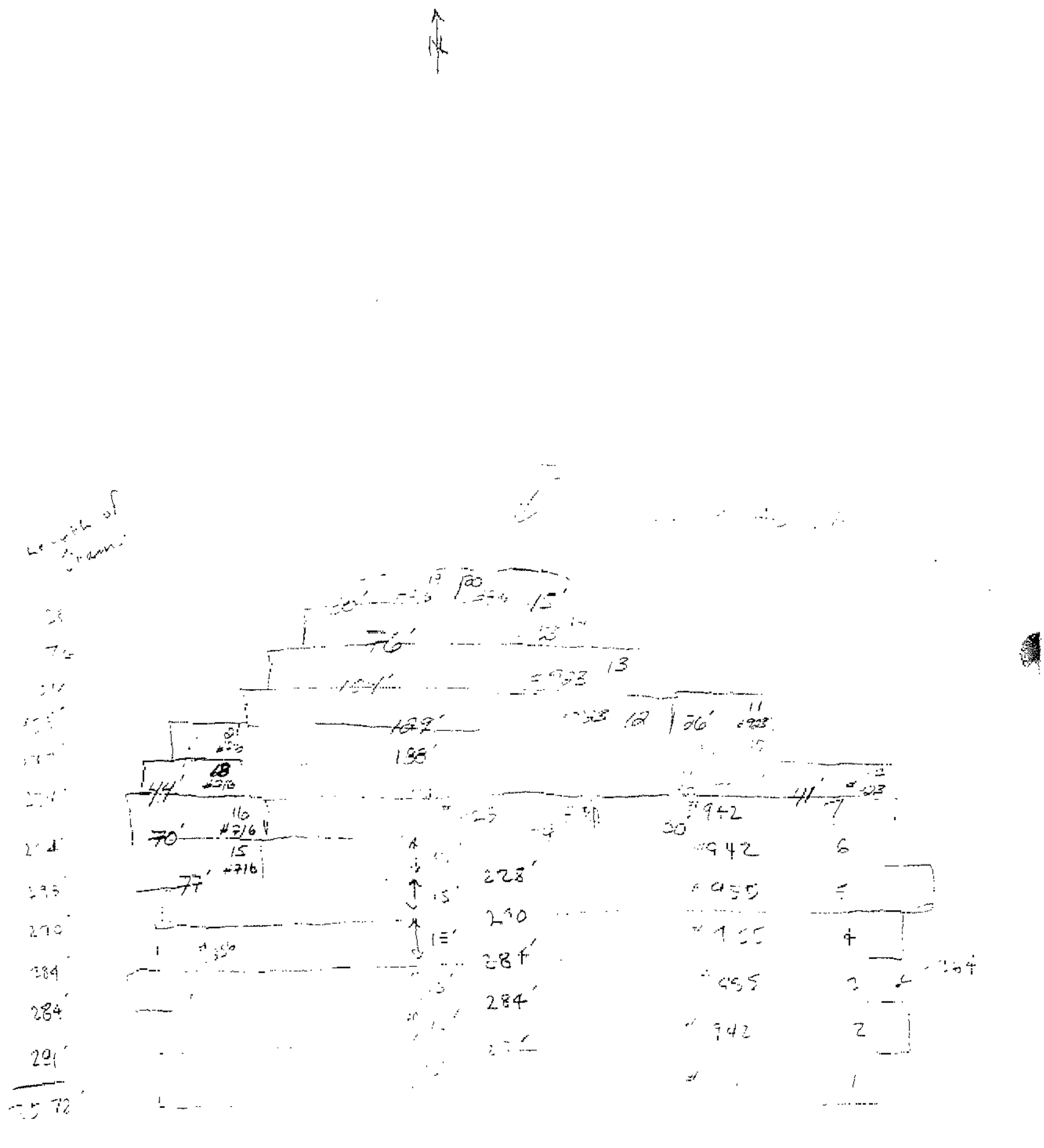
At the end of [illegible]
This [illegible]

Peter Neumann
Inspector

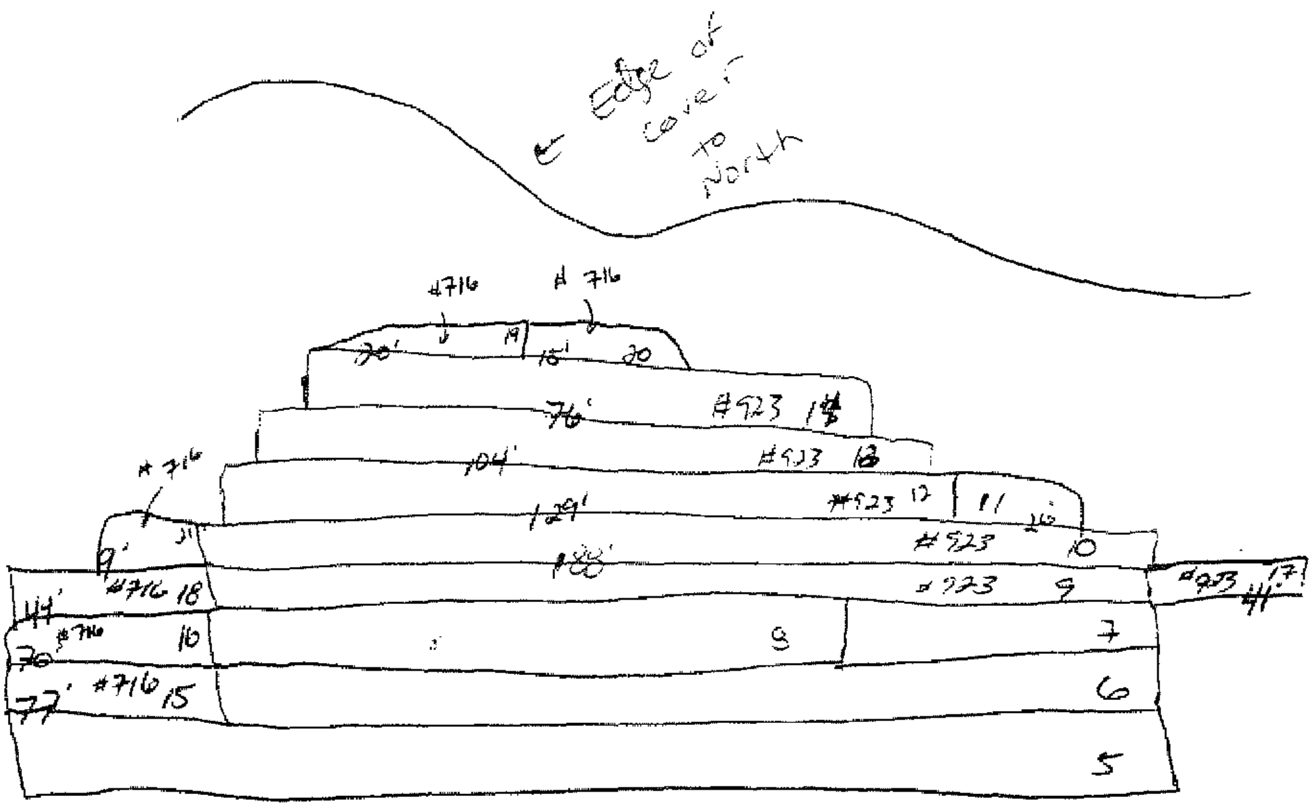
10-12-93
Date

GOLDER ASSOCIATES INC.

REV 8/93



76'
192'
198'
70'
228'
290'
284'
NOT TO SCALE



9/7, 9/8, 9/10, 10/11, 11/12, 12/13, 12/10, 17/7

13/14, 14/19, 14/20, 5/15, 15/16, 16/18, 18/21

New full #716

GEOTEXTILE
DAILY INSPECTION FORM

SHEET ____ OF ____

PROPERTY ______________________ LOCATION ______________________

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ____ Acceptable ____ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ____ Acceptable ____ Unacceptable
Comments:

-WEIGHT INSPECTION ____6oz. ____10 oz. ____16 oz

-ROLL NUMBERS USED

SEAM INSPECTION

-SEWING MACHINE NUMBER ____________

-TOTAL SEAM LENGTH ____________

-FOLDED OVERLAP BEFORE BACKFILL ____ Acceptable ____Unacceptable
(Measured appr. 10 feet; 6-inch min.)

-EDGE TO SEAM LIMIT ____ Acceptable ____Unacceptable
(Minimum 3 inches minus 1 inch)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS

______________________ ______________________
Inspector Date

GOLDER ASSOCIATES INC.

REV 8/93

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 10/12/93

Project Name: [illegible]

Site Name: [illegible] Site

Location of Subgrade Surface to be Lined: See reverse - plan sketch
S to #372 E to #352 to #356

I hereby certify that the above area is suitable for the installation of geosynthetics, and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): [illegible] Date: 10/12/93

Title: Foreman [illegible]

Representing: [illegible] Environmental

Signature: [illegible]

Acknowledged by:

GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

Name (print): Peter Neumann Date: 10/12/93

Title: Resident Engineer

Representing: [illegible]

Signature: Peter Neumann

0.256

ZA

GEOTEXTILE
DAILY INSPECTION FORM

SHEET 1 OF 1

PROPERTY North Slope
EL

LOCATION See Base
[illegible]
Slope (Cont.)

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
Comments:

-WEIGHT INSPECTION ✓ 6oz. ___ 10 oz. ___ 16 oz

-ROLL NUMBERS USED

SEAM INSPECTION

-SEWING MACHINE NUMBER 2700 B

-TOTAL SEAM LENGTH ________

-FOLD WIDTH BEFORE BACKFILL ✓ Acceptable ___ Unacceptable
(Measured appr. 10 feet; 6-inch min.)

-EDGE TO SEAM LIMIT ✓ Acceptable ___ Unacceptable
(1-inch to 3-inches from edge of geotextile)
(slack 3-inch min)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

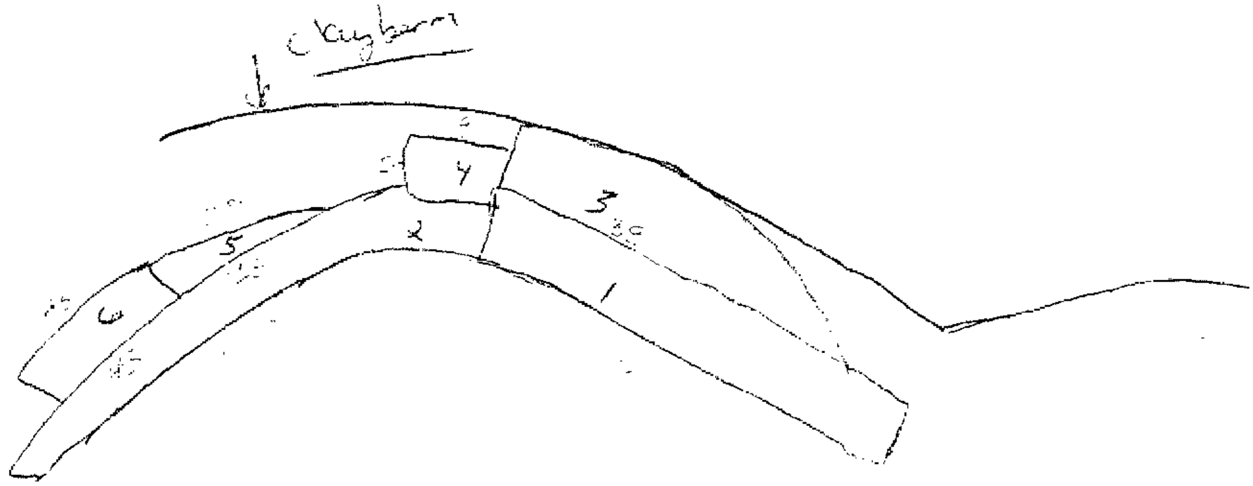
COMMENTS

CWM/RUST QC Officer — Date: 9/Nov 93

QA Inspector — Date: 11/09/93

GOLDER ASSOCIATES INC.

REV 10/93



Seams

1/3, 2/4, 2/5, 2/6

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

Date: 11/09/93

Project Name: FSRT / RED. ENV. / MA

Site Name: North slope

Location of Subgrade Surface to be Lined: clay berm along the top of the slope.

I hereby certify that the above area is suitable for the installation of geosynthetics, and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): KELLY FAGAN Date: 11/9/93

Title: PROJ. ENGR

Representing: TRS

Signature: KG

Acknowledged by:

GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

Name (print): Alfred A. Tang Date: 11/09/93

Title: Geotechnical Engineer

Representing: Golder Associates Inc.

Signature: alfred A. Tang

GEOTEXTILE
DAILY INSPECTION FORM

SHEET / OF /

PROPERTY CUSTODIAL TRUST

LOCATION North Slope East of the East Wide Pile

SUBGRADE INSPECTION

-SUBGRADE INSPECTED X Acceptable ___ Unacceptable
On 10/18/93

MATERIAL INSPECTION

-VISUAL INSPECTION X Acceptable ___ Unacceptable
Comments: See Report 10/18/93

-WEIGHT INSPECTION X 6oz. ___ 10 oz. ___ 16 oz
See Report 10/18/93

-ROLL NUMBERS USED
See Report 10/18/93

SEAM INSPECTION

-SEWING MACHINE NUMBER ___ } See report 10/18/93

-TOTAL SEAM LENGTH ___

-FOLDED OVERLAP BEFORE BACKFILL X Acceptable ___ Unacceptable
(Measured appr. 10 feet; 6-inch min.)
1/2, 2/3, 3/4, 4/5, 5/6, 6/7, 7/8, 8/9

-EDGE TO SEAM LIMIT ___ Acceptable ___ Unacceptable
(Minimum 3 inches minus 1 inch)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS

Peter Neumann
Inspector

10-19-93
Date

GOLDER ASSOCIATES INC.

REV 8/93

CERTIFICATE OF COMPLETION

OF SOIL SUBGRADE SURFACE

10-18-93 PCN
~~10-14-93~~
Date: ~~10-13-93~~

Project Name: ISRT / RES. ENG. / MA

Site Name: Industri-Plex.

Location of Subgrade Surface to be Lined: See reverse sketch

I hereby certify that the above area is suitable for the installation of geosynthetics, and that I shall be responsible for its integrity and suitability in accordance with the specifications from this date to completion of the installation.

INSTALLER'S REPRESENTATIVE

Name (print): Brian J. Barbella Date: 10/14/93

Title: Foreman / Super

Representing: Barbella Environmental Technology

Signature: Brian J. Barbella

Acknowledged by:

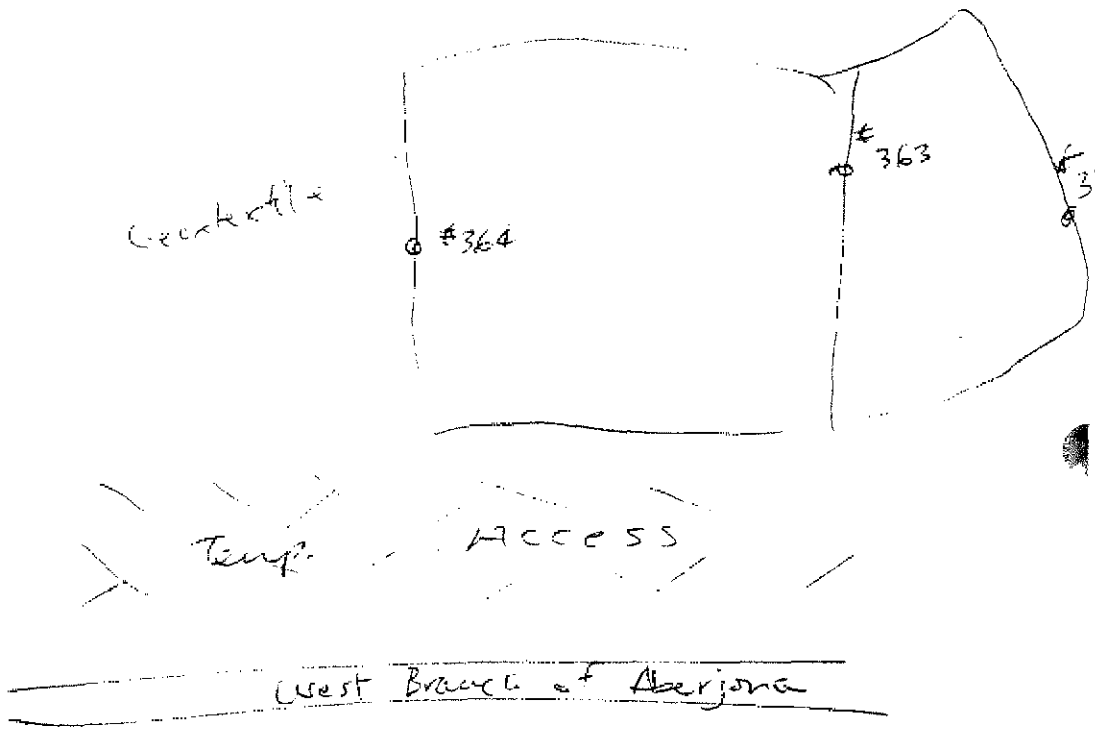
GEOSYNTHETIC QUALITY ASSURANCE CONSULTANT

Name (print): PETER NEUMANN Date: 10/14/93

Title: RESIDENT ENGINEER

Representing: Industri-Plex Site Remedial Trust

Signature: Peter C. Neumann



#364
#363
#37
Temp. Access
West Branch of Aberjona

TESTED FOR:

PROJECT: INDUSTRI - PLEX
WOBURN, MASS

DATE: 10-18-93

OUR REPORT NO:

REMARKS:

GEOTEXTILE
DAILY INSPECTION FORM

PROPERTY CUSTODIAL TRUST

LOCATION AREA NORTH OF WETLAND 24, EAST OF EAST HIDE PILE ACCES ROAD, TO LIMITS OF COVER NORT

SUBGRADE INSPECTION
-SUBGRADE INSPECTED X Acceptable ___ Unacceptable

MATERIAL INSPECTION
-VISUAL INSPECTION X Acceptable ___ Unacceptable
Comments

-WEIGHT INSPECTION X 6 oz. ___ 10 oz. ___ 16 oz.
-ROLL NUMBERS USED 716, 712

SEAM INSPECTION
-SEWING MACHINE NUMBER 2200B (1-2) (2-3) (3-4) (4-5) (5-6) (6-7) (7-8) (8
-TOTAL SEAM LENGTH 1497

-FOLDED OVERLAP BEFORE BACKFILL ___ Acceptable X Unacceptable
(Measured appr. 10 feet; 6 inch min.)
-EDGE TO SEAM LIMIT X Acceptable ___ Unacceptable
(Minimum 3 inches minus 1 inch)

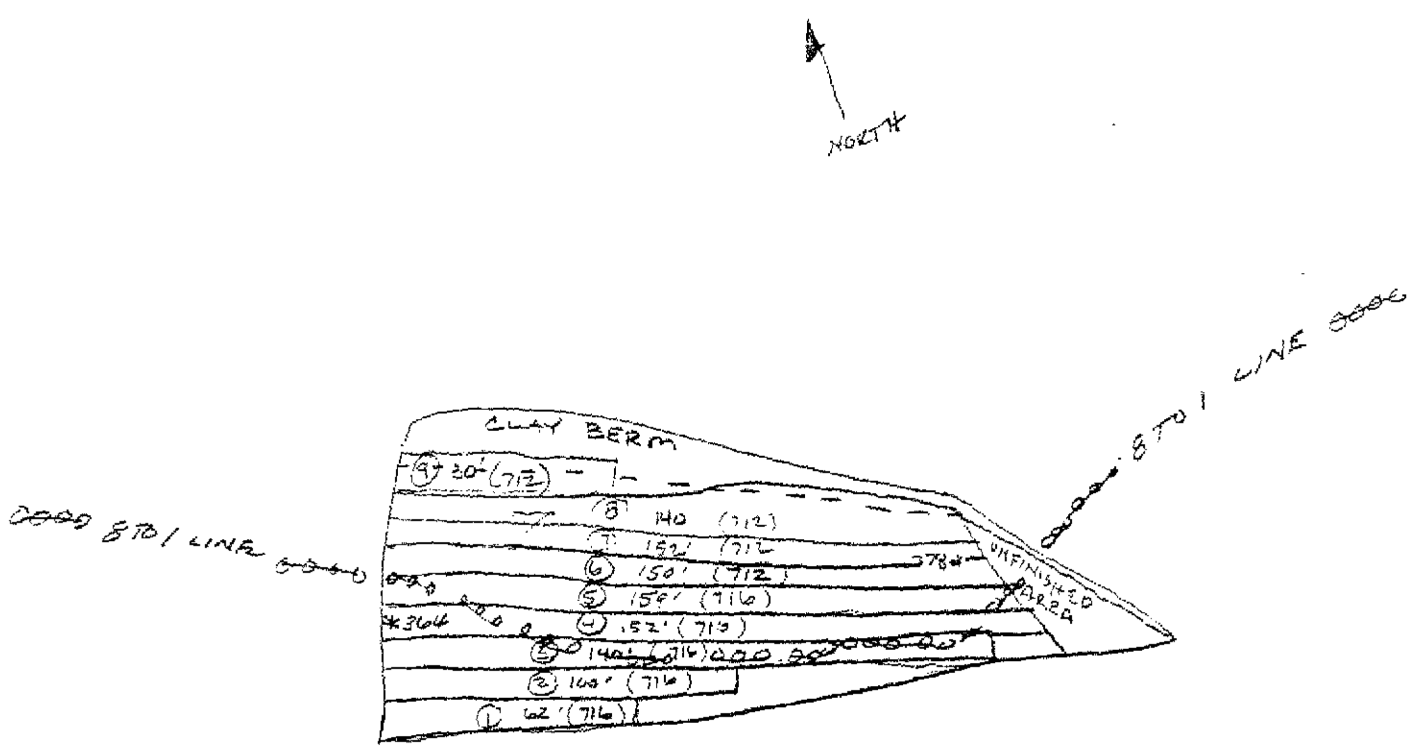
DAMAGE/REPAIR INSPECTION
-LOCATION(S)
-PATCH SIZE(S)

COMMENTS: FOLDED OVERLAP OF SEAMS NOT DONE AS OF THIS DATE. PLEASE SEE ATTACHED SKETCH.

Anthony P. [signature]
Inspector

10-18-93
Date

NORTH SLOPE, EAST OF THE EAST CENTRAL HIDE PILE.



NOT TO SCALE

1 = SEAM #

*364 = GRADE STAKE 364

(712) = ROLL # 712 OF PERM. FABRIC.

oooo = 8' TO 1' GRADE LINE.

☐ = 12 X 12 SECTION ABOVE 3 TO 1 SLOPE.

TOTAL SEAMS THIS DATE: 1497 LIN/FT

A. CRUPI

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 2

PROPERTY I-PLEX / EAST HIDE PILE / NORTHERN AREA

LOCATION NEAR NORTH FENCE / (SEE SKETCH ON BACK)

SUBGRADE INSPECTION

-SUBGRADE INSPECTED X Acceptable ____ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION X Acceptable ____ Unacceptable
Comments:

-WEIGHT INSPECTION X 6oz. ____ 10 oz. X 16 oz

-ROLL NUMBERS USED 36689, 36744, / 4501558, 4501476

PANEL LAYOUT SUBMITTAL ____ Met X Revised. See Comments

SEAM INSPECTION

-SEWING MACHINE NUMBER A7

-TOTAL SEAM LENGTH 1550'

-EDGE TO SEAM LIMIT ✓ Acceptable ____ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS ~~SEE SKETCH ON BACK~~

Mike Tanner
CWM/RUST QC Officer

11/4/94
Date

Alfred A. Long
QA Inspector

11/04/94
Date

REV 05/94

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

Area North of the East Hide Pile.

11/ /94 2 OF 2

PROPERTY I-PLEX EAST HIDE PILE NORTHERN AREA

LOCATION NEAR NORTH FENCE (SEE SKETCH ON BACK)

SUBGRADE INSPECTION

-SUBGRADE INSPECTED X Acceptable ____ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION X Acceptable ____ Unacceptable

Comments:

-WEIGHT INSPECTION X 6 oz. ____ 10 oz. X 16 oz

-ROLL NUMBERS USED 36689, 36744, 4501658, 4501476

PANEL LAYOUT SUBMITTAL ____ Yes X Revised. See Comments

SEAM INSPECTION

-SEWING MACHINE NUMBER 4 7

-TOTAL SEAM LENGTH 550'

-EDGE TO SEAM LIMIT ____ Acceptable ____ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS See sketch on back

CWM/RUST QC Officer ____ Date ____

QA Inspector ____ Date ____

16oz
16oz
16oz
16oz
16oz
16oz
16oz
6oz.
6oz.
6oz.
6oz

11/ /94.

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY E.H.P. LOCATION N.E. Slope near 18"RCP

SUBGRADE INSPECTION

-SUBGRADE INSPECTED X Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION X Acceptable ___ Unacceptable
Comments:

-WEIGHT INSPECTION ___ 6oz. ___ 10 oz. X 16 oz

-ROLL NUMBERS USED 36819

PANEL LAYOUT SUBMITTAL

___ Met X Revised. See Comments

SEAM INSPECTION

-SEWING MACHINE NUMBER A 8

-TOTAL SEAM LENGTH ≈600'

-EDGE TO SEAM LIMIT X Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS

Mike Manno 12/21/94
CWM/RUST QC Officer Date

QA Inspector 12/21/94
Date

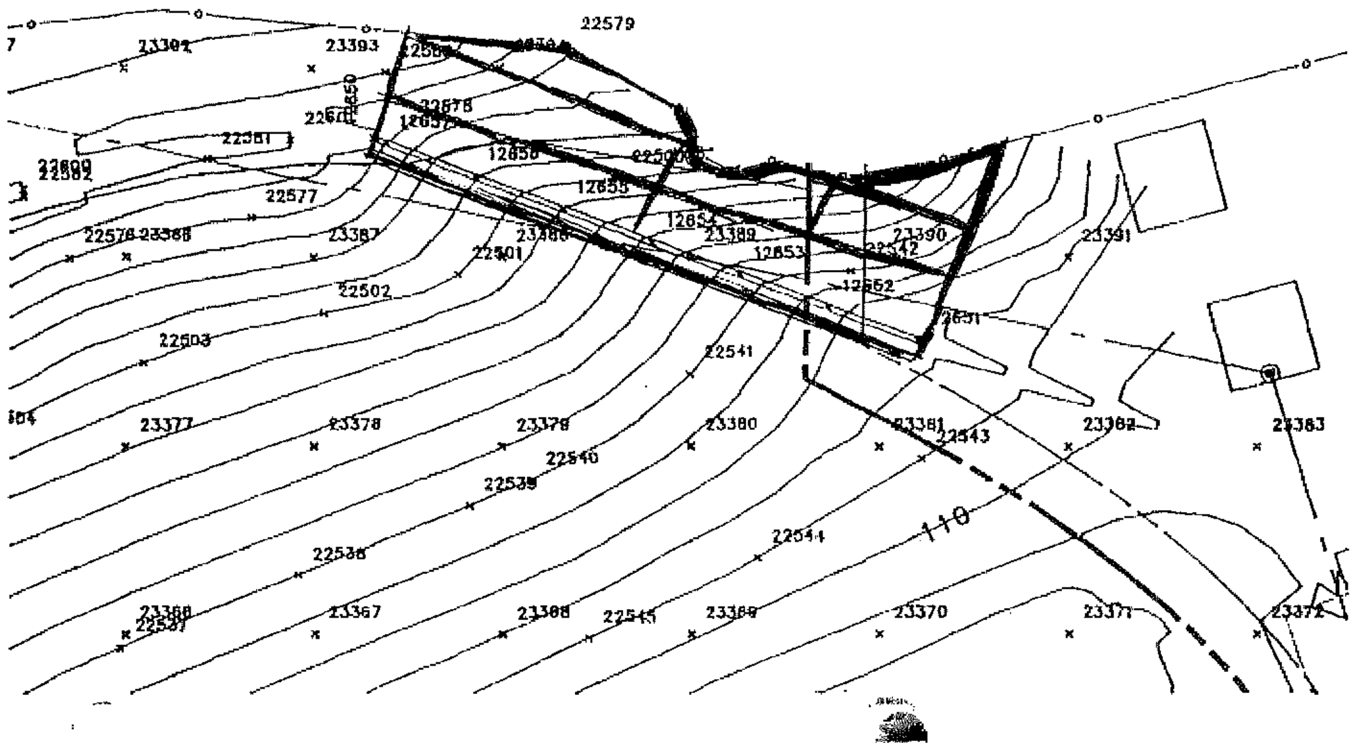
REV 05/94

EHP

NORTH EAST CORNER ≠
18" RCP.

1" = 50'

12/20/94



GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY North Slope

LOCATION Trench for Fence Line

☐ Panel layout on back or ☐ Attached

SUBGRADE INSPECTION
Subgrade inspected ____ Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection ____ Acceptable ____ Unacceptable
Comments:

Weight inspection ____6-oz. ____10 oz. ____16-oz.

SEAM INSPECTION
Sewing machine number A-6
Total seam length 2 @ 102' = 204'

Edge to seam limit ✓ Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

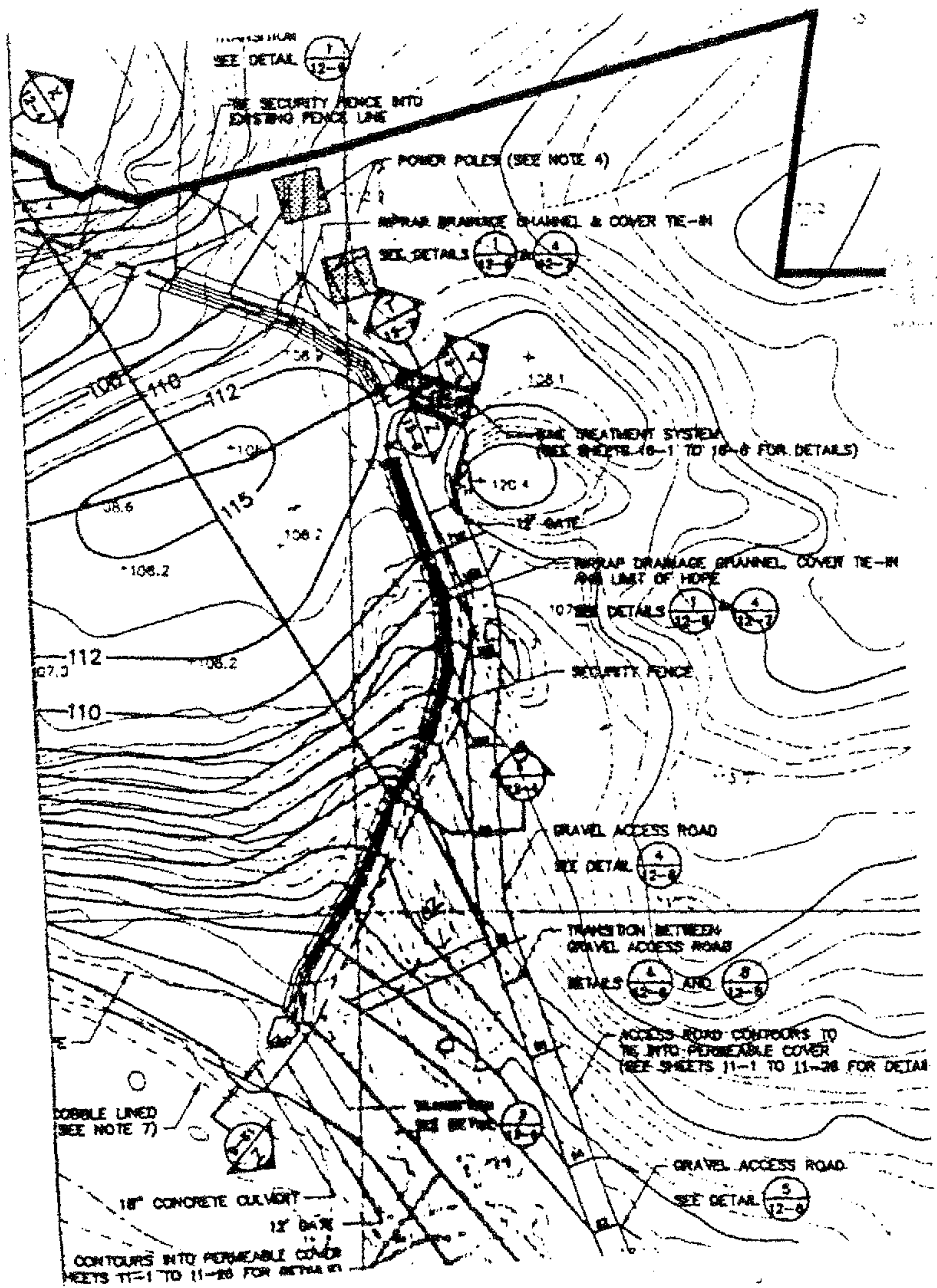
DAMAGE/REPAIR INSPECTION

Location (s) ____

Patch Size (s) ____

Comments:

[signature]	General Foreman	4-14-95
CWM/RUST QC Rep	Title	Date
FOR [signature]	CM SUPERVISOR	4/14/95
QA Inspector TIBEBE MENKIR	Title	Date


SEE DETAIL
POWER POLES (SEE NOTE 4)
SEE DETAILS
12' GATE
SECURITY FENCE
GRAVEL ACCESS ROAD
SEE DETAIL
GRAVEL ACCESS ROAD
DETAILS
AND
COBBLE LINED
(SEE NOTE 7)
18" CONCRETE CULVERT
GRAVEL ACCESS ROAD
SEE DETAIL
106
110
112
115
112
110
128.1
120.4
106.2
106.2

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY EHP.
Toe of Slope to 76 contour

LOCATION Drain way from culvert North
to End of Draining above 76 contour PANEL 1-3

☑ Panel layout on back or ☒ Attached SITE SKETCH

SUBGRADE INSPECTION
Subgrade inspected ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection ✓ Acceptable ____ Unacceptable
Comments:

Weight inspection ✓ 6-oz. ____ 10 oz. ____ 16-oz.

SEAM INSPECTION
Sewing machine number B6

Total seam length 208'

Edge to seam limit ✓ Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

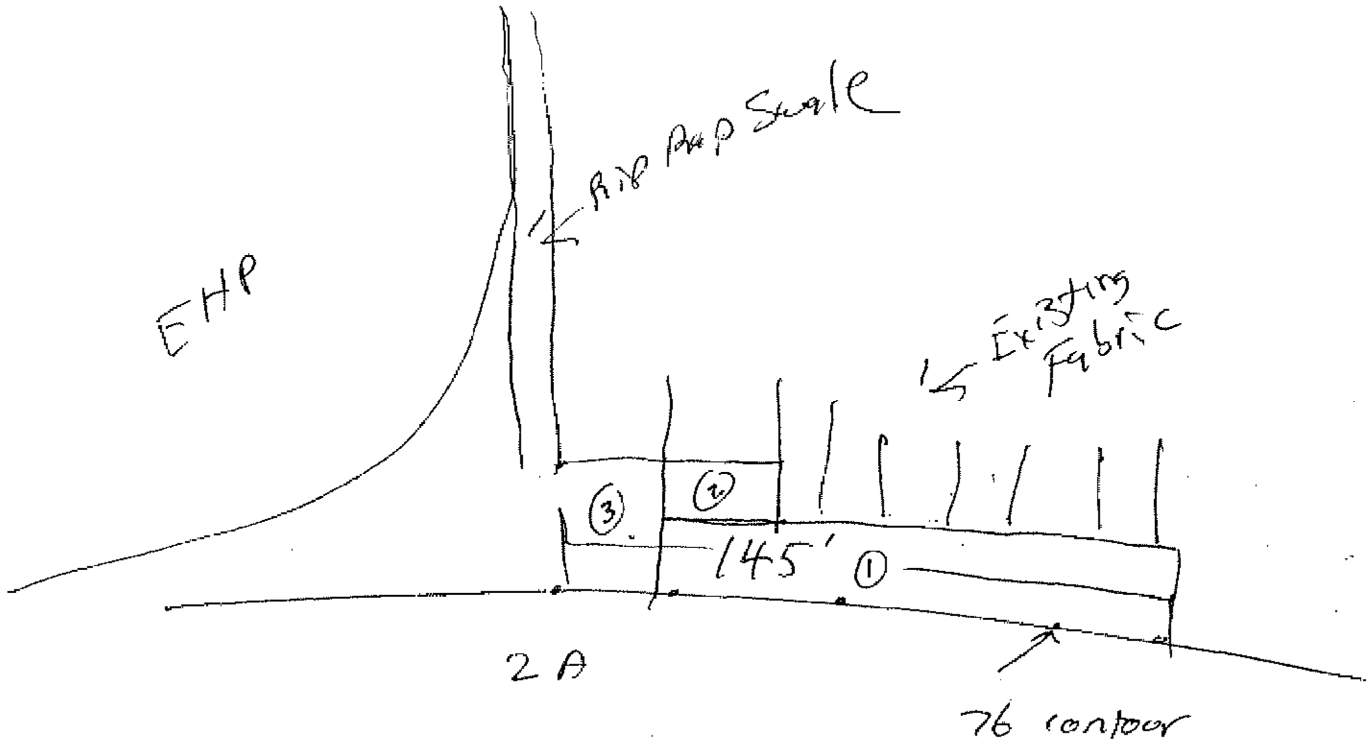
DAMAGE/REPAIR INSPECTION

Location (s) N/A

Patch Size (s) N/A

Comments:

[signature]	Grant [illegible]	4-20-95
CWM/RUST QC Rep	Title	Date
[signature]	SENIOR FIELD INSP.	4-20-95
QA Inspector	Title	Date


Rip Rap Swale
EHP
Existing Fabric
145'
2A
76 contour

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY EAST HIDE PILE

LOCATION SOUTH SWALE CONSTRUCTION REPLACING CONC. PIPE CONSTRUCTION.

[X] Panel layout on back or [X] Attached FIELD SKETCH

SUBGRADE INSPECTION
Subgrade inspected X Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection X Acceptable ____ Unacceptable
Comments:

Weight inspection ____ 6-oz. ____ 10 oz. X 16-oz.

SEAM INSPECTION
Sewing machine number A-6

Total seam length 70'±

Edge to seam limit X Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

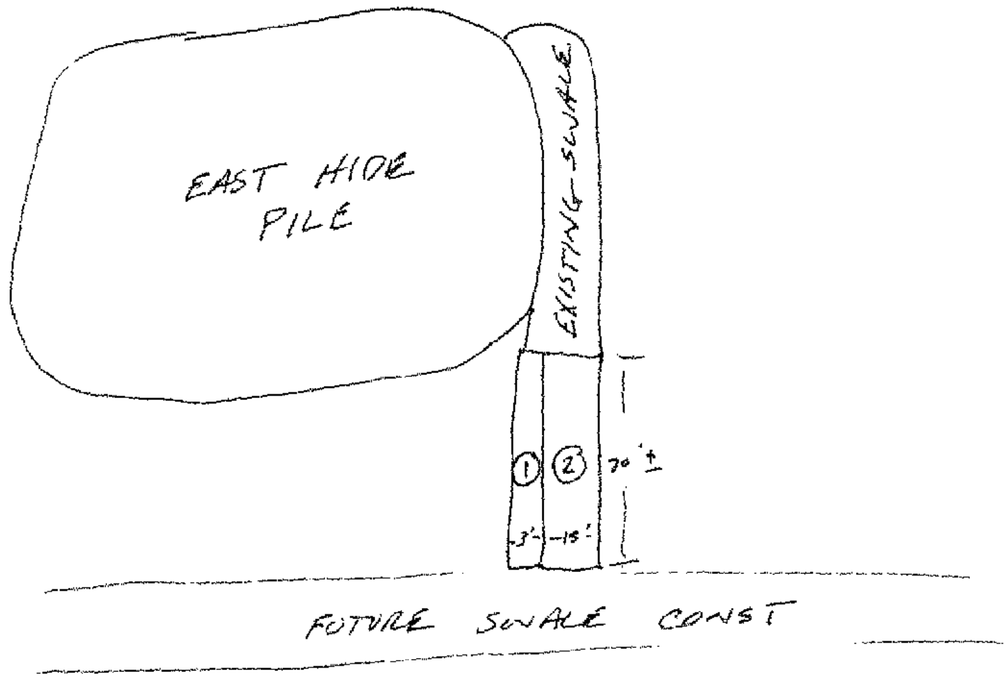
Location (s) ____

Patch Size (s) 3' OVERLAP ON NORTH SIDE

Comments:

Doug Campbell — General Foreman — 4-24-95
CWM/RUST QC Rep — Title — Date

[signature] — SENIOR FIELD INSP. — 4-24-95
QA Inspector — Title — Date


EAST HIDE PILE
EXISTING SWALE
1
2
70'±
3'
15'
FUTURE SWALE CONST

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY EAST HIDE PILE
(WORK DONE ON 5-1-95)

LOCATION NORTH/EAST SWALE REPLACING THE
18" RCP.

[X] Panel layout on back or [ ] Attached

SUBGRADE INSPECTION
Subgrade inspected X Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection X Acceptable ____ Unacceptable
Comments:

Weight inspection ____ 6-oz. ____ 10 oz. X 16-oz.

SEAM INSPECTION
Sewing machine number A-6

Total seam length 180'

Edge to seam limit X Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

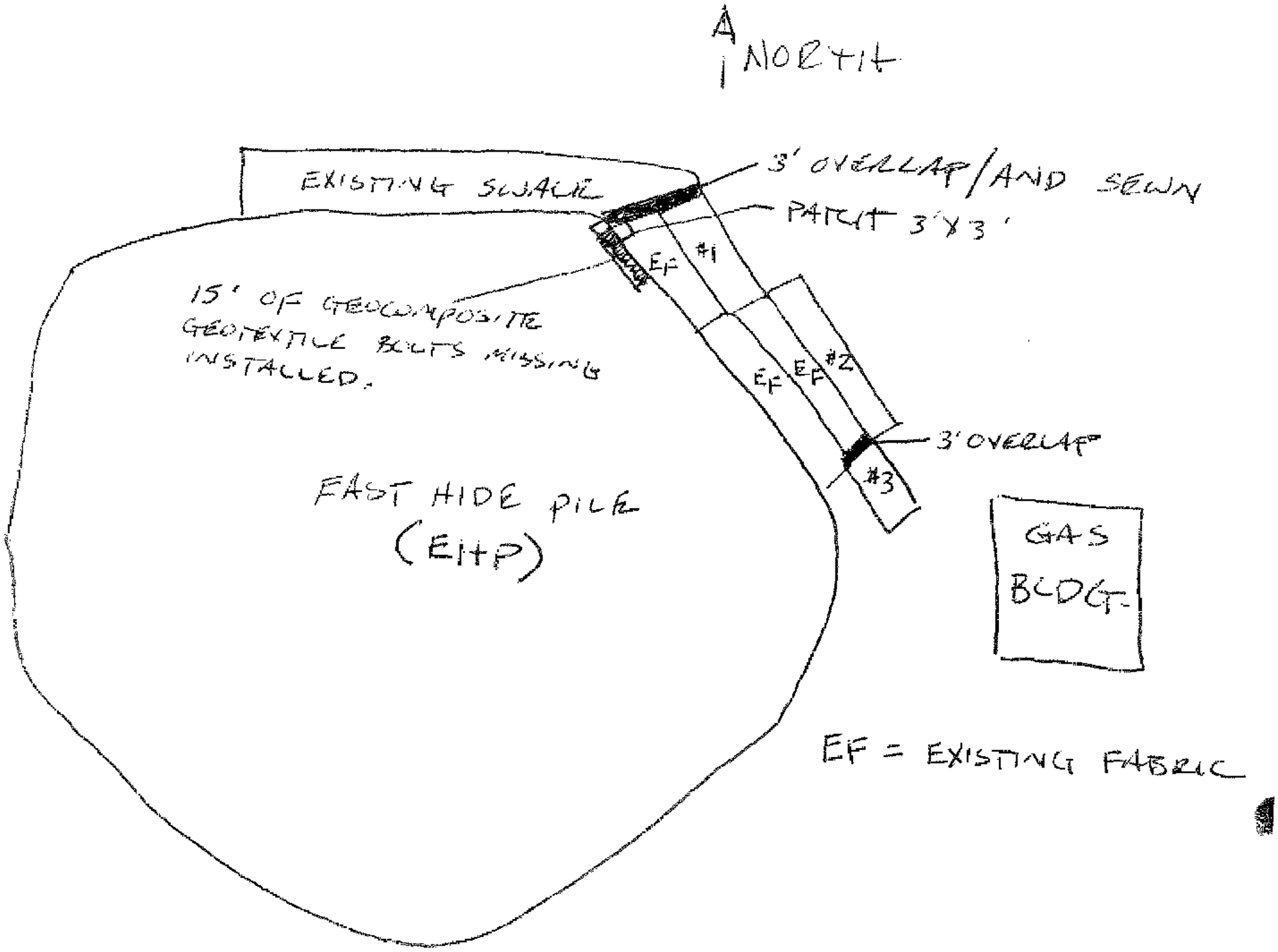
Location (s) AT SWALE CONNECTION

Patch Size (s) 3' X 3'

Comments:

Doug Campbell — General Foreman — 5-2-95
CWM/RUST QC Rep — Title — Date

Anthony C [illegible] — SENIOR FIELD INSP. — 5-1-95
QA Inspector — Title — Date


NORTH
EXISTING SWALE
3' OVERLAP/AND SEWN
PATCH 3'X3'
15' OF GEOCOMPOSITE GEOTEXTILE BOLTS MISSING INSTALLED.
EF
#1
EF
EF
#2
3' OVERLAP
#3
EAST HIDE PILE (EHP)
GAS BLDG.
EF = EXISTING FABRIC

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY Cast Hide Pile

LOCATION Toe drain around Cast Hide Pile

[L] Panel layout on back or [ ] Attached

SUBGRADE INSPECTION
Subgrade inspected N/A Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection ✓ Acceptable ____ Unacceptable
Comments:

Weight inspection ____ 6-oz. ____ 10 oz. ✓ 16-oz.

SEAM INSPECTION
Sewing machine number A-2

Total seam length 450'

Edge to seam limit ✓ Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

Location (s) ____________

Patch Size (s) ____________

Comments:

John F. Kiley | Gen Foreman | 5/31/95
CWM/RUST QC Rep | Title | Date

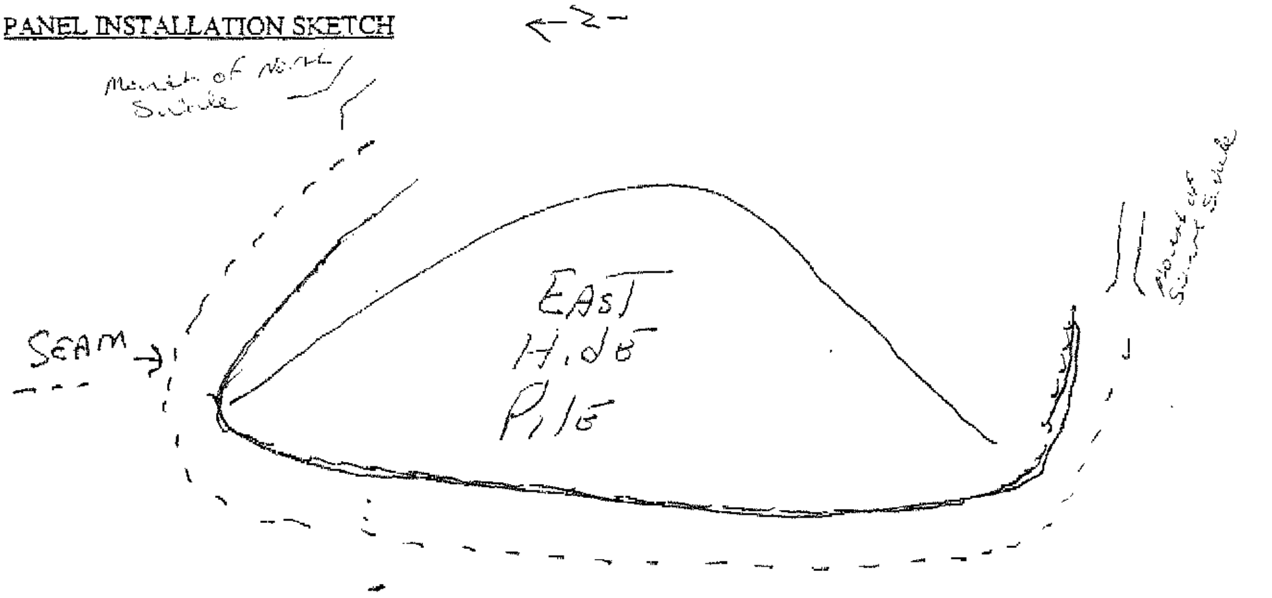
Arford A. Toney | Field Engineer | 06/01/95
QA Inspector | Title | Date

Work From 05/23/95 to 06/01/95

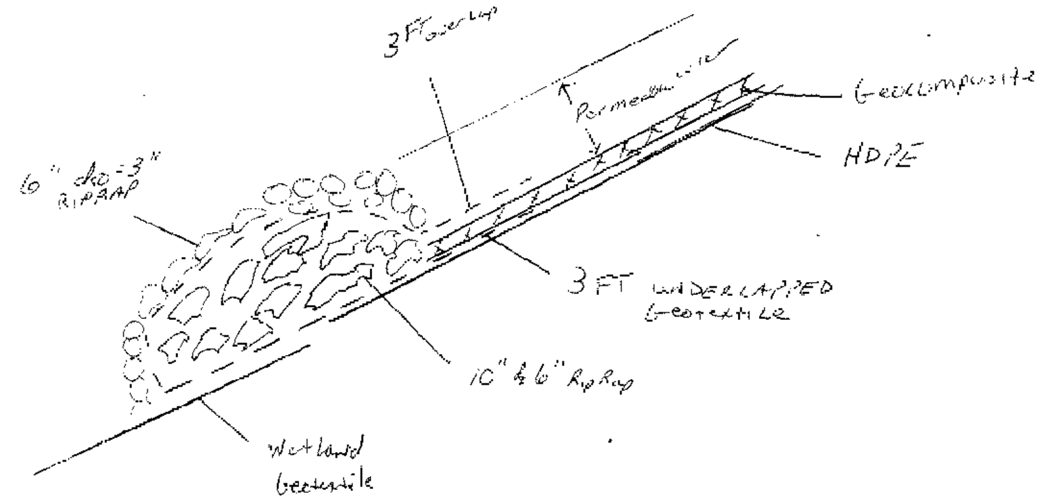
SHEET ____ OF ____

GEOTEXTILE FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH



COMMENTS



GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 2

PROPERTY I-PLEX
EAST HIDE PILE
NORTHERN AREA

LOCATION NEAR NORTH FENCE
(SEE SKETCH ON BACK)

SUBGRADE INSPECTION

-SUBGRADE INSPECTED X Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION X Acceptable ___ Unacceptable
Comments:

-WEIGHT INSPECTION X 6oz. ___ 10 oz. X 16 oz

-ROLL NUMBERS USED 36689, 36744, / 4501558, 4501476

PANEL LAYOUT SUBMITTAL ___ Met X Revised. See Comments

SEAM INSPECTION

-SEWING MACHINE NUMBER A7

-TOTAL SEAM LENGTH 1550'

-EDGE TO SEAM LIMIT ✓ Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS ~~SEE SKETCH ON BACK~~

Mike Tanner
CWM/RUST QC Officer

11/4/94
Date

Alfred C. [signature]
QA Inspector

11/04/94
Date

REV 05/94

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

Area North of the East Hide Pile.

11/~~4~~/94 2 OF 2

PROPERTY ~~I-PLEX~~ ~~EAST HIDE PILE~~ ~~NORTHERN AREA~~ LOCATION NEAR NORTH FENCE (SEE SKETCH ON BACK)

SUBGRADE INSPECTION

-SUBGRADE INSPECTED X Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION X Acceptable ___ Unacceptable

Comments:

-WEIGHT INSPECTION X 6oz ___ 10 oz. X 16 oz

-ROLL NUMBERS USED 36689, 36744, / 4501558, 4501476

PANEL LAYOUT SUBMITTAL ___ Yes X Revised. See Comments

SEAM INSPECTION

-SEWING MACHINE NUMBER 4 7

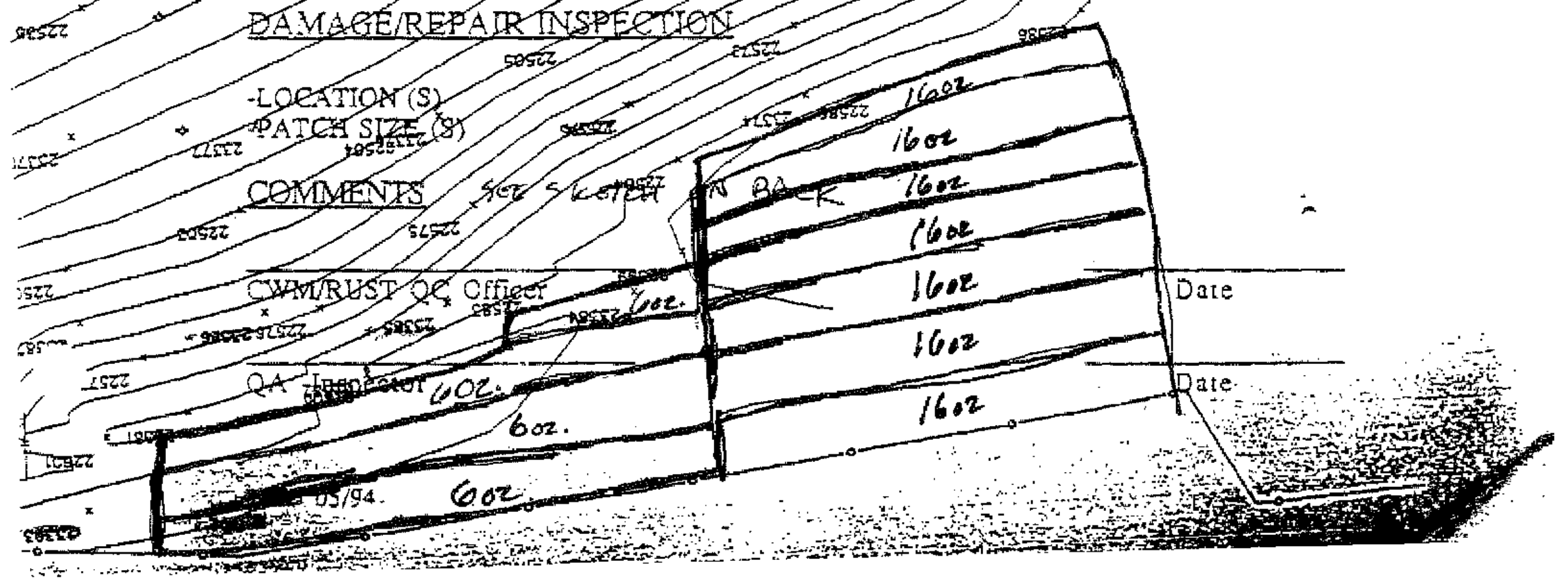
-TOTAL SEAM LENGTH 550'

-EDGE TO SEAM LIMIT ___ Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

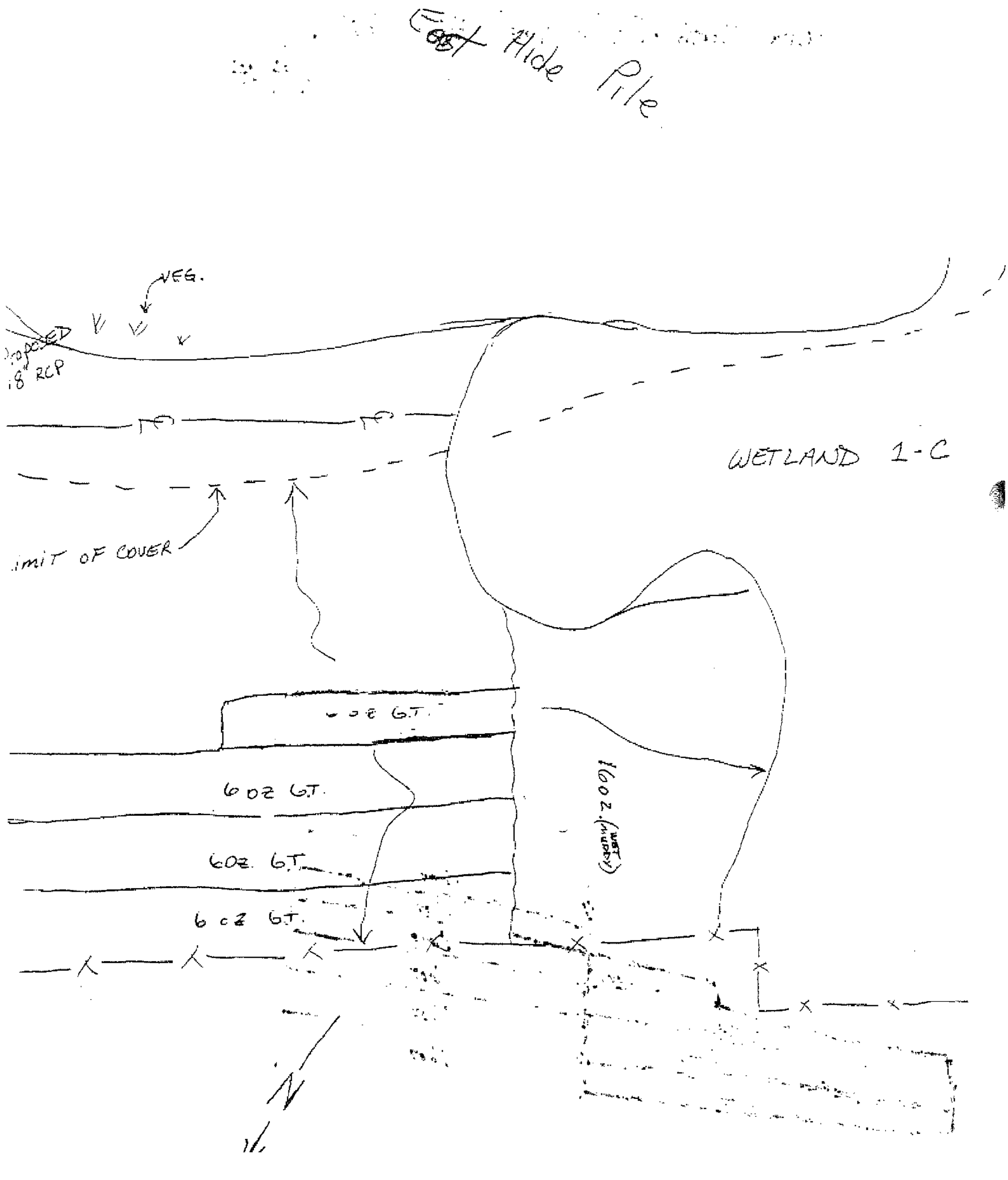
-LOCATION (S)
-PATCH SIZE (S)

COMMENTS SEE SKETCH ON BACK



CWM/RUST QC Officer ___ Date ___

QA Inspector ___ Date ___



Goat Hide Pile
VEG.
Proposed 18" RCP
WETLAND 1-C
LIMIT OF COVER
6 OZ G.T.
6 OZ G.T.
6 OZ. G.T.
6 OZ G.T.
16 OZ. (WET MUDDY)
N

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET OF

PROPERTY W.H.P.

LOCATION SOUTH Plateau OF THE S.H.P.

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ____ Unacceptable
Comments:

-WEIGHT INSPECTION ~~8~~ oz. ____10 oz. X 16 oz

-ROLL NUMBERS USED 37818, 27130, 37833, 30233, 37823, 37745, ~~37746~~, 37738, 37855, 26330

PANEL LAYOUT SUBMITTAL ✓ Met ____ Revised. See Comments

SEAM INSPECTION

-SEWING MACHINE NUMBER A-1 (BARBELLA)

-TOTAL SEAM LENGTH ≈ 2200'

-EDGE TO SEAM LIMIT ✓ Acceptable ____Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS

Mike Tanner
CWM/RUST QC Officer

06-22-94
Date

Alfred A. Toner
QA Inspector

06/22/94
Date

REV 05/94

≈ 40,000 SF as of 6/22/94

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY WEST HIDE PILE LOCATION Southern Plateau.

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ____ Unacceptable
Comments: very few minor skips-

-WEIGHT INSPECTION ____6oz. ____10 oz. ✓ 16 oz

-ROLL NUMBERS USED 37818, 27130, 37833, 30233, 37823, 37745, 37738, 037 855
26330

PANEL LAYOUT SUBMITTAL ✓ Met ____ Revised. See Comments

SEAM INSPECTION

-SEWING MACHINE NUMBER A-1 (BET)

-TOTAL SEAM LENGTH 2200

-EDGE TO SEAM LIMIT ✓ Acceptable ____Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS

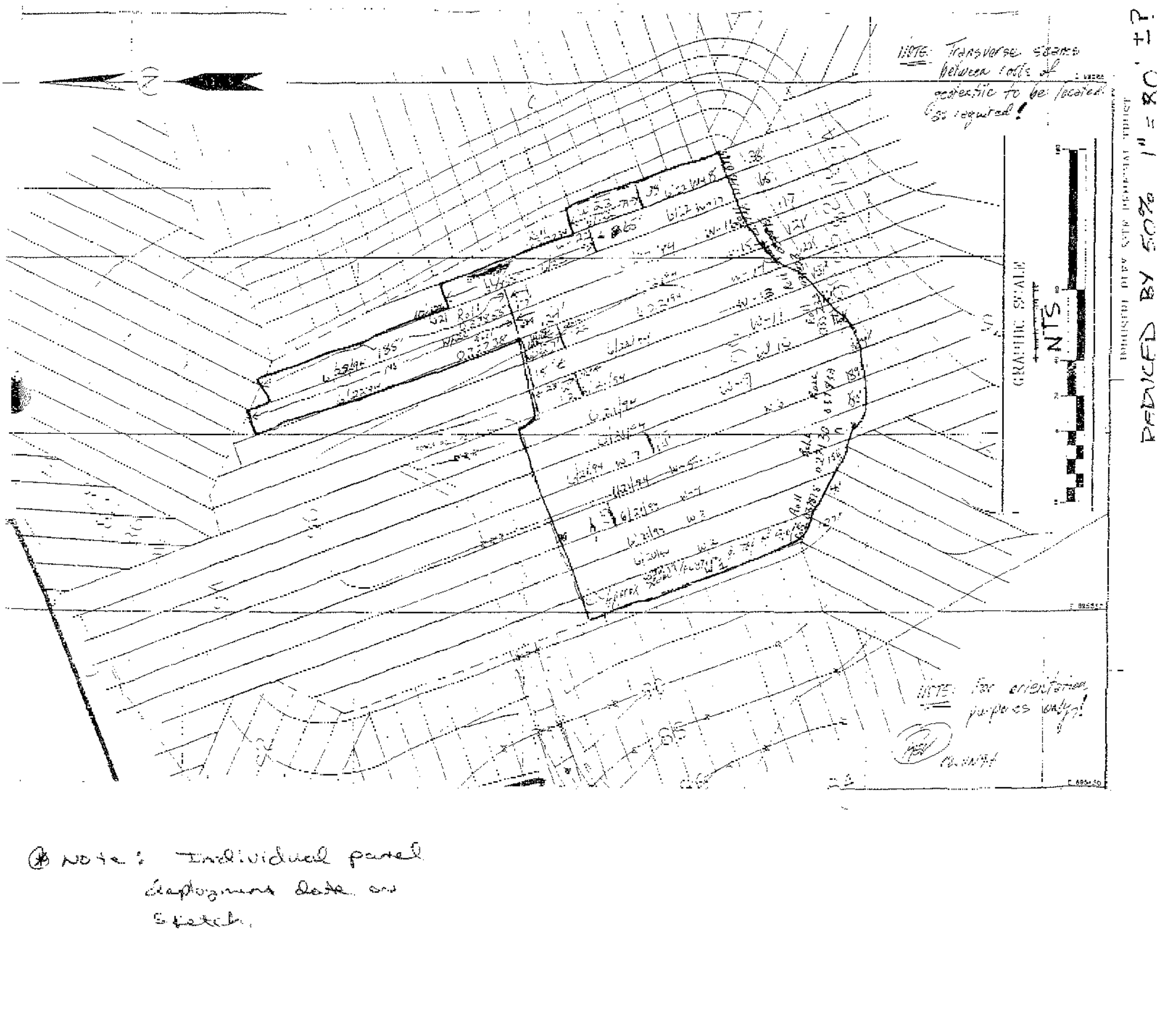
Mike Tanner
CWM/RUST QC Officer

06-24-94 MT
~~06-25-94~~
Date

Alfred [signature]
QA Inspector

06/24/94
Date

REV 05/94



(*) Note: Individual panel deployment date on sketch.

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY WEST HIDE PILE LOCATION NORTHERN PLATEAU

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ____ Unacceptable
Comments:

-WEIGHT INSPECTION ____6oz. ____10 oz. ✓16 oz

-ROLL NUMBERS USED ~~37733~~, ~~37853~~ 37751, 37728

PANEL LAYOUT SUBMITTAL

✓ Met ____ Revised. See Comments

SEAM INSPECTION

-SEWING MACHINE NUMBER A-1 (AET)

-TOTAL SEAM LENGTH ≈ 835'

-EDGE TO SEAM LIMIT ✓ Acceptable ____Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS

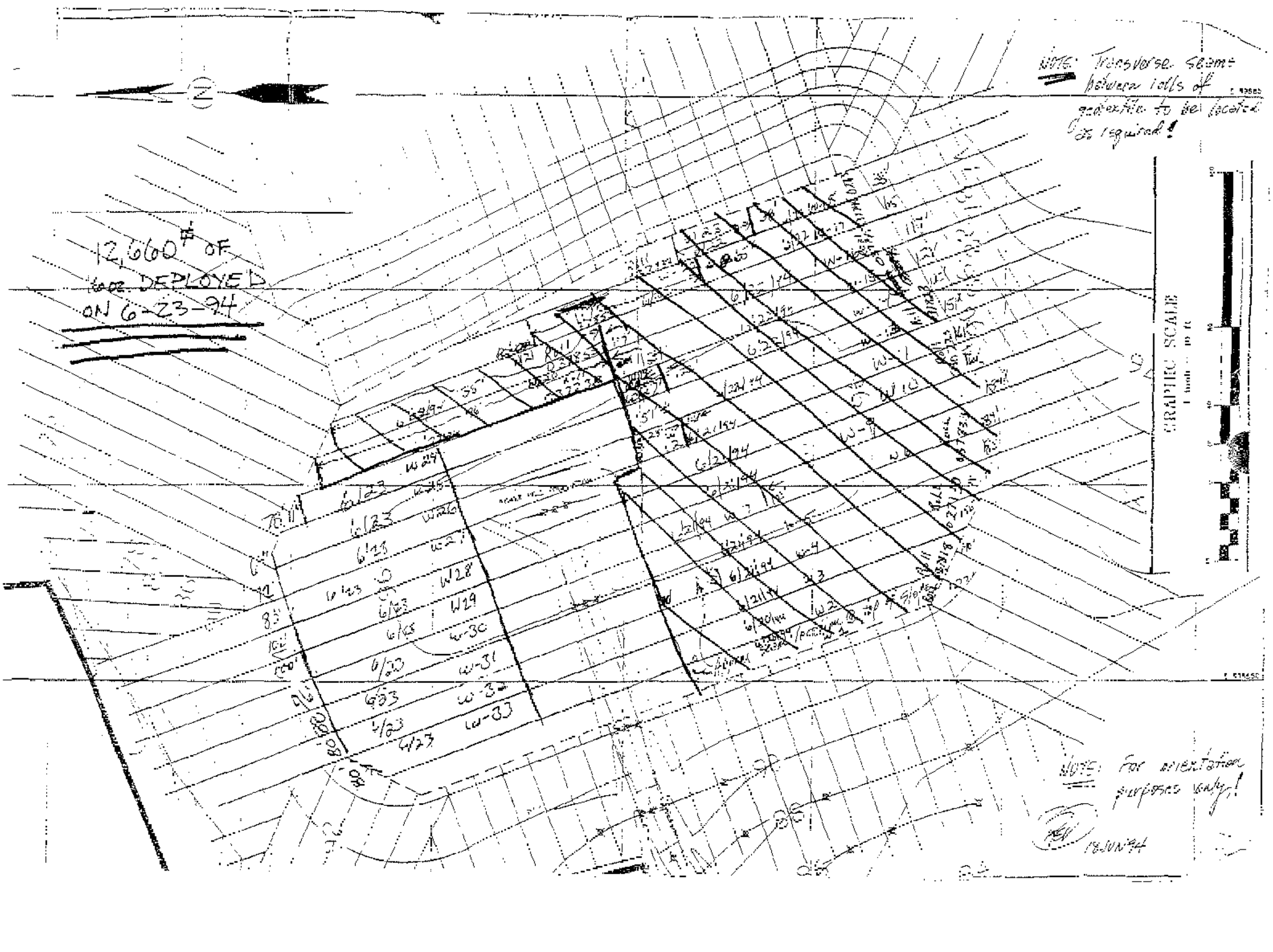
Mike Tanner
CWM/RUST QC Officer

06-25-94
Date

QA Inspector

06/25/94
Date

REV 05/94


12,660# OF
DEPLOYED
ON 6-23-94
NOTE: Transverse seams between rolls of geotextile to be located as required!
GRAPHIC SCALE
NOTE: For orientation purposes only!
18JUN94

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET ____ OF ____

PROPERTY W.H.P ______________ LOCATION EAST SlOPE ______________

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ____ Unacceptable
Comments:

-WEIGHT INSPECTION ____ 6oz. ____ 10 oz. ✓ 16 oz

-ROLL NUMBERS USED ~~036626~~ 36626

PANEL LAYOUT ✓ Conformance ____ Nonconformance
SEAM INSPECTION

-SEWING MACHINE NUMBER A-3

-TOTAL SEAM LENGTH ~~±~~ 250'

-EDGE TO SEAM LIMIT ✓ Acceptable ____ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS

Mike Tanner [signature] 09-07-94
CWM/RUST QC Officer Date

[signature] 09-07-94
QA Inspector Date

REV 04/94

RUST ENVIRONMENT & INFRASTRUCTURE

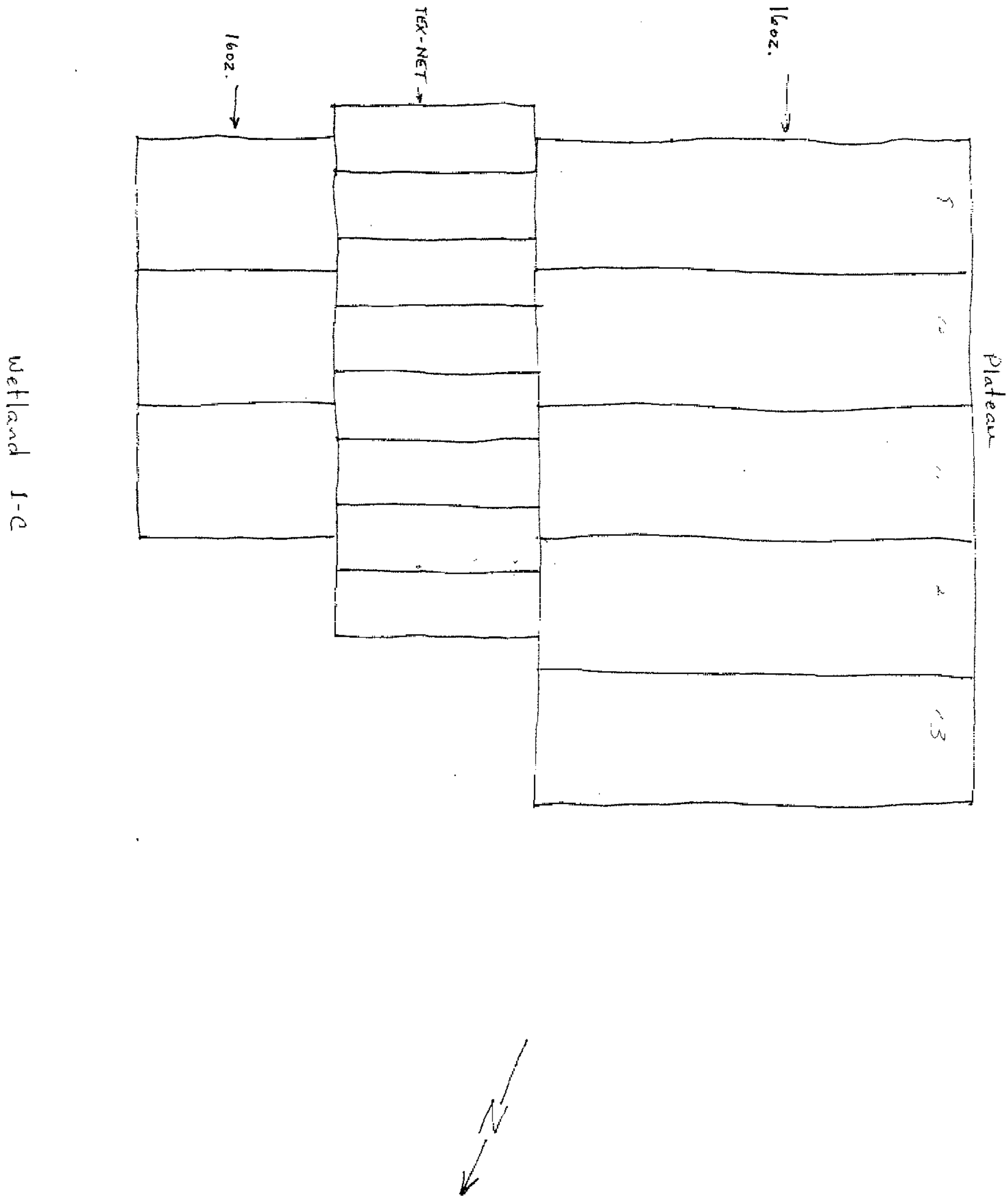
CALCULATION SHEET

PAGE 1 OF ____
PROJECT NO. 38012.050

CLIENT Rust Remedial
PROJECT West Hide Pile

SUBJECT Geosynthetic Panel layout.

Prepared By MT Date 9-7-94
Reviewed By ____ Date ____
Approved By ____ Date ____



GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET OF

PROPERTY W.H.P LOCATION EAST SlOPE

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
Comments:

-WEIGHT INSPECTION ___6oz. ___10 oz. ✓16 oz

-ROLL NUMBERS USED 31907, 31963, 36761

PANEL LAYOUT ✓ Conformance ___ Nonconformance
SEAM INSPECTION

-SEWING MACHINE NUMBER A-

-TOTAL SEAM LENGTH ≈200

-EDGE TO SEAM LIMIT ✓ Acceptable ___Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS on 9/20 seam 13/14 was opened and subgrade repaired and seam resewn.

Mike Tanner
CWM/RUST QC Officer

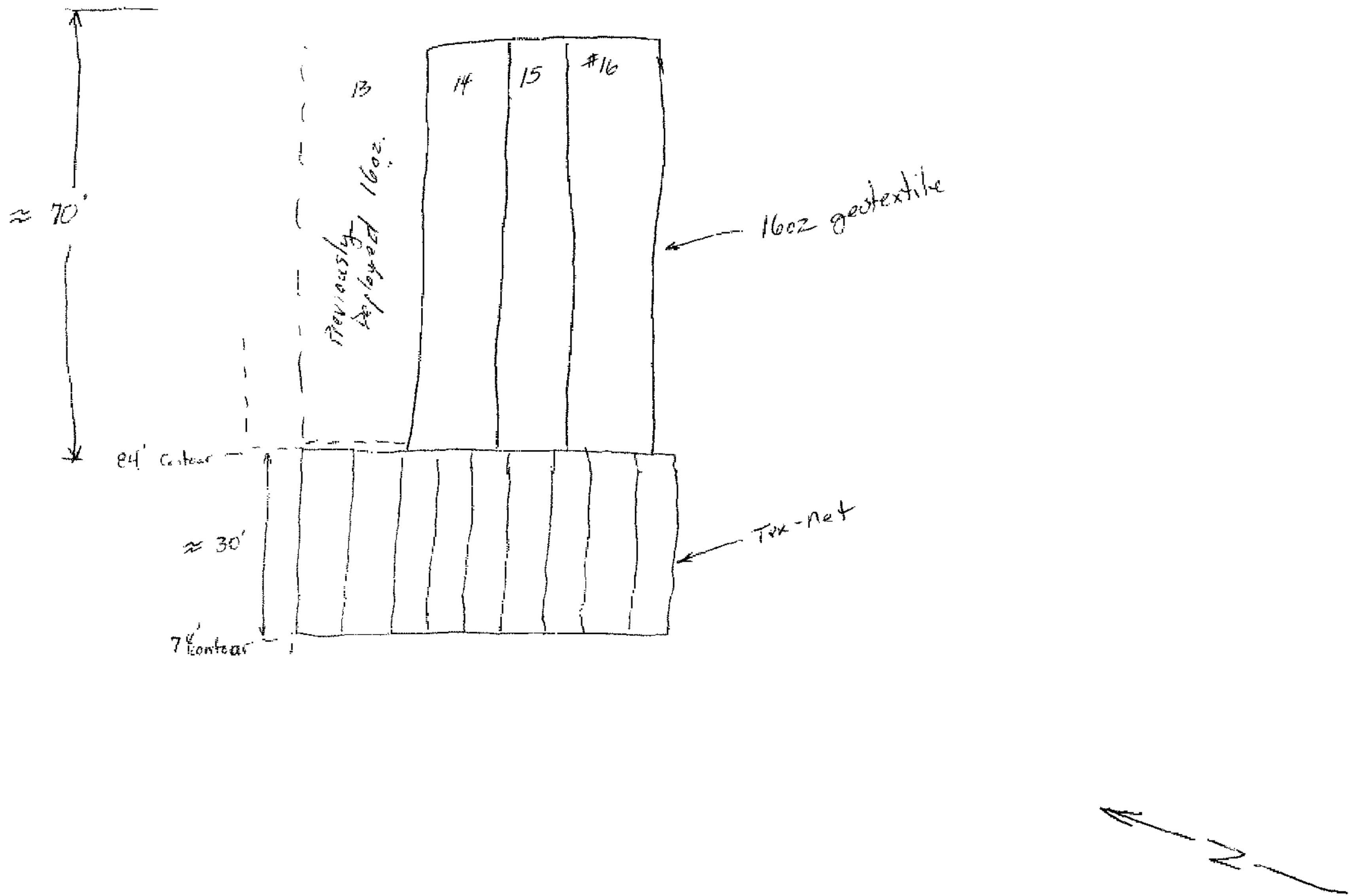
09/16/94
Date

Arthur P. [illegible]
QA Inspector

09/16/94
Date

REV 04/94

WAP - EASTERN OLU



GEOTEXTILE/GEOCOMPOSITE FIELD INSPECTION FORM INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY West Hide Pile LOCATION East Slope

MATERIAL INSPECTION

VISUAL INSPECTION ✓ Acceptable ___ Unacceptable

-Comments:

SEAM INSPECTION

MINIMUM 12-INCH OVERLAP ✓ Acceptable ___ Unacceptable

GEOTEXTILE/GEOCOMPOSITE SECURED EVERY 3-FEET -Hex Lag Screws ✓ Acceptable ___ Unacceptable

GEOTEXTILE SEAM -Thermal bonded ✓ Acceptable ___ Unacceptable

Some small holes noticed.

DAMAGE/REPAIR INSPECTION

NOTE: SEE SKETCH ON Geotextile/Geocomposite form dated 9/16/94

Mike Tanner
CWM/RUST QC Officer

20 Sept 94
Date

Anthony C Craig
QA Inspector

9-20-94
Date

REV 09/94

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY W.H.P. LOCATION The boot penisula

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
(*) Comments: SEE SKETCH FOR PANEL LAYOUT

-WEIGHT INSPECTION ___ 6oz. ___ 10 oz. ✓ 16 oz

-ROLL NUMBERS USED 35967, 35972

PANEL LAYOUT ___ Conformance ✓ Nonconformance (*)

SEAM INSPECTION

-SEWING MACHINE NUMBER A-4

180
120
300
-TOTAL SEAM LENGTH ≈300'

-EDGE TO SEAM LIMIT ✓ Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS

Mike Tanner
CWM/RUST QC Officer
09/21/94
Date

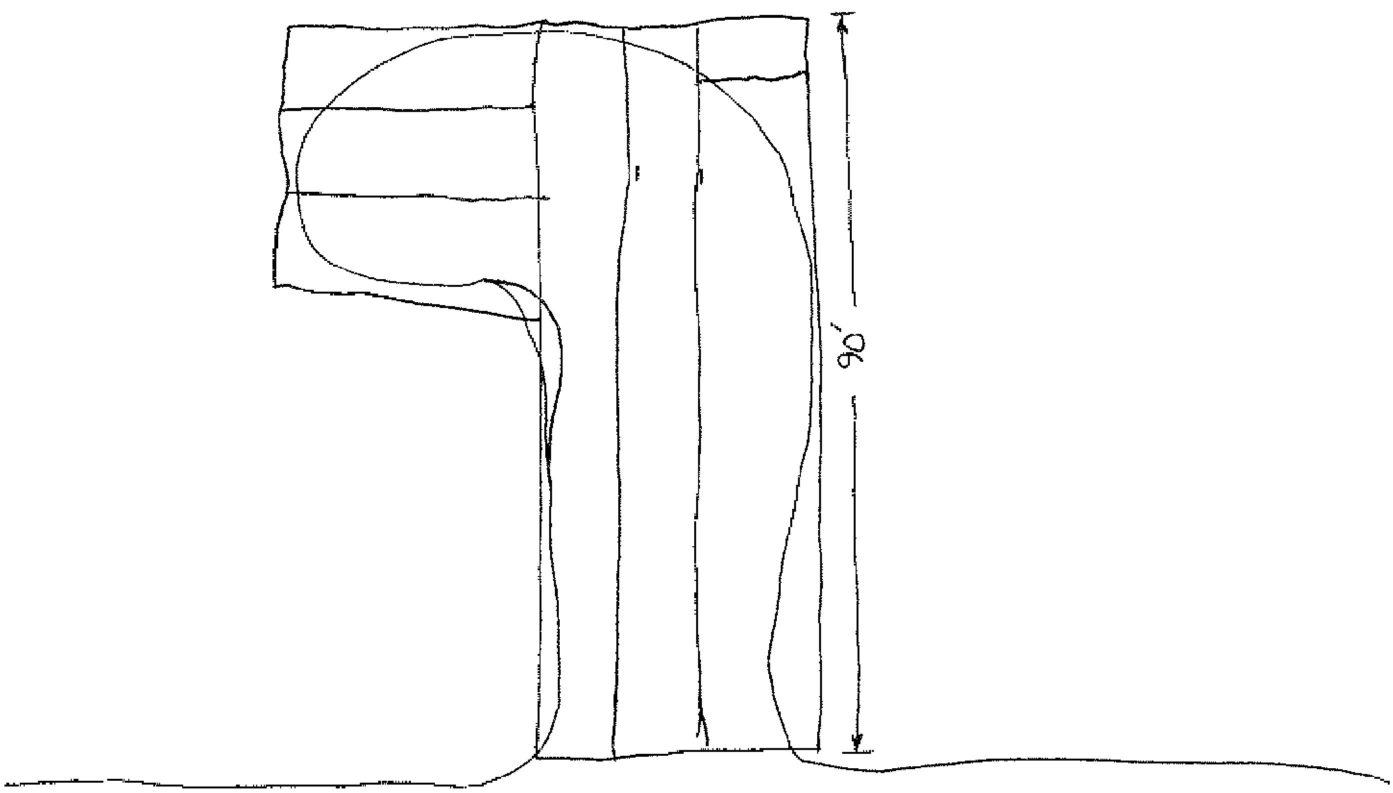
Anthony C [illegible]
QA Inspector
09/21/94
Date

REV 04/94

WAP 31907, 31965 — [illegible]

N

Wetland 1-C



SLOPE WEST HIDE PILE

GEOTEXTILE/GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY WITP

LOCATION SEE SKETCH

MATERIAL INSPECTION

VISUAL INSPECTION ✓ Acceptable ____ Unacceptable
-Comments:

SEAM INSPECTION

MINIMUM 12-INCH OVERLAP ✓ Acceptable ____ Unacceptable

GEOTEXTILE/GEOCOMPOSITE SECURED EVERY 3-FEET -Hex Lag Screws ✓ Acceptable ____ Unacceptable

GEOTEXTILE SEAM -Thermal bonded ✓ Acceptable ____ Unacceptable

DAMAGE/REPAIR INSPECTION

Mike Tanner
CWM/RUST QC Officer

09-30-94
Date

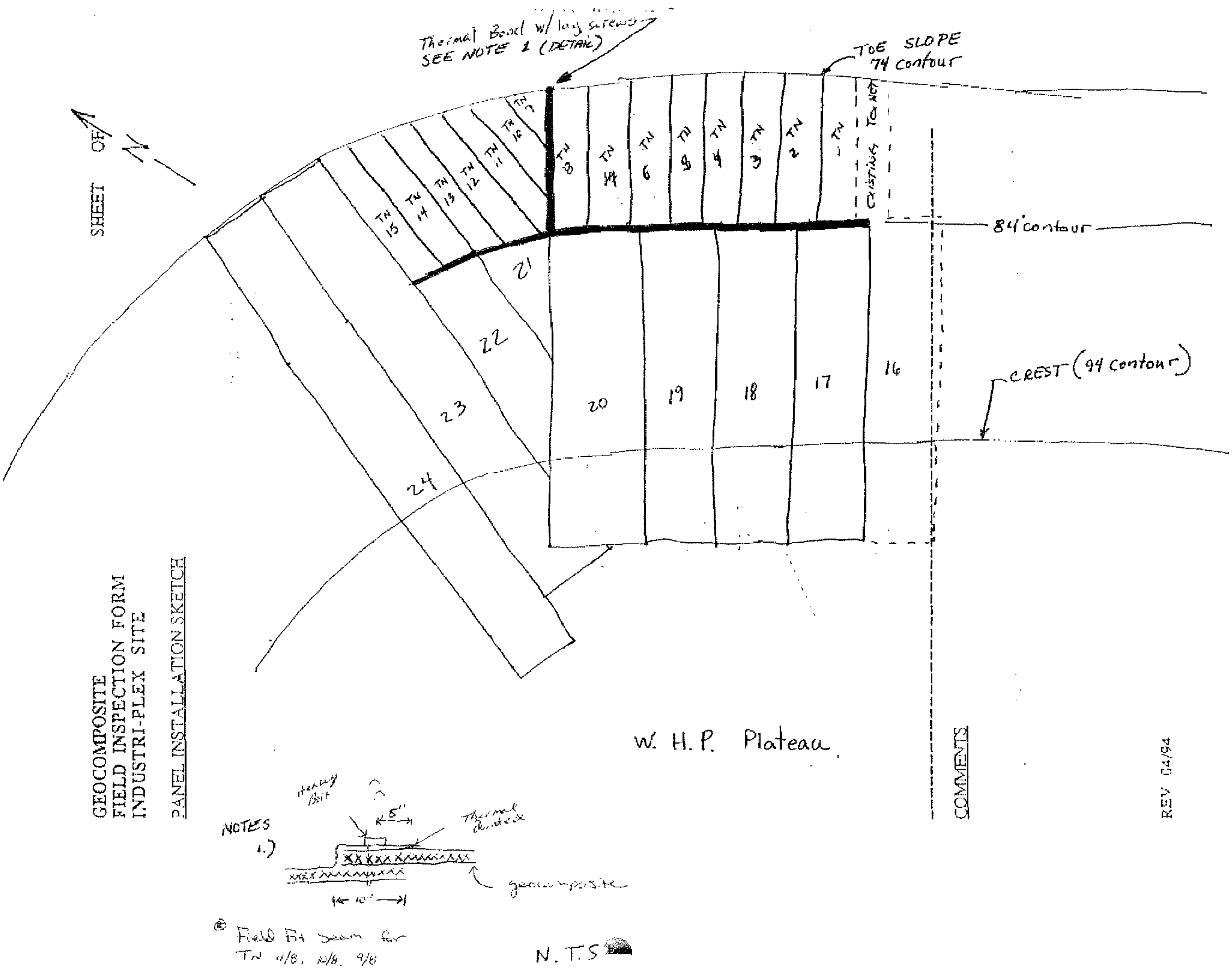
Arthur E. [signature]
QA Inspector

09-30-94
Date

REV 09/94

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE
PANEL INSTALLATION SKETCH

SHEET OF



COMMENTS

REV 04/94

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY W. H. P. LOCATION SEE SKETCH

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
Comments:

-WEIGHT INSPECTION ___ 6oz. ___ 10 oz. ✓ 16 oz

-ROLL NUMBERS USED 035987, ~~[illegible]~~

PANEL LAYOUT
SEAM INSPECTION

✓ Conformance ___ Nonconformance

-SEWING MACHINE NUMBER A-4

-TOTAL SEAM LENGTH ≈240'

-EDGE TO SEAM LIMIT ✓ Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

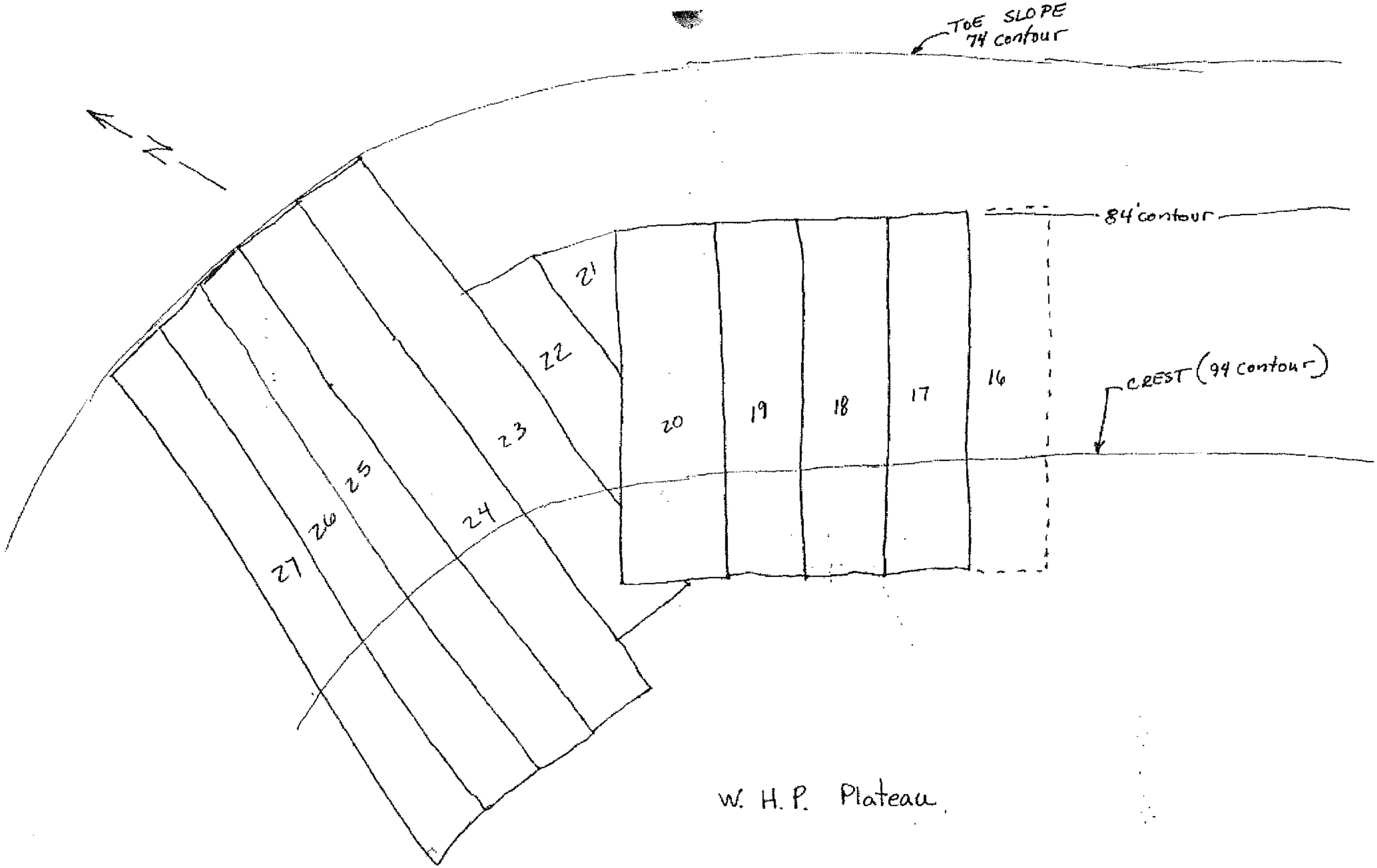
COMMENTS

Mike Tanner
CWM/RUST QC Officer

09-30-94
Date

[signature]
QA Inspector

09-30-94
Date


TOE SLOPE
74 contour
N
84' contour
CREST (94 contour)
21
22
23
24
25
26
27
20
19
18
17
16
W. H. P. Plateau

N.T.S.

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET ___ OF ___

PROPERTY W.H.P. Northeast Slope.   LOCATION SEE SKETCH

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
Comments:

-WEIGHT INSPECTION ___ 6oz. ___ 10 oz. ✓ 16 oz

-ROLL NUMBERS USED 31918, 31958, 35973

PANEL LAYOUT ✓ Conformance ___ Nonconformance
SEAM INSPECTION

-SEWING MACHINE NUMBER A-4

-TOTAL SEAM LENGTH ≈ 350'

-EDGE TO SEAM LIMIT ✓ Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

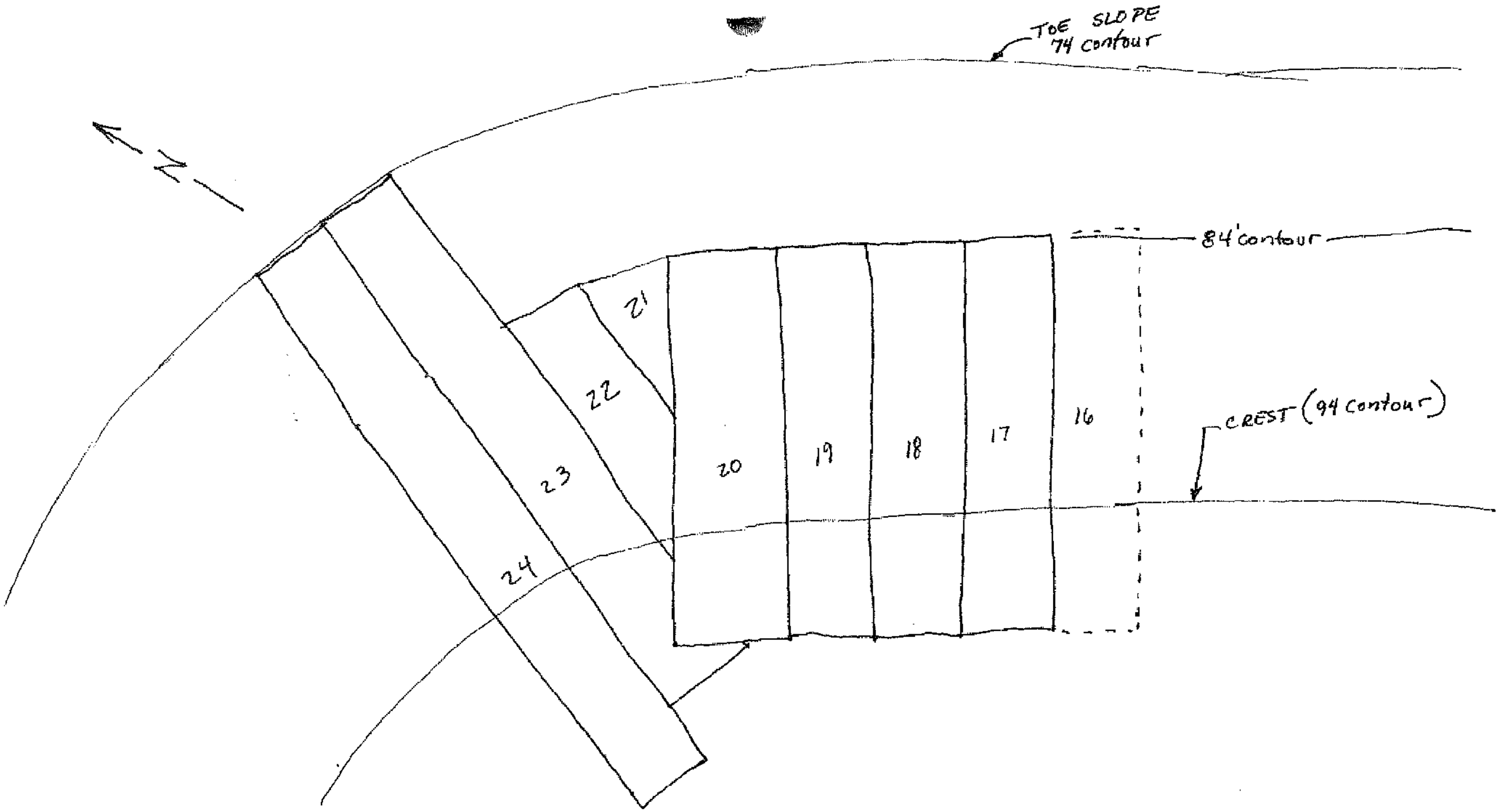
-LOCATION (S)
-PATCH SIZE (S)

COMMENTS

Mike Tanner
CWM/RUST QC Officer   09-30-94 Date

Anthony E. [illegible]
QA Inspector   09-29-94 Date

REV 04/94



W. H. P. Plateau

N.T.S.

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET ___ OF ___

PROPERTY W.H.P. LOCATION SEE SKETCH

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
Comments:

-WEIGHT INSPECTION ___ 6oz. ___ 10 oz. ✓ 16 oz

-ROLL NUMBERS USED 36629, 36610

PANEL LAYOUT ✓ Conformance ___ Nonconformance

SEAM INSPECTION

-SEWING MACHINE NUMBER A-4

-TOTAL SEAM LENGTH ≈ 298'

-EDGE TO SEAM LIMIT ✓ Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

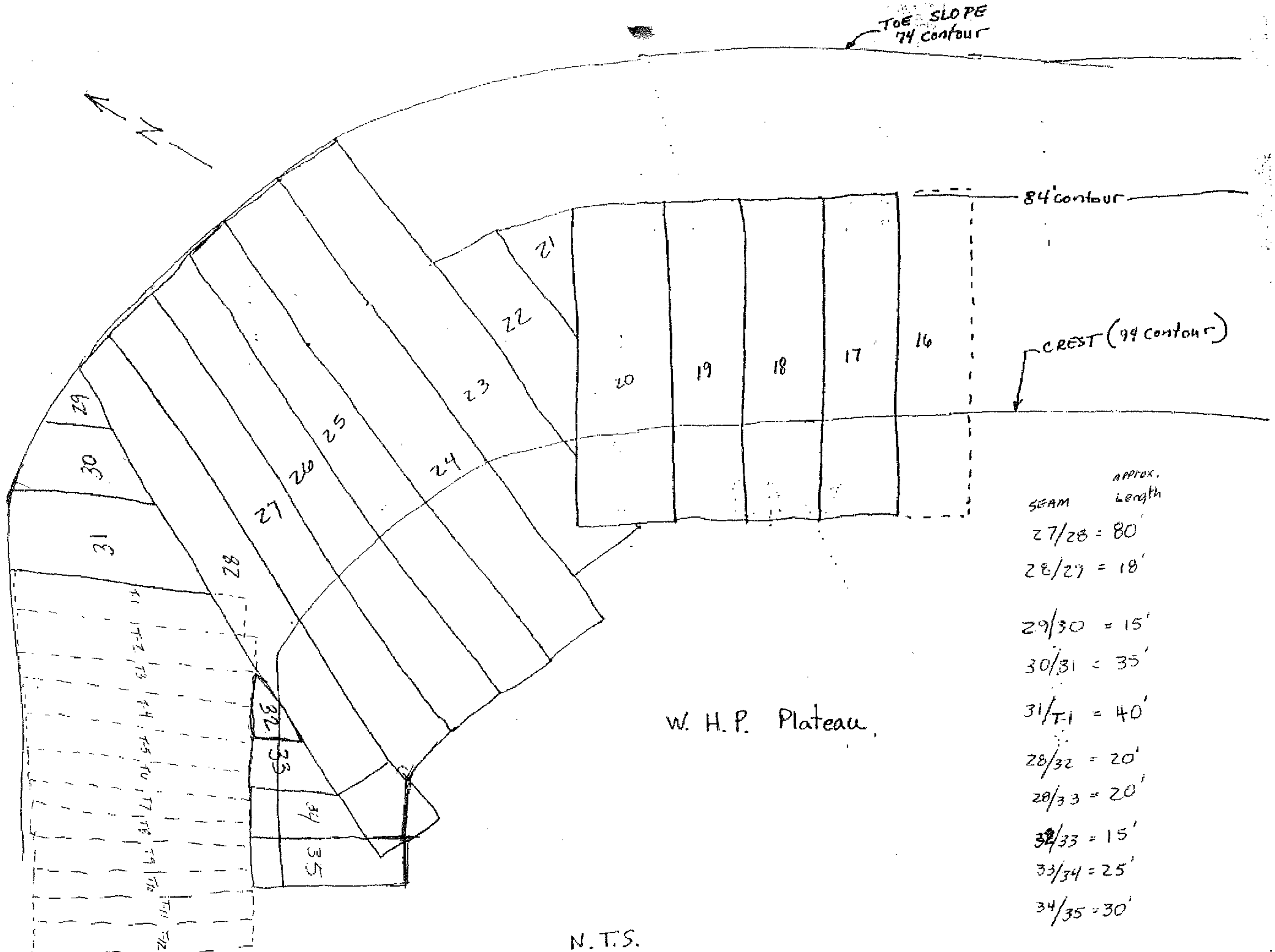
-LOCATION (S)
-PATCH SIZE (S)

COMMENTS

M. Tanner 10-03-94
CWM/RUST QC Officer Date

Arthur E C... 10-03-94
QA Inspector Date

REV 04/94



N.T.S.

36629
36610 = Panel 3U

2802009B7

2802010B7

2811005B7

GEOTEXTILE/GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET ____ OF ____

PROPERTY W.H.P. LOCATION SEE SKETCH

MATERIAL INSPECTION

VISUAL INSPECTION ✓ Acceptable ____ Unacceptable

-Comments:

SEAM INSPECTION

MINIMUM 12-INCH OVERLAP ✓ Acceptable ____ Unacceptable

GEOTEXTILE/GEOCOMPOSITE SECURED EVERY 3-FEET -Hex Lag Screws ✓ Acceptable ____ Unacceptable

GEOTEXTILE SEAM -Thermal bonded ✓ Acceptable ____ Unacceptable

DAMAGE/REPAIR INSPECTION

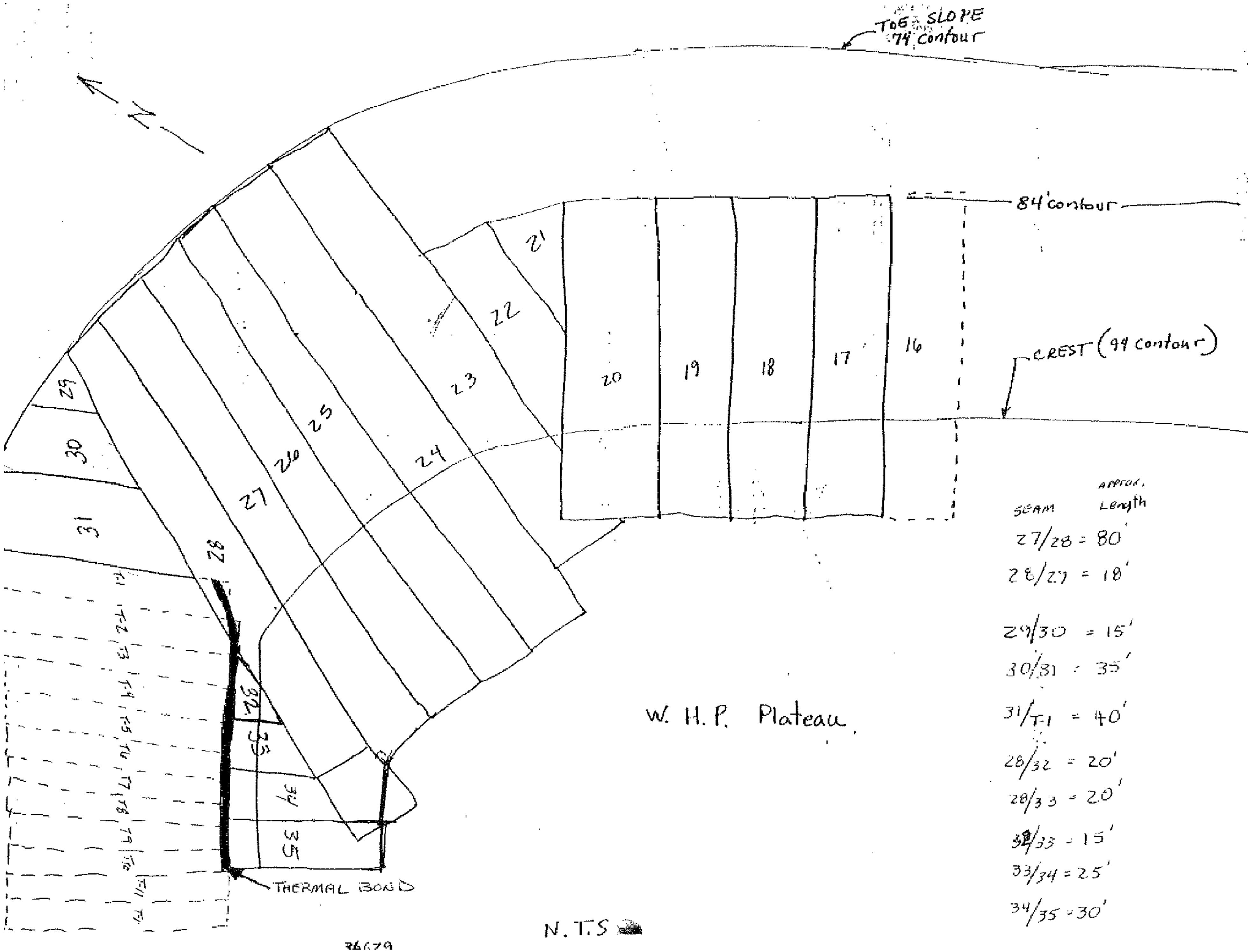
Mike Jaime
CWM/RUST QC Officer

10-03-94
Date

Arthur E Cu.
QA Inspector

10-03-94
Date

REV 09/94



SEAM	APPROX. Length
27/28	= 80'
28/29	= 18'
29/30	= 15'
30/31	= 35'
31/T-1	= 40'
28/32	= 20'
28/33	= 20'
32/33	= 15'
33/34	= 25'
34/35	= 30'

GEOTEXTILE/GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY WHP

LOCATION SEE SKETCH

MATERIAL INSPECTION

VISUAL INSPECTION — ✓ Acceptable ____ Unacceptable

-Comments:

SEAM INSPECTION

MINIMUM 12-INCH OVERLAP — ✓ Acceptable ____ Unacceptable

GEOTEXTILE/GEOCOMPOSITE SECURED EVERY 3-FEET -Hex Lag Screws — ✓ Acceptable ____ Unacceptable

GEOTEXTILE SEAM -Thermal bonded — ✓ Acceptable * ____ Unacceptable

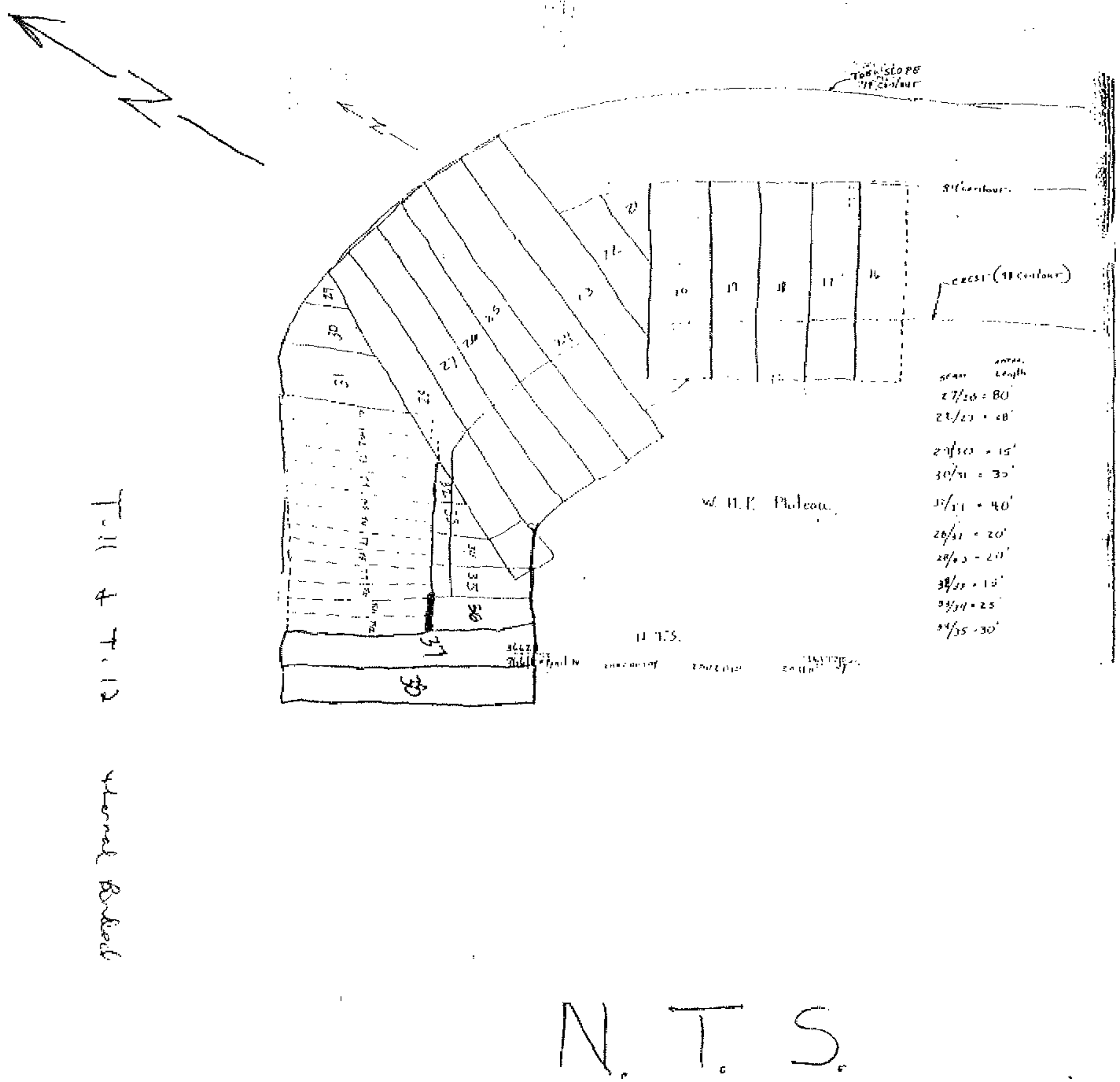
DAMAGE/REPAIR INSPECTION

* 6'x6' Thermal bonded patch to cover damaged seam from over heating on panels T10/35 seam.

Mike Tanner
CWM/RUST QC Officer — 10/04/94 Date

Alfred A. Tang
QA Inspector — 10/04/94 Date

REV 09/94



W.H.P. Plateau
N.T.S.
CREST (11 Contour)
27/28 = 80'
28/29 = 60'
29/30 = 15'
30/31 = 35'
N.T.S.

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET / OF /

PROPERTY WHP

LOCATION SEE SKETCH

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ___ Unacceptable

Comments:

-WEIGHT INSPECTION ___ 6oz. ___ 10 oz. ✓ 16 oz.

-ROLL NUMBERS USED 30610

PANEL LAYOUT ✓ Conformance ___ Nonconformance

SEAM INSPECTION

-SEWING MACHINE NUMBER A-4

-TOTAL SEAM LENGTH ≈ 210'

-EDGE TO SEAM LIMIT ✓ Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S) 6'X6' Thermal bonded patch on over heated composite To 16oz seam @ PANEL T-10/35.

COMMENTS

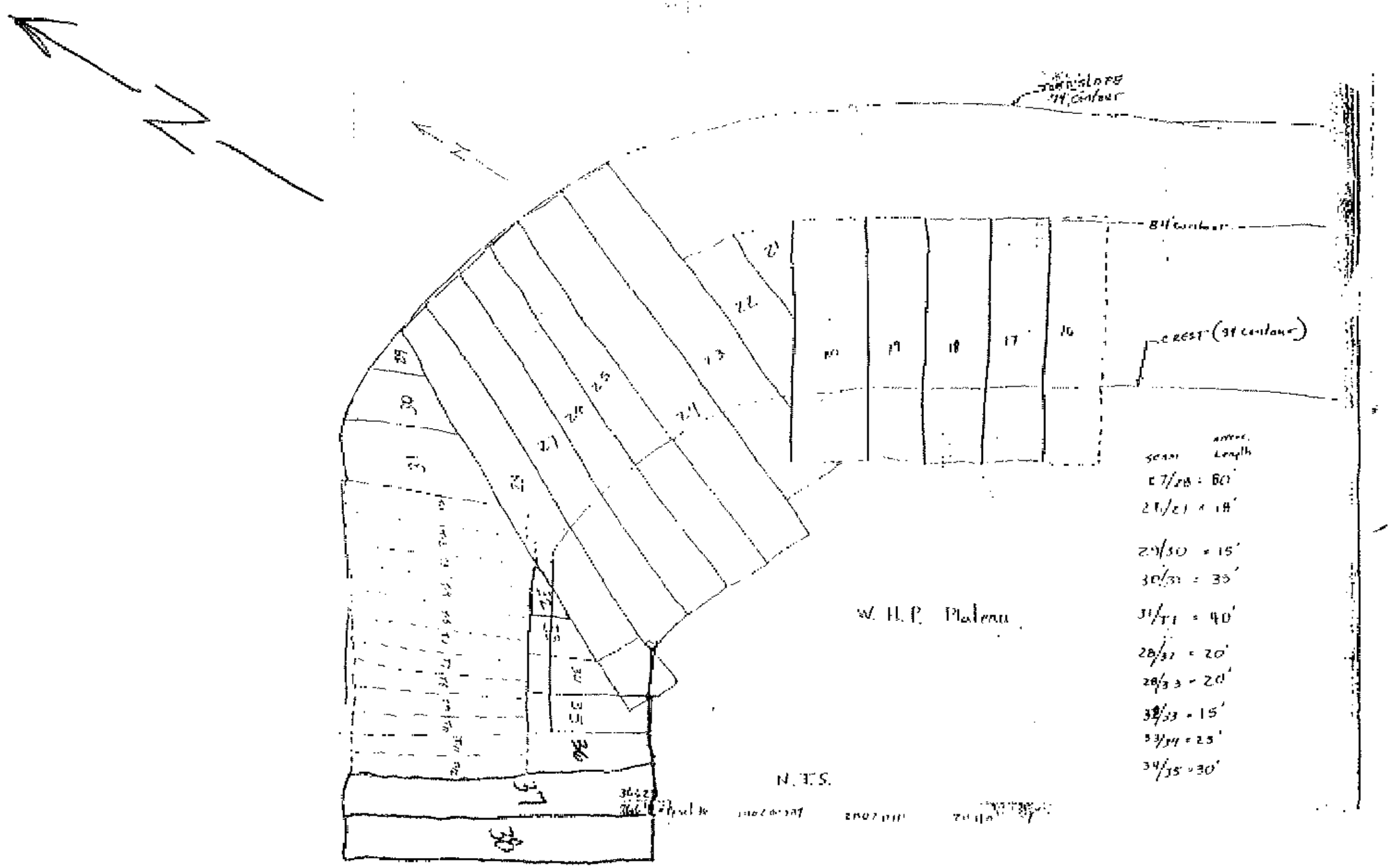
Mike Tanner
CWM/RUST QC Officer

10-04-94
Date

Alfred A. Tony
QA Inspector

10/04/94
Date

REV 04/94


84' contour
CREST (37 contour)
W. H. P. Plateau
N.T.S.
Length
29/30 = 15'
30/31 = 35'
31/T1 = 40'
28/33 = 20'
33/34 = 25'
34/35 = 30'

N. T. S.

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY WHP LOCATION Pipe corridor

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
Comments:

-WEIGHT INSPECTION ___ 6oz. ___ 10 oz. ✓ 16 oz

-ROLL NUMBERS USED 36610

PANEL LAYOUT ✓ Conformance ___ Nonconformance
SEAM INSPECTION

-SEWING MACHINE NUMBER A-4

-TOTAL SEAM LENGTH 60'

-EDGE TO SEAM LIMIT ✓ Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

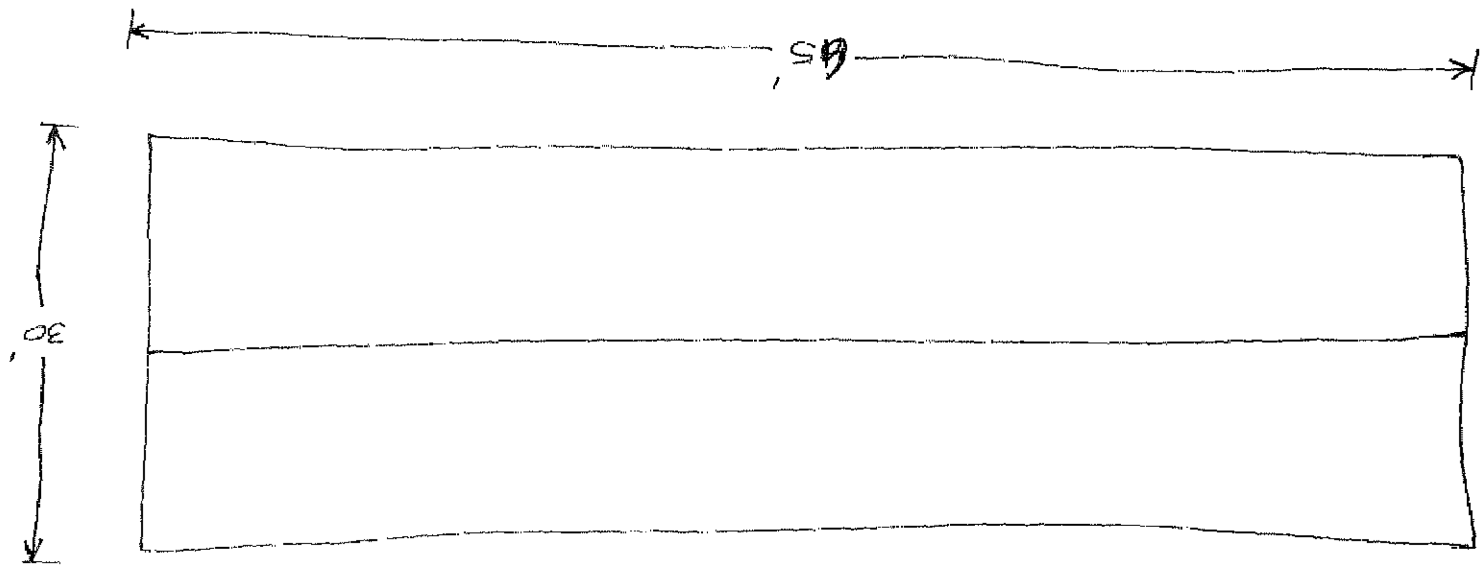
-LOCATION (S)
-PATCH SIZE (S)

COMMENTS

Mike Zanne 10/7/94
CWM/RUST QC Officer Date

Alfred A. Lang 10/06/94
QA Inspector Date

REV 04/94



Pipe corridor @ the W.H.P. BECO Access Rd.

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY W.H.P. LOCATION SEE SKETCH

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
Comments:

-WEIGHT INSPECTION ___ 6oz. ___ 10 oz. ✓ 16 oz

-ROLL NUMBERS USED 036631, 036632, 035974, 031910

PANEL LAYOUT SUBMITTAL ___ Met ✓ Revised. See Comments

SEAM INSPECTION

-SEWING MACHINE NUMBER A-5

-TOTAL SEAM LENGTH ≈ 1200'

-EDGE TO SEAM LIMIT ✓ Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

-LOCATION (S)
-PATCH SIZE (S)

COMMENTS SEE THIS SKETCH FOR PANEL LAYOUT.

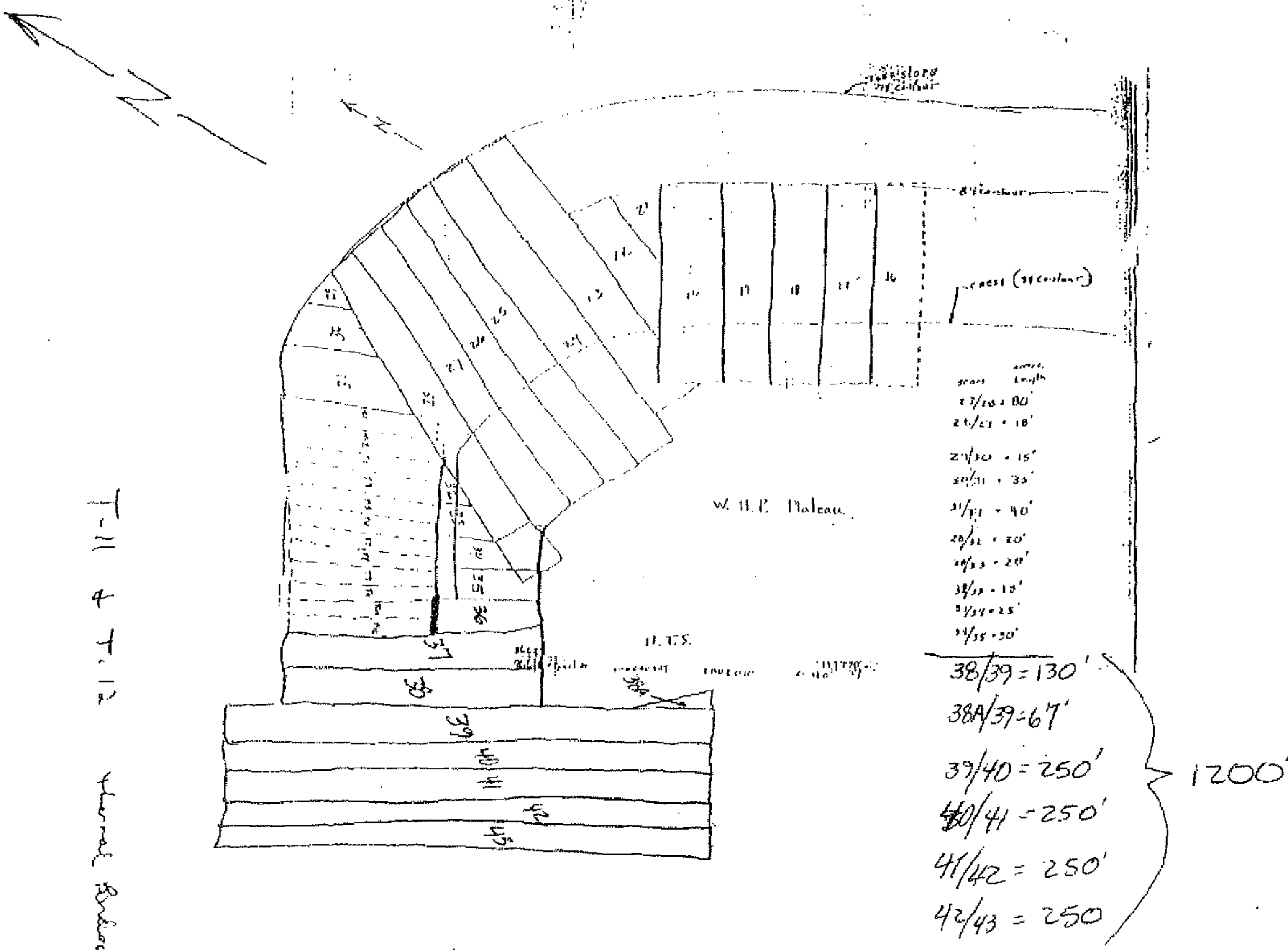
Mike Tanner
CWM/RUST QC Officer

10/13/94
Date

Anthony E. Cury
QA Inspector

10/13/94
Date

REV 05/94


W.H.P. Plateau
38/39 = 130'
38A/39 = 67'
39/40 = 250'
40/41 = 250'
41/42 = 250'
42/43 = 250
1200'

N.T.S.

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY W.H.P. LOCATION SEE SKETCH

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
Comments:

-WEIGHT INSPECTION ___ 8oz. ___ 10 oz. ✓ 16 oz

-ROLL NUMBERS USED 37822, 36631,

PANEL LAYOUT SUBMITTAL ✓ Met ___ Revised. See Comments

SEAM INSPECTION

-SEWING MACHINE NUMBER A-6

-TOTAL SEAM LENGTH ≈ 400'

-EDGE TO SEAM LIMIT ✓ Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

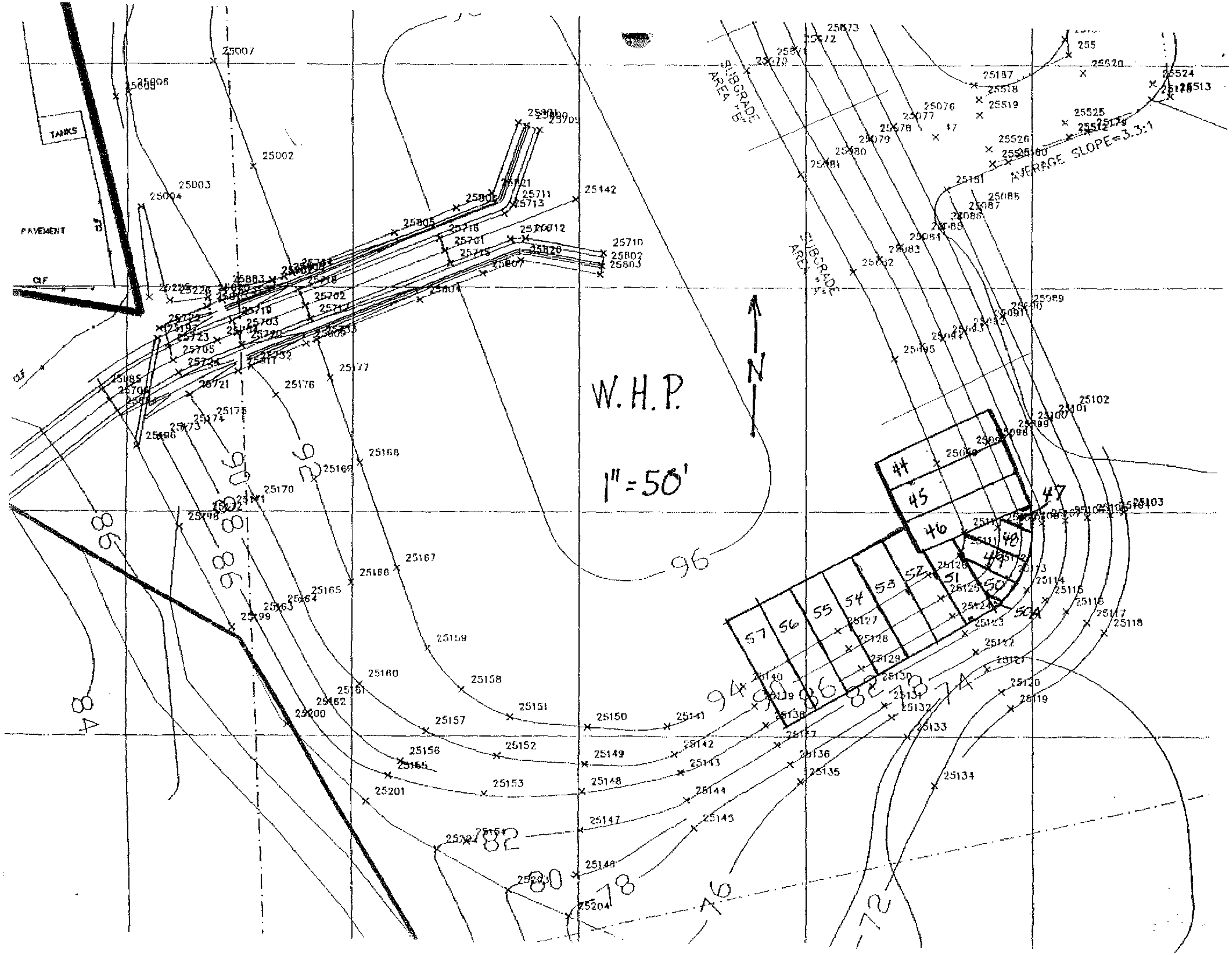
-LOCATION (S)
-PATCH SIZE (S)

COMMENTS

Mike Tanner
CWM/RUST QC Officer 10/15/94 Date

[signature]
QA Inspector 10/15/94 Date

REV 05/94


W.H.P.
1" = 50'
N
AVERAGE SLOPE=3.3:1
SUBGRADE AREA "B"
SUBGRADE AREA "A"
TANKS
PAVEMENT

GEOTEXTILE/GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET OF

PROPERTY W.H.P. LOCATION SEE SKETCH

MATERIAL INSPECTION

VISUAL INSPECTION ✓ Acceptable ___ Unacceptable

-Comments:

SEAM INSPECTION

MINIMUM 12-INCH OVERLAP ✓ Acceptable ___ Unacceptable

GEOTEXTILE/GEOCOMPOSITE SECURED EVERY 3-FEET -Hex Lag Screws ✓ Acceptable ___ Unacceptable

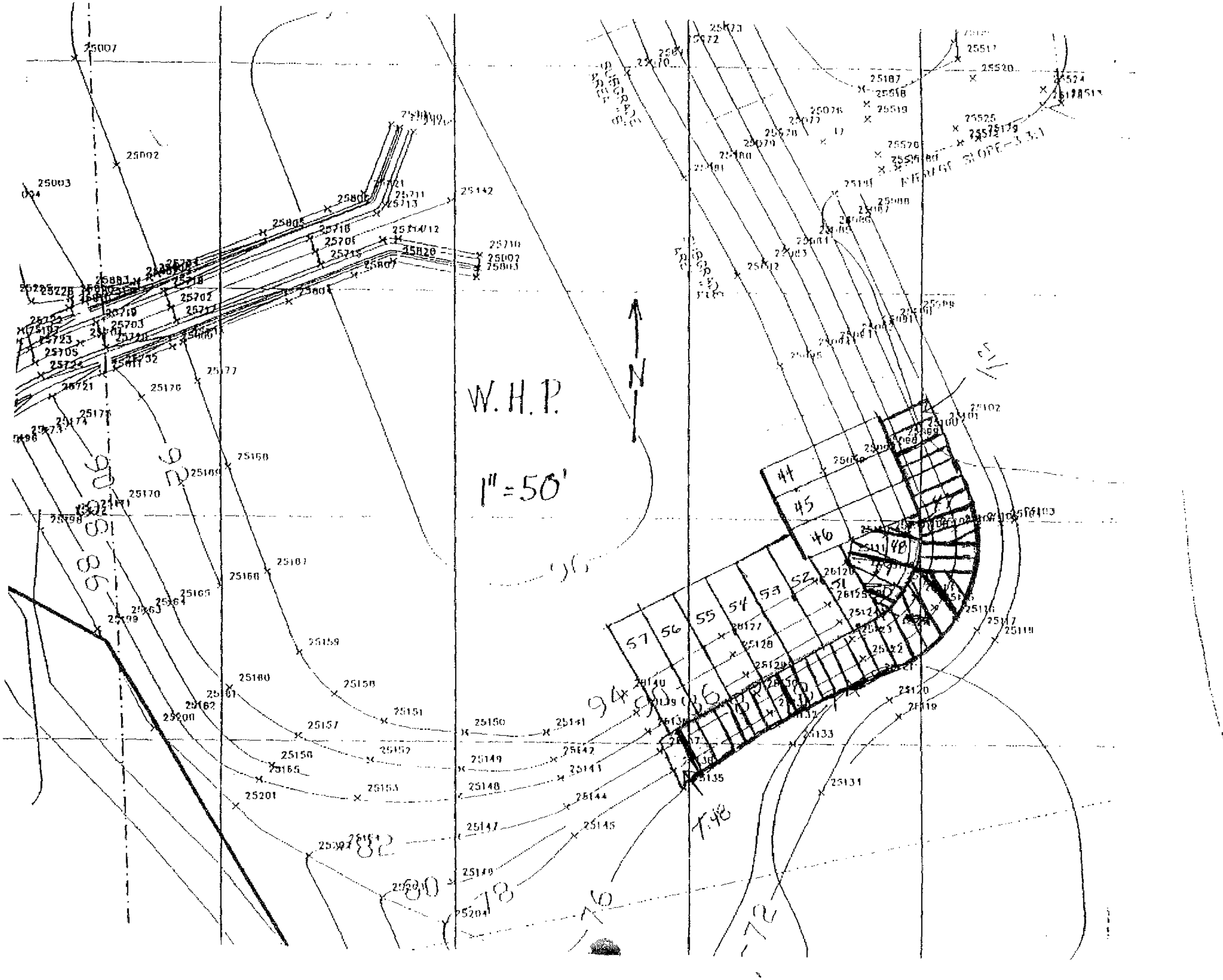
GEOTEXTILE SEAM -Thermal bonded ✓ Acceptable ___ Unacceptable

DAMAGE/REPAIR INSPECTION

Mike Tanner
CWM/RUST QC Officer 10/17/94 Date

[signature]
QA Inspector 10/17/94 Date

REV 09/94



W.H.P.
1" = 50'
N
44
45
46
48
52
53
54
55
56
57

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET / OF /

PROPERTY W.H.P. LOCATION SEE SKETCH

SUBGRADE INSPECTION

-SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION

-VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
Comments:

-WEIGHT INSPECTION ___6oz. ___10 oz. ✓16 oz

-ROLL NUMBERS USED 024968, 35988

PANEL LAYOUT SUBMITTAL ✓Met ___ Revised. See Comments
* Revised in field when needed.

SEAM INSPECTION

-SEWING MACHINE NUMBER A-6

-TOTAL SEAM LENGTH ≈1300'

-EDGE TO SEAM LIMIT ✓ Acceptable ___ Unacceptable
(1-inch min. from edge of geotextile)

DAMAGE/REPAIR INSPECTION

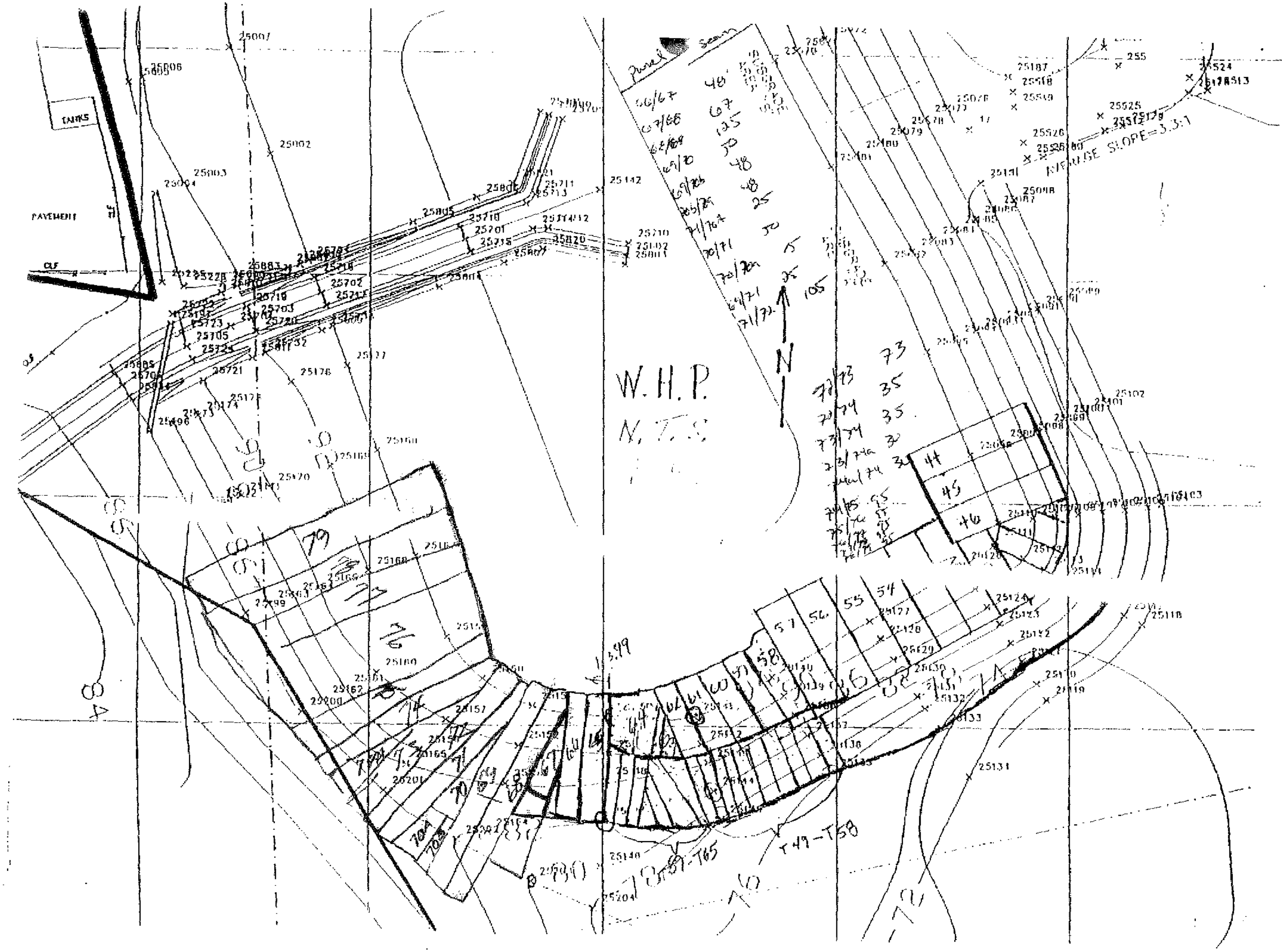
-LOCATION (S)
-PATCH SIZE (S)

COMMENTS

Mike Tanner 10/19/94
CWM/RUST QC Officer Date

Alfred Cartony 10/20/94
QA Inspector Date

REV 05/94


TANKS
PAVEMENT
W.H.P.
N
AVERAGE SLOPE=3.3:1
T49-T58
Panel
Seam

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY: WEST HIDE PILE, OFF SOUTH/ EAST TOE CONSTRUCTION

LOCATION: Area between 1-C + 2 ... SW corner of W. Hide Pile

☐ Panel layout on back or ☒ Attached FIELD SKETCH

SUBGRADE INSPECTION
Subgrade inspected ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection ✓ Acceptable ____ Unacceptable
Comments:

Weight inspection ____ 6-oz. ____ 10 oz. ✓ 16-oz.

SEAM INSPECTION
Sewing machine number: SM 2

Total seam length: 400'

Edge to seam limit ✓ Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

Location (s): N/A

Patch Size (s): N/A

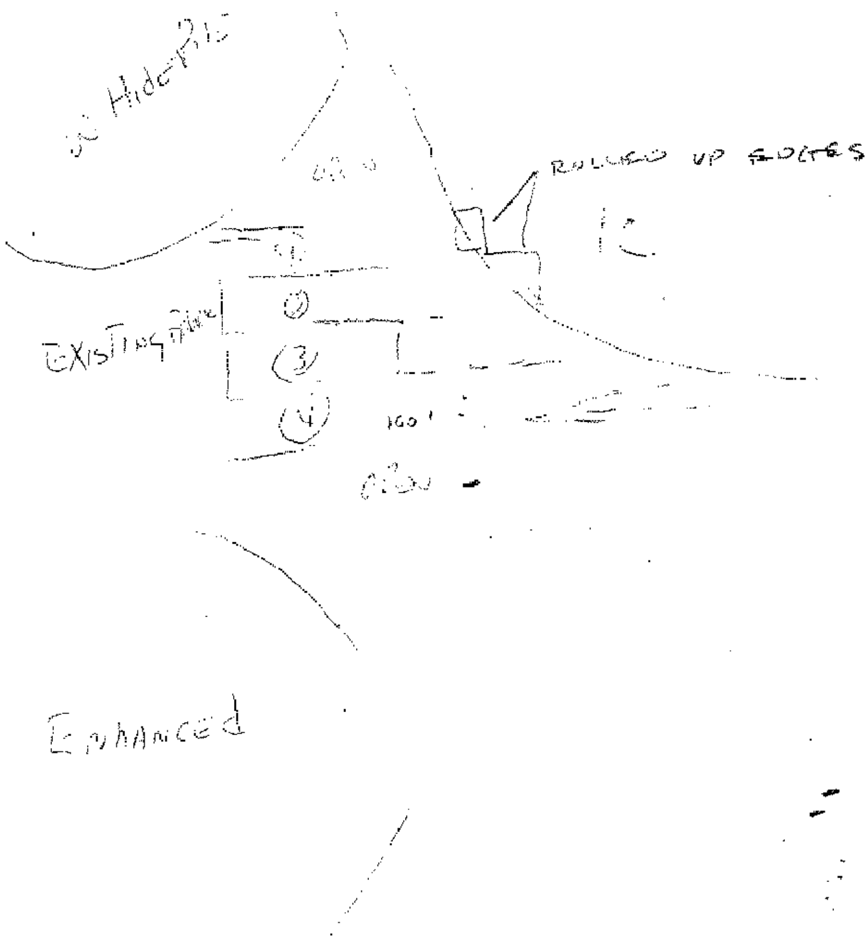
Comments:

CWM/RUST QC Rep	Title	Date
[signature]	General Foreman	4/14/95

QA Inspector	Title	Date
[signature]	SENIOR FIELD INSP.	4/14/95

GEOTEXTILE FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH



COMMENTS

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY WEST HIDE PILE
4-7-95 WORK

LOCATION PANEL #1-4 AT THE BASE OF THE WEST HIDE PILE INCLUDING TOE AREA

[X] Panel layout on back or [ ] Attached

SUBGRADE INSPECTION
Subgrade inspected X Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection X Acceptable ____ Unacceptable
Comments:

Weight inspection ____ 6-oz. ____ 10 oz. X 16-oz.

SEAM INSPECTION
Sewing machine number A-2

Total seam length 600'±

Edge to seam limit X Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

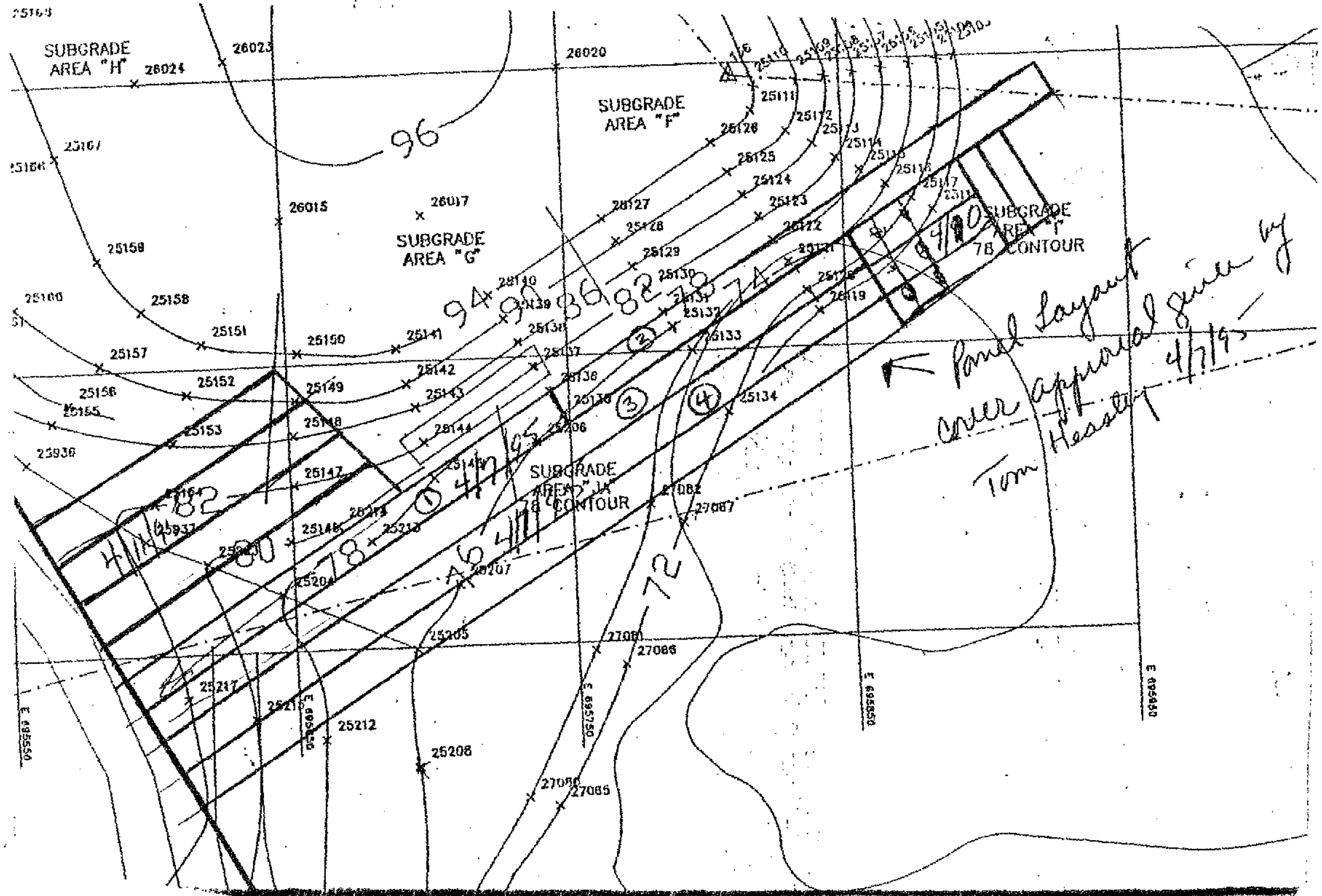
Location (s) N/A

Patch Size (s) N/A

Comments:

Joe F. Kile
CWM/RUST QC Rep Title General Foreman Date 4/14/95

Thomas Hesslog
QA Inspector Title Construction Manager Date 4/14/95



SUBGRADE AREA "H"
SUBGRADE AREA "F"
SUBGRADE AREA "G"
SUBGRADE AREA "I" 78 CONTOUR
SUBGRADE AREA "J" 78 CONTOUR
Panel Layout cover approval given by Tom Hessty 4/7/95

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY WEST HIDE PILE

LOCATION TIE IN BETWEEN WHP TOE CONST. AND IC TOE CONST

☒ Panel layout on back or ☐ Attached

SUBGRADE INSPECTION
Subgrade inspected X Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection X Acceptable ____ Unacceptable
Comments:

Weight inspection ____ 6-oz. ____ 10 oz. X 16-oz.

SEAM INSPECTION
Sewing machine number SM 2

Total seam length 200' ±

Edge to seam limit X Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

Location (s) N/A

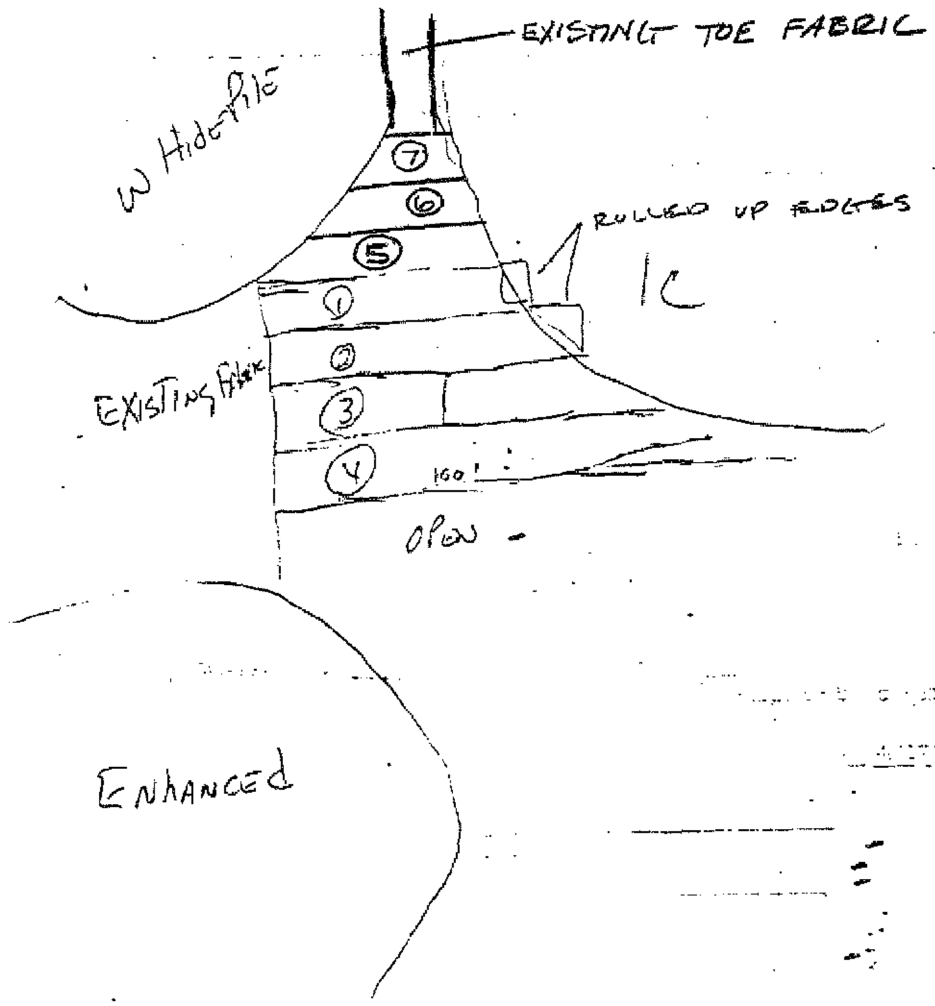
Patch Size (s) N/A

Comments:

[signature]	General Foreman	4/17/95
CWM/RUST QC Rep	Title	Date
[signature]	SENIOR FIELD INSP.	4/17/95
QA Inspector	Title	Date

GEOTEXTILE FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH



PANELS #1-4 DONE ON 4-14-95

PANELS #5-7 DONE ON 4-17-95

COMMENTS

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY West Hide Pile

LOCATION Between Road and existing fabric on top of West hide pile

[✓] Panel layout on back or [ ] Attached

SUBGRADE INSPECTION
Subgrade inspected ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection ✓ Acceptable ____ Unacceptable
Comments:

Weight inspection ____ 6-oz. ____ 10 oz. ✓ 16-oz.

SEAM INSPECTION
Sewing machine number A-2

Total seam length 325'

Edge to seam limit ✓ Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

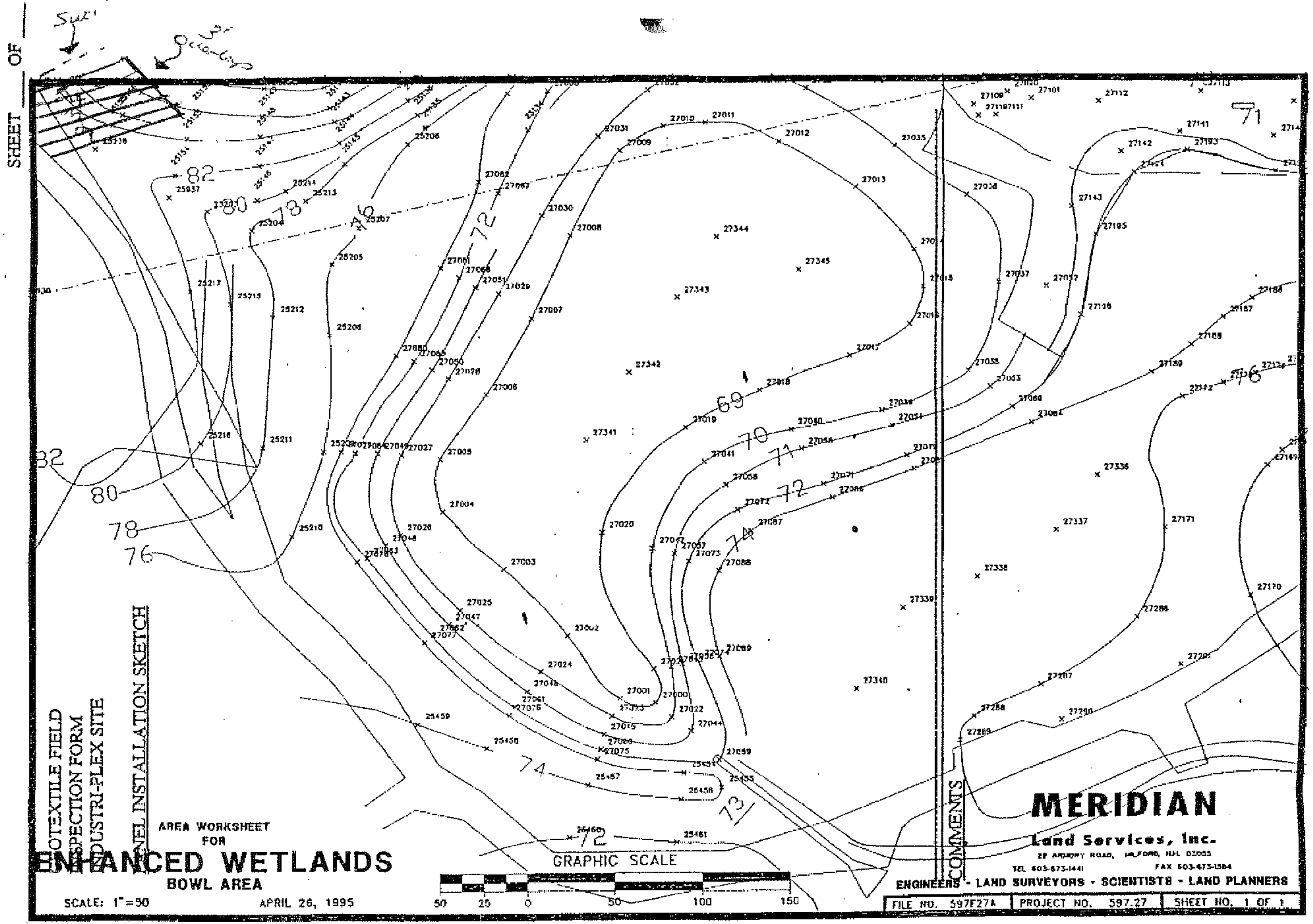
Location (s) N/A

Patch Size (s) N/A

Comments:

John F. Kiley General Foreman 5/10/95
CWM/RUST QC Rep Title Date

Alfred A. Loney Staff Engineer 05/10/95
QA Inspector Title Date


SHEET OF
OTEXTILE FIELD
SPECTION FORM
DUSTRI-PLEX SITE
NEL INSTALLATION SKETCH
AREA WORKSHEET
FOR
ENHANCED WETLANDS
BOWL AREA
SCALE: 1"=50
APRIL 26, 1995
GRAPHIC SCALE
50 25 0 50 100 150
COMMENTS
MERIDIAN
Land Services, Inc.
ENGINEERS - LAND SURVEYORS - SCIENTISTS - LAND PLANNERS
FILE NO. 597F27A
PROJECT NO. 597.27
SHEET NO. 1 OF 1

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY N.W. Corner W. Hide Pile

LOCATION Property bordered by Pavement at 315 New Boston south towards Jarpet

☐ Panel layout on back or ☒ Attached

SUBGRADE INSPECTION
Subgrade inspected ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection ✓ Acceptable ____ Unacceptable
Comments:

Weight inspection ✓ 6-oz. ____ 10 oz. ____ 16-oz.

SEAM INSPECTION
Sewing machine number A-2

Total seam length 230'

Edge to seam limit X Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

Location (s) N/A

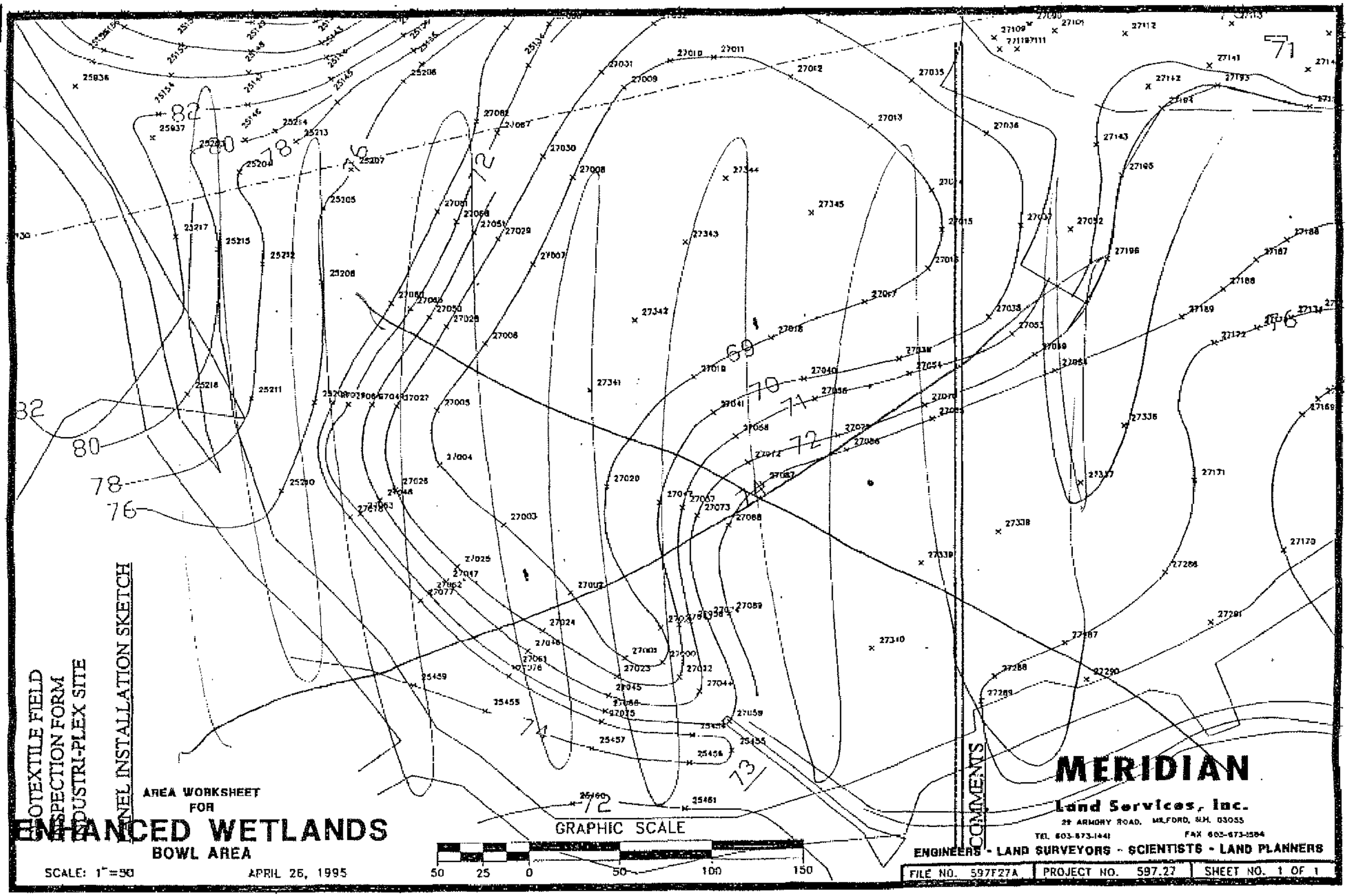
Patch Size (s) N/A

Comments:

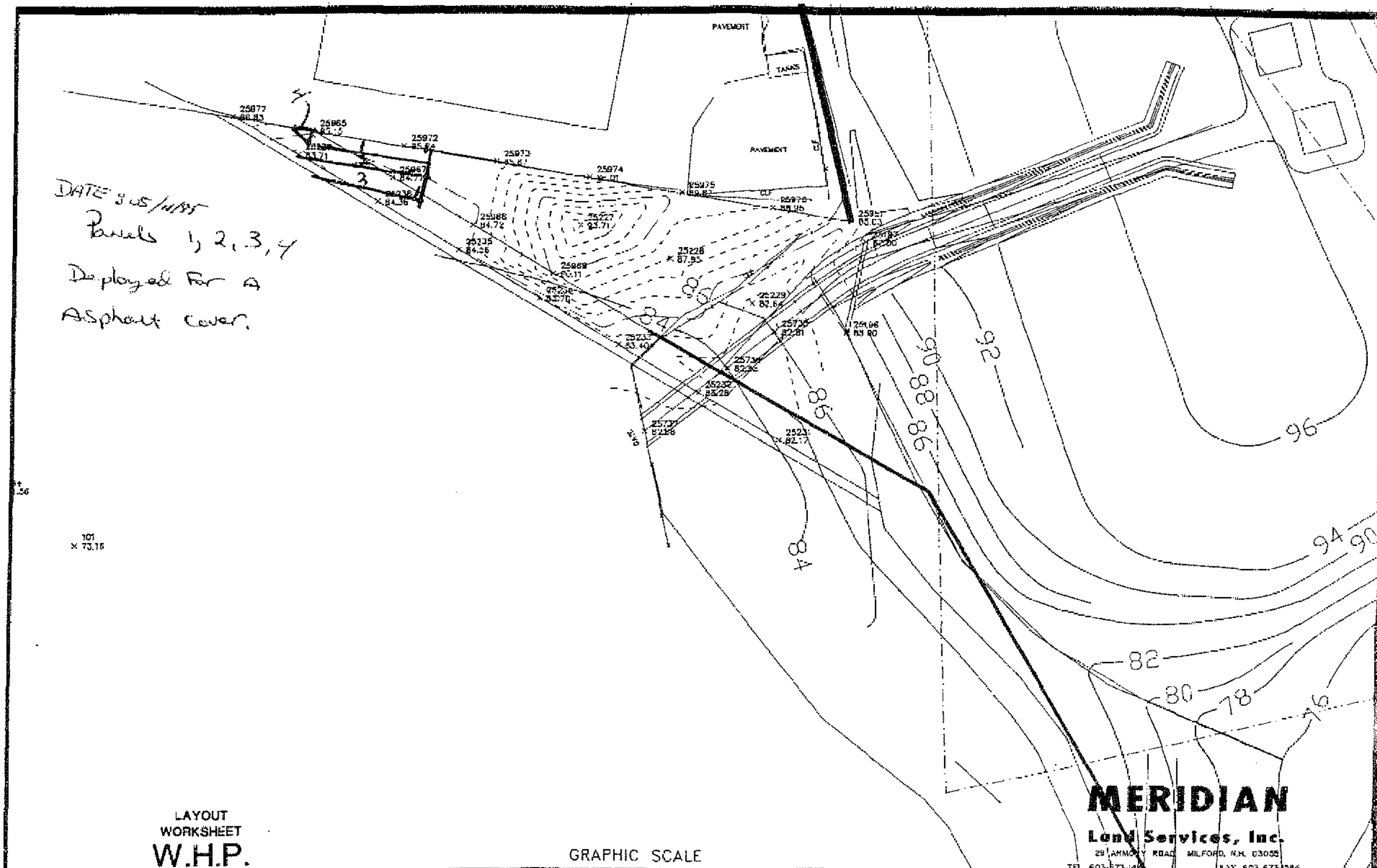
John F. Kiley — Gen Foreman — 5/11/95
CWM/RUST QC Rep — Title — Date

Alfred A. Carey — Staff Engineer — 05/11/95
QA Inspector — Title — Date

SHEET ___ OF ___



GEOTEXTILE FIELD INSPECTION FORM
INDUSTRI-PLEX SITE
PANEL INSTALLATION SKETCH
AREA WORKSHEET FOR
ENHANCED WETLANDS
BOWL AREA
SCALE: 1"=50
APRIL 26, 1995
GRAPHIC SCALE
50 25 0 50 100 150
COMMENTS
MERIDIAN
Land Services, Inc.
29 ARMORY ROAD, MILFORD, N.H. 03055
TEL 603-673-1441 FAX 603-673-1584
ENGINEERS - LAND SURVEYORS - SCIENTISTS - LAND PLANNERS
FILE NO. 597F27A
PROJECT NO. 597.27
SHEET NO. 1 OF 1



LAYOUT
WORKSHEET
W.H.P.
ISRT, WOBURN MA

SCALE: 1"= 50'
MAY 09, 1995

MERIDIAN
Land Services, Inc.
29 ARMORY ROAD MILFORD, N.H. 03055
TEL 603-673-14__ FAX 603-673-1584
ENGINEERS - LAND SURVEYORS - SCIENTISTS - LAND PLANNERS

FILE NO. 597F22A | PROJECT NO. 597.22 | SHEET NO. 1 OF 1

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY West Hide Pile

LOCATION NW Corner of W Hide Pile Bordered by 315 New Boston St

☐ Panel layout on back or ☒ Attached

SUBGRADE INSPECTION
Subgrade inspected ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection ✓ Acceptable ____ Unacceptable
Comments:

Weight inspection ____ 6-oz. ____ 10 oz. ✓ 16-oz.

SEAM INSPECTION
Sewing machine number A-2

Total seam length ≈ 980'

Edge to seam limit ✓ Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

Location (s) N/A

Patch Size (s) N/A

Comments:

Joel F. Kiley — Jim Foreman — 5/12/95
CWM/RUST QC Rep — Title — Date

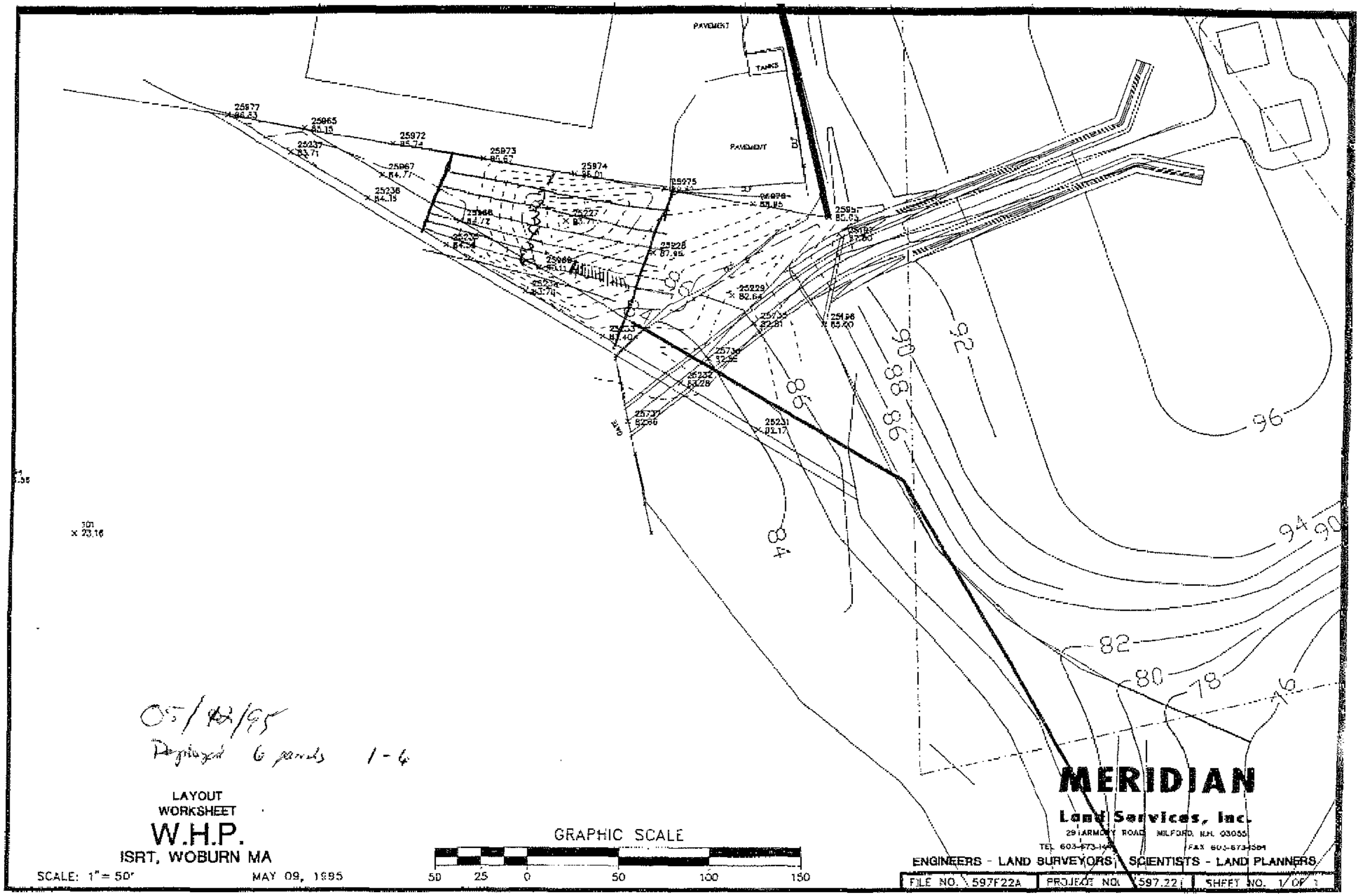
Alfred A[illegible] — Staff Engineer — 05/12/95
QA Inspector — Title — Date

SHEET ____ OF ____

GEOTEXTILE FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH

COMMENTS


PAVEMENT
TANKS
PAVEMENT
LAYOUT
WORKSHEET
W.H.P.
ISRT, WOBURN MA
SCALE: 1"= 50'
MAY 09, 1995
GRAPHIC SCALE
50 25 0 50 100 150
MERIDIAN
Land Services, Inc.
ENGINEERS - LAND SURVEYORS - SCIENTISTS - LAND PLANNERS
FILE NO. 597F22A
PROJECT NO. 597.22
SHEET NO. 1 OF 1

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY West Hide Pile

LOCATION N.W. Corner of West Hide pile Connecting existing fabric on W Hide pile

☐ Panel layout on back or ☑ Attached

SUBGRADE INSPECTION
Subgrade inspected ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection ✓ Acceptable ____ Unacceptable
Comments:

Weight inspection ✓ 6-oz. ____ 10 oz. ✓ 16-oz.

SEAM INSPECTION
Sewing machine number A-2

Total seam length ~~1130'~~ 830 JFK

Edge to seam limit ✓ Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

Location (s) N/A

Patch Size (s) N/A

Comments:

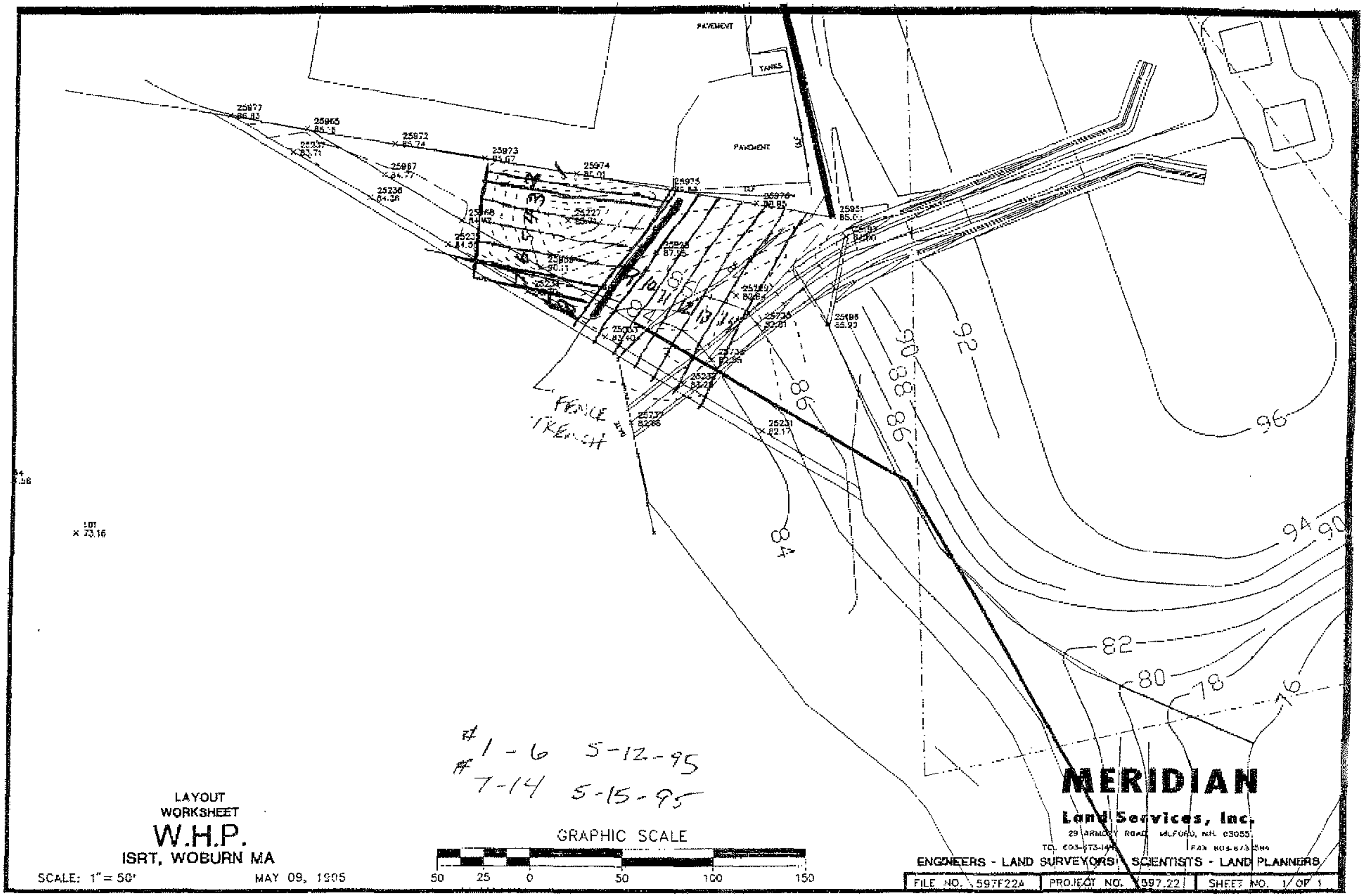
John F. Kiley | Gen Foreman | 5/15/95
CWM/RUST QC Rep | Title | Date

Anthony E. [illegible] | Senior Field Insp. | 5/15/95
QA Inspector | Title | Date

GEOTEXTILE FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH

COMMENTS



LAYOUT
WORKSHEET
W.H.P.
ISRT, WOBURN MA
SCALE: 1" = 50'
MAY 09, 1995

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY West Hide Pile

LOCATION N.W. Corner of W Hide Pile Connecting seams between two areas of existing fabric

☐ Panel layout on back or ☑ Attached PANELS # 15-18

SUBGRADE INSPECTION
Subgrade inspected ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection ✓ Acceptable ____ Unacceptable
Comments:

Weight inspection ✓ 6-oz. ____ 10 oz. ____ 16-oz.

SEAM INSPECTION
Sewing machine number A-2

Total seam length 375'

Edge to seam limit ✓ Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

Location (s) N/A

Patch Size (s) N/A

Comments:

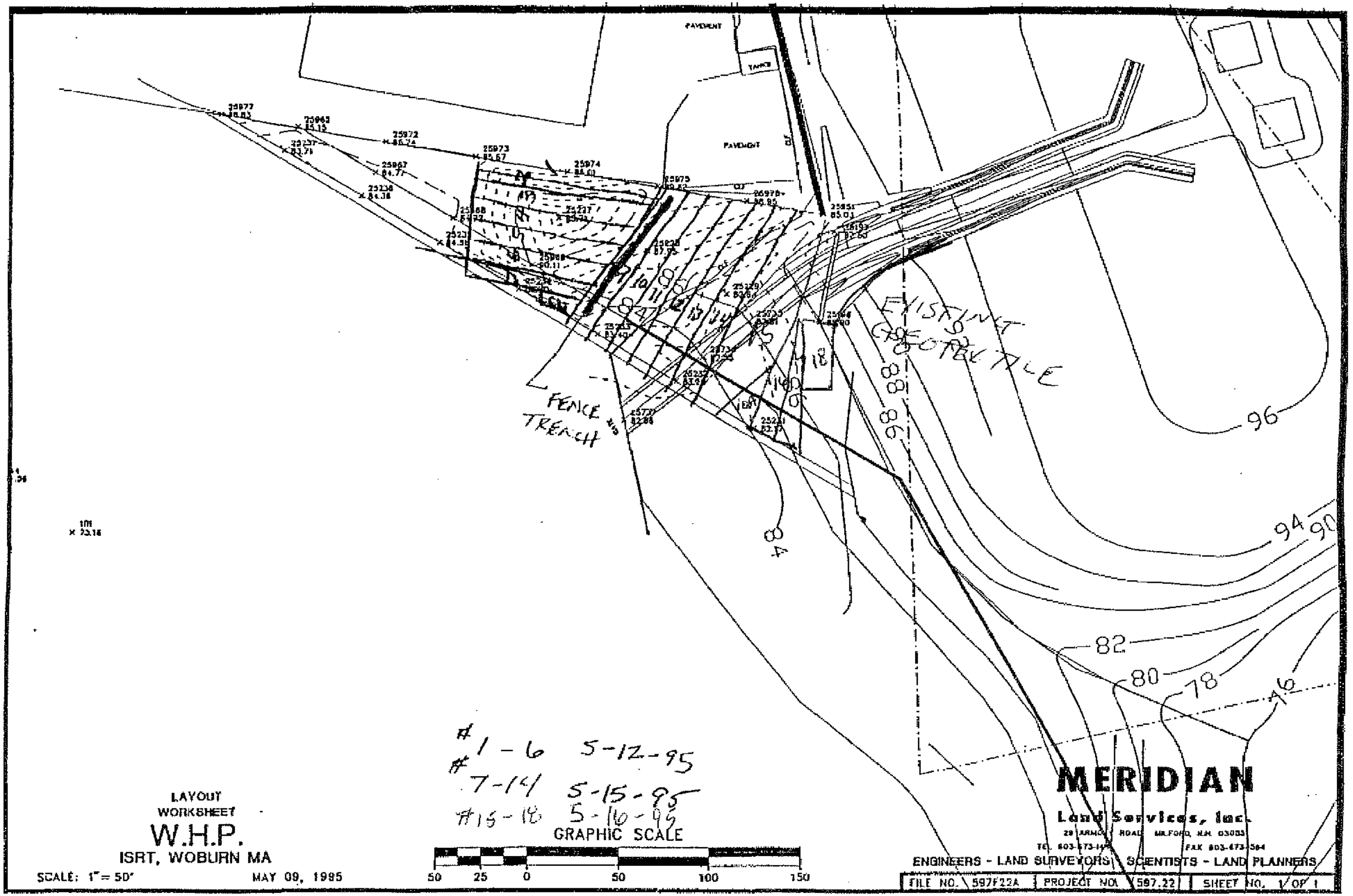
John F. Kiley ____ Foreman ____ 5/16/95
CWM/RUST QC Rep ____ Title ____ Date

Anthony E. Cur ____ SENIOR FIELD INSP. ____ 5/16/95
QA Inspector ____ Title ____ Date

GEOTEXTILE FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH

COMMENTS


PAVEMENT
PAVEMENT
EXISTING GEOTEXTILE
FENCE TRENCH
96
94
90
88
86
84
82
80
78
76
#1-6 5-12-95
#7-14 5-15-95
#15-18 5-16-95
GRAPHIC SCALE
50 25 0 50 100 150
LAYOUT
WORKSHEET
W.H.P.
ISRT, WOBURN MA
SCALE: 1" = 50'
MAY 09, 1995
MERIDIAN
Land Services, Inc.
ENGINEERS - LAND SURVEYORS - SCIENTISTS - LAND PLANNERS
FILE NO. 597F22A
PROJECT NO. 597.22
SHEET NO. 1 OF 1

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY West Hide Pile

LOCATION Area from Culvert running east towards the power poles on top of W Hide Pile tied into existing fabric on all four sides

☐ Panel layout on back or ☑ Attached

SUBGRADE INSPECTION
Subgrade inspected ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection ✓ Acceptable ____ Unacceptable
Comments:

Weight inspection ~~10~~ 6-oz. ____ 10 oz. ✓ 16-oz.

SEAM INSPECTION
Sewing machine number A-2

Total seam length 513'

Edge to seam limit ✓ Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

Location (s) N/A

Patch Size (s) N/A

Comments:

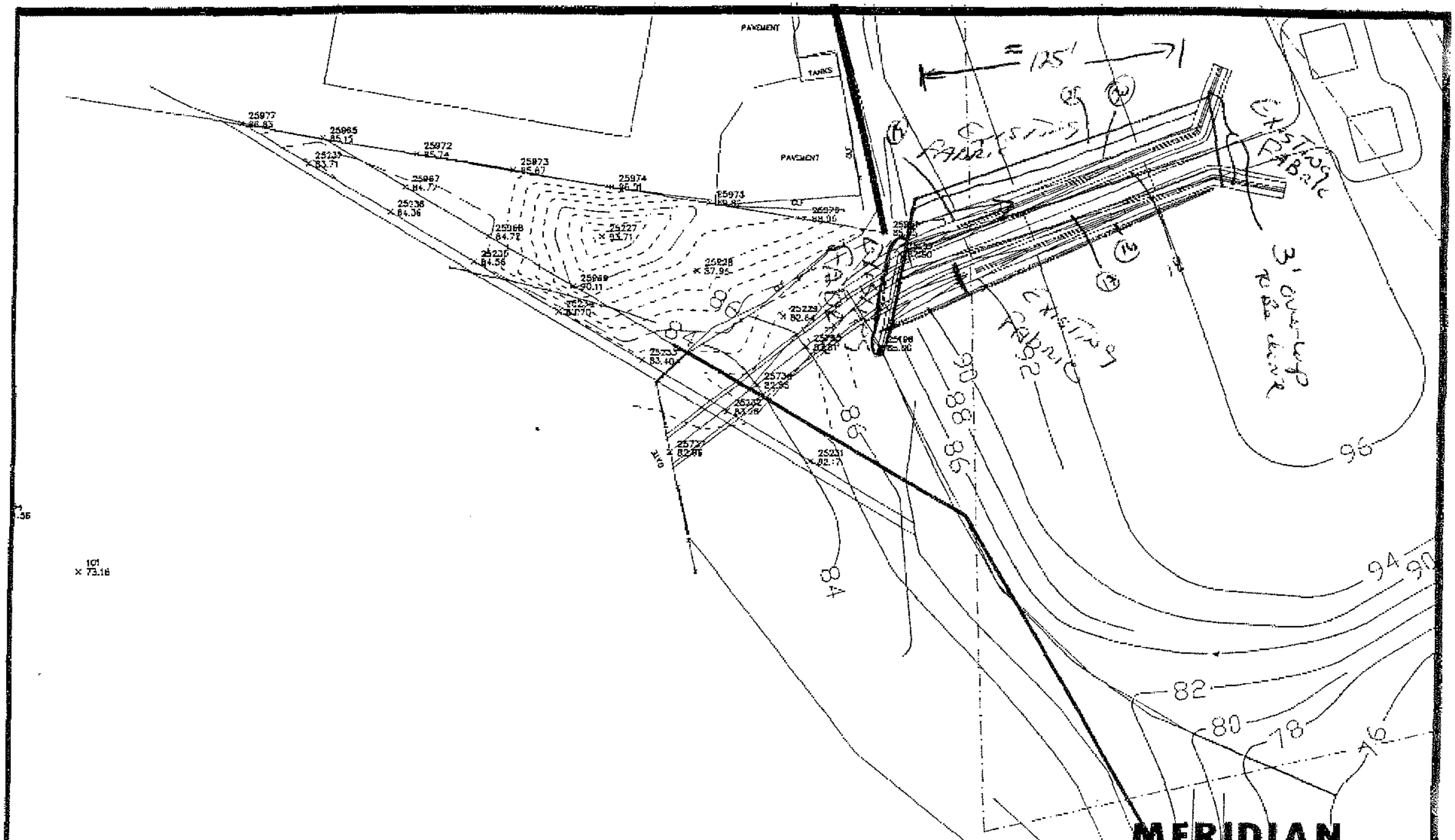
John F. Riley — Gen Foreman — 5/17/95
CWM/RUST QC Rep — Title — Date

[signature] — Field Engineer — 05/17/95
QA Inspector — Title — Date

GEOTEXTILE FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH

COMMENTS



LAYOUT
WORKSHEET
W.H.P.
ISRT, WOBURN MA

SCALE: 1" = 50'   MAY 09, 1995

GRAPHIC SCALE

50 25 0 50 100 150

MERIDIAN
Land Services, Inc.
29 ARMORY ROAD MILFORD, N.H. 03055
TEL 603-673-14.. FAX 603-673-1584
ENGINEERS - LAND SURVEYORS - SCIENTISTS - LAND PLANNERS

FILE NO. 597F22A	PROJECT NO. 597.22	SHEET NO. 1 OF 1

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY [illegible]

LOCATION [illegible]

☒ Panel layout on back or ☐ Attached

SUBGRADE INSPECTION

Subgrade inspected ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION

Visual inspection ✓ Acceptable ____ Unacceptable

Comments:

Weight inspection ____ 6-oz. ____ 10 oz. X 16-oz.

SEAM INSPECTION

Sewing machine number A-2

Total seam length [illegible]

Edge to seam limit X Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

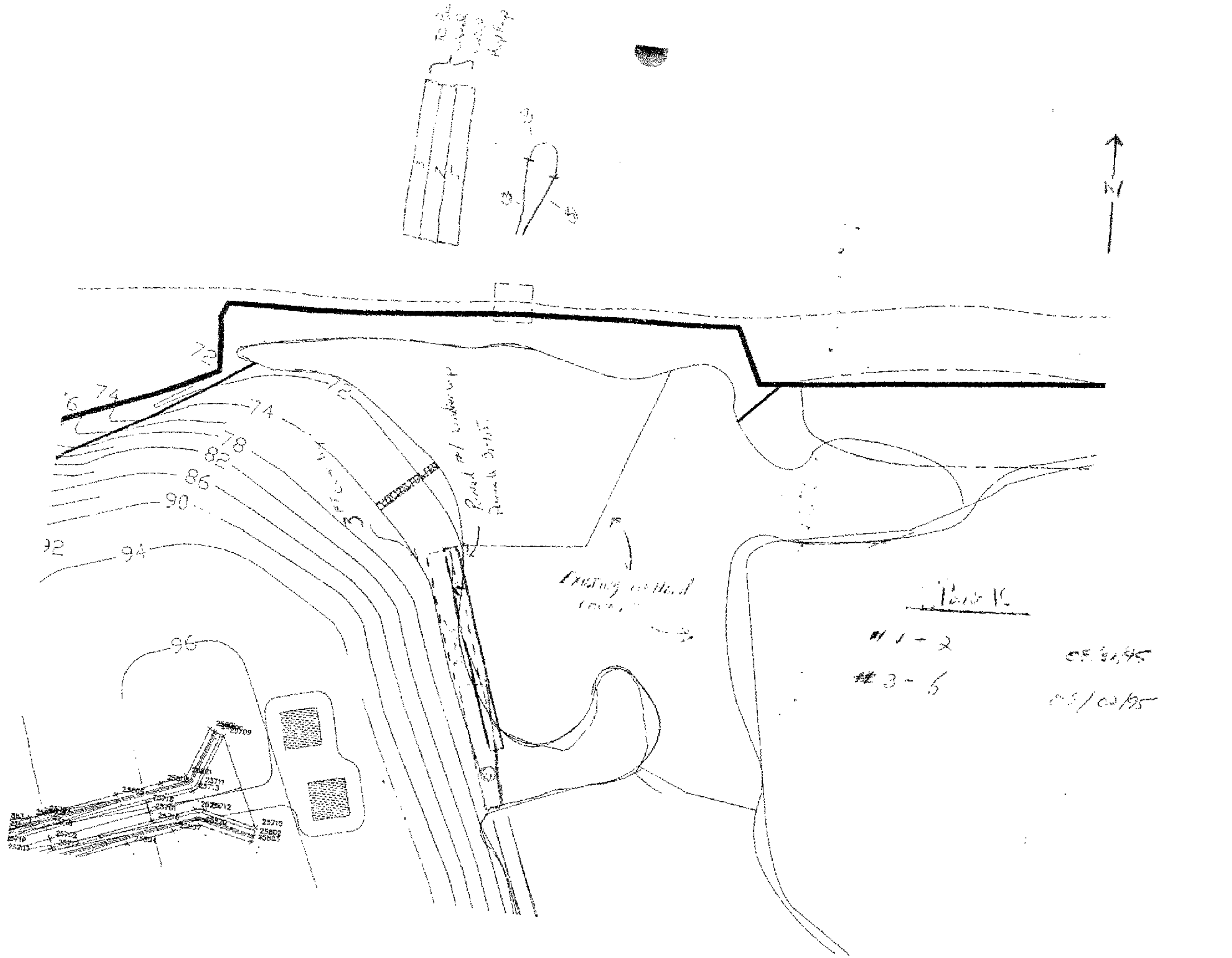
Location (s) n/a

Patch Size (s) n/a

Comments:

[signature] [signature] 8/2/95
CWM/RUST QC Rep Title Date

[signature] [illegible] [illegible]
QA Inspector Title Date


72
74
76
74
78
82
86
90
92
94
96
N
#1 - 2
#3 - 5

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY [illegible]

LOCATION Toe drain on E. slope adjacent to enhanced wetland

☒ Panel layout on back or ☐ Attached

SUBGRADE INSPECTION
~~Subgrade inspected~~ X Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection X Acceptable ____ Unacceptable
Comments:

Weight inspection ____ 6-oz. ____ 10 oz. X 16-oz.

SEAM INSPECTION
Sewing machine number A-2

Total seam length ~~300~~ 160'

Edge to seam limit X Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

Location (s) ____________

Patch Size (s) ____________

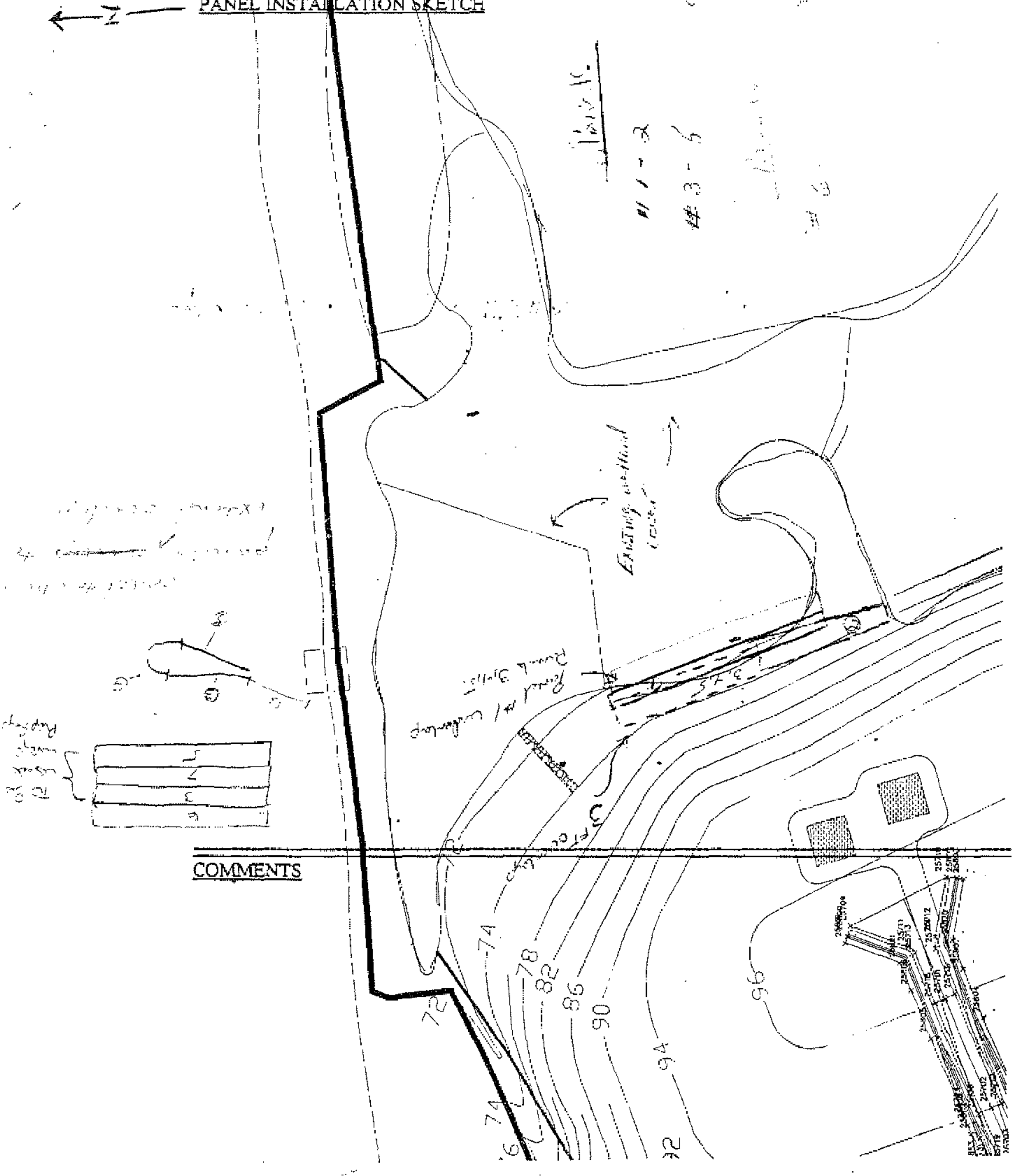
Comments:

[signature]	[signature]	8/8/95
CWM/RUST QC Rep	Title	Date
[signature]	Field Engineer	8/8/95
QA Inspector	Title	Date

SHEET ___ OF _

GEOTEXTILE FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH



COMMENTS

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY: West Hide Pile

LOCATION: Toe drain [illegible]
[illegible]

[X] Panel layout on back or [ ] Attached

SUBGRADE INSPECTION

Subgrade inspected — X Acceptable — ___ Unacceptable

MATERIAL INSPECTION

Visual inspection — X Acceptable — ___ Unacceptable

Comments:

Weight inspection — ___ 6-oz. — ___ 10 oz. — X 16-oz.

SEAM INSPECTION

Sewing machine number: #14

Total seam length: 1125'

Edge to seam limit — X Acceptable — ___ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

Location (s) ______

Patch Size (s) ______

Comments:

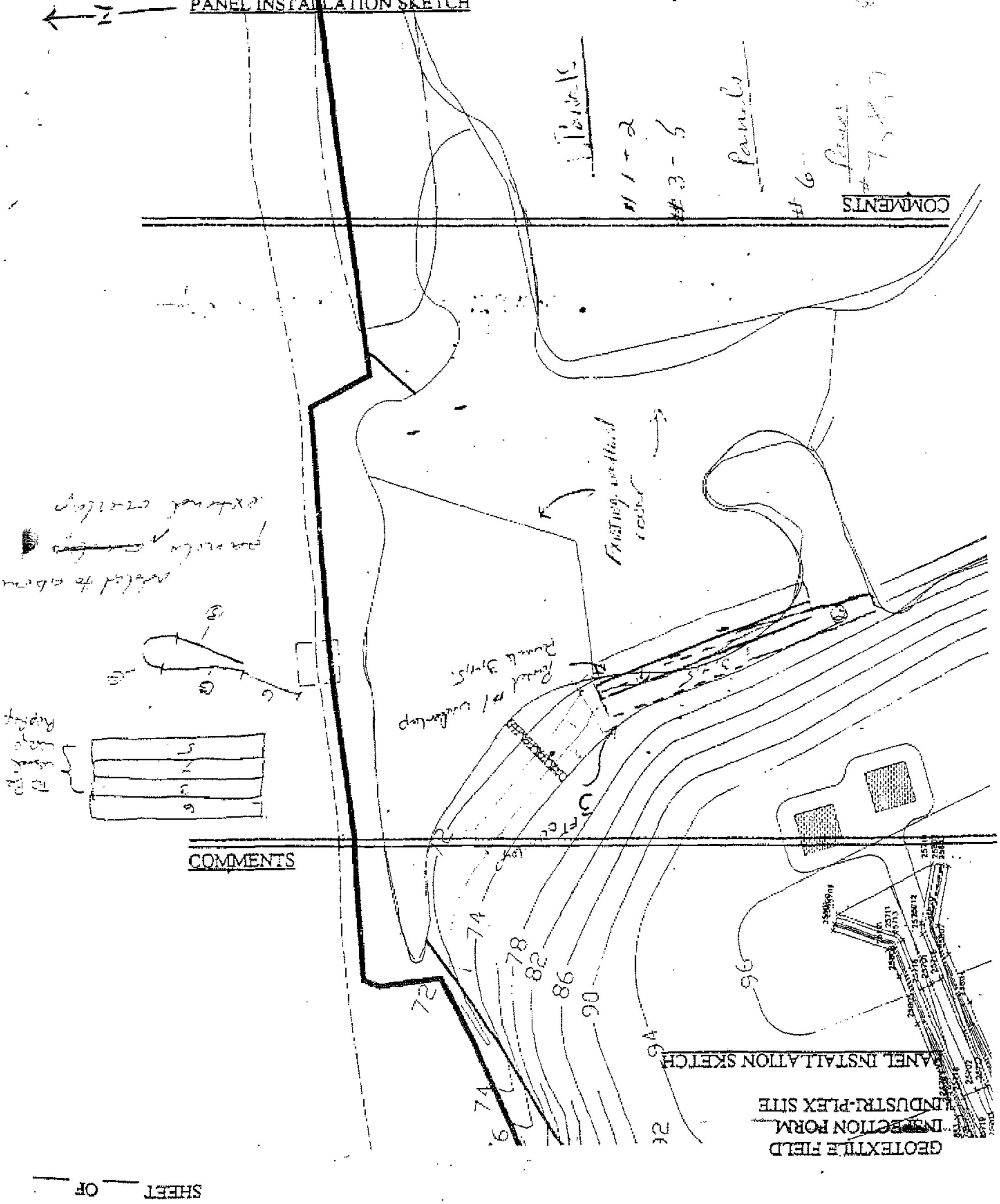
CWM/RUST QC Rep	Title	Date
[illegible signature]	Foreman	8/9/95

QA Inspector	Title	Date
[illegible signature]	Field Engineer	8/9/95

SHEET ___ OF ___

GEOTEXTILE FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH



COMMENTS

Panels
#1 + 2 08/01/95
#3 - 5 08/02/95

Panels
#6 8/8/95

Panels
#7, 8, 9

GEOTEXTILE FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH

SHEET ___ OF ___

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY WEST HIDE PILE

LOCATION EE Ditch adjacent to Enhanced wetland

☐ Panel layout on back or ☒ Attached

SUBGRADE INSPECTION
Subgrade inspected X Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection X Acceptable ____ Unacceptable
Comments:

Weight inspection ____ 6-oz. ____ 10 oz. X 16-oz.

SEAM INSPECTION
Sewing machine number A-4

Total seam length ~120'

Edge to seam limit X Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

Location (s) ________

Patch Size (s) ________

Comments:

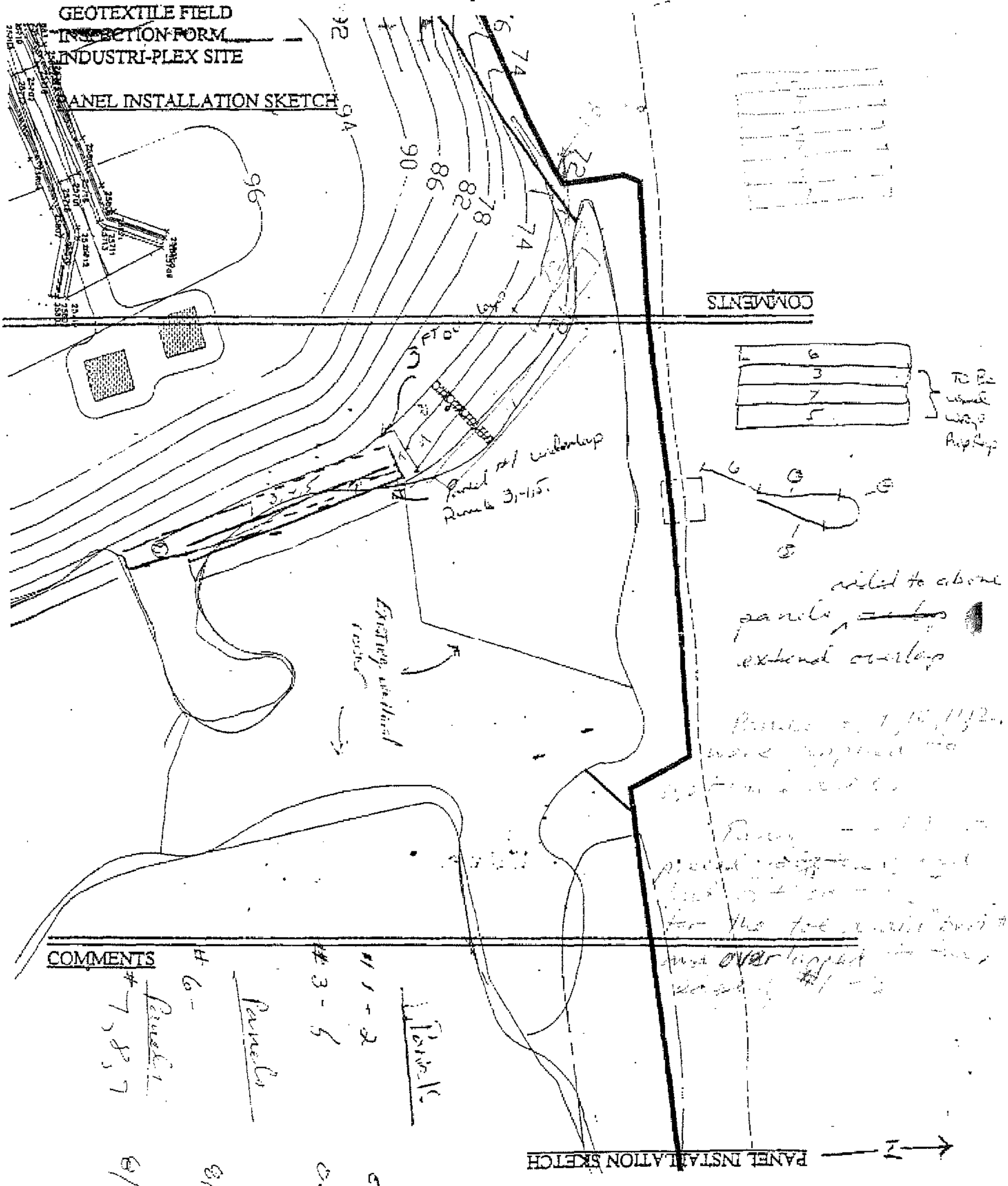
John F. Kil Gen Foreman 8/11/95
CWM/RUST QC Rep Title Date

[signature] Field Engineer 8/11/95
QA Inspector Title Date

(this work was performed on 8/15/95

GEOTEXTILE FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH



COMMENTS

Panels #1 + 2 08/01/95
#3 - 5 08/02/95
Panels #6 - 8/8/95
Panels #7, 8, 9 8/9/95

GEOTEXTILE FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE
PANEL INSTALLATION SKETCH
COMMENTS
SHEET ___ OF ___

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY: West Hide Pile

LOCATION: Toe drain adjacent to the enhanced wetland

[X] Panel layout on back or [ ] Attached

SUBGRADE INSPECTION
Subgrade inspected — X Acceptable — ___ Unacceptable

MATERIAL INSPECTION
Visual inspection — X Acceptable — ___ Unacceptable
Comments:

Weight inspection — ___ 6-oz. — ___ 10 oz. — X 16-oz.

SEAM INSPECTION
Sewing machine number: A-4

Total seam length: ~100 FT

Edge to seam limit — X Acceptable — ___ Unacceptable
(1-inch min. From edge of geotextile)

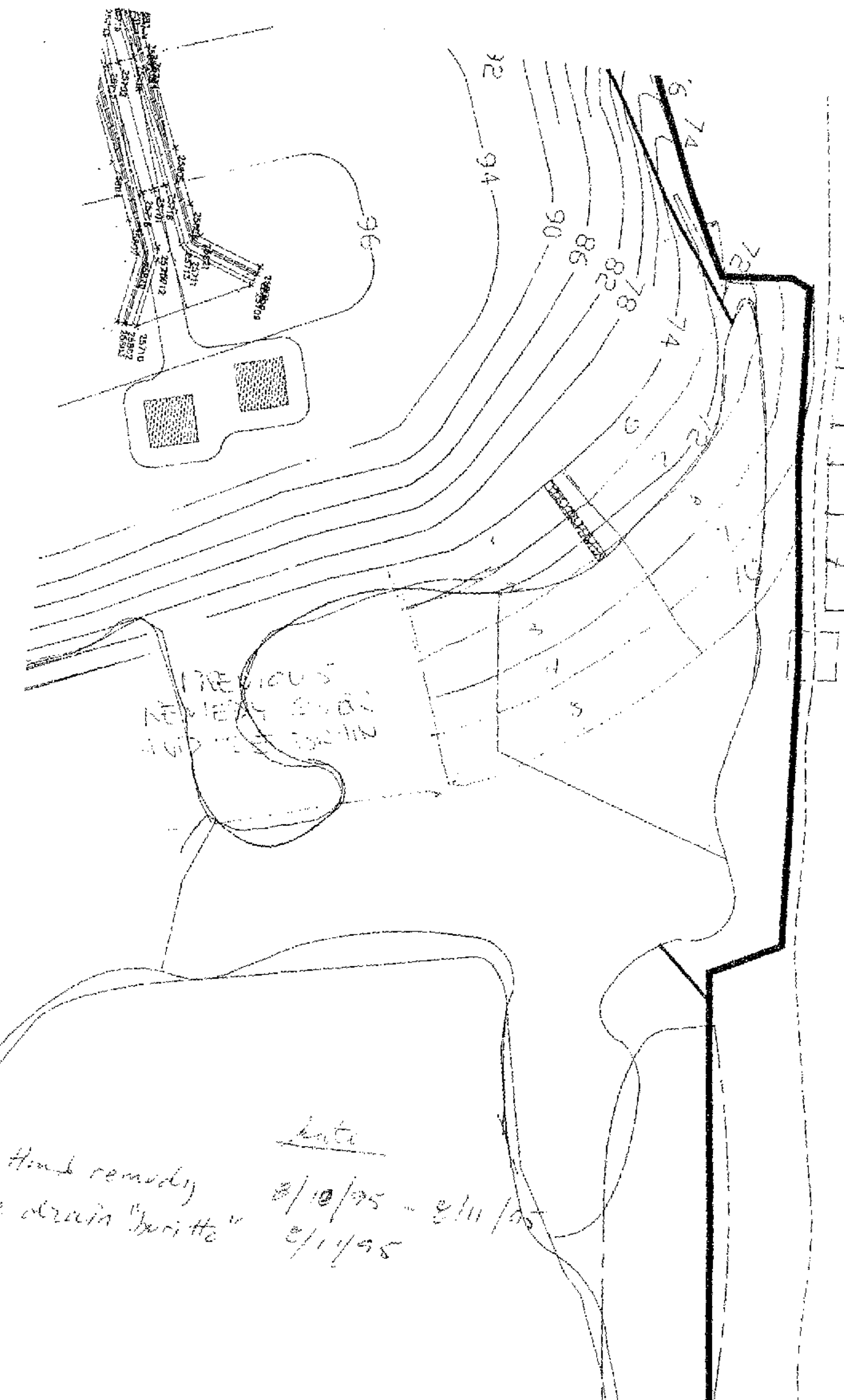
DAMAGE/REPAIR INSPECTION

Location (s) ________

Patch Size (s) ________

Comments:

[signature]	Gen Foreman	8/11/95
CWM/RUST QC Rep	Title	Date
[signature]	Field Engineer	8/11/95
QA Inspector	Title	Date



Equipment Benchmark

#11	19
12	20
13	21
14	22
15	23
16	24
17	25
18	26

Points

#1 – 10 Wetland remedy

#11 – 20 Toe drain "burito"

Date

8/10/95 – 8/11/95

8/11/95

[illegible]

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY WEST Hide Pile

LOCATION Toe drain on NE Corner

☒ Panel layout on back or ☐ Attached

SUBGRADE INSPECTION
Subgrade inspected X Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection X Acceptable ____ Unacceptable
Comments:

Weight inspection ____ 6-oz. ____ 10 oz. X 16-oz.

SEAM INSPECTION
Sewing machine number ____________

Total seam length ~180 FT

Edge to seam limit X Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

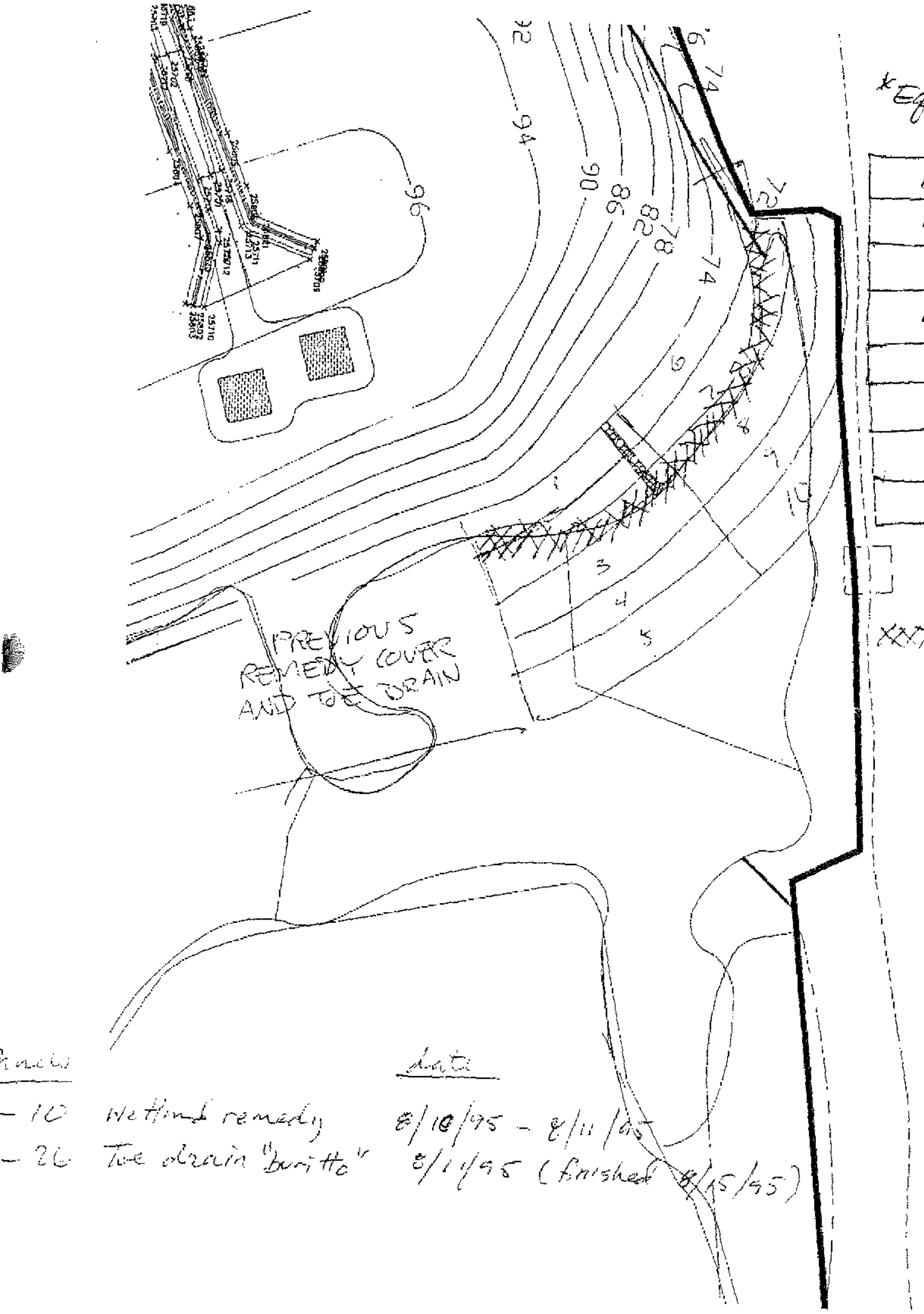
DAMAGE/REPAIR INSPECTION

Location (s) ____________

Patch Size (s) ____________

Comments:

John F. Kil[illegible]	Len Foreman	8/15/95
CWM/RUST QC Rep	Title	Date
David Callahan	Field Engineer	8/15/95
QA Inspector	Title	Date



*Equivelent Panel Area

11	19
12	20
13	21
14	22
15	23
16	24
17	25
18	26

XXXXXX Toedrain "burrito"

Panels		date
#1 – 10	Wetland remedy	8/10/95 – 8/11/95
*11 – 26	Toe drain "burito"	8/11/95 (finished 8/15/95)

*This #. "EQUIVELENT" panels are due to carry around the custom seaming and Triangular pieces corners.

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY WHP

LOCATION north side along the Fence

[X] Panel layout on back or [ ] Attached

SUBGRADE INSPECTION
Subgrade inspected X Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection X Acceptable ____ Unacceptable
Comments:

Weight inspection ____ 6-oz. ____ 10 oz. X 16-oz.

SEAM INSPECTION
Sewing machine number A-4

Total seam length ≈ 250'

Edge to seam limit X Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

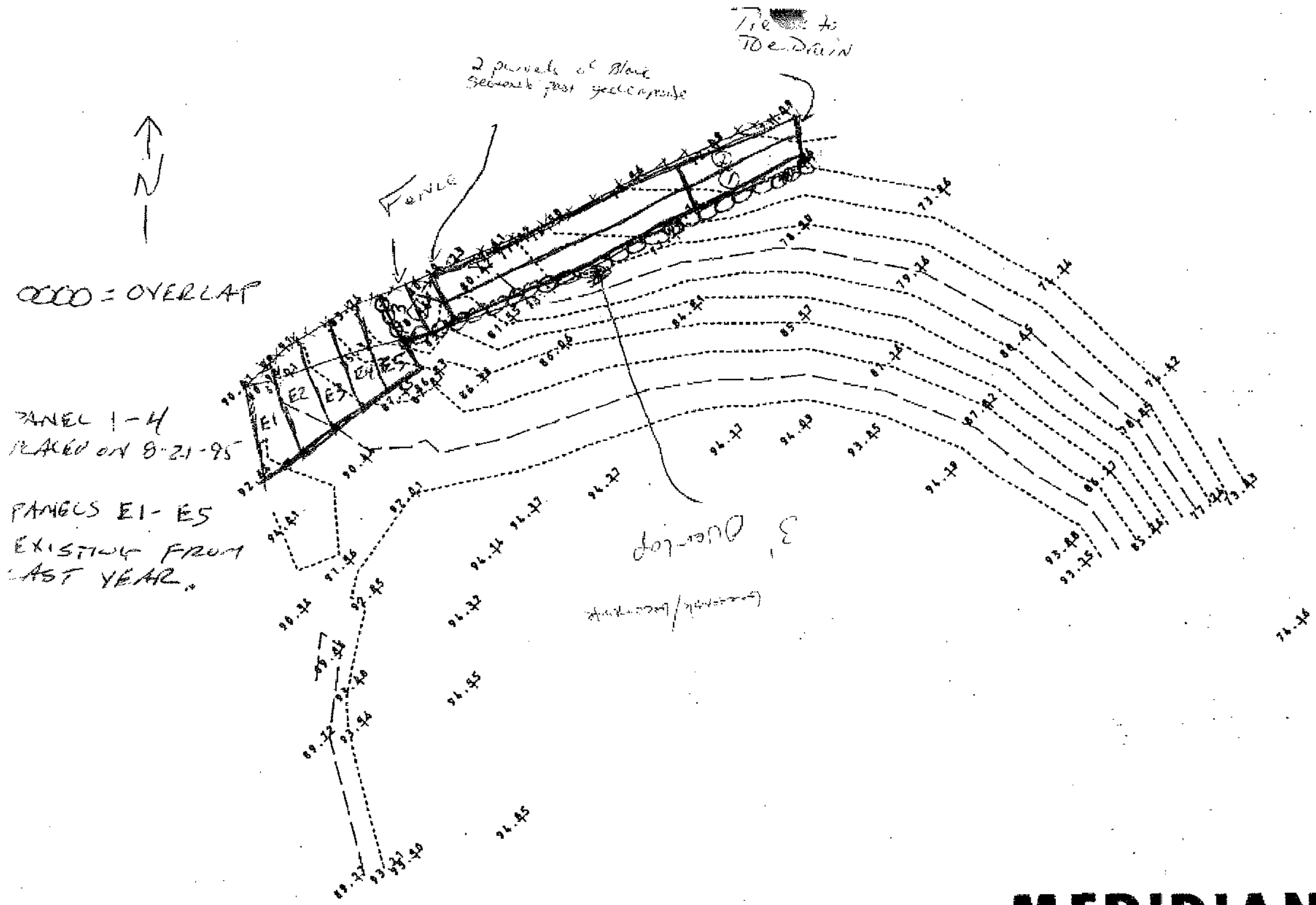
DAMAGE/REPAIR INSPECTION

Location (s) N/A

Patch Size (s) N/A

Comments:

John F. Kiley	Sen Foreman	8-21-95
CWM/RUST QC Rep	Title	Date
Anthony P. C[illegible]	Service Agey Rep.	8-21-95
QA Inspector	Title	Date



GRAPHIC SCALE

50 25 0 50 100 150

MERIDIAN

Land Services, Inc.

29 ARMORY ROAD, MILFORD, N.H. 03055

TEL 603-673-1441 FAX 603-673-1584

ENGINEERS - LAND SURVEYORS - SCIENTISTS - LAND PLANNERS

FILE NO. 597TB22A	PROJECT NO. 597.22	SHEET NO. 1 OF 1

Panels 8/18/95 1-2

GEOTEXTILE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY West Hide Pile

LOCATION West Side near Access Road

[X] Panel layout on back or [ ] Attached

SUBGRADE INSPECTION
Subgrade inspected X Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection X Acceptable ____ Unacceptable
Comments:

Weight inspection X 6-oz. ____ 10 oz. ____ 16-oz.

SEAM INSPECTION
Sewing machine number A-3

Total seam length 900' ±

Edge to seam limit X Acceptable ____ Unacceptable
(1-inch min. From edge of geotextile)

DAMAGE/REPAIR INSPECTION

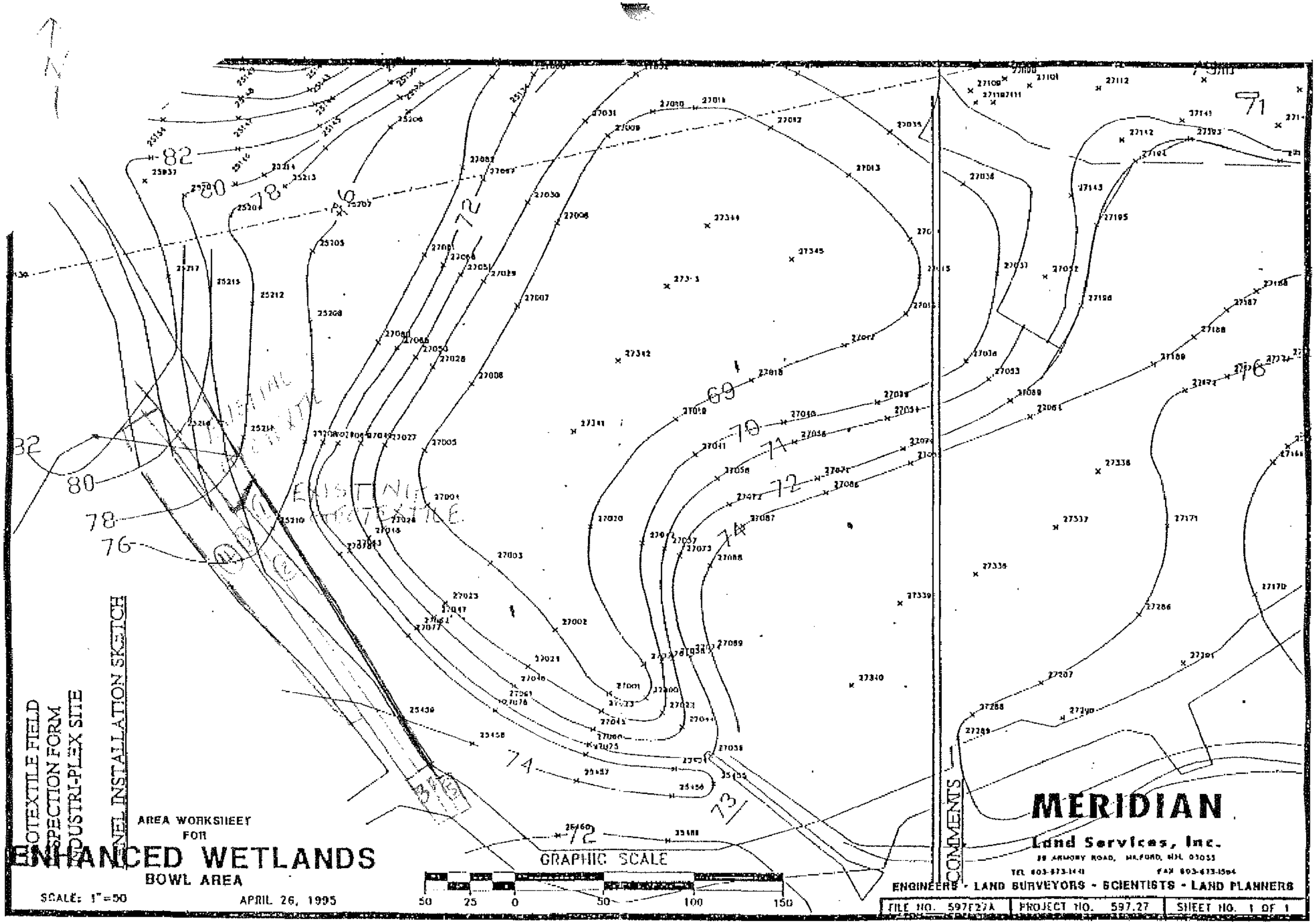
Location (s) N/A

Patch Size (s) N/A

Comments:

John F. Kiley / Sen Foreman / 9-8-95
CWM/RUST QC Rep / Title / Date

[signature] / SENIOR FIELD INSP. / 9-8-95
QA Inspector / Title / Date



OTEXTILE FIELD
SPECTION FORM
DUSTRI-PLEX SITE
NEL INSTALLATION SKETCH
EXISTING GEOTEXTILE
AREA WORKSHEET
FOR
ENHANCED WETLANDS
BOWL AREA
SCALE: 1"=50
APRIL 26, 1995
GRAPHIC SCALE
50 25 0 50 100 150
COMMENTS
MERIDIAN
Land Services, Inc.
ENGINEERS - LAND SURVEYORS - SCIENTISTS - LAND PLANNERS
FILE NO. 597F27A
PROJECT NO. 597.27
SHEET NO. 1 OF 1

APPENDIX I.3

Geocomposite Inspection Summary

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY E.H.B.

LOCATION TOP CENTER PLATEAU EASTERN HALF

WEATHER INSPECTION (WINDY?)
If yes, were sand bags used? X Yes ____ No

SUBGRADE INSPECTION
HDPE SUBGRADE INSPECTED X Acceptable ____ Unacceptable

MATERIAL INSPECTION
VISUAL INSPECTION X Acceptable ____ Unacceptable
-Comments:

ROLL NUMBERS USED Partial Rolls.

SEAM INSPECTION
MINIMUM 4-INCH OVERLAP X Acceptable ____ Unacceptable

GEONET SECURED EVERY 5-FEET X Acceptable ____ Unacceptable
-Plastic Ties

UPPER SEWN GEOTEXTILE SEAM X Acceptable ____ Unacceptable

PANEL INSTALLATION SKETCH
-See reverse side of this sheet.

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT X Acceptable ____ Unacceptable
Field deployment installed

DAMAGE/REPAIR INSPECTION

Mike Turner
CWM/RUST QC Officer

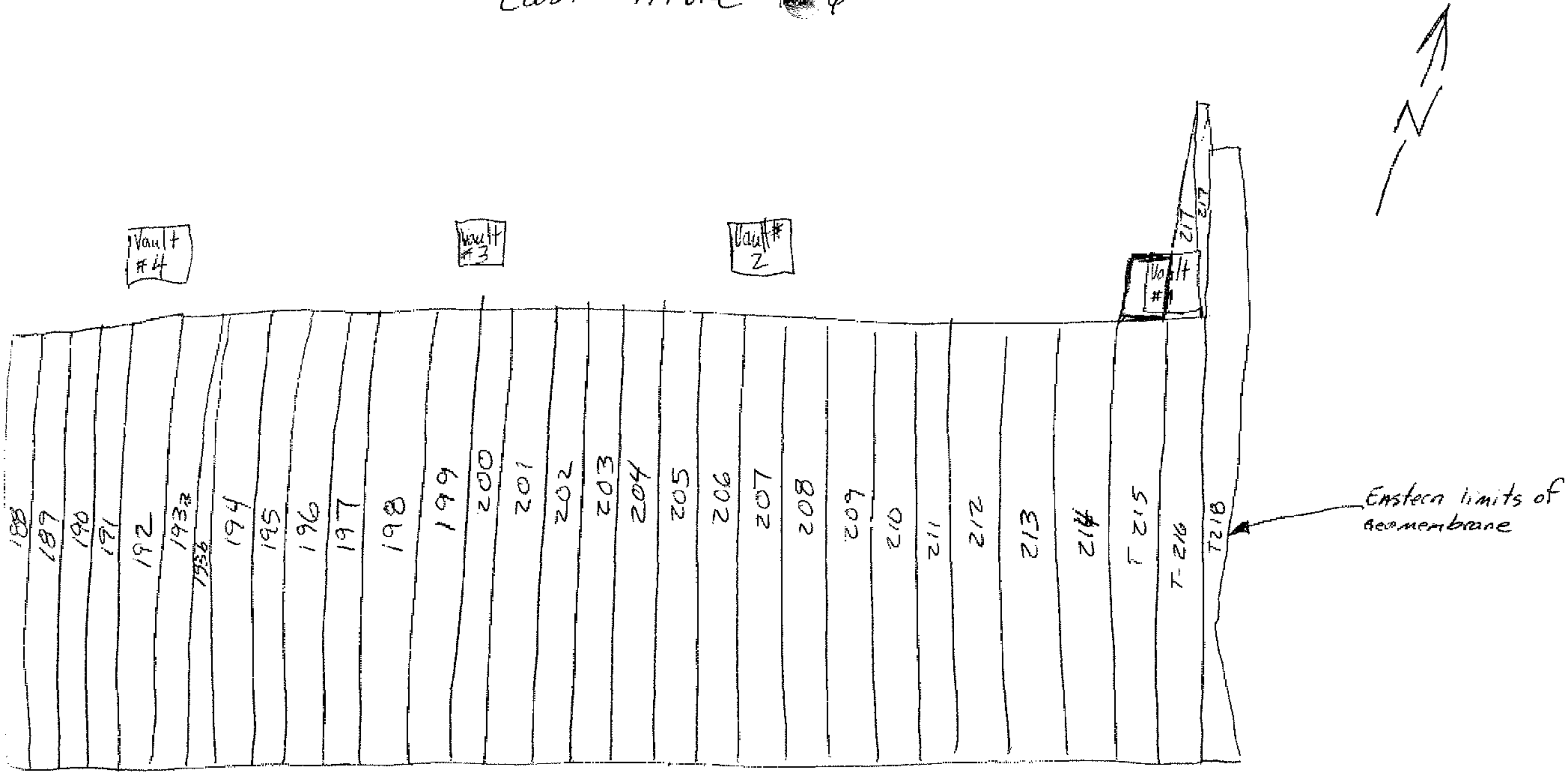
12/21/94
Date

Alfred A. Toney
QA Inspector

12/21/94
Date

REV 04/94

East Hide



Avg. Panel length = ≈ 50.0' ± 5'

Merridian is locating Butt seams.

N.T.S.

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY EHP

Existing grade to 76 contour

LOCATION Toe of Slope on South Side EHP

Panels 1-22

[✓] Panel layout on back or [ ] Attached

WEATHER INSPECTION (Windy?)
If yes, were sand bags used? ____ Yes ✓ No
Comments:

SUBGRADE INSPECTION ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION
Visual inspection ✓ Acceptable ____ Unacceptable
Comments:

SIDE SEAM INSPECTION
Minimum 4" overlap ✓ Acceptable ____ Unacceptable

Geonet secured every 5' with plastic ties ✓ Acceptable ____ Unacceptable

Upper sewn geotextile seam ✓ Acceptable ____ Unacceptable

BUTT SEAM INSPECTION
Minimum 1' overlap NA Acceptable ____ Unacceptable

Geonet secured every 6" with plastic ties ____ Acceptable ____ Unacceptable

DAMAGE/REPAIR INSPECTION

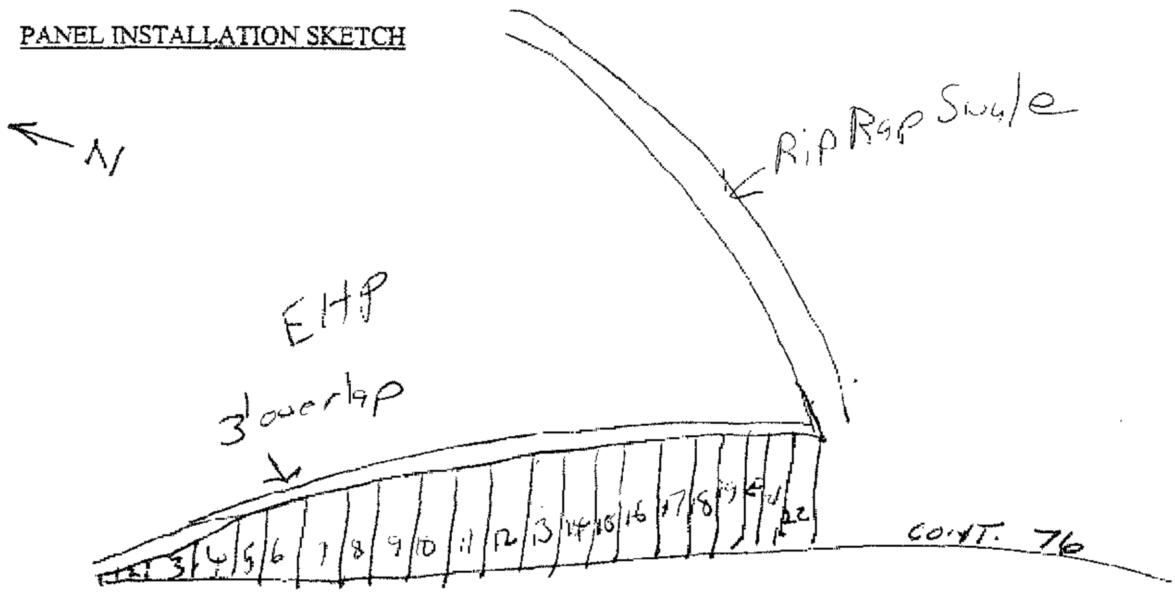
Comments: 3' overlap AS PER VARIANCE NO. 073.

Signature	Title	Date
[signature]	General Foreman	4-20-95
CWM/RUST QC Rep	Title	Date
Anthony E. [signature]	SENIOR FIELD INSP	4-20-95
QA Inspector	Title	Date

SHEET ___ OF ___

GEOCOMPOSITE FIELD
INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH



COMMENTS

SHEET 1/3

RUST REMEDIAL SERVICES INC.

I-Plex Remediation Site
Woburn, Massachusetts
Project #492900

VARIANCE REQUEST

41 Atlantic Avenue
Woburn, MA 01801
Tel. (617) 938-7190
Fax (617) 938-7194

Date of Request: 18-Apr-95	Suspense Date: 18-Apr-95	Variance No: 073	
Proposed Variance:	Drwg Ref: 12-3	Spec Ref: 02598 3.01 (e)	Site Location: EHP, S. Slope

A THREE (3) FOOT OVERLAP IS PROPOSED FOR THE GEOCOMPOSITE TIE-IN AT THE TOE OF THE EHP'S SOUTH SLOPE. THIS OVERLAP IS RECOMMENDED BECAUSE THE PREVIOUSLY INSTALLED GEOCOMPOSITE'S CONDITION, SOILED & WET, DOES NOT PERMIT THERMAL BONDING W/O JEOPARDIZING THE INTEGRITY OF THE MATERIAL.

The undersigned represents that the contract documents have been reviewed and that acceptance of this proposed variance will have no impact on cost or time of performance to this contract and that incorporation of this variance into the permanent work will not conflict or adversely effect follow on trades or the ultimate end product.

cc: R. SANTUCCI, RRS
B. SPEDDING, RRS
D. HIMES, REI

K.A. Logan
RUST Remedial Services Representative

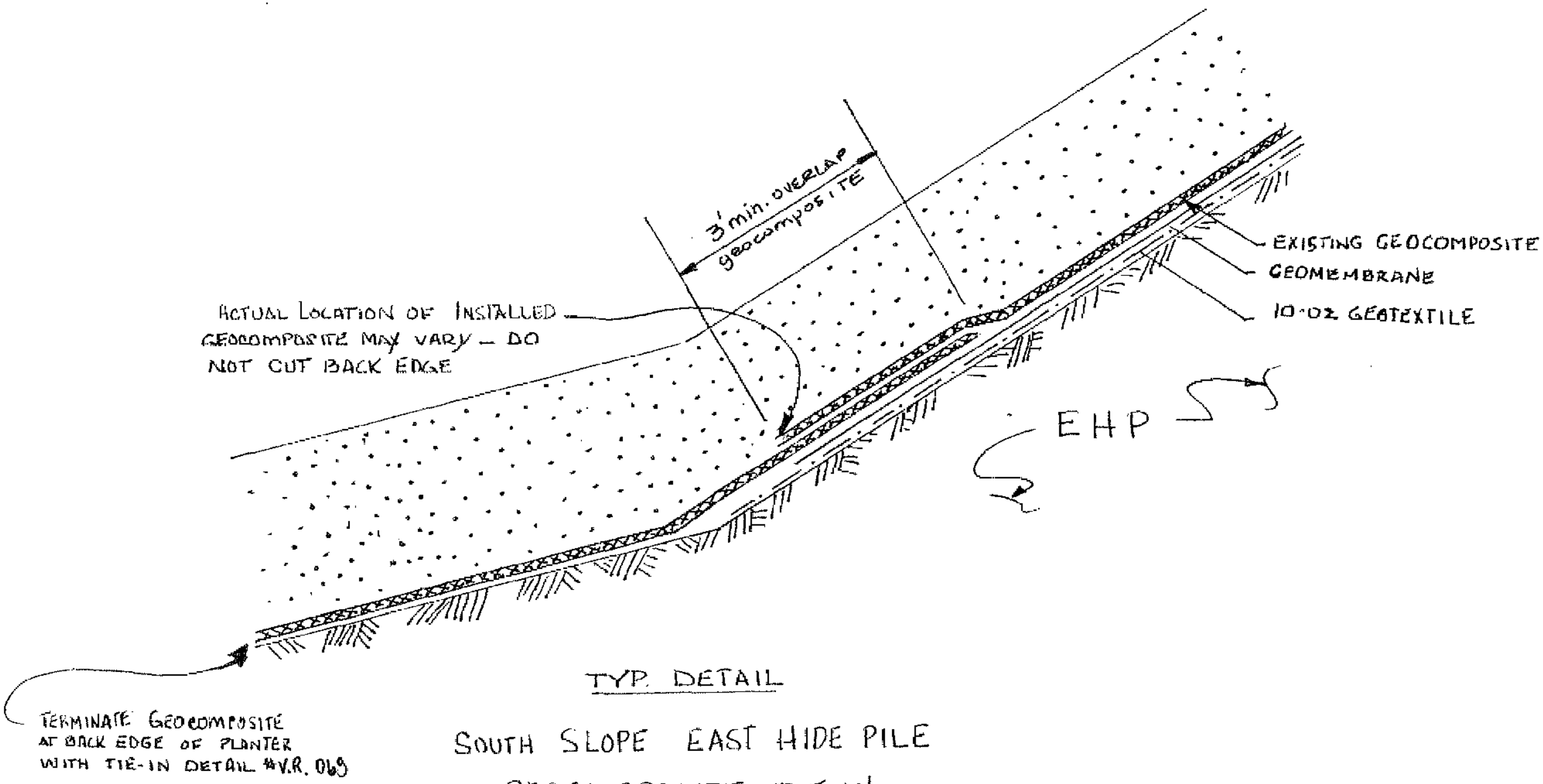
4/18/95
Date

Disposition: Approved [] Modified [] Rejected []

Certifying Engineer ______ Date ______

I-Plex Site Remedial Trust Representative ______ Date ______

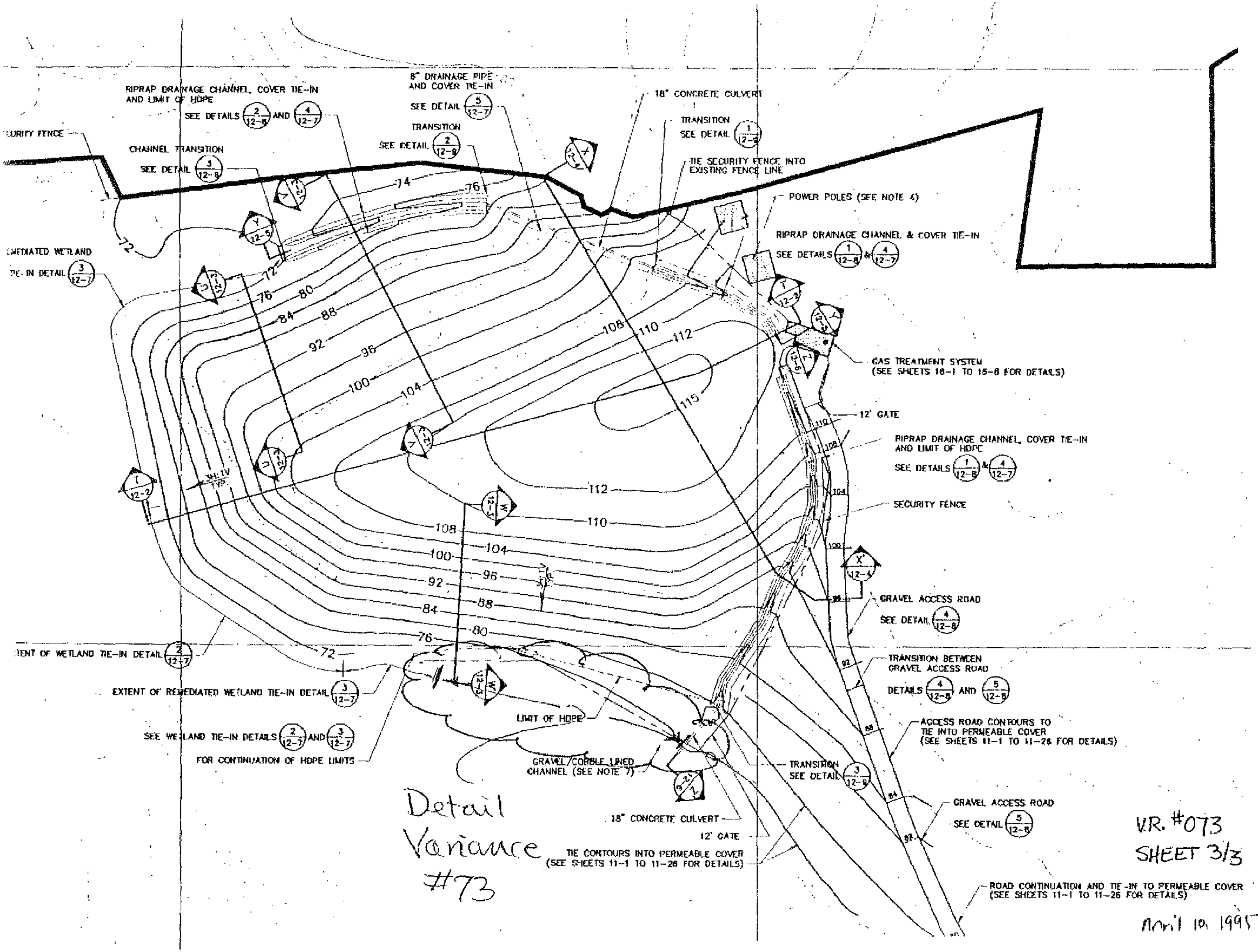
INDUSTRI-PLEX SITE REMEDIATION
#492900



TYP. DETAIL

SOUTH SLOPE EAST HIDE PILE
GEOCOMPOSITE TIE-IN
N. T. S.

V.R. #073
SHEET 2/3
APRIL 18, 1995
BY: KDF



Detail Variance #73

V.R. #073
SHEET 3/3

April 19, 1995

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF

PROPERTY W.H.P. LOCATION EAST SlopE

WEATHER INSPECTION (~~WINDY?~~)
If yes, were sand bags used? ___ Yes ✓ No

SUBGRADE INSPECTION
HDPE SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION
VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
-Comments:

ROLL NUMBERS USED ~~023106547~~ ZK11009B7

SEAM INSPECTION
MINIMUM 4-INCH OVERLAP ✓ Acceptable ___ Unacceptable

GEONET SECURED EVERY 5-FEET ✓ Acceptable ___ Unacceptable
-Plastic Ties

UPPER SEWN GEOTEXTILE SEAM ✓ Acceptable ___ Unacceptable

PANEL INSTALLATION SKETCH
-See reverse side of this sheet.

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT ✓ Acceptable ___ Unacceptable

DAMAGE/REPAIR INSPECTION

Mike James 09-07-94
CWM/RUST QC Officer Date

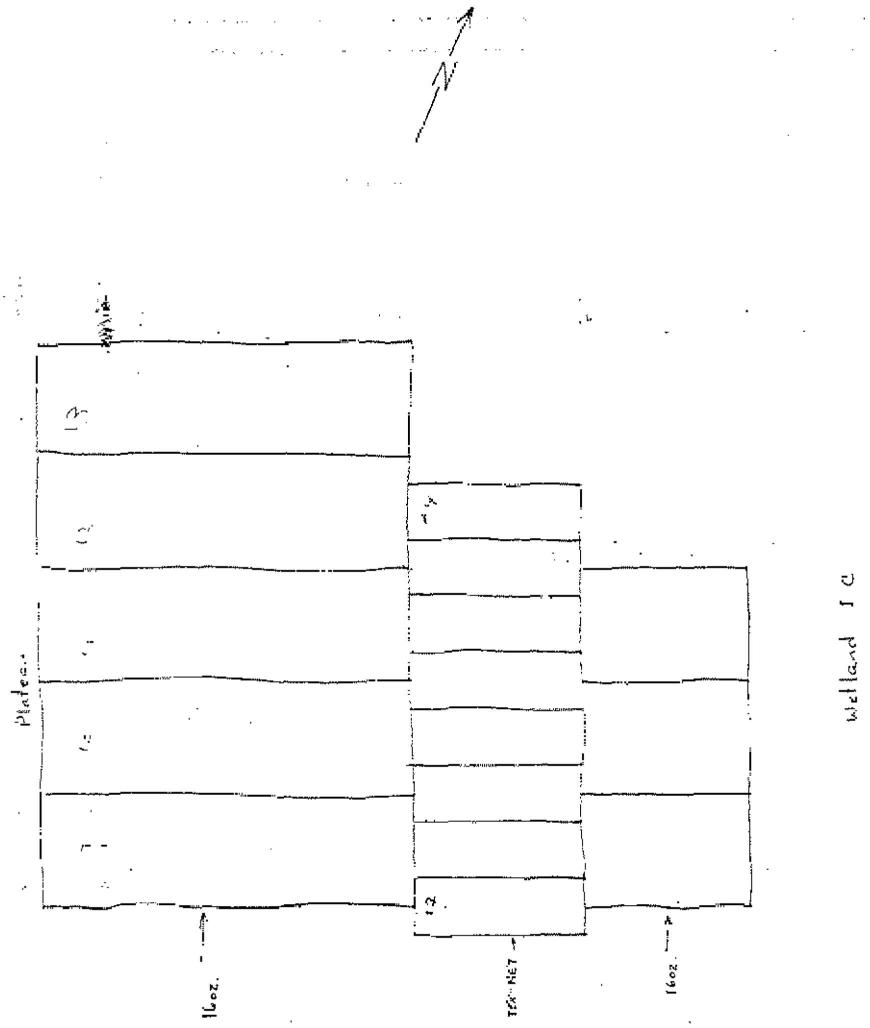
Anthony E. [illegible] 09-07-94
QA Inspector Date

REV 04/94

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET OF

PANEL INSTALLATION SKETCH



RUST ENVIRONMENT & INFRASTRUCTURE

CALCULATION SHEET

PAGE OF

PROJECT NO.

CLIENT

PROJECT

SUBJECT

Prepared By Date

Reviewed By Date

Approved By Date

COMMENTS

REV 04/94

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY W.H.P. LOCATION East slope

WEATHER INSPECTION ~~(WINDY?)~~
If yes, were sand bags used? ____ Yes ✓ No

SUBGRADE INSPECTION
HDPE SUBGRADE INSPECTED ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION
VISUAL INSPECTION ✓ Acceptable ____ Unacceptable
-Comments: ~~Bare seam opened~~ The tie-in to perviously deployed tex-net was inspected.
ROLL NUMBERS USED ZK11011B7

SEAM INSPECTION
MINIMUM 4-INCH OVERLAP ✓ Acceptable ____ Unacceptable

GEONET SECURED EVERY 5-FEET ✓ Acceptable ____ Unacceptable
-Plastic Ties

UPPER SEWN GEOTEXTILE SEAM ✓ Acceptable ____ Unacceptable

PANEL INSTALLATION SKETCH
-See reverse side of this sheet.

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT ✓ Acceptable ____ Unacceptable

DAMAGE/REPAIR INSPECTION

Mike Tamm[illegible] 9/16/94
CWM/RUST QC Officer Date

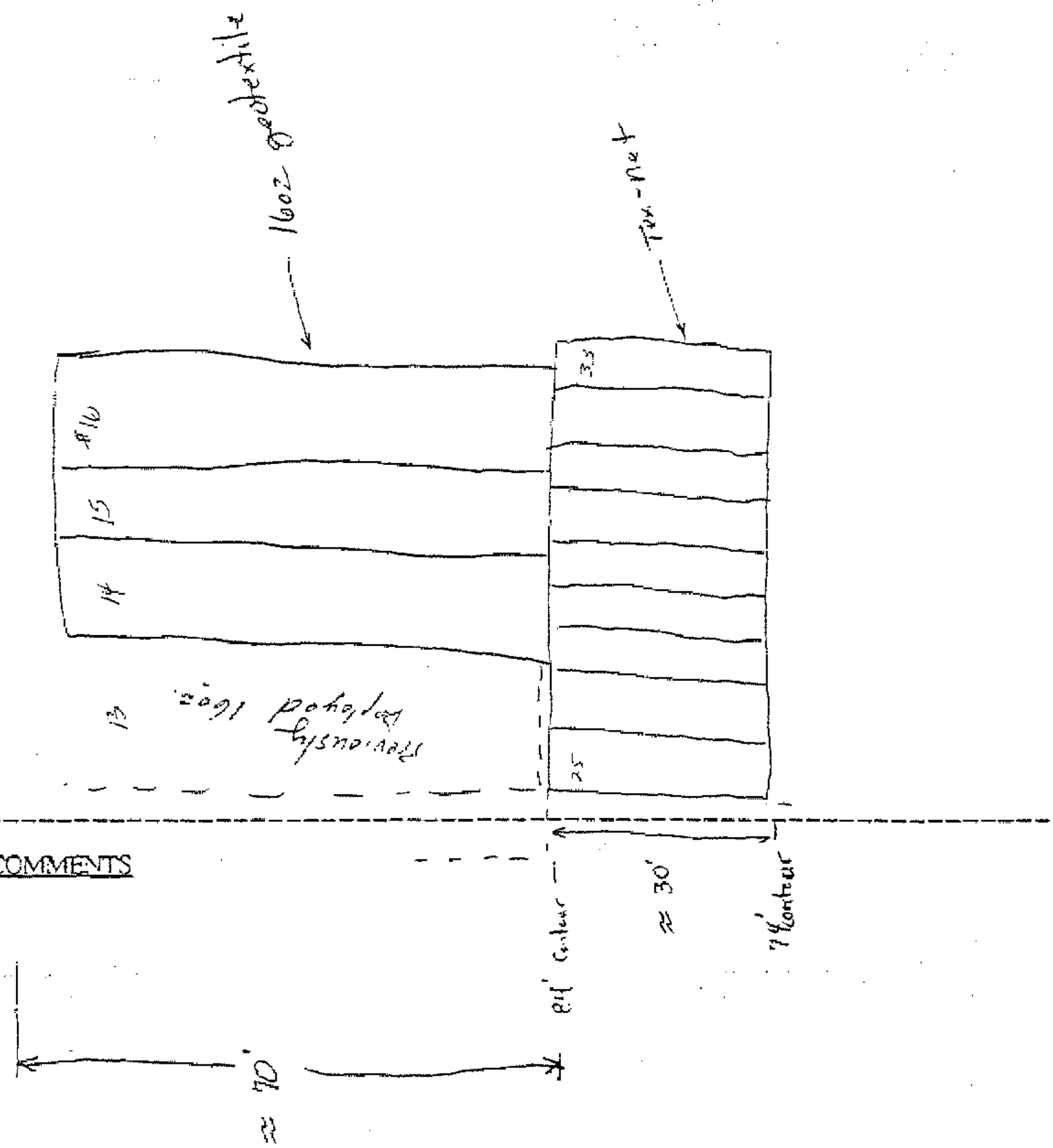
Anthony E. C[illegible] 09/16/94
QA Inspector Date

REV 04/94

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET OF

PANEL INSTALLATION SKETCH



COMMENTS

REV 04/94

RUST ENVIRONMENT & INFRASTRUCTURE

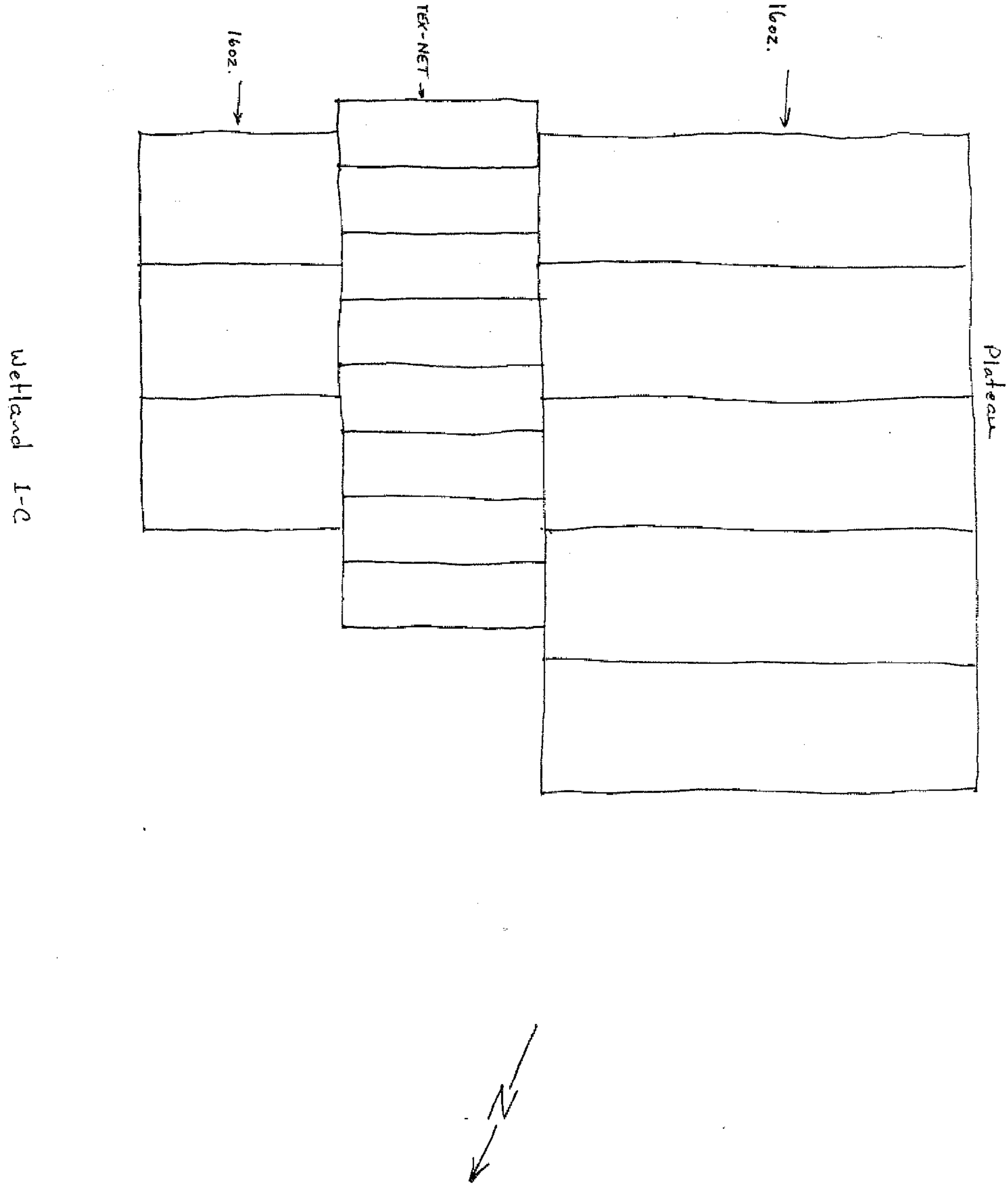
CALCULATION SHEET

PAGE 1 OF ____
PROJECT NO. 38012.050

CLIENT Rust Remedial
PROJECT West Hide Pile
Eastern Slope

SUBJECT Geosynthetic
Panel layout.

Prepared By MT Date 9-7-94
Reviewed By ____ Date ____
Approved By ____ Date ____



GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY W.H.P. — LOCATION N.E. Slope

SEE SKETCH

WEATHER INSPECTION (WINDY?)
If yes, were sand bags used? yes — ✓ Yes ___ No

SUBGRADE INSPECTION
HDPE SUBGRADE INSPECTED — ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION
VISUAL INSPECTION — ✓ Acceptable ___ Unacceptable
-Comments:

ROLL NUMBERS USED ZK0Z008B7, ZK0Z009B7

SEAM INSPECTION
MINIMUM 4-INCH OVERLAP — ✓ Acceptable ___ Unacceptable

GEONET SECURED EVERY 5-FEET — ✓ Acceptable ___ Unacceptable
-Plastic Ties

UPPER SEWN GEOTEXTILE SEAM — ✓ Acceptable ___ Unacceptable

PANEL INSTALLATION SKETCH
-See reverse side of this sheet.

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT — ✓ Acceptable ___ Unacceptable

(R) No geocomposite Design Layout submitted. It does follow the geotextile layout.

DAMAGE/REPAIR INSPECTION

Mike Tanner — 09/30/94
CWM/RUST QC Officer — Date

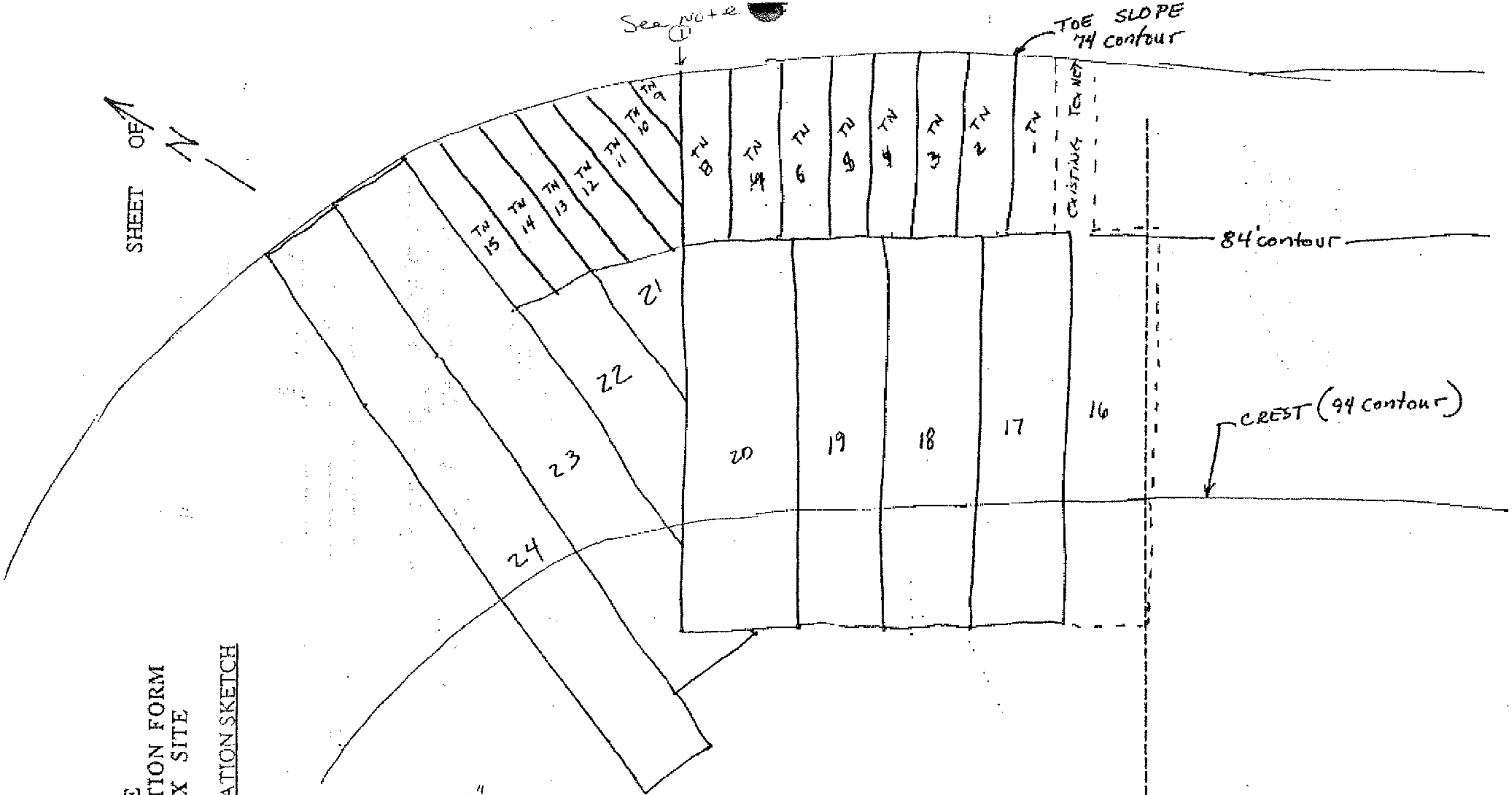
Alfred A. Toney — 09/30/94
QA Inspector — Date

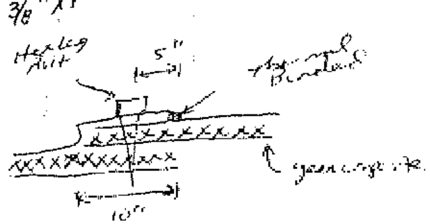
REV 04/94

SHEET OF

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH





W. H. P. Plateau

field fit seams
11/8, 10/8, 9/8

COMMENTS

REV 04/94

N.T.S.

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET OF

PROPERTY W.H.P LOCATION SEE Sketch

WEATHER INSPECTION (WINDY?)
If yes, were sand bags used? ✓ Yes ___ No

SUBGRADE INSPECTION
HDPE SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION
VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
-Comments:

ROLL NUMBERS USED 2K02009B7, 2K02010B7, 2K11005B7

SEAM INSPECTION
MINIMUM 4-INCH OVERLAP ✓ Acceptable ___ Unacceptable

GEONET SECURED EVERY 5-FEET ✓ Acceptable ___ Unacceptable
-Plastic Ties

UPPER SEWN GEOTEXTILE SEAM ✓ Acceptable ___ Unacceptable

PANEL INSTALLATION SKETCH
-See reverse side of this sheet.

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT ✓ Acceptable ___ Unacceptable

DAMAGE/REPAIR INSPECTION

Mike Tanner
CWM/RUST QC Officer

10-03-94
Date

Arthur E C[illegible]
QA Inspector

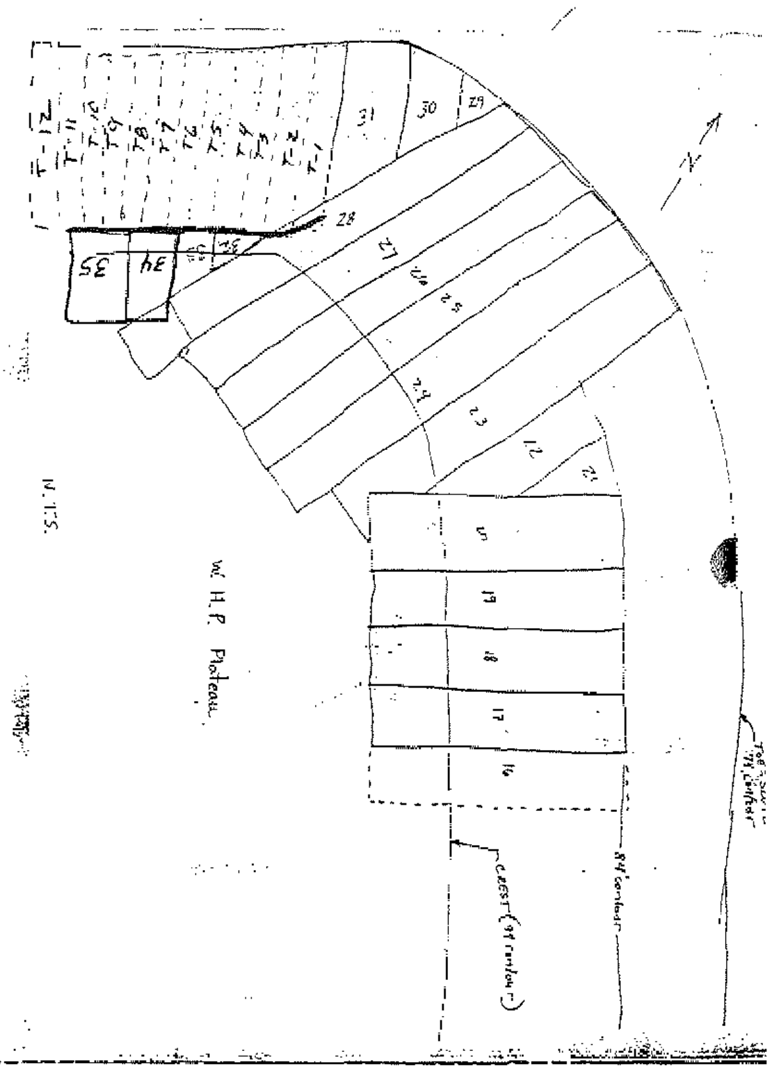
10-03-94
Date

REV 04/94

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PANEL INSTALLATION SKETCH



COMMENTS

REV 04/94

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY W H P

LOCATION SEE SKETCH

WEATHER INSPECTION (WINDY?)
If yes, were sand bags used? ___ Yes ✓ No

SUBGRADE INSPECTION
HDPE SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION
VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
-Comments:

ROLL NUMBERS USED ZK04009B7, ZK04010B7

SEAM INSPECTION
MINIMUM 4-INCH OVERLAP ✓ Acceptable ___ Unacceptable

GEONET SECURED EVERY 5-FEET ✓ Acceptable ___ Unacceptable
-Plastic Ties

UPPER SEWN GEOTEXTILE SEAM ✓ Acceptable ___ Unacceptable

PANEL INSTALLATION SKETCH
-See reverse side of this sheet.

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT ✓ Acceptable ___ Unacceptable
* See Back Sketch

DAMAGE/REPAIR INSPECTION
* Thermal Bonding was used on some seams

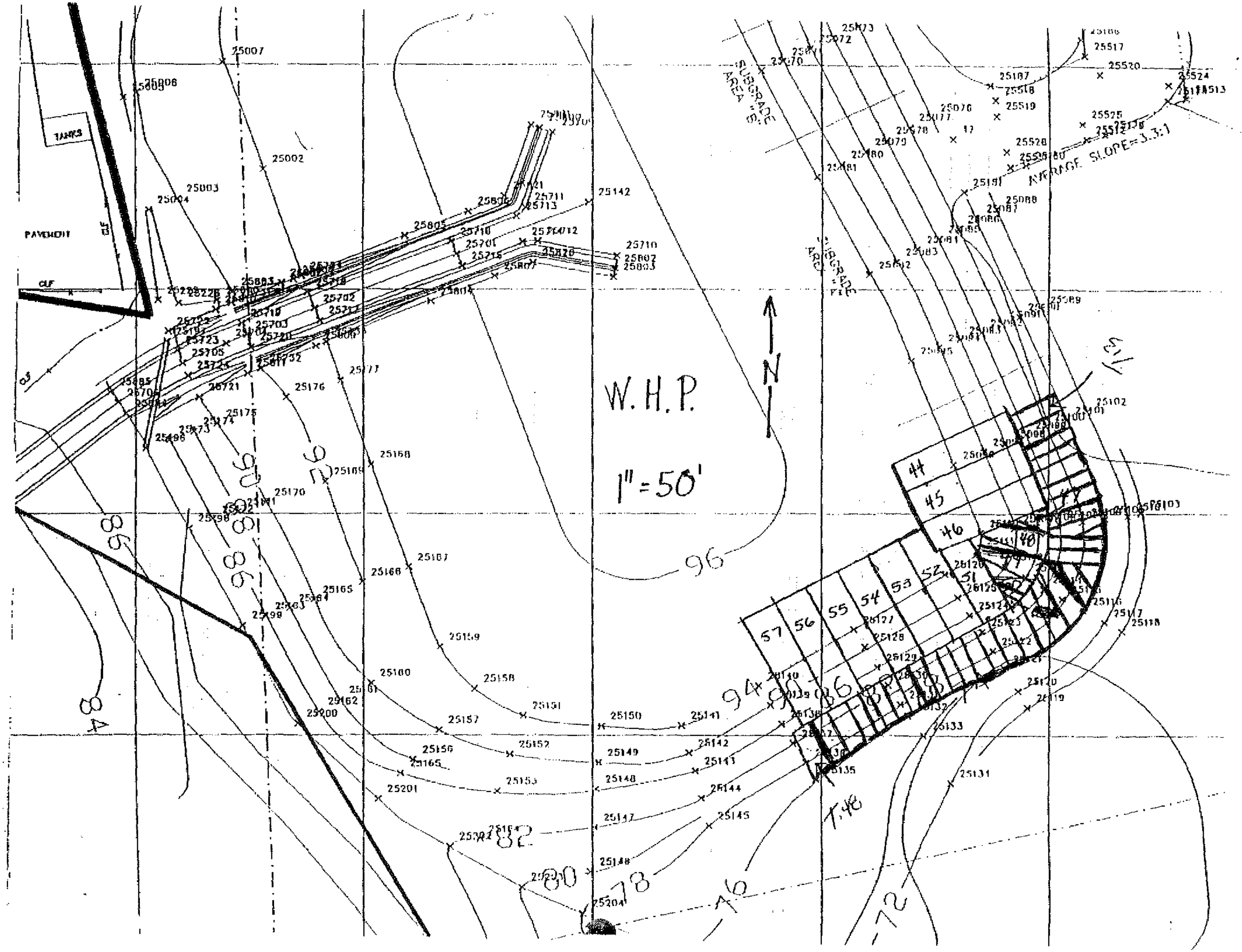
Mike Tanner
CWM/RUST QC Officer

10/17/94
Date

[signature]
QA Inspector

10/18/94
Date

REV 04/94



W.H.P.
1" = 50'
N
PAVEMENT
TANKS
AVERAGE SLOPE=3.3:1
25007
25002
25003
25004
25142
25176
25177
25175
25168
25170
25166
25167
25165
25159
25158
25160
25157
25151
25150
25141
25152
25149
25148
25147
25146
25145
25144
25143
25153
25201
25200
25162
25133
25131
25102
25103
25116
25117
25118
25120
25119
25517
25520
25524
25519
25525
25528
25088
44
45
46
47
48
49
50
51
52
53
54
55
56
57
96
94
92
90
88
86
84
82
80
78
76
72

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 2

PROPERTY WEST HIDE PILE LOCATION EAST SLOPE

WEATHER INSPECTION (WINDY?)
If yes, were sand bags used? ✓ Yes ___ No

SUBGRADE INSPECTION
~~HDPE~~ SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable
Placed on soil.

MATERIAL INSPECTION
VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
-Comments:

ROLL NUMBERS USED 0231 02405, 023106547.

SEAM INSPECTION
MINIMUM 4-INCH OVERLAP ✓ Acceptable ___ Unacceptable

GEONET SECURED EVERY 5-FEET ✓ Acceptable ___ Unacceptable
-Plastic Ties

UPPER SEWN GEOTEXTILE SEAM ✓ Acceptable ___ Unacceptable

PANEL INSTALLATION SKETCH
-See reverse side of this sheet.

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT ✓ Acceptable ___ Unacceptable

DAMAGE/REPAIR INSPECTION
NONE

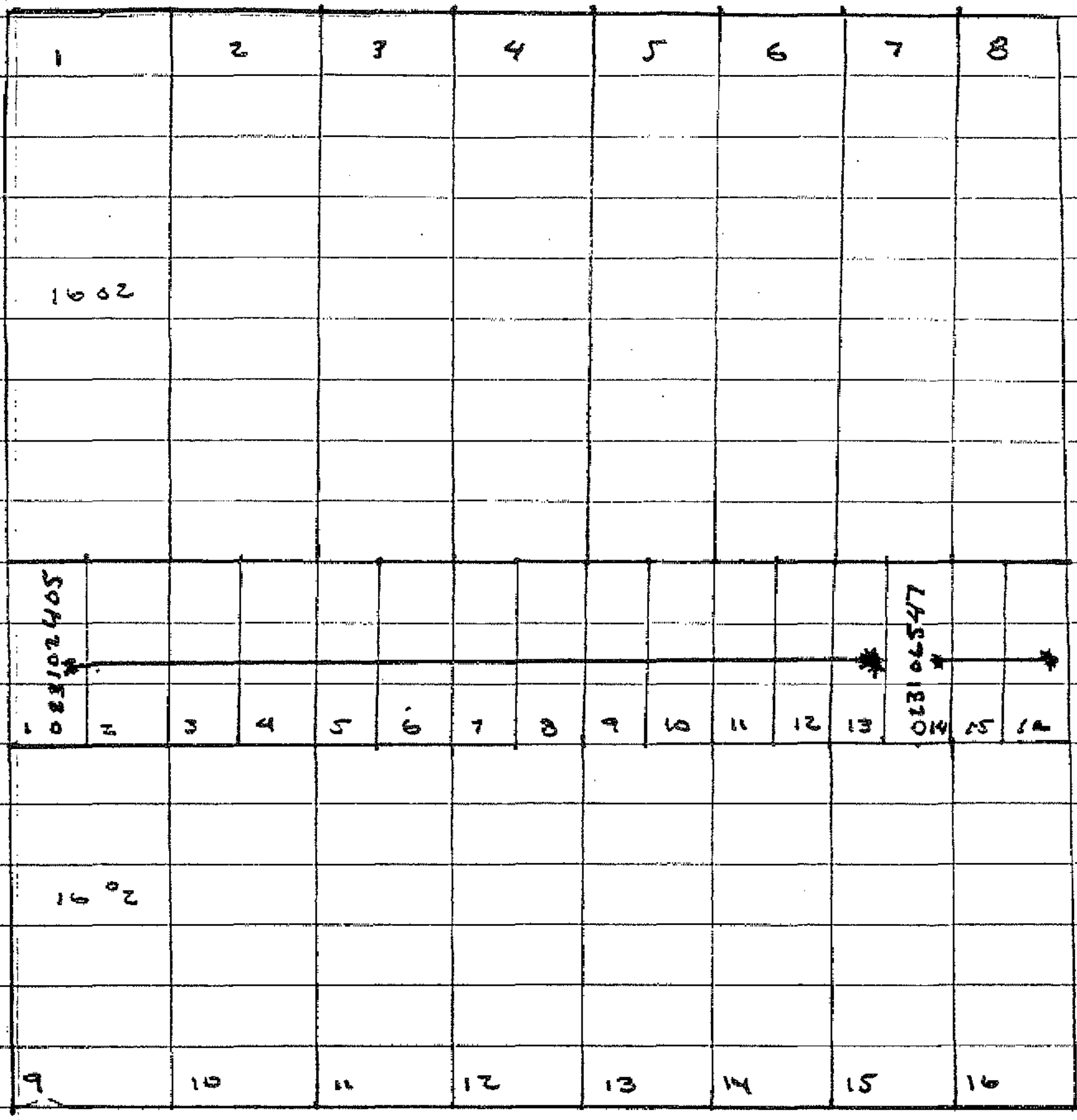
Mike Tanner — 09-06-94
CWM/RUST QC Officer — Date

[signature] — 09/06/94
QA Inspector — Date

Placed on the 09/07/94

REV 04/94

WEST HIDE PILE SEPT 2 1994



1-3 = Roll # 035981 16 oz GEO

4-6 = Roll # 031917 16 oz GEO

7-8 = Roll # 035971 16 oz GEO

1-13 = 023102405 comp

4-16 = 023106547 comp

APPENDIX I.4

Geogrid Inspection Summary

GEOGRID
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET / OF /

PROPERTY E.H.P.

LOCATION ~~At~~ South and west slope

MATERIAL INSPECTION

VISUAL INSPECTION — X Acceptable ___ Unacceptable

-Comments:

ROLL NUMBERS USED LOT 3871 - ROLL 162, 157, 156. 3874-67, 68, 59, 55, 72, 63, 60, 64, 74, 73, 61, 66, 56, 70, 5' 58, 62. 3875-140, 125, 127, 121, 135, 129, 126, 123, 122, 131, 133, 134, 128

ORIENTATION

-Placed on slope along the machine direction — X Acceptable ___ Unacceptable

SEAM INSPECTION

Adjacent -NO OVERLAP REQUIRED Ends-OVERLAP 12 INCHES WITH HDPE BAR. AT LEAST 20 FEET OF SEPARATION BETWEEN JOINTS IN ADJACENT ROLLS. — X Acceptable ___ Unacceptable

GEOGRID SECURED EVERY 6-FEET -Plastic Ties — X Acceptable ___ Unacceptable

PANEL INSTALLATION SKETCH

-See reverse side of this sheet.

-Extend a distance of 10' beyond the crest. — X Acceptable ___ Unacceptable

Butted we vault AA where needed

-Anchored at the crest before placing cover on the slope. — X Acceptable ___ Unacceptable

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT

No Panel Layout Submitted → X Acceptable ___ Unacceptable

DAMAGE/REPAIR INSPECTION

Mike Tanner
CWM/RUST QC Officer — Date 12/19/94

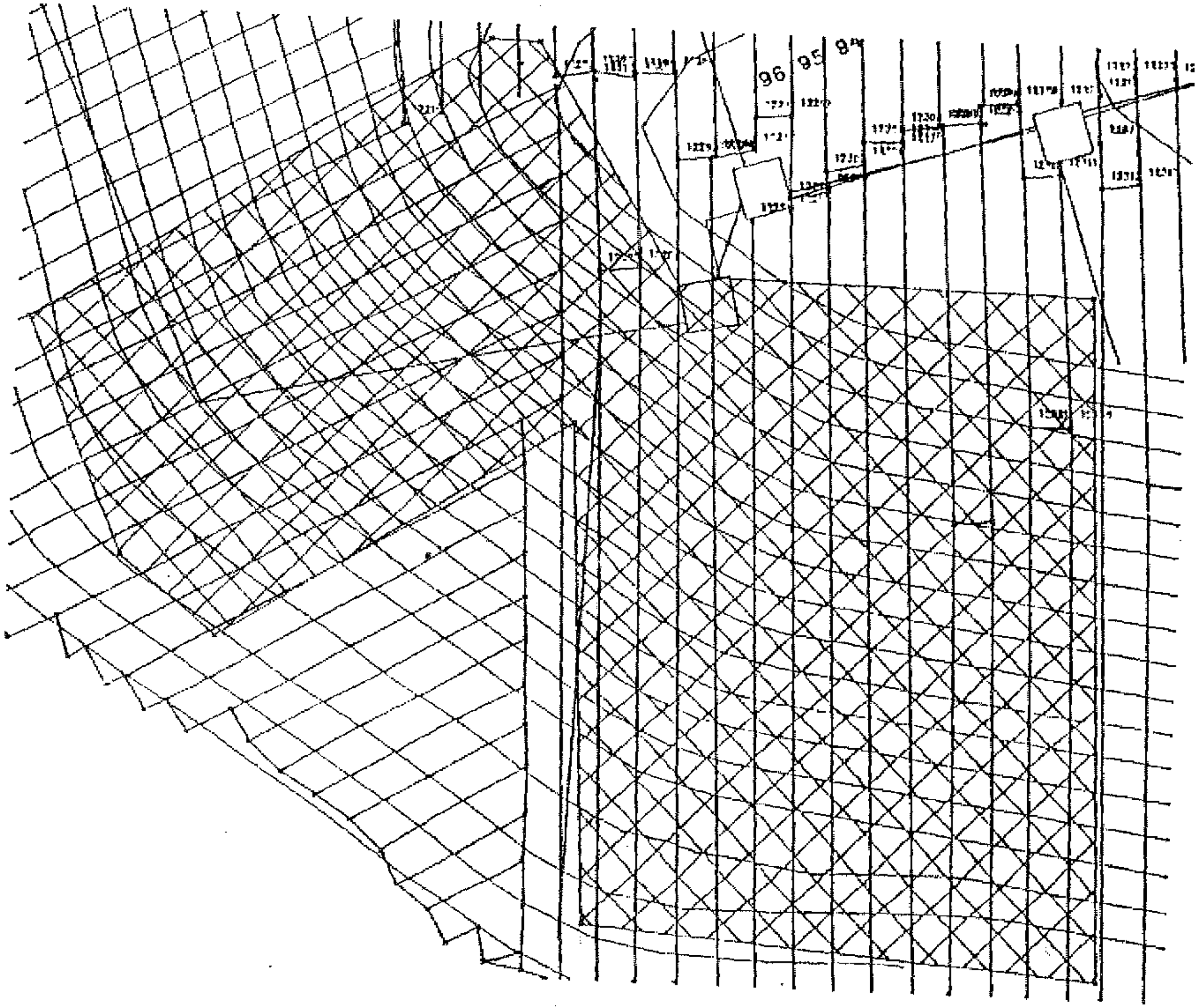
QA / Inspector — Date 12/19/94

REV 09/94

S.W. Corner of E.H.

12/20/94
1" = 30'

GEOGRID &
GEOCOMPOSITE



N

GEOGRID
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF

PROPERTY West Hide Pile LOCATION East Slope

MATERIAL INSPECTION
VISUAL INSPECTION ✓ Acceptable ____ Unacceptable
-Comments:

ROLL NUMBERS USED 43, 45, 42, 48, 46, 38, 84, 87, 52, 53, 98, 100, 95, 83, 43,

ORIENTATION
-Placed on slope along the machine direction ✓ Acceptable ____ Unacceptable

SEAM INSPECTION
Adjacent -NO OVERLAP REQUIRED
Ends-OVERLAP 12 INCHES WITH HDPE BAR. AT LEAST 20 FEET OF SEPARATION BETWEEN JOINTS IN ADJACENT ROLLS. ✓ Acceptable ____ Unacceptable

GEOGRID SECURED EVERY 6-FEET ✓ Acceptable ____ Unacceptable
-Plastic Ties

PANEL INSTALLATION SKETCH
-See reverse side of this sheet.
-Extend a distance of 10' beyond the crest. ✓ Acceptable ____ Unacceptable

-Anchored at the crest before placing cover on the slope. ✓ Acceptable ____ Unacceptable

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT ✓ Acceptable ____Unacceptable

DAMAGE/REPAIR INSPECTION

Mike Tame
CWM/RUST QC Officer

09-06-94
Date

Alfred A. Tomey
QA Inspector

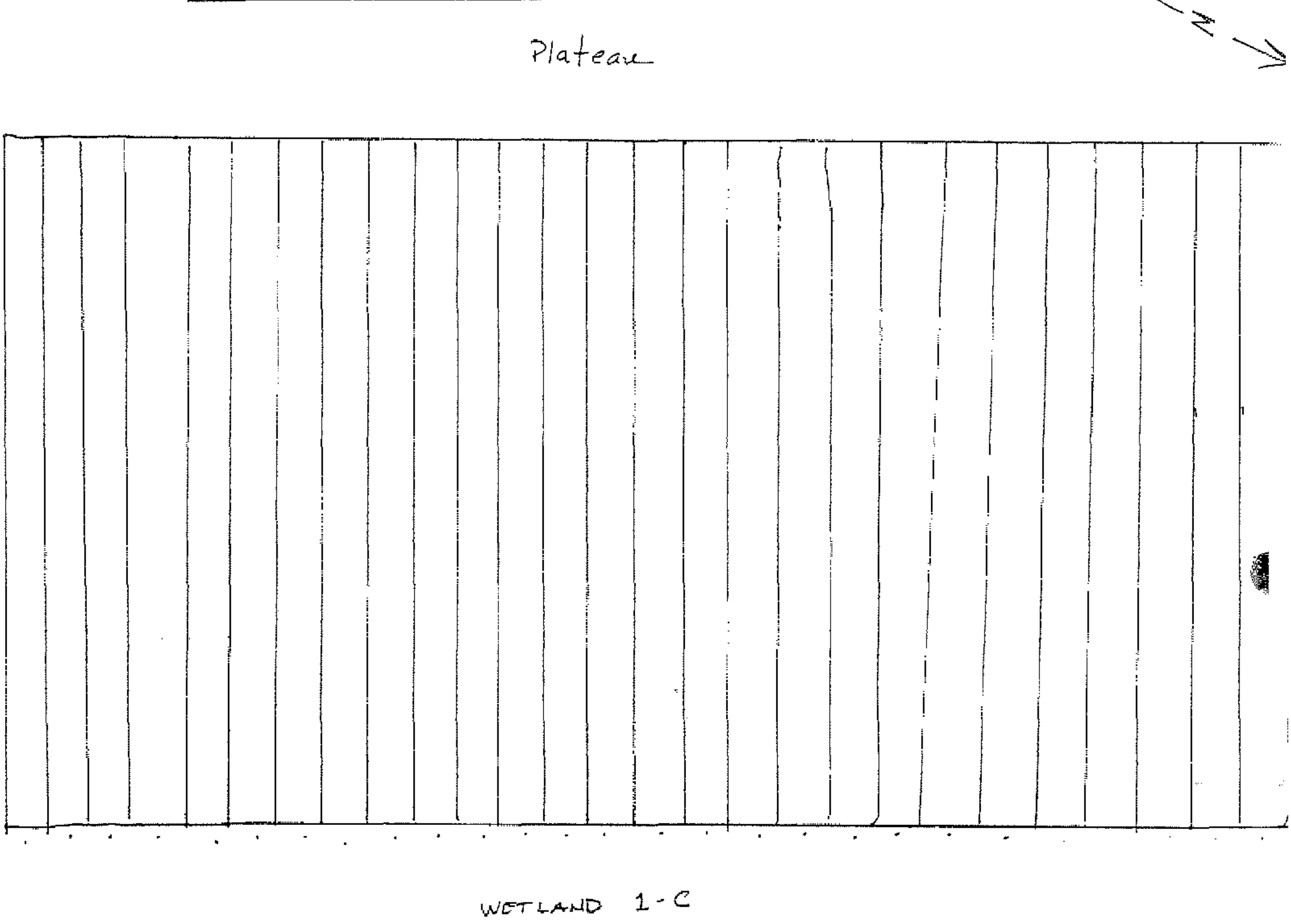
09/06/94
Date

REV 09/94

GEOGRID
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET OF

PANEL INSTALLATION SKETCH



COMMENTS 28 panels from 10' above the crest of slope to the toe @ slope toe protection.

REV 09/94

GEOGRID
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET OF

PROPERTY W. H. P. LOCATION East slope

MATERIAL INSPECTION

VISUAL INSPECTION ✓ Acceptable ____ Unacceptable

-Comments:

ROLL NUMBERS USED 189, 185, 184, 93, 36, 97, 34, 50, 41, 47, 44,

-COMMENTS Batch # 1-3871, 1-3875

ORIENTATION

-Placed on slope along the machine direction ✓ Acceptable ____ Unacceptable

SEAM INSPECTION

Adjacent -NO OVERLAP REQUIRED
Ends-OVERLAP 12 INCHES WITH HDPE BAR. AT LEAST 20 FEET OF SEPARATION BETWEEN JOINTS IN ADJACENT ROLLS. ✓ Acceptable ____ Unacceptable

GEOGRID SECURED EVERY 6-FEET ✓ Acceptable ____ Unacceptable
-Plastic Ties

PANEL INSTALLATION SKETCH

-See reverse side of this sheet.

-Extend a distance of 10' beyond the crest. ✓ Acceptable ____ Unacceptable

-Anchored at the crest before placing cover on the slope. ✓ Acceptable ____ Unacceptable

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT ✓ Acceptable ____ Unacceptable

DAMAGE/REPAIR INSPECTION

Mike Tanner
CWM/RUST QC Officer

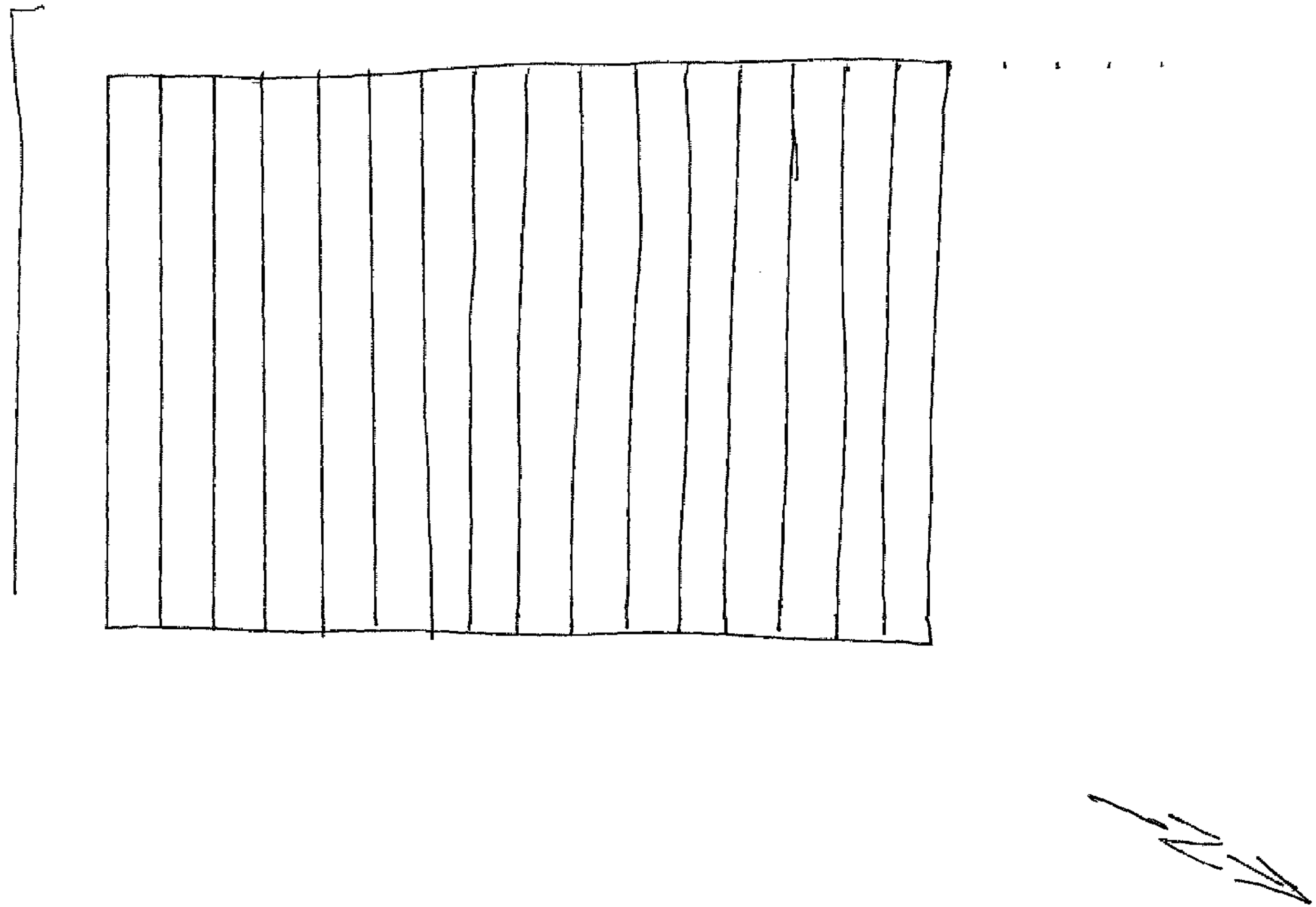
09-07-94
Date

[signature]
QA Inspector

09/07/94
Date

REV 09/94

GeoGrid place from 10' back of crest to the top of the geocomposite. See geocomposite form dated 09-07-94.



GEOGRID
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET / OF /

PROPERTY W.H.P. LOCATION SEE SKETCH

MATERIAL INSPECTION

VISUAL INSPECTION ✓ Acceptable ____ Unacceptable
-Comments:

ROLL NUMBERS USED weathered labels could not read roll numbers.

ORIENTATION

-Placed on slope along the machine direction ✓ Acceptable ____ Unacceptable

SEAM INSPECTION

Adjacent -NO OVERLAP REQUIRED
Ends-OVERLAP 12 INCHES WITH HDPE BAR. AT LEAST 20 FEET OF SEPARATION BETWEEN JOINTS IN ADJACENT ROLLS. ✓ Acceptable ____ Unacceptable

GEOGRID SECURED EVERY 6-FEET ✓ Acceptable ____ Unacceptable
-Plastic Ties

PANEL INSTALLATION SKETCH

-See reverse side of this sheet.
-Extend a distance of 10' beyond the crest. ✓ Acceptable ____ Unacceptable

-Anchored at the crest before placing cover on the slope. ✓ Acceptable ____ Unacceptable

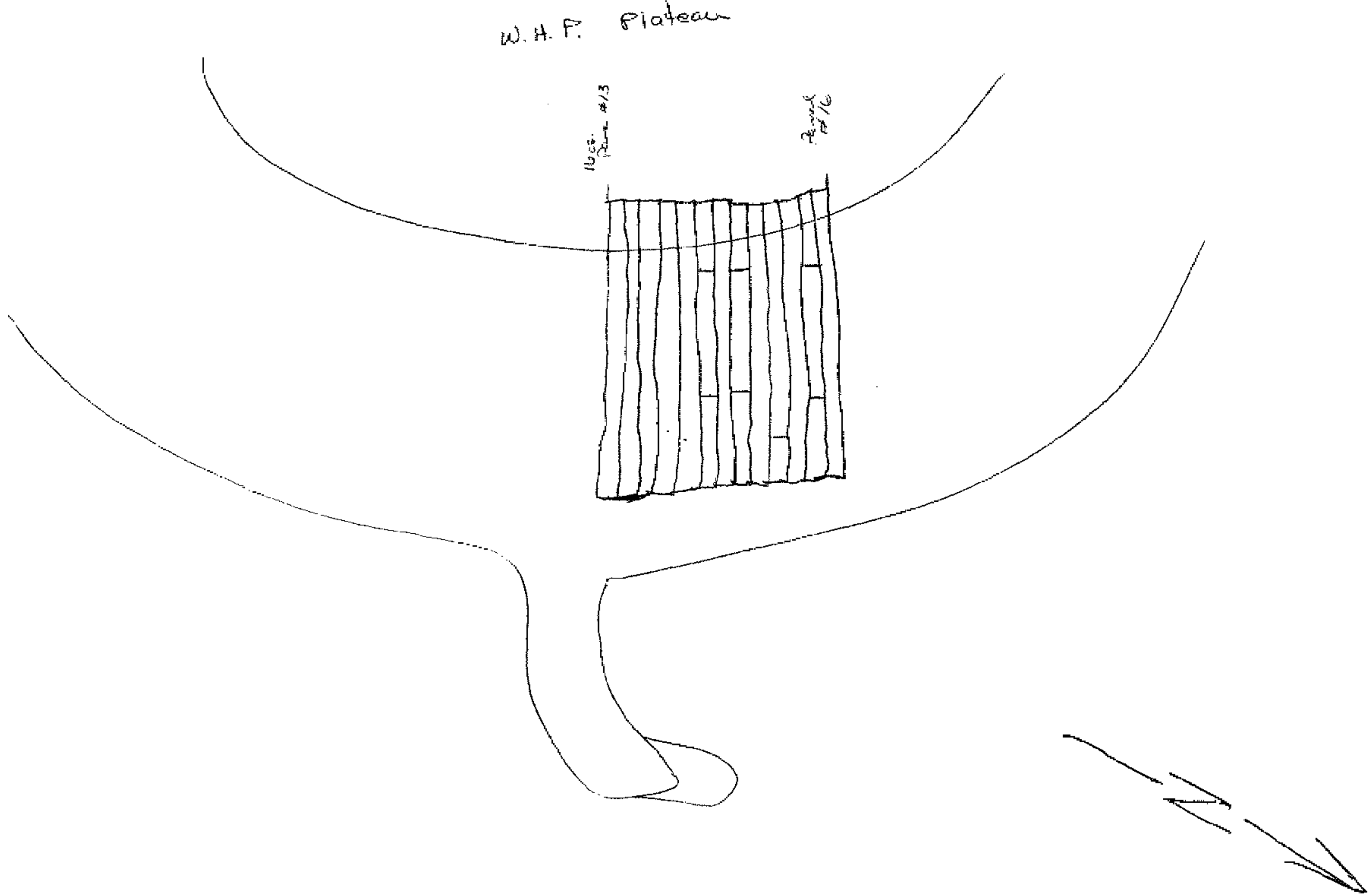
PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT ✓ Acceptable ____ Unacceptable

DAMAGE/REPAIR INSPECTION

Mike Tanner 9/21/94
CWM/RUST QC Officer Date

Anthony G. Crespi 9/21/94
QA Inspector Date

REV 09/94


W.H.F. Plateau

GEOGRID
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET ___ OF ___

PROPERTY W.H.R. LOCATION SEE COMMENTS & SKETCH

MATERIAL INSPECTION

VISUAL INSPECTION ✓ Acceptable ___ Unacceptable

-Comments: THE ENTIRE SLOPE COVERED WITH GEOTEXTILE AND GEOCOMPOSITE REQUIRED GEO-GRID.

ROLL NUMBERS USED 57 Panels to cover from GEOTEXTILE PANEL 44 to 57.
170, 43, 45, 171, 39, 51, 168, 84, 38, 50, 35, 181, 54, 175, 176, 41, 164, 48, 40, 174, 49, 160, 53, 36, 172, 46
Roll #'s supplied by contractor. (Geocomposite T-13 to T-47 covered)

ORIENTATION

-Placed on slope along the machine direction ✓ Acceptable ___ Unacceptable

SEAM INSPECTION

Adjacent -NO OVERLAP REQUIRED
Ends-OVERLAP 12 INCHES WITH HDPE BAR. AT LEAST 20 FEET OF SEPARATION BETWEEN JOINTS IN ADJACENT ROLLS. ✓ Acceptable ___ Unacceptable

GEOGRID SECURED EVERY 6-FEET ✓ Acceptable ___ Unacceptable
-Plastic Ties

PANEL INSTALLATION SKETCH

No Panel lay out Submitted.

-See reverse side of this sheet.
-Extend a distance of 10' beyond the crest. ✓ Acceptable ___ Unacceptable

-Anchored at the crest before placing cover on the slope. ✓ Acceptable ___ Unacceptable

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT

✓ Acceptable ___ Unacceptable

DAMAGE/REPAIR INSPECTION

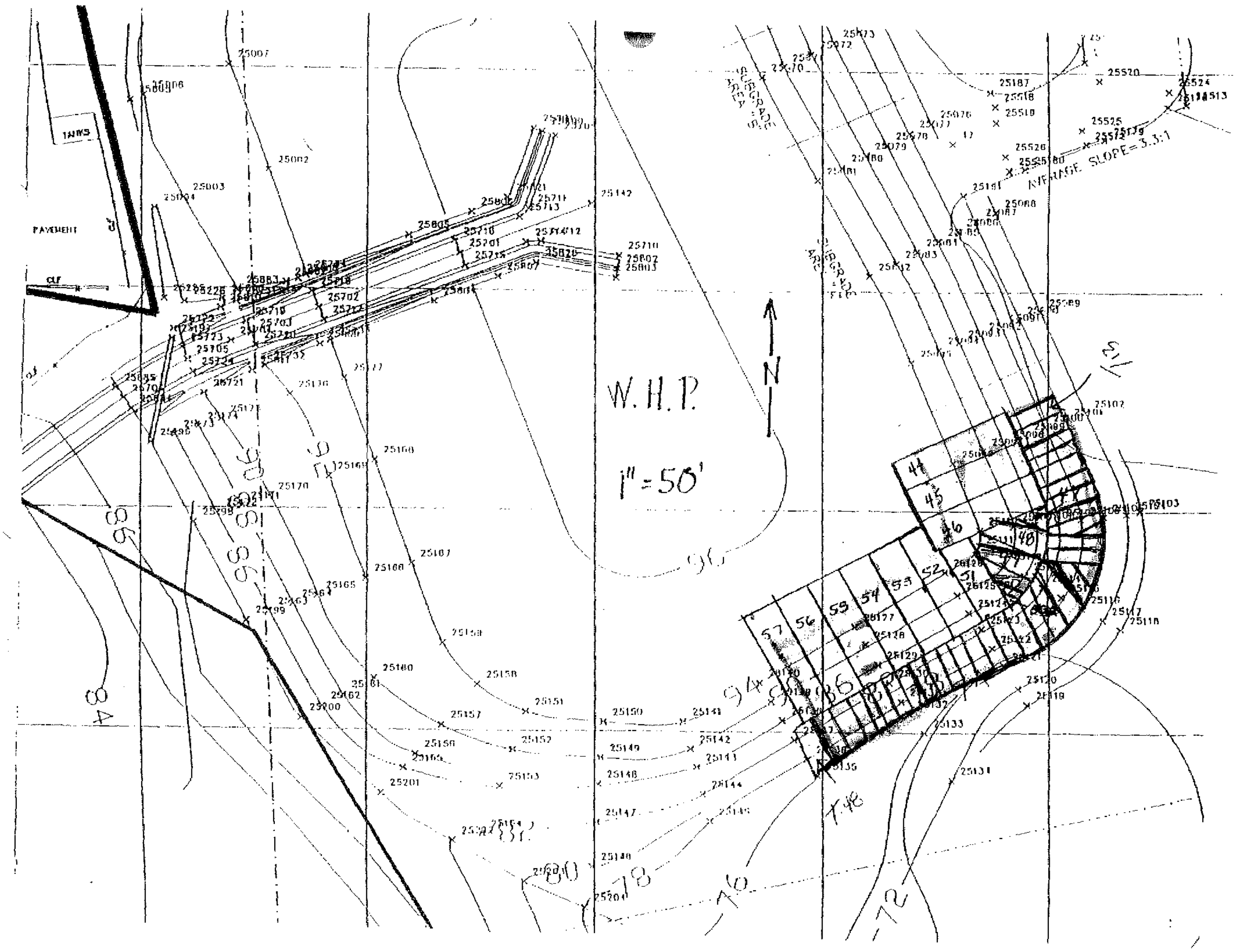
Mike Tanner
CWM/RUST QC Officer

10/17/94
Date

Alfred A. [illegible]
QA Inspector

10/18/94
Date

REV 09/94


W.H.P.
1" = 50'
N
AVERAGE SLOPE=3.3:1
PAVEMENT
TANKS

GEOGRID
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY W H P LOCATION SEE SKETCH

MATERIAL INSPECTION

VISUAL INSPECTION ✓ Acceptable ____ Unacceptable
-Comments:

ROLL NUMBERS USED
① Roll #s supplied by foreman
158, 131, 44, 163, 129, 137, 165, 135

ORIENTATION

-Placed on slope along the machine direction ~~153~~ ✓ Acceptable ____ Unacceptable

SEAM INSPECTION

Adjacent -NO OVERLAP REQUIRED
Ends-OVERLAP 12 INCHES WITH HDPE BAR. AT LEAST 20 FEET OF SEPARATION BETWEEN JOINTS IN ADJACENT ROLLS. ✓ Acceptable ____ Unacceptable

GEOGRID SECURED EVERY 6-FEET ✓ Acceptable ____ Unacceptable
-Plastic Ties

PANEL INSTALLATION SKETCH

-See reverse side of this sheet.
-Extend a distance of 10' beyond the crest. ✓ Acceptable ____ Unacceptable

-Anchored at the crest before placing cover on the slope. ✓ Acceptable ____ Unacceptable

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT

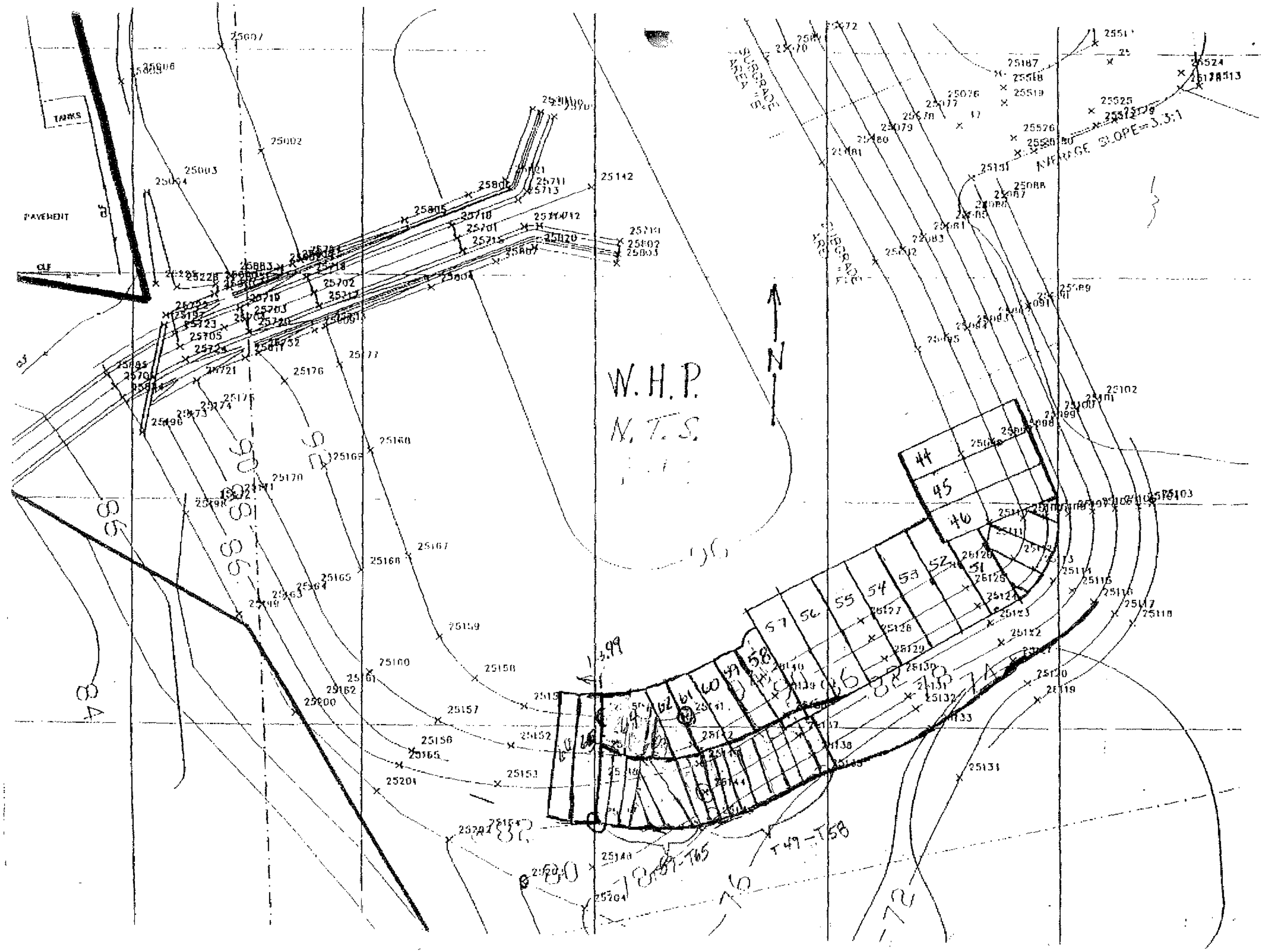
N/A Acceptable ____ Unacceptable
① No Panel Layout submitted

DAMAGE/REPAIR INSPECTION

Mike Tanner 10/19/94
CWM/RUST QC Officer Date

Alfred A. Tony 10/20/94
QA Inspector Date

REV 09/94


W.H.P.
N.T.S.
N
TANKS
PAVEMENT
SUBGRADE AREA
AVERAGE SLOPE=3.3:1
T49-T58

GEOGRID
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET OF

PROPERTY W.H.R.

LOCATION SEE COMMENTS & SKETCH

MATERIAL INSPECTION

VISUAL INSPECTION ✓ Acceptable ___ Unacceptable

-Comments: THE ENTIRE SLOPE COVERED WITH GEOTEXTILE AND GEOCOMPOSITE REQUIRED GEO-GRID.

ROLL NUMBERS USED 57 panels to cover from GEOTEXTILE PANEL 44 to 57.
170, 43, 45, 171, 39, 51, 168, 84, 38, 50, 35, 181, 54, 175, 176, 41, 164, 48, 40, 174, 49, 160, 53, 36, 172, 46
9 Roll #'s supplied by contractor. (Geocomposite T-13 to T-47 covered)

ORIENTATION

-Placed on slope along the machine direction ✓ Acceptable ___ Unacceptable

SEAM INSPECTION

Adjacent -NO OVERLAP REQUIRED
Ends-OVERLAP 12 INCHES WITH HDPE BAR. AT LEAST 20 FEET OF SEPARATION BETWEEN JOINTS IN ADJACENT ROLLS. ✓ Acceptable ___ Unacceptable

GEOGRID SECURED EVERY 6-FEET
-Plastic Ties ✓ Acceptable ___ Unacceptable

PANEL INSTALLATION SKETCH No Panel lay out submitted

-See reverse side of this sheet.

-Extend a distance of 10' beyond the crest. ✓ Acceptable ___ Unacceptable

-Anchored at the crest before placing cover on the slope. ✓ Acceptable ___ Unacceptable

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT ✓ Acceptable ___ Unacceptable

DAMAGE/REPAIR INSPECTION

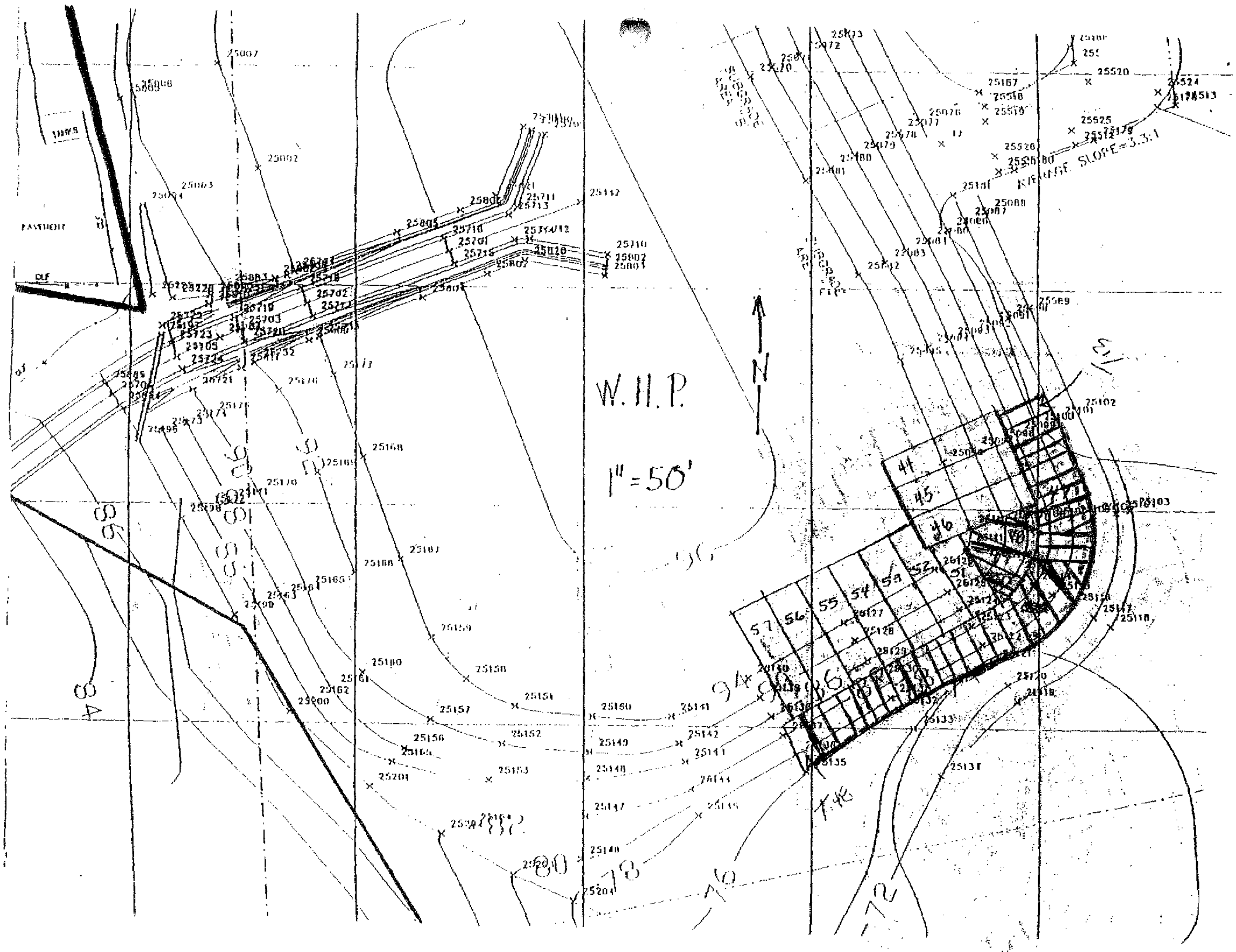
Mike Tanner
CWM/RUST QC Officer

10/17/94
Date

[signature]
QA Inspector

10/18/94
Date

REV 09/94


W.H.P.
1" = 50'
N

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY W H P   LOCATION SEE SKETCH

WEATHER INSPECTION (WINDY?)
If yes, were sand bags used? ___ Yes ✓ No

SUBGRADE INSPECTION
HDPE SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION
VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
-Comments:

ROLL NUMBERS USED ZK04009B7, ZK04010B7

SEAM INSPECTION
MINIMUM 4-INCH OVERLAP ✓ Acceptable ___ Unacceptable

GEONET SECURED EVERY 5-FEET ✓ Acceptable ___ Unacceptable
-Plastic Ties

UPPER SEWN GEOTEXTILE SEAM ✓ Acceptable ___ Unacceptable

PANEL INSTALLATION SKETCH
-See reverse side of this sheet.

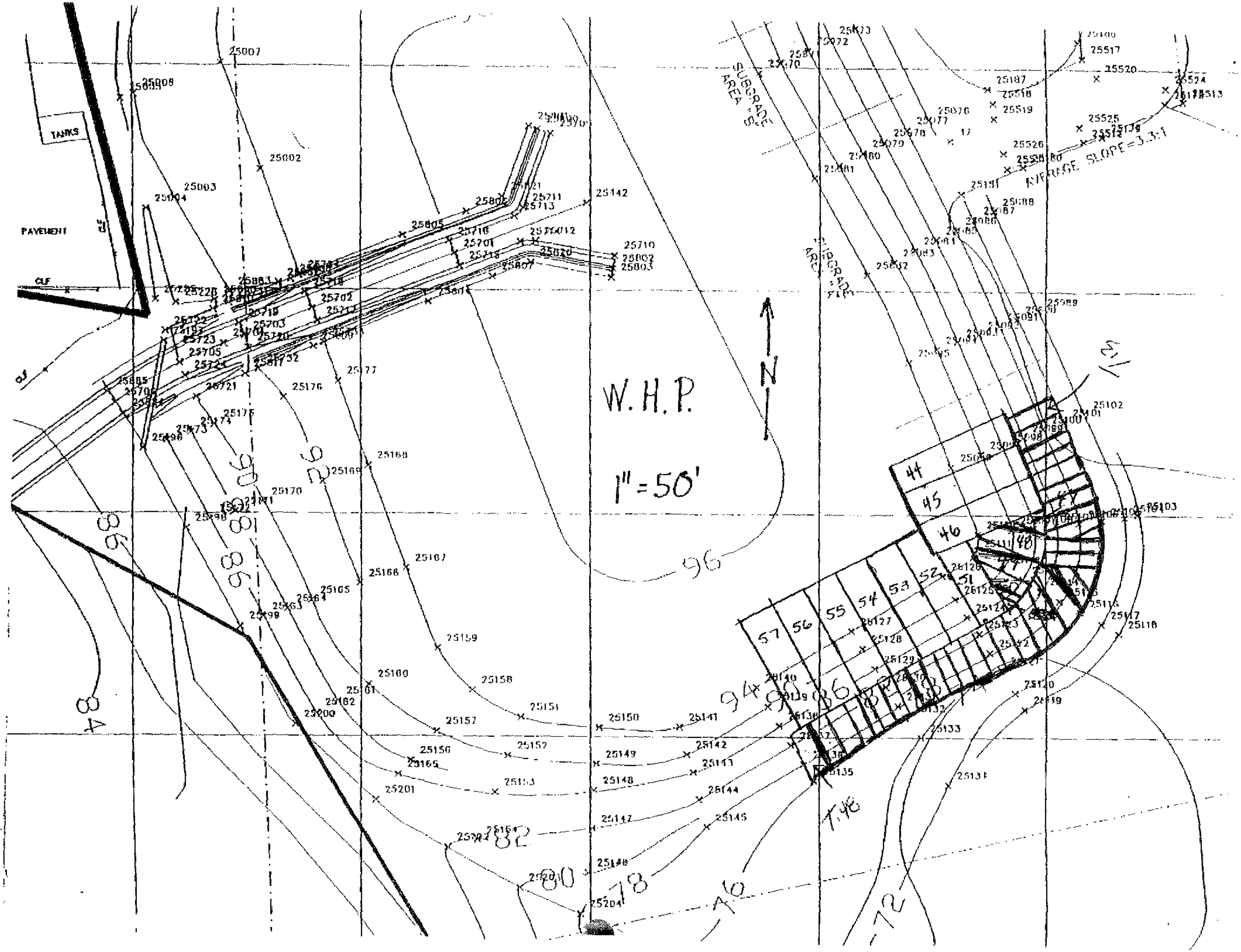
PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT ✓ Acceptable ___ Unacceptable
* See Back Sketch

DAMAGE/REPAIR INSPECTION
* Thermal Bonding was used on some seams

Mike Tanner
CWM/RUST QC Officer   10/17/94 Date

[signature]
QA Inspector   10/18/94 Date

REV 04/94



W.H.P.
1" = 50'
N
TANKS
PAVEMENT
AVERAGE SLOPE=3.3:1
SUBGRADE AREA
96
94
92
90
88
86
84
82
80
78
76
72
44
45
46
47
48
49
50
51
52
53
54
55
56
57

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET OF

PROPERTY W.H.P LOCATION SEE Sketch

WEATHER INSPECTION (WINDY?)
If yes, were sand bags used? ✓ Yes ___ No

SUBGRADE INSPECTION
HDPE SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION
VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
-Comments:

ROLL NUMBERS USED ZK020C9B7, ZK0210B7, ZK11005B7

SEAM INSPECTION
MINIMUM 4-INCH OVERLAP ✓ Acceptable ___ Unacceptable

GEONET SECURED EVERY 5-FEET ✓ Acceptable ___ Unacceptable
-Plastic Ties

UPPER SEWN GEOTEXTILE SEAM ✓ Acceptable ___ Unacceptable

PANEL INSTALLATION SKETCH
-See reverse side of this sheet.

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT ✓ Acceptable ___ Unacceptable

DAMAGE/REPAIR INSPECTION

Mike Tanner
CWM/RUST QC Officer

10-03-94
Date

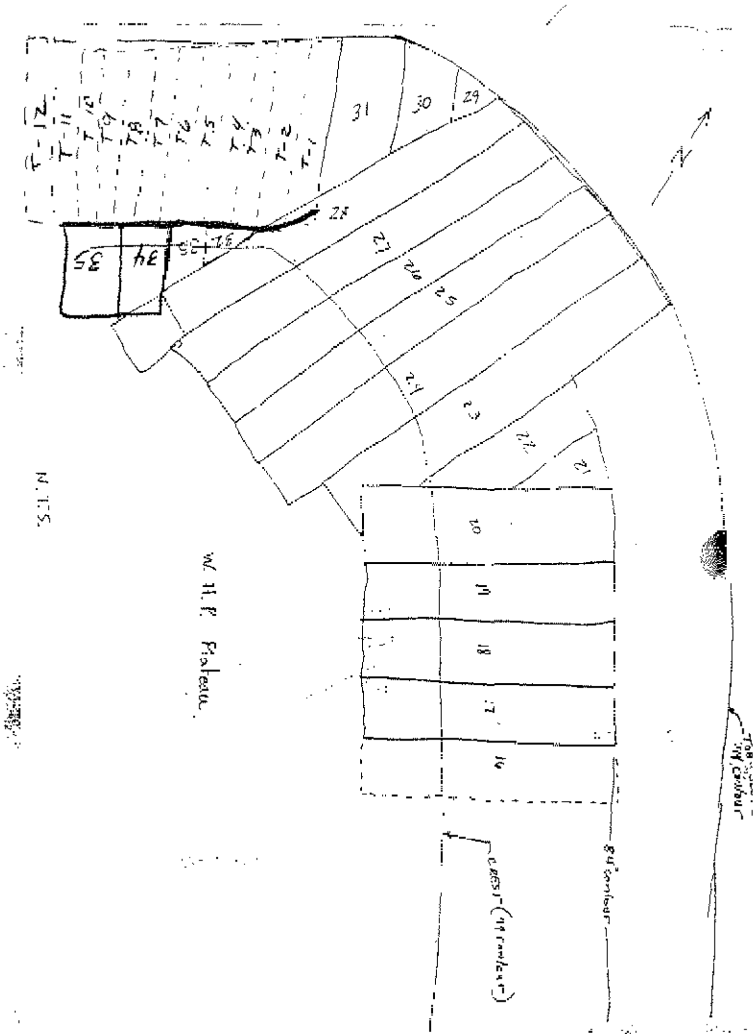
[signature]
QA Inspector

10-03-94
Date

REV 04/94

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH



COMMENTS

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PROPERTY W.H.P.

LOCATION N.E. Slope
SEE SKETCH

WEATHER INSPECTION (WINDY?)
If yes, were sand bags used? Yes — ✓ Yes ___ No

SUBGRADE INSPECTION
HDPE SUBGRADE INSPECTED — ✓ Acceptable ___ Unacceptable

MATERIAL INSPECTION
VISUAL INSPECTION — ✓ Acceptable ___ Unacceptable
-Comments:

ROLL NUMBERS USED ZKOZ00[illegible]B7, ZKOZ009B7

SEAM INSPECTION
MINIMUM 4-INCH OVERLAP — ✓ Acceptable ___ Unacceptable

GEONET SECURED EVERY 5-FEET — ✓ Acceptable ___ Unacceptable
-Plastic Ties

UPPER SEWN GEOTEXTILE SEAM — ✓ Acceptable ___ Unacceptable

PANEL INSTALLATION SKETCH
-See reverse side of this sheet.

PANEL INSTALLATION CONFORMS
TO SUBMITTED DESIGN LAYOUT — ✓ Acceptable ___ Unacceptable
No geocomposite design layout submitted. It does follow the geotextile layout.

DAMAGE/REPAIR INSPECTION

CWM/RUST QC Officer — Date 09/30/94

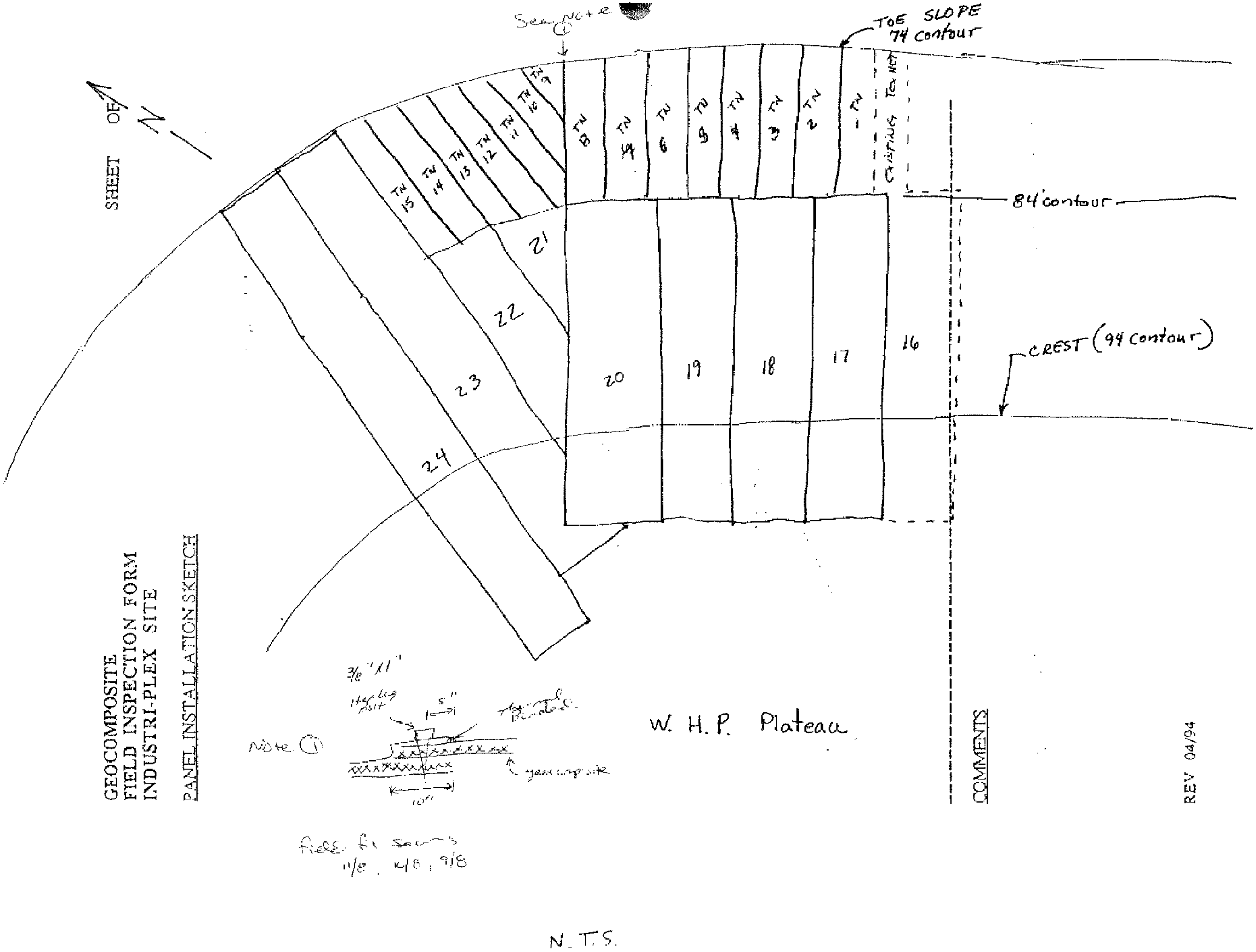
QA Inspector — Date 09/30/94

REV 04/94

SHEET OF

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

PANEL INSTALLATION SKETCH



COMMENTS

REV 04/94

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 1

PROPERTY W.H.P. LOCATION East Slope

WEATHER INSPECTION (~~WINDY?~~)

If yes, were sand bags used? ____Yes ✓ No

SUBGRADE INSPECTION

HDPE SUBGRADE INSPECTED ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION

VISUAL INSPECTION ✓ Acceptable ____ Unacceptable

-Comments: ~~Done seam~~ ~~opened~~
tie-in to perviously deployed tex-net was inspected.

ROLL NUMBERS USED ZK11011B7

SEAM INSPECTION

MINIMUM 4-INCH OVERLAP ✓ Acceptable ____ Unacceptable

GEONET SECURED EVERY 5-FEET ✓ Acceptable ____ Unacceptable
-Plastic Ties

UPPER SEWN GEOTEXTILE SEAM ✓ Acceptable ____ Unacceptable

PANEL INSTALLATION SKETCH

-See reverse side of this sheet.

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT

✓ Acceptable ____Unacceptable

DAMAGE/REPAIR INSPECTION

Mike Tamm[illegible]
CWM/RUST QC Officer 9/16/94 Date

Anthony E. C[illegible]
QA Inspector 09/16/94 Date

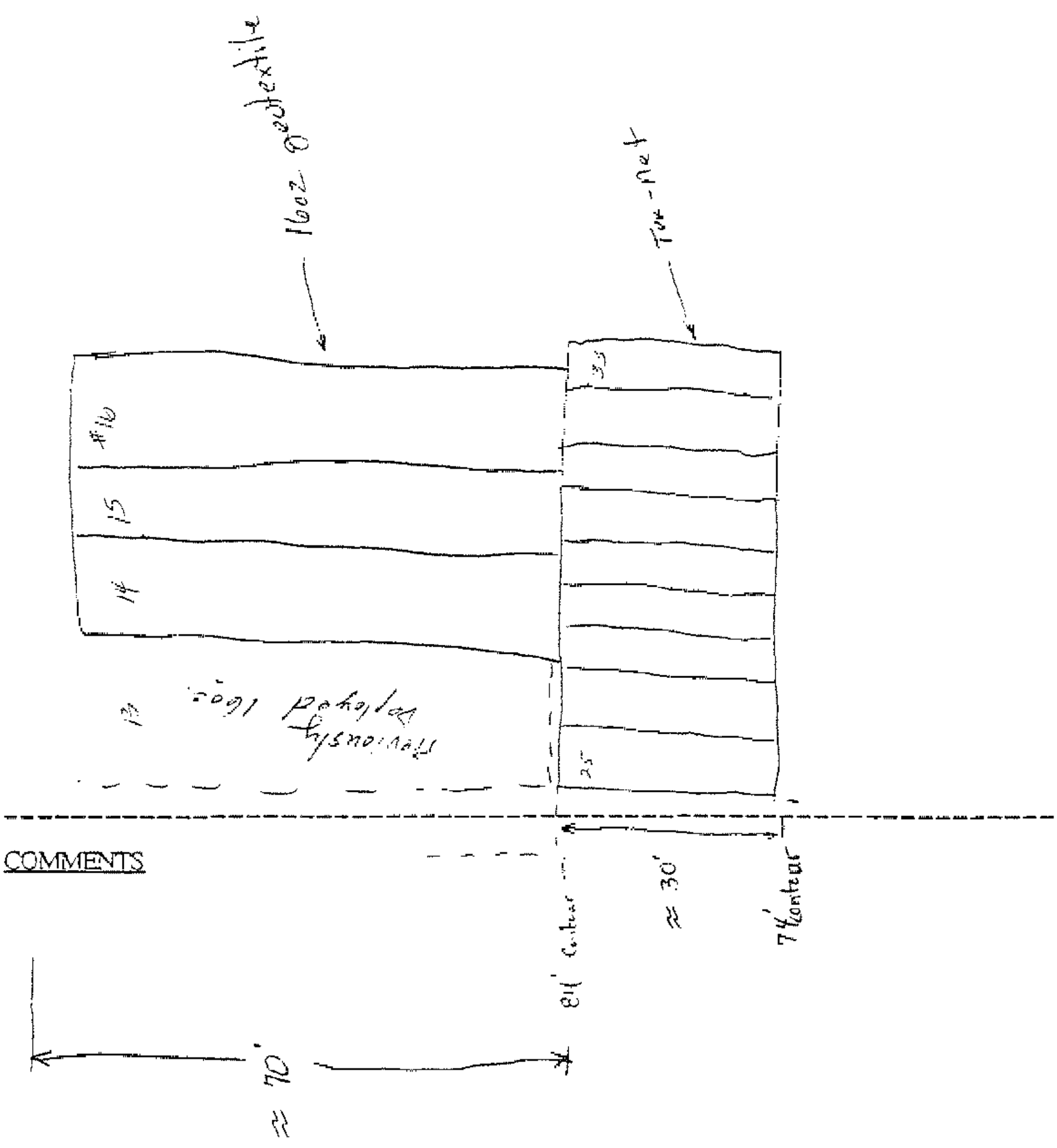
REV 04/94

WAP - EASTERN SLOPE

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET OF

PANEL INSTALLATION SKETCH



COMMENTS

REV 04/94

RUST ENVIRONMENT & INFRASTRUCTURE

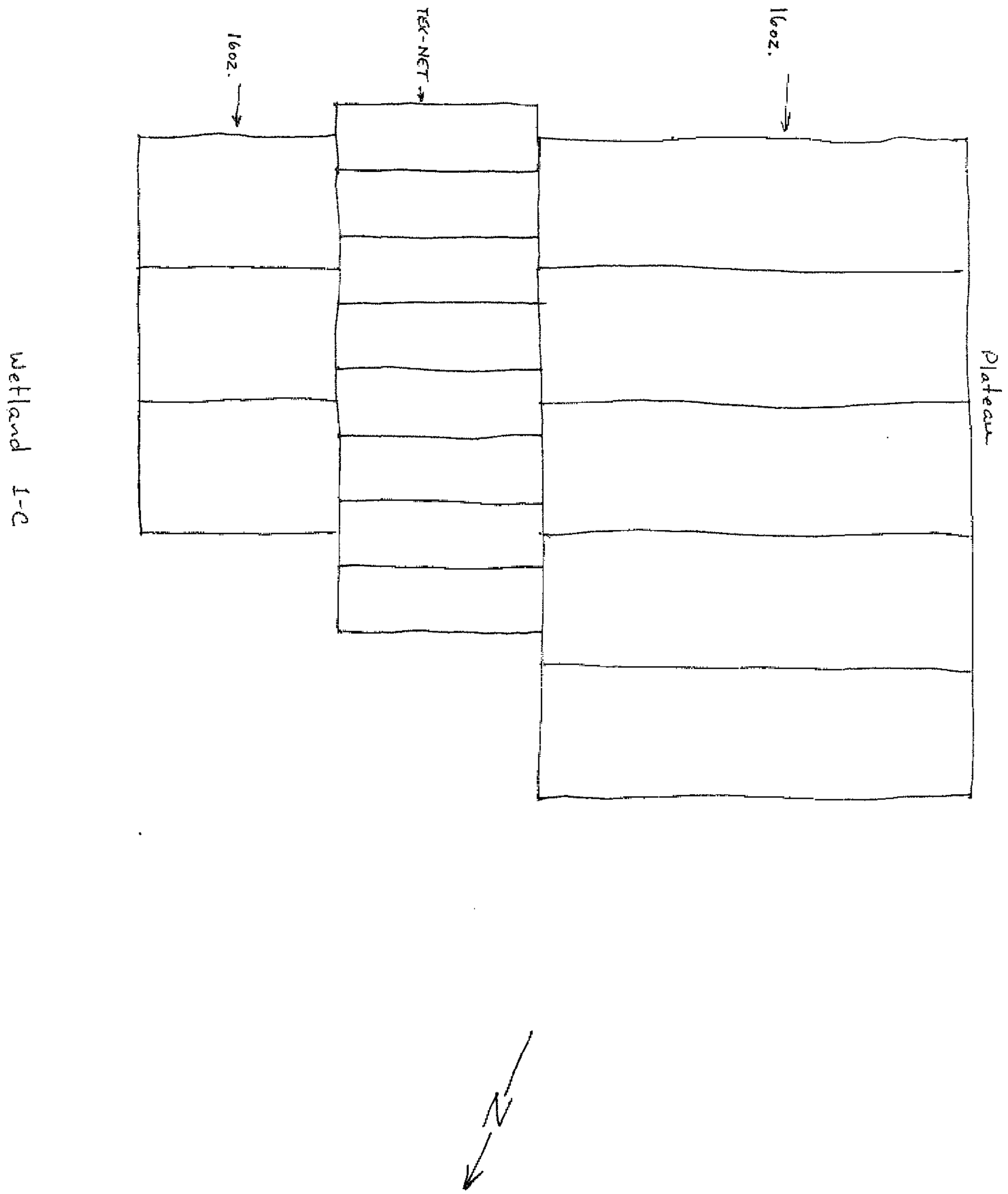
CALCULATION SHEET

PAGE 1 OF ___
PROJECT NO. 38012.050

CLIENT Rust Remedial
PROJECT West Hide Pile
Eastern Slope

SUBJECT Geosynthetic
Panel layout.

Prepared By MT Date 9-7-94
Reviewed By ___ Date ___
Approved By ___ Date ___



GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF

PROPERTY W.H.P. LOCATION EAST SLOPE

WEATHER INSPECTION (~~WINDY?~~)
If yes, were sand bags used? ____Yes ✓ No

SUBGRADE INSPECTION
HDPE SUBGRADE INSPECTED ✓ Acceptable ____ Unacceptable

MATERIAL INSPECTION
VISUAL INSPECTION ✓ Acceptable ____ Unacceptable
-Comments:

ROLL NUMBERS USED ~~023100547~~ ZK11009B7

SEAM INSPECTION
MINIMUM 4-INCH OVERLAP ✓ Acceptable ____ Unacceptable

GEONET SECURED EVERY 5-FEET ✓ Acceptable ____ Unacceptable
-Plastic Ties

UPPER SEWN GEOTEXTILE SEAM ✓ Acceptable ____ Unacceptable

PANEL INSTALLATION SKETCH
-See reverse side of this sheet.

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT ✓ Acceptable ____ Unacceptable

DAMAGE/REPAIR INSPECTION

Mike Jame[signature] 09-07-94
CWM/RUST QC Officer Date

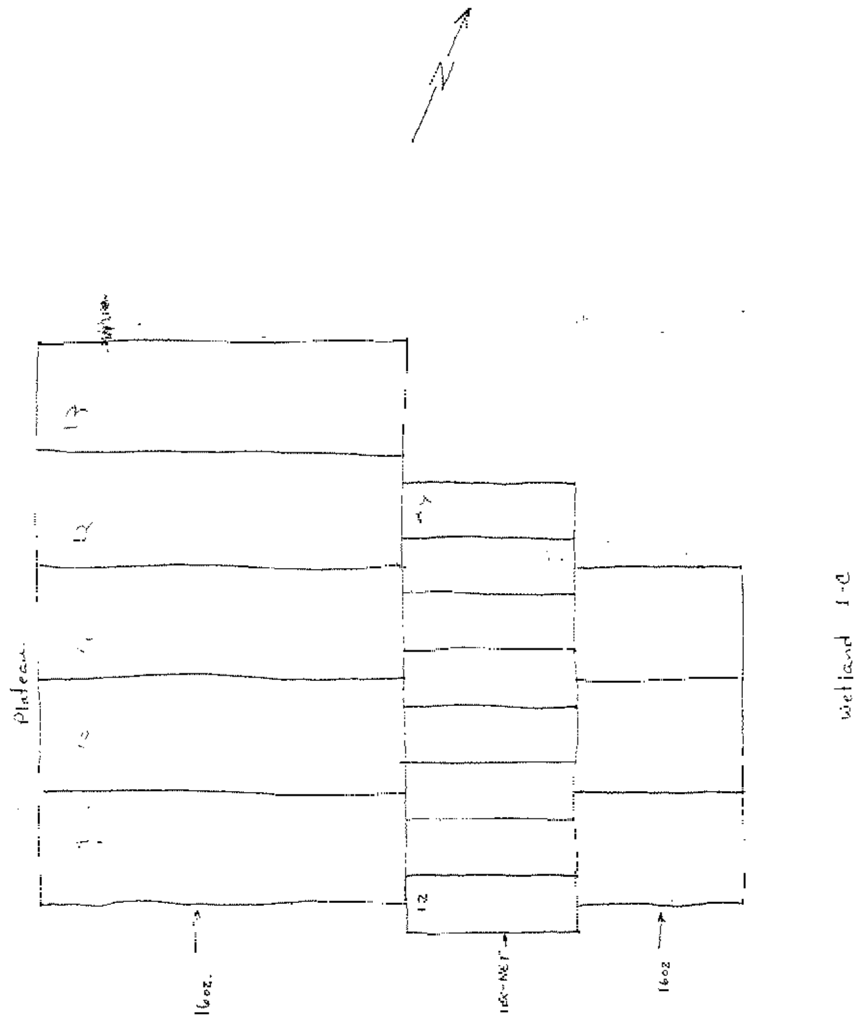
Anthony P [signature] 09-07-94
QA Inspector Date

REV 04/94

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET OF

PANEL INSTALLATION SKETCH



COMMENTS

REV 04/94

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET 1 OF 2

PROPERTY WEST HIDE PILE LOCATION EAST SlOPE

WEATHER INSPECTION (WINDY?)
If yes, were sand bags used? ✓ Yes ___ No

SUBGRADE INSPECTION
~~HDPE~~ SUBGRADE INSPECTED ✓ Acceptable ___ Unacceptable
Placed on fill.

MATERIAL INSPECTION
VISUAL INSPECTION ✓ Acceptable ___ Unacceptable
-Comments:

ROLL NUMBERS USED 0231 02405, 023106547

SEAM INSPECTION
MINIMUM 4-INCH OVERLAP ✓ Acceptable ___ Unacceptable

GEONET SECURED EVERY 5-FEET ✓ Acceptable ___ Unacceptable
-Plastic Ties

UPPER SEWN GEOTEXTILE SEAM ✓ Acceptable ___ Unacceptable

PANEL INSTALLATION SKETCH
-See reverse side of this sheet.

PANEL INSTALLATION CONFORMS TO SUBMITTED DESIGN LAYOUT ✓ Acceptable ___ Unacceptable

DAMAGE/REPAIR INSPECTION
NONE

Mike Tanner
CWM/RUST QC Officer

09-06-94
Date

[signature]
QA Inspector

09/06/94
Date

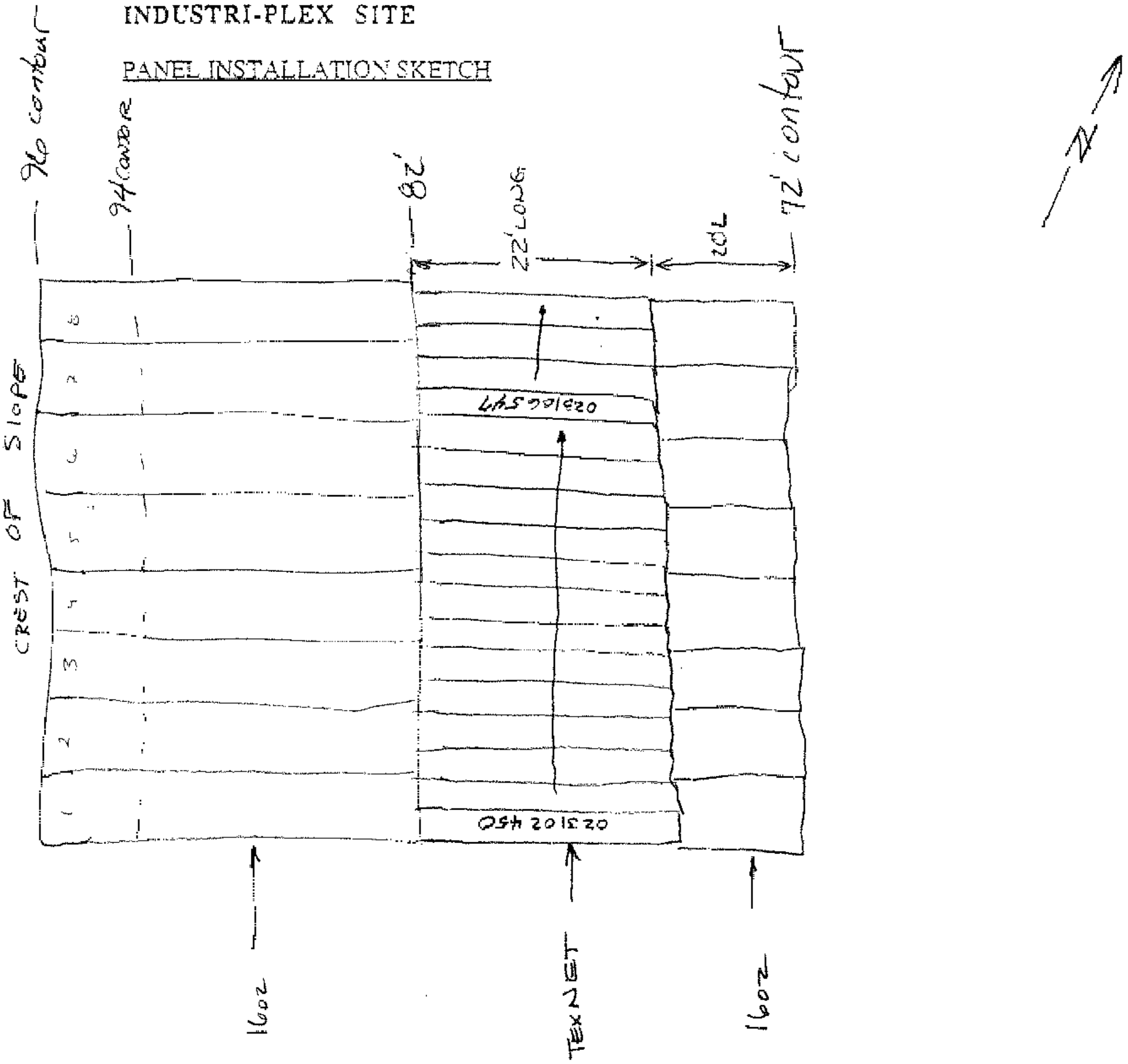
Placed on the 09/03/94

REV 04/94

GEOCOMPOSITE
FIELD INSPECTION FORM
INDUSTRI-PLEX SITE

SHEET OF

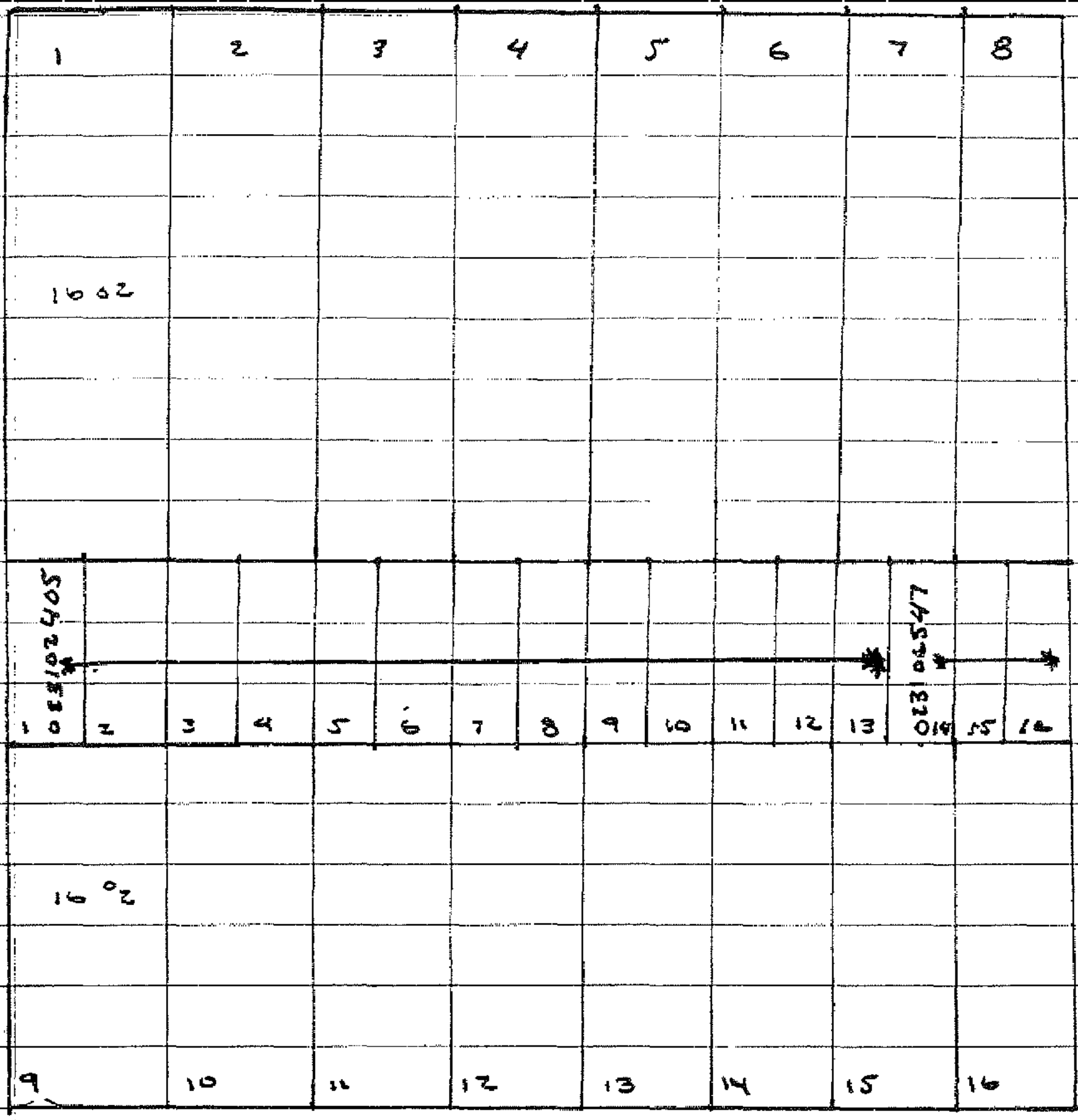
PANEL INSTALLATION SKETCH



COMMENTS

REV 04/94

WEST HIDE PILE SEPT 2 1994



1-3 = Roll # 035981 16 oz GEO

4-6 = Roll # 031917 16 oz GEO

7-8 = Roll # 035971 16 oz GEO

1-13 = 023102405 comp

4-16 = 023106547 comp

APPENDIX I.5

Concrete Testing

[Not Applicable To This Property]

APPENDIX I.6

HDPE Pipe Pressure Test Summary

VAULT PRESSURE TEST SUMMARY

Pipe Sections Between Vaults	4-3 PSI	3-2 PSI	2-1 PSI	1-0 PSI	Total Minutes	Date
#1 to TOU BLD. 2 Hours, OK					2 hours	5/31/95
#2 - #1	2	4	7	15	28	5/31/95
#3 - #2	1.5	4	6.5	14	26	5/31/95
#4 - #3	but was to retested for gradient.				<2 hours	5/31/95
#5 - #4	2	4.5	8	13	27.5	6/12/95
#6 - #5	2.5	5	8,5	12.5	28.5	5/23/95
#7 - #6	2	5	8	13	28	5/23/95
#8 - #7	2 hours, Ok				2 hours	5/23/95
#9 - #8	2.5	5	8.5	12	28	6/12/95

Date of Report 6/12/95

APPENDIX I.7

East Central Hide Pile Amendment

[Not Applicable To This Property]

APPENDIX J

Created Wetland Cover System/
Final Vegetation Establishment and Soil Stabilization Plan

APPENDIX J.1

Hydraulic Conductivity Testing Summary

[Not Applicable To This Property]

APPENDIX J.2

Coastal Environmental Services, Inc. As-built

Attachment 1

AS-BUILT DESCRIPTION OF WETLAND PLANTING

INDUSTRI-PLEX

WOBURN, MASSACHUSETTS

PREPARED FOR:

RUST REMEDIAL SERVICES, INC.
41 ATLANTIC AVENUE
WOBURN, MASSACHUSETTS 01801

PREPARED BY:

COASTAL ENVIRONMENTAL SERVICES, INC.
2 RESEARCH WAY
PRINCETON, NEW JERSEY 08540

PROJECT NO. 95-405-17

6 JUNE 1996

AS-BUILT DESCRIPTION OF WETLAND PLANTING

INDUSTRI-PLEX

WOBURN, MASSACHUSETTS

PREPARED FOR:

RUST REMEDIAL SERVICES, INC.
41 ATLANTIC AVENUE
WOBURN, MASSACHUSETTS 01801

PREPARED BY:

COASTAL ENVIRONMENTAL SERVICES, INC.
2 RESEARCH WAY
PRINCETON, NEW JERSEY 08540

PROJECT NO. 95-405-17

6 JUNE 1996

TABLE OF CONTENTS

APPENDICES

gallagher22/fplex

As-Built Description of Wetland Planting
Industri-Plex

Woburn, Massachusetts

1.0 INTRODUCTION

Coastal Environmental Services, Inc. (Coastal) managed the implementation of Section 02937, Wetland Mitigation of the Work Plan for the Remediation of the Industri-Plex site. The implementation of this task was performed jointly with OHM (formerly Rust Remedial Services, Inc.). The scope of this project was based on Section 02937, Wetland Mitigation, prepared by Normandeau Associates, Inc. The version of Section 02937 on which Coastal Environmental Services, Inc. based its planting effort was developed during the pre-proposal meeting of March 1995. The revised scope developed at that time provided the exact numbers of each species to be planted within each designated planting type (See Appendix I). This meeting also resulted in a substantially reduced scope for the supplemental planting area and the incorporation of goose control measures into the revegetation of Wetland 1C.

This report will discuss the steps taken to implement this wetland mitigation project. The report will also describe modifications to the mitigation plan that occurred during the course of this project. Table 1 provides the dates that the planting of each area began and the current project status. Information relevant to this project are provided in the Appendices.

2.0 PLANT MATERIAL AND SEED

Based on the March 1995 revisions to Section 02937, Coastal began making arrangements with regional nurseries to provide 5,886 trees/shrubs and 11,000 herbaceous plants. However, due to the relatively late timing for the order and the quantity of material required, the nurseries had difficulty in obtaining all of the plant material specified. Following the March meeting, Coastal requested minor modifications to the plant list so that the project could commence immediately. Most of the changes were associated with the Drainway Banks plant list (please see Letter in Appendix II). These changes increased the number of species that would be utilized for the drainways and added species suitable for the drier portions of the drainways. Coastal also requested changes to the Shallow Marsh-Seasonally Flooded (SM-SF) plant list. The changes requested at that time focused on increasing the species diversity of the Shallow Marsh-Seasonally Flooded wetland planting areas. A listing of the material initially ordered is provided in Appendix III. The plant material was obtained from the following nurseries:

Bigelow Nurseries	Bestmann Green Systems	Pierson Nurseries, Inc.
P.O. Box 718	53 Mason Street	24 Buzzell Road
Northborough, MA 01532	Salem, MA 01970	Biddeford, ME 04005

Table 1

Initial Plant Installation Dates

and Status of Each Mitigation Site

Location	Dates Initiated	Completion Status
New Boston St. Drainway	5/95	Complete
Atlantic Avenue Drainway	11/95	Incomplete
Enhanced Wetland	9/95	Complete
Created Wetland	9/95	Complete
Revitalization Area (1C)	9/95	Complete
3A Wetland Restoration	9/95	Complete
Supplemental Planting Area	5/17/95	Complete

Additional modifications to the mitigation plan were made over the course of the project. These changes were typically necessitated by design modifications associated with site remediation. These modifications and how they affected the planting effort at each mitigation area as described in Section 3.0 (Plan Implementation). Due to design modifications to the easternmost portion of Wetland 1C Revitalization Area, a modified list of herbaceous vegetation is provided in Appendix IV. Copies of the invoices indicating the type and quantity of the plant material ordered from each nursery are provided in Appendix V.

3.0 PLAN IMPLEMENTATION

Descriptions of the revegetation effort for each of the following mitigation areas will be provided in this section: New Boston Street Drainway, Supplemental Planting Area, Created Wetland, Wetland 1C Enhancement Area, Wetland 1C Revitalization Areas, Wetland 3A, Aberjona Drainway and Atlantic Avenue Drainway. The installation of plant material was performed immediately upon completion of topsoil placement in each of the mitigation areas. Since planting was the final step in the remediation process, the planting schedule closely reflected the completion dates of remedial activities in each of the mitigation areas. The first areas to be planted were the New Boston Street Drainway and the supplemental planting area. The planting of the Wetland 1C Enhancement Area, Wetland 1C Revitalization Areas, the Aberjona Drainway, and the Created Wetland and Wetland 3A were initiated in September 1995.

3.1 New Boston Street Drainway

The planting of the New Boston Street Drainways was initiated on 12 May 1995. As of 6 June 1995, over eight hundred shrubs had been installed in the drainway planters. The shrubs planted included the following: rugose rose (*Rosa rugosa*), gray dogwood (*Cornus racemosa*), sweet pepperbush (*Clethra alnifolia*), maple-leaved viburnum (*Viburnum acerifolium*), hazelnut (*Corylus americana*) and nannyberry (*Viburnum lentago*). The majority of the plants consisted of pepperbush, rugose rose and gray dogwood. The drainways were planted with a mix of all of the species. In selected areas, however, the plantings favored certain species due to site conditions. For example, pepperbush was planted more heavily in the wettest segments of the drainway and rugose rose was preferentially planted in the drainway planters adjacent to Kaknes Wood Products due to the greater potential for water stress in this area. Drier conditions are anticipated in the area adjacent to Kaknes Wood Products due to the proximity of pavement and the Jersey barriers.

An additional 50 plants, all pepperbush, remain to be planted in this area. These plants were back-ordered and were delivered to the site on 22 May 1995. In addition, a small segment of the drainway south of Kaknes Wood Products was not planted during the initial planting period since maintenance work required in this area was not completed. The area was planted on 31 May 1995. The eastern part of this planter was planted in a single row and the plants spaced four feet apart. This deviation from the specification was done as a result of the placement of rip-rap along the adjacent portions to control erosion.

One slow release fertilizer tablet was placed in each planting hold throughout this project. All of the plants were mulched with hemlock bark mulch upon completion of the installation. On 19 May 1995 it was observed that two plants had been stolen from the New Boston Street side of the drainway in front of Kaknes Wood Products. These plants, probably roses, were replaced with gray dogwood later that same day. The planting holes left after the plants were removed were photographed to document this act of vandalism (Appendix VI). No further vandalism was observed.

Subsequent to the completion of shrub installation and prior to mulching, those portions of the planters in which the grass was disturbed during the planting effort were seeded and the seed lightly raked into the soil. The areas were seeded with a mix containing winter rye, big blue stem, red top, annual rye and indian grass.

On June 24, 1995 the 140-foot long planter adjacent to the northern edge of the Kaknes Wood Products parking lot was planted with 39 shrubs. The shrubs were planted at five foot intervals in two rows. The composition of the species installed differed from that of the other drainway plantings due to the wetness of this area. The species planted were as follows: gray dogwood, winterberry (*Ilex verticillata*), silky dogwood (*Cornus amomum*) and pussy willow (*Salix discolor*).

Approximately 80 of the plants died during the summer of 1995 and were replaced the following November.

3.2 Supplemental Planting Area

The installation of woody plants in the supplemental planting area commenced on 17 May 1995. One hundred and forty six plants were installed in three locations to supplement the existing vegetation. The approximate locations of the plantings are indicated on Figure 1. The plants installed are listed in Table 2.

Prior to planting, the soil in each area was amended with either topsoil or peat moss to improve soil conditions. Additional topsoil was placed in Area 1 and the southern end of Area 3, and worked into the surface of the existing soil. Both of these areas were selected for this treatment due to the near complete absence of vascular plants. In other similar, but less accessible areas, peat moss was utilized as an amendment to improve the soils. Peat moss was utilized in those areas in which access for heavy equipment was considered to result in excessive and unnecessary damage to the existing vegetation.

Plants were installed in the areas of amended soils and in adjacent areas in which few tree or shrub species existed. The composition of the species that were planted in each of the three areas differed due to the unique environmental features of each location. The southernmost area, Area 1, was the driest of the three areas and the northernmost area, Area 3, the wettest (Figure 1). Since species such as red maple tend to be more productive in moister areas, they were planted only in Area 3. Species such as red oak (*Quercus rubra*), black cherry (*Prunus serotina*) and quaking aspen (*Populus tremuloides*) were planted in the drier environments of Areas 1 and 2.

Upon completion of the installation of woody plant material, the three areas were seeded with a mix containing winter rye, big blue stem, red top, annual rye and indian grass. The seed was lightly raked into the soil and the areas lightly mulched with hay. All of the woody plants installed in the supplemental planting area are marked with pink survey flagging.

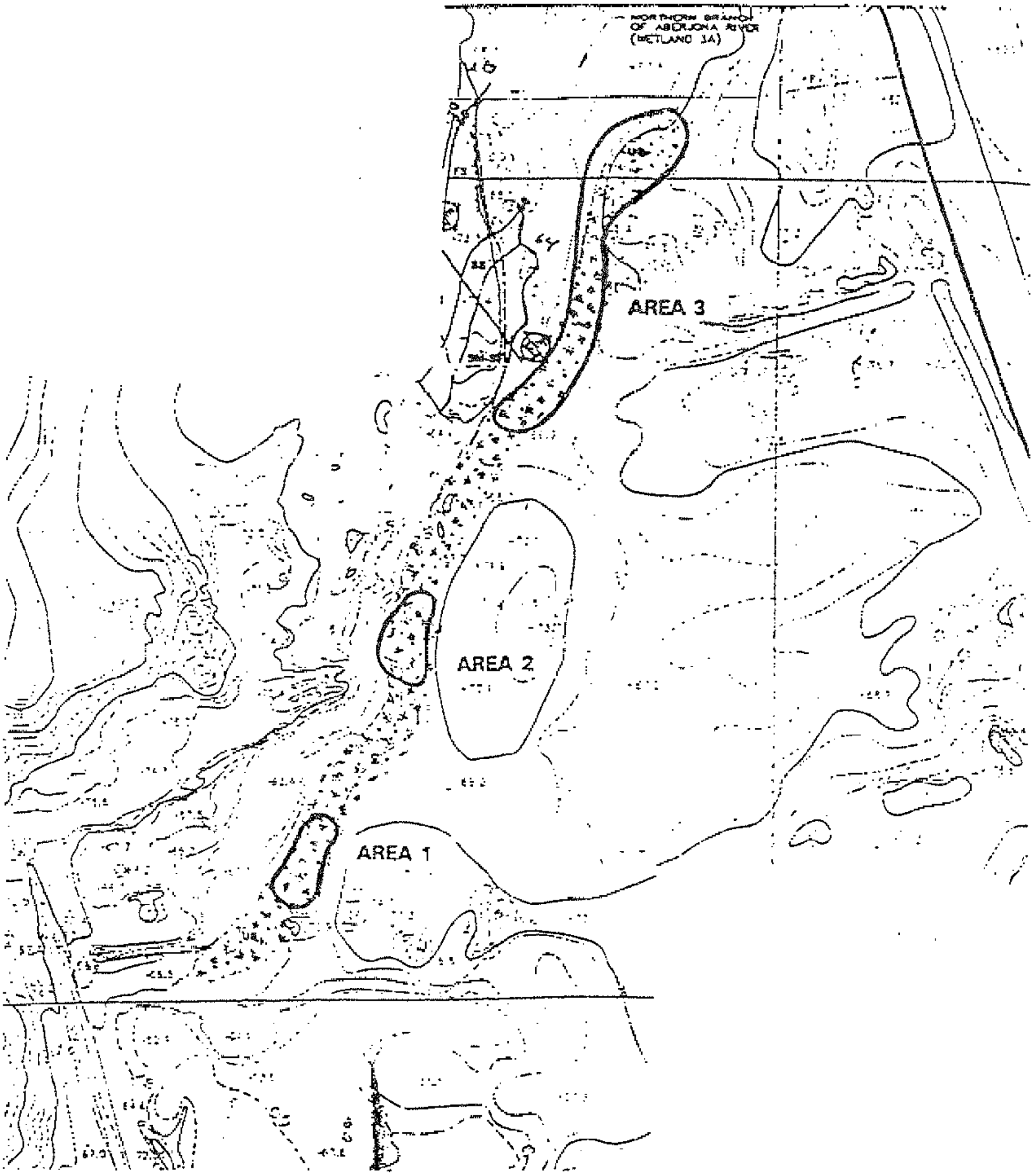


FIGURE 1
Supplemental Planting Area
Industri-Plex
Woburn, MA

N

COASTAL
ENVIRONMENTAL SERVICES INC.

Not to Scale

Table 2

Plants installed in the Supplemental Planting area.

Species Name - Common	Species Name - Scientific	Quantity
White pine	*Pinus strobus*	20
Red oak	*Quercus rubra*	20
Quaking aspen	*Populus tremula*	20
Blackcherry	*Prunus cerotina*	25
Hazelnut	*Corylus americana*	20
Gray dogwood	*Cornus racemosa*	21
Red maple	*Acer rubrum*	20
Total		**146**

3.3 Wetland 1C, Enhanced Area

The planting of the created wetland began in late September 1995. Due to the extensive area of open water associated with this mitigation site, a goose exclusion fence was constructed prior to the installation of any herbaceous plant material. The details regarding the construction of this fence are provided in Section 3.3.1.

The enhanced wetland was designed to possess the following planting zones: Deep Marsh-Open Water (DM-OW), Shallow Marsh-Semipermanently Flooded (SM-SP) and Shrub Swamp (SS). Each of these planting zones was based primarily on elevation.

For example, the Shrub Swamp was to be planted between the 71 and 71.5 foot contours. Due to the depth of water in the area designated as Deep Marsh-Open Water and the need to exclude Canada geese, this zone was established along the periphery of the site. The lower limit was established in areas where the water depth was approximately 18 inches deep. Deeper water areas within the DM-OW planting zone was not planted since smaller plant propagules tend to do poorly in deeper water, especially if it is turbid.

The major modification to this mitigation area was associated with the reduction in the area of the Shrub Swamp planting zone. The area anticipated for planting was designed to be approximately 10-15 feet wide and covered approximately 0.22 acres. The post-remediation grades were, however, steeper than designed and the planting area between the 71 and 71.5 foot contours were relatively narrow. The reduced size of the planting area made it difficult to find appropriate planting locations for all of the woody plant material. To further complicate the installation of woody plants in this area, the topsoil was not as thick as specified and the underlying gravel layer was very firm. These soil conditions made the identification of suitable planting locations and installation of woody plants in this area extremely difficult. The loss of topsoil in this area appeared to be the result of wave action since most of the shallowest areas of topsoil occurred at the edge of the inundated portion of this wetland.

In order to utilize the 355 shrubs [71 each of winterberry, pussy willow, highbush blueberry - (*Vaccinium corymbosum*), silky dogwood and arrowwood - (*Viburnum dentatum*)] designated for planting in the Created Wetland, the shrub swamp area was, upon the approval of Normandeau Associates, extended around the entire area, onto the peninsula in the northeastern portion of the area and along the ponds shoreline to the southernmost section of the Wetland 1C, Revitalization Area. Even with the expansion of the shrub swamp planting area, nearly half of the 355 shrubs designated for this area could not be planted.

The Shallow Marsh-Semipermanently Flooded was established from the water's edge to a depth of approximately 1 foot. The pickerelweed (*Pontederia cordata*) was planted in the deeper end of this planting zone, 8-12 inches deep. The smartweed (*Polygonum* sp.) was planted in the shallow water of this planting zone, 0-4 inches deep. The remaining plants were planted in the middle portion of this planting zone in water depths of 4 to 18 inches.

The Deep Marsh Open Water planting zone occurred in water 12 to, approximately, 18 inches deep. All of the plants except for soft-stemmed bulrush (*Scirpus validus*) were primarily planted in the deeper end of the planting zone.

Subsequent to completion of planting, the shoreline was seeded by hand with the wetland seed mix and the area lightly raked to incorporate the seed into the soil.

3.3.1 Goose Control

In order to protect recently planted aquatic vegetation in those areas designated as Deep Marsh-Open Water goose exclusion measures were implemented. The measures taken involved the installation of a goose exclusion fence along the limit of the planting area at a water depth of approximately two feet. The goose control fence utilized was G-Grid. G-Grid is a black polypropylene netting.

The fence was attached to wooden survey stakes placed at 10-15 foot intervals. The stakes were carefully driven into the backfill material to avoid puncturing the underlying geotextile liner. During the installation of the fence, some of the stakes were difficult to anchor firmly into the cap material due to the firmness of the gravel layer and variability in the depth of the topsoil layer. The fence was attached to the stakes so that approximately six inches of fence was underwater. In addition, a grid of survey stakes on a 10-20 foot grid was established on the landward side of this fence. A double row of twine was tied between the stakes to further deter access to the planting area by geese. Colored survey flagging was tied to the twine to clearly identify the barrier.

3.4 Wetland 1C, Revitalization Area

The planting of Wetland 1C, Revitalization Area, was performed concurrently with that of Wetland 1C, Enhanced Area. The presence of surface water over most of the northernmost of the two revitalization areas and portions of the other areas dictated the need for goose control measures as described in Section 3.3.1.

The two areas comprising the Wetland 1C, Revitalization Area were designed to have three planting zones, including Wet Meadow (WM), Deep Marsh-Open Water (DM-OW) and Shallow Marsh-Semipermanently Flooded (SM-SP). Each of these planting zones were based on contour elevations.

Elevational changes that resulted from design modifications required during the remediation of the southern revitalization area dictated the need to alter the planting design. The modified wetland planting design was based on the final elevation of the area and resulted in most of the area being Wet Meadow and Shallow Marsh-Semipermanently Flooded. Due to the elevational changes, the area of Deep Marsh-Open Water was substantially reduced. The modifications primarily affected the habitat created and therefore the type of herbaceous plant material that would be best suited for this area. Coastal revised the orders to the pertinent nurseries (Appendix IV) to replace the Deep Marsh-Open Water plants with those specified for Shallow Marsh-Semipermanently Flooded planting zones. In addition, since much of the area was only covered with a few inches of water, plants specified for the Shallow Marsh-Seasonally Flooded planting zones were also ordered.

The areas of Shallow Marsh-Semipermanently Flooded Wetland were planted with all the species specified. Small areas of deeper water, greater than 12 inches deep, were planted with spatterdock (*Nuphar luteum*), water lily (*Nymphaea odorata*) and pondweed (*Potamogeton natans*). The shallow water areas (less than two inches deep) and low areas bordering shallow water were planted with fringed sedge (*Carex crinita*), soft rush (*Juncus effusus*), tussock sedge (*Carex stricta*), woolgrass (*Scirpus cyperinus*), rice cutgrass (*Leersia oryzoides*) and fowl grass (*Glyceria striata*). The Wet Meadow plantings were supplemented by shrubs such as pussy willow, silky dogwood and highbush blueberry.

Subsequent to the completion of planting the shoreline was seeded with the wetland seed mix by hand and the area lightly raked to incorporate the seed into the soil.

3.5 Created Wetland

The Created Wetland was designed to possess four planting zones, including Upland Buffer (UB), Successional Forested Wetland (SF), Shrub Swamp and Shallow Marsh-Semipermanently Flooded. The modifications to the post-remediation elevation and the depth of water substantially affected the planting design of this area. The initial design specified that the Shrub Swamp and Successional Forested Wetland planting zones would cover approximately two acres. Although modifications to the topography of the created wetland served to reduce the planting area of the Upland Buffer, the presence of standing water at an elevation of approximately 68 feet substantially reduced the planting area designated as Shrub Swamp.

The planting of this area was initiated in September 1995. Prior to initiation of planting, several fingers of dry land were created as planting locations for the woody plant material. Although this provided suitable planting area for shrubs, the area was still insufficient to meet the requirements of the specification. Due to the lack of suitable planting locations, a substantial number of the 940 shrubs specified to be planted in the Shrub Swamp planting zone could not be installed. In order to utilize the excess plant material, shrubs were planted at a higher density than the six foot spacing specified.

The Upland Buffer planting zone and the Successional Forested Wetland planting zone were also smaller than specified. The woody plants specified for those planting zones were planted at a higher density than specified.

Most of the plants specified for the shallow marsh planting were planted in the area of deeper water located in the western central portion of this mitigation area. Other plants were planted in the coves along the peninsulas of Shrub Swamp and Successional Forested Wetland. In addition, a patch of cattail was planted downgradient of the outfall in the northern portion of the site.

Since only a relatively small area of Shallow Marsh-Semipermanently Flooded was specified to be created in the Created Wetland, no plan for a goose exclusion fence was provided. The extensive area of inundation may, however, make the establishment of herbaceous vegetation in this area difficult. Evidence of goose herbivory was identified during the planting effort.

Subsequent to the completion of woody plant installation, the entire area above water was seeded with the wetland seed mix and the seed lightly raked into the soil. No seeding was possible below the 68 foot contour in this area due to the presence of standing water.

3.6 Aberjona River Drainway

The drainway planting of the Aberjona River was initiated in late September 1995. This area was situated to the east of the easternmost portion of the Wetland 1C, Revitalization Area. Most of the drainway was relatively high above the river and appeared to be relatively dry. Due to the apparent dryness of this drainway, most of it was planted with rugose rose. The portions of the drainway adjacent to Wetland 1C were planted with a mix of all the species specified. Species planted in this primarily included: rugose rose, pepperbush, and gray dogwood.

3.7 Wetland 3A

The planting of Wetland 3A was initiated shortly after completion of topsoil placement in late September 1995. The specified planting zones included Shrub-Swamp, Successional Forested Wetland, Upland Buffer and Shallow Marsh-Seasonally Flooded. Table 3 indicates the woody plant material that was initially planted in this wetland.

Due to construction-related difficulties, all of the plant material could not be installed at one time and several hundred plants were left stockpiled on this site for planting at a later date. Subsequent to the initial planting effort, additional construction activities along the water line occurred in Wetland 3A. These activities resulted in a number of the plants previously installed being lost and, therefore, requiring replacement. The exact number of plants lost was not determined. To replace these plants, the plants remaining after the completion of Wetland 1C Revitalization Areas, and the Created Wetland were utilized. The replacement plants included silky dogwood, arrowwood, pussy willow, highbush blueberry and winterberry. These plants were installed primarily in the Shrub Swamp and Successional Forested Wetland portion of this site. Replacement upland plantings also utilized plants left over from the planting of the created wetland and as the drainways. These species included gray dogwood, hazelnut, pepperbush and red maple. Due to the number of plants remaining after the completion of planting the other mitigation areas, additional plants were installed in adjacent areas disturbed during site construction, but outside of the original planting area. The exact number of additional woody plants installed in this area is unknown.

The Shallow Marsh-Seasonally Flooded portion of Wetland 3A was situated mostly in the southern portion of the site. The balance of this planting area was located along the eastern edge of the site. Due to the depth of the water throughout most of the southern end of this site, the herbaceous plants specified for installation in this area could not be planted due to the lack of appropriate habitat. Therefore, most of the plants were installed in shallow water areas of the pond and along the shoreline. Herbaceous vegetation was planted along the entire eastern edge of this site.

Subsequent to completion of the planting, the entire area was seeded by hand and the entire area lightly raked.

3.8 Created Wetland Berm

The plant material for this area was ordered in May 1995 and included a total of 720 shrubs. In August 1995, Coastal was informed that this area was removed from the scope of the project. Subsequently, the order for the plant material designated for this area was canceled.

Table 3

Woody Plant Material Initially Installed in Wetland 3A

Species Name - Common	Species Name - Scientific	Quantity
Shrub Swamp		
Silky dogwood	*Cornus ammomum*	65
Winterberry	*Ilex verticillata*	65
Highbush blueberry	*Vaccinium corymbosum*	65
Arrowwood	*Viburnum recognitum*	65
Pussy willow	*Salix discolor*	65
Successional Forested Wetland		
Red maple	*Acer rubrum*	30
Green ash	*Fraxinus pennsylvanica*	15
Common elder	*Sambucus canadensis*	10
Highbush blueberry	*Vaccinium corymbosum*	10
Silky dogwood	*Cornus amomum*	10
Cinnamon fern	*Osmunda cinamomea*	100
Upland Buffer		
White pine	*Pinus strobus*	5
Trembling aspen	*Populus tremuloides*	5
Hazelnut	*Corylus americana*	4
Gray dogwood	*Cornus racemosa*	5
Red maple	*Acer rubrum*	5
Red oak	*Quercus rubra*	60
Black cherry	*Prunus serotina*	45

3.9 Atlantic Avenue Drainway

The planting of the Atlantic Avenue Drainway was performed in November 1995. At that time, only the segment adjacent to the ISRT parking lot was completed. The installation of plants to the south of Atlantic Avenue was postponed since the area would not be completed until December and planting at that time was considered inappropriate. It was anticipated that this area would be planted in the Spring of 1996. The plants to be installed in this area were placed in single species groups in the stockyard and heavily mulched for winter protection.

In September 1995, the scope of the planting effort for the Atlantic Avenue Drainway was reduced. The elimination of 300 feet of drainway from the planting scope resulted in a 240 plant reduction in the plant material required for this area. The nursery was notified of this change and the order was reduced accordingly.

4.0 COMMENTS AND RECOMMENDATIONS

During the course of this planting project, Coastal has identified several issues that may affect the attainment of a level of vegetative cover in which the regulatory agencies would consider the Industri-Plex Mitigation effort successful. These issues are related to the survivorship of shrubs and trees and the establishment of herbaceous vegetation.

The shrubs and trees installed in the various mitigation sites will be subject to a variety of perturbations which can result in a high level of mortality. For example, the condition and subsequent survivorship of shrubs planted along the New Boston Street Drainway indicated evidence of damage from power weed trimming devices. In addition, the proximity of the planter to paved parking/work areas at the Kaknes Wood Products and Gemel International facilitates damage to the plants at these locations. The plants in these areas have been driven over by tractor trailers and, during the snowstorm of late November 1995, Coastal observed snow being pushed from the parking lot into the drainway planter. Activities such as these may significantly increase mortality of the shrubs in these areas.

Due to the presence of standing water throughout a large portion of the Created Wetland, virtually no vegetation was planted in 1995. In order to attain a relatively high level of vegetative cover in the inundated portions of this wetland, additional plantings will likely be required. Plants such as those specified for the Shallow Marsh-Semipermanently Flooded planting zone would be suitable for this area. Without the planting of additional vegetation, the natural colonization of this area could take many years. If this area is planted, goose exclusion methods should be utilized.

The establishment of woody plants along the shoreline of the Created Wetland and Wetland 1C may, at least in selected locations, be difficult due to shoreline instability. Unstable shorelines in the Created Wetland and the Wetland 1C mitigations areas appeared to be the result of wave action. This problem will affect the establishment of both herbaceous and woody vegetation. The loss of topsoil due to erosion will make the establishment of woody plants especially difficult since they require more soil than herbaceous plants. This problem will likely be exacerbated in the Created Wetland since it may be subject to periodic flooding during storm events. In addition, the fingers of soil placed in the Created Wetland last fall appeared especially subject to bank instability. Erosion control measures may be required in these areas if the problem persists.

The goose fence was designed to provide temporary protection for recently planted herbaceous vegetation. Typically, the fence is only required for one or two growing seasons so that the plants can be firmly established. Once the plants have developed a strong root system they are substantially more difficult to pull out. During the one -two year period in which the fence remains in place periodic maintenance of the fence should be performed.

APPENDIX I

WETLAND MITIGATION PLAN SPECIFICATIONS

Table 0

SPECIES TO BE PLANTED WITHIN EACH OF THE WETLAND AREAS. AN ASTERISK (*) INDICATES THE SPECIES WAS OBSERVED WITHIN THE ONSITE OR ADJACENT WETLANDS

SPECIES	FUNCTIONAL VALUE[1]	PROPOSED SIZE/TYPE	PLANTING SPECIFICATIONS	
DEEP MARSH - OPEN WATER, WATER DEPTH 1-3 FEET		pots - Nl. Nursery	2.5 acres	
Potamogeton spp./Pondweeds	WF,NRT,AB *	Weighted tuber	2000	A
Nuphar variegatum/Spatterdock	WF,A	Weighted tuber	2000	A
Nymphaea odorata/Water lily*	WF,A *	Weighted tuber	2000	A
Scirpus validus/Softstem bulrush	WQ/FW,NRT,WF,SS	Tuber	225	B
SHALLOW MARSH - SEMIPERMANENTLY FLOODED TO INTERMITTENTLY EXPOSED			1.3 acres	
Typha latifolia/Broad-leaved cattail*	WF,WQ/FW,SS,NRT,AB,WC	Tuber (Peat pots)	117	B
Scirpus validus/Softstem bulrush	WQ/FW,NRT,WF,SS	Tuber	117	B
Sagittaria latifolia/Arrowhead*	WF,AB,A	Tuber	1040	A
Polygonum spp./Smartweeds	WF	Roots	1040	A
Pontederia cordata/Pickerel weed*	A,AB	Tuber	1040	A
* *Sparganium eurycarpum*/Giant burreed	WF,WQ/FW,SS,AB	Tuber	117	B
SHALLOW MARSH - SEASONALLY FLOODED			0.2 acres	
Wetland seed mix(1) (~~*Echinochloa crusgalli*, *Juncus effusus**, *Scirpus atrovirens*, *Glyceria canadensis*~~)	WF,NRT,WQ/FW,SS,WC	Seed mix		C
move *Iris versicolor*/Blue flag iris	NRT,A	Bulb	100	D
Carex lurida, C. stricta, C. crinita/sedges*	WF,SS,WC	2" potted plants	480	A
WET MEADOW - SATURATED			0.2 acres	
Wetland seed mix(2) ~~*Echinochloa crusgalli*, *Juncus effusus*, *Glyceria canadensis*, *Phalaris arundinacea*~~	SS,WC,WF,WQ/FW	Seed mix		C
Spirea latifolia/meadowsweet	WC,A	Container grown	~~60~~ 12	E
10 1 thin 1 ft Scirpus cyperinus, Scirpus atrovirens, Juncus effusus, Glyceria canadensis, Glyceria striata	WC, WF, SS	2" potted plants		A

Table 02937-1 (continued)

SPECIES	FUNCTIONAL VALUE[1]	PROPOSED SIZE/TYPE	PLANTING SPECIFICATIO
SHRUB SWAMP - SEASONALLY FLOODED TO SATURATED		1620	2.4 acres
Cornus amomum/Silky dogwood*	WQ/FW,NRT,A,WC,WF	Container grown, 2-3 ft.	324 F
Ilex verticillata/Winterberry*	WQ/FW,NRT,A,WF	Container grown, 2-3 ft.	324 F,HF
Vaccinium corymbosum/Highbush blueberry*	A,WF	Container grown, 2-3 ft.	324 F
Viburnum recognitum/Northern arrowwood*	WQ/FW,NRT,WF,WC	Container grown, 2-3 ft.	324 F
Salix sp./Willow*	WC,WF	Container grown, 2-3 ft.	324 F
Wetland seed mix[1] (~~*Echinochloa crusgalli, Glyceria canadensis, Scirpus atrovirens, Juncus effusus*~~	WF,NRT,SS,WC,WQ/FW	Seed mix	G
SUCCESSIONAL FORESTED WETLAND - SATURATED		141	0.5 acres 3 A
Acer rubrum/Red maple*	WC,WF,A	Balled, Burlapped 4-6 ft.	38 H 15
Acer rubrum/Red maple seedlings*	WC,WF,A	Bare root, 18-24 in.	38 H 15
Fraxinus pennsylvanica/Green ash*	WF,WC,A	Bare root, 18-24 in.	38 H 15
Sambucus canadensis/Common elder*	WC,WF,A	Container grown, 2-3 ft.	25 I 10
Vaccinium corymbosum/Highbush blueberry*	WC,WF	Container grown, 2-3 ft.	25 I 10
Cornus amomum/Silky dogwood*	WC,WF	Container grown, 2-3 ft.	25 I 10
Wetland seed mix[1] ~~(*Echinochloa crusgalli, Glyceria canadensis, Scirpus atrovirens, Juncus effusus*)~~	SS,WF,NRT	Seed mix	G 13
Osmunda cinnamomea/Cinnamon fern*	A,SS	Container grown (qt. size)	250 D

Table 02937-1 (continued)

SPECIES	FUNCTIONAL VALUE[1]	PROPOSED SIZE/TYPE	PLANTING SPECIFICAT
UPLAND BUFFER[3]		490	1.2 acres
Acer rubrum/Red maple seedlings[M]	WC, WF, A cut	Bare root, 18-24 in. 110	90 H
Pinus strobus/White pine	WC, WF	Bare root, 1-2 ft. 110	90 H
Quercus rubra/Red oak[M4]	WC, WF	Bare root, 1-2 ft. 65	45 H
Populus tremula/Trembling aspen[M]	WC, WF	Bare root, 1-2 ft. 110	90 H
Prunus serotina/Black cherry[M4]	WC, WF, A	Bare root, 1-2 ft. 70	45 H
Cornus racemosa/Gray dogwood	WC, WF	Container grown, 2-3 ft 40	60 I
Corylus sp./Hazlenut	WC, WF	Container grown, 2-3 ft. 40	60 I
Upland seed mix	SS, WF	Seed mix	See Section 0
DRAINWAY BANKS,		2720 plants	(est. 3400 linear feet x 1.25 feet/pl
Corylus americana / Hazelnut ~~*Alnus rugosa*/Speckled Alder[M]~~	WC, WF, SS, AB	Container grown, 2-3 ft.	907 J
Cornus amomum/Silky dogwood[M]	WC, WF, SS, AB	Container grown, 2-3 ft.	907 J
Viburnum acerifolium ~~*recognitum*~~/Maple-leaved viburnum ~~Northern arrowwood[M]~~	WC, WF, SS, AB	Container grown, 2-3 ft.	907 J
CREATED WETLAND BERM (			0.8 acres
Cornus racemosa/Gray dogwood	WC, WF	Container grown, 2-3 ft.	180 K
Corylus sp./Hazlenut	WC, WF	Container grown, 2-3 ft.	180 K
Rosa rugosa/Rugosa rose[5]	WC, WF, A	Container grown, 2-3 ft.	180 K
Viburnum acerifolium/Maple-leaved viburnum	WC, WF	Container grown, 2-3 ft.	180 K
Upland seed mix	SS, WF	Seed Mix	See Section 0 720

also add for

- 720

w/o banks

Table 02937-1 (continued)

SPECIES	FUNCTIONAL VALUE[1]	PROPOSED SIZE/TYPE	PLANTING SPECIFICAT
UPLAND BUFFER[3]			1.2 acres
Acer rubrum/Red maple seedlings*	WC,WF,A	Bare root, 18-24 in.	90 H
Pinus strobus/White pine	WC,WF	Bare root, 1-2 ft.	90 H
Quercus rubra/Red oak*4	WC,WF	Bare root, 1-2 ft.	45 H
Populus tremula/Trembling aspen*	WC,WF	Bare root, 1-2 ft.	90 H
Prunus serotina/Black cherry*4	WC,WF,A	Bare root, 1-2 ft.	45 H
Cornus racemosa/Gray dogwood	WC,WF	Container grown, 2-3 ft	60 I
Corylus sp./Hazlenut	WC,WF	Container grown, 2-3 ft.	60 I
Upland seed mix	SS,WF	Seed mix	See Section 0
DRAINWAY BANKS, 2720 plants (est. 2400 linear feet × 1.25 feet/p			
Corylus americana /Hazelnut ~~*Alnus rugosa*/Speckled Alder*~~	WC,WF,SS,AD	Container grown, 2-3 ft.	907 J
Cornus amomum/Silky dogwood*	WC,WF,SS,AD	Container grown, 2-3 ft.	907 J
Viburnum ~~*recognitum*~~ acerifolium /~~Northern arrowwood*~~ Maple-leaved viburnum	WC,WF,SS,AD	Container grown, 2-3 ft.	907 J
CREATED WETLAND BERM (ha			0.8 acres
Cornus racemosa/Gray dogwood	WC,WF	Container grown, 2-3 ft.	180 K
Corylus sp./Hazlenut	WC,WF	Container grown, 2-3 ft.	180 K
Rosa rugosa/Rugosa rose[5]	WC,WF,A	Container grown, 2-3 ft.	180 K
Viburnum acerifolium/Maple-leaved viburnum	WC,WF	Container grown, 2-3 ft.	180 K
Upland seed mix	SS, WF	Seed Mix	See Section

also add

[1]SPECIES FUNCTIONAL VALUE

- WC - Provides cover for wildlife species
- WF - High, wildlife food value (waterfowl, songbirds, and/or mammals)
- WQ/FW - Offers frictional resistance and enhances water quality protection and floodwater storage
- NRT - Effective in uptake and transformation of nutrients
- A - Visually attractive flowers, fruit or foliage
- SS - Has shoreline or sediment stabilization value
- AB - Provides shade or cover for aquatic biota

[2]PLANTING SPECIFICATIONS

2400 plants/acre A - Mix of species+/cluster; planted on 3-foot centers; 15 propagules/12-foot diameter cluster, 160 clusters/acre

90 plants/acre B - Single species/cluster; planted on 3-foot centers; 30 propagules/12x24 foot cluster; 3 clusters/acre

C - ~~35~~ 37 lbs. seed/acre ~~(15 lbs. *Echinocloa crusgalli*, 20 lbs. mix of other species)~~

500/acre D - Propagules planted irregularly throughout habitat; minimum spacing of 4 feet; 500 plants/acre

60/acre E - Single species/cluster; planted on 6-foot centers; 6 plants/12-foot diameter cluster; 10 clusters/acre

675/acre F - Mix of species+/cluster; planted on 6-foot centers; 15 plants/25-foot diameter cluster, 45 clusters/acre; planted on 6 to 16 in. high soil hummocks

G - 25 lbs seed/acre ~~25 lbs. seed/acre (15 lbs. *Echinocloa crusgalli*, 10 lbs. mix of other species)~~

225/acre H - Mix of species+/cluster; planted on 10-foot centers; 15 plants/40-foot diameter cluster, 15 clusters/acre

50/acre I - Plants spaced irregularly throughout habitat; minimum spacing of 15 feet; 50 plants/acre

J - Mix of species+/row; planted on 5-foot centers in 2 staggered rows along drainways; 1 row 1 foot from edge of bank; another row 3 feet from edge of bank

K - Mix of species+/row; planted on 5 to 10-foot centers (irregular spacing) in 2 staggered rows 5 feet apart along the southern and western berm slopes and in one row along the top of the berm.

MF - Both male and female plants must be planted

+Include in mix only those species listed within a habitat.

[3]UPLAND BUFFER - Planting specifications are for unvegetated areas only, not including the created wetland berm. For areas to receive supplemental plantings only (i.e., areas that currently have ≤50 percent total vegetation cover), plant enough seed and nursery stock to achieve 75 percent cover.

[4]*Quercus rubra* and *Prunus serotina* will be planted along Wetland 3A only, not within the created wetland buffer, due to long tap roots.

[5]*Rosa rugosa* is considered a naturalized plant, not native to New England, but widely planted and adapted to this climate. It is an ideal choice for planting along the wetland berm as it provides a thorny but visually attractive screen for the created wetland while discouraging human intrusion.

APPENDIX II

REQUEST FOR MODIFYING THE SPECIES COMPOSITION OF THE MITIGATION PLAN

COASTAL ENVIRONMENTAL SERVICES INC.

via Telecopier

24 March 1995

Ms. Lee E. Carbonneau
Normandeau Associates, Inc.
25 Nashua Road
Bedford, NH 03110-5500

Re: Request to Alter Planting Plan
Industri-Plex
Woburn, MA

Dear Ms. Carbonneau:

In order to obtain the plant material required to initiate the revegetation phase of the Industri-Plex remediation project this spring minor changes to the current plant list are requested. Most of the changes requested are associated with the Drainway Bank plant list. Due to the number of plants specified to be installed in these areas, Coastal anticipates difficulty in obtaining the required quantity of plant material. To avoid this problem, increasing the number of plant species for planting along the drainways from three to seven would be beneficial. As per our 23 March 1995 discussion, the following plants are proposed to be added to the drainway plant list;

Viburnum lentago	Nannyberry
Rosa virginiana	Pasture rose
Rosa rugosa	Rugose rose
Clethra alnifolia	Sweet pepperbush

All plants added to the list will be 2-3 feet high, container grown material.

An increase in the number of herbaceous species, proposed for shallow marsh-seasonally flooded mitigation areas is also proposed. The addition of more species will serve to improve the overall habitat value and provide for greater long term stability of this wetland. Species suggested to be added include the following:

Scirpus cyperinus	Woolgrass	*Glyceria canadensis*	American manna grass
Scirpus atrovirens	Green bulrush	*Juncus effusus*	Soft rush
Glyceria striata	Fowl manna grass	*Leersia oryzoides*	Rice cutgrass

2 RESEARCH WAY, PRINCETON, NJ 08540 • TEL (609) 987-0966 • FAX (609) 987-2443
WITH OFFICES IN BALTIMORE, MD AND ST. PETERSBURG, FL

The addition of these species to the list will also help to offset previously made changes to the wetland seed mix by replacing these species in which seed was eliminated with established plants. All of the species selected are indigenous to northeastern Massachusetts.

If you have any questions or comments regarding this request, do not hesitate to call me at our Princeton office.

Sincerely,

Mark Gallagher

Mark Gallagher
Senior Scientist

cc: Kelly Fagan (Rust)
Jeff Orchard (Normandeau)

APPENDIX III

PLANT MATERIAL ORDER LIST

MAY 1995

Species		* Size	Number		
Scientific	Common		Spring	Fall	Total
Acer rubrum	Red maple	18-24"/C	20	128	148
Acer rubrum	Red maple	4-6'/ BB		38	38
Cornus amomum	Silky dogwood	2-3'/C		349	349
Cornus racemosa	Gray dogwood	2-3'/C	20	240	260
Corylus americana	Hazelnut	2-3'/C	20	240	260
Fraxinus pennsylvanica	Green ash	18-24"/C		34	38
Ilex verticillata	Winterberry	2-3'/C		324	324
Pinus strobus	White pine	1-2'/C or BR	20	90	110
Populus tremula	Trembling aspen	1-2'/C	20	90	110
Prunus serotina	Black cherry	1-2'C	25	45	70
Quercus rubra	Red oak	1-2'/C/BR	20	60	65
Rosa rugosa or R. Virginiana	Rugose rose/Pasture rose	2-3'/C		180	180
Salix discolor	Pussy willow	2-3'/C		324	324
Sambucus canadensis	Elderberry	2-3'/C		25	25
Spirea latifolia	Meadowsweet	C	12		12
Vaccinium corymbosum	Highbush blueberry	2-3'/C		346	349
Viburnum acerifolium	Maple-leaved viburnum	2-3'/C		130	180
Viburnum recognitum	N. Arrowwood	2-3'/C		324	324

Species		* Size	Number		
Scientific	Common		Spring	Fall	Total
Viburnum lentago	Nannyberry	2-3'/C			A
Rosa virginiana	Pasture rosa	2-3'/C			A
Rosa rugosa	Rugosa rose	2-3'/C			A
Clethra alnifolia	Sweet pepperbush	2-3'/C			A
Cornus racemosa	Gray dogwood	2-3'/C			A
Corylus americana	Hazelnut	2-3'/C			A
Viburnum acerifolium	Maple-leaved viburnum	2-3'/C			A

A - A relatively equal mix of each species is requested. The total number of plants required is 2,720. Of this total, 1,184 are needed by the end of April and the balance in the fall of 1995.

Revised 5 May 1995

Species		* Size	Number		
Scientific	Common		Spring	Fall	Total
Nuphar variegatum	Spatterdock	T	1300	700	500
Nymphaea odorata	Water lily	T	1300	700	2000
Scirpus validus	Soft-stemmed bulrush	PP	200	150	350
Potamogeton pectinatus	Pondweed	BR	1300	700	2000
Typha latifolia	Cattail	BR	40	77	117
Polygonum sp.	Waterpepper/Smartweed	BR	350	690	1040
Sagittaria latifolia	Arrowhead	BR	350	690	1050
Pontedaria cordata	Pickerelweed	BR	350	690	1050
Sparganium eurycarpum	Giant burreed	BR	40	77	117
Carex lurida	Shallow sedge	PP		100	100
Carex stricta	Tussock sedge	PP		100	100
Carex crinita	Fringed sedge	PP		100	100
Scirpus cyperinus	Woolgrass	PP		150	150
Scirpus atrovirens	Green bulrush	PP		100	100
Juncus effusus	Soft rush	PP		150	150
Glyceria canadensis	Atlantic manna grass	PP		100	100
Glyceria striata	Fowl manna grass	PP		100	100
Leersia oryzoides	Rice cutgrass	PP		100	100
Iris versicolor	Blueflag	PP	100		100
Osmunda cinnamomea	Cinnamon fern	1 QT		250	250

* PP - 2 inch Peat Pot or equivalent
BR - Bare Root
T - Tuber

APPENDIX IV

REVISED PLANT LIST

JULY 1995

Revised 12 July 1995

Species		Size	Number		
Scientific	Common		Spring	Fall	Total
Nuphar variegatum	Spatterdock	T			
Nymphaea odorata	Water lily	T			
Scirpus validus	Soft-stemmed bulrush	PP		300	300
Potamogeton pectinatus	Pondweed	BR			
Typha latifolia	Cattail	BR			
Polygonum sp.	Waterpepper/Smartweed	BR			
Sagittaria latifolia	Arrowhead	BR			
Pontedaria cordata	Pickerelweed	BR		1250	1250
Sparganium eurycarpum	Giant burreed	BR			
Carex lurida	Shallow sedge	PP		100	100
Carex stricta	Tussock sedge	PP		100	100
Carex crinita	Fringed sedge	PP		300	300
Scirpus cyperinus	Woolgrass	PP		350	350
Scirpus atrovirens	Green bulrush	PP		100	100
Juncus effusus	Soft rush	PP		350	350
Glyceria canadensis	Atlantic manna grass	PP		100	100
Glyceria striata	Fowl manna grass	PP		300	300
Leersia oryzoides	Rice cutgrass	PP		300	300
Iris versicolor	Blueflag	PP		150	150
Osmunda cinnamomea	Cinnamon fern	1QT			

PP - 2 inch Peat Pot or equivalent
BR - Bare Root
T - Tuber

Revised 12 July 1995

Species		Size	Number		
Scientific	Common		Spring	Fall	Total
Nuphar variegatum	Spatterdock	T		1360	1360
Nymphaea odorata	Water lily	T		1360	1360
Scirpus validus	Soft-stemmed bulrush	PP			
Potamogeton pectinatus	Pondweed	BR		1360	1360
Typha latifolia	Cattail	BR		141	141
Polygonum sp.	Waterpepper/Smartweed	BR		1250	1250
Sagittaria latifolia	Arrowhead	BR		1250	1250
Pontedaria cordata	Pickerelweed	PP			
Sparganium eurycarpum	Giant burreed	BR		141	141
Carex lurida	Shallow sedge	PP			
Carex stricta	Tussock sedge	PP			
Carex crinita	Fringed sedge	PP			
Scirpus cyperinus	Woolgrass	PP			
Scirpus atrovirens	Green bulrush	PP			
Juncus effusus	Soft rush	PP			
Glyceria canadensis	Atlantic manna grass	PP			
Glyceria striata	Fowl manna grass	PP			
Leersia oryzoides	Rice cutgrass	PP			
Iris versicolor	Blueflag	PP			
Osmunda cinnamomea	Cinnamon fern	1 QT		250	250

PP - 2 inch Peat Pot or equivalent
BR - Bare Root
T - Tuber

APPENDIX V

NURSERY INVOICES

Telephone Shrewsbury
(508) 845-2143
FAX (508) 842-9245

BIGELOW NURSERIES Inc.

HARDY NURSERY STOCK GARDEN SUPPLIES
P.O. BOX 718
NORTHBOROUGH, MA 01532

B I

INVOICE

DATE	PAGE	NUMBER
10 MAY 95	1	50393

SHIP TO

COASTAL ENVIR. SERVICES, INC.
1099 WINTERSON ROAD
SUITE 130
LINTHICUM MD 21090

CUST	SHIP DATE	CUSTOMER P.O.#	RELEASE	SALESMAN	TERMS	SHIP VIA
14985	05/11/95		DSA	21	NET 30 DAYS	OUR DELIVERY

ITEM #	DESCRIPTION	UM	QTY	QBO	QSH	PRICE	AMOUNT
CRNAM2H024	SILKY DOGWOOD 2 FT. C.G.		71	0	71		
VCCCR1H024	HIGHBUSH BLUEBERRY 2 FT. B&B		71	16	55		
VBRDN2H024	ARROWWOOD 2 FT. C.G.		71	0	71		
SLXDS2H024	PUSSYWILLOW 2 FT. C.G.		71	0	71		
ILXVR2H024	WINTERBERRY 2 FT. C.G.		71	0	71		

MMENTS THANK YOU !

Red Maple 12
Broken 3 dead
Please credit.

Subtotal

ELOW NURSERIES INC.

Tax on 2376.50 @ 5.%

ITIONS OF SALE
ES F.O.B. BIGELOW NURSERIES INC.
VICE CHARGE: 1 1/2 % PER MONTH ON OVERDUE

Telephone Shrewsbury
(508) 845-2143
FAX (508) 842-9245

BIGELOW NURSERIES Inc.

HARDY NURSERY STOCK GARDEN SUPPLIES
P.O. BOX 718
NORTHBOROUGH, MA 01532

INVOICE

DATE	PAGE	NUMBER
10 MAY 95	1	50097

BILL TO

COASTAL ENVIR. SERVICES, INC.
1099 WINTERSON ROAD
SUITE 130
LINTHICUM MD 21090

SHIP TO

WOBURN
INDUSTRIPLEX

CUST	SHIP DATE	CUSTOMER P.O. # RELEASE	SALESMAN	TERMS	SHIP VIA
14985	05/11/95	DSA	21	CASH	OUR DELIVERY

ITEM #	DESCRIPTION	UM	QTY	QBO	QSH	PRICE	AMOUNT
* CRNRC1H024	GRAY DOGWOOD 2 FT. B&B		20	0	20		.00
* CRYAM2H036	AMERICAN FILBERT 3 FT. C.G.		20	20	0		
* PNSSR2H012	WHITE PINE 12 IN. C.G.		20	0	20		
* PRNST2H012	BLACK CHERRY 12 IN. C.G.		25	0	25		
* QRCRRR1C^12	RED OAK 12 IN. C.G.		20	0	20		
LT221GL	LATIFOLIA SPIREA 2 FT. B&B		12	0	12		
* AL2H024	SUMMERSWEET 2 FT. C.G.		300	60	240		
* RSRG2H024	RUGOSA ROSE 2 FT. C.G.		300	0	300		
PPLTR2H012	QUAKING ASPEN 12 IN. C.G.		20	0	20		
VBRLT1H024	LENTAGO VIBURNUM 2 FT. B&B		61	61	0		
* VBRAC1H018	ACERFOLIA VIBURNUM 18 IN. B&B		61	0	61		
CRNRC1H024	GRAY DOGWOOD 2 FT. B&B		400	400	0		
ACRRB5H018	* RED MAPLE 18 IN. C.G.		20	0	20		
* CRYAM2H036	AMERICAN FILBERT 3 FT. C.G.		61	61	0		

COMMENTS THANK YOU !

Mark [illegible]

1 Red Maple 18"
Broken & dead
Please credit.

Subtotal

BIGELOW NURSERIES INC.

Tax on

CONDITIONS OF SALE
PRICES F.O.B. BIGELOW NURSERIES INC.
SERVICE CHARGE: 1 1/2 % PER MONTH ON OVERDUE
ACCOUNTS PLUS COST OF COLLECTION IF ANY

Shipping

TOTAL

Telephone Shrewsbury
(508) 845-2143
FAX (508) 842-9245

BIGELOW NURSERIES Inc.

HARDY NURSERY STOCK GARDEN SUPPLIES
P.O. BOX 718
NORTHBOROUGH, MA 01532

INVOICE

DATE	PAGE	NUMBER
15 MAY 95	1	5289281

BILL TO

COASTAL ENVIR. SERVICES, INC.
1099 WINTERSON ROAD
SUITE 130
LINTHICUM MD 21090

SHIP TO

WOBURN
INDUSTRIFLEX

CUST	SHIP DATE	CUSTOMER P.O.# RELEASE	SALESMAN	TERMS	SHIP VIA
14985	05.16/95	DSA	21	NET 30 DAYS	OUR DELIVERY

ITEM #	DESCRIPTION	UM	QTY	QBO	QSH	PRICE	AMOUNT
CRYAM2H036	AMERICAN FILBERT 3 FT. C.G.		20	0	20		
* CLTAL2H024	SUMMERSWEET 2 FT. C.G.		60	60	0		
VBRLT1H024	LENTAGO VIBURNUM 2 FT. B&B		61	0	61		
CRNRC1H024	GRAY DOGWOOD 2 FT. B&B		400	0	400		
* CRYAM2H036	AMERICAN FILBERT 3 FT. C.G.		61	0	61		
VCCCR1H024	HIGHBUSH BLUEBERRY 2 FT. B&B		16	0	16		

COMMENTS THANK YOU !

Subtotal

BIGELOW NURSERIES INC.
CONDITIONS OF SALE
PRICES F.O.B. BIGELOW NURSERIES INC.

Tax on [illegible]
Shipping

Telephone Shrewsbury
(508) 845-2143
FAX (508) 842-9245

BIGELOW NURSERIES Inc.

HARDY NURSERY STOCK GARDEN SUPPLIES
P.O. BOX 718
NORTHBOROUGH, MA 01532

INVOICE

DATE	PAGE	NUMBER
25 SEP 95	1	55517

BILL TO

COASTAL ENVIR. SERVICES, INC.
1099 WINTERSON ROAD
SUITE 130
LINTHICUM MD 21090

SHIP TO

INDUSTRIPLEX

CUST	SHIP DATE	CUSTOMER P.O.#	RELEASE	SALESMAN	TERMS	SHIP VIA
14985	09/26/95		JLS	21	NET 30 DAYS	OUR DELIVERY

ITEM #	DESCRIPTION	UM	QTY	QBO	QSH	PRICE	AMOUNT
ACRRB2H015	RED MAPLE 18 IN C.G.		128	0	128		
ACRRB1H048	RED MAPLE 4 FT. B&B		38	38	0		
[illegible]M2H024	SILKY DOGWOOD 2 FT. C.G.		278	278 ✓	0		
[illegible]DY	GREY TWIG DOGWOOD 2 FT C.G.		60	0	60		
CRYAM2H024	AMERICAN FILBERT 2 FT B.B.		60	0	60		
FRXPN2H018	GREEN ASH 18 IN. C.G.		38	38	0		
ILXVR2H024	WINTERBERRY 2 FT. C.G.		253	253	0		
PNSSR2H012	WHITE PINE 12 IN. C.G.		90	90	0		
WOODY	QUAKING ASPEN 12 IN C.G.	[illegible]	90	90 −60	0		
PRNST2H012	BLACK CHERRY 12 IN. C.G.		45	45	0		
QRCRRR1C100	RED OAK 12 IN C.G.		60	0	60		
SLXDS2H024	PUSSYWILLOW 2 FT. C.G.		253	73	180		
WOODY	COMMON ELDERBERRY 2 FT C.G.		25	25	0		
VCCC22H024	HIGHBUSH BLUEBERRY 2 FT. C.G.		278	188	90		
WOODY	N. ARROWWOOD VIB. 2 FT C.G.		253	0	253		
VBRLT1H024	LENTAGO VIBURNUM 2 FT. B&B		280	0	280		
RSRG2H024	RUGOSA ROSE 2 FT. C.G.		488	0	488		
PERENNIALS	CLETHRA 2 FT C.G.		384	384	0		
CRNRC2H024	GRAY DOGWOOD 2 FT. C.G.		384	384 ✓	0		

[illegible]MMENTS THANK YOU !

Subtotal

[illegible]GELOW NURSERIES INC.
[illegible]NDITIONS OF SALE

Shipping

Telephone Shrewsbury
(508) 845-2143
FAX (508) 842-9245

BIGELOW NURSERIES Inc.

HARDY NURSERY STOCK GARDEN SUPPLIES
P.O. BOX 718
NORTHBOROUGH, MA 01532

INVOICE

DATE	PAGE	NUMBER
25 SEP 95	1	5551781

BILL TO

COASTAL ENVIR. SERVICES, INC.
1099 WINTERSON ROAD
SUITE 130
LINTHICUM MD 21090

SHIP TO

INDUSTRIPLEX

CUST	SHIP DATE	CUSTOMER P.O.#	RELEASE	SALESMAN	TERMS	SHIP VIA
14905	09/26/95		JLS	21	NET 30 DAYS	OUR DELIVERY

ITEM #	DESCRIPTION	UM	QTY	QBO	QSH	PRICE	AMOUNT
ACRRB1H048	RED MAPLE 4 FT. B&B		38	38	0		
CRNAM2H024	SILKY DOGWOOD 2 FT. C.G.		278	278	0		
FRXPN2H018	GREEN ASH 18 IN. C.G.		38	38	0		
ILXVR2H024	WINTERBERRY 2 FT. C.G.		253	253	0		
PNSSR2H012	WHITE PINE 12 IN. C.G.		90	90	0		
WOODY	QUAKING ASPEN 12 IN C.G.		90	90	0		
PRNST2H012	BLACK CHERRY 12 IN. C.G.		45	45	0		
SLXDS2H024	PUSSYWILLOW 2 FT. C.G.		73	73	0		
WOODY	COMMON ELDERBERRY 2 FT C.G.		25	25	0		
VCCCR2H024	HIGHBUSH BLUEBERRY 2 FT. C.G.		188	188	0		
PERENNIALS	CLETHRA 2 FT C.G.		384	384	0		
CRNRC2H024	GRAY DOGWOOD 2 FT. C.G.		384	0	384		

OMMENTS THANK YOU !

Subtotal

'GELOW NURSERIES INC.
NDITIONS OF SALE

Telephone Shrewsbury
(508) 845-2143
FAX (508) 842-9245

BIGELOW NURSERIES Inc.

HARDY NURSERY STOCK GARDEN SUPPLIES
P.O. BOX 718
NORTHBOROUGH, MA 01532

INVOICE

DATE	PAGE	NUMBER
25 SEP 95	1	555178?

BILL TO

COASTAL ENVIR. SERVICES, INC.
1099 WINTERSON ROAD
SUITE 130
LINTHICUM MD 21090

SHIP TO

INDUSTRIPLEX

CUST	SHIP DATE	CUSTOMER P.O.# RELEASE	SALESMAN	TERMS	SHIP VIA
14985	09/26/95	JLS	21	NET 30 DAYS	OUR DELIVERY

ITEM #	DESCRIPTION	UM	QTY	QBO	QSH	PRICE	AMOUNT
ACRRB1H048	RED MAPLE 4 FT. B&B		38	38	0		
IAM2H024	SILKY DOGWOOD 2 FT. C.G.		278	0	$\boxed{278}$		
FRXPN2H018	GREEN ASH 18 IN. C.G.		38	38	0		
ILXVR2H024	WINTERBERRY 2 FT. C.G.		253	253	0		
PNSSR2H012	WHITE PINE 12 IN. C.G.		90	90	0		
WOODY	QUAKING ASPEN 12 IN C.G.		90	90	0		
PRNST2H012	BLACK CHERRY 12 IN. C.G.		45	45	0		
SLXDS2H024	PUSSYWILLOW 2 FT. C.G.		73	73	0		
WOODY	COMMON ELDERBERRY 2 FT C.G.		25	25	0		
VCCCR2H024	HIGHBUSH BLUEBERRY 2 FT. C.G.		188	188	0		
PERENNIALS	CLETHRA 2 FT C.G.		384	384	0		

OMMENTS THANK YOU !

Subtotal

IGELOW NURSERIES INC.
ONDITIONS OF SALE

Telephone Shrewsbury
(508) 845-2143
FAX (508) 842-9245

BIGELOW NURSERIES Inc.

HARDY NURSERY STOCK GARDEN SUPPLIES
P.O. BOX 718
NORTHBOROUGH, MA 01532

INVOICE

DATE	PAGE	NUMBER
27 SEP 95	1	5551783

BILL TO

COASTAL ENVIR. SERVICES, INC.
1099 WINTERSON ROAD
SUITE 130
LINTHICUM MD 21090

SHIP TO

INDUSTRIPLEX

CUST	SHIP DATE	CUSTOMER P.O.# RELEASE	SALESMAN	TERMS	SHIP VIA
14985	09/28/95	JLS	21	NET 30 DAYS	OUR DELIVERY

ITEM #	DESCRIPTION	UM	QTY	QBO	QSH	PRICE	AMOUNT
ACRRB1H048	RED MAPLE 4 FT. B&B		48	0	48		
FRXPN2H018	GREEN ASH 18 IN. C.G.		38	0	38		
ILXVR2H024	WINTERBERRY 2 FT. C.G.		253	0	253		
PNSSR2H012	WHITE PINE 12 IN. C.G.		97	0	97		
WOODY	QUAKING ASPEN 12 IN C.G.		73	0	73		
PRNST2H012	BLACK CHERRY 12 IN. C.G.		45	0	45		
SLXDS2H024	PUSSYWILLOW 2 FT. C.G.		73	0	73		
WOODY	COMMON ELDERBERRY 2 FT C.G.		25	0	25		
VCCCR2H024	HIGHBUSH BLUEBERRY 2 FT. C.G.		188	0	188		
PERENNIALS	CLETHRA 2 FT C.G.		144	0	144		

MMENTS THANK YOU !

Subtotal

BELOW NURSERIES INC.
IDITIONS OF SALE

FREIGHT BILL TO FOLLOW

PIERSON NURSERIES, INC.
24 Buzzell Road
Biddeford, Maine 04005
Tel. & Fax (207) 499-2994

INVOICE

INVOICE NUMBER: 000032

INVOICE DATE: 09/22/95

PAGE: 1

SOLD TO:
COASTAL ENVIRONMENTAL SRV
2 RESEARCH WAY
PRINCETON, NJ
08540

SHIP TO:
COASTAL ENVIRONMENTAL SRV
2 RESEARCH WAY
PRINCETON, NJ
08540

SHIP VIA:
SHIP DATE: 09/22/95
DUE DATE: 10/22/95
TERMS: ~~NET 30~~ COD

CUST I.D.: COASTE
P.O. NUMBER:
P.O. DATE: 09/22/95
OUR ORDER NO.:
SALESPERSON:

ITEM I.D./DESC.	ORDERED	SHIPPED	UNIT	PRICE	NET	TX
	860	860	EACH			
NUPHAR VARIEGATUM SPATTERDOCK						
	1250	1250	EACH			
POLYGONUM SP SMARTWEED						

THE TWO ITEMS LISTED ABOVE WILL BE ARRIVING AROUND 9/28/95 BY UPS. THEY ARE INVOICED SEPERATLY FOR YOUR CONVIENENCE PLEASE PAY TOTAL AMOUNT OF 2 INVOICES

THANKS. IF YOU HAVE ANY QUESTIONS PLEASE CALL

INVOICE

PIERSON NURSERIES, INC.
24 Buzzell Road
Biddeford, Maine 04005
Tel. & Fax (207) 499-2994

INVOICE NUMBER: 006101
INVOICE DATE: 08/23/95 Source: Quote 006101
PAGE: 1

SOLD TO: COASTAL ENVIRONMENTAL SRV
2 RESEARCH WAY
PRINCETON, NJ
08540

SHIP TO: COASTAL ENVIRONMENTAL SRV
WOBURN MASS

CUST I.D.: COASTE
P.O. NUMBER:
P.O. DATE: 04/12/95
OUR ORDER NO.:
SALESPERSON:

SHIP VIA:
SHIP DATE: 08/23/95
DUE DATE: 08/23/95
TERMS: C.O.D.

ITEM I.D./DESC.	ORDERED	SHIPPED	UNIT	PRICE	NET	TX
	500	500	EACH			
NUPHAR VARIEGATUM SPATTERDOCK						
	1360	1360	EACH			
NYMPHAEA ODORATA BULB WHITE WATER LILY						
	1360	1360	EACH			
POTAMOGETON NATANS PONDWEED - THIS WAS SENT AFTER FINDING IT HARVESTED THE BEST AND STILL MET YOUR SPECIFICATIONS.						
	141	141	EACH			
TYPHA LATIFOLIA CATTAIL						
	1250	0	EACH			
POLYGONUM SP WATERPEPPER/SMARTWEED						
	1250	1250	EACH			
SAGITTARIA LATIFOLIA BULBS ARROWHEAD						
	141	141	EACH			
SPARGANIUM EURYCARPUM GIANT BURREED						
	250	250	EACH			
.5 GAL OSMUNDA CINNAMONMEA CINNAMON FERN						

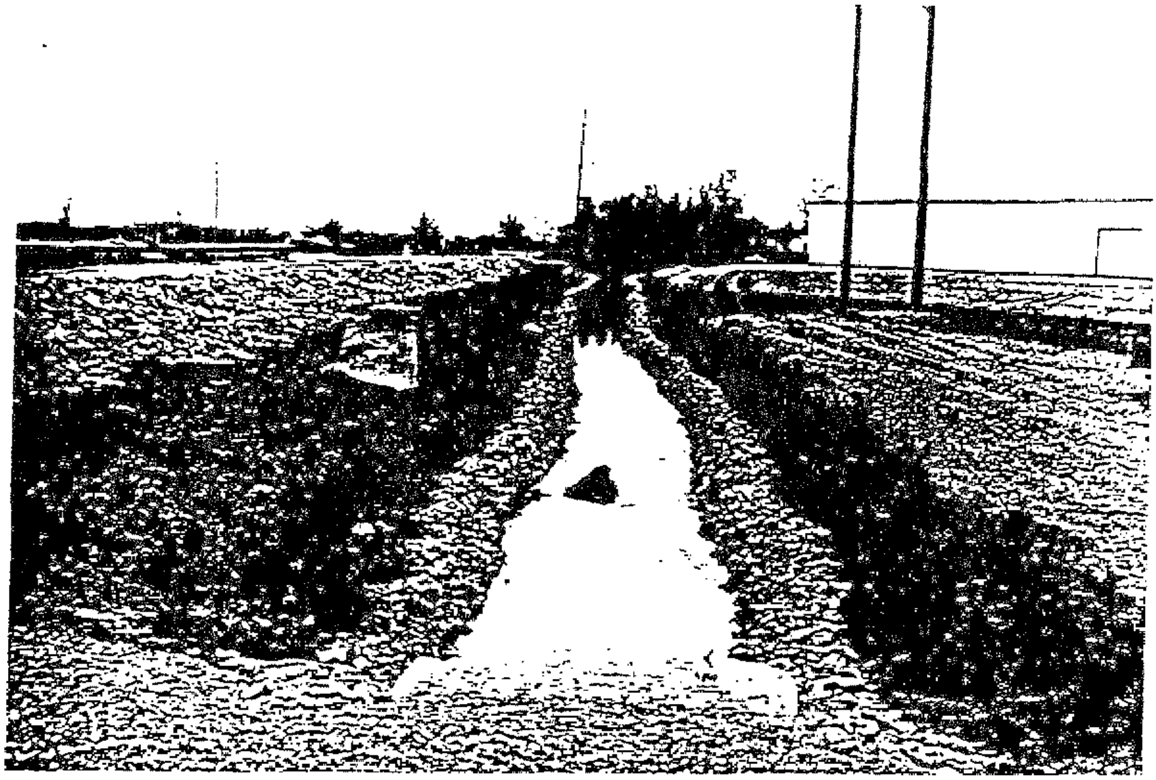
SUBTOTAL:
TAX:
PAYMENT:
TOTAL:

APPENDIX VI

PHOTOGRAPHS

Photograph 1. View of New Boston Street drainway adjacent to Kaknes Wood Products.

Photograph 2. Portion of New Boston Street drainway between Kaknes Wood Products and Gemel International.



Photograph 3. Section of New Boston Street drainway adjacent to railroad.

Photograph 4. View of Supplemental Planting Area, Area 3.

Photograph 5. View of Supplemental Planting Area, Area 3.

Photograph 6. View of Supplemental Planting Area, Area 2.

Photograph 7. View of Supplemental Planting Area, Area 1.

Attachment 2

A - ECHP - West Side

Industri-plex Site
Vegetative Monitoring Form
(1m x 1m plots)

Plot # 1 Location A - ECHP West Side Date 10/1/97 Observer P. Fanham Total Perennial % Cover 40 % Dominant Species or Type Perennial Grasses	Plot # 2 Location A - ECHP Date 10/1/97 Observer P.F. Total Perennial % Cover 30 % Dominant Species or Type Perennial Grasses
Plot # 3 Location A - ECHP Date 10/1/97 Observer PF Total Perennial % Cover 30 Dominant Species or Type	Plot # 4 Location A - ECHP Date 10/1/97 Observer PF Total Perennial % Cover 30 Dominant Species or Type
Plot # 5 Location A - ECHP Date 10/1/97 Observer P.F. Total Perennial % Cover 50 - 60 Dominant Species or Type	Plot # 6 Location A - ECHP Date 10/1/97 Observer PF Total Perennial % Cover 30 - 40 Dominant Species or Type
Plot # 7 Location A - ECHP Date 10/1/97 Observer PF Total Perennial % Cover 50 - 60 Dominant Species or Type	Plot # 8 Location [illegible] A ECHP Date 10/1/97 Observer PF Total Perennial % Cover 30 Dominant Species or Type

B - ECHP - E Side.

Industri-plex Site
Vegetative Monitoring Form
(1m x 1m plots)

Plot # 1 Location B-ECHP Date 10/1/97 Observer PF/LC Total Perennial % Cover 15% Dominant Species or Type Trifolium repens + annuals	Plot # 2 Location B-ECHP Date 10/1/97 Observer PF/LC Total Perennial % Cover 15 Dominant Species or Type Annuals Artemisia sanguinalis (crabgrass) annuals + per. grasses
Plot # 3 Location B Date Observer PF/LC Total Perennial % Cover 15 Dominant Species or Type	Plot # 4 Location B Date Observer PF/LC Total Perennial % Cover 20 Dominant Species or Type Perennials herbs, grasses + annuals [illegible]
Plot # Location Date Observer Total Perennial % Cover Dominant Species or Type	Plot # Location Date Observer Total Perennial % Cover Dominant Species or Type
Plot # Location Date Observer Total Perennial % Cover Dominant Species or Type	Plot # Location Date Observer Total Perennial % Cover Dominant Species or Type

Attachment 3

Fax (207) 499-2912

PAGE: 1

COASTAL ENVIRONMENTAL SRV
IBIS PLAZA, SUITE 400
3535 QUAKER BRIDGE RD.
HAMILTON, NJ
3619

SHIP TO: COASTAL ENVIRONMENTAL SRV
I-PLEX JOB

HIP VIA..........:
HIP DATE.......: 11/12/97
UE DATE.......: 11/12/97
ERMS..........: C. O. D.

CUST I.D.............: COASTE
P.O. NUMBER............:
P.O. DATE...............: 10/31/97
OUR ORDER NO...........:
SALESPERSON............:

EM I.D./DESC.	ORDERED	SHIPPED	UNIT	PRICE	NET	TX
	600	600	EACH	0.40	240.00	T
IRPUS TABERNAEMONTANI SOFT-STEM BULRUSH (BR--CLUMP)						
	600	600	EACH	0.55	330.00	T
AGITTARIA LATIFOLIA ARROWHEAD THIS MATERIAL WILL BE DIRECT SHIPPED						
	600	600	EACH	0.90	540.00	T
ONTEDERIA CORDATA PICKEREL WEED						
	600	600	EACH	0.50	300.00	[illegible]
ARGANIUM AMERICANUM--AMERICAN BUR-REED 11/5/97 YOU WERE ADVISED, THIS TE AL MAY NOT SURVIVE INSTALLING SO TE N THE YEAR.						
	50	50	EACH	2.60	130.00	T
UPHAR LUTEA PATTERDOCK YELLOW WATER LILY BARE ROOT						
	50	50	EACH	2.80	140.00	T
YMPHAEA TUBEROSA WHITE WATER LILY (BR--PLANT)						
	100	100	EACH	0.40	40.00	T
NCUS EFFUSUS SOFT RUSH (BR--CLUMP)						
	50	50	EACH	0.66	33.00	E
IRPUS CYPERINUS WOOL GRASS (BR--CLUMP)						

Continued ....

SUBTOTAL:	1761.00
TAX :	
PAYMENT :	
TOTAL :	

PLEASE PAY FROM THIS INVOICE

INVOICE

PIERSON NURSERIES, INC.
24 Buzzell Road
Biddeford, Maine 04005-9327
Tel. (207) 499-2994
Fax (207) 499-2912

INVOICE NUMBER: 010005
INVOICE DATE: 11/12/97
PAGE: 2

D COASTAL ENVIRONMENTAL SRV
IBIS PLAZA, SUITE 400
3535 QUAKER BRIDGE RD.
HAMILTON, NJ
08619

SHIP TO: COASTAL ENVIRONMENTAL SRV
I-PLEX JOB

SHIP VIA..........:
SHIP DATE........: 11/12/97
DUE DATE........: 11/12/97
TERMS...........: C.O.D.

CUST I.D.............: COASTE
P.O. NUMBER.............:
P.O. DATE...............: 10/31/97
OUR ORDER NO...........:
SALESPERSON............:

ITEM I.D./DESC.	ORDERED	SHIPPED	UNIT	PRICE	NET	TX
	50	50	EACH	0.38	19.00	T
F..SIA ORYZOIDES ..CE CUTGRASS (BR--ROOT)						
THE SAGITTARIA LATIFOLIA WILL BE DIRECT SHIPPED. AMOUNT DUE ON THIS MATERIAL WILL BE COD ON THIS INVOICE. ANY QUESTIONS, PLEASE CALL.						
	1	1	EACH	110.00	110.00	T
SHIPPING & HANDLING WILL ADVISE YOU ON SHIPPING & HANDLING CHARGES WHEN WE SHIP ~~MONDAY 11/10/97~~ Wednesday 11/12/97						

NKS, IF YOU HAVE ANY QUESTIONS, PLEASE CALL

SUBTOTAL:	1890.00
TAX:	0.00
PAYMENT:	0.00
TOTAL:	1890.00

PLEASE PAY FROM THIS INVOICE

Pierson Nurseries, Inc
2 `uzzell Road
B. .eford, Maine 04005
(207)499-2994
Fax (207)499-2912

PACKING SLIP

Document Number: 010026 ** ON HOLD **

Document Date: 11/18/97

Page: 1

Sold To: COASTAL ENVIRONMENTAL SRV
IBIS PLAZA, SUITE 400
3535 QUAKER BRIDGE RD.
HAMILTON, NJ
08619

Ship To: I.S.R.T.
ATTN: JOHN FIORE
23 ATLANTIC AVE.
WOBURN, MA.J
01801

Ship Via.:
Ship Date: 11/17/97

Cust I.D.....: COASTE
P.O. Number..:
P.O. Date....: 11/17/97
Job/Order No.:
Salesperson..:

tem I.D./Desc.	Ordered	Shipped	Unit	Initials
0( )0000WHOLE SCIRPUS TABERNAEMONTANI SOFT-STEM BULRUSH (BR-CLUMP) ORDER SHORTAGE--N/C	100.00	100.00	EACH	

SHIPPING LIST

HANKS, IF YOU HAVE ANY QUESTIONS, PLEASE CALL

NOTICE TO BUYER: EXCLUSION OF WARRANTY AND LIMITATION OF LIABILITY

Ernst Conservation Seeds warrants that this seed has been labeled as required by State and Federal Seed Laws and conforms to the label within recognized tolerances. This warranty excludes all other express or implied warranties. including any warranty of merchantability and of fitness for a particular purpose. Seller makes no other warranty express or implied including yield or tolerance to insects, diseases, or growing conditions of the seed or the crop produced therefrom. The amount of the purchase price of the seed is the limit of seller's liability to the buyer or others. To assert a claim the reason for the claim must have been reported in writing to Ernst Conservation Seeds within 60 days of the claimant's discovery thereof. If Buyer chooses not to be bound to the above stated warranty terms, he may return the seed at his sole expense in unopened containers within 10 days of receipt.

ERNST Conservation Seeds

9006 Mercer Pike, Meadville, PA 16335

COASTAL ENVIRONMENTAL SERVICES SEED MIX

	PURITY	GERM
JAPANESE MILLET:	35.04%	91%
DEERTONGUE:	26.21%	86%
CREEPING BENTGRASS:	25.26%	89%
GREEN BULRUSH:	4.40%	
FOX SEDGE:	3.26%	76%
CANADA WILD RYE:	1.71%	92%
PA SMARTWEED:	0.81%	42%
BEGGARS TICK:	0.51%	80%

Other Crop: 0.02%
Inert Matter: 2.11%
Weed Seed: 0.67%

Net Weight: 22.725 lbs.
Lot Number: NL119510
Date Tested: Nov 1997

APPENDIX J.3

Normandeau Final Vegetation As-built

Final Vegetation Establishment/Soil Stabilization
As-Built Plan
Industri-plex Site, Woburn, Massachusetts

Prepared for:

Industri-plex Site Remedial Trust
23 Atlantic Avenue
Woburn, MA 01801

Prepared by:

Normandeau Associates, Inc.
25 Nashua Road
Bedford, NH 03110

December 1997

1.0 Introduction

Final US Environmental Protection Agency approval for the Industri-plx Site remedy construction is contingent on meeting all construction standards as described in the Construction Specifications. Most wetland- and upland-related remediation and restoration activities were completed in 1995. An As-built Wetland Report was prepared by Coastal Environmental for the wetland plantings completed at that time (Attachment 1). However, a few construction activities, including some drainway plantings, were not completed until 1997. Therefore, final approval of the overall construction has not yet been granted, and long-term monitoring of wetlands and other facilities has not yet begun. In 1997, the Industri-plex Site Remedial Trust completed construction and identified and repaired cover and plant survival deficiencies that had developed in the last two years to bring the project back up to design standards. This As-built report is being submitted to document corrective actions so that final approval may be granted.

2.0 Deficiency Identification

A site walk was held at the Industri-plex Site (the Site) on August 21, 1997 with USEPA, MADEP, ISRT, HNUS, and NAI to identify areas of the project site which do not meet the final design construction standards. The standards for vegetation establishment on the site as presented in Construction Specification Sections 02936 (Seeding) and 02938 (Wetland Planting Mitigation) are:

Uplands	60 % Cover of established permanent grass species
	75 % Cover on wetland buffer and berm
Wetlands	75 % Cover herbaceous cover in non-inundated areas
	Replacement of dead shrubs

NAI returned to the Site on September 30 and October 1 and 2, 1997 with an as-built plan and aerial photograph to delineate obviously deficient areas, further evaluate borderline-deficient areas, and estimate shrub replacement quantities. Areas obviously deficient in herbaceous cover were sketched on an aerial photograph of the site and then transferred to a site plan (Figure 1). Where the percent cover was close to the design specifications, visual estimates of cover were made in plots established by random placement of 1 m x 1 m fixed frame. At each plot, percent cover of desirable (perennial grasses or herbs) was recorded on a data form (Attachment 2).

Shrub plantings along each drainway were evaluated for survival. Live and dead shrubs were tallied, and species which appeared to be most vigorous were noted. The location of woody weeds that have the potential to clog drainways were also noted on the plans. Estimates of shrub mortality were made, and water levels in the Created Wetland were assessed for adherence to the design goals.

Figure 1 illustrates the approximate boundaries of deficient areas and the repairs made at each site.

3.0 Results and Repairs

3.1 Upland Cover Reseeding

The top and south and east slopes of the West Hide Pile were deficient in herbaceous cover in many locations. Several very small patches of deficient cover were also observed on the East Hide Pile, East Central Hide Pile, and South Hide Pile. The upland buffer zone around the Created Wetland also had inadequate herbaceous cover. These areas were covered with approximately 2-5 inches of additional topsoil, and were then reseeded.

Since warm season grasses tend to dominate the uplands on the site, they were included in the permanent upland seed mix. However, these species germinate and grow slowly when the soil warms in the spring. Therefore, since grass cover in the fall was desired, oats were added to the mix. However, this species will not provide long term cover, so perennial cool season grasses were also added to provide some interim cover until the warm season grasses fully develop (which takes several years. The seed mix applied to upland areas on the site is as follows:

Table 1. Upland Seed Mix

Species	lbs/acre	Estimated Quantity (lbs)
Oats/*Avena sativa*	30	99
Big Bluestem/*Andropogon gerardi*	10	33
Indian Grass/*Sorghastrum nutans*	10	33
Little Bluestem/*Schizachryium scoparium*	10	33
Hard Fescue/*Festuca ovina* var. *duriuscula*	10	33
Switchgrass/*Panicum virgatum*	8	26
Red Top/*Agrostis alba*	1	3

The timing of seeding can greatly affect germination success. The goal was for the annuals in the mix to germinate in the fall and provide some grass cover to stabilize the soil while the perennials in the mix would lie dormant until favorable spring conditions. Annual grasses germinate and grow quickly, and perennials germinate and grow more slowly, especially the warm season grasses. According to the NRCS, the overlap of annual cover seeding and dormant perennial seeding schedules occurs around October 20 in most years in central New England. The fall of 1997 was slightly warmer than normal, so the seed was sown just after October 20, 1997. An early persistent snow cover has likely prevented germination of the oats, but soils have been stabilized by snow and freezing conditions, as well as jute matting on all slopes. Some mortality of perennial seed can be expected over the winter, so the seeding rate was increased slightly. The monitoring program will be used to determine if supplemental seeding is necessary in the spring.

Mowing Recommendations

During the first year of establishment, warm season grasses may be mowed to a height of 5 to 6 inches during the growing season to reduce weed competition. After the first year, warm season grasses should never be mowed shorter than 8 inches during the growing season or growth will stop. Ideally, this grass should only be mowed in late summer or fall (August or later) or early spring (before greenup) to a height of 8 inches. Mowers should stay at least 10 feet away from the edge of Wetland 1C, the Enhancement area, the Created Wetland, and all drainways to avoid damaging shrubs.

3.2 Created Wetland

Water Levels

Since construction two years ago, an 8 inch high flashboard in the outlet structure has been controlling water levels in the Created Wetland. The original intent of the flashboard was to insure a sufficient volume of water to promote ponded conditions during late summer in case surface water inputs dried up. However, during the last few years, surface water flow into the wetland was almost continuous throughout the growing season. The flashboard elevated water levels beyond the desired levels. The elevated water level appears to have caused some shrub mortality and increased the area of emergent marsh beyond the design goals. The flashboard was removed in early October 1997 to re-establish the water levels for which the wetland was designed. It is possible that a flashboard may be re-installed temporarily in the future should drought conditions prevail or if necessary for weed control. The long-term monitoring plan includes a protocol for evaluating the need for outlet invert changes.

Herbaceous Cover

Previously inundated wetland soils exposed after flashboard removal were seeded with approximately 22.7 lbs. of wetland seed mix (Table 2) on November 21, 1997. Due to the late date, this was a dormant seeding. The relatively narrow section of exposed sediment along the large peninsula was not seeded. In addition, a small area of wetland with insufficient cover in the shrub zone was not seeded due to frozen conditions at the time of seeding. Sediments receiving seed were raked clear of snow, seeded by hand, and then mulched with straw mulch. The previously approved wetland seed mix was used with minor modifications. Two additional species, fox sedge and greenstem bulrush, were added, and annual rye was deleted due to the late season. The suppliers shipping tags for all wetland seed and nursery stock is attached (Attachment 3).

Table 2. Wetland Seed Mix

Species	lbs./acre	Estimated Quantity
Japanese millet/*Echinochloa crusgalli*	10	8 lbs.
Creeping bentgrass/*Agrostis stolonifera*	8	6 lbs.
Deertongue/*Panicum clandestinum*	8	6 lbs.
Fox sedge/*Carex vulpinoidea*	1	1 lb.
Greenstem bulrush/*Scirpus atrovirens*	1	1 lb.
Canada wildrye/*Elymus canadensis*	8 ozs.	6.5 ozs.
Penn. smartweed/*Polygonum pennsylvanicum*	4 ozs.	3.0 ozs.
Beggartick/*Bidens cernua*	2 ozs.	1.5 oz.

Additional reseeding in the spring will be done if necessary based on monitoring observations.

Emergent Plantings

Emergent vegetation was planted in the Created Wetland in 1995. Heavy depredation by geese and other waterfowl left sparse emergents. However, at a minimum, cattail (*Typha latifolia, T. angustifolia*), burreed (*Sparganium eurycarpum*) and softstem bulrush (*Scirpus validus*) are present, and it is likely that a well distributed assortment of plants would emerge under protection from waterfowl even without additional plantings. Goose fencing as used in Wetland 1C was installed on November 19, 1997 (see next section). Then, to insure re-establishment of emergent plants at design densities, areas that remained flooded after flashboard removal received supplemental plantings selected from the 100% Design emergent plant list. Selected species (Table 3) are those that showed vigorous growth in Wetland 1C and the Enhancement Area. Plants were distributed throughout approximately 0.8 acres of the Created Wetlands on November 20 and 21, 1997. All materials were dormant bare-root stock.

Table 3. Emergent Plantings

Wet Meadow - (saturated to 2 inches deep)

Species	Quantity	Spacing
Soft rush/*Juncus effusus*	100	clusters of mixed plants on 2' centers
Rice cutgrass/*Leersia oryzoides*	50	around marsh perimeter.
Wool grass/*Scirpus cyperinus*	50	

Shallow Marsh - (0-8 inches deep)

Species	Quantity	Spacing
Softstem bulrush/*Scirpus validus*	600	clusters of plants on 2' centers
Arrowhead/*Sagittaria latifolia*	600	clusters of plants on 2' centers
Pickerel weed/*Pontederia cordata*	600	clusters of plants on 2' centers
Burreed/*Sparganium* sp.	600	clusters of plants on 2' centers

Deep Marsh (>12 inches deep)

Species	Quantity	Spacing
Spatterdock/*Nuphar variegatum*	50	clusters of plants on 3' centers
Water Lily/*Nymphaea odorata*	50	clusters of plants on 3' centers

Emergent plants were installed around the edges of all peninsulas and in the shallow bays between peninsulas (Figure 1). This spatial arrangement enabled protection with goose control fencing as described below.

Herbivore Control

Emergent plantings in the Created Wetland will be protected from goose predation by the same methods employed during Wetland 1A plant establishment, mesh and string fencing. Fences were erected within the Created Wetland one day before emergent plant installation. The fences consist of 4-foot grade stakes placed approximately 10-feet apart, with strings 6 to 8 inches above the water connecting each stake in a grid pattern. Sturdy plastic mesh fencing was attached to perimeter grade stakes (land side and water side) with a few exceptions. The approximate location of goose fencing is shown in Figure 1.

Shrub Assessment

Despite the elevated water levels, shrub mortality has been low. Mortality estimates were not possible, since the exact number of shrubs installed in the Created Wetland was not recorded by the contractor. The 1996 As-Built Report by Coastal Environmental (Attachment 1) indicates that less than 940 shrubs were installed. However, planting densities were greater than the design called for since grading changes left a smaller shrub planting zone than originally planned. Approximately 64 dead or nearly dead shrubs were observed in the wetland, and 22 in the upland buffer. These low mortality levels do not compromise design densities, in fact, there are no apparent spaces between shrub clusters. There has been vegetation stress, but stressed plants are sprouting from the base and are likely to survive. No further shrub plantings are recommended for the Created Wetland.

Earthwork

Some erosion on the eastern bank of the Created Wetland caused deposits of sand in the upland buffer and wetland that were excavated in early October. A thin layer of topsoil was then spread in this area. Shrubs were flagged with blue flagging to increase their visibility and prevent accidental destruction by equipment. This area was reseeded with upland and wetland seed mix.

3.3 Wetland 1C

Herbaceous Cover

Herbaceous cover in the wet meadow and marsh areas of Wetland 1C is satisfactory.

Shrub Assessment

Twenty nine dead shrubs were observed around the perimeter of Wetland 1C. The As-built Report indicates that 177 shrubs were planted in this area. This mortality rate of 16% is partially attributed to mower damage. Less than ideal planting conditions (shallow topsoil, compacted subsoil) as identified in the As-built report by Coastal Environmental may also have contributed to plant mortality. However, natural recruitment of various species of willow has been strong.

To ensure a visual screen for the Wetland 1C marsh, 30 shrubs were added around the southern perimeter of Wetland 1C and the Enhancement Area. This included 12 silky dogwood (*Cornus amomum*), 11 nannyberry (*Viburnum lentago*), and 7 sweet pepperbush (*Clethra alnifolia*).

3.4 Wetland 3A Restoration Area

Shrub Assessment

Shrub mortality rates are estimated to be approximately 0-1% based on the number of living and dead shrubs observed in a portion of the Wetland 3A Restoration Area. As in the Created Wetland, shrubs were planted more densely than designed, so design densities are still exceeded. No further planting is required. Plant stress is evident, but most shrubs with dieback are sprouting vigorously from the base and are expected to survive. In addition, natural recruitment of alder and willows is occurring, which increases shrub density.

Herbaceous Cover

Herbaceous cover in the Wetland 3A Restoration Area is satisfactory, with the exception of weed problems as noted in Section 3.7.

3.5 Wetland 3A Supplemental Planting Area

Shrub Assessment

In 1995, 146 shrubs were installed in the supplemental planting area (Coastal Environmental, 1996). A tally of remaining plants on October 1, 1997 identified approximately 6-11 deaths, or 4-8 % mortality. Flagging tied to each plant was missing in some cases, and it was not always possible to distinguish between nursery stock and natural recruits. The naturally recruited shrubs include many of the species intentionally planted.

The trees and shrubs in the buffer of zone of Wetland 3A provide excellent cover and screening. Replacing the few dead nursery shrubs would not provide a measurable increase in density or community structure.

3.6 Drainways

Shrub Assessment

Plantings along the Atlantic Ave. Drainway, which was reconstructed based on Regional Transportation Center design, were completed in early October, 1997, according to design spacing and species requirements. However, it was decided that a very narrow planter on the eastern side of the drainway along a chain link fence would not be planted. This area (Figure 1) is extremely narrow, steeply sloping, and reportedly receives snow from the adjacent parking area. Shrub plantings in this area would be unlikely to survive or thrive. In addition, shrub plantings along the Created Wetland berm were not planted. This area will be planted when the adjacent Regional Transportation Center parking area is constructed.

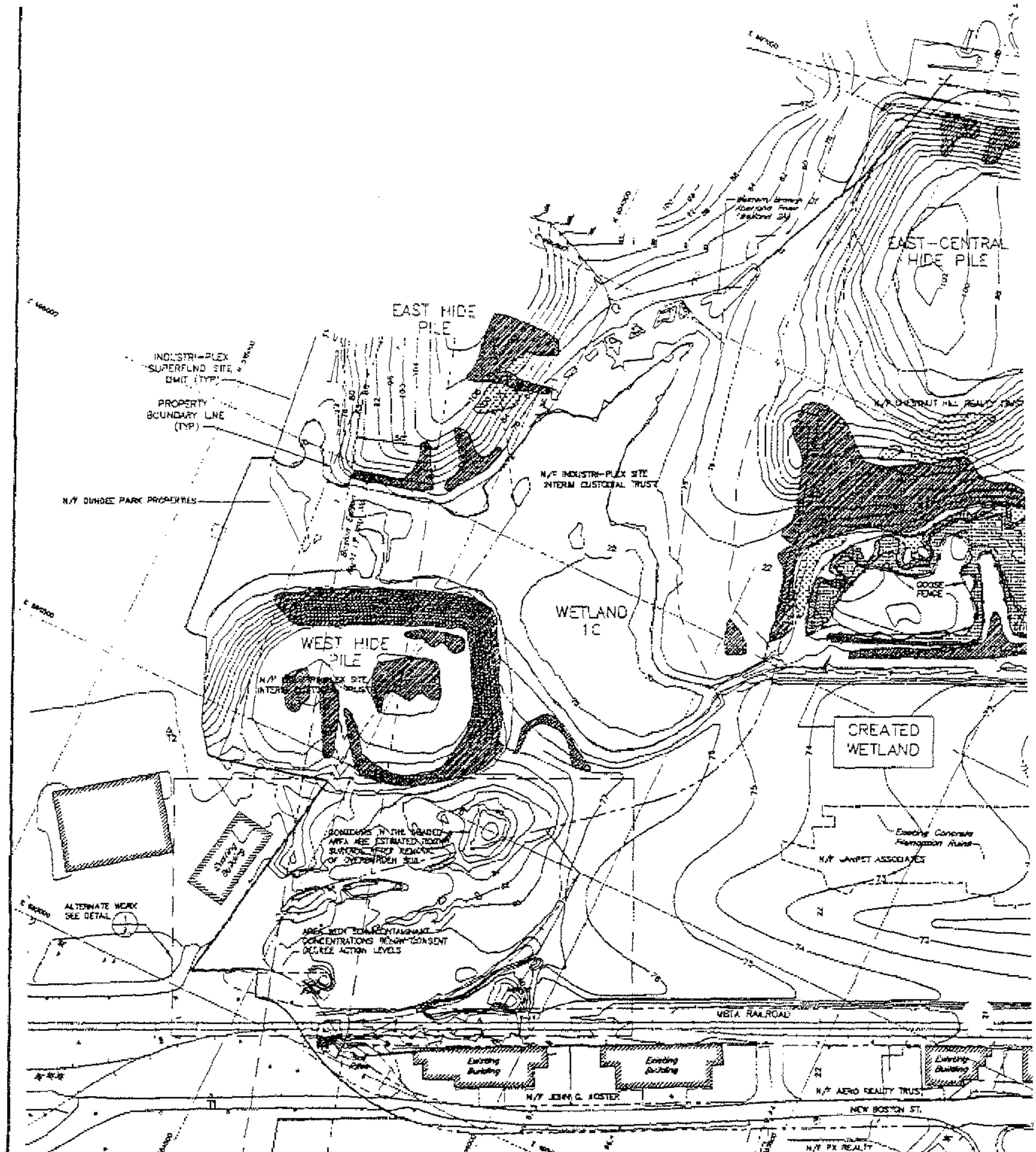
All other drainways were planted in 1995. Approximately 80 shrubs died along the New Boston Street Drainway in the summer of 1995, and were replaced in November, 1995. In September and October 1997, dead shrubs along the New Boston Street Drainway and the drainways leading from Wetland 1C were tallied again. Only two dead shrubs were observed along the Wetland 1C outlet. Mortality along the New Boston Street Drainway was much higher, particularly on the east (road) side. The number of dead shrubs observed in the New Boston Street Drainway planters (excluding the powerline right-of-way) was 53 out of an estimated 460 shrubs (at least 12% mortality), and an unknown number are missing altogether. At least some of the deaths resulted from stem injury by mowing or weeding equipment. The most vigorous species along the New Boston Street Drainway by far was rugosa rose, which was also favored during planting.

Approximately 124 new shrubs were installed on October 9, 1997 along the eastern side of the New Boston Street Drainway. The planting procedures outlined in Construction Specification Section 02938 were followed. The species planted included virginia rose, sweet pepperbush, maple-leaved viburnum, and nannyberry. An additional 48 shrubs were planted along the western side of the New Boston Street Drainway and its tributary near the southern end of the Kaknes Wood Products property.

3.7 Weed Removal

Woody shrubs and trees growing in drainway channels have the potential to collect debris and block flow. The location of greatest woody plant invasion is the New Boston Street Drainway in front of the Kaknes property. Since these plants are growing in rip rap, removal of the entire plant (including roots) may be difficult. However, simply cutting the stem or trunk of some species encourages vigorous growth of multiple stems. Therefore, removal of roots is recommended. This may be done by pulling or herbicide. This maintenance activity is not critical at this time, and will be addressed during long-term monitoring and maintenance.

In wetlands, problem species are purple loosestrife and common reed. Purple loosestrife is present along the edges of the Created Wetland and Wetland 1C. Eradication of the entire plant is essential, and these species can spread vegetatively. Hand removal of small plants is best performed in spring and summer before plants mature, but while soils are very wet. Plants should be removed from the site and disposed of to prevent seed dispersal. Larger plants that are difficult or impractical to pull can be treated with spot applications of the herbicide Round-up or Rodeo to kill the entire plant. Both purple loosestrife and common reed are abundant in the seasonally flooded portion of the Wetland 3A Restoration Area. Control by hand removal would be very difficult at this stage. Complete control of these invasive plants by any means is virtually impossible, since they are abundant in upstream wetlands. Over time, their abundance in the Restoration Area will diminish as shrubs and trees grow and provide shade.



PLAN REFERENCES

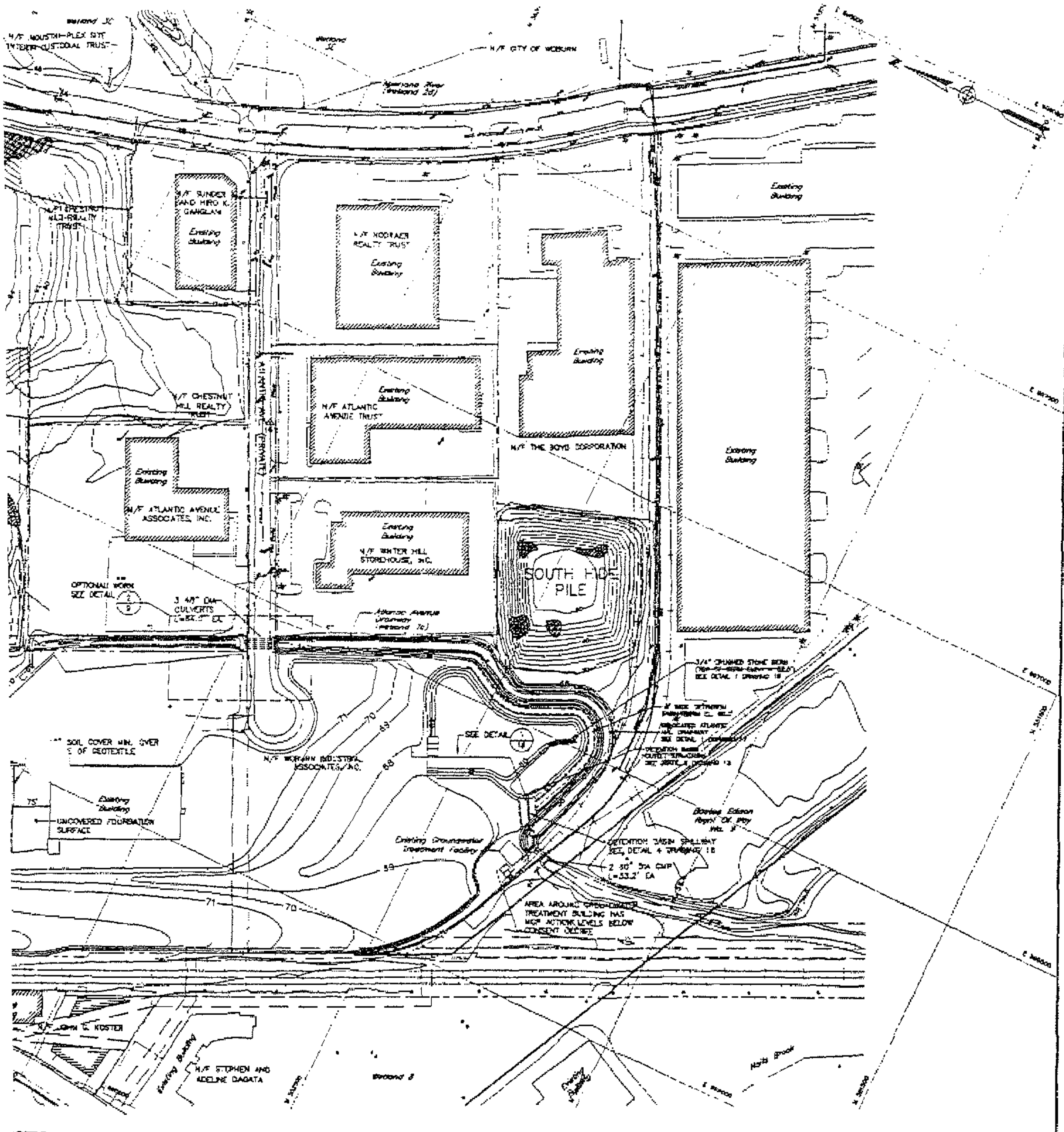
1. PLAN TITLED "COMPENSATORY WETLANDS PLAN VIEW" INDUSTRI-PLEX SITE REMEDIAL TRUST, WOBURN, MASSACHUSETTS, SCALE: 1"=150', DATED: 4/10/92, REVISED: 9/93, PREPARED BY NORMANDEAU ASSOCIATES INC.
2. PLANS TITLED "COVER TYPES" INDUSTRI-PLEX SITE REMEDIAL TRUST WOBURN, MASSACHUSETTS, SCALE: 1"=100', DATED: 12/20/91, REVISED: 4/92, PREPARED BY: GOLDER ASSOCIATES.
3. PLANS TITLED "WORKSHEET, JANPET SITE, EXISTING CONDITIONS" INDUSTRI-PLEX SITE REMEDIAL TRUST, WOBURN, MASSACHUSETTS, SCALE: 1"=60', DATED: JANUARY 30, 1995, PREPARED BY: MERIDIAN LAND SERVICES INC.
4. PLANS TITLED "EXISTING TOPOGRAPHY" INDUSTRI-PLEX SITE REMEDIAL TRUST, WOBURN, MASSACHUSETTS, SCALE 1"=100' DATED: DECEMBER 17, 1991, REVISED 04/92, PREPARED BY: GOLDER ASSOCIATES.
5. PLANS TITLED "PROJECT RECORD" INDUSTRI-PLEX SITE REMEDIAL TRUST, WOBURN, MASSACHUSETTS, SCALE VARIES PROGRESS PRINTS DATED: FEBRUARY 7, 1996, PREPARED BY: MERIDIAN LAND SERVICES INC.
6. PLANS TITLED "REGIONAL TRANSPORTATION CENTER-ALTERNATE COVER DESIGN", WOBURN MASSACHUSETTS, PREPARED FOR WOBURN REDEVELOPMENT AUTHORITY, MASS HIGHWAY, MASSPORT AND MBTA, PREPARED BY VANASSE HANGEN BRUSTLIN, INC AND GOLDER ASSOCIATES, INC. SCALE 1"=100', DATED 5/15/95 REVISED 12/13/95.

LEGEND

- 1/A — DETAIL/CROSS SECTION DESIGNATION
- 20 — SHT. No. WHERE DETAIL/CROSS SECTION IS PRESENTED
- SITE BOUNDARY
- PROPERTY LINE
- 73 — COMMERCIAL COVER CONTOUR
- 100% DESIGN REMEDIAL COVER CONTOUR
- PROPOSED SEDIMENTATION BASIN OUTFLOW STRUCTURE (SEE DETAIL 1 DRAWING 18)
- EXISTING RAILROAD TRACKS
- E 534000 — STATE PLANE COORDINATE GRID
- SURVEY CONTROL POINTS (REFER TO DRAWING 2)
- LIMIT OF WORK
- SEDIMENTATION STRUCTURE (SEE DETAIL 1 DRAWING 18)
- EXISTING FENCE LINE

LEGEND– 1997 REVEGETATION AREAS

- UPLAND TOPSOIL AND UPLAND SEED MIX – 118,050 SQ.
- WETLAND SEED MIX – 12,400 SQ.FT.
- EMERGENT PLANTING – 35,075 SQ.FT.
- BORDERLINE OR DEFICIENT AREAS TO BE SEEDED IF NECESSARY IN SPRING OF 1998. – 20,450 SQ.FT.
- APPROXIMATE LOCATION OF GOOSE CONTROL FENCING



OTES

THE PROJECT IS LOCATED WITHIN THE INDUSTRI-PLEX SUPERFUND SITE AREA. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE USEPA / MADEP APPROVED REMEDIAL ACTION PLAN FOR THIS SITE. ALL COVER WORK PROPOSED ON THIS PLAN SET SHALL BE REFERRED TO AS COMMERCIAL REMEDIAL COVER.

WETLAND LIMITS WERE TAKEN FROM PLAN REFERENCE No 5.

HIDE PILE LOCATIONS WERE TAKEN FROM PLAN REFERENCE No 2 AND 5.

THE EXISTING CONDITIONS PLAN IS A COMPOSITE OF SEVERAL PLANS, (SEE "PLAN REFERENCES") DUE TO ON GOING SITE WORK THIS PLAN MAY NOT REPRESENT CURRENT ON-SITE CONDITIONS. THE CONTRACTOR SHALL VERIFY ACTUAL FIELD CONDITIONS PRIOR TO THE START OF WORK.

EXISTING SITE CONTROL COORDINATES SHOWN WERE PROVIDED BY LIU AERIAL SURVEYS AND SAIC ENGINEERS, INC.

THE CONTRACTOR SHALL GRADE THE SITE TO DRAIN. LOW AREAS THAT [illegible] ATER WITHOUT OUTLETS VIA SURFACE DRAINAGE WILL [illegible] PERMITTED.

THE [illegible] PAVEMENT PATCH WITHIN ATLANTIC AVENUE R.O.W SHALL MEET OR EXCEED CITY OF WOBURN STANDARDS.

THE CONTRACTOR SHALL PREPARE CLEAN UTILITY CORRIDORS FOR FUTURE UTILITIES (WATER, SEWER, GAS, TELEPHONE, AND ELECTRIC) AS SHOWN ON DRAWING 6. THE CORRIDORS SHALL BE CONSTRUCTED ACCORDING TO THE DETAILS SHOWN ON DRAWING 18.

UPON AWARD OF CONTRACT THE CONTRACTOR SHALL APPLY FOR ALL NECESSARY PERMITS (PUBLIC/PRIVATE), PAY ALL FEES AND POST ALL BONDS ASSOCIATED WITH THE SAME. THE CONTRACTOR SHALL COORDINATE WITH THE ENGINEER AS NECESSARY.

10. ALL MONUMENTATION DISTURBED OUTSIDE THE LIMIT OF WORK DURING CONSTRUCTION SHALL BE RESET BY A REGISTERED LICENSED SURVEYOR AT THE CONTRACTORS EXPENSE.

11. THE CONTRACTOR SHALL PROVIDE WITHOUT ADDITIONAL COMPENSATION, SAFE AND CONVENIENT ACCESS TO THE GROUND WATER TREATMENT BUILDING AND ATLANTIC AVENUE DURING THE PROSECUTION OF THE WORK. THE ACCESS SHALL BE PROVIDED TO THE ISRT, ITS REPRESENTATIVES AND DIRECT ABUTTERS TO ATLANTIC AVENUE.

12. THE CONTRACTOR SHALL NOT ENTER INTO THE MBTA RIGHT OF WAY TO PERFORM WORK WITHOUT FIRST OBTAINING ALL NECESSARY PERMITS, APPROVALS AND CLEARANCES FROM THE MBTA AND AMTRAK.

13. ANY WETLANDS DISTURBED BY THE CONTRACTOR THAT IS NOT INCLUDED IN THE SCOPE OF WORK, SHALL BE REESTABLISHED IN KIND, AT THE CONTRACTORS EXPENSE.

14. IF THE ROCK LEDGE REMOVAL OPTION IS USED, REGRADING AT THE NORTH END WILL BE REQUIRED AND IS TO BE INCLUDED IN THE COST OF THE ALTERNATE.

100 0 100 200

1"=300'

REV	DATE	DESCRIPTION	DR BY	CHK BY	APP BY

PROJECT: INDUSTRI-PLEX SITE REMEDIAL TRUST
COMMERCIAL REMEDIAL COVER
WOBURN, MASSACHUSETTS

SHEET TITLE: 1997 REVEGETATION AS-BUILT PLAN
COMMERCIAL REMEDIAL COVER
GRADING AND DRAINAGE PLAN

NORMANDEAU ASSOCIATES INC.
ENVIRONMENTAL CONSULTANTS

PROJECT No.		FILE No.:	
CLIENT PROJ. No.		DRAFTING SOFTWARE	
DES BY: LEC	10/14/97	SCALE:	AS SHOWN
DR BY: OPS	12/15/97	DRAWING:	
CHK BY: WLC	1/30/97		FIG. 1
APP BY:			

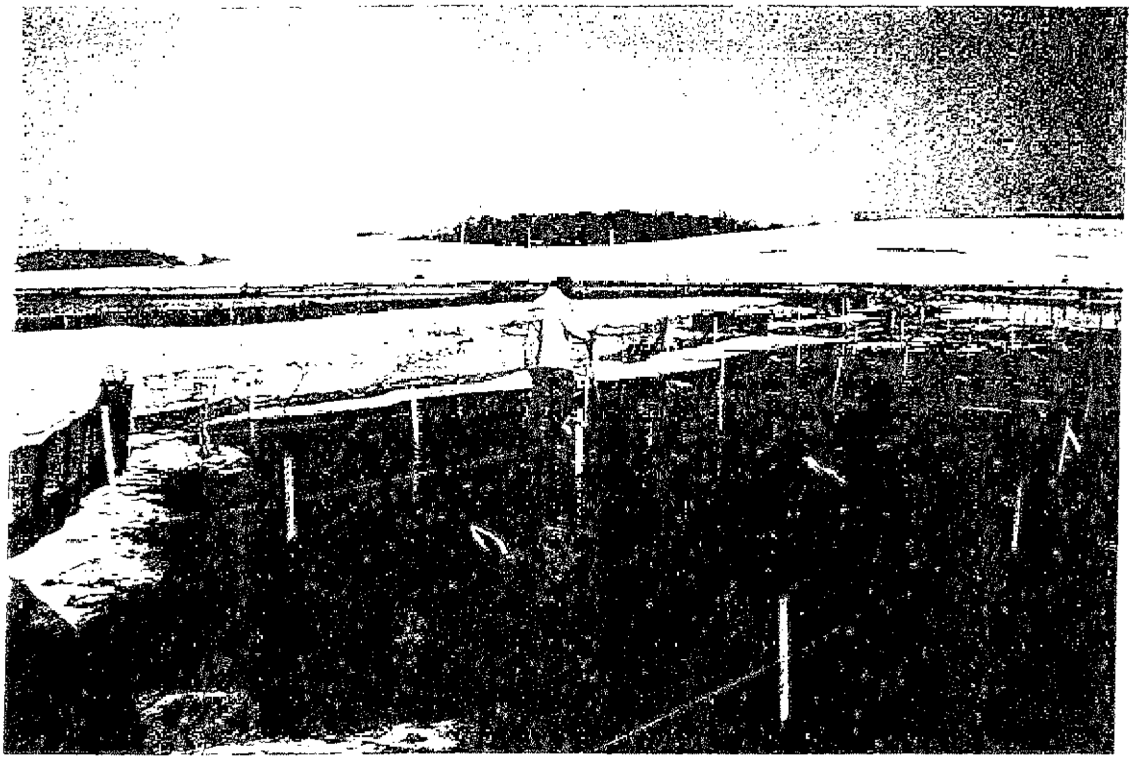


Photo 1 Emergent and aquatic plants were installed in the Created Wetland on November 20-21, 1997 in areas protected by goose fence.

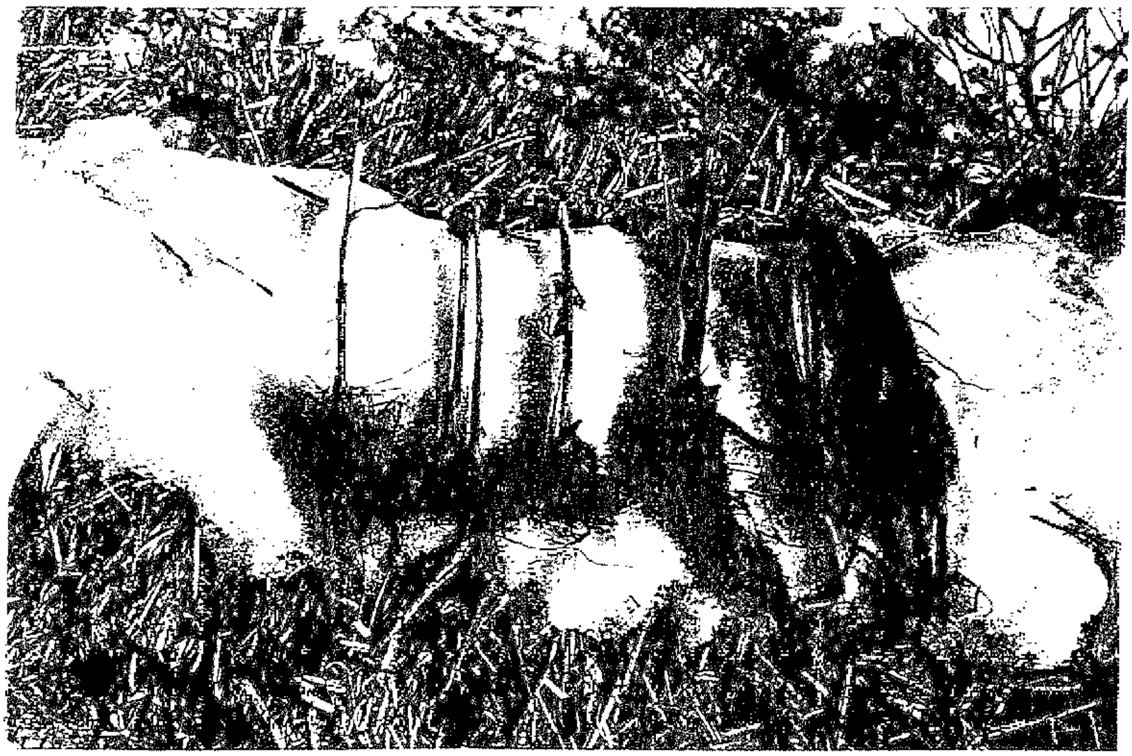


Photo 2 Dormant soft-stem bulrush *Scirpus tabernaemontani* and burreed *Sparganium americanum* nursery stock

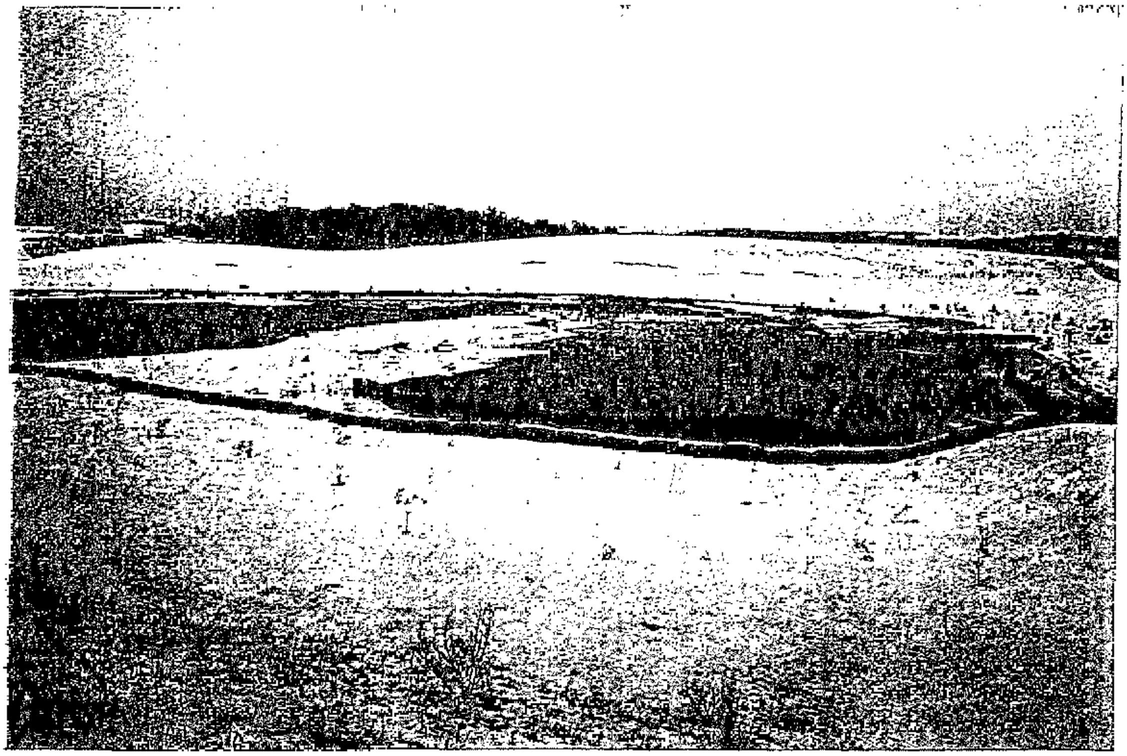


Photo 3. The southern bay of the Created Wetland on November 20-21, 1997 with the goose fencing grid installed.

Photo 4. The south slope of the West Hide Pile as it appeared on November 21, 1997. Topsoil, jute matting, upland seed mix and mulch were installed in October. The Enhanced Wetland is to the right

APPENDIX K

Thermal Oxidation Unit

67470-003-01

"D R A F T "

CERTIFICATION OF COMPLETION

LANDFILL GAS TREATMENT

INDUSTRI-PLEX SUPERFUND SITE

Prepared by

ICF KAISER ENGINEERS, INC.
Pittsburgh, Pennsylvania
December 1996

CERTIFICATION OF COMPLETION

LANDFILL GAS TREATMENT

INDUSTRI-PLEX SUPERFUND SITE

Prepared by
ICF KAISER ENGINEERS, INC.
Pittsburgh, Pennsylvania

George Wong-Chong 12/20/96

George M. Wong-Chong, PhD, P.E.
Manager: Environmental Process Engineering

INTRODUCTION

Site Description

The Consent Decree requires the execution of remedial action for the containment and/or treatment of hazardous substances in the soils, air and groundwater of the subject site. For the control of air emissions, including odor compounds produced as a result of the decay of hides in the hide pile, the remedial action consisted of the following components:

- Stabilize the side slopes of the East Hide Pile
- Install a gas collection system
- Cap the hide pile with a synthetic membrane to establish impregnability and soil cover
- Treat the collected gaseous emissions; thermal oxidation treatment was selected.

This Certification of Completion Report addresses the treatment of collected gaseous emissions using a thermal oxidation treatment system.

LANDFILL GAS AND TREATMENT SYSTEMS

Gas Treatment System

The gas treatment system is essentially a flare-type thermal oxidizer system; ancillary equipment includes:

- Landfill gas exhausters
- Continuous emissions monitoring system (CEMS)
- System instrumentation and controls
- Supplemental fuel supply (propane tanks) with feed control system
- Nitrogen generation system (pneumatic fluid for activation of butterfly valves on gas collection laterals.)

The landfill gas thermal oxidizer system is housed in an 18 ft by 32 ft section of the TOU building, the adjoining space is occupied by a conference room and offices.

DESIGN BASIS

Total collected gas flow was estimated at approximately 80 cubic feet per minute (cfm). This gas flow was assumed to be a combination of gas generated by hide decay and atmospheric leakage through the geomembrane liner. Gas characterization investigation revealed that gas collected over the decaying hides contain the following constituents:

- Methane - 5.5 to 240,000 ppmv
- Hydrogen sulfide - 0.027 to 2,890 ppmv
- Other organic constituents - 0.005 to 4.4 ppmv

For design purposes a conservative continuous gas flow rate of 150 cfm with 24 percent methane and 0.28 percent hydrogen sulfide was selected. It must be noted that this design basis appears to be very conservative when compared to estimates based on the field measurements and estimations of atmospheric air leakage into the collection system. The TOU system was installed as described in the 100% Design Report with one modification--elimination of the water seal.

APPROACH TO EVALUATING COMPLETION

In determining that implementation activities have been completed in full satisfaction of the requirements of the Consent Decree, the following activities were performed:

- Review of Consent Decree - Civil Action No. 89-0195-MC
- Review of Volume 5 of 100% Design Report
  - Chapter 15: Gas Collection System
  - Chapter 16: Gas Treatment System
- Review of Volume 6 of 100% Design Report
  - Bid Form and Specifications
- Change request documents
- Field inspection of Gas Collection and Treatment Facility and observation of system operation

Certificate of Completion
December 1996

- Review of Facility Design Drawings

  - Sheets 15-1 through 15-3

  - Sheets 16-1 through 16-6

- Discussions with installation and operation contractor

TOU SYSTEM PERFORMANCE

The TOU system was designed to continuously process 150 cfm of landfill gas containing 24 percent methane and 0.28 percent of hydrogen sulfide.

Operation of the TOU has not been on a continuous basis, operation has been batch-wise three time per week (Mondays, Wednesdays and Fridays) lasting about eight hours each day. Observations on these operations have indicated that after two to four hours the gas extracted from the hide pile appear to be greatly reduced in fuel value. This observation strongly suggests that the hide pile is not producing gas at the rate initially estimated in the design phase of this project.

Processed gas emissions of hydrogen sulfide as monitored by the CEMS analyzer unit have demonstrated the TOU to be effective..

In summary, aside from the reduced gas production, the TOU system functions as designed, ~~with a one slight drawback~~. One drawback of the system as currently operated is an excessive consumption of supplemental fuel; for about 4 to 6 hours supplemental fuel is consumed without benefit., (i.e., extracted landfill gas contain low levels of methane and hydrogen sulfide).

PLANNED SYSTEM UP-GRADE

The current batch mode of operation of the TOU system requires a significant amount of man-power attention especially during the start-up. To meet both reduced gas production and to moderate the man-power requirement for system operation, an up-grade of the treatment system is planned.

This up-grade entails automation of the system to provide for:

- Less operator attention

- More economical use of supplemental fuel

- More structured operating schedule
- A mechanism whereby the operation of the system can be adjusted to meet the dynamic characteristics of gas generation in the hide pile.

The approach to the proposed system automation is time sequencing of the operation.

CONCLUSION

The TOU system was installed in accordance with the 100% design as modified. Continuous operation of the system has not been found to be necessary, contrary to the expectations/ anticipations in the original design. This is likely due to the very conservative estimate of gas production from the hide pile (i.e., 150 cfm).

The gas production rate from the hide pile will be dynamic, decreasing with time as the pile dries out and as degradable organic matter diminishes. Therefore the planned system automation is a good strategy to effectively and economically meet these changing conditions.

12/18/96

John N. Olsen
508 851-9895
65 Patten Rd
Tewksbury

John,

John Olsen will call next week & set up a meeting w/ you and Jon Tibebe.

Mike

SUSAN J. CRANE

Attorney at Law

321 Boston Post Road
Sudbury, MA 01776
tel. 508-440-8700
fax 508-443-9490

Via Facsimile and U.S. Mail

December 12, 1996

Mr. John Fiore
Project Manager
Industri-Plex Site Remedial Trust
23 Atlantic Avenue
Woburn, MA 01801

Re: Access Agreement for 74-110 Commerce Way, Woburn

Dear Mr. Fiore:

As we discussed on the telephone yesterday afternoon, I represent WHTR Real Estate Limited Partnership, the first mortgagee on the above-referenced property (the "Property"). It has been called to my attention by John Horan, the Property manager at The Hamilton Company, that trucks containing clean fill and perhaps other heavy equipment operated by contractors working on behalf of the Industri-Plex Remedial Trust (the "Trust") in their performance of a response action on the Industri-Plex Site have been using the Property as a means of access to the Industri-Plex Site. These activities have been conducted without any authorization from the Property owner, Commerce Way Limited Partnership.

You informed me that these unauthorized activities on the Property were an oversight on the part of the Trust and that, unless and until an agreement is reached with the Property owner, all activities by the Trust's contractors will immediately cease on the Property. You further informed me that, as of Tuesday of this week, there is a road providing access through the Industri-Plex Site to the area where capping activities requiring large quantities of clean fill to be trucked in are currently being conducted. As a result, access through the Property has become unnecessary but could be needed in the future in the event of an emergency rendering the new road inaccessible.

If the Trust requests any further activities on the Property, in advance of entering the Property for any purpose, please send me a draft access agreement for execution by Commerce Way Limited Partnership by Commerce Way Corp., its managing general partner. The draft agreement should include the following: a) a complete description of all activities to be conducted on the Property, including the nature and number of any trucks or other heavy equipment that would be seeking access and the times of day and dates when access would be needed; b) the reason for that request; c) a comprehensive indemnification of Commerce Way Limited Partnership, The Hamilton Company and WHTR Real Estate Limited Partnership from both the contractor(s) that would be accessing the Property and the Trust for any and all harm, damages, injuries or other liabilities arising from the contractors' activities on the Property; and d) a copy of the liability insurance policy of the contractor(s) providing the indemnification.

Very truly yours,

Susan J. Crane

Susan J. Crane

cc: Mr. John Horan (The Hamilton Co.)
Mr. Greg Rooks (WHTR Real Estate Limited Partnership)

Woburn TOU Inlet Concentrations

Date	Day	CH4, percent	H2S, ppmv	CH3SH, ppmv	Others, ppmv	Source	Reference
May-90	NA	< 0.0004 - 0.075%	< 0.008 - 0.251	< 0.006 - < 0.021	VOCs - < 0.004 - 0.011	Hide pile gas vents	12/91 Golder Design Report
Aug-90	NA	0.00055 - 24%	0.027 - 2890	< 0.032 - < 0.185	VOCs - < 0.004 - 4.4	Hide pile gas vents	12/91 Golder Design Report
NA	NA	0. - 24%	3000	NA	VOCs - 0.004 % CO2 - 75.5%	TOU inlet assumption	Process Criteria, 4/92 Golder Design Report
NA	NA	NA	3000	NA	NT	TOU inlet assumption	Air Dispersion Modeling in 12/91 Golder Design Report
11/27/95	Mon.	16%	120	NT	NT	TOU inlet after 1 hour operation	Tedlar bag sample by D. Kling
5/24/96	Fri.	22%	16	NT	NT	TOU inlet at startup	Tedlar bag sample by D. Gile
7/29/96	Mon.	38%	88	0.41	(CH3)2CHSH - 1.5 CS2 - 0.6	TOU inlet at startup	Tedlar bag sample by D. Gile
8/5/96	Mon.	23%	55	NT	NT	TOU inlet at startup	Tedlar bag sample by D. Gile
8/12/96	Mon.	20%	17	NT	NT	TOU inlet at startup	Tedlar bag sample by D. Gile
8/19/96	Mon.	21%	26	NT	NT	TOU inlet at startup	Tedlar bag sample by D. Gile

CH4 - Methane (flammable range 5 - 15%)
H2S - Hydrogen Sulfide
CH3SH - Methyl Mercaptan
VOCs - benzene, toluene, chlorobenzene, ethylbenzene, dichlorobenzene
(Other VOCs ND) (per 12/91 Golder Design Report)
(CH3)2CHSH - Isopropylmercaptan
CS2 - Carbon Disulfide
NT - Not Tested
NA - Not Applicable
ND - Not Detected

Post-it® Fax Note 7671

Date 9/10	# of pages ▶ 2
To JOHN FIORE	From MIKE LIGHT
Co./Dept. ISRT	Co.
Phone #	Phone # 314/694-1617
Fax # 617/933-4821	Fax #

Monsanto

FACSIMILE TRANSMISSION

MONSANTO BUSINESS SERVICES
ENVIRONMENT, SAFETY, & HEALTH
REMEDIAL PROJECTS
MAIL CODE F2EP
800 NORTH LINDBERGH BOULEVARD
ST. LOUIS, MO 63167

DATE: 3/5/97

TO: John Olsen

FAX NUMBER: 617-933-4821

PAGES INCLUDING COVER: 2

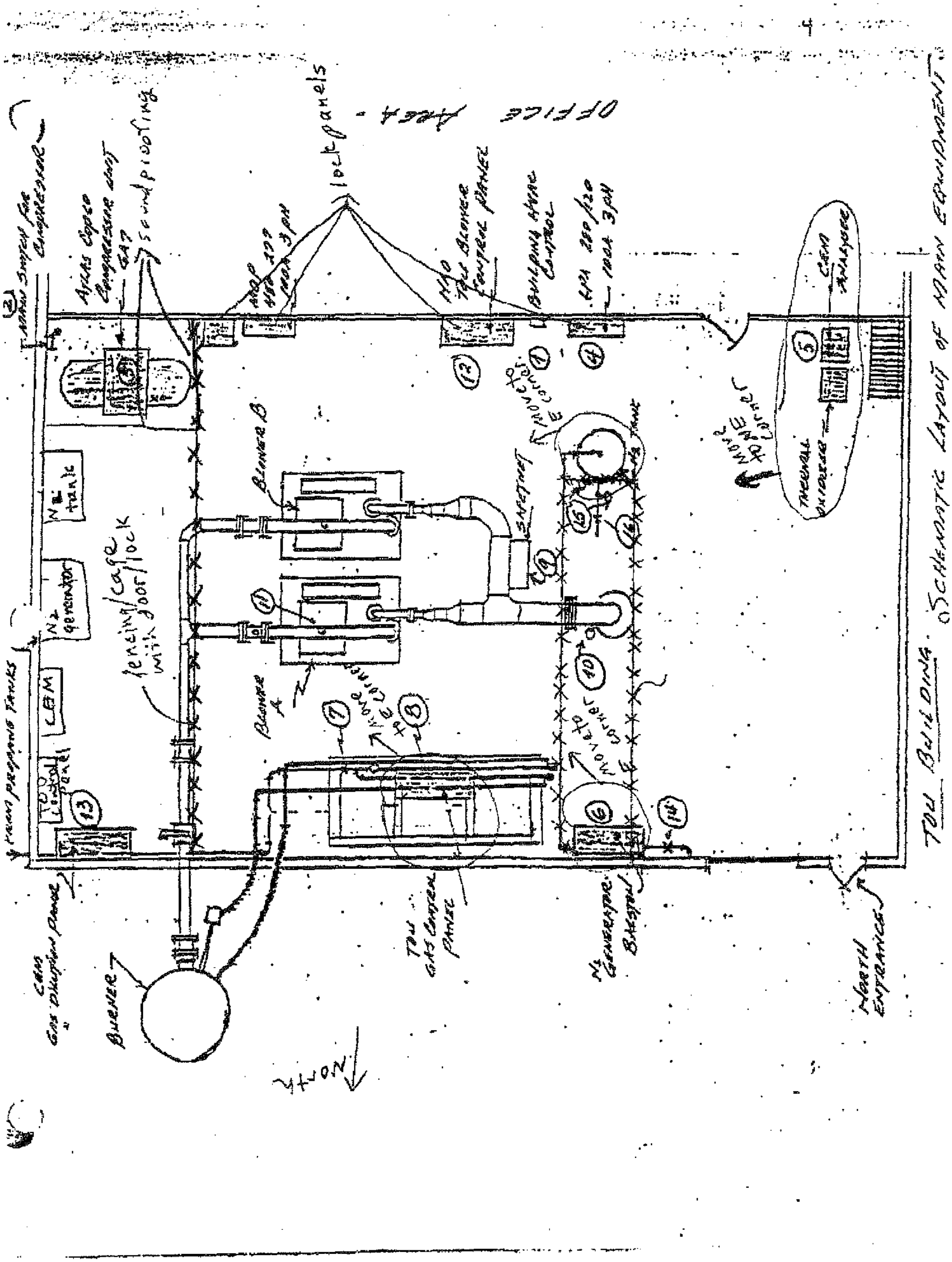
FROM: KIMBERLY PERRY

PHONE: 314-694-3402

FAX: 314-694-6138

SUBJECT: Woburn TOU

REMARKS: FYI, a proposed layout for the TOU equipment area. Tell me what you think.



TOU BUILDING. SCHEMATIC LAYOUT OF MAIN EQUIPMENT
OFFICE AREA
NORTH
BURNER
Blower A
Blower B
N2 tank
N2 generator
CEM
TOU control panel
lock panels
fencing/cage with door/lock
soundproofing
Atlas Copco Compressor unit GA7
TOU Gas Control Panel
Thermal Oxidizer
CEM Analyzer
NORTH ENTRANCE
From propane tanks

Industri-plex Site

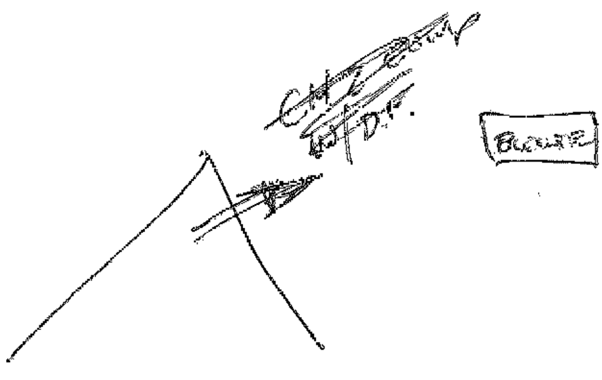
Thermal Oxidizing Unit Notes — December 7, 1998

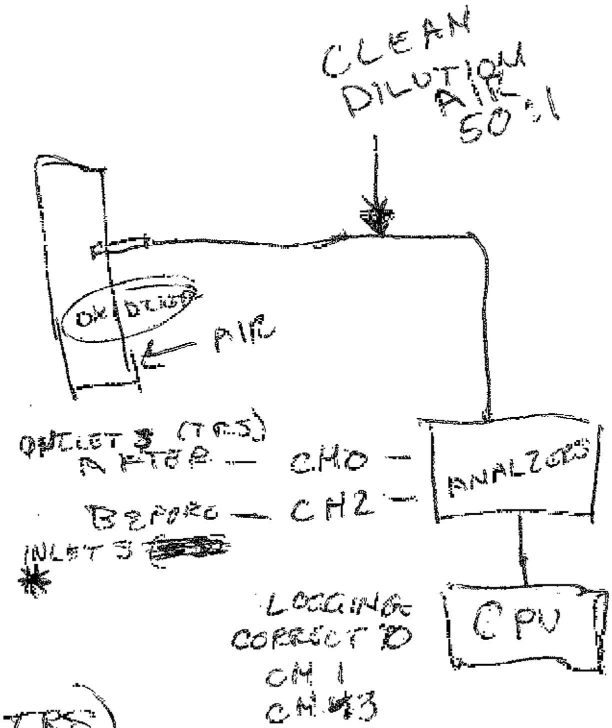
- If disconnect the CEM, will CPU still run the TOU on timed runs?
- Data Flags
    - F's – System off, no Reading
    - P's – Partial Reading

Explanation of the Channel Readings

Channel	Sample Reading	Explanation
CH0	0.001	Diluted escaping TRS after oxidation (not oxidized, ppb). This is diluted to use the highly accurate analyzer as well as removal of particulate and moisture.
CH1	0.020	Escaping TRS after oxidation (not oxidized, ppb). This is CH0, corrected for the dilution factor. (~50:1) typically
CH2	0.204	Total sulfur entering the oxidizer (ppb) from the hide pile. This number assumes 5% correction for methane and air mixture (CH3 / 0.05)
CH3	10.250	Exiting SO_2 from the stack. CORRECTED 4 DIL FACT (50/1 TYP)

mol Ratio (SO_2 1)(TRS 1)





* measured by SO_2 (OXIDIZED TRS) COZ ASSUME no SO_2 in pile.

methyl mercap in Assist gas oxides in SO_2 so ~35 ppb from propane

D J Gile, Inc.

P.O. Box 706, Kennebunkport, Maine 04046 Tel: 207-967-5286
40 MacChipkay Road, Arundel, Maine 04046 Fax: 207-967-4107

May 22, 1998

Industri-Plex Site Remedial Trust
c/o Mr. John Fiore
Maverick Construction Management Services
603 Apple Brier Lane
Marlborough, MA 01752

Subject: Compliance Assessment of the ISRT TOU CEMS and Options for Alternative Monitoring Methods

Dear John:

At the request of the Industri-Plex Site Remedial Trust (ISRT), D J Gile, Inc. has completed a compliance assessment of the East Hide Pile thermal oxidizer unit (TOU) continuous emission monitoring system (CEMS). Along with this assessment, ISRT also requested that a research of alternative monitoring methods to the TOU CEMS be conducted in order to identify a more cost-effective solution to demonstrating emissions compliance.

With respect to the CEMS assessment, the objective was to review the existing program operational QA/QC procedures and identify portions of those procedures, if any, which fail to comply with existing regulatory guidance for CEMS. This was done by researching all existing regulations involving a CEMS of the type installed on the TOU program, as well as regulations directed at sources such as the TOU, and determining which parts apply, or may apply. Upon identifying those sections, the TOU CEMS program was then assessed for compliance based on those regulations.

The other co-objective to this assessment was to identify technically valid, cost-effective alternatives (monitoring/test methods) to the CEMS which would continue to demonstrate TOU emissions compliance and likely to be acceptable to both EPA and/or Mass DEP. This was accomplished by researching and evaluating both traditional and non-traditional methods of sampling stack gases containing total reduced sulfur (TRS) compounds. Non-traditional methods are defined as those that are not included as EPA source-specific test methods. Methods that were likely to be as costly as operating the existing CEMS were not considered. Methods that were not technically proven as being accurate for TRS sampling were also not considered.

<u>**Description of Current CEMS**</u>

The current TOU CEMS is the third system to be considered for continuous monitoring of TOU stack effluents. The first system, specified by the Trust's remedial contractor, was designed by Anarad. During the final stages of consideration, this system was identified to be technically inappropriate due to conflicts between the systems measurement method and the unique species of compounds likely to be emitted from the TOU stack. The second system, also specified by the remedial contractor, was designed and manufactured by Datatest. This system passed the technical evaluation stage and was installed by Datatest technicians several months ago. Unfortunately, the system proved unreliable and was disassembled following a series design problems and component failures caused, in part, by the extreme temperature environment inside the TOU stack. The existing system, manufactured by Thermo Environmental Instruments (TEI), was installed last fall. However, due to subsequent alterations to the TOU operational cycle, and the associated cyclical changes in stack chemistry (i.e., formation of condensation in the stack probe when the TOU was off), the system had to be modified and did not become fully operational until February of this year. One of the modifications also included an additional system to monitor inlet hide pile TRS compounds feeding into the TOU.

The existing CEMS, TEI Model 200, utilizes an *in situ* stack dilution probe such that extracted stack gas is diluted sufficiently enough to be measured by extremely accurate ambient gas analyzers. In order to reduce the capital costs of the CEMS, the effluent portion of the analytical system is comprised of components originally used in ISRT's now decommissioned ambient TRS monitoring program. The stack gas extraction system utilizes materials that are commercially available for the most extreme (hot) temperature environments, yet the TOU stack effluent exceeds those ratings. Therefore, the probe is offset slightly from the direct effluent stream to allow for sufficient cooling before stack gas is introduced into the system. Upon measurement by the analyzers, analog signal outputs are sent to a PC-based data acquisition system for data archiving. This PC-based system also serves as the TOU automation controller (DAS/Controller). For routine QA/QC checks, the CEMS allows for the manual introduction of multiple calibrations gases for zero and span calibration drift assessments. In order to maintain system stability the CEMS is operated continuously, even during periods when the TOU is off.

Given the uniqueness of the TOU, and the complex chemistry associated with the effluent, the current CEMS is technically the most appropriate of all commercially available CEMS for this application.

Compliance Assessment of TOU CEMS

With respect to compliance assessment, the CEMS in operation at the TOU building is not subject to specific air guidance since the TOU is not included as any of the sources targeted by existing air regulations. Also, the TOU is part of a Superfund remedial project. Therefore it is normally the decision of the project's regulatory authority (i.e., EPA and/or Mass DEP) to require, and approve, methods for the establishing compliance along with associated QA/QC procedures. In the case of the Industri-Plex, the site's 100% design plan simply states that a CEMS will be used to monitor effluents and incorporate an alarm system should TRS emissions exceed 30 parts per million. There is no mention of a formal monitoring plan as part of the 100 % design plan, and there was no CEMS type formally proposed for the TOU. Given this, and the fact that EPA and Mass DEP have approved the design plan as written, it would suggest that ISRT may install a CEMS of any type or configuration, as well as follow any QA/QC procedures it deems appropriate. However, this may not be the case.

All regulations with respect to a CEMS of the type installed at the TOU building are discussed in ***Title 40 of the Code of Federal Regulations, Subchapter C - Air Programs***. Specific CEMS regulations can be found in ***Part 60 - Standards of Performance for New Stationary Sources (NSPS), and Part 75 - Continuous Emissions Monitoring***. The regulations found in these sections are directed at new industrial sources (Part 60) and at sources which are applicable under the Acid Rain Program (Part 75) as a result of the 1990 Clean Air Act Amendments (CAAA). The guidance for both parts is very specific and detailed with respect to operational QA/QC requirements and is directed at any CEMS, regardless of the pollutant monitored. Even though the CEMS QA/QC procedures discussed in both Parts 60 & 75 are not directed specifically at the TOU CEMS - as a result of the TOU not being included as a source targeted in those parts - they are regulations directed at those similar to the TOU CEMS. Given this, it would not be unreasonable for the regulating agencies in charge of the Industri-Plex to require, or at least expect, that the TOU CEMS be operated within those guidelines. If individuals of EPA's air branch were to become involved with the TOU program they would very likely expect this. Therefore, the TOU CEMS should be assessed for compliance based on those regulations.

Parts 60 & 75 CEMS QA/QC Requirements

Since Parts 60 & 75 provide very detailed guidance depending on the specific source and pollutant(s) monitored, this assessment highlights the most basic areas of compliance required for any CEMS, i.e., performance specifications, calibration schedules, data validation, personnel involvement, etc. Those requirements are as follows:

Facility pre-installation requirements:

- Submittal to regulatory agencies, and subsequent approval, of a monitoring plan and CEMS method of monitoring (i.e., CEMS type). This plan is to include and detail all proposed CEMS operational QA/QC procedures, procedures for correcting CEMS "Out-of-Control" situations, routine maintenance procedures, data review QA/QC procedures, procedures for missing data, audit procedures, and data reporting protocol.

Following CEMS installation, the operating facility is to:

- conduct a relative accuracy (RA) performance specification test, and;

- conduct a seven-day calibration drift (CD) performance specification test.

After initial testing, the following routine QA/QC procedures are required:

- daily CEMS zero and span calibration drift checks using compressed calibration gases;

- quarterly relative accuracy test audit (RATA) using EPA source test methods *or*;

- quarterly cylinder gas audits (CGA) using EPA Protocol I gases;

- yearly RATA test using EPA source test methods.

The above QA/QC procedures do not include mandatory daily assessment of data and corrective action requirements should any of the QA/QC procedures reveal unsatisfactory results.

Compliance Assessment of TOU CEMS as Compared to Parts 60 & & 75

As the TOU CEMS program currently operates, none of the above requirements have been met, or to-date been completed. As part of the TOU CEMS program, there was no formal monitoring plan developed or submitted, though it is not known whether a plan was ever requested by either EPA and/or Mass DEP.

Since becoming fully operational, the TOU CEMS to-date has not completed any type of performance specification test, nor has the program instituted the daily zero and span calibration drift checks. It should be noted that originally, the TOU DAS/Controller was programmed to operate on an irregular schedule depending on the level of TRS entering the TOU. This prevented the programming of regular daily zero and span calibration drift checks as a result of inevitable computer software conflicts. Subsequently, the TOU was found to operate more efficiently based on a regularly cycled operating frequency (i.e., a set time of operation and a set time of inactivity), and as a result, now allows for the capability to program daily drift checks. As the program operates today, calibration drift checks are conducted on a monthly basis only.

With respect to quarterly audits, none has been completed to-date. Since the TOU CEMS has been in operation for less than one year, the annual RATA test requirement has not been exceeded.

Alternative Monitoring Methods to Demonstrate Emissions Compliance

Assuming the TOU CEMS is required to meet compliance, as specified in Parts 60 or 70, the program will require a significant, unavoidable increase in scope. More importantly, the program will be subject to a significant, unavoidable increase in operational costs. This is in addition to the cost to maintain the system as is. As a result, it is strongly recommended that an alternative(s) to the CEMS be studied in order to demonstrate the mandatory emission compliance as stated in the 100% design plan.

It is important to understand that the only reason a TOU CEMS program is required is that the Trust's 100% design plan proposed, and the regulatory agencies approved, that a CEMS would be used for compliance demonstration. Since the TOU is not a specific source that is defined in existing regulations, a CEMS is not a requirement, and it is therefore acceptable, and reasonable, to propose any technically valid approach for compliance demonstration. Therefore, it is also reasonable for the Trust to obtain approval for an alternative method for compliance demonstration.

CAM Rule

EPA has recently promulgated alternatives for affected sources in order to demonstrate air emissions compliance as a result of the CAAA Title V permit program. The sources which are affected by Title V were initially required to install costly monitoring systems (i.e., a CEMS) in order to demonstrate compliance with air regulations. However due to great public criticism of these requirements, EPA has adopted the Compliance Assurance Monitoring Rule, otherwise known as the "CAM" rule. This regulation allows affected facilities to demonstrate and establish compliance by monitoring and verifying critical process parameters for proper operation, thereby assuring regulatory agencies that they comply with established guidelines. In simple terms, if a source is operating properly, and critical operating parameters are monitored effectively, it is therefore assumed to be in compliance. Parameters monitored may include process feed rates, temperatures, fuel types, etc. These are parameters that are typically already monitored by a facility in order to maintain the efficiency of a process. Since a source is already monitoring these parameters, it removes the need to install other, more costly monitoring devices, such as a CEMS.

In the case of the TOU, critical operating parameters already monitored include temperature as well as several other system checks in order to operate efficiently and properly. The CAM rule also requires that if a process is not operating properly then corrective actions are to be implemented immediately. The TOU incorporates several system interlocks which shutdown the TOU in the event of process failure, thereby complying with that part of the rule. It is likely that a technically valid case can be made that if the TOU is operating properly it can be assured that it complies with the established 30 parts per million emission limit. Even though the TOU is not required to meet Title V regulations, the CAM rule is a compliance tool that is intended to help sources similar to the TOU. Therefore, it is recommended that this approach be proposed for the TOU.

Alternative Emissions Test

In order to prove that the CAM rule approach applies to the TOU, it may be necessary to conduct some type of non-continuous emissions test during TOU operation. There are two approved EPA stationary source-specific methods to measure sulfur compounds - methods 15 & 16. Method 15 was derived to determine hydrogen sulfide (H_2S), carbonyl sulfide, and carbon disulfide emissions from tail gas control units of sulfur recovery plants. Method 16 is used to determine H_2S, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide. These methods, by definition, incorporate several other EPA source-specific methods for measuring stack diameter, isokinetic flow, and particulates. They are also equipment and labor intensive, and as a result, are very expensive to complete. Therefore, these methods do not satisfy the objective of a cost-effective alternative.

Several other alternative methods were researched and evaluated, however the vast majority were found to be unacceptable as a result of either being too costly or technically inappropriate.

Stack Emission Sampling Using Restek SilcoCan™ Canisters

Due to the general instability of gaseous TRS compounds, EPA has in the past officially disapproved of many other test methods, such as grab-bag (Tedlar®) or Summa® passivated canister samples for source emissions testing. However, as a result of recent technological improvements with respect to the stabilization of TRS sample media, EPA and/or Mass DEP may now be willing to consider one of these non-traditional methods as an alternative.

A dramatic technological improvement to Summa® canisters is the **Silcosteel®-lined SilcoCan™** passivated stainless steel canister manufactured by Restek Corporation (Restek). Similar in design to Summa®, these new canisters are lined with fused silica (glass) and have shown extremely encouraging results with respect to the collection and stabilization of gaseous TRS compounds. The process of lining the canister with glass inhibits sulfur compounds from binding to the canister walls, as occurs with Summa® passivated canisters and/or untreated Tedlar® bags. The advantages to canister sampling is that samples are less likely to be lost in shipment due to rough handling, and that the necessary equipment required to extract a sample of stack gas is relatively small and inexpensive. The canisters are typically rushed via overnight carrier to a laboratory for immediate analysis.

Concerning a possible method protocol, samples would be taken after a pre-determined period of TOU operation, for example after fifteen minutes of flare activation. A sample of stack gas would also be collected for a pre-determined time period, such as a one hour integrated sample. The exposed canister would then be sent overnight carrier to a laboratory specializing in gaseous TRS analysis. This laboratory would also specialize in SilcoCan™ canister preparation. Samples would be collected from the same location as the current CEMS probe using a modified sample port. SilcoCan™ canisters can be exposed using either positive pressure or partial evacuation. Partially evacuated canisters are the least equipment intensive and easiest to use since the canister itself extracts the entire sample under vacuum. Positive pressure canisters allow for higher detection limits but require additional equipment, including a Teflon-lined pump, to extract the sample. Since the TOU emission limit of 30 PPM is well above the detection limit for partially evacuated canisters, these would be used for this method. A six-liter canister would provide more than a sufficient sample for analysis. QA/QC possibilities include a batch or trip blank, collocated sample, and a laboratory spiked trip sample.

With respect to emissions determination, data results should ideally be reported as a volumetric mean, i.e., parts per million or parts per billion. This eliminates the need to measure stack flow which would require the implementation of several costly EPA source-specific flow measurement methods. Volumetric data is also appropriate since the 100% design plan specifies a not to exceed emission limit in parts per million. In the case of the Industri-Plex TOU, a reasonable testing schedule would be to conduct sampling on a quarterly basis, i.e., four (4) times per year. A yearly test could be proposed but would be less likely to be approved. Another approach would be to sample quarterly, and if all results are satisfactory, reduce the schedule after one year to an annual test.

The most obvious advantage to canister sampling is the relatively low cost to extract and analyze the sample. Analyses of sulfur compounds using ASTM D-5504 is typically $300 per sample and includes canister preparation, shipment, and basic laboratory QA/QC documentation. Another is the relative ease in extracting the sample. This method would require no more than one day and two individuals, with minimal equipment, to complete the task. In actuality, one individual could complete the work, however for safety purposes (stack climbing), two individuals should be involved.

After extensive research and evaluating several alternatives, this method was found to best meet the two key criteria of an alternative that is cost-effective and technically valid. Therefore, this is the method we recommend as an alternative to the TOU CEMS. It is suggested that a final method protocol be generated after EPA and/or Mass DEP have given their initial approval to this method (i.e., canister sampling).

Contained in **Attachment A** is documentation from Restek describing the applicability of the SilcoCan™ for TRS sampling. This information is provided to support the technical validity of this method.

Also included in **Attachment B**, is a summary of the related experience of Air Toxics, Ltd. of Folsom, California. We recommend Air Toxics, Ltd because of their extensive program experience analyzing sulfur compounds as well as preparing and extracting SilcoCan™ samples. As noted in their summary, projects involving the use of the SilcoCan™ for sulfur analysis include government clients, as well as programs involving source testing.

CEMS Data

As a supplement to this assessment, **Attachment C** contains five-minute averaged TOU CEMS data from February 1 through May 14, 1998. This database reflects nearly four (4) months of TOU operation. The CEMS data is provided to document the low TRS levels emitted from the TOU stack. The data is divided into raw analyzer and dilution-multiplied values. It is the dilution-multiplied data that are the actual stack emissions and is reported in parts per million (column three). Data for both the effluent (columns three & four) and East Hide Pile inlet (columns five & six) systems are provided and are also reported in parts per million.

Even though the CEMS does not comply specifically with Parts 60 & 75 QA/QC requirements, the CEMS has nonetheless been checked for calibration drift on a monthly basis throughout the database period. The gases used to check for calibration drift includes those certified to EPA Protocol I standards as specified by Parts 60 & 75. During each monthly assessment, no calibration drift check result has exceeded 15% - the maximum allowable limit for Parts 60 & 75 CGA standards. Therefore, the data should be considered with a high degree of reliance.

As presented in the database, the stack effluent TRS emissions are extremely low at all times during TOU operation. In fact, all stack effluent TRS data values are well under 1 PPM during the entire period - well below the emission limit of 30 PPM. This strongly suggests that the TOU is in fact, well within compliance.

Conclusions

The following is a summary of the points discussed:

- The Trust's 100% Design Plan proposed, and the regulating agencies approved, the use of a CEMS as the method for demonstrating compliance with the established TOU stack effluent emission limit of 30 parts per million.

- The existing TOU CEMS program, as currently operated, is not likely to be considered in compliance with established guidance for CEMS operations.

- To bring the CEMS into compliance, including the necessary QA/QC effort, would require an extremely costly and labor intensive upgrade to the program.

- As a result of the cost to bring the CEMS into compliance, it is recommended to identify and propose alternative compliance monitoring methods which are cost-effective, technically valid, and acceptable to EPA and/or Mass DEP.

- The Title V CAM rule allows for affected sources to assure compliance by monitoring process systems for proper operation. If the process is operating properly then the source is assured to be in compliance. The TOU currently monitors critical operating parameters, such as temperature, therefore this rule can likely be applied to the TOU.

- In conjunction with the CAM rule, propose a quarterly test to prove that while the TOU is operating properly, it is in fact within compliance.

- Propose the use of glass-lined SilcoCan™ canisters for stack gas sampling, followed by next-day laboratory analysis, as the test method.

- Report test results as a volumetric mean in order to avoid costly EPA stack flow methods used in mass emissions calculations. Since the 100% Design Plan stack emission limit is volumetric, this approach is valid and most appropriate.

Based on the various points discussed in this assessment, it is likely that the TOU CEMS QA/QC procedures would be considered inadequate by regulatory personnel. Given the high cost to implement the necessary improvements, it would be beneficial for the Trust to propose alternatives to the TOU CEMS. The combination of assurance monitoring in conjunction with regularly scheduled canister sampling, is a reasonable, cost-effective, technically valid approach to demonstrating continued emissions compliance.

I truly hope this information addresses the Trust's needs. Please feel free to call me at (207) 967-5286, or e-mail me at *dewg@cybertours.com* should you have any questions or comments concerning this document.

Sincerely,

Dewey J Gile
President & Air Quality Meteorologist

Attachments

ATTACHMENT A

Restek
Corporation
110 Benner Circle
Bellefonte, PA 16823-8812

From:
Kristi Sellers

Did you get a complete, clear, transmission?
If not, please call:
814-353-1300 or
800-356-1688

Ext.: 2150

To: Dewey Bile No. of pages to follow: 2

Company: DJ Bile, Inc. Date: 5-20-98

Fax Number: 207-967-4107 Time: —

Message:

Please call if you have questions.
—Krista

☐ FAX your reply to 814-353-1309 ☐ Call 814-353-1300 or 800-356-1688

☐ I will call you ☐ No reply requested

RESTEK
CORPORATION

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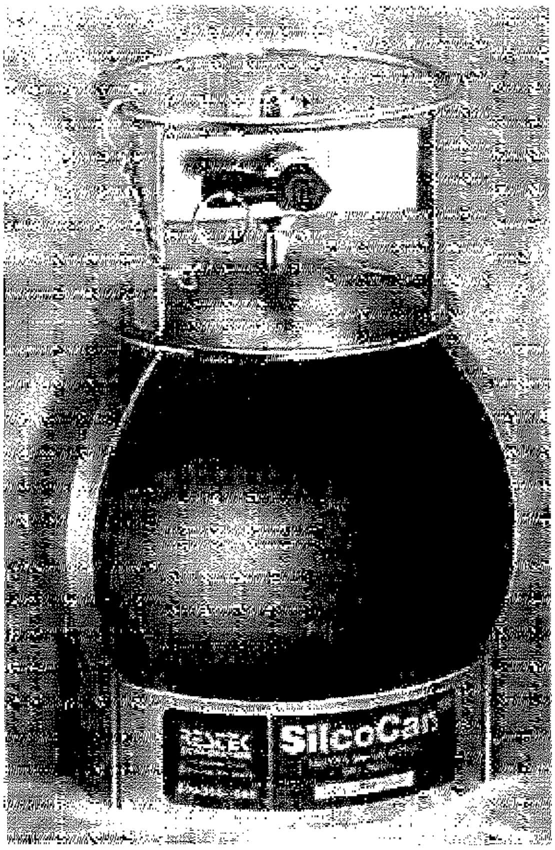
SilcoCan™ The Ideal Canister for Sulfur Compound Storage



Sulfur compounds are emitted from a variety of sources including petrochemical processes, land fills, and stack emissions. Because of their odor, these compounds are a nuisance. They frequently require air monitoring and analysis.

Figure 1: The Silcosteel® lining in the SilcoCan™ canister reduces adsorption of sulfur compounds.

Collection of air samples containing trace levels of sulfur compounds is difficult because they readily react with stainless steel sampling vessels such as Summa® Canisters. Because of this reactivity with stainless steel, Tedlar® bags have been used for collection of sulfur compounds. However, the stability of these compounds in Tedlar® bags is limited to 24-48 hours.

Restek's Silcosteel®-lined Silcocan™ canister is the ultimate solution for long term storage of air samples containing sulfur compounds. Silcosteel is a unique process that chemically bonds a layer of fused silica material to the stainless steel surface, reducing adsorption and breakdown of active compounds. The Silcocan air sampling canister has been shown to maintain the stability of trace level sulfur compounds up to seven days with little or no degradation.

A stability study of six common sulfur compounds was recently conducted by the Bay Area Air Quality Management District. These compounds were spiked at two concentration levels into Silcocan air sampling canisters and measured at time intervals of 1, 2, 3, 4, and 7 days. The results of this study are shown in Figures 2 and 3. The data clearly shows that even after seven days of storage in a Silcocan canister, over 90% of these six sulfur compounds were successfully recovered.

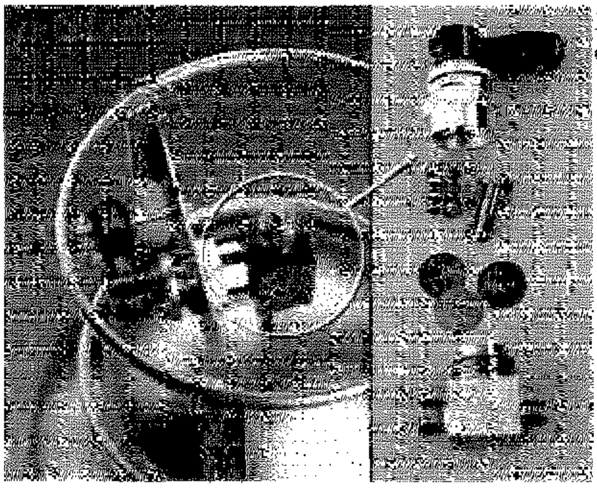


Figure 4: A Silcosteel®-treated diaphragm valve insures a completely inert sample pathway.

Since any stainless steel surfaces that come into contact with sulfur compounds will cause adsorption, a Silcocan canister with a Silcosteel-treated valve is recommended. Figure 4 shows a Silcosteel-treated diaphragm valve. All internal parts that come into contact with the sample have been Silcosteel-treated. Also, any portion of the sampling pathway, such as the flow controller or tubing, should also be Silcosteel-treated. For more information about Restek's Silcosteel process, please contact our Technical Service team or your local Restek representative.

Collection and storage of highly adsorptive sulfur compounds is no longer a problem with Restek's Silcocan canister. Silcosteel technology reduces the adsorptive characteristics of stainless steel. Even trace levels of sensitive sulfur compounds can be stored for up to seven days without significant loss using Restek's innovative technology.

Product Listing

SilcoCan™ Canisters with Silcosteel®-treated Valves

Sizes	Cat. #
1.0 Liter	24201-650
1.8 Liter	24202-650
3.0 Liter	24203-650
6.0 Liter	24200-650
15.0 Liter	24204-650

Silcosteel® Replacement Diaphragm Valve: cat.# 24221

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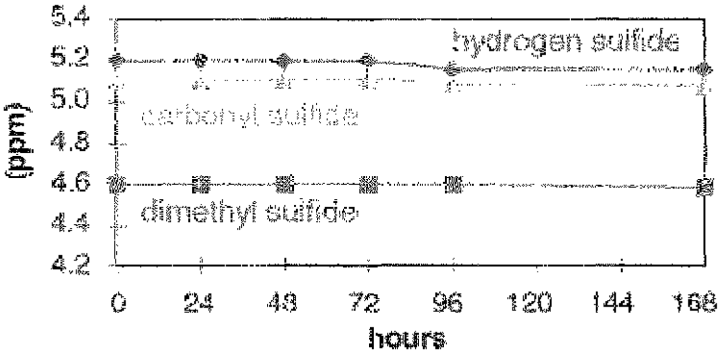
Figure 2: No significant loss of sulfur compounds when stored in a SilcoCan™ for up to 7 days.



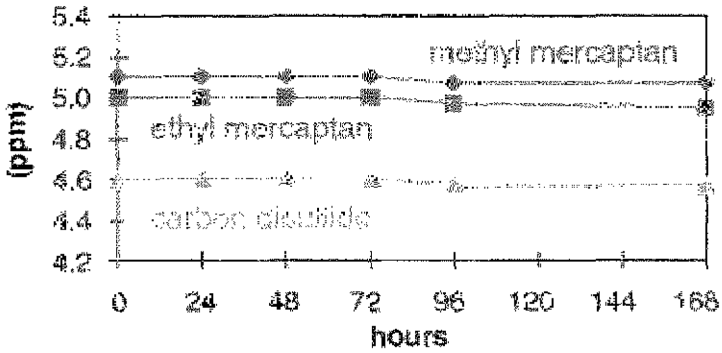
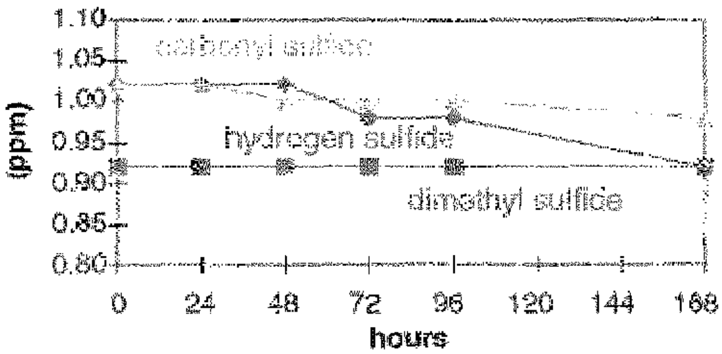
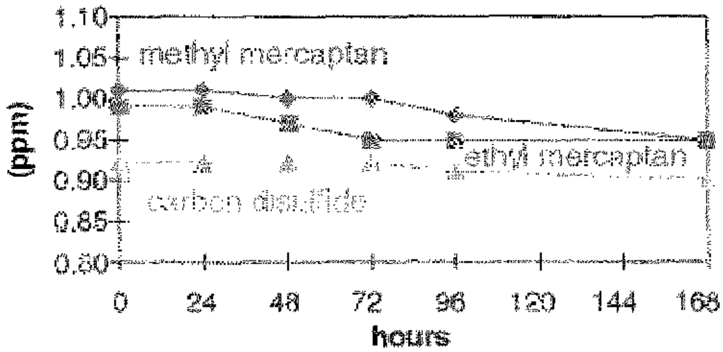


Figure 3: Even 1ppm of sulfur compounds is recovered from a SilcoCan™ canister after 7 days.





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NEW SilcoCan™ Canister with Pressure/Vacuum Gauge

- **Easily monitors pressure inside a SilcoCan™ canister.**
- **Accurately measures from 30" Hg to 60 psig**
- **Fully protected by the canister frame.**
- **Excellent inertness for polar or sulfur compounds.**
- **Leak-free 1/4-turn diaphragm valve.**
- **Five sizes available.**

No more guessing the pressure in your air sampling canister! We have equipped an additional port on the SilcoCan™ canister with a high-quality vacuum/pressure gauge to continuously indicate the pressure inside and to ensure sample integrity during transport. The gauge is positioned to easily read vacuum as low as 30" of Hg or pressures as high as 60 psig and is fully protected inside the canister frame.

SilcoCan™ canisters have many additional features that make them superior to other commercially available canisters. The inert fused silica lining prevents the sample from coming in contact with the metal surface on the inside of the canister, so even active polar or sulfur compounds can be stored without adsorption. The high quality 1/4-turn diaphragm valve eliminates leaks and is connected to the canister with a vacuum-tight Ultraseal® fitting that cannot be overtightened. The easy-to-read indicating plate quickly shows if the valve is open or closed. The rugged canister frame surrounds the canister, eliminating weld spots that can cause adsorption sites inside the canister. The new vacuum/pressure gauge makes this SilcoCan™ canister the ultimate in air collection equipment.

SilcoCan™ Canister with Vacuum/Pressure Guage:

Size	cat.#
1-liter:	24210
1.8-liter:	24211
3-liter:	24212
6-liter:	24213
15-liter:	24214

To order the SilcoCan™ canister with a Silcosteel® valve, include suffix # -650 with the catalog #.

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SilcoCan™ Canisters for All Air Sampling Needs!

--*Updated in the Summer 96 Advantage!*

A complete line of SilcoCan™ canisters for air sampling is now available from Restek!

The small 1.0 and 1.8 liter canisters are perfect for grab samples and soil gases. The 3.2, 6.0 and 15.0 liter SilcoCan™ canisters are great for integrated ambient air samples. The 15.0 liter SilcoCan™ canister is an excellent size for making standards for analytical testing and easily allows for 24-hour sampling as well.

All sizes offer the same innovations as our 6.0 liter SilcoCan™ canisters:

Fused Silica Lining:

Each SilcoCan™ canister is lined with a layer of fused silica. This layer is chemically bonded to the interior surface using Restek's proprietary Silcosteel® process. This layer provides unsurpassed inertness for active compounds and will not crack from harsh handling in the field or during transport.

1/4 Turn Valve and Locking Pin

Restek has incorporated Parker's 1/4 turn diaphragm valve with an indicator plate to help analysts easily determine if the valve is open or closed. The locking pin prevents the valve from accidentally opening during transport.

Vacuum/Pressure Fittings

SilcoCan™ canisters are equipped with Parker's Ultraseal fittings that have metal o-rings which increase sealing ability and eliminate leakage. Also, these fittings cannot be overtightened.

Rugged Canister Frame

The unique frame design of the SilcoCan™ canister surrounds the sphere and holds it upright without requiring welding. It is stronger and more functional than a welded frame, eliminating areas where adsorption of active compounds can occur.

Shorter Cleaning Cycles

Each SilcoCan™ canister and valve can be heated to 250°C, allowing volatile organic compounds to be removed quickly while the valve is attached to the canister during the cleaning cycles.

SilcoCan™ Canisters:	
Size	**cat.#**
1-liter:	24201

1.8-liter:	24202
3.2-liter:	24203
6-liter:	24200
15-liter:	24204

To order the SilcoCan™ canister with a Silcosteel® valve, include suffix # -650 with the catalog #.

ATTACHMENT B

AIR TOXICS LTD.
SELECTED EXPERIENCE SUMMARY

Sulfur Projects using SilcoSteel™ Canisters and Deactivated Tedlar Bags

Project	Client	Description
Seneca Meadows, NY Odor Incident Response	New York Dept. of Health / EMCON Grand Island, NY	ASTM D-5504 reduced sulfur compounds – 24 hour, 7 days/week standby for receipt of samples in Silco canisters
Bay Park Subdivision, NJ Episodic Odor Response & background monitoring	McLaren/Hart Warren, NJ	Over 1,400 samples using glass-lined canisters for Modified EPA Method 15/16 sulfur compounds, TO-14 low level VOCs + tentatively identified compounds
New York City Wastewater Treatment Plant Odor Study	Malcolm Pirnie White Plains, NY	ASTM D-5504 reduced sulfur compounds in deactivated Tedlar bags
Sacramento County Landfill, CA	Best Environmental San Leandro, CA	ASTM D-5504 sulfur compounds in Silco canisters
Bayer Products Thermoxidizer #2249	Air Source Testing Lenexa, CA	ASTM D5504 total reduced sulfur, TO-14 VOCs in deactivated Tedlar bags
Brookfield Avenue Landfill Superfund Site, NY	Camp, Dresser & McKee Woodbury, NY	ASTM D-5504 hydrogen sulfide and mercaptans, D-3416 methane, TO-14 VOCs, NIOSH 6010 hydrogen cyanide in Silco canisters
Shell Oil San Francisco Airport	Pacific Environmental Group San Jose, CA	TO-3 BTEX/TPH, ASTM D-3416 atmos. gases, ASTM D5504 sulfur – Silco cans
East Bay Municipal Utilities District, Oakland , CA	Malcolm Pirnie White Plains, NY	ASTM D-5504 for hydrogen sulfide, dimethyl sulfide, and methyl mercaptan in deactivated Tedlar bags
Sun Oil, PA	CDM Philadelphia, PA	TO-14 VOCs, ASTM D-5504 sulfur compounds in SilcoSteel canisters
Tosco Refinery Rodeo, CA	direct	TO-14 VOCs, ASTM D-5504 sulfur compounds in SilcoSteel canisters
Compac Industries Edison, NJ	Environmental Risk Ltd. Bloomfield, CT	ASTM D-5504 H2S, ASTM D-1945 methane in deactivated Tedlar bags
Port of San Diego, CA monitoring	SAIC San Diego, CA	ASTM D-5504 total reduced sulfur, TO-14 VOCs in Silco canisters
Neighborhood odor study	IT Corporation Cincinnati, OH	ASTM D-5504 reduced sulfur compounds in SilcoSteel canisters
Fort Dix, NJ Landfill monitoring	EA Engineering Hunt Valley, MD	ASTM D-5504 reduced sulfur compounds, TO-14 VOCs, Method 25C NMOC in SilcoSteel canisters
Nashua, NH school monitoring	Woodard & Curran Portland, ME	ASTM D-5504 sulfur compounds, ASTM D-1945 atmos. Gases, TO-14 VOCs in SilcoSteel canisters
Cedar Creek, NY Odor Event Study and background monitoring	Environmental Standards Valley Force, PA	EPA Method 15/16 extended list sulfur compounds in SilcoSteel canisters
Modern Landfill Buffalo, NY	EMCON Grand Island, NY	ASTM D-5504 sulfur compounds, TO-14 VOCs, 25C NMOC in SilcoSteel canisters
Bayer odor monitoring	Bayer Products Kansas City, MO	ASTM D-5504 sulfur compounds in deactivated Tedlar bags
Ponderosa Fibers	Roy F. Weston West Chester, PA	ASTM D-5504 sulfur compounds, TO-14 VOCs in SilcoSteel canisters
Danbury Landfill, CT	Metcalf & Eddy Wakefield, MA	TO-14 VOCs, ASTM D-5504 sulfur compounds in deactivated Tedlar bags

ATTACHMENT C

Date	Time	Raw Effluent TRS	Dilution-Multiplied Effluent TRS	Raw Inlet TRS	Dilution-Multiplied Inlet TRS
2/1/98	17:25:00	0.003	0.17	0.003	0.17
2/1/98	17:30:00	0.002	0.12	0.002	0.12
2/1/98	17:35:00	0.002	0.11	0.002	0.11
2/1/98	17:40:00	0.002	0.11	0.002	0.12
2/1/98	17:45:00	0.002	0.12	0.002	0.11
2/1/98	17:50:00	0.002	0.12	0.002	0.12
2/1/98	17:55:00	0.003	0.13	0.035	1.74
2/1/98	18:00:00	0.003	0.13	0.096	4.82
2/1/98	18:05:00	0.002	0.12	0.116	5.82
2/1/98	18:10:00	0.003	0.13	0.135	6.73
2/1/98	18:15:00	0.003	0.14	0.146	7.32
2/1/98	18:20:00	0.003	0.14	0.158	7.90
2/1/98	18:25:00	0.003	0.13	0.164	8.18
2/1/98	18:30:00	0.003	0.13	0.170	8.49
2/1/98	18:35:00	0.003	0.14	0.177	8.84
2/1/98	18:40:00	0.003	0.14	0.182	9.11
2/1/98	18:45:00	0.003	0.13	0.185	9.26
2/1/98	18:50:00	0.003	0.14	0.189	9.46
2/1/98	18:55:00	0.003	0.14	0.195	9.73
2/1/98	19:00:00	0.003	0.14	0.210	10.50
2/1/98	19:05:00	0.003	0.15	0.218	10.88
2/1/98	19:10:00	0.003	0.15	0.222	11.08
2/1/98	19:15:00	0.003	0.14	0.239	11.96
2/1/98	19:20:00	0.003	0.14	0.256	12.78
2/1/98	19:25:00	0.003	0.14	0.268	13.41
2/1/98	19:30:00	0.003	0.15	0.278	13.92
2/1/98	19:35:00	0.003	0.15	0.289	14.45
2/1/98	19:40:00	0.003	0.14	0.307	15.35
2/1/98	19:45:00	0.003	0.14	0.323	16.14
2/1/98	19:50:00	0.003	0.14	0.331	16.54
2/1/98	19:55:00	0.003	0.15	0.331	16.54
2/1/98	20:00:00	0.003	0.14	0.340	16.98
2/1/98	20:05:00	0.003	0.14	0.345	17.25
2/1/98	20:10:00	0.003	0.15	0.365	18.23
2/1/98	20:15:00	0.003	0.15	0.397	19.86
2/1/98	20:20:00	0.003	0.15	0.409	20.44
2/1/98	20:25:00	0.003	0.15	0.398	19.92
2/1/98	20:30:00	0.003	0.15	0.409	20.47
2/1/98	20:35:00	0.003	0.16	0.404	20.20
2/1/98	20:40:00	0.003	0.15	0.418	20.91
2/1/98	20:45:00	0.003	0.16	0.424	21.22
2/1/98	20:50:00	0.003	0.15	0.424	21.19
2/1/98	20:55:00	0.003	0.16	0.444	22.19
2/1/98	21:00:00	0.003	0.15	0.447	22.35
2/1/98	21:05:00	0.003	0.15	0.435	21.76
2/1/98	21:10:00	0.003	0.16	0.459	22.96
2/1/98	21:15:00	0.003	0.16	0.478	23.92
2/5/98	08:20:00	0.004	0.19	0.004	0.19

2/5/98	08:25:00	0.003	0.13	0.006	0.32
2/5/98	08:30:00	0.002	0.09	0.039	1.93
2/5/98	08:35:00	0.002	0.12	0.025	1.26
2/5/98	08:40:00	0.002	0.11	0.012	0.60
2/5/98	08:45:00	0.002	0.11	0.072	3.59
2/5/98	08:50:00	0.002	0.12	0.160	8.01
2/5/98	08:55:00	0.002	0.11	0.205	10.26
2/5/98	09:00:00	0.002	0.11	0.238	11.92
2/5/98	09:05:00	0.002	0.11	0.263	13.13
2/5/98	09:10:00	0.002	0.11	0.283	14.16
2/5/98	09:15:00	0.002	0.12	0.294	14.72
2/5/98	09:20:00	0.003	0.13	0.304	15.20
2/5/98	09:25:00	0.003	0.13	0.300	15.02
2/5/98	09:30:00	0.003	0.13	0.296	14.80
2/5/98	09:35:00	0.003	0.14	0.294	14.70
2/5/98	09:40:00	0.003	0.15	0.294	14.72
2/5/98	09:45:00	0.002	0.12	0.297	14.87
2/5/98	09:50:00	0.003	0.13	0.296	14.81
2/5/98	09:55:00	0.003	0.14	0.288	14.40
2/5/98	10:00:00	0.003	0.15	0.289	14.46
2/5/98	10:05:00	0.003	0.14	0.295	14.73
2/5/98	10:10:00	0.003	0.14	0.303	15.15
2/5/98	10:15:00	0.003	0.13	0.311	15.56
2/5/98	10:20:00	0.003	0.15	0.327	16.33
2/5/98	10:25:00	0.003	0.14	0.334	16.68
2/5/98	10:30:00	0.003	0.14	0.350	17.52
2/5/98	10:35:00	0.003	0.14	0.365	18.23
2/5/98	10:40:00	0.003	0.15	0.385	19.26
2/5/98	10:45:00	0.003	0.15	0.391	19.57
2/5/98	10:50:00	0.003	0.13	0.387	19.35
2/5/98	10:55:00	0.003	0.13	0.413	20.66
2/5/98	11:00:00	0.003	0.14	0.412	20.60
2/5/98	11:05:00	0.003	0.14	0.424	21.18
2/5/98	11:10:00	0.003	0.15	0.437	21.85
2/5/98	11:15:00	0.003	0.15	0.438	21.89
2/5/98	11:20:00	0.003	0.15	0.429	21.43
2/5/98	11:25:00	0.003	0.15	0.469	23.47
2/5/98	11:30:00	0.003	0.14	0.482	24.11
2/5/98	11:35:00	0.003	0.15	0.482	24.11
2/5/98	11:40:00	0.003	0.15	0.507	25.34
2/5/98	11:45:00	0.003	0.15	0.510	25.49
2/5/98	11:50:00	0.003	0.15	0.540	26.99
2/5/98	11:55:00	0.003	0.14	0.556	27.78
2/5/98	12:00:00	0.003	0.14	0.577	28.86
2/5/98	12:05:00	0.003	0.15	0.635	31.75
2/5/98	12:10:00	0.003	0.16	0.601	30.07
2/5/98	12:15:00	0.003	0.15	0.606	30.30
2/9/98	12:35:00	0.009	0.44	0.037	1.86
2/9/98	12:40:00	0.006	0.28	0.025	1.26
2/9/98	12:45:00	0.004	0.20	0.020	1.02
2/9/98	12:50:00	0.003	0.15	0.019	0.93

2/9/98	12:55:00	0.002	0.12	0.020	0.98
2/9/98	13:00:00	0.002	0.11	0.020	1.01
2/9/98	13:05:00	0.002	0.11	0.021	1.04
2/9/98	13:10:00	0.002	0.11	0.023	1.15
2/9/98	13:15:00	0.002	0.09	0.025	1.24
2/9/98	13:20:00	0.002	0.10	0.027	1.36
2/9/98	13:25:00	0.002	0.10	0.029	1.46
2/9/98	13:30:00	0.002	0.09	0.033	1.63
2/9/98	13:35:00	0.002	0.09	0.037	1.83
2/9/98	13:40:00	0.002	0.10	0.039	1.94
2/9/98	13:45:00	0.002	0.09	0.050	2.49
2/9/98	13:50:00	0.002	0.11	0.062	3.10
2/9/98	13:55:00	0.002	0.12	0.076	3.81
2/9/98	14:00:00	0.002	0.12	0.088	4.41
2/9/98	14:05:00	0.002	0.12	0.100	5.01
2/9/98	14:10:00	0.002	0.11	0.111	5.54
2/9/98	14:15:00	0.002	0.11	0.117	5.86
2/9/98	14:20:00	0.002	0.12	0.126	6.28
2/9/98	14:25:00	0.003	0.14	0.130	6.49
2/9/98	14:30:00	0.003	0.13	0.135	6.74
2/9/98	14:35:00	0.003	0.13	0.139	6.96
2/9/98	14:40:00	0.003	0.14	0.141	7.07
2/9/98	14:45:00	0.003	0.14	0.144	7.20
2/9/98	14:50:00	0.003	0.14	0.147	7.37
2/9/98	14:55:00	0.003	0.14	0.150	7.51
2/9/98	15:00:00	0.003	0.15	0.152	7.59
2/9/98	15:05:00	0.003	0.15	0.154	7.72
2/9/98	15:10:00	0.003	0.16	0.159	7.93
2/9/98	15:15:00	0.003	0.17	0.160	8.01
2/9/98	15:20:00	0.003	0.17	0.162	8.11
2/9/98	15:25:00	0.003	0.16	0.165	8.24
2/9/98	15:30:00	0.003	0.16	0.164	8.19
2/9/98	15:35:00	0.003	0.16	0.165	8.24
2/9/98	15:40:00	0.003	0.17	0.165	8.24
2/9/98	15:45:00	0.003	0.16	0.164	8.20
2/9/98	15:50:00	0.003	0.17	0.161	8.07
2/9/98	15:55:00	0.003	0.16	0.161	8.04
2/9/98	16:00:00	0.004	0.18	0.158	7.92
2/9/98	16:05:00	0.003	0.17	0.156	7.79
2/9/98	16:10:00	0.003	0.16	0.151	7.55
2/9/98	16:15:00	0.003	0.16	0.149	7.46
2/9/98	16:20:00	0.003	0.17	0.149	7.44
2/9/98	16:25:00	0.003	0.16	0.149	7.44
2/11/98	07:50:00	0.004	0.22	0.005	0.24
2/11/98	07:55:00	0.003	0.13	0.003	0.16
2/11/98	08:00:00	0.002	0.11	0.003	0.14
2/11/98	08:05:00	0.002	0.11	0.003	0.15
2/11/98	08:10:00	0.002	0.11	0.002	0.12
2/11/98	08:15:00	0.002	0.09	0.002	0.10
2/11/98	08:20:00	0.002	0.10	0.002	0.10
2/11/98	08:25:00	0.002	0.11	0.002	0.10

2/11/98	08:30:00	0.002	0.10	0.002	0.09
2/11/98	08:35:00	0.002	0.10	0.002	0.10
2/11/98	08:40:00	0.002	0.09	0.002	0.09
2/11/98	08:45:00	0.002	0.09	0.002	0.08
2/11/98	08:50:00	0.002	0.08	0.002	0.09
2/11/98	08:55:00	0.002	0.08	0.002	0.08
2/11/98	09:00:00	0.002	0.09	0.002	0.09
2/11/98	09:05:00	0.002	0.09	0.002	0.09
2/11/98	09:10:00	0.002	0.08	0.001	0.07
2/11/98	09:15:00	0.002	0.08	0.001	0.07
2/11/98	09:20:00	0.002	0.08	0.001	0.07
2/11/98	09:25:00	0.002	0.09	0.002	0.09
2/11/98	09:30:00	0.002	0.10	0.002	0.09
2/11/98	09:35:00	0.002	0.11	0.002	0.10
2/13/98	13:25:00	0.010	0.52	0.010	0.52
2/13/98	13:30:00	0.003	0.17	0.004	0.22
2/13/98	13:35:00	0.003	0.15	0.003	0.17
2/13/98	13:40:00	0.003	0.14	0.003	0.15
2/13/98	13:45:00	0.003	0.14	0.003	0.14
2/13/98	13:50:00	0.003	0.13	0.003	0.14
2/13/98	13:55:00	0.002	0.12	0.003	0.14
2/13/98	14:00:00	0.002	0.12	0.003	0.15
2/13/98	14:05:00	0.003	0.13	0.005	0.26
2/13/98	14:10:00	0.003	0.14	0.016	0.78
2/13/98	14:15:00	0.003	0.13	0.045	2.23
2/13/98	14:20:00	0.003	0.14	0.077	3.86
2/13/98	14:25:00	0.003	0.14	0.104	5.19
2/13/98	14:30:00	0.003	0.15	0.118	5.90
2/13/98	14:35:00	0.003	0.14	0.131	6.53
2/13/98	14:40:00	0.003	0.15	0.139	6.93
2/13/98	14:45:00	0.003	0.14	0.142	7.11
2/13/98	14:50:00	0.003	0.15	0.144	7.21
2/13/98	14:55:00	0.003	0.15	0.147	7.34
2/13/98	15:00:00	0.003	0.15	0.151	7.57
2/13/98	15:05:00	0.003	0.14	0.151	7.53
2/13/98	15:10:00	0.003	0.16	0.149	7.45
2/13/98	15:15:00	0.003	0.16	0.147	7.34
2/13/98	15:20:00	0.003	0.15	0.143	7.17
2/13/98	15:25:00	0.003	0.16	0.145	7.24
2/13/98	15:30:00	0.003	0.15	0.142	7.12
2/13/98	15:35:00	0.003	0.16	0.143	7.13
2/13/98	15:40:00	0.003	0.14	0.134	6.71
2/13/98	15:45:00	0.003	0.16	0.136	6.79
2/13/98	15:50:00	0.003	0.16	0.138	6.89
2/13/98	15:55:00	0.003	0.16	0.144	7.20
2/13/98	16:00:00	0.003	0.15	0.145	7.25
2/13/98	16:05:00	0.003	0.15	0.150	7.51
2/13/98	16:10:00	0.003	0.16	0.155	7.73
2/13/98	16:15:00	0.003	0.16	0.158	7.88
2/13/98	16:20:00	0.003	0.16	0.157	7.86
2/13/98	16:25:00	0.003	0.16	0.157	7.87

2/13/98	16:30:00	0.003	0.16	0.164	8.20
2/13/98	16:35:00	0.003	0.16	0.170	8.48
2/13/98	16:40:00	0.003	0.14	0.174	8.68
2/13/98	16:45:00	0.003	0.17	0.188	9.41
2/13/98	16:50:00	0.003	0.15	0.193	9.63
2/13/98	16:55:00	0.003	0.16	0.199	9.95
2/13/98	17:00:00	0.003	0.15	0.212	10.58
2/13/98	17:05:00	0.003	0.16	0.227	11.33
2/13/98	17:10:00	0.003	0.15	0.234	11.72
2/13/98	17:15:00	0.003	0.16	0.241	12.05
2/15/98	17:25:00	0.005	0.23	0.007	0.33
2/15/98	17:30:00	0.002	0.12	0.004	0.22
2/15/98	17:35:00	0.002	0.11	0.003	0.13
2/15/98	17:40:00	0.002	0.11	0.003	0.14
2/15/98	17:45:00	0.002	0.11	0.004	0.22
2/15/98	17:50:00	0.002	0.11	0.008	0.40
2/15/98	17:55:00	0.002	0.10	0.012	0.59
2/15/98	18:00:00	0.002	0.11	0.016	0.79
2/15/98	18:05:00	0.002	0.11	0.019	0.93
2/15/98	18:10:00	0.002	0.10	0.021	1.06
2/15/98	18:15:00	0.002	0.09	0.023	1.13
2/15/98	18:20:00	0.002	0.11	0.027	1.33
2/15/98	18:25:00	0.003	0.13	0.033	1.66
2/15/98	18:30:00	0.003	0.14	0.037	1.83
2/15/98	18:35:00	0.003	0.15	0.038	1.92
2/15/98	18:40:00	0.003	0.15	0.040	2.02
2/15/98	18:45:00	0.003	0.15	0.042	2.09
2/15/98	18:50:00	0.003	0.14	0.042	2.12
2/15/98	18:55:00	0.003	0.15	0.044	2.18
2/15/98	19:00:00	0.003	0.14	0.045	2.24
2/15/98	19:05:00	0.003	0.15	0.045	2.26
2/15/98	19:10:00	0.003	0.15	0.046	2.31
2/15/98	19:15:00	0.003	0.15	0.047	2.36
2/15/98	19:20:00	0.003	0.15	0.046	2.31
2/15/98	19:25:00	0.003	0.15	0.046	2.29
2/15/98	19:30:00	0.003	0.15	0.046	2.30
2/15/98	19:35:00	0.003	0.14	0.045	2.25
2/15/98	19:40:00	0.003	0.15	0.045	2.26
2/15/98	19:45:00	0.003	0.15	0.044	2.22
2/15/98	19:50:00	0.003	0.15	0.045	2.27
2/15/98	19:55:00	0.003	0.14	0.046	2.30
2/15/98	20:00:00	0.003	0.15	0.046	2.29
2/15/98	20:05:00	0.003	0.15	0.045	2.27
2/15/98	20:10:00	0.003	0.15	0.045	2.24
2/15/98	20:15:00	0.003	0.15	0.045	2.25
2/15/98	20:20:00	0.003	0.15	0.046	2.28
2/15/98	20:25:00	0.003	0.15	0.046	2.30
2/15/98	20:30:00	0.003	0.15	0.046	2.32
2/15/98	20:35:00	0.003	0.15	0.047	2.33
2/15/98	20:40:00	0.003	0.16	0.047	2.34
2/15/98	20:45:00	0.003	0.15	0.048	2.38

2/15/98	20:50:00	0.003	0.16	0.049	2.44
2/15/98	20:55:00	0.003	0.16	0.050	2.51
2/15/98	21:00:00	0.003	0.16	0.051	2.57
2/15/98	21:05:00	0.003	0.16	0.053	2.65
2/15/98	21:10:00	0.003	0.16	0.054	2.72
2/15/98	21:15:00	0.003	0.16	0.055	2.74
2/16/98	08:10:00	0.005	0.27	0.008	0.42
2/16/98	08:15:00	0.002	0.12	0.004	0.22
2/16/98	08:20:00	0.002	0.11	0.004	0.19
2/16/98	08:25:00	0.003	0.13	0.003	0.17
2/16/98	08:30:00	0.002	0.12	0.004	0.19
2/16/98	08:35:00	0.002	0.12	0.005	0.24
2/16/98	08:40:00	0.002	0.12	0.006	0.28
2/16/98	08:45:00	0.002	0.11	0.006	0.32
2/16/98	08:50:00	0.002	0.12	0.007	0.37
2/16/98	08:55:00	0.002	0.11	0.009	0.45
2/16/98	09:00:00	0.002	0.11	0.010	0.52
2/16/98	09:05:00	0.002	0.11	0.013	0.66
2/16/98	09:10:00	0.003	0.13	0.016	0.82
2/16/98	09:15:00	0.003	0.14	0.019	0.95
2/16/98	09:20:00	0.003	0.14	0.022	1.10
2/16/98	09:25:00	0.003	0.14	0.025	1.23
2/16/98	09:30:00	0.003	0.14	0.026	1.32
2/16/98	09:35:00	0.003	0.15	0.028	1.41
2/16/98	09:40:00	0.003	0.15	0.030	1.52
2/16/98	09:45:00	0.003	0.15	0.032	1.62
2/16/98	09:50:00	0.003	0.15	0.033	1.67
2/16/98	09:55:00	0.003	0.15	0.035	1.74
2/16/98	10:00:00	0.003	0.15	0.036	1.82
2/16/98	10:05:00	0.003	0.15	0.038	1.92
2/16/98	10:10:00	0.003	0.15	0.040	2.02
2/16/98	10:15:00	0.003	0.14	0.041	2.07
2/16/98	10:20:00	0.003	0.15	0.043	2.16
2/16/98	10:25:00	0.003	0.16	0.044	2.22
2/16/98	10:30:00	0.003	0.15	0.046	2.32
2/16/98	10:35:00	0.003	0.15	0.050	2.48
2/16/98	10:40:00	0.003	0.15	0.051	2.56
2/16/98	10:45:00	0.003	0.16	0.052	2.62
2/16/98	10:50:00	0.003	0.15	0.058	2.89
2/16/98	10:55:00	0.003	0.16	0.063	3.15
2/16/98	11:00:00	0.003	0.15	0.070	3.49
2/16/98	11:05:00	0.003	0.15	0.077	3.85
2/16/98	11:10:00	0.003	0.15	0.081	4.07
2/16/98	11:15:00	0.003	0.15	0.086	4.29
2/16/98	11:20:00	0.003	0.15	0.094	4.68
2/16/98	11:25:00	0.003	0.16	0.099	4.95
2/16/98	11:30:00	0.003	0.16	0.102	5.11
2/16/98	11:35:00	0.003	0.16	0.108	5.40
2/16/98	11:40:00	0.003	0.16	0.115	5.75
2/16/98	11:45:00	0.003	0.16	0.123	6.13
2/16/98	11:50:00	0.003	0.16	0.123	6.15

2/16/98	11:55:00	0.003	0.16	0.131	6.53
2/16/98	12:00:00	0.003	0.15	0.140	6.99
2/18/98	12:10:00	0.005	0.23	0.009	0.45
2/18/98	12:15:00	0.002	0.10	0.014	0.71
2/18/98	12:20:00	0.002	0.10	0.014	0.71
2/18/98	12:25:00	0.002	0.09	0.018	0.91
2/18/98	12:30:00	0.002	0.08	0.040	2.02
2/18/98	12:35:00	0.002	0.08	0.068	3.42
2/18/98	12:40:00	0.002	0.09	0.093	4.67
2/18/98	12:45:00	0.002	0.09	0.119	5.94
2/18/98	12:50:00	0.002	0.09	0.142	7.11
2/18/98	12:55:00	0.002	0.08	0.154	7.70
2/18/98	13:00:00	0.002	0.09	0.171	8.53
2/18/98	13:05:00	0.002	0.10	0.188	9.41
2/18/98	13:10:00	0.002	0.10	0.225	11.26
2/18/98	13:15:00	0.002	0.11	0.249	12.44
2/18/98	13:20:00	0.002	0.11	0.271	13.56
2/18/98	13:25:00	0.002	0.11	0.278	13.89
2/18/98	13:30:00	0.002	0.11	0.314	15.72
2/18/98	13:35:00	0.002	0.12	0.380	19.01
2/18/98	13:40:00	0.002	0.10	0.460	23.02
2/18/98	13:45:00	0.002	0.11	0.497	24.85
2/18/98	13:50:00	0.002	0.12	0.495	24.76
2/18/98	13:55:00	0.002	0.12	0.508	25.39
2/18/98	14:00:00	0.003	0.14	0.508	25.38
2/18/98	14:05:00	0.002	0.12	0.509	25.45
2/18/98	14:10:00	0.002	0.12	0.533	26.65
2/18/98	14:15:00	0.003	0.13	0.584	29.18
2/18/98	14:20:00	0.002	0.12	0.596	29.80
2/18/98	14:25:00	0.003	0.13	0.614	30.71
2/18/98	14:30:00	0.003	0.14	0.574	28.71
2/18/98	14:35:00	0.003	0.14	0.617	30.83
2/18/98	14:40:00	0.003	0.14	0.669	33.43
2/18/98	14:45:00	0.003	0.14	0.683	34.13
2/18/98	14:50:00	0.003	0.14	0.643	32.14
2/18/98	14:55:00	0.002	0.12	0.665	33.26
2/18/98	15:00:00	0.003	0.15	0.657	32.86
2/18/98	15:05:00	0.003	0.14	0.670	33.51
2/18/98	15:10:00	0.003	0.15	0.637	31.83
2/18/98	15:15:00	0.003	0.14	0.655	32.73
2/18/98	15:20:00	0.003	0.14	0.686	34.28
2/18/98	15:25:00	0.003	0.14	0.683	34.13
2/18/98	15:30:00	0.003	0.14	0.697	34.87
2/18/98	15:35:00	0.003	0.15	0.681	34.04
2/18/98	15:40:00	0.003	0.15	0.691	34.53
2/18/98	15:45:00	0.003	0.16	0.680	34.00
2/18/98	15:50:00	0.003	0.16	0.648	32.42
2/18/98	15:55:00	0.003	0.16	0.692	34.61
2/18/98	16:00:00	0.003	0.15	0.745	37.27
2/20/98	16:15:00	0.004	0.18	0.082	4.10
2/20/98	16:20:00	0.002	0.12	0.102	5.12

2/20/98	16:25:00	0.002	0.12	0.127	6.36
2/20/98	16:30:00	0.002	0.11	0.150	7.52
2/20/98	16:35:00	0.002	0.10	0.172	8.62
2/20/98	16:40:00	0.002	0.10	0.182	9.09
2/20/98	16:45:00	0.002	0.10	0.183	9.17
2/20/98	16:50:00	0.002	0.09	0.180	8.98
2/20/98	16:55:00	0.002	0.08	0.177	8.85
2/20/98	17:00:00	0.002	0.10	0.184	9.22
2/20/98	17:05:00	0.002	0.09	0.191	9.53
2/20/98	17:10:00	0.002	0.08	0.186	9.29
2/20/98	17:15:00	0.002	0.09	0.194	9.70
2/20/98	17:20:00	0.002	0.09	0.256	12.79
2/20/98	17:25:00	0.002	0.09	0.310	15.50
2/20/98	17:30:00	0.002	0.11	0.355	17.74
2/20/98	17:35:00	0.002	0.10	0.401	20.04
2/20/98	17:40:00	0.002	0.11	0.445	22.25
2/20/98	17:45:00	0.002	0.11	0.479	23.97
2/20/98	17:50:00	0.002	0.12	0.493	24.66
2/20/98	17:55:00	0.002	0.11	0.541	27.03
2/20/98	18:00:00	0.002	0.11	0.555	27.73
2/20/98	18:05:00	0.003	0.13	0.567	28.33
2/20/98	18:10:00	0.002	0.12	0.594	29.69
2/20/98	18:15:00	0.002	0.12	0.604	30.18
2/20/98	18:20:00	0.002	0.12	0.599	29.97
2/20/98	18:25:00	0.003	0.14	0.602	30.12
2/20/98	18:30:00	0.002	0.12	0.619	30.95
2/20/98	18:35:00	0.003	0.14	0.606	30.31
2/20/98	18:40:00	0.003	0.14	0.646	32.29
2/20/98	18:45:00	0.003	0.13	0.723	36.17
2/20/98	18:50:00	0.003	0.13	0.760	37.99
2/20/98	18:55:00	0.003	0.13	0.781	39.07
2/20/98	19:00:00	0.003	0.14	0.771	38.57
2/20/98	19:05:00	0.003	0.15	0.762	38.11
2/20/98	19:10:00	0.003	0.13	0.773	38.66
2/20/98	19:15:00	0.003	0.14	0.777	38.87
2/20/98	19:20:00	0.003	0.14	0.783	39.17
2/20/98	19:25:00	0.003	0.14	0.819	40.96
2/20/98	19:30:00	0.003	0.14	0.801	40.04
2/20/98	19:35:00	0.003	0.15	0.788	39.41
2/20/98	19:40:00	0.003	0.14	0.836	41.79
2/20/98	19:45:00	0.003	0.14	0.854	42.71
2/20/98	19:50:00	0.003	0.15	0.833	41.64
2/20/98	19:55:00	0.003	0.15	0.818	40.92
2/20/98	20:00:00	0.003	0.14	0.811	40.55
2/20/98	20:05:00	0.003	0.14	0.817	40.85
2/22/98	20:15:00	0.005	0.27	0.014	0.68
2/22/98	20:20:00	0.002	0.12	0.017	0.84
2/22/98	20:25:00	0.002	0.10	0.024	1.21
2/22/98	20:30:00	0.002	0.11	0.042	2.12
2/22/98	20:35:00	0.002	0.11	0.061	3.07
2/22/98	20:40:00	0.002	0.12	0.080	3.98

2/22/98	20:45:00	0.002	0.11	0.103	5.17
2/22/98	20:50:00	0.002	0.10	0.122	6.12
2/22/98	20:55:00	0.002	0.10	0.131	6.57
2/22/98	21:00:00	0.002	0.10	0.137	6.85
2/22/98	21:05:00	0.002	0.10	0.143	7.16
2/22/98	21:10:00	0.002	0.12	0.148	7.42
2/22/98	21:15:00	0.002	0.11	0.141	7.07
2/22/98	21:20:00	0.002	0.12	0.154	7.71
2/22/98	21:25:00	0.002	0.12	0.203	10.13
2/22/98	21:30:00	0.003	0.13	0.259	12.96
2/22/98	21:35:00	0.003	0.13	0.289	14.44
2/22/98	21:40:00	0.003	0.14	0.310	15.49
2/22/98	21:45:00	0.003	0.14	0.333	16.65
2/22/98	21:50:00	0.003	0.15	0.355	17.74
2/22/98	21:55:00	0.003	0.13	0.394	19.71
2/22/98	22:00:00	0.003	0.15	0.407	20.33
2/22/98	22:05:00	0.003	0.15	0.409	20.47
2/22/98	22:10:00	0.003	0.15	0.442	22.08
2/22/98	22:15:00	0.003	0.15	0.485	24.25
2/22/98	22:20:00	0.003	0.16	0.496	24.79
2/22/98	22:25:00	0.003	0.16	0.473	23.67
2/22/98	22:30:00	0.003	0.16	0.474	23.71
2/22/98	22:35:00	0.003	0.16	0.521	26.06
2/22/98	22:40:00	0.003	0.17	0.535	26.75
2/22/98	22:45:00	0.003	0.16	0.539	26.95
2/22/98	22:50:00	0.003	0.16	0.544	27.19
2/22/98	22:55:00	0.003	0.16	0.531	26.56
2/22/98	23:00:00	0.003	0.16	0.544	27.19
2/22/98	23:05:00	0.003	0.16	0.582	29.09
2/22/98	23:10:00	0.003	0.17	0.610	30.48
2/22/98	23:15:00	0.004	0.18	0.595	29.74
2/22/98	23:20:00	0.003	0.17	0.605	30.23
2/22/98	23:25:00	0.003	0.17	0.577	28.84
2/22/98	23:30:00	0.003	0.17	0.590	29.48
2/22/98	23:35:00	0.004	0.18	0.582	29.09
2/22/98	23:40:00	0.004	0.18	0.607	30.34
2/22/98	23:45:00	0.004	0.18	0.599	29.97
2/22/98	23:50:00	0.004	0.19	0.597	29.83
2/22/98	23:55:00	0.004	0.18	0.639	31.97
2/22/98	00:00:00	0.004	0.18	0.630	31.51
2/23/98	00:05:00	0.004	0.19	0.677	33.83
2/23/98	09:10:00	0.005	0.25	0.030	1.50
2/23/98	09:15:00	0.003	0.14	0.061	3.06
2/23/98	09:20:00	0.002	0.11	0.066	3.31
2/23/98	09:25:00	0.002	0.09	0.093	4.67
2/23/98	09:30:00	0.002	0.10	0.128	6.38
2/23/98	09:35:00	0.002	0.10	0.158	7.92
2/23/98	09:40:00	0.002	0.10	0.172	8.60
2/23/98	09:45:00	0.002	0.09	0.196	9.81
2/23/98	09:50:00	0.002	0.08	0.202	10.09
2/23/98	09:55:00	0.002	0.08	0.215	10.73

2/23/98	10:00:00	0.002	0.08	0.221	11.04
2/23/98	10:05:00	0.002	0 08	0.248	12.38
2/23/98	10:10:00	0.002	0.08	0.252	12.58
2/23/98	10:15:00	0.002	0.08	0.230	11.51
2/23/98	10:20:00	0.001	0.07	0.291	14.54
2/23/98	10:25:00	0.002	0.09	0.385	19.27
2/23/98	10:30:00	0.002	0.10	0.490	24.48
2/23/98	10:35:00	0.002	0.10	0.512	25.59
2/23/98	10:40:00	0.002	0.11	0.532	26.62
2/23/98	10:45:00	0.002	0.12	0.597	29.83
2/23/98	10:50:00	0.002	0.11	0.609	30.43
2/23/98	10:55:00	0.002	0.11	0.609	30.46
2/23/98	11:00:00	0.002	0.11	0.620	31.00
2/23/98	11:05:00	0.002	0.12	0.691	34.57
2/23/98	11:10:00	0.003	0.13	0.703	35.13
2/23/98	11:15:00	0.003	0.13	0.693	34.64
2/23/98	11:20:00	0.003	0.13	0.695	34.77
2/23/98	11:25:00	0.003	0.14	0.637	31.84
2/23/98	11:30:00	0.003	0.13	0.668	33.40
2/23/98	11:35:00	0.003	0.14	0.628	31.39
2/23/98	11:40:00	0.003	0.14	0.651	32.57
2/23/98	11:45:00	0.003	0.13	0.602	30.12
2/23/98	11:50:00	0.003	0.14	0.607	30.36
2/23/98	11:55:00	0.003	0.14	0.651	32.57
2/23/98	12:00:00	0.003	0.14	0.686	34.30
2/23/98	12:05:00	0.003	0.14	0.681	34.07
2/23/98	12:10:00	0.003	0.14	0.696	34.82
2/23/98	12:15:00	0.003	0.15	0.684	34.19
2/23/98	12:20:00	0.003	0.16	0.682	34.10
2/23/98	12:25:00	0.003	0.15	0.689	34.43
2/23/98	12:30:00	0.003	0.16	0.698	34.90
2/23/98	12:35:00	0.003	0.14	0.739	36.93
2/23/98	12:40:00	0.003	0.15	0.750	37.48
2/23/98	12:45:00	0.003	0.15	0.831	41.54
2/23/98	12:50:00	0.003	0.15	0.740	36.99
2/23/98	12:55:00	0.003	0.16	0.755	37.76
2/23/98	13:00:00	0.003	0.15	0.775	38.75
2/25/98	13:15:00	0.002	0.11	0.089	4.44
2/25/98	13:20:00	0.001	0.05	0.068	3.40
2/25/98	13:25:00	0.001	0.06	0.076	3.79
2/25/98	13:30:00	0.001	0.05	0.109	5.47
2/25/98	13:35:00	0.001	0.06	0.139	6.95
2/25/98	13:40:00	0.001	0.06	0.162	8.10
2/25/98	13:45:00	0.001	0.05	0.178	8.91
2/25/98	13:50:00	0.001	0.06	0.205	10.24
2/25/98	13:55:00	0.001	0.06	0.229	11.46
2/25/98	14:00:00	0.001	0.05	0.234	11.72
2/25/98	14:05:00	0.001	0.05	0.250	12.50
2/25/98	14:10:00	0.001	0.05	0.266	13.32
2/25/98	14:15:00	0.001	0.07	0.283	14.13
2/25/98	14:20:00	0.001	0.07	0.280	13.99

2/25/98	14:25:00	0.001	0.07	0.318	15.88
2/25/98	14:30:00	0.001	0.07	0.335	16.74
2/25/98	14:35:00	0.002	0.09	0.376	18.82
2/25/98	14:40:00	0.002	0.08	0.396	19.81
2/25/98	14:45:00	0.002	0.08	0.408	20.41
2/25/98	14:50:00	0.002	0.09	0.426	21.28
2/25/98	14:55:00	0.002	0.09	0.439	21.97
2/25/98	15:00:00	0.002	0.08	0.477	23.86
2/25/98	15:05:00	0.002	0.09	0.490	24.49
2/25/98	15:10:00	0.002	0.08	0.512	25.60
2/25/98	15:15:00	0.002	0.10	0.537	26.84
2/25/98	15:20:00	0.002	0.11	0.557	27.83
2/25/98	15:25:00	0.002	0.11	0.541	27.06
2/25/98	15:30:00	0.002	0.11	0.561	28.06
2/25/98	15:35:00	0.002	0.10	0.563	28.14
2/25/98	15:40:00	0.002	0.11	0.572	28.60
2/25/98	15:45:00	0.002	0.12	0.576	28.79
2/25/98	15:50:00	0.002	0.11	0.587	29.34
2/25/98	15:55:00	0.002	0.12	0.627	31.36
2/25/98	16:00:00	0.002	0.12	0.623	31.16
2/25/98	16:05:00	0.003	0.13	0.648	32.42
2/25/98	16:10:00	0.003	0.13	0.643	32.15
2/25/98	16:15:00	0.003	0.14	0.687	34.33
2/25/98	16:20:00	0.002	0.12	0.699	34.95
2/25/98	16:25:00	0.003	0.14	0.654	32.69
2/25/98	16:30:00	0.003	0.13	0.682	34.08
2/25/98	16:35:00	0.003	0.13	0.678	33.89
2/25/98	16:40:00	0.003	0.13	0.680	33.99
2/25/98	16:45:00	0.002	0.12	0.711	35.54
2/25/98	16:50:00	0.002	0.12	0.739	36.96
2/25/98	16:55:00	0.003	0.13	0.708	35.41
2/25/98	17:00:00	0.003	0.13	0.712	35.60
2/25/98	17:05:00	0.003	0.14	0.751	37.57
2/27/98	17:15:00	0.004	0.21	0.030	1.50
2/27/98	17:20:00	0.001	0.05	0.036	1.78
2/27/98	17:25:00	0.001	0.04	0.048	2.41
2/27/98	17:30:00	0.001	0.06	0.070	3.51
2/27/98	17:35:00	0.001	0.06	0.088	4.39
2/27/98	17:40:00	0.001	0.05	0.100	4.98
2/27/98	17:45:00	0.001	0.06	0.109	5.44
2/27/98	17:50:00	0.001	0.05	0.114	5.71
2/27/98	17:55:00	0.001	0.03	0.112	5.60
2/27/98	18:00:00	0.001	0.05	0.107	5.36
2/27/98	18:05:00	0.001	0.04	0.105	5.26
2/27/98	18:10:00	0.001	0.05	0.099	4.97
2/27/98	18:15:00	0.001	0.05	0.092	4.58
2/27/98	18:20:00	0.001	0.05	0.102	5.12
2/27/98	18:25:00	0.001	0.06	0.126	6.31
2/27/98	18:30:00	0.001	0.07	0.143	7.14
2/27/98	18:35:00	0.001	0.07	0.154	7.72
2/27/98	18:40:00	0.002	0.09	0.162	8.09

2/27/98	18:45:00	0.002	0.09	0.166	8.29
2/27/98	18:50:00	0.002	0.09	0.170	8.51
2/27/98	18:55:00	0.002	0.10	0.172	8.58
2/27/98	19:00:00	0.002	0.10	0.173	8.65
2/27/98	19:05:00	0.002	0.10	0.177	8.87
2/27/98	19:10:00	0.002	0.10	0.178	8.92
2/27/98	19:15:00	0.002	0.10	0.179	8.94
2/27/98	19:20:00	0.002	0.09	0.178	8.89
2/27/98	19:25:00	0.002	0.10	0.179	8.94
2/27/98	19:30:00	0.002	0.12	0.181	9.04
2/27/98	19:35:00	0.002	0.11	0.188	9.41
2/27/98	19:40:00	0.002	0.11	0.194	9.68
2/27/98	19:45:00	0.002	0.10	0.199	9.97
2/27/98	19:50:00	0.002	0.11	0.206	10.32
2/27/98	19:55:00	0.002	0.11	0.217	10.86
2/27/98	20:00:00	0.002	0.11	0.229	11.47
2/27/98	20:05:00	0.002	0.10	0.238	11.91
2/27/98	20:10:00	0.002	0.11	0.240	12.00
2/27/98	20:15:00	0.002	0.11	0.241	12.06
2/27/98	20:20:00	0.002	0.12	0.252	12.58
2/27/98	20:25:00	0.002	0.10	0.267	13.35
2/27/98	20:30:00	0.002	0.11	0.278	13.92
2/27/98	20:35:00	0.002	0.11	0.299	14.96
2/27/98	20:40:00	0.002	0.11	0.309	15.45
2/27/98	20:45:00	0.002	0.12	0.335	16.74
2/27/98	20:50:00	0.002	0.12	0.337	16.87
2/27/98	20:55:00	0.002	0.11	0.339	16.93
2/27/98	21:00:00	0.002	0.11	0.342	17.11
2/27/98	21:05:00	0.002	0.12	0.365	18.23

3/6/98	1:20:00	0.002	0.12	0.034	1.71
3/6/98	1:25:00	0.001	0.06	0.070	3.52
3/6/98	1:30:00	0.001	0.06	0.106	5.28
3/6/98	1:35:00	0.001	0.06	0.141	7.03
3/6/98	1:40:00	0.001	0.06	0.168	8.40
3/6/98	1:45:00	0.001	0.06	0.189	9.45
3/6/98	1:50:00	0.001	0.05	0.201	10.05
3/6/98	1:55:00	0.001	0.06	0.210	10.49
3/6/98	2:00:00	0.001	0.05	0.213	10.65
3/6/98	2:05:00	0.001	0.05	0.225	11.23
3/6/98	2:10:00	0.001	0.05	0.228	11.40
3/6/98	2:15:00	0.001	0.05	0.227	11.36
3/6/98	2:20:00	0.001	0.04	0.209	10.47
3/6/98	2:25:00	0.001	0.06	0.241	12.06
3/6/98	2:30:00	0.001	0.07	0.311	15.53
3/6/98	2:35:00	0.001	0.07	0.361	18.07
3/6/98	2:40:00	0.002	0.08	0.397	19.83
3/6/98	2:45:00	0.002	0.09	0.422	21.10
3/6/98	2:50:00	0.002	0.08	0.441	22.05
3/6/98	2:55:00	0.002	0.08	0.468	23.41
3/6/98	3:00:00	0.002	0.09	0.482	24.08
3/6/98	3:05:00	0.002	0.11	0.488	24.38
3/6/98	3:10:00	0.002	0.10	0.489	24.43
3/6/98	3:15:00	0.002	0.11	0.510	25.51
3/6/98	3:20:00	0.002	0.12	0.529	26.47
3/6/98	3:25:00	0.002	0.12	0.541	27.05
3/6/98	3:30:00	0.002	0.12	0.543	27.15
3/6/98	3:35:00	0.002	0.12	0.563	28.13
3/6/98	3:40:00	0.003	0.13	0.586	29.28
3/6/98	3:45:00	0.003	0.14	0.583	29.16
3/6/98	3:50:00	0.003	0.14	0.600	29.98
3/6/98	3:55:00	0.003	0.15	0.620	31.00
3/6/98	4:00:00	0.003	0.15	0.637	31.87
3/6/98	4:05:00	0.003	0.15	0.645	32.26
3/6/98	4:10:00	0.003	0.15	0.641	32.07
3/6/98	4:15:00	0.003	0.17	0.658	32.90
3/6/98	4:20:00	0.003	0.17	0.668	33.41
3/6/98	4:25:00	0.004	0.18	0.675	33.77
3/6/98	4:30:00	0.004	0.18	0.698	34.92
3/6/98	4:35:00	0.004	0.19	0.717	35.87
3/6/98	4:40:00	0.004	0.20	0.732	36.58
3/6/98	4:45:00	0.004	0.21	0.748	37.40
3/6/98	4:50:00	0.004	0.22	0.756	37.80
3/6/98	4:55:00	0.004	0.22	0.751	37.53
3/6/98	5:00:00	0.005	0.24	0.764	38.19
3/6/98	5:05:00	0.005	0.26	0.755	37.74
3/6/98	5:10:00	0.005	0.25	0.771	38.55
3/8/98	5:20:00	0.004	0.22	0.013	0.66
3/8/98	5:25:00	0.001	0.06	0.030	1.48
3/8/98	5:30:00	0.001	0.06	0.029	1.44
3/8/98	5:35:00	0.001	0.07	0.041	2.03

3/8/98	5:40:00	0.001	0.07	0.060	2.98
3/8/98	5:45:00	0.001	0.06	0.078	3.89
3/8/98	5:50:00	0.001	0.05	0.093	4.66
3/8/98	5:55:00	0.001	0.05	0.110	5.52
3/8/98	6:00:00	0.001	0.04	0.117	5.84
3/8/98	6:05:00	0.001	0.06	0.112	5.58
3/8/98	6:10:00	0.001	0.06	0.113	5.65
3/8/98	6:15:00	0.001	0.07	0.110	5.49
3/8/98	6:20:00	0.001	0.05	0.107	5.33
3/8/98	6:25:00	0.001	0.06	0.118	5.92
3/8/98	6:30:00	0.001	0.07	0.164	8.19
3/8/98	6:35:00	0.002	0.09	0.210	10.48
3/8/98	6:40:00	0.002	0.09	0.244	12.21
3/8/98	6:45:00	0.002	0.09	0.257	12.83
3/8/98	6:50:00	0.002	0.11	0.268	13.38
3/8/98	6:55:00	0.002	0.10	0.290	14.48
3/8/98	7:00:00	0.002	0.11	0.291	14.56
3/8/98	7:05:00	0.002	0.11	0.319	15.95
3/8/98	7:10:00	0.002	0.10	0.325	16.23
3/8/98	7:15:00	0.002	0.11	0.348	17.41
3/8/98	7:20:00	0.002	0.11	0.352	17.60
3/8/98	7:25:00	0.002	0.12	0.390	19.49
3/8/98	7:30:00	0.002	0.11	0.399	19.94
3/8/98	7:35:00	0.002	0.12	0.424	21.22
3/8/98	7:40:00	0.003	0.13	0.421	21.07
3/8/98	7:45:00	0.003	0.13	0.436	21.82
3/8/98	7:50:00	0.003	0.13	0.466	23.29
3/8/98	7:55:00	0.002	0.12	0.478	23.89
3/8/98	8:00:00	0.003	0.13	0.541	27.05
3/8/98	8:05:00	0.003	0.14	0.503	25.17
3/8/98	8:10:00	0.003	0.14	0.550	27.52
3/8/98	8:15:00	0.003	0.15	0.585	29.25
3/8/98	8:20:00	0.003	0.15	0.624	31.21
3/8/98	8:25:00	0.003	0.16	0.572	28.60
3/8/98	8:30:00	0.003	0.17	0.635	31.77
3/8/98	8:35:00	0.003	0.16	0.647	32.36
3/8/98	8:40:00	0.004	0.18	0.635	31.75
3/8/98	8:45:00	0.004	0.18	0.669	33.46
3/8/98	8:50:00	0.004	0.18	0.631	31.54
3/8/98	8:55:00	0.004	0.19	0.668	33.39
3/8/98	9:00:00	0.004	0.19	0.708	35.42
3/8/98	9:05:00	0.004	0.21	0.713	35.63
3/8/98	9:10:00	0.005	0.23	0.722	36.10
3/12/98	11:35:00	0.015	0.73	0.114	5.70
3/12/98	11:40:00	0.013	0.66	0.097	4.87
3/12/98	11:45:00	0.013	0.64	0.096	4.78
3/12/98	11:50:00	0.012	0.60	0.131	6.57
3/12/98	11:55:00	0.012	0.58	0.168	8.38
3/12/98	12:00:00	0.011	0.55	0.196	9.78
3/12/98	12:05:00	0.011	0.54	0.210	10.52
3/12/98	12:10:00	0.011	0.54	0.221	11.03

3/12/98	12:15:00	0.011	0.55	0.226	11.32
3/12/98	12:20:00	0.011	0.54	0.223	11.16
3/12/98	12:25:00	0.010	0.52	0.224	11.18
3/12/98	12:30:00	0.010	0.52	0.224	11.19
3/12/98	12:35:00	0.010	0.52	0.217	10.87
3/12/98	12:40:00	0.011	0.53	0.207	10.33
3/12/98	12:45:00	0.010	0.50	0.206	10.28
3/12/98	12:50:00	0.010	0.49	0.201	10.03
3/12/98	12:55:00	0.010	0.49	0.201	10.03
3/12/98	13:00:00	0.010	0.48	0.195	9.76
3/12/98	13:05:00	0.009	0.45	0.192	9.62
3/12/98	13:10:00	0.009	0.43	0.174	8.68
3/12/98	13:15:00	0.008	0.39	0.180	8.99
3/12/98	13:20:00	0.008	0.38	0.178	8.90
3/12/98	13:25:00	0.007	0.37	0.183	9.16
3/12/98	13:30:00	0.008	0.38	0.185	9.26
3/12/98	13:35:00	0.008	0.41	0.182	9.10
3/12/98	13:40:00	0.008	0.40	0.185	9.27
3/12/98	13:45:00	0.008	0.40	0.187	9.37
3/12/98	13:50:00	0.008	0.41	0.189	9.43
3/12/98	13:55:00	0.008	0.38	0.183	9.14
3/12/98	14:00:00	0.007	0.36	0.184	9.20
3/12/98	14:05:00	0.009	0.43	0.175	8.75
3/12/98	14:10:00	0.009	0.43	0.180	9.01
3/12/98	14:15:00	0.008	0.39	0.172	8.61
3/12/98	14:20:00	0.008	0.38	0.168	8.41
3/12/98	14:25:00	0.007	0.36	0.183	9.17
3/12/98	14:30:00	0.006	0.32	0.183	9.14
3/12/98	14:35:00	0.007	0.36	0.184	9.18
3/12/98	14:40:00	0.008	0.40	0.183	9.13
3/12/98	14:45:00	0.009	0.44	0.186	9.28
3/12/98	14:50:00	0.009	0.43	0.191	9.53
3/12/98	14:55:00	0.009	0.45	0.195	9.77
3/12/98	15:00:00	0.008	0.42	0.194	9.71
3/12/98	15:05:00	0.008	0.39	0.191	9.54
3/12/98	15:10:00	0.007	0.37	0.188	9.40
3/12/98	15:15:00	0.007	0.34	0.192	9.58
3/12/98	15:20:00	0.006	0.31	0.199	9.95
3/12/98	15:25:00	0.007	0.33	0.193	9.65
3/14/98	15:35:00	0.004	0.21	0.034	1.68
3/14/98	15:40:00	0.003	0.17	0.058	2.91
3/14/98	15:45:00	0.003	0.17	0.054	2.72
3/14/98	15:50:00	0.003	0.17	0.076	3.82
3/14/98	15:55:00	0.004	0.19	0.094	4.71
3/14/98	16:00:00	0.003	0.17	0.107	5.35
3/14/98	16:05:00	0.003	0.17	0.111	5.55
3/14/98	16:10:00	0.003	0.17	0.113	5.66
3/14/98	16:15:00	0.003	0.17	0.109	5.46
3/14/98	16:20:00	0.004	0.18	0.102	5.12
3/14/98	16:25:00	0.004	0.18	0.094	4.71
3/14/98	16:30:00	0.004	0.18	0.087	4.37

3/14/98	16:35:00	0.003	0.17	0.073	3.67
3/14/98	16:40:00	0.003	0.17	0.072	3.59
3/14/98	16:45:00	0.004	0.18	0.071	3.53
3/14/98	16:50:00	0.004	0.18	0.087	4.37
3/14/98	16:55:00	0.004	0.18	0.109	5.43
3/14/98	17:00:00	0.004	0.19	0.121	6.06
3/14/98	17:05:00	0.004	0.19	0.127	6.34
3/14/98	17:10:00	0.004	0.19	0.131	6.57
3/14/98	17:15:00	0.004	0.21	0.137	6.83
3/14/98	17:20:00	0.004	0.20	0.138	6.89
3/14/98	17:25:00	0.004	0.20	0.136	6.81
3/14/98	17:30:00	0.004	0.20	0.136	6.78
3/14/98	17:35:00	0.004	0.20	0.138	6.92
3/14/98	17:40:00	0.004	0.20	0.137	6.85
3/14/98	17:45:00	0.004	0.20	0.141	7.05
3/14/98	17:50:00	0.004	0.21	0.140	6.99
3/14/98	17:55:00	0.004	0.22	0.146	7.28
3/14/98	18:00:00	0.004	0.21	0.146	7.28
3/14/98	18:05:00	0.004	0.22	0.146	7.32
3/14/98	18:10:00	0.004	0.22	0.143	7.16
3/14/98	18:15:00	0.004	0.22	0.147	7.37
3/14/98	18:20:00	0.004	0.22	0.150	7.51
3/14/98	18:25:00	0.004	0.21	0.154	7.69
3/14/98	18:30:00	0.004	0.22	0.154	7.69
3/14/98	18:35:00	0.005	0.23	0.156	7.82
3/14/98	18:40:00	0.004	0.22	0.159	7.96
3/14/98	18:45:00	0.004	0.20	0.160	7.98
3/14/98	18:50:00	0.004	0.21	0.158	7.89
3/14/98	18:55:00	0.004	0.22	0.156	7.81
3/14/98	19:00:00	0.004	0.22	0.159	7.97
3/14/98	19:05:00	0.004	0.22	0.169	8.46
3/14/98	19:10:00	0.004	0.21	0.176	8.81
3/14/98	19:15:00	0.005	0.23	0.174	8.69
3/14/98	19:20:00	0.005	0.23	0.175	8.76
3/14/98	19:25:00	0.004	0.21	0.183	9.13
3/16/98	19:40:00	0.002	0.12	0.026	1.28
3/16/98	19:45:00	0.002	0.10	0.015	0.73
3/16/98	19:50:00	0.002	0.11	0.014	0.72
3/16/98	19:55:00	0.002	0.12	0.015	0.77
3/16/98	20:00:00	0.002	0.12	0.018	0.89
3/16/98	20:05:00	0.002	0.12	0.020	1.01
3/16/98	20:10:00	0.002	0.12	0.022	1.09
3/16/98	20:15:00	0.002	0.12	0.021	1.05
3/16/98	20:20:00	0.003	0.13	0.023	1.13
3/16/98	20:25:00	0.002	0.12	0.024	1.21
3/16/98	20:30:00	0.003	0.13	0.025	1.24
3/16/98	20:35:00	0.003	0.13	0.024	1.18
3/16/98	20:40:00	0.002	0.12	0.023	1.16
3/16/98	20:45:00	0.002	0.12	0.028	1.38
3/16/98	20:50:00	0.003	0.15	0.036	1.80
3/16/98	20:55:00	0.003	0.14	0.042	2.10

3/16/98	21:00:00	0.003	0.15	0.046	2.29
3/16/98	21:05:00	0.003	0.16	0.048	2.42
3/16/98	21:10:00	0.003	0.16	0.050	2.52
3/16/98	21:15:00	0.003	0.17	0.052	2.60
3/16/98	21:20:00	0.003	0.17	0.054	2.68
3/16/98	21:25:00	0.004	0.18	0.056	2.80
3/16/98	21:30:00	0.004	0.19	0.056	2.78
3/16/98	21:35:00	0.004	0.18	0.056	2.79
3/16/98	21:40:00	0.003	0.17	0.057	2.87
3/16/98	21:45:00	0.004	0.19	0.058	2.91
3/16/98	21:50:00	0.004	0.20	0.060	2.99
3/16/98	21:55:00	0.004	0.20	0.064	3.19
3/16/98	22:00:00	0.004	0.19	0.066	3.29
3/16/98	22:05:00	0.004	0.21	0.069	3.43
3/16/98	22:10:00	0.004	0.22	0.070	3.50
3/16/98	22:15:00	0.004	0.21	0.071	3.56
3/16/98	22:20:00	0.004	0.21	0.074	3.71
3/16/98	22:25:00	0.004	0.19	0.076	3.79
3/16/98	22:30:00	0.005	0.23	0.079	3.93
3/16/98	22:35:00	0.005	0.23	0.080	4.00
3/16/98	22:40:00	0.005	0.23	0.084	4.18
3/16/98	22:45:00	0.004	0.22	0.085	4.23
3/16/98	22:50:00	0.004	0.21	0.084	4.19
3/16/98	22:55:00	0.004	0.22	0.088	4.42
3/16/98	23:00:00	0.005	0.23	0.093	4.64
3/16/98	23:05:00	0.005	0.23	0.094	4.68
3/16/98	23:10:00	0.005	0.23	0.095	4.77
3/16/98	23:15:00	0.005	0.24	0.098	4.91
3/16/98	23:20:00	0.005	0.23	0.101	5.06
3/16/98	23:25:00	0.004	0.22	0.105	5.26
3/16/98	23:30:00	0.005	0.24	0.109	5.44
3/17/98	9:35:00	0.006	0.30	0.045	2.23
3/17/98	9:40:00	0.004	0.18	0.042	2.12
3/17/98	9:45:00	0.003	0.16	0.034	1.68
3/17/98	9:50:00	0.003	0.16	0.034	1.71
3/17/98	9:55:00	0.003	0.15	0.038	1.89
3/17/98	10:00:00	0.003	0.15	0.041	2.03
3/17/98	10:05:00	0.003	0.15	0.042	2.09
3/17/98	10:10:00	0.003	0.14	0.045	2.25
3/17/98	10:15:00	0.003	0.14	0.047	2.33
3/17/98	10:20:00	0.003	0.13	0.048	2.39
3/17/98	10:25:00	0.002	0.12	0.050	2.49
3/17/98	10:30:00	0.003	0.14	0.051	2.55
3/17/98	10:35:00	0.003	0.14	0.048	2.40
3/17/98	10:40:00	0.003	0.14	0.061	3.04
3/17/98	10:45:00	0.003	0.15	0.081	4.04
3/17/98	10:50:00	0.003	0.16	0.096	4.81
3/17/98	10:55:00	0.003	0.16	0.116	5.80
3/17/98	11:00:00	0.003	0.17	0.125	6.26
3/17/98	11:05:00	0.003	0.17	0.136	6.82
3/17/98	11:10:00	0.004	0.18	0.149	7.46

3/17/98	11:15:00	0.004	0.18	0.150	7.51
3/17/98	11:20:00	0.004	0.19	0.164	8.18
3/17/98	11:25:00	0.004	0.19	0.175	8.73
3/17/98	11:30:00	0.004	0.21	0.182	9.11
3/17/98	11:35:00	0.004	0.21	0.194	9.68
3/17/98	11:40:00	0.004	0.20	0.204	10.20
3/17/98	11:45:00	0.004	0.19	0.210	10.48
3/17/98	11:50:00	0.004	0.20	0.223	11.13
3/17/98	11:55:00	0.004	0.20	0.222	11.11
3/17/98	12:00:00	0.004	0.22	0.233	11.65
3/17/98	12:05:00	0.004	0.21	0.247	12.35
3/17/98	12:10:00	0.004	0.22	0.258	12.90
3/17/98	12:15:00	0.004	0.22	0.272	13.60
3/17/98	12:20:00	0.005	0.23	0.283	14.16
3/17/98	12:25:00	0.005	0.23	0.288	14.38
3/17/98	12:30:00	0.005	0.23	0.310	15.52
3/17/98	12:35:00	0.005	0.23	0.322	16.08
3/17/98	12:40:00	0.005	0.23	0.326	16.32
3/17/98	12:45:00	0.005	0.24	0.342	17.10
3/17/98	12:50:00	0.005	0.23	0.347	17.34
3/17/98	12:55:00	0.005	0.24	0.343	17.13
3/17/98	13:00:00	0.005	0.23	0.362	18.10
3/17/98	13:05:00	0.005	0.24	0.373	18.64
3/17/98	13:10:00	0.005	0.24	0.379	18.95
3/17/98	13:15:00	0.005	0.23	0.405	20.25
3/17/98	13:20:00	0.005	0.23	0.421	21.04
3/17/98	13:25:00	0.004	0.22	0.440	21.99
3/19/98	13:35:00	0.004	0.18	0.026	1.30
3/19/98	13:40:00	0.002	0.10	0.056	2.78
3/19/98	13:45:00	0.002	0.09	0.032	1.58
3/19/98	13:50:00	0.002	0.10	0.040	2.02
3/19/98	13:55:00	0.002	0.09	0.068	3.41
3/19/98	14:00:00	0.002	0.08	0.099	4.97
3/19/98	14:05:00	0.002	0.08	0.134	6.72
3/19/98	14:10:00	0.002	0.08	0.158	7.91
3/19/98	14:15:00	0.001	0.07	0.194	9.69
3/19/98	14:20:00	0.002	0.08	0.236	11.82
3/19/98	14:25:00	0.002	0.09	0.280	13.99
3/19/98	14:30:00	0.002	0.08	0.252	12.61
3/19/98	14:35:00	0.002	0.09	0.193	9.63
3/19/98	14:40:00	0.002	0.09	0.194	9.69
3/19/98	14:45:00	0.002	0.09	0.214	10.72
3/19/98	14:50:00	0.002	0.10	0.285	14.23
3/19/98	14:55:00	0.002	0.09	0.360	18.01
3/19/98	15:00:00	0.002	0.10	0.379	18.97
3/19/98	15:05:00	0.002	0.10	0.435	21.77
3/19/98	15:10:00	0.002	0.10	0.474	23.72
3/19/98	15:15:00	0.002	0.11	0.480	24.00
3/19/98	15:20:00	0.002	0.11	0.446	22.29
3/19/98	15:25:00	0.002	0.11	0.513	25.63
3/19/98	15:30:00	0.002	0.11	0.541	27.05

3/19/98	15:35:00	0.002	0.10	0.568	28.39
3/19/98	15:40:00	0.002	0.11	0.557	27.85
3/19/98	15:45:00	0.002	0.12	0.601	30.03
3/19/98	15:50:00	0.002	0.12	0.599	29.94
3/19/98	15:55:00	0.002	0.12	0.605	30.27
3/19/98	16:00:00	0.002	0.11	0.653	32.67
3/19/98	16:05:00	0.002	0.11	0.678	33.88
3/19/98	16:10:00	0.002	0.12	0.704	35.19
3/19/98	16:15:00	0.002	0.12	0.681	34.07
3/19/98	16:20:00	0.002	0.12	0.673	33.65
3/19/98	16:25:00	0.002	0.12	0.709	35.43
3/19/98	16:30:00	0.002	0.12	0.761	38.03
3/19/98	16:35:00	0.003	0.14	0.782	39.09
3/19/98	16:40:00	0.003	0.13	0.768	38.38
3/19/98	16:45:00	0.003	0.14	0.730	36.51
3/19/98	16:50:00	0.003	0.13	0.728	36.40
3/19/98	16:55:00	0.003	0.14	0.780	39.00
3/19/98	17:00:00	0.003	0.15	0.795	39.75
3/19/98	17:05:00	0.003	0.16	0.754	37.72
3/19/98	17:10:00	0.003	0.15	0.811	40.55
3/19/98	17:15:00	0.003	0.16	0.778	38.92
3/19/98	17:20:00	0.003	0.16	0.791	39.54
3/19/98	17:25:00	0.004	0.18	0.818	40.89
3/20/98	9:35:00	0.004	0.20	0.055	2.73
3/20/98	9:40:00	0.002	0.12	0.066	3.32
3/20/98	9:45:00	0.002	0.10	0.060	2.99
3/20/98	9:50:00	0.002	0.10	0.084	4.19
3/20/98	9:55:00	0.002	0.10	0.121	6.04
3/20/98	10:00:00	0.002	0.10	0.159	7.93
3/20/98	10:05:00	0.002	0.11	0.196	9.79
3/20/98	10:10:00	0.002	0.10	0.208	10.39
3/20/98	10:15:00	0.002	0.11	0.186	9.32
3/20/98	10:20:00	0.002	0.11	0.202	10.10
3/20/98	10:25:00	0.002	0.11	0.247	12.35
3/20/98	10:30:00	0.002	0.11	0.262	13.12
3/20/98	10:35:00	0.002	0.10	0.239	11.94
3/20/98	10:40:00	0.002	0.12	0.234	11.70
3/20/98	10:45:00	0.002	0.12	0.307	15.35
3/20/98	10:50:00	0.002	0.12	0.380	18.98
3/20/98	10:55:00	0.002	0.12	0.415	20.77
3/20/98	11:00:00	0.002	0.12	0.513	25.67
3/20/98	11:05:00	0.003	0.14	0.543	27.13
3/20/98	11:10:00	0.003	0.13	0.546	27.30
3/20/98	11:15:00	0.003	0.14	0.595	29.77
3/20/98	11:20:00	0.003	0.14	0.515	25.77
3/20/98	11:25:00	0.003	0.14	0.562	28.12
3/20/98	11:30:00	0.003	0.15	0.548	27.38
3/20/98	11:35:00	0.003	0.15	0.607	30.35
3/20/98	11:40:00	0.003	0.15	0.634	31.72
3/20/98	11:45:00	0.003	0.16	0.691	34.56
3/20/98	11:50:00	0.003	0.16	0.678	33.88

3/20/98	11:55:00	0.004	0.18	0.605	30.23
3/20/98	12:00:00	0.003	0.17	0.647	32.35
3/20/98	12:05:00	0.004	0.18	0.659	32.96
3/20/98	12:10:00	0.004	0.19	0.667	33.34
3/20/98	12:15:00	0.003	0.17	0.627	31.34
3/20/98	12:20:00	0.003	0.17	0.667	33.35
3/20/98	12:25:00	0.004	0.18	0.702	35.10
3/20/98	12:30:00	0.004	0.20	0.737	36.86
3/20/98	12:35:00	0.004	0.20	0.714	35.69
3/20/98	12:40:00	0.004	0.20	0.683	34.15
3/20/98	12:45:00	0.004	0.21	0.703	35.17
3/20/98	12:50:00	0.004	0.21	0.750	37.48
3/20/98	12:55:00	0.004	0.22	0.727	36.36
3/20/98	13:00:00	0.004	0.22	0.726	36.29
3/20/98	13:05:00	0.005	0.23	0.658	32.91
3/20/98	13:10:00	0.005	0.23	0.727	36.37
3/20/98	13:15:00	0.005	0.24	0.669	33.46
3/20/98	13:20:00	0.005	0.24	0.632	31.61
3/20/98	13:25:00	0.005	0.23	0.680	34.01
3/22/98	13:40:00	0.002	0.09	0.198	9.92
3/22/98	13:45:00	0.002	0.08	0.118	5.92
3/22/98	13:50:00	0.002	0.08	0.132	6.61
3/22/98	13:55:00	0.002	0.08	0.165	8.27
3/22/98	14:00:00	0.002	0.08	0.201	10.04
3/22/98	14:05:00	0.002	0.08	0.241	12.03
3/22/98	14:10:00	0.001	0.07	0.254	12.71
3/22/98	14:15:00	0.001	0.07	0.270	13.48
3/22/98	14:20:00	0.001	0.06	0.278	13.88
3/22/98	14:25:00	0.002	0.08	0.288	14.40
3/22/98	14:30:00	0.002	0.08	0.316	15.78
3/22/98	14:35:00	0.002	0.08	0.290	14.51
3/22/98	14:40:00	0.001	0.07	0.283	14.15
3/22/98	14:45:00	0.002	0.08	0.304	15.20
3/22/98	14:50:00	0.001	0.07	0.367	18.33
3/22/98	14:55:00	0.001	0.07	0.424	21.22
3/22/98	15:00:00	0.002	0.09	0.467	23.35
3/22/98	15:05:00	0.002	0.09	0.501	25.04
3/22/98	15:10:00	0.002	0.10	0.515	25.76
3/22/98	15:15:00	0.002	0.08	0.535	26.77
3/22/98	15:20:00	0.002	0.09	0.567	28.37
3/22/98	15:25:00	0.002	0.09	0.588	29.42
3/22/98	15:30:00	0.002	0.10	0.578	28.92
3/22/98	15:35:00	0.002	0.11	0.603	30.13
3/22/98	15:40:00	0.002	0.10	0.637	31.87
3/22/98	15:45:00	0.002	0.11	0.660	33.00
3/22/98	15:50:00	0.002	0.11	0.673	33.66
3/22/98	15:55:00	0.002	0.12	0.690	34.49
3/22/98	16:00:00	0.002	0.12	0.703	35.16
3/22/98	16:05:00	0.003	0.13	0.715	35.77
3/22/98	16:10:00	0.002	0.12	0.701	35.05
3/22/98	16:15:00	0.003	0.15	0.716	35.81

3/22/98	16:20:00	0.003	0.16	0.733	36.66
3/22/98	16:25:00	0.004	0.18	0.769	38.46
3/22/98	16:30:00	0.004	0.18	0.758	37.91
3/22/98	16:35:00	0.004	0.19	0.754	37.72
3/22/98	16:40:00	0.004	0.21	0.757	37.85
3/22/98	16:45:00	0.004	0.20	0.786	39.30
3/22/98	16:50:00	0.004	0.22	0.800	40.02
3/22/98	16:55:00	0.005	0.24	0.791	39.55
3/22/98	17:00:00	0.005	0.23	0.783	39.14
3/22/98	17:05:00	0.005	0.23	0.793	39.65
3/22/98	17:10:00	0.005	0.23	0.767	38.34
3/22/98	17:15:00	0.005	0.24	0.745	37.26
3/22/98	17:20:00	0.005	0.24	0.744	37.20
3/22/98	17:25:00	0.005	0.26	0.757	37.83
3/22/98	17:30:00	0.006	0.29	0.740	36.98
3/24/98	17:40:00	0.003	0.16	0.032	1.61
3/24/98	17:45:00	0.002	0.09	0.025	1.27
3/24/98	17:50:00	0.002	0.08	0.024	1.22
3/24/98	17:55:00	0.002	0.08	0.027	1.37
3/24/98	18:00:00	0.002	0.08	0.031	1.54
3/24/98	18:05:00	0.002	0.08	0.034	1.68
3/24/98	18:10:00	0.001	0.07	0.038	1.88
3/24/98	18:15:00	0.002	0.09	0.040	1.99
3/24/98	18:20:00	0.002	0.09	0.040	1.99
3/24/98	18:25:00	0.002	0.08	0.040	2.00
3/24/98	18:30:00	0.002	0.08	0.042	2.09
3/24/98	18:35:00	0.002	0.08	0.042	2.12
3/24/98	18:40:00	0.002	0.08	0.042	2.10
3/24/98	18:45:00	0.001	0.07	0.047	2.35
3/24/98	18:50:00	0.002	0.08	0.060	3.02
3/24/98	18:55:00	0.002	0.10	0.071	3.56
3/24/98	19:00:00	0.002	0.10	0.081	4.04
3/24/98	19:05:00	0.002	0.09	0.087	4.34
3/24/98	19:10:00	0.002	0.10	0.092	4.59
3/24/98	19:15:00	0.002	0.11	0.098	4.92
3/24/98	19:20:00	0.002	0.11	0.107	5.35
3/24/98	19:25:00	0.002	0.11	0.115	5.79
3/24/98	19:30:00	0.002	0.12	0.126	6.31
3/24/98	19:35:00	0.002	0.11	0.134	6.68
3/24/98	19:40:00	0.003	0.13	0.144	7.22
3/24/98	19:45:00	0.002	0.12	0.155	7.73
3/24/98	19:50:00	0.003	0.14	0.168	8.41
3/24/98	19:55:00	0.003	0.13	0.182	9.11
3/24/98	20:00:00	0.003	0.14	0.198	9.90
3/24/98	20:05:00	0.003	0.15	0.212	10.58
3/24/98	20:10:00	0.003	0.15	0.229	11.47
3/24/98	20:15:00	0.003	0.15	0.247	12.36
3/24/98	20:20:00	0.003	0.14	0.261	13.06
3/24/98	20:25:00	0.003	0.15	0.274	13.72
3/24/98	20:30:00	0.003	0.15	0.287	14.35
3/24/98	20:35:00	0.003	0.15	0.307	15.34

3/24/98	20:40:00	0.003	0.17	0.328	16.42
3/24/98	20:45:00	0.003	0.17	0.351	17.53
3/24/98	20:50:00	0.003	0.16	0.367	18.33
3/24/98	20:55:00	0.003	0.17	0.382	19.12
3/24/98	21:00:00	0.003	0.17	0.400	19.98
3/24/98	21:05:00	0.003	0.17	0.411	20.57
3/24/98	21:10:00	0.003	0.16	0.412	20.62
3/24/98	21:15:00	0.004	0.18	0.417	20.86
3/24/98	21:20:00	0.004	0.18	0.430	21.52
3/24/98	21:25:00	0.004	0.19	0.477	23.83
3/24/98	21:30:00	0.004	0.19	0.482	24.08
3/26/98	21:40:00	0.002	0.11	0.020	1.00
3/26/98	21:45:00	0.001	0.07	0.028	1.42
3/26/98	21:50:00	0.001	0.07	0.020	0.99
3/26/98	21:55:00	0.002	0.08	0.019	0.94
3/26/98	22:00:00	0.001	0.06	0.021	1.05
3/26/98	22:05:00	0.002	0.08	0.023	1.13
3/26/98	22:10:00	0.001	0.07	0.025	1.27
3/26/98	22:15:00	0.002	0.08	0.028	1.41
3/26/98	22:20:00	0.001	0.07	0.031	1.54
3/26/98	22:25:00	0.001	0.06	0.032	1.59
3/26/98	22:30:00	0.001	0.07	0.032	1.60
3/26/98	22:35:00	0.001	0.07	0.030	1.51
3/26/98	22:40:00	0.001	0.05	0.029	1.43
3/26/98	22:45:00	0.001	0.06	0.027	1.37
3/26/98	22:50:00	0.001	0.06	0.029	1.46
3/26/98	22:55:00	0.002	0.08	0.033	1.66
3/26/98	23:00:00	0.002	0.08	0.040	2.02
3/26/98	23:05:00	0.001	0.07	0.048	2.41
3/26/98	23:10:00	0.001	0.07	0.054	2.69
3/26/98	23:15:00	0.002	0.08	0.059	2.97
3/26/98	23:20:00	0.001	0.07	0.064	3.18
3/26/98	23:25:00	0.002	0.08	0.066	3.29
3/26/98	23:30:00	0.001	0.07	0.068	3.42
3/26/98	23:35:00	0.001	0.07	0.070	3.49
3/26/98	23:40:00	0.001	0.07	0.073	3.64
3/26/98	23:45:00	0.002	0.08	0.075	3.77
3/26/98	23:50:00	0.002	0.09	0.077	3.84
3/26/98	23:55:00	0.002	0.08	0.078	3.91
3/26/98	24:00:00	0.001	0.07	0.080	4.00
3/27/98	0:05:00	0.002	0.08	0.082	4.09
3/27/98	0:10:00	0.002	0.08	0.084	4.19
3/27/98	0:15:00	0.002	0.08	0.086	4.30
3/27/98	0:20:00	0.002	0.08	0.088	4.38
3/27/98	0:25:00	0.002	0.08	0.091	4.53
3/27/98	0:30:00	0.002	0.08	0.092	4.60
3/27/98	0:35:00	0.002	0.08	0.094	4.69
3/27/98	0:40:00	0.002	0.08	0.097	4.87
3/27/98	0:45:00	0.002	0.09	0.097	4.86
3/27/98	0:50:00	0.002	0.09	0.099	4.96
3/27/98	0:55:00	0.002	0.09	0.099	4.95

3/27/98	1:00:00	0.002	0.09	0.100	4.98
3/27/98	1:05:00	0.002	0.08	0.102	5.09
3/27/98	1:10:00	0.002	0.08	0.109	5.45
3/27/98	1:15:00	0.002	0.10	0.113	5.65
3/27/98	1:20:00	0.002	0.08	0.118	5.92
3/27/98	1:25:00	0.002	0.08	0.126	6.28
3/27/98	1:30:00	0.002	0.10	0.131	6.56

4/3/98	14:40:00	0.001	0.05	0.019	0.95
4/3/98	14:45:00	0.000	0.00	0.048	2.39
4/3/98	14:50:00	0.000	0.01	0.056	2.80
4/3/98	14:55:00	0.000	-0.01	0.070	3.49
4/3/98	15:00:00	0.000	0.00	0.085	4.23
4/3/98	15:05:00	0.000	0.00	0.096	4.82
4/3/98	15:10:00	0.000	0.00	0.110	5.49
4/3/98	15:15:00	0.000	0.00	0.128	6.38
4/3/98	15:20:00	0.000	-0.01	0.155	7.76
4/3/98	15:25:00	0.000	-0.01	0.190	9.51
4/3/98	15:30:00	0.000	0.00	0.217	10.86
4/3/98	15:35:00	0.000	0.00	0.253	12.63
4/3/98	15:40:00	0.000	0.00	0.279	13.96
4/3/98	15:45:00	0.000	0.00	0.295	14.77
4/3/98	15:50:00	0.000	0.00	0.304	15.21
4/3/98	15:55:00	0.000	0.01	0.359	17.93
4/3/98	16:00:00	0.000	0.00	0.394	19.69
4/3/98	16:05:00	0.000	0.00	0.375	18.77
4/3/98	16:10:00	0.000	0.00	0.386	19.31
4/3/98	16:15:00	0.000	-0.01	0.316	15.81
4/3/98	16:20:00	0.000	-0.01	0.336	16.80
4/3/98	16:25:00	0.000	0.00	0.398	19.88
4/3/98	16:30:00	0.000	0.00	0.448	22.40
4/3/98	16:35:00	0.000	0.01	0.426	21.32
4/3/98	16:40:00	0.000	0.00	0.485	24.27
4/3/98	16:45:00	0.000	0.01	0.514	25.68
4/3/98	16:50:00	0.000	0.01	0.541	27.06
4/3/98	16:55:00	0.000	0.00	0.536	26.80
4/3/98	17:00:00	0.000	0.00	0.552	27.59
4/3/98	17:05:00	0.000	0.00	0.580	29.02
4/3/98	17:10:00	0.000	0.00	0.634	31.70
4/3/98	17:15:00	0.000	0.00	0.656	32.78
4/3/98	17:20:00	0.000	0.01	0.713	35.63
4/3/98	17:25:00	0.000	0.00	0.731	36.56
4/3/98	17:30:00	0.000	0.00	0.737	36.86
4/3/98	17:35:00	0.000	0.01	0.732	36.61
4/3/98	17:40:00	0.000	0.02	0.725	36.25
4/3/98	17:45:00	0.000	0.01	0.727	36.35
4/3/98	17:50:00	0.000	0.00	0.726	36.31
4/3/98	17:55:00	0.000	0.01	0.744	37.20
4/3/98	18:00:00	0.000	0.01	0.698	34.88
4/3/98	18:05:00	0.000	0.00	0.682	34.12
4/3/98	18:10:00	0.000	0.00	0.701	35.07
4/3/98	18:15:00	0.000	0.00	0.726	36.31
4/3/98	18:20:00	0.000	0.00	0.791	39.56
4/3/98	18:25:00	0.000	0.00	0.804	40.21
4/3/98	18:30:00	0.000	0.02	0.820	41.01
4/5/98	18:40:00	0.001	0.03	0.009	0.43
4/5/98	18:45:00	0.000	-0.01	0.036	1.81
4/5/98	18:50:00	0.000	-0.01	0.037	1.84
4/5/98	18:55:00	0.000	0.00	0.055	2.76

4/5/98	19:00:00	0.000	0.01	0.080	4.00
4/5/98	19:05:00	0.000	0.00	0.107	5.34
4/5/98	19:10:00	0.000	0.01	0.133	6.63
4/5/98	19:15:00	0.000	0.01	0.152	7.60
4/5/98	19:20:00	0.000	0.00	0.169	8.43
4/5/98	19:25:00	0.000	0.00	0.182	9.12
4/5/98	19:30:00	0.000	0.01	0.208	10.42
4/5/98	19:35:00	0.000	0.00	0.219	10.95
4/5/98	19:40:00	0.000	-0.01	0.224	11.22
4/5/98	19:45:00	0.000	0.01	0.226	11.31
4/5/98	19:50:00	0.000	0.00	0.237	11.83
4/5/98	19:55:00	0.000	0.00	0.248	12.42
4/5/98	20:00:00	0.000	0.00	0.244	12.20
4/5/98	20:05:00	0.000	0.00	0.256	12.78
4/5/98	20:10:00	0.000	0.00	0.295	14.75
4/5/98	20:15:00	0.000	0.00	0.316	15.80
4/5/98	20:20:00	0.000	0.00	0.348	17.42
4/5/98	20:25:00	0.000	-0.01	0.384	19.18
4/5/98	20:30:00	0.000	0.01	0.416	20.80
4/5/98	20:35:00	0.000	0.01	0.422	21.12
4/5/98	20:40:00	0.000	0.01	0.457	22.83
4/5/98	20:45:00	0.000	0.00	0.484	24.19
4/5/98	20:50:00	0.000	0.01	0.507	25.34
4/5/98	20:55:00	0.000	0.01	0.520	26.00
4/5/98	21:00:00	0.000	0.02	0.539	26.93
4/5/98	21:05:00	0.000	0.00	0.562	28.10
4/5/98	21:10:00	0.000	0.01	0.577	28.85
4/5/98	21:15:00	0.000	0.01	0.606	30.29
4/5/98	21:20:00	0.000	0.01	0.622	31.08
4/5/98	21:25:00	0.000	0.00	0.632	31.59
4/5/98	21:30:00	0.000	0.02	0.632	31.60
4/5/98	21:35:00	0.000	0.01	0.658	32.92
4/5/98	21:40:00	0.000	0.01	0.680	33.98
4/5/98	21:45:00	0.000	0.02	0.669	33.44
4/5/98	21:50:00	0.000	0.02	0.685	34.25
4/5/98	21:55:00	0.000	0.02	0.699	34.94
4/5/98	22:00:00	0.000	0.01	0.720	36.00
4/5/98	22:05:00	0.000	0.02	0.734	36.72
4/5/98	22:10:00	0.000	0.02	0.746	37.28
4/5/98	22:15:00	0.000	0.02	0.756	37.81
4/5/98	22:20:00	0.000	0.01	0.772	38.61
4/5/98	22:25:00	0.000	0.02	0.794	39.69
4/5/98	22:30:00	0.000	0.02	0.793	39.67
4/7/98	22:40:00	0.002	0.08	0.008	0.42
4/7/98	22:45:00	0.000	0.00	0.028	1.42
4/7/98	22:50:00	0.000	0.00	0.031	1.56
4/7/98	22:55:00	0.000	0.02	0.035	1.76
4/7/98	23:00:00	0.000	0.01	0.041	2.03
4/7/98	23:05:00	0.000	0.02	0.049	2.46
4/7/98	23:10:00	0.000	0.02	0.061	3.03
4/7/98	23:15:00	0.000	0.01	0.078	3.92

4/7/98	23:20:00	0.000	0.00	0.098	4.89
4/7/98	23:25:00	0.000	0.00	0.110	5.51
4/7/98	23:30:00	0.000	0.01	0.113	5.65
4/7/98	23:35:00	0.000	0.01	0.123	6.16
4/7/98	23:40:00	0.000	-0.01	0.131	6.54
4/7/98	23:45:00	0.000	0.01	0.140	7.00
4/7/98	23:50:00	0.000	0.02	0.147	7.35
4/7/98	23:55:00	0.000	0.02	0.156	7.78
4/7/98	24:00:00	0.000	0.01	0.169	8.43
4/8/98	0:05:00	0.000	0.01	0.203	10.15
4/8/98	0:10:00	0.001	0.03	0.242	12.09
4/8/98	0:15:00	0.000	0.01	0.275	13.77
4/8/98	0:20:00	0.000	0.01	0.305	15.25
4/8/98	0:25:00	0.000	0.02	0.329	16.46
4/8/98	0:30:00	0.001	0.04	0.352	17.62
4/8/98	0:35:00	0.001	0.03	0.376	18.78
4/8/98	0:40:00	0.001	0.03	0.394	19.72
4/8/98	0:45:00	0.001	0.03	0.418	20.91
4/8/98	0:50:00	0.001	0.03	0.426	21.32
4/8/98	0:55:00	0.001	0.04	0.445	22.25
4/8/98	1:00:00	0.001	0.03	0.464	23.19
4/8/98	1:05:00	0.001	0.04	0.470	23.48
4/8/98	1:10:00	0.001	0.04	0.487	24.37
4/8/98	1:15:00	0.001	0.04	0.508	25.39
4/8/98	1:20:00	0.001	0.04	0.512	25.61
4/8/98	1:25:00	0.001	0.05	0.529	26.44
4/8/98	1:30:00	0.001	0.04	0.536	26.82
4/8/98	1:35:00	0.001	0.05	0.540	27.00
4/8/98	1:40:00	0.001	0.06	0.537	26.86
4/8/98	1:45:00	0.001	0.05	0.558	27.92
4/8/98	1:50:00	0.001	0.06	0.569	28.47
4/8/98	1:55:00	0.001	0.06	0.587	29.36
4/8/98	2:00:00	0.001	0.05	0.601	30.06
4/8/98	2:05:00	0.001	0.06	0.603	30.17
4/8/98	2:10:00	0.001	0.06	0.610	30.49
4/8/98	2:15:00	0.001	0.07	0.644	32.20
4/8/98	2:20:00	0.001	0.06	0.665	33.27
4/8/98	2:25:00	0.001	0.07	0.663	33.13
4/8/98	2:30:00	0.001	0.07	0.661	33.04
4/10/98	2:40:00	0.002	0.12	0.010	0.49
4/10/98	2:45:00	0.000	0.02	0.176	8.78
4/10/98	2:50:00	0.000	0.02	0.122	6.11
4/10/98	2:55:00	0.000	0.00	0.149	7.46
4/10/98	3:00:00	0.000	0.02	0.210	10.52
4/10/98	3:05:00	0.000	0.02	0.269	13.45
4/10/98	3:10:00	0.001	0.03	0.332	16.62
4/10/98	3:15:00	0.001	0.03	0.375	18.76
4/10/98	3:20:00	0.001	0.03	0.409	20.47
4/10/98	3:25:00	0.000	0.02	0.455	22.76
4/10/98	3:30:00	0.001	0.03	0.476	23.81
4/10/98	3:35:00	0.000	0.02	0.478	23.89

4/10/98	3:40:00	0.001	0.04	0.531	26.56
4/10/98	3:45:00	0.001	0.04	0.515	25.75
4/10/98	3:50:00	0.001	0.04	0.519	25.97
4/10/98	3:55:00	0.001	0.03	0.504	25.22
4/10/98	4:00:00	0.001	0.04	0.571	28.56
4/10/98	4:05:00	0.001	0.04	0.588	29.39
4/10/98	4:10:00	0.001	0.04	0.516	25.78
4/10/98	4:15:00	0.001	0.03	0.494	24.72
4/10/98	4:20:00	0.001	0.05	0.570	28.49
4/10/98	4:25:00	0.001	0.04	0.596	29.78
4/10/98	4:30:00	0.001	0.05	0.632	31.58
4/10/98	4:35:00	0.001	0.05	0.677	33.87
4/10/98	4:40:00	0.001	0.04	0.719	35.95
4/10/98	4:45:00	0.001	0.04	0.773	38.66
4/10/98	4:50:00	0.001	0.05	0.829	41.46
4/10/98	4:55:00	0.001	0.05	0.848	42.42
4/10/98	5:00:00	0.001	0.05	0.847	42.34
4/10/98	5:05:00	0.001	0.06	0.834	41.68
4/10/98	5:10:00	0.001	0.06	0.824	41.18
4/10/98	5:15:00	0.001	0.05	0.812	40.61
4/10/98	5:20:00	0.001	0.05	0.797	39.85
4/10/98	5:25:00	0.001	0.06	0.807	40.33
4/10/98	5:30:00	0.001	0.05	0.766	38.29
4/10/98	5:35:00	0.001	0.05	0.750	37.51
4/10/98	5:40:00	0.001	0.06	0.775	38.74
4/10/98	5:45:00	0.001	0.06	0.781	39.07
4/10/98	5:50:00	0.001	0.07	0.751	37.56
4/10/98	5:55:00	0.001	0.06	0.743	37.16
4/10/98	6:00:00	0.001	0.07	0.762	38.10
4/10/98	6:05:00	0.001	0.06	0.775	38.74
4/10/98	6:10:00	0.001	0.06	0.801	40.03
4/10/98	6:15:00	0.001	0.06	0.778	38.90
4/10/98	6:20:00	0.001	0.07	0.830	41.52
4/10/98	6:25:00	0.001	0.06	0.829	41.43
4/10/98	6:30:00	0.001	0.07	0.820	40.99
4/12/98	12:30:00	0.002	0.12	0.016	0.79
4/12/98	12:35:00	0.000	0.02	0.038	1.91
4/12/98	12:40:00	0.000	0.02	0.036	1.81
4/12/98	12:45:00	0.000	0.02	0.042	2.12
4/12/98	12:50:00	0.000	0.01	0.056	2.80
4/12/98	12:55:00	0.001	0.03	0.076	3.82
4/12/98	13:00:00	0.000	0.02	0.088	4.38
4/12/98	13:05:00	0.001	0.03	0.101	5.07
4/12/98	13:10:00	0.001	0.04	0.112	5.58
4/12/98	13:15:00	0.000	0.02	0.129	6.45
4/12/98	13:20:00	0.001	0.05	0.149	7.47
4/12/98	13:25:00	0.001	0.03	0.159	7.96
4/12/98	13:30:00	0.001	0.04	0.167	8.36
4/12/98	13:35:00	0.001	0.04	0.188	9.41
4/12/98	13:40:00	0.001	0.04	0.213	10.63
4/12/98	13:45:00	0.001	0.03	0.237	11.87

4/12/98	13:50:00	0.001	0.05	0.236	11.78
4/12/98	13:55:00	0.001	0.04	0.236	11.80
4/12/98	14:00:00	0.001	0.05	0.250	12.48
4/12/98	14:05:00	0.001	0.07	0.301	15.06
4/12/98	14:10:00	0.001	0.06	0.335	16.77
4/12/98	14:15:00	0.001	0.07	0.353	17.63
4/12/98	14:20:00	0.001	0.05	0.384	19.22
4/12/98	14:25:00	0.001	0.07	0.404	20.21
4/12/98	14:30:00	0.001	0.06	0.439	21.95
4/12/98	14:35:00	0.001	0.07	0.453	22.63
4/12/98	14:40:00	0.001	0.06	0.473	23.66
4/12/98	14:45:00	0.001	0.07	0.485	24.27
4/12/98	14:50:00	0.001	0.06	0.517	25.85
4/12/98	14:55:00	0.001	0.06	0.540	26.99
4/12/98	15:00:00	0.002	0.08	0.558	27.91
4/12/98	15:05:00	0.001	0.07	0.571	28.57
4/12/98	15:10:00	0.001	0.06	0.568	28.38
4/12/98	15:15:00	0.001	0.07	0.592	29.60
4/12/98	15:20:00	0.001	0.07	0.597	29.87
4/12/98	15:25:00	0.001	0.07	0.614	30.69
4/12/98	15:30:00	0.001	0.07	0.615	30.74
4/12/98	15:35:00	0.002	0.08	0.631	31.57
4/12/98	15:40:00	0.002	0.08	0.640	31.99
4/12/98	15:45:00	0.001	0.07	0.633	31.64
4/12/98	15:50:00	0.001	0.07	0.644	32.18
4/12/98	15:55:00	0.002	0.08	0.662	33.09
4/12/98	16:00:00	0.002	0.08	0.683	34.13
4/12/98	16:05:00	0.002	0.08	0.680	33.99
4/12/98	16:10:00	0.001	0.07	0.679	33.97
4/12/98	16:15:00	0.002	0.08	0.665	33.26
4/12/98	16:20:00	0.002	0.08	0.660	32.99
4/14/98	7:35:00	0.001	0.04	0.020	1.01
4/14/98	7:40:00	0.000	0.01	0.088	4.41
4/14/98	7:45:00	0.000	0.00	0.081	4.03
4/14/98	7:50:00	0.000	0.00	0.101	5.05
4/14/98	7:55:00	0.000	-0.01	0.128	6.40
4/14/98	8:00:00	0.000	0.01	0.150	7.48
4/14/98	8:05:00	0.000	0.00	0.168	8.41
4/14/98	8:10:00	0.000	0.00	0.200	9.99
4/14/98	8:15:00	0.000	0.00	0.222	11.10
4/14/98	8:20:00	0.000	0.00	0.239	11.96
4/14/98	8:25:00	0.000	0.01	0.249	12.45
4/14/98	8:30:00	0.000	0.00	0.282	14.12
4/14/98	8:35:00	0.000	0.01	0.295	14.77
4/14/98	8:40:00	0.000	0.01	0.322	16.11
4/14/98	8:45:00	0.000	0.00	0.335	16.73
4/14/98	8:50:00	0.000	0.00	0.305	15.25
4/14/98	8:55:00	0.000	0.01	0.294	14.71
4/14/98	9:00:00	0.000	-0.01	0.320	16.02
4/14/98	9:05:00	0.000	0.02	0.365	18.24
4/14/98	9:10:00	0.000	0.01	0.419	20.94

4/14/98	9:15:00	0.000	0.01	0.461	23.05
4/14/98	9:20:00	0.000	0.02	0.490	24.50
4/14/98	9:25:00	0.000	0.02	0.530	26.51
4/14/98	9:30:00	0.000	0.02	0.547	27.33
4/14/98	9:35:00	0.000	0.02	0.571	28.55
4/14/98	9:40:00	0.000	0.01	0.601	30.04
4/14/98	9:45:00	0.000	0.02	0.618	30.92
4/14/98	9:50:00	0.000	0.02	0.645	32.27
4/14/98	9:55:00	0.000	0.02	0.662	33.10
4/14/98	10:00:00	0.001	0.03	0.691	34.55
4/14/98	10:05:00	0.001	0.03	0.698	34.92
4/14/98	10:10:00	0.001	0.03	0.708	35.42
4/14/98	10:15:00	0.001	0.03	0.733	36.67
4/14/98	10:20:00	0.001	0.04	0.739	36.94
4/14/98	10:25:00	0.001	0.04	0.757	37.83
4/14/98	10:30:00	0.001	0.05	0.784	39.18
4/14/98	10:35:00	0.001	0.04	0.794	39.68
4/14/98	10:40:00	0.001	0.04	0.814	40.72
4/14/98	10:45:00	0.001	0.06	0.809	40.45
4/14/98	10:50:00	0.001	0.05	0.811	40.54
4/14/98	10:55:00	0.001	0.06	0.816	40.80
4/14/98	11:00:00	0.001	0.06	0.839	41.93
4/14/98	11:05:00	0.001	0.06	0.863	43.13
4/14/98	11:10:00	0.001	0.05	0.869	43.43
4/14/98	11:15:00	0.001	0.05	0.884	44.21
4/14/98	11:20:00	0.001	0.07	0.889	44.46
4/14/98	11:25:00	0.001	0.05	0.894	44.72
4/17/98	8:40:00	0.001	0.05	0.010	0.51
4/17/98	8:45:00	0.000	0.00	0.116	5.81
4/17/98	8:50:00	0.000	0.00	0.093	4.66
4/17/98	8:55:00	0.000	0.01	0.120	6.00
4/17/98	9:00:00	0.000	-0.01	0.157	7.84
4/17/98	9:05:00	0.000	-0.02	0.183	9.15
4/17/98	9:10:00	0.000	-0.01	0.220	11.01
4/17/98	9:15:00	0.000	0.00	0.256	12.79
4/17/98	9:20:00	0.000	0.00	0.276	13.82
4/17/98	9:25:00	0.000	-0.01	0.299	14.94
4/17/98	9:30:00	0.000	-0.01	0.331	16.53
4/17/98	9:35:00	0.000	0.00	0.353	17.63
4/17/98	9:40:00	0.000	0.01	0.359	17.96
4/17/98	9:45:00	0.000	0.00	0.357	17.87
4/17/98	9:50:00	0.000	-0.01	0.394	19.71
4/17/98	9:55:00	0.000	0.00	0.395	19.73
4/17/98	10:00:00	0.000	0.00	0.382	19.10
4/17/98	10:05:00	0.000	-0.01	0.374	18.69
4/17/98	10:10:00	0.000	0.00	0.407	20.34
4/17/98	10:15:00	0.000	0.00	0.432	21.59
4/17/98	10:20:00	0.000	0.00	0.406	20.29
4/17/98	10:25:00	0.000	0.00	0.407	20.34
4/17/98	10:30:00	0.000	0.00	0.424	21.19
4/17/98	10:35:00	0.000	0.00	0.431	21.54

4/17/98	10:40:00	0.000	0.00	0.423	21.13
4/17/98	10:45:00	0.000	0.01	0.420	20.98
4/17/98	10:50:00	0.000	0.01	0.443	22.15
4/17/98	10:55:00	0.000	0.00	0.491	24.57
4/17/98	11:00:00	0.000	0.01	0.456	22.78
4/17/98	11:05:00	0.000	0.01	0.474	23.71
4/17/98	11:10:00	0.000	0.00	0.517	25.85
4/17/98	11:15:00	0.000	0.02	0.503	25.15
4/17/98	11:20:00	0.000	0.00	0.519	25.95
4/17/98	11:25:00	0.000	0.00	0.546	27.28
4/17/98	11:30:00	0.000	0.01	0.608	30.39
4/17/98	11:35:00	0.000	0.01	0.576	28.78
4/17/98	11:40:00	0.000	0.00	0.603	30.15
4/17/98	11:45:00	0.000	0.01	0.604	30.20
4/17/98	11:50:00	0.000	0.02	0.673	33.66
4/17/98	11:55:00	0.000	0.01	0.765	38.23
4/17/98	12:00:00	0.000	0.02	0.851	42.54
4/17/98	12:05:00	0.000	0.01	0.977	48.85
4/17/98	12:10:00	0.000	0.02	0.945	47.27
4/17/98	12:15:00	0.000	0.01	0.890	44.52
4/17/98	12:20:00	0.000	0.01	0.886	44.28
4/17/98	12:25:00	0.000	0.02	0.857	42.83
4/17/98	12:30:00	0.000	0.02	0.849	42.43
4/19/98	12:45:00	0.000	0.02	0.072	3.62
4/19/98	12:50:00	0.000	0.00	0.060	2.99
4/19/98	12:55:00	0.000	0.00	0.070	3.51
4/19/98	13:00:00	0.000	0.00	0.093	4.66
4/19/98	13:05:00	0.000	0.00	0.125	6.27
4/19/98	13:10:00	0.000	0.00	0.150	7.48
4/19/98	13:15:00	0.000	-0.01	0.179	8.95
4/19/98	13:20:00	0.000	0.00	0.204	10.20
4/19/98	13:25:00	0.000	-0.01	0.243	12.16
4/19/98	13:30:00	0.000	0.01	0.276	13.79
4/19/98	13:35:00	0.000	-0.01	0.286	14.31
4/19/98	13:40:00	0.000	0.01	0.314	15.68
4/19/98	13:45:00	0.000	0.00	0.322	16.11
4/19/98	13:50:00	0.000	0.01	0.350	17.48
4/19/98	13:55:00	0.000	0.00	0.357	17.85
4/19/98	14:00:00	0.000	0.01	0.380	19.00
4/19/98	14:05:00	0.000	0.00	0.441	22.06
4/19/98	14:10:00	0.000	0.00	0.431	21.55
4/19/98	14:15:00	0.000	-0.01	0.409	20.44
4/19/98	14:20:00	0.000	0.00	0.424	21.20
4/19/98	14:25:00	0.000	0.01	0.464	23.20
4/19/98	14:30:00	0.000	0.00	0.521	26.05
4/19/98	14:35:00	0.000	0.01	0.591	29.54
4/19/98	14:40:00	0.000	0.01	0.626	31.29
4/19/98	14:45:00	0.000	0.01	0.629	31.46
4/19/98	14:50:00	0.000	0.02	0.564	28.21
4/19/98	14:55:00	0.000	0.01	0.617	30.84
4/19/98	15:00:00	0.000	0.00	0.698	34.89

4/19/98	15:05:00	0.000	0.01	0.674	33.71
4/19/98	15:10:00	0.000	0.01	0.676	33.79
4/19/98	15:15:00	0.000	0.01	0.637	31.83
4/19/98	15:20:00	0.000	0.01	0.688	34.38
4/19/98	15:25:00	0.000	0.02	0.756	37.82
4/19/98	15:30:00	0.000	0.02	0.782	39.12
4/19/98	15:35:00	0.000	0.01	0.792	39.60
4/19/98	15:40:00	0.000	0.02	0.841	42.07
4/19/98	15:45:00	0.000	0.02	0.828	41.42
4/19/98	15:50:00	0.001	0.03	0.843	42.15
4/19/98	15:55:00	0.000	0.02	0.869	43.46
4/19/98	16:00:00	0.001	0.03	0.880	43.98
4/19/98	16:05:00	0.001	0.04	0.919	45.93
4/19/98	16:10:00	0.001	0.04	0.887	44.34
4/19/98	16:15:00	0.001	0.04	0.898	44.91
4/19/98	16:20:00	0.001	0.05	0.887	44.37
4/19/98	16:25:00	0.001	0.04	0.895	44.76
4/19/98	16:30:00	0.001	0.04	0.887	44.35
4/19/98	16:35:00	0.001	0.04	0.848	42.38
4/21/98	9:40:00	0.000	0.02	0.081	4.03
4/21/98	9:45:00	0.000	0.00	0.073	3.65
4/21/98	9:50:00	0.000	0.00	0.088	4.42
4/21/98	9:55:00	0.000	0.00	0.139	6.96
4/21/98	10:00:00	0.000	0.00	0.191	9.54
4/21/98	10:05:00	0.000	-0.02	0.232	11.62
4/21/98	10:10:00	0.000	0.00	0.288	14.41
4/21/98	10:15:00	0.000	0.00	0.343	17.15
4/21/98	10:20:00	0.000	0.00	0.361	18.03
4/21/98	10:25:00	0.000	-0.01	0.408	20.42
4/21/98	10:30:00	0.000	0.00	0.418	20.90
4/21/98	10:35:00	0.000	0.00	0.452	22.58
4/21/98	10:40:00	0.000	0.01	0.480	24.01
4/21/98	10:45:00	0.000	0.00	0.482	24.12
4/21/98	10:50:00	0.000	0.00	0.482	24.10
4/21/98	10:55:00	0.000	0.00	0.487	24.33
4/21/98	11:00:00	0.000	0.01	0.528	26.41
4/21/98	11:05:00	0.000	0.00	0.543	27.15
4/21/98	11:10:00	0.000	0.01	0.531	26.56
4/21/98	11:15:00	0.000	0.00	0.536	26.82
4/21/98	11:20:00	0.000	0.00	0.604	30.18
4/21/98	11:25:00	0.000	0.00	0.632	31.58
4/21/98	11:30:00	0.000	0.01	0.639	31.94
4/21/98	11:35:00	0.000	0.02	0.686	34.29
4/21/98	11:40:00	0.000	0.00	0.738	36.90
4/21/98	11:45:00	0.000	0.02	0.778	38.90
4/21/98	11:50:00	0.000	0.02	0.794	39.69
4/21/98	11:55:00	0.000	0.01	0.846	42.30
4/21/98	12:00:00	0.000	0.01	0.881	44.05
4/21/98	12:05:00	0.000	0.02	0.873	43.67
4/21/98	12:10:00	0.000	0.02	0.883	44.15
4/21/98	12:15:00	0.000	0.02	0.890	44.52

4/21/98	12:20:00	0.000	0.02	0.937	46.84
4/21/98	12:25:00	0.000	0.02	0.963	48.17
4/21/98	12:30:00	0.000	0.02	0.945	47.24
4/21/98	12:35:00	0.001	0.04	0.961	48.07
4/21/98	12:40:00	0.001	0.03	0.976	48.78
4/21/98	12:45:00	0.001	0.04	0.992	49.58
4/21/98	12:50:00	0.001	0.03	0.983	49.13
4/21/98	12:55:00	0.001	0.03	0.990	49.49
4/21/98	13:00:00	0.001	0.04	0.979	48.93
4/21/98	13:05:00	0.001	0.04	0.992	49.59
4/21/98	13:10:00	0.001	0.03	1.000	49.98
4/21/98	13:15:00	0.001	0.04	1.000	49.98
4/21/98	13:20:00	0.001	0.04	1.000	49.98
4/21/98	13:25:00	0.001	0.04	1.000	49.98
4/21/98	13:30:00	0.001	0.04	1.000	49.98
4/23/98	13:40:00	0.003	0.16	0.110	5.46
4/23/98	13:45:00	0.001	0.04	0.160	8.02
4/23/98	13:50:00	0.001	0.03	0.140	6.99
4/23/98	13:55:00	0.001	0.03	0.191	9.56
4/23/98	14:00:00	0.001	0.03	0.248	12.41
4/23/98	14:05:00	0.001	0.03	0.329	16.46
4/23/98	14:10:00	0.001	0.03	0.398	19.88
4/23/98	14:15:00	0.001	0.04	0.448	22.41
4/23/98	14:20:00	0.001	0.03	0.495	24.77
4/23/98	14:25:00	0.001	0.03	0.578	28.91
4/23/98	14:30:00	0.001	0.04	0.657	32.83
4/23/98	14:35:00	0.001	0.04	0.675	33.76
4/23/98	14:40:00	0.001	0.05	0.669	33.43
4/23/98	14:45:00	0.001	0.05	0.663	33.13
4/23/98	14:50:00	0.001	0.04	0.657	32.86
4/23/98	14:55:00	0.001	0.04	0.702	35.09
4/23/98	15:00:00	0.001	0.04	0.700	34.98
4/23/98	15:05:00	0.001	0.05	0.775	38.74
4/23/98	15:10:00	0.001	0.05	0.798	39.88
4/23/98	15:15:00	0.001	0.06	0.787	39.34
4/23/98	15:20:00	0.001	0.05	0.775	38.76
4/23/98	15:25:00	0.001	0.05	0.818	40.91
4/23/98	15:30:00	0.001	0.07	0.875	43.77
4/23/98	15:35:00	0.001	0.07	0.868	43.38
4/23/98	15:40:00	0.002	0.08	0.890	44.49
4/23/98	15:45:00	0.001	0.07	0.932	46.60
4/23/98	15:50:00	0.001	0.07	0.993	49.65
4/23/98	15:55:00	0.002	0.08	1.000	49.98
4/23/98	16:00:00	0.002	0.08	1.000	49.98
4/23/98	16:05:00	0.002	0.08	1.000	49.98
4/23/98	16:10:00	0.002	0.10	1.000	49.98
4/23/98	16:15:00	0.002	0.09	1.000	49.98
4/23/98	16:20:00	0.002	0.11	1.000	49.98
4/23/98	16:25:00	0.002	0.11	0.999	49.97
4/23/98	16:30:00	0.002	0.12	1.000	49.98
4/23/98	16:35:00	0.002	0.12	1.000	49.98

4/23/98	16:40:00	0.002	0.12	1.000	49.98
4/23/98	16:45:00	0.003	0.14	1.000	49.98
4/23/98	16:50:00	0.003	0.15	1.000	49.98
4/23/98	16:55:00	0.003	0.15	1.000	49.98
4/23/98	17:00:00	0.003	0.16	1.000	49.98
4/23/98	17:05:00	0.004	0.18	1.000	49.98
4/23/98	17:10:00	0.004	0.18	1.000	49.98
4/23/98	17:15:00	0.004	0.18	1.000	49.98
4/23/98	17:20:00	0.004	0.20	1.000	49.98
4/23/98	17:25:00	0.004	0.20	1.000	49.98
4/23/98	17:30:00	0.004	0.20	1.000	49.98
4/25/98	17:40:00	0.001	0.07	0.006	0.31
4/25/98	17:45:00	0.001	0.03	0.074	3.69
4/25/98	17:50:00	0.000	0.01	0.090	4.51
4/25/98	17:55:00	0.000	0.01	0.123	6.14
4/25/98	18:00:00	0.001	0.03	0.161	8.04
4/25/98	18:05:00	0.000	0.02	0.198	9.92
4/25/98	18:10:00	0.000	0.01	0.241	12.07
4/25/98	18:15:00	0.000	0.00	0.269	13.45
4/25/98	18:20:00	0.000	0.01	0.273	13.67
4/25/98	18:25:00	0.000	0.01	0.290	14.52
4/25/98	18:30:00	0.000	0.01	0.315	15.76
4/25/98	18:35:00	0.000	0.01	0.324	16.21
4/25/98	18:40:00	0.000	0.00	0.336	16.80
4/25/98	18:45:00	0.001	0.03	0.346	17.32
4/25/98	18:50:00	0.000	0.01	0.344	17.22
4/25/98	18:55:00	0.000	0.01	0.373	18.66
4/25/98	19:00:00	0.000	0.01	0.354	17.69
4/25/98	19:05:00	0.000	0.02	0.343	17.15
4/25/98	19:10:00	0.000	0.02	0.355	17.74
4/25/98	19:15:00	0.001	0.04	0.391	19.54
4/25/98	19:20:00	0.000	0.01	0.423	21.13
4/25/98	19:25:00	0.000	0.02	0.456	22.81
4/25/98	19:30:00	0.001	0.03	0.483	24.17
4/25/98	19:35:00	0.000	0.02	0.507	25.34
4/25/98	19:40:00	0.001	0.04	0.522	26.11
4/25/98	19:45:00	0.000	0.01	0.543	27.17
4/25/98	19:50:00	0.000	0.02	0.571	28.57
4/25/98	19:55:00	0.001	0.03	0.612	30.61
4/25/98	20:00:00	0.001	0.04	0.620	30.99
4/25/98	20:05:00	0.001	0.03	0.626	31.28
4/25/98	20:10:00	0.001	0.03	0.658	32.91
4/25/98	20:15:00	0.001	0.04	0.673	33.64
4/25/98	20:20:00	0.001	0.04	0.666	33.30
4/25/98	20:25:00	0.001	0.04	0.676	33.78
4/25/98	20:30:00	0.001	0.04	0.700	35.02
4/25/98	20:35:00	0.001	0.03	0.734	36.71
4/25/98	20:40:00	0.001	0.05	0.755	37.73
4/25/98	20:45:00	0.001	0.04	0.772	38.59
4/25/98	20:50:00	0.001	0.05	0.773	38.64
4/25/98	20:55:00	0.001	0.05	0.779	38.94

4/25/98	21:00:00	0.001	0.06	0.790	39.49
4/25/98	21:05:00	0.001	0.06	0.808	40.39
4/25/98	21:10:00	0.001	0.05	0.816	40.79
4/25/98	21:15:00	0.001	0.05	0.812	40.58
4/25/98	21:20:00	0.001	0.06	0.804	40.18
4/25/98	21:25:00	0.001	0.06	0.805	40.27
4/25/98	21:30:00	0.001	0.07	0.858	42.92
4/27/98	21:45:00	0.001	0.04	0.043	2.13
4/27/98	21:50:00	0.000	0.01	0.050	2.49
4/27/98	21:55:00	0.000	0.01	0.065	3.26
4/27/98	22:00:00	0.000	0.01	0.094	4.69
4/27/98	22:05:00	0.000	0.02	0.125	6.27
4/27/98	22:10:00	0.000	0.01	0.158	7.90
4/27/98	22:15:00	0.000	0.01	0.174	8.68
4/27/98	22:20:00	0.000	0.01	0.179	8.93
4/27/98	22:25:00	0.000	0.01	0.193	9.63
4/27/98	22:30:00	0.000	0.01	0.197	9.84
4/27/98	22:35:00	0.000	0.01	0.204	10.19
4/27/98	22:40:00	0.001	0.03	0.212	10.59
4/27/98	22:45:00	0.000	0.02	0.219	10.93
4/27/98	22:50:00	0.000	0.02	0.218	10.90
4/27/98	22:55:00	0.000	0.01	0.233	11.67
4/27/98	23:00:00	0.000	0.02	0.258	12.90
4/27/98	23:05:00	0.000	0.02	0.251	12.54
4/27/98	23:10:00	0.000	0.02	0.260	13.01
4/27/98	23:15:00	0.000	0.00	0.268	13.41
4/27/98	23:20:00	0.000	0.02	0.284	14.21
4/27/98	23:25:00	0.000	0.02	0.296	14.80
4/27/98	23:30:00	0.000	0.02	0.317	15.86
4/27/98	23:35:00	0.001	0.03	0.340	17.01
4/27/98	23:40:00	0.001	0.03	0.368	18.40
4/27/98	23:45:00	0.000	0.01	0.383	19.14
4/27/98	23:50:00	0.000	0.02	0.409	20.45
4/27/98	23:55:00	0.001	0.03	0.436	21.80
4/27/98	24:00:00	0.001	0.03	0.461	23.07
4/28/98	0:05:00	0.001	0.03	0.498	24.88
4/28/98	0:10:00	0.001	0.03	0.526	26.29
4/28/98	0:15:00	0.000	0.02	0.544	27.18
4/28/98	0:20:00	0.001	0.03	0.561	28.04
4/28/98	0:25:00	0.001	0.04	0.580	29.00
4/28/98	0:30:00	0.001	0.04	0.606	30.30
4/28/98	0:35:00	0.001	0.04	0.609	30.46
4/28/98	0:40:00	0.001	0.04	0.627	31.35
4/28/98	0:45:00	0.001	0.03	0.653	32.66
4/28/98	0:50:00	0.001	0.04	0.678	33.90
4/28/98	0:55:00	0.001	0.04	0.692	34.61
4/28/98	1:00:00	0.001	0.05	0.702	35.09
4/28/98	1:05:00	0.001	0.05	0.711	35.54
4/28/98	1:10:00	0.001	0.05	0.740	37.00
4/28/98	1:15:00	0.001	0.05	0.739	36.97
4/28/98	1:20:00	0.001	0.04	0.755	37.76

4/28/98	1:25:00	0.001	0.05	0.776	38.78
4/28/98	1:30:00	0.001	0.06	0.786	39.30
4/28/98	1:35:00	0.001	0.06	0.793	39.67

MAY 98 INLET DATA MISSING
DUE TO ANALYZER FAILURE

5/1/98	10:50:00	0.002	0.12
5/1/98	10:55:00	0.002	0.09
5/1/98	11:00:00	0.002	0.09
5/1/98	11:05:00	0.002	0.08
5/1/98	11:10:00	0.002	0.08
5/1/98	11:15:00	0.002	0.09
5/1/98	11:20:00	0.001	0.07
5/1/98	11:25:00	0.002	0.08
5/1/98	11:30:00	0.001	0.07
5/1/98	11:35:00	0.001	0.07
5/1/98	11:40:00	0.001	0.07
5/1/98	11:45:00	0.001	0.07
5/2/98	11:55:00	0.002	0.11
5/2/98	12:00:00	0.001	0.03
5/2/98	12:05:00	0.001	0.03
5/2/98	12:10:00	0.000	0.02
5/2/98	12:15:00	0.001	0.03
5/2/98	12:20:00	0.000	0.02
5/2/98	12:25:00	0.000	0.02
5/2/98	12:30:00	0.001	0.03
5/2/98	12:35:00	0.001	0.03
5/2/98	12:40:00	0.000	0.01
5/2/98	12:45:00	0.001	0.03
5/2/98	12:50:00	0.001	0.03
5/4/98	13:05:00	0.002	0.10
5/4/98	13:10:00	0.002	0.08
5/4/98	13:15:00	0.002	0.08
5/4/98	13:20:00	0.002	0.08
5/4/98	13:25:00	0.001	0.07
5/4/98	13:30:00	0.002	0.09
5/4/98	13:35:00	0.002	0.08
5/4/98	13:40:00	0.002	0.09
5/4/98	13:45:00	0.002	0.08
5/4/98	13:50:00	0.002	0.08
5/4/98	13:55:00	0.002	0.08
5/4/98	14:00:00	0.002	0.09
5/8/98	14:10:00	0.002	0.09
5/8/98	14:15:00	0.001	0.05
5/8/98	14:20:00	0.001	0.04
5/8/98	14:25:00	0.001	0.03
5/8/98	14:30:00	0.000	0.02
5/8/98	14:35:00	0.001	0.03
5/8/98	14:40:00	0.001	0.04
5/8/98	14:45:00	0.001	0.04
5/8/98	14:50:00	0.001	0.04
5/8/98	14:55:00	0.001	0.04
5/8/98	15:00:00	0.001	0.04
5/8/98	15:05:00	0.001	0.05
5/9/98	15:15:00	0.002	0.12
5/9/98	15:20:00	0.001	0.05
5/9/98	15:25:00	0.001	0.06

5/9/98	15:30:00	0.001	0.06
5/9/98	15:35:00	0.001	0.06
5/9/98	15:40:00	0.001	0.06
5/9/98	15:45:00	0.001	0.07
5/9/98	15:50:00	0.001	0.05
5/9/98	15:55:00	0.001	0.06
5/9/98	16:00:00	0.001	0.06
5/9/98	16:05:00	0.001	0.07
5/9/98	16:10:00	0.001	0.06
5/10/98	16:20:00	0.003	0.13
5/10/98	16:25:00	0.001	0.06
5/10/98	16:30:00	0.001	0.06
5/10/98	16:35:00	0.001	0.05
5/10/98	16:40:00	0.001	0.07
5/10/98	16:45:00	0.001	0.06
5/10/98	16:50:00	0.001	0.06
5/10/98	16:55:00	0.001	0.06
5/10/98	17:00:00	0.001	0.05
5/10/98	17:05:00	0.001	0.06
5/10/98	17:10:00	0.001	0.07
5/10/98	17:15:00	0.001	0.07
5/11/98	17:25:00	0.002	0.12
5/11/98	17:30:00	0.001	0.06
5/11/98	17:35:00	0.001	0.05
5/11/98	17:40:00	0.001	0.04
5/11/98	17:45:00	0.001	0.05
5/11/98	17:50:00	0.001	0.07
5/11/98	17:55:00	0.001	0.05
5/11/98	18:00:00	0.001	0.06
5/11/98	18:05:00	0.001	0.06
5/11/98	18:10:00	0.001	0.06
5/11/98	18:15:00	0.001	0.05
5/11/98	18:20:00	0.001	0.07
5/12/98	18:30:00	0.003	0.13
5/12/98	18:35:00	0.001	0.06
5/12/98	18:40:00	0.001	0.04
5/12/98	18:45:00	0.001	0.06
5/12/98	18:50:00	0.001	0.05
5/12/98	18:55:00	0.001	0.04
5/12/98	19:00:00	0.001	0.05
5/12/98	19:05:00	0.001	0.06
5/12/98	19:10:00	0.001	0.07
5/12/98	19:15:00	0.001	0.05
5/12/98	19:20:00	0.001	0.06
5/12/98	19:25:00	0.001	0.07
5/13/98	19:35:00	0.002	0.11
5/13/98	19:40:00	0.001	0.05
5/13/98	19:45:00	0.001	0.05
5/13/98	19:50:00	0.001	0.05
5/13/98	19:55:00	0.001	0.05
5/13/98	20:00:00	0.001	0.05

5/13/98	20:05:00	0.001	0.04
5/13/98	20:10:00	0.001	0.05
5/13/98	20:15:00	0.001	0.05
5/13/98	20:20:00	0.001	0.06
5/13/98	20:25:00	0.001	0.05
5/13/98	20:30:00	0.001	0.06
5/14/98	8:00:00	0.001	0.04
5/14/98	8:05:00	0.001	0.03
5/14/98	8:10:00	0.000	0.02
5/14/98	8:15:00	0.001	0.03
5/14/98	8:20:00	0.001	0.03
5/14/98	8:25:00	0.001	0.03
5/14/98	8:30:00	0.001	0.03
5/14/98	8:35:00	0.001	0.04
5/14/98	8:40:00	0.001	0.03
5/14/98	8:45:00	0.001	0.03
5/14/98	8:50:00	0.001	0.04
5/14/98	8:55:00	0.001	0.05

DRAFT

MAVERICK

Construction Management Services, Inc.

June 4, 1999

Mr. Michael Light
Project Coordinator
Solutia
10300 Olive Boulevard
St. Louis, MO 63141

Subject: Proposed Operations and Maintenance Modifications
Gas Treatment System
Industri-plex Superfund Site
Woburn, Massachusetts

Dear Mike:

Outlined below are the proposed modifications to the gas treatment system operation and maintenance plan. These modifications were developed in conjunction with the Industri-plex site air consultant, D.J. Gile Inc.

Current Operations & Maintenance Requirements

Currently the Data Acquisition Software (DAS) controls the activation and termination of the TOU system based upon timed intervals. These intervals are manually set based upon the rate of gas generation from the hide pile. Ideally, when the system begins relying primarily on assist gas (propane) for combustion and maintaining ideal temperature, the TOU is terminated until the next scheduled timed run. This method reduces the amount of propane utilized by the TOU and reduces costs. However, with varying atmospheric temperature and pressures, as well anaerobic decomposition variables, such as moisture, pH, microbe populations and microbe nutrients in the hide pile, the gas generation rate fluctuates. Therefore, periodic monitoring of the timed intervals has been required to ensure that the appropriate amount of hide pile gas is treated and minimal assist gas is consumed.

Currently the Continuous Emissions Monitoring System is monitoring the emissions of the TOU through onsite analyzers that determine the TRS concentration in the emissions. Although the system has accumulated reliable data since November 1997, the equipment is very expensive to maintain and repair. Furthermore, preliminary diagnostics have indicated that minor upgrades will be required to avoid any adverse affects of the upcoming Year 2000 issues.

Proposed Operations & Maintenance Requirements and Justification.

As requested by ISRT, D.J. Gile Inc. has provided his opinion on cost-effective monitoring alternatives for the TOU. As detailed in Attachment A, "Compliance Assessment and Alternative Monitoring Methods" provided to the ISRT on May 22, 1998 by D.J.Gile Inc., the TOU may be covered by the EPA's Compliance Assurance Monitoring (CAM) Rule. The CAM Rule allows affected facilities to demonstrate and establish compliance by monitoring and verifying critical process parameters for proper operation, thereby assuring regulatory agencies that they comply with established guidelines. In short, this regulation allows facilities to monitor critical system parameters, rather than the effluent emissions in order to demonstrate compliance and reduce facility costs. In the event of system deficiencies, the system must be shut down and corrected immediately. More information is available on the CAM Rule through a US EPA Fact sheet and the detailed regulations, as provided in Attachment B and C, respectively.

We proposes the changes to the Operations & Maintenance for the Thermal Oxidizer Unit (TOU) based upon the U.S. EPA Compliance Assurance Monitoring (CAM) Rule to assure the proper operation of the system.

For the TOU, temperature and flow rate are the critical parameters that would require monitoring. Influent gas is treated so long as the operating temperature is maintained at 1200 degrees Fahrenheit and sufficient residence time are maintained. Further monitoring of the correct operation of the TOU can be demonstrated by annual inspections by a technician from the manufacturer (NAO, Inc.), as outlined in the current Operation & Maintenance Plan.

In consultation with D.J. Gile Inc., the ISRT has developed the following monitoring plan to assure the proper operation of the TOU. In many cases, this proposed operation and maintenance plan is more strict and reliable than the current operation and maintenance plan, while remaining cost effective for the ISRT. A summarized chart of the following plan is located in Attachment D.

Initial Assurance

To effectively implement that CAM Rule, assurance must be obtained that while the system is operating in accordance with the manufacturer's design, odors are not being released. This will be demonstrated by two initial events.

First, a manufacturer's representative will conduct an inspection of the system and verify that the system is operating as designed. This will include the verification of checks and safeguards that are incorporated into the system such as the correct operation of block valves that prevent the introduction of gas until designated flare temperature is achieved, thus preventing the escape of untreated hide pile gas.

Secondly, all collected CEMS data from the past twenty (20) months will be under Quality Control and Assurance procedures, to include an audit of the CEMS by means of a stack test, as outlined in the current Operation & Maintenance Plan. In addition to the stack test, TO-14 sampling and analysis will be performed at the inlet of the system to correlate future TO-14 data to this audit.

Upon completion of the aforementioned procedures, a high level of assurance will be demonstrated that the TOU is effectively destroying TRS at its current operational state.

Future Assurance

To continue assurance that the TOU is effectively destroying TRS is a two-fold operation and maintenance plan. ISRT will document that the influent composition is not significantly changing the TOU effectiveness. This will be accomplished by the quarterly collection and analysis of TO-14 samples in Silco Cans at the inlet of the system. The specifics of the Silco Can are described in Attachment A.

Secondly, as outlined in the US EPA CAM Rule, the critical parameters of the system will be monitored. The current TOU controller software is to be modified to monitor the critical parameter of temperature and flow rate for the system. Building upon the previous assumptions, as long as the system is operating correctly, to include the flare temperature and flow rate, the TOU is effectively destroying odors.

Finally, a manufacturer's representative will conduct an annual inspection of the system to verify the continued operation in accordance with the manufacturer's design. In the event that equipment is not operating in accordance with the manufacturer's design, the equipment will be taken off-line and corrective actions will be taken in a timely manner.

I have included a cost estimate for these proposed changes in Attachment E. Please feel free to contact me if you have any questions regarding this information, or would like to discuss this further.

Sincerely

John Fiore
Project Manager

ATTACHMENTS

ATTACHMENT A	D.J. GILE ASSESSMENT AND ALTERNATIVE MONITORING METHODS w/o Attachments B & C
ATTACHMENT B	CAM RULE FACT SHEET
ATTACHMENT C	40 CFR PART 64 - COMPLIANCE ASSURANCE MONITORING RULE
ATTACHMENT D	SUMMARY OF PROPOSED SCHEDULED MONITORING EVENTS
ATTACHMENT E	COST ESTIMATE

ATTACHMENT A

D. J. GILE ASSESSMENT AND ALTERNATE MONITORING METHODS

P.O. Box 706, Kennebunkport, Maine 04046
40 MacChipkay Road, Arundel, Maine 04046

Tel: 207-967-5286
Fax: 207-967-4107

May 22, 1998

Industri-Plex Site Remedial Trust
c/o Mr. John Fiore
Maverick Construction Management Services
603 Apple Brier Lane
Marlborough, MA 01752

Subject: Compliance Assessment of the ISRT TOU CEMS and Options for Alternative Monitoring Methods

Dear John:

At the request of the Industri-Plex Site Remedial Trust (ISRT), D J Gile, Inc. has completed a compliance assessment of the East Hide Pile thermal oxidizer unit (TOU) continuous emission monitoring system (CEMS). Along with this assessment, ISRT also requested that a research of alternative monitoring methods to the TOU CEMS be conducted in order to identify a more cost-effective solution to demonstrating emissions compliance.

With respect to the CEMS assessment, the objective was to review the existing program operational QA/QC procedures and identify portions of those procedures, if any, which fail to comply with existing regulatory guidance for CEMS. This was done by researching all existing regulations involving a CEMS of the type installed on the TOU program, as well as regulations directed at sources such as the TOU, and determining which parts apply, or may apply. Upon identifying those sections, the TOU CEMS program was then assessed for compliance based on those regulations.

The other co-objective to this assessment was to identify technically valid, cost-effective alternatives (monitoring/test methods) to the CEMS which would continue to demonstrate TOU emissions compliance and likely to be acceptable to both EPA and/or Mass DEP. This was accomplished by researching and evaluating both traditional and non-traditional methods of sampling stack gases containing total reduced sulfur (TRS) compounds. Non-traditional methods are defined as those that are not included as EPA source-specific test methods. Methods that were likely to be as costly as operating the existing CEMS were not considered. Methods that were not technically proven as being accurate for TRS sampling were also not considered.

Description of Current CEMS

The current TOU CEMS is the third system to be considered for continuous monitoring of TOU stack effluents. The first system, specified by the Trust's remedial contractor, was designed by Anarad. During the final stages of consideration, this system was identified to be technically inappropriate due to conflicts between the systems measurement method and the unique species of compounds likely to be emitted from the TOU stack. The second system, also specified by the remedial contractor, was designed and manufactured by Datatest. This system passed the technical evaluation stage and was installed by Datatest technicians several months ago. Unfortunately, the system proved unreliable and was disassembled following a series design problems and component failures caused, in part, by the extreme temperature environment inside the TOU stack. The existing system, manufactured by Thermo Environmental Instruments (TEI), was installed last fall. However, due to subsequent alterations to the TOU operational cycle, and the associated cyclical changes in stack chemistry (i.e., formation of condensation in the stack probe when the TOU was off), the system had to be modified and did not become fully operational until February of this year. One of the modifications also included an additional system to monitor inlet hide pile TRS compounds feeding into the TOU.

The existing CEMS, TEI Model 200, utilizes an *in situ* stack dilution probe such that extracted stack gas is diluted sufficiently enough to be measured by extremely accurate ambient gas analyzers. In order to reduce the capital costs of the CEMS, the effluent portion of the analytical system is comprised of components originally used in ISRT's now decommissioned ambient TRS monitoring program. The stack gas extraction system utilizes materials that are commercially available for the most extreme (hot) temperature environments, yet the TOU stack effluent exceeds those ratings. Therefore, the probe is offset slightly from the direct effluent stream to allow for sufficient cooling before stack gas is introduced into the system. Upon measurement by the analyzers, analog signal outputs are sent to a PC-based data acquisition system for data archiving. This PC-based system also serves as the TOU automation controller (DAS/Controller). For routine QA/QC checks, the CEMS allows for the manual introduction of multiple calibrations gases for zero and span calibration drift assessments. In order to maintain system stability the CEMS is operated continuously, even during periods when the TOU is off.

Given the uniqueness of the TOU, and the complex chemistry associated with the effluent, the current CEMS is technically the most appropriate of all commercially available CEMS for this application.

<u>Compliance Assessment of TOU CEMS</u>

With respect to compliance assessment, the CEMS in operation at the TOU building is not subject to specific air guidance since the TOU is not included as any of the sources targeted by existing air regulations. Also, the TOU is part of a Superfund remedial project. Therefore it is normally the decision of the project's regulatory authority (i.e., EPA and/or Mass DEP) to require, and approve, methods for the establishing compliance along with associated QA/QC procedures. In the case of the Industri-Plex, the site's 100% design plan simply states that a CEMS will be used to monitor effluents and incorporate an alarm system should TRS emissions exceed 30 parts per million. There is no mention of a formal monitoring plan as part of the 100 % design plan, and there was no CEMS type formally proposed for the TOU. Given this, and the fact that EPA and Mass DEP have approved the design plan as written, it would suggest that ISRT may install a CEMS of any type or configuration, as well as follow any QA/QC procedures it deems appropriate. However, this may not be the case.

All regulations with respect to a CEMS of the type installed at the TOU building are discussed in ***Title 40 of the Code of Federal Regulations, Subchapter C - Air Programs***. Specific CEMS regulations can be found in ***Part 60 - Standards of Performance for New Stationary Sources (NSPS), and Part 75 - Continuous Emissions Monitoring***. The regulations found in these sections are directed at new industrial sources (Part 60) and at sources which are applicable under the Acid Rain Program (Part 75) as a result of the 1990 Clean Air Act Amendments (CAAA). The guidance for both parts is very specific and detailed with respect to operational QA/QC requirements and is directed at any CEMS, regardless of the pollutant monitored. Even though the CEMS QA/QC procedures discussed in both Parts 60 & 75 are not directed specifically at the TOU CEMS - as a result of the TOU not being included as a source targeted in those parts - they are regulations directed at those similar to the TOU CEMS. Given this, it would not be unreasonable for the regulating agencies in charge of the Industri-Plex to require, or at least expect, that the TOU CEMS be operated within those guidelines. If individuals of EPA's air branch were to become involved with the TOU program they would very likely expect this. Therefore, the TOU CEMS should be assessed for compliance based on those regulations.

<u>**Parts 60 & 75 CEMS QA/QC Requirements**</u>

Since Parts 60 & 75 provide very detailed guidance depending on the specific source and pollutant(s) monitored, this assessment highlights the most basic areas of compliance required for any CEMS, i.e., performance specifications, calibration schedules, data validation, personnel involvement, etc. Those requirements are as follows:

Facility pre-installation requirements:

- Submittal to regulatory agencies, and subsequent approval, of a monitoring plan and CEMS method of monitoring (i.e., CEMS type). This plan is to include and detail all proposed CEMS operational QA/QC procedures, procedures for correcting CEMS "Out-of-Control" situations, routine maintenance procedures, data review QA/QC procedures, procedures for missing data, audit procedures, and data reporting protocol.

Following CEMS installation, the operating facility is to:

- conduct a relative accuracy (RA) performance specification test, and;

- conduct a seven-day calibration drift (CD) performance specification test.

After initial testing, the following routine QA/QC procedures are required:

- daily CEMS zero and span calibration drift checks using compressed calibration gases;

- quarterly relative accuracy test audit (RATA) using EPA source test methods *or*;

- quarterly cylinder gas audits (CGA) using EPA Protocol I gases;

- yearly RATA test using EPA source test methods.

The above QA/QC procedures do not include mandatory daily assessment of data and corrective action requirements should any of the QA/QC procedures reveal unsatisfactory results.

Compliance Assessment of TOU CEMS as Compared to Parts 60 & & 75

As the TOU CEMS program currently operates, none of the above requirements have been met, or to-date been completed. As part of the TOU CEMS program, there was no formal monitoring plan developed or submitted, though it is not known whether a plan was ever requested by either EPA and/or Mass DEP.

Since becoming fully operational, the TOU CEMS to-date has not completed any type of performance specification test, nor has the program instituted the daily zero and span calibration drift checks. It should be noted that originally, the TOU DAS/Controller was programmed to operate on an irregular schedule depending on the level of TRS entering the TOU. This prevented the programming of regular daily zero and span calibration drift checks as a result of inevitable computer software conflicts. Subsequently, the TOU was found to operate more efficiently based on a regularly cycled operating frequency (i.e., a set time of operation and a set time of inactivity), and as a result, now allows for the capability to program daily drift checks. As the program operates today, calibration drift checks are conducted on a monthly basis only.

With respect to quarterly audits, none has been completed to-date. Since the TOU CEMS has been in operation for less than one year, the annual RATA test requirement has not been exceeded.

Alternative Monitoring Methods to Demonstrate Emissions Compliance

Assuming the TOU CEMS is required to meet compliance, as specified in Parts 60 or 70, the program will require a significant, unavoidable increase in scope. More importantly, the program will be subject to a significant, unavoidable increase in operational costs. This is in addition to the cost to maintain the system as is. As a result, it is strongly recommended that an alternative(s) to the CEMS be studied in order to demonstrate the mandatory emission compliance as stated in the 100% design plan.

It is important to understand that the only reason a TOU CEMS program is required is that the Trust's 100% design plan proposed, and the regulatory agencies approved, that a CEMS would be used for compliance demonstration. Since the TOU is not a specific source that is defined in existing regulations, a CEMS is not a requirement, and it is therefore acceptable, and reasonable, to propose any technically valid approach for compliance demonstration. Therefore, it is also reasonable for the Trust to obtain approval for an alternative method for compliance demonstration.

CAM Rule

EPA has recently promulgated alternatives for affected sources in order to demonstrate air emissions compliance as a result of the CAAA Title V permit program. The sources which are affected by Title V were initially required to install costly monitoring systems (i.e., a CEMS) in order to demonstrate compliance with air regulations. However due to great public criticism of these requirements, EPA has adopted the Compliance Assurance Monitoring Rule, otherwise known as the "CAM" rule. This regulation allows affected facilities to demonstrate and establish compliance by monitoring and verifying critical process parameters for proper operation, thereby assuring regulatory agencies that they comply with established guidelines. In simple terms, if a source is operating properly, and critical operating parameters are monitored effectively, it is therefore assumed to be in compliance. Parameters monitored may include process feed rates, temperatures, fuel types, etc. These are parameters that are typically already monitored by a facility in order to maintain the efficiency of a process. Since a source is already monitoring these parameters, it removes the need to install other, more costly monitoring devices, such as a CEMS.

In the case of the TOU, critical operating parameters already monitored include temperature as well as several other system checks in order to operate efficiently and properly. The CAM rule also requires that if a process is not operating properly then corrective actions are to be implemented immediately. The TOU incorporates several system interlocks which shutdown the TOU in the event of process failure, thereby complying with that part of the rule. It is likely that a technically valid case can be made that if the TOU is operating properly it can be assured that it complies with the established 30 parts per million emission limit. Even though the TOU is not required to meet Title V regulations, the CAM rule is a compliance tool that is intended to help sources similar to the TOU. Therefore, it is recommended that this approach be proposed for the TOU.

Alternative Emissions Test

In order to prove that the CAM rule approach applies to the TOU, it may be necessary to conduct some type of non-continuous emissions test during TOU operation. There are two approved EPA stationary source-specific methods to measure sulfur compounds - methods 15 & 16. Method 15 was derived to determine hydrogen sulfide (H_2S), carbonyl sulfide, and carbon disulfide emissions from tail gas control units of sulfur recovery plants. Method 16 is used to determine H_2S, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide. These methods, by definition, incorporate several other EPA source-specific methods for measuring stack diameter, isokinetic flow, and particulates. They are also equipment and labor intensive, and as a result, are very expensive to complete. Therefore, these methods do not satisfy the objective of a cost-effective alternative.

Several other alternative methods were researched and evaluated, however the vast majority were found to be unacceptable as a result of either being too costly or technically inappropriate.

<u>Stack Emission Sampling Using Restek SilcoCan™ Canisters</u>

Due to the general instability of gaseous TRS compounds, EPA has in the past officially disapproved of many other test methods, such as grab-bag (Tedlar®) or Summa® passivated canister samples for source emissions testing. However, as a result of recent technological improvements with respect to the stabilization of TRS sample media, EPA and/or Mass DEP may now be willing to consider one of these non-traditional methods as an alternative.

A dramatic technological improvement to Summa® canisters is the **Silcosteel®-lined SilcoCan™** passivated stainless steel canister manufactured by Restek Corporation (Restek). Similar in design to Summa®, these new canisters are lined with fused silica (glass) and have shown extremely encouraging results with respect to the collection and stabilization of gaseous TRS compounds. The process of lining the canister with glass inhibits sulfur compounds from binding to the canister walls, as occurs with Summa® passivated canisters and/or untreated Tedlar® bags. The advantages to canister sampling is that samples are less likely to be lost in shipment due to rough handling, and that the necessary equipment required to extract a sample of stack gas is relatively small and inexpensive. The canisters are typically rushed via overnight carrier to a laboratory for immediate analysis.

Concerning a possible method protocol, samples would be taken after a pre-determined period of TOU operation, for example after fifteen minutes of flare activation. A sample of stack gas would also be collected for a pre-determined time period, such as a one hour integrated sample. The exposed canister would then be sent overnight carrier to a laboratory specializing in gaseous TRS analysis. This laboratory would also specialize in SilcoCan™ canister preparation. Samples would be collected from the same location as the current CEMS probe using a modified sample port. SilcoCan™ canisters can be exposed using either positive pressure or partial evacuation. Partially evacuated canisters are the least equipment intensive and easiest to use since the canister itself extracts the entire sample under vacuum. Positive pressure canisters allow for higher detection limits but require additional equipment, including a Teflon-lined pump, to extract the sample. Since the TOU emission limit of 30 PPM is well above the detection limit for partially evacuated canisters, these would be used for this method. A six-liter canister would provide more than a sufficient sample for analysis. QA/QC possibilities include a batch or trip blank, collocated sample, and a laboratory spiked trip sample.

With respect to emissions determination, data results should ideally be reported as a volumetric mean, i.e., parts per million or parts per billion. This eliminates the need to measure stack flow which would require the implementation of several costly EPA source-specific flow measurement methods. Volumetric data is also appropriate since the 100% design plan specifies a not to exceed emission limit in parts per million. In the case of the Industri-Plex TOU, a reasonable testing schedule would be to conduct sampling on a quarterly basis, i.e., four (4) times per year. A yearly test could be proposed but would be less likely to be approved. Another approach would be to sample quarterly, and if all results are satisfactory, reduce the schedule after one year to an annual test.

The most obvious advantage to canister sampling is the relatively low cost to extract and analyze the sample. Analyses of sulfur compounds using ASTM D-5504 is typically $300 per sample and includes canister preparation, shipment, and basic laboratory QA/QC documentation. Another is the relative ease in extracting the sample. This method would require no more than one day and two individuals, with minimal equipment, to complete the task. In actuality, one individual could complete the work, however for safety purposes (stack climbing), two individuals should be involved.

After extensive research and evaluating several alternatives, this method was found to best meet the two key criteria of an alternative that is cost-effective and technically valid. Therefore, this is the method we recommend as an alternative to the TOU CEMS. It is suggested that a final method protocol be generated after EPA and/or Mass DEP have given their initial approval to this method (i.e., canister sampling).

Contained in **Attachment A** is documentation from Restek describing the applicability of the SilcoCan™ for TRS sampling. This information is provided to support the technical validity of this method.

Also included in **Attachment B**, is a summary of the related experience of Air Toxics, Ltd. of Folsom, California. We recommend Air Toxics, Ltd because of their extensive program experience analyzing sulfur compounds as well as preparing and extracting SilcoCan™ samples. As noted in their summary, projects involving the use of the SilcoCan™ for sulfur analysis include government clients, as well as programs involving source testing.

CEMS Data

As a supplement to this assessment, **Attachment C** contains five-minute averaged TOU CEMS data from February 1 through May 14, 1998. This database reflects nearly four (4) months of TOU operation. The CEMS data is provided to document the low TRS levels emitted from the TOU stack. The data is divided into raw analyzer and dilution-multiplied values. It is the dilution-multiplied data that are the actual stack emissions and is reported in parts per million (column three). Data for both the effluent (columns three & four) and East Hide Pile inlet (columns five & six) systems are provided and are also reported in parts per million.

Even though the CEMS does not comply specifically with Parts 60 & 75 QA/QC requirements, the CEMS has nonetheless been checked for calibration drift on a monthly basis throughout the database period. The gases used to check for calibration drift includes those certified to EPA Protocol I standards as specified by Parts 60 & 75. During each monthly assessment, no calibration drift check result has exceeded 15% - the maximum allowable limit for Parts 60 & 75 CGA standards. Therefore, the data should be considered with a high degree of reliance.

As presented in the database, the stack effluent TRS emissions are extremely low at all times during TOU operation. In fact, all stack effluent TRS data values are well under 1 PPM during the entire period - well below the emission limit of 30 PPM. This strongly suggests that the TOU is in fact, well within compliance.

Conclusions

The following is a summary of the points discussed:

- The Trust's 100% Design Plan proposed, and the regulating agencies approved, the use of a CEMS as the method for demonstrating compliance with the established TOU stack effluent emission limit of 30 parts per million.

- The existing TOU CEMS program, as currently operated, is not likely to be considered in compliance with established guidance for CEMS operations.

- To bring the CEMS into compliance, including the necessary QA/QC effort, would require an extremely costly and labor intensive upgrade to the program.

- As a result of the cost to bring the CEMS into compliance, it is recommended to identify and propose alternative compliance monitoring methods which are cost-effective, technically valid, and acceptable to EPA and/or Mass DEP.

- The Title V CAM rule allows for affected sources to assure compliance by monitoring process systems for proper operation. If the process is operating properly then the source is assured to be in compliance. The TOU currently monitors critical operating parameters, such as temperature, therefore this rule can likely be applied to the TOU.

- In conjunction with the CAM rule, propose a quarterly test to prove that while the TOU is operating properly, it is in fact within compliance.

- Propose the use of glass-lined SilcoCan™ canisters for stack gas sampling, followed by next-day laboratory analysis, as the test method.

- Report test results as a volumetric mean in order to avoid costly EPA stack flow methods used in mass emissions calculations. Since the 100% Design Plan stack emission limit is volumetric, this approach is valid and most appropriate.

Based on the various points discussed in this assessment, it is likely that the TOU CEMS QA/QC procedures would be considered inadequate by regulatory personnel. Given the high cost to implement the necessary improvements, it would be beneficial for the Trust to propose alternatives to the TOU CEMS. The combination of assurance monitoring in conjunction with regularly scheduled canister sampling, is a reasonable, cost-effective, technically valid approach to demonstrating continued emissions compliance.

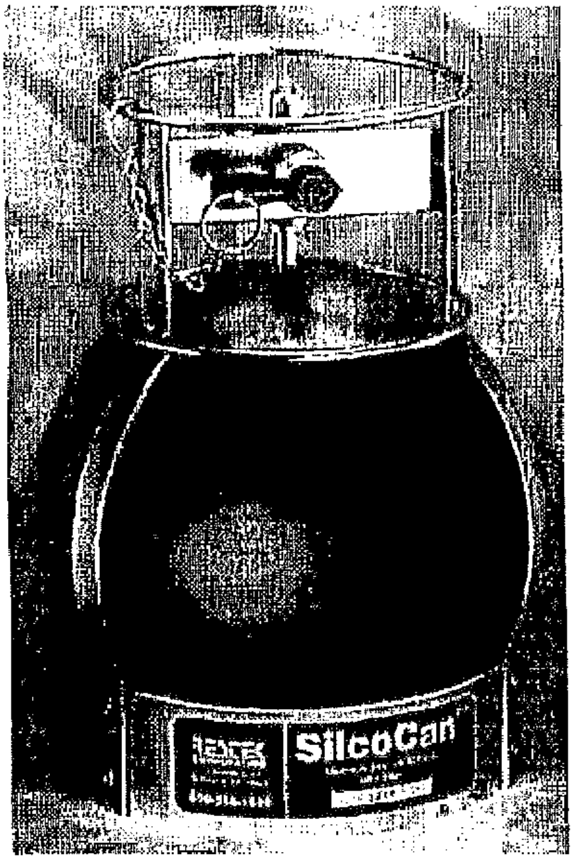
I truly hope this information addresses the Trust's needs. Please feel free to call me at (207) 967-5286, or e-mail me at *dewg@cybertours.com* should you have any questions or comments concerning this document.

Sincerely,

Dewey J Gile
President & Air Quality Meteorologist

Attachments

SilcoCan™ The Ideal Canister for Sulfur Compound Storage



Sulfur compounds are emitted from a variety of sources including petrochemical processes, land fills, and stack emissions. Because of their odor, these compounds are a nuisance. They frequently require air monitoring and analysis.

Figure 1: The Silcosteel® lining in the SilcoCan™ canister reduces adsorption of sulfur compounds.

Collection of air samples containing trace levels of sulfur compounds is difficult because they readily react with stainless steel sampling vessels such as Summa® Canisters. Because of this reactivity with stainless steel, Tedlar® bags have been used for collection of sulfur compounds. However, the stability of these compounds in Tedlar® bags is limited to 24-48 hours.

Restek's Silcosteel®-lined Silcocan™ canister is the ultimate solution for long term storage of air samples containing sulfur compounds. Silcosteel is a unique process that chemically bonds a layer of fused silica material to the stainless steel surface, reducing adsorption and breakdown of active compounds. The Silcocan air sampling canister has been shown to maintain the stability of trace level sulfur compounds up to seven days with little or no degradation.

A stability study of six common sulfur compounds was recently conducted by the Bay Area Air Quality Management District. These compounds were spiked at two concentration levels into Silcocan air sampling canisters and measured at time intervals of 1, 2, 3, 4, and 7 days. The results of this study are shown in Figures 2 and 3. The data clearly shows that even after seven days of storage in a Silcocan canister, over 90% of these six sulfur compounds were successfully recovered.

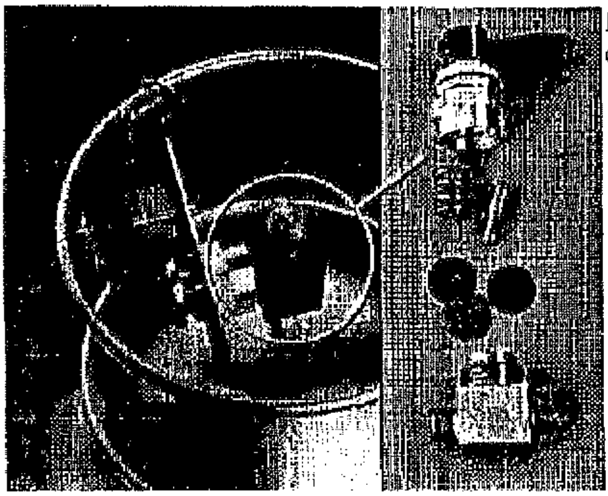


Figure 4: A Silcosteel®-treated diaphragm valve insures a completely inert sample pathway.

Since any stainless steel surfaces that come into contact with sulfur compounds will cause adsorption, a Silcocan canister with a Silcosteel-treated valve is recommended. Figure 4 shows a Silcosteel-treated diaphragm valve. All internal parts that come into contact with the sample have been Silcosteel-treated. Also, any portion of the sampling pathway, such as the flow controller or tubing, should also be Silcosteel-treated. For more information about Restek's Silcosteel process, please contact our Technical Service team or your local Restek representative.

Collection and storage of highly adsorptive sulfur compounds is no longer a problem with Restek's Silcocan canister. Silcosteel technology reduces the adsorptive characteristics of stainless steel. Even trace levels of sensitive sulfur compounds can be stored for up to seven days without significant loss using Restek's innovative technology.

Product Listing

SilcoCan™ Canisters with Silcosteel®-treated Valves

Sizes	Cat. #
1.0 Liter	24201-650
1.8 Liter	24202-650
3.0 Liter	24203-650
6.0 Liter	24200-650
15.0 Liter	24204-650

Silcosteel® Replacement Diaphragm Valve: cat.# 24221

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Figure 2: No significant loss of sulfur compounds when stored in a SilcoCan™ for up to 7 days.

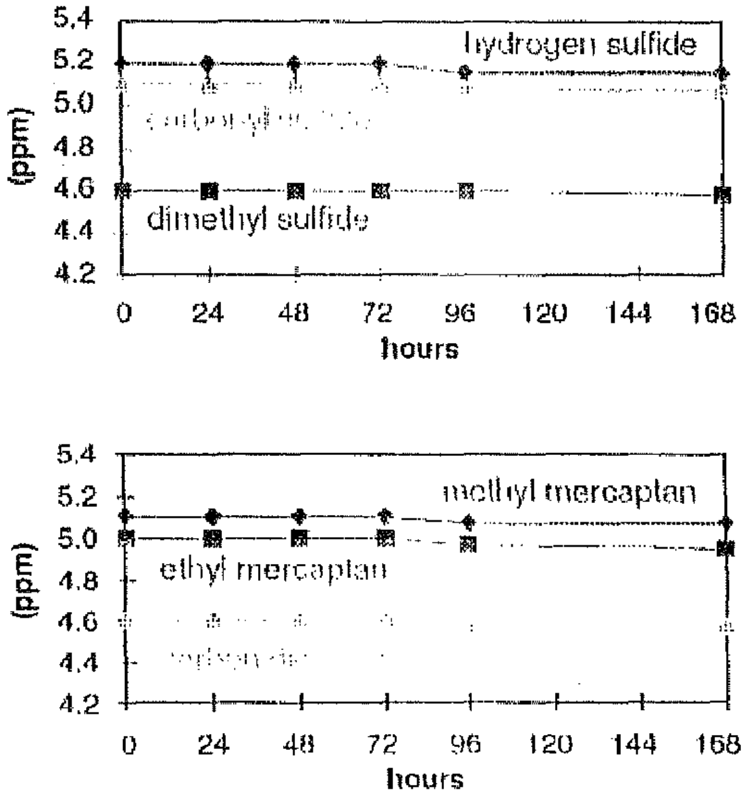
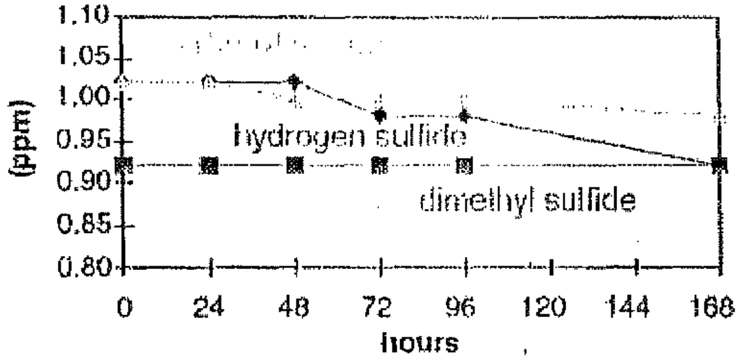
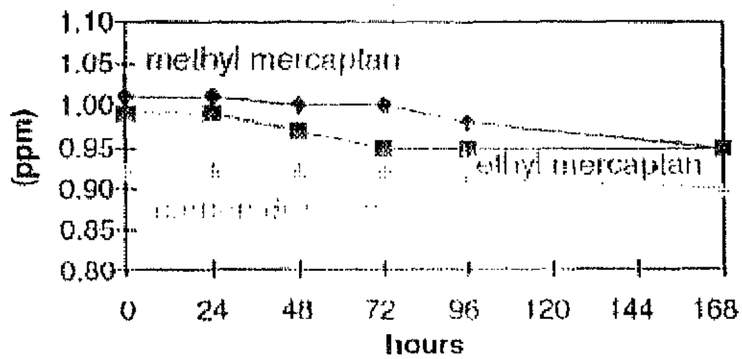


Figure 3: Even 1ppm of sulfur compounds is recovered from a SilcoCan™ canister after 7 days.





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NEW SilcoCan™ Canister with Pressure/Vacuum Gauge

- **Easily monitors pressure inside a SilcoCan™ canister.**
- **Accurately measures from 30" Hg to 60 psig**
- **Fully protected by the canister frame.**
- **Excellent inertness for polar or sulfur compounds.**
- **Leak-free 1/4-turn diaphragm valve.**
- **Five sizes available.**

No more guessing the pressure in your air sampling canister! We have equipped an additional port on the SilcoCan™ canister with a high-quality vacuum/pressure gauge to continuously indicate the pressure inside and to ensure sample integrity during transport. The gauge is positioned to easily read vacuum as low as 30" of Hg or pressures as high as 60 psig and is fully protected inside the canister frame.

SilcoCan™ canisters have many additional features that make them superior to other commercially available canisters. The inert fused silica lining prevents the sample from coming in contact with the metal surface on the inside of the canister, so even active polar or sulfur compounds can be stored without adsorption. The high quality 1/4-turn diaphragm valve eliminates leaks and is connected to the canister with a vacuum-tight Ultraseal® fitting that cannot be overtightened. The easy-to-read indicating plate quickly shows if the valve is open or closed. The rugged canister frame surrounds the canister, eliminating weld spots that can cause adsorption sites inside the canister. The new vacuum/pressure gauge makes this SilcoCan™ canister the ultimate in air collection equipment.

SilcoCan™ Canister with Vacuum/Pressure Guage:

Size	cat.#
1-liter:	24210
1.8-liter:	24211
3-liter:	24212
6-liter:	24213
15-liter:	24214

To order the SilcoCan™ canister with a Silcosteel® valve, include suffix # -650 with the catalog #.

SilcoCan™ Canisters for All Air Sampling Needs!

--*Updated in the Summer 96 Advantage!*

A complete line of SilcoCan™ canisters for air sampling is now available from Restek!

The small 1.0 and 1.8 liter canisters are perfect for grab samples and soil gases. The 3.2, 6.0 and 15.0 liter SilcoCan™ canisters are great for integrated ambient air samples. The 15.0 liter SilcoCan™ canister is an excellent size for making standards for analytical testing and easily allows for 24-hour sampling as well.

All sizes offer the same innovations as our 6.0 liter SilcoCan™ canisters:

Fused Silica Lining:

Each SilcoCan™ canister is lined with a layer of fused silica. This layer is chemically bonded to the interior surface using Restek's proprietary Silcosteel® process. This layer provides unsurpassed inertness for active compounds and will not crack from harsh handling in the field or during transport.

1/4 Turn Valve and Locking Pin

Restek has incorporated Parker's 1/4 turn diaphragm valve with an indicator plate to help analysts easily determine if the valve is open or closed. The locking pin prevents the valve from accidentally opening during transport.

Vacuum/Pressure Fittings

SilcoCan™ canisters are equipped with Parker's Ultraseal fittings that have metal o-rings which increase sealing ability and eliminate leakage. Also, these fittings cannot be overtightened.

Rugged Canister Frame

The unique frame design of the SilcoCan™ canister surrounds the sphere and holds it upright without requiring welding. It is stronger and more functional than a welded frame, eliminating areas where adsorption of active compounds can occur.

Shorter Cleaning Cycles

Each SilcoCan™ canister and valve can be heated to 250°C, allowing volatile organic compounds to be removed quickly while the valve is attached to the canister during the cleaning cycles.

SilcoCan™ Canisters:	
Size	cat.#
1-liter:	24201

1.8-liter:	24202
3.2-liter:	24203
6-liter:	24200
15-liter:	24204

To order the SilcoCan™ canister with a Silcosteel® valve, include suffix # -650 with the catalog #.

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ATTACHMENT B

CAM RULE FACT SHEET

10-3-97

FACT SHEET

COMPLIANCE ASSURANCE MONITORING

TODAY'S ACTION

Today, the Environmental Protection Agency (EPA) is issuing a regulation that will help facility owners conduct effective monitoring of their air pollution control equipment. If monitoring is conducted properly, facility owners will be able to assure state and local agencies, EPA, and the public that they comply with established emissions standards [hence the title Compliance Assurance Monitoring (CAM)]. Note that in earlier stages this action was known as the "enhanced monitoring" rule.

EPA establishes emissions standards to protect public health and the environment. It is therefore important that affected facilities comply with these standards.

The CAM rule requires owners and operators to monitor the operation and maintenance of their control equipment so that they can evaluate the performance of their control devices and report whether or not their facilities meet established emission standards.

If owners and operators of these facilities find that their control equipment is not working properly, the CAM rule requires them to take action to correct any malfunctions and to report such instances to the appropriate enforcement agency (i.e., State and local environmental agencies).

Additionally, the CAM rule provides some enforcement tools that will help State and local environmental agencies require facilities to respond appropriately to the monitoring results and improve pollution control operations.

BACKGROUND

The Clean Air Act includes provisions (Title V) that describe the requirements of permit programs, permit applications, as well as permit requirements and conditions. These provisions also address other aspects of the permits program such as compliance, enforcement, submission of applications, and approval of permits.

EPA requires facilities that emit pollution into the air to obtain a permit to operate. This permit (known as an "operating permit") contains information about how the facility will comply with established emissions standards and guidelines. Operating permits provide facility owners, State inspectors, and the public with specific information about the air pollution regulations that apply to each facility. The operating permits program will improve compliance with existing regulatory requirements and ensure that desired emission reductions actually occur and are maintained.

The Clean Air Act Amendments (Title VII) of 1990 also authorize EPA to develop regulations requiring facilities to monitor the performance of their emission control equipment. In September 1993, EPA proposed an "enhanced monitoring" rule that established general monitoring criteria that facilities should follow to demonstrate continuous compliance. Many state and local agencies, industry representatives and other stakeholders strongly criticized the proposed rule. They believed the proposed rule was overly prescriptive and would have imposed excessive burden on industry to install and operate continuous emission monitoring equipment and on State and local agencies in implementing their operating permit programs.

Since April 1995, EPA has held numerous meetings with major stakeholders to develop a new, more flexible approach to enhanced monitoring. Through this stakeholder process, EPA redrafted the enhanced monitoring rule and in September 1995, released a new draft rule that changed the focus to compliance assurance.

The extensive comments that EPA received on the draft CAM rule indicated the need for additional EPA analysis of the compliance assurance monitoring approach and other associated issues. Based on these comments, EPA revised the draft rule and issued a second draft for public comment on August 2, 1996, with a public comment period that ended October 15, 1996. Today, EPA is issuing the final version of the CAM rule.

WHAT ARE THE ENVIRONMENTAL BENEFITS OF THE CAM RULE?

Approximately 10 percent of processes at major industrial facilities that are subject to air pollution emission standards are fitted with air pollution control equipment. [It is important to note that not all processes or facilities require the use of control devices to meet establised emission standards. Some facilities achieve emission reductions through other techniques.] Approximately 60 percent of these facilities are covered by the CAM rule. Altogether, the control devices monitored under the CAM rule will control over 97 percent of the total emissions from all facilities utilizing air pollution control devices and receiving operating permits.

The CAM rule is designed to improve compliance with EPA's emission standards. It is important that facilities comply with these standards as they are designed to protect public health and the environment.

HOW DOES THE CAM RULE DIFFER FROM THE PROPOSED ENHANCED MONITORING RULE?

EPA's September 1993 proposed enhanced monitoring rule focused on direct compliance monitoring which in many cases might have required affected facilities to install expensive continuous emission monitoring systems (CEMS) or develop other monitoring directly correlated with emission values.

In contrast, the compliance assurance monitoring approach builds on regulatory monitoring approaches already in place at the facilities in question. Its purpose is to provide reasonable assurance that facilities comply with emission limitations by monitoring the operation and maintenance of their control devices with the same high level of attention that is given to the manufacturing or production portions of the facility.

The CAM rule defines minimum applicable monitoring, operation, and maintenance requirements to ensure that the equipment does not deteriorate to the point of failing to comply with emission limits. As a result of these minimum requirements, EPA believes that the CAM rule will improve compliance with the Clean Air Act; the rule will help facilities achieve emission reductions as well as decrease the need for additional regulations.

WHAT CHANGES HAS EPA MADE TO THE CAM RULE SINCE THE SEPTEMBER 1995 AND AUGUST 1996 DRAFTS?

EPA received extensive public comments from stakeholders on its initial draft of the compliance assurance monitoring rule issued in September 1995 and a second draft issued in August 1996. There were three principal areas of concern revealed by the comments: 1) who would be affected by the rule; 2) the requirements for the monitoring and the relationship to the operating permit; and 3) compliance certification requirements including use of data obtained from methods other than the specified test method.

EPA addressed these concerns in the August 2, 1996 draft, and has made them part of the final rule:

1) EPA greatly simplified the applicability of the rule. In order to focus the requirements of the CAM rule on preventing pollution control problems before they occur, EPA determined that the CAM rule would apply only to those units with control devices (active controls). Further, whether an emission unit is subject to the rule is defined by the level of emissions that would occur without the control device in place (i.e., pre-control emissions). This approach to defining which units must have monitoring will ensure that control devices, which must be operated at the highest efficiencies in order to comply with emission limitations, are properly monitored.

2) EPA streamlined the monitoring requirements so that only the important monitoring elements are included in the Title V operating permit. The operating permit will include the facility's approach to monitoring, the acceptable range of control device operation, and the basic data quality assurance criteria. The detailed day-to-day monitoring operations are left to the facility owner to maintain and are not part of the permit.

3) The compliance certifications will include the applicable compliance requirements, the methods/monitoring used to determine compliance status, the compliance status, and the identification of any possible exceptions to compliance based on the monitoring.

WHAT ARE THE MAIN COMPONENTS OF EPA'S CAM RULE?

The CAM rule establishes criteria that define what monitoring of existing control devices that the source owner or operator should conduct to provide reasonable assurance of compliance with emission limits and standards. This monitoring will help source the owner or operator certify compliance under the Title V operating permits program.

The CAM rule includes Title V compliance certification language that allows the source owner or operator to use compliance assurance monitoring data to establish their compliance status with permit terms or conditions. They can then use this information to certify that their facilities comply with air pollution control requirements, as required by the Clean Air Act.

For situations where continuous compliance monitoring is already specified in an operating permit, the rule exempts the owner or operator from additional CAM rule-related monitoring requirements and directs the owner or operator to use the continuous compliance monitoring data to fulfill the CAM rule monitoring and certification requirements.

For emission units with control equipment, the rule requires the owner or operator to develop and conduct monitoring. The monitoring will include an acceptable range with in which to operate the control device (known as an "indicator range"). Generally, facility owners will use results of performance tests in conjunction with equipment design or other information to determine the indicator ranges that (if the equipment is operated within those ranges) will provide a reasonable assurance of compliance with emission limitations.

Operating control devices within acceptable ranges, as they were designed to operate, will minimize emissions and provide reasonable assurance that the facility is complying with permit terms and conditions.

If control equipment is found to be operating outside acceptable ranges owners and operators will be required to take prompt corrective actions to make necessary adjustments to the control equipment as well as notify State and local authorities that potential compliance problems may exist.

If the control equipment is found to be operating outside the indicator range for long periods of time, the CAM rule provides optional tools for the State or local (or Federal if necessary) permitting authority to require more intensive evaluation and improvement of control practices.

WHO WILL BE AFFECTED BY THE CAM RULE?

The CAM rule applies to facilities that operate emission control devices in accordance with federally enforceable regulations (issued prior to 1990). These federal regulations are not limited to EPA regulations, instead they include any regulation that pertains to the Title V operating permit.

With the passage of the 1990 Clean Air Act Amendments, EPA incorporated "directly enforceable monitoring" into all emission regulations. In some cases, this monitoring is more stringent than the monitoring required under the CAM rule.

- Therefore, this rule does not apply to facilities that are subject to EPA regulations issued after 1990. However, it is possible that some portions of a facility operate control devices in order to comply with emission standards issued prior to 1990. In this case, these portions of the facility must comply with the requirements of the CAM rule.

HOW DOES THE CAM RULE AFFECT SMALL BUSINESS?

With few exceptions, the CAM rule does not include specific allowances to reduce the rule applicability for small businesses; however, the actual burden associated with the monitoring is relatively small. The EPA estimates that of the approximately 9000 facilities affected by the rule about 55 percent are small firms. Of those small firms, EPA estimates that less than 1 percent will experience a cost of more than 1 percent of annual revenues. None would experience costs of more than 3 percent of annual revenues.

WHAT ENFORCEMENT TOOLS IS EPA PROVIDING TO STATE AND LOCAL AGENCIES?

The operating permits program requires facility owners periodically (at least annually) to report on the compliance status for each requirement in the permit and note any periods of operation outside the established CAM indicator ranges. These compliance certification reports along with the monitoring results are valuable tools for the enforcement agency to use in identifying facilities with significant compliance problems and in deciding how to target limited enforcement resources.

To address persistent control device problems indicated by excessive periods of operation outside the established indicator ranges, the CAM rule allows State and local agencies to require the owner or operator to implement a quality improvement plan (QIP). A QIP is a comprehensive two-step evaluation and correction process that will require the facility owner to prepare a formal plan and schedule for correcting control device problems. Such activities may include significant repairs to or even replacement of control devices.

WHAT IS THE RELATIONSHIP BETWEEN CAM AND ENFORCEMENT RESULTING FROM THE CREDIBLE EVIDENCE RULE?

- Given that operating an air pollution control device outside the acceptable range will not necessarily indicate that the facility is out of compliance, the CAM rule cannot and does not replace a facility's obligation to comply with emission limits that otherwise apply. Nonetheless, EPA expects that a unit that is operating within appropriately established ranges as part of an approved CAM plan will, in fact, be in compliance with its applicable emission limits. For this reason, units operating within their CAM indicator ranges will be presumed to be in compliance and will not be targets for enforcement actions.

- For more information on the credible evidence rule see the February 24, 1997, Federal Register notice.

FOR FURTHER INFORMATION

- Interested parties can download the rule from EPA's web site on the Internet at the following address: (http://www.epa.gov/ttn/uatw/eparules.html). For further information about the rule, contact Mr. Peter Westlin of EPA's Office of Air Quality Planning and Standards at (919) 541-1058.

- EPA's Office of Air and Radiation's homepage on the Internet contains a wide range of information on the air toxics program, as well as many other air pollution programs and issues. The Office of Air and Radiation's home page address is: (http://www.epa.gov/oar/).

ATTACHMENT C

40 CFR PART 64
COMPLIANCE ASSURANCE MONITORING RULE

federal register

Wednesday
October 22, 1997

Part II

Environmental Protection Agency

40 CFR Part 64, et al.

Compliance Assurance Monitoring; Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 64, 70, and 71

[IL–64–2–5807; FRL–5908–6]

RIN 2060–AD18

Compliance Assurance Monitoring

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule; Final rule revisions.

SUMMARY: Pursuant to requirements concerning enhanced monitoring and compliance certification under the Clean Air Act (the Act), EPA is promulgating new regulations and revised regulations to implement compliance assurance monitoring (CAM) for major stationary sources of air pollution that are required to obtain operating permits under title V of the Act. Subject to certain exemptions, the new regulations require owners or operators of such sources to conduct monitoring that satisfies particular criteria established in the rule to provide a reasonable assurance of compliance with applicable requirements under the Act. Monitoring will focus on emissions units that rely on pollution control device equipment to achieve compliance with applicable standards. The regulations also provide procedures for coordinating these new requirements with EPA's operating permits program regulations. Revisions to the operating permits program regulations clarify the relationship between the 64 requirements and periodic monitoring and compliance certification requirements. The rulemaking is estimated to improve compliance with existing regulations which will potentially reduce the need for further regulation to achieve clean air goals at a cost significantly less than that of the 1993 proposed rule.

DATES: The effective date of this rule is November 21, 1997.

ADDRESSES: *Docket.* Supporting information used in developing the regulations is contained in Docket No. A–91–52. This docket is available for public inspection and copying between 8:00 a.m. and 5:30 p.m. Monday through Friday, excluding government holidays, and is located at: EPA Air Docket (LE-131), Room M–1500, Waterside Mall, 401 M Street SW, Washington, DC 20460. A reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: Peter Westlin, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, at (919) 541–1058.

SUPPLEMENTARY INFORMATION: The contents of the preamble are listed in the following outline:

The first section of this preamble provides an introduction to the principles underlying EPA's CAM approach, the benefits of the part 64 rulemaking, and background on the statutory provisions and key issues involved with developing the rule. This section also summarizes the public's participation in the development of the rulemaking. The second section of the preamble presents a more detailed summary of the regulations. This section includes a description of the provisions and the basic purpose of each provision. This section also describes the Agency's response to the comments received on the original proposal, as supplemented by additional comments during subsequent periods in which public input was requested and obtained. The preamble describes how the final rule has been changed from the proposal in response to the input received. The final section of the preamble addresses administrative requirements for Federal regulatory actions.

The preamble includes many citations which refer the reader to more detailed discussions of a topic or to the origin of certain requirements. These citation sections generally will not be followed by their source, such as "of this preamble" or "of the Act." Rather, the reader can recognize the origins of the sections by their nature: sections of the preamble begin with a Roman numeral; sections of the regulations in 40 CFR part 64 range from §§ 64.1 to 64.11; sections of the regulations in 40 CFR part 70 range from §§ 70.1 to 70.11; sections of other existing EPA regulations are preceded by 40 CFR; and sections of the Act are referenced by a three-digit number, such as 114 or 504.

This preamble often refers to "State" or "permitting authority." The reader should assume that where the preamble refers to a "State", such term also includes local air pollution agencies, Indian tribes, and territories of the United States to the extent they are or will be the permitting authority for their area, or have been or will be delegated permitting responsibilities under the Act. In addition, the term "permitting authority" would also include EPA to the extent EPA is the permitting authority of record.

Finally, this preamble often refers to 40 CFR part 70, the regulations promulgated July 21, 1992, implementing the operating permits program under title V of the Act (57 FR 32250). The EPA has proposed revisions to those regulations on August 29, 1994 (59 FR 44460), and August 31, 1995 (60 FR 45530). Those regulations, including the proposed revisions, provide requirements applicable to federally-approved, State-administered operating permits programs. Where a State fails to submit an approvable program or to adequately administer and enforce an approved program, EPA will have to promulgate, administer and enforce a Federal program for title V permits in that State. The reader should assume that where the preamble refers to 40 CFR part 70, such term may also refer to an EPA-administered (Federal) operating permits program, which EPA has promulgated under 40 CFR part 71 (see July 1, 1996, 61 FR 34202).

I. Background and Summary of the Rulemaking

A. Statutory Authority

The part 64 regulations respond to the statutory mandate in the Clean Air Act Amendments of 1990. The 1990 Amendments contain several provisions directing the Agency to require owners or operators to conduct monitoring and to make compliance certifications. These provisions are set forth in both title V (operating permits provisions) and title VII (enforcement provisions) of the 1990 Amendments.

Title V directs the Agency to implement monitoring and compliance certification requirements through the operating permits program. Section 503(b)(2) requires at least annual certifications of compliance with permit requirements and prompt reporting of deviations from permit requirements. Section 504(a) mandates that owners or operators submit to the permitting authority the results of any required monitoring at least every six months. This section also requires permits to include "such other conditions as are necessary to assure compliance with applicable requirements" of the Act. Section 504(b) of the Act also allows the Agency to prescribe, by rule, methods and procedures for determining compliance, and states that continuous emission monitoring systems need not be required if other methods or procedures provide sufficiently reliable and timely information for determining compliance. Under section 504(c), each operating permit must "set forth inspection, entry, monitoring, compliance certification, and reporting requirements to assure compliance with the permit terms and conditions."

Title VII of the 1990 Amendments added a new section 114(a)(3) that requires EPA to promulgate rules on enhanced monitoring and compliance certifications. This paragraph provides, in part:

The Administrator shall in the case of any person which is the owner or operator of a major stationary source, and may, in the case of any other person, require enhanced monitoring and submission of compliance certifications. Compliance certifications shall include (A) identification of the applicable requirement that is the basis of the certification, (B) the method used for determining the compliance status of the source, (C) the compliance status, (D) whether compliance is continuous or intermittent, (E) such other facts as the Administrator may require.

The 1990 Amendments also revised section 114(a)(1) of the Act to provide additional authority concerning monitoring, reporting, and recordkeeping requirements. As amended, that section provides the Administrator with the authority to require any owner or operator of a source:

On a one-time, periodic or continuous basis to—

(A) Establish and maintain such records;

(B) Make such reports;

(C) Install, use, and maintain such monitoring equipment;

(D) Sample such emissions (in accordance with such procedures or methods, at such locations, at such intervals, during such periods and in such manner as the Administrator shall prescribe);

(E) Keep records on control equipment parameters, production variables, or other indirect data when direct monitoring of emissions is impractical;

(F) Submit compliance certifications in accordance with section 114(a)(3); and

(G) Provide such other information as the Administrator may reasonably require.

B. Rulemaking History

The EPA has acted to implement the statutory provisions discussed above in two separate ways. First, the part 70 operating permits program includes basic monitoring and compliance certification requirements. Section 70.6(a)(3)(i) requires that permits include all existing monitoring and testing requirements set forth in applicable requirements. In many cases, the monitoring requirements in the underlying regulations will suffice for assessing compliance. However, if particular applicable requirements do not include periodic testing or monitoring, then § 70.6(a)(3)(i)(B) requires the permit to include "periodic monitoring" to fill that gap. Section 70.6(c)(5)(iii) requires the submittal of compliance certifications no less frequently than annually, and generally incorporates the language on compliance certifications included in section 114(a)(3) of the Act.

To implement the statutory requirement for enhanced monitoring, EPA has developed through this rulemaking a general monitoring rule in 40 CFR part 64 to be implemented through the part 70 operating permits program. The Agency first provided notice in the **Federal Register** of an opportunity for public review and comment on this concept in August 1991 (see 56 FR 37700). A public information document was made available, a public meeting was held, and written comments were received after the meeting. A subsequent public meeting was held in August 1993, and a proposed rule was published on October 22, 1993 (58 FR 54648). This proposed rule is referred to as the "1993 EM proposal" throughout the remainder of this preamble.

The Agency received approximately 2000 comment letters during the public comment period. These letters contained several thousand individual comments on more than 500 major and minor issue topics. Because of some of the complex and difficult issues raised, the Agency held a series of stakeholder meetings in the fall of 1994, released draft sections of a possible final rule, and then officially reopened the public comment period on specific issues on December 28, 1994 (59 FR 66844). An additional stakeholder meeting was held near the close of that reopened comment period, and more than 200 additional comment letters were received.

In April 1995, EPA decided to shift the emphasis of part 64. The Agency issued a press release in early April 1995 that indicated EPA's intent to hold a public meeting to discuss the potential changes to the proposed enhanced monitoring rule, and then contacted various stakeholder groups so that they would have the opportunity to participate. A formal notice of the meeting was also published in the **Federal Register** on May 26, 1995 (60 FR 27943). Approximately 200 people attended the meeting on May 31, 1995, and many additional people attended the follow-up meetings held in June 1995 in Washington, DC, Cincinnati, Austin, and Portland, Oregon. The Agency then drafted a preamble and rule for public discussion and comment, and held another public meeting in September 1995. (See 60 FR 48679, September 20, 1995, for the formal **Federal Register** notice of that meeting and request for comment.) Approximately 150 people attended that meeting, and EPA received more than 60 written comment letters on the draft rule package. The Agency subsequently issued a draft final part 64 and discussion document in August 1996 (see 61 FR 41991, August 13, 1996) and held another public meeting in September 1996. The 1995 and 1996 draft rules are referred to as the "1995 part 64 Draft" and "1996 part 64 Draft," respectively, throughout the remainder of this preamble. Approximately 200 people attended and 120 written comment letters were submitted during the comment period. The Agency also has held numerous informal stakeholder discussions with interested parties to discuss the CAM approach, and received additional written comments during the period since April 1995. (See the items in sections II–D, II–E, IV–D, IV–E, IV–F, VI–D, VI–E, and VI–F of Docket A–91–52 for a complete record of written comments submitted by stakeholders, and discussions between EPA and interested parties concerning the rulemaking.)

This preamble addresses the changes to part 64 that have been made in response to the significant public comment received during the course of the rulemaking. The focus is on documenting the changes made in response to the comments received on the formal 1993 proposed rule, as well as specific changes made in response to comments received on the draft rule materials made available in 1995 and 1996. The Agency has also prepared a detailed, three-part Response to Comments Document which includes a response to all material comments on the rule. See Docket Items A–91–52–VII–C–1 through VII–C–3.

C. Overview of the CAM Approach

1. General Approach

The CAM approach as defined in part 64 is intended to address the requirement in title VII of the 1990 Amendments that EPA promulgate enhanced monitoring and compliance certification requirements for major sources, and the related requirement in title V that operating permits include monitoring, compliance certification, reporting and recordkeeping provisions to assure compliance. The EPA has long recognized that obtaining ongoing compliance is a two-step process. First, the Agency must determine whether properly designed control measures—including, as applicable, control devices, process modifications, operating limitations or other control measures—are installed or otherwise employed, and that those control measures are proven to be capable of achieving applicable requirements. In the past, this step has been addressed through new source review permitting, initial stack testing, compliance inspections and similar mechanisms. The title V permit application and review process, including the applicant's initial compliance certification and compliance plan obligations, will add another tool for assuring that source owners or operators have adopted the proper control measures for achieving compliance. The second step is to monitor to determine that the source continues to meet applicable requirements. An important aspect of this second step is to assure that the control measures, once installed or otherwise employed, are properly operated and maintained so that they do not deteriorate to the point where the owner or operator fails to remain in compliance with applicable requirements. The Agency believes that monitoring, reporting, recordkeeping and ongoing or recurring compliance certification requirements under title VII should be designed so that owners or operators carry out this second step in assuring ongoing compliance.

There are two basic approaches to assuring that control measures taken by the owner or operator to achieve compliance are properly operated and maintained so that the owner or operator continues to achieve compliance with applicable requirements. One method is to establish monitoring as a method for directly determining continuous compliance with applicable requirements. The Agency has adopted this approach in some rulemakings and, as discussed below, is committed to following this approach whenever appropriate in future rulemakings. Another approach is to establish monitoring for the purpose of: (1) Documenting continued operation of the control measures within ranges of specified indicators of performance (such as emissions, control device parameters and process parameters) that are designed to provide a reasonable assurance of compliance with applicable requirements; (2) indicating any excursions from these ranges; and (3) responding to the data so that excursions are corrected. The part 64 published today adopts this second approach as an appropriate approach to enhancing monitoring in the context of title V permitting for significant emission units that use control devices to achieve compliance with emission limits. For units not covered by part 64, a similar but less detailed approach is provided for in the monitoring and related recordkeeping and reporting provisions of part 70 (see § 70.6(a)(3)).

The rule defines "control devices" to mean equipment that removes pollutants or transforms pollutants to passive emissions (see § 64.1), as opposed to other control measures, such as process modifications, material substitution, and other control options. For significant units that use control devices to achieve compliance, the owner or operator will have to develop and propose, through the part 70 permit process, monitoring that meets specified criteria for selecting appropriate indicators of control performance, establishing ranges for those indicators, and for responding to any excursions from those ranges. The final rule also includes performance and operating criteria that must be achieved, as well as documentation requirements for the monitoring proposed by the owner or operator.

The final element of part 64 is the concept of a quality improvement plan (QIP). Under the final rule, a QIP may be required where the owner or operator has failed to satisfy the general duty to properly operate and maintain an emissions unit (including the applicable control device) or the owner or operator has evidence of a failure to comply with an applicable requirement, as determined through part 64 monitoring data and/or other appropriate information (such as inspections). The rule allows for the permit to establish a "bright line" test for implementing a QIP, but does not require such a test.

The QIP would include both an initial "problem investigation" phase and a "corrective action" phase. The rule provides for the QIP mechanism so that permitting authorities have a specific regulatory tool to address situations in which an owner or operator operates in a manner that involves excursions followed by ineffective actions to bring the monitored indicators back into the acceptable ranges established in the permit. Thus, the QIP will help assure that the owner or operator pays attention to the data and, if necessary, improves performance to the point where ongoing compliance with applicable requirements is reasonably assured. See Section II.H. for further discussion of QIP issues.

2. Implementation through Permits

a. *Burdens to the Permitting Process.* Many commenters, including State and local agencies, industry, and environmental groups raised concerns in their comments that the part 64 process of selecting the appropriate monitoring for a particular source would overburden the permitting process and lead to poor implementation. The Agency is very sensitive to these concerns; however, the Agency continues to believe that, consistent with the preamble to the 1993 EM proposal, the permit implementation approach provides the greatest amount of flexibility to the regulated community and States while at the same time ensuring that enhanced monitoring will be implemented for all major sources in a reasonably expeditious time frame. In addition, the Agency has taken several significant steps in the final rule to reduce the potential burden to the permitting process, including the actions discussed below.

i. *Applicability.* The focus of applicability on those pollutant-specific emissions units that rely on control devices to achieve compliance has reduced the estimated number of units that will be subject to part 64 and also has reduced the variety of emissions unit types that will be affected by part 64. This reduction in the volume and breadth of units covered by part 64 will reduce the overall burdens on the permit process.

ii. *Extended Implementation Period.* As discussed in Section II.E., the final rule provides for a new extended implementation schedule. Only those units which are major units based on their potential to emit will be subject to part 64 requirements prior to the renewal of an initial part 64 permit. In addition, in many cases, implementation will not be required for these large units until permit renewal. For the smaller units covered by part 64, implementation will not occur until permit renewal. This extended implementation schedule will relieve much of the burden on source owners or operators to develop and prepare proposed monitoring during the initial part 70 permitting process and will similarly relieve the burdens of the approval process on permitting authorities.

iii. *Guidance Development Process.* The Agency is committed to developing non-prescriptive examples of the types of monitoring that can be used to satisfy part 64 for various types of control devices and emissions units. The guidance development process will provide an opportunity for source owners or operators and other interested parties to submit suggestions, review drafts and generally clarify the part 64 requirements. The Agency emphasizes that the development of example monitoring approaches is intended to assist both regulated industry and permitting authorities to streamline permit review in those instances where a source owner or operator proposes monitoring based on one of the examples. These examples should not be considered as an implied limitation on the owner or operator's ability to propose a different approach that the owner or operator can demonstrate satisfies the part 64 requirements or on the permitting authority's authority to require additional monitoring.

iv. *General Clarifications.* Finally, the potential implementation burdens have been reduced by adopting many general clarifications in the final rule. For instance, the final rule clearly states that emissions units that are not subject to applicable requirements are not required to conduct part 64 monitoring. A second example is the streamlined performance and operating design criteria in the final rule, which are substantially less complex and burdensome than the comparable requirements in the appendices to the 1993 EM proposal.

b. *Creation of New Substantive Standards.* Many commenters argued that the requirements in part 64 were inconsistent with EPA's stated position that the part 70 operating permits program was intended solely to collect existing requirements in one document, without creating new substantive obligations for source owners or operators. The Agency disagrees with these arguments. As mentioned in section I.A., the part 64 regulations respond to the statutory mandate in the Clean Air Act Amendments of 1990 and the part 70 regulations implement title V of the Clean Air Act Amendments of 1990, which directs the Agency to implement monitoring and compliance certification requirements through the operating permits program. The part 64 requirements are independently applicable, substantive requirements that an owner or operator must achieve. The fundamental requirements of part 64 are to: (a) Monitor compliance in a manner that is sufficient to yield data that provide a reasonable assurance of compliance and allow an owner or operator to make an informed certification of compliance; (b) take necessary corrective actions in response to the monitoring data; (c) report on the results of such monitoring; and (d) maintain records of such monitoring. None of these fundamental obligations under part 64 will be added as part of a part 70 permit independently of part 64. What will be added as part of the permit process are the particulars as to how a specific source owner or operator will satisfy these general part 64 requirements. This type of regulatory structure is entirely consistent with the purpose of a permit process which is to specify how general obligations will be achieved in particular circumstances.

c. *Consistency of Implementation.* Implementation of part 64 through the part 70 permits program means that part 64 will be implemented on a case-by-case basis. Many industry and State and local agencies supported EPA's proposal to allow for a flexible implementation approach that allows for adopting monitoring that is most appropriate to a particular emission unit's circumstances. However, many industry, environmental and State and local agency commenters also raised concerns that the case-by-case implementation process in part 64 may not be implemented in a reasonably consistent manner by different permitting authorities.

The EPA acknowledges the potential significance of these concerns; however, EPA believes that they have been overstated by the commenters. As discussed in Section II. below, EPA has taken steps to minimize potential inconsistencies by simplifying and clarifying the final rule. Also, EPA must weigh these concerns against the significant policy concerns that would exist if the Agency attempted to develop specific enhanced monitoring requirements for each NSPS and NESHAP standard, as well as the burdens on States to revisit each SIP regulation, as well as individual State preconstruction and operating permits. The administrative burdens associated with that approach would severely hinder the effective and timely implementation of enhanced monitoring for most sources for many years. In addition, such an approach fails to acknowledge the new benefits of the operating permits program to tailor general requirements in a manner that is most appropriate to the circumstances at a particular source. For these reasons, EPA believes that the benefits of the permit implementation approach far outweigh the concerns over consistency in implementation.

d. *Programmatic Options.* Some stakeholders have suggested alternative means of implementing part 64 requirements. One alternative suggested was to allow a State the option of implementing part 64 monitoring requirements through programmatic rule changes instead of implementing CAM through source-specific part 64 requirements. One potential method for allowing this option is to exempt from part 64 monitoring any emissions units for which a State has developed requirements specifically designed to satisfy part 64 in a rule that has been submitted and approved as part of the SIP. Another would be to delay implementation of part 64 to provide an opportunity for a State to devise a competitive monitoring program for submittal to and approval by EPA.

The final rule will allow states to implement CAM through rulemaking pertaining to categories of sources. The EPA encourages States to consider adding monitoring requirements to existing and new rules that are consistent with part 64 requirements. In this manner, the burdens associated with source-specific monitoring development could be reduced. To provide an incentive for this type of rule, the final rule includes a provision (see § 64.4(b)) that allows the owner or operator to rely upon this type of programmatic rule as the primary documentation of the appropriateness of its monitoring. This approach would reduce the number of case-by-case reviews necessary to implement part 64.

On the other hand, EPA does not agree with commenters who suggest that states that choose to use programmatic rulemaking should be allowed to apply different criteria in determining monitoring and to have additional time to implement such an approach. The EPA believes monitoring decisions should be made on the same basis whether done on a programmatic or case-by-case basis. Second, EPA questions both the need for a substantial delay for programmatic rulemaking and whether the purported advantages of a programmatic approach justify any substantial delay. The final part 64 does not include an option for permitting authorities to delay implementation of part 64 through use of a programmatic approach.

Because of the implementation schedule for part 64 (see Section II.E.), owners or operators will not have to implement part 64 for many emissions units until renewal of initial part 70 permits. These include both large units that are at sources which have already received or are in the process of receiving part 70 permits, and smaller units for which the rule explicitly delays implementation until permit renewal. This schedule provides substantial time for States to adopt SIP regulations, as discussed above, that are consistent with part 64, especially for smaller units that could most benefit from generic monitoring requirements that could be developed through programmatic SIP rule changes.

3. Limited Purpose of Part 64

Part 64 is intended to provide a reasonable means of supplementing existing regulatory provisions that are not consistent with the statutory requirements of titles V and VII of the 1990 Amendments to the Act. The EPA believes that the CAM approach is a reasonable approach commensurate with this role. The Agency does not believe that existing monitoring requirements that are more rigorous than part 64 should be reduced or that monitoring imposed in future regulatory actions necessarily should be guided by part 64.

If existing requirements are more rigorous than part 64, those requirements should continue to exist unaffected by part 64. This point is made explicitly in several instances in the final rule. In addition, EPA is committed to developing new emission standards subsequent to the 1990 Amendments with methods specified for directly determining continuous compliance whenever possible, taking into account technical and economic feasibility, and other pertinent factors. In recognition of this EPA commitment, the rule exempts New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP) rules that are proposed after the 1990 Amendments to the Act from part 64 requirements. The Agency believes that States should approach their regulatory actions from the same perspective and thus the Agency does not believe that part 64 will have a significant impact on requirements imposed subsequent to the 1990 Amendments.

Comments on the 1996 part 64 Draft received from environmental, public health and labor organizations emphasized the public's right to information about air pollution from major stationary sources. These commenters argued that the CAM approach provides insufficient information about actual emissions and thus will frustrate the public's right to know about actual emissions from a source. Their comments also asserted that source owners should not be allowed to use information gathered under the CAM approach, including information on pollution control operations and practices, to certify compliance with applicable standards.

The Agency responded to those comments (see letter from Mary Nichols to various environmental and other organizations dated December 19, 1996, docket item A-91-52-VI-C-18) and summarizes its response here. The Agency agrees with incorporating direct emissions and compliance monitoring where the technology is available and feasible, and promoting public disclosure of air pollution emissions information. On the other hand, the Agency does not believe that such a broad, expensive, and technically complex objective can be accomplished through a single rulemaking at this time. Not only would trying to impose such monitoring requirements across the board in the short term be technically unrealistic, doing so would put in jeopardy the possibility of advancing monitoring of existing emissions sources through part 70 operating permits program already in progress.

The Agency notes that current requirements for submission of emission statements prepared by owners of industrial air pollution sources continues independent of part 64 (such as statements required under section 182(a)(3) of the Act) and such statements will be based on the most currently available information, including new monitoring data produced under part 64.

As described above, the Agency firmly believes that continued proper operation and maintenance of process operations and air pollution controls demonstrated capable of achieving applicable standards is vital to ongoing compliance. By providing the necessary data and requiring appropriate corrective action, part 64 will result in owners and operators being more conscientious in the attention paid to the operation and maintenance of air pollution control equipment and practices than has been the case in the past. This approach has proven effective in reducing air pollution emissions and improving compliance performance in the implementation of many existing regulations with similar requirements. See further discussion on the use of part 64 data for purposes of part 70 compliance certifications in Section I.C.5., below.

4. Relationship to Part 70 Monitoring

Part 70 currently requires all title V operating permits to include monitoring to assure compliance with the permit. This includes all existing monitoring requirements as well as additional monitoring (generally referred to as "periodic monitoring") if current requirements fail to specify appropriate monitoring. As noted in the 1993 EM proposal, because part 64 contains applicable monitoring requirements sufficient to demonstrate compliance with applicable emission limitations or standards, the part 70 periodic monitoring requirements will not apply to the emissions units and applicable requirements covered by part 64. This conclusion is equally applicable under the final part 64 rule. However, during the course of the rulemaking, two other issues have been raised that concern the relationship of the final part 64 rule to the existing part 70 periodic monitoring requirements: (1) The extent to which periodic monitoring should be relied on as "enhanced monitoring" and (2) timing concerns where periodic monitoring may be required prior to implementation of part 64.

With respect to relying on part 70 periodic monitoring as "enhanced monitoring" for at least some units, EPA suggested this option in both the 1993 EM proposal and the December 1994 notice reopening the comment period on that proposal (see 58 FR 54648, 54653 and 59 FR 66844, 66849). Industry commenters generally supported this option; although, many suggested that EPA rely completely on periodic monitoring as "enhanced monitoring." Some environmental groups, however, argued against this option. They asserted further that EPA's part 64 applicability provisions would not meet the statutory requirement that all major stationary sources conduct enhanced monitoring. The EPA considered including in part 64 requirements analogous to the existing part 70 provisions (see subpart C of part 64 in the 1996 part 64 Draft). This approach would clearly indicate EPA's position that the part 70 monitoring requirements including periodic monitoring if necessary, constitute the appropriate "enhanced monitoring" for units not covered by part 64. However, in the final rule, EPA has determined to rely on the position originally discussed in the 1993 EM proposal that existing monitoring when supplemented as necessary by periodic monitoring is sufficiently enhanced for emissions units not subject to part 64. The Agency decided not to pursue the Subpart C option included in the 1996 part 64 Draft based on the comments received (see Section II.B., below) and also because of concerns about disrupting the ongoing implementation of part 70.

Because of the delays in finalizing part 64 and the delayed implementation schedule included in the final rule (see Section II.E., below), many part 70 permits will address periodic monitoring issues prior to implementation of part 64. To address concerns about the potential duplication and disruption that this situation could cause, EPA has taken certain steps. First, the "Subpart C" option has been rejected and the existing part 70 monitoring, including periodic monitoring, requirements will continue to apply. Because the majority of emissions units do not use control devices, this decision will result in part 64 creating no duplication or disruption for the majority of emissions units. As discussed in the Regulatory Impact Analysis (RIA) for this rulemaking, EPA estimates that the final part 64 rule will affect less than 27,000 emissions units, while an additional 54,000 units that could have been affected by subpart C will remain affected by part 70 monitoring requirements.

Second, for units with control devices, EPA has adopted a phased implementation schedule under which part 64 will apply only to the largest units prior to the first renewal of a part 70 permit. To the extent part 64 and periodic monitoring may have some overlap for these largest units, any overlap should be minimal because these units are most likely to have existing monitoring that would make the periodic monitoring provisions in part 70 unnecessary. For the smaller units that will not be required to implement part 64 until part 70 permit renewal, the periodic monitoring provisions of part 70 may apply. While there may be some concern that this will result in installation of monitoring that could later be found inappropriate for part 64, EPA does not believe this would generally be the case. In many instances, such periodic monitoring would likely serve as the basis, in whole or in part, for compliance with part 64. For instance, a source owner or operator may conduct intermittent monitoring of visible emissions or certain parameters to satisfy part 70 periodic monitoring. To the extent successful, the experience with that monitoring could be used to justify its use under part 64. At the least, the experience gained under periodic monitoring could be used to develop data to support proposed part 64 monitoring at permit renewal. Such data could be used, for example, to justify appropriate indicator ranges, quality assurance procedures, monitoring frequency and similar part 64 requirements. Just as importantly, the continued presence of part 70 monitoring requirements during the initial permit term is essential to provide the minimum level of assurance that a source remains in compliance with a part 70 permit as required under title V of the Act. Thus, EPA rejects the position suggested by some commenters that it should immediately suspend the part 70 periodic monitoring requirements pending implementation of part 64.

5. Relationship to part 70 Compliance Certifications

In developing an implementation approach in the 1993 EM proposal, EPA indicated that owners or operators must rely on methods for determining continuous compliance to submit a certification of whether compliance is continuous or intermittent. Many industry representatives and State and local agencies objected to the burdens associated with the 1993 proposal. A large part of those burdens would have occurred as a result of having to develop monitoring that could produce data of sufficient reliability to make determinations of continuous compliance with a degree of representativeness, accuracy, precision, and reliability equivalent to that provided by conducting the test method established for a particular requirement. In response to those concerns, the Agency opted to pursue the CAM approach which provides a reasonable assurance of compliance through monitoring of control operations. The EPA believes that the CAM approach does enhance existing monitoring requirements and provides sufficient information for an owner or operator to reach a conclusion about the compliance status of the owner or operator's source that is adequate to satisfy the compliance certification obligations in the Act. Such monitoring also provides data sufficient for EPA, permitting authorities, and the public to evaluate a source's compliance and to take appropriate action where potential compliance problems are discovered.

The part 64 rulemaking also clarifies the Agency's interpretation of the phrase "continuous or intermittent" as used in section 114(a)(3) of the Act. The 1993 EM proposal interpreted the requirement that source owners or operators certify "whether compliance is continuous or intermittent" to require monitoring sufficient to determine if compliance was continuous. (58 FR 54654, 54658) Thus the term "continuous" was read as meaning that compliance was achieved during all averaging periods for a standard and "intermittent" was read generally as meaning that one or more deviations occurred during the certification period. (58 FR 54665). This proposed interpretation was consistent with the Agency's position in the preamble to proposed part 70 as well (see 56 FR 21737, May 10, 1991 ("The compliance certification must document * * * whether compliance was continuous or intermittent (i.e., whether there were periods of noncompliance).").

The Agency reconsidered this interpretation in reopening the public comment period on the 1993 EM proposal and noted that "intermittent" could mean either that noncompliance had occurred or that the owner or operator has data sufficient to certify compliance only on an intermittent basis. (See 59 FR 66848, col. 2 ("nothing in section 114(a)(3) dictates that all source owners or operators must certify to being in either continuous compliance or else be considered in noncompliance; source owners or operators may also certify to being in compliance as demonstrated on an intermittent basis.")). The EPA believes that the statutory interpretation discussed in the preamble to the 1993 EM proposal and this alternative interpretation are both reasonable, and that EPA has discretion to clarify the meaning of this statutory provision given the ambiguity in the legislation. As outlined below, today's rulemaking (see the revisions to §70.6(c)(5)) is derived from the interpretation contained in the December 1994 notice reopening the comment period on the 1993 EM proposal.

6. Consistency with Regulatory Reinvention Efforts

The approach in this rule lays out broad principles and performance criteria for appropriate monitoring, but does not mandate the use of a particular technology. The proposal is intended to reflect the principles articulated in President Clinton's and Vice President Gore's March 16, 1995 report, "Reinventing Environmental Regulation." That report established as goals for environmental regulation building partnerships between EPA and State and local agencies, minimizing costs, providing flexibility in implementing programs, tailoring solutions to the problem, and shifting responsibilities to State and local agencies. The Agency believes that part 64 meets the goals of the report.

This approach also is consistent with President Clinton's regulatory reform initiatives and EPA's Common Sense Initiative in that it focuses on steps to prevent pollution rather than to impose unnecessary command and control regulations on regulated sources. The approach is based on the assumption that pollution control is an integral part of doing business and that owners or operators should pay attention to their pollution control operations with the same care they do their product operations. The CAM approach emphasizes the role of the owner or operator in developing a plan to achieve this goal for specific circumstances.

D. Benefits of a CAM Approach and Potential Control Costs

The EPA believes that monitoring under part 64 can in some situations, reduce operating costs. For example, monitoring data can be used to increase combustion efficiency in an industrial boiler or to increase capture and reuse of solvents at a coating plant. A 1990 study by the General Accounting Office entitled "Air Pollution: Improvements Needed in Detecting and Preventing Violations" (see docket item A-91-52-VI-I-12) noted several instances in which companies have achieved such operating cost reductions. The CAM approach also alerts owners or operators that potential control device problems may exist. The owner or operator can use this information to target control devices for routine maintenance and repair, and reduce the potential for costly breakdowns. While benefits may occur to some facilities as the result of better awareness of equipment operation, changes in equipment operation are not required by part 64.

Part 64 does not itself have emissions reductions benefits, EPA does expect, however, that some sources may have to reduce emissions in order to comply with their underlying emissions standards in response to monitoring under part 64. EPA expects that some emissions reductions may result from sources having to reduce emissions overall, and/or to respond to periods of excess emissions more quickly, thus reducing their frequency and duration. EPA has not estimated the emissions reductions that may result from this; EPA believes these reductions and any associated health and welfare benefits are not attributable to part 64—but to the underlying emissions standards.

The Agency believes that there is adequate evidence that monitoring control performance will assure continuing compliance with applicable requirements. Studies conducted by the Agency have shown that control device operation and maintenance problems are a significant factor in creating excess emissions (see docket items II-A-22 and VI-A-2). In addition, these studies have documented that assumptions about compliance status are often inaccurate when detailed inspections of control devices are conducted (see, for example, docket item VI-A-2). Moreover, information included in the Regulatory Impact Analyses (RIA) documents that, based on data sheets compiled for all major sources by State agency inspectors in fifteen States, approximately 20 percent of all major sources have significant compliance problems and there is a significant corollary between the adequacy of a source's operation and maintenance procedures and compliance risk.

There will be real costs associated with measures sources may take to reduce emissions in order to comply with their underlying emissions standards in response to monitoring under part 64. Costs as well as emissions reductions benefits will result from sources having to reduce emissions overall, and/or to respond to periods of excess emissions more quickly, thus reducing their frequency and duration. Such costs would be due to increase expenditures for operation and maintenance and capital equipment. The EPA has not estimated the cost associated with emissions reductions that may result; EPA believes such costs are not attributable to part 64—but to the underlying emissions standard.

E. The Relationship of Part 64 to Credible Evidence and Enforcement Issues

1. General CAM Enforcement Policy

As a general matter, the Agency expects that source owners or operators will be in compliance with all applicable emission requirements if they conform to the requirements of part 64. Further, the Agency expects that there will be relatively limited information available to override the information provided by the owner or operator on an emissions unit's compliance status beyond that provided through monitoring that satisfies part 64 or part 70. However, neither these expectations nor complete compliance with part 64 will prohibit the Agency from undertaking enforcement investigations when appropriate under the circumstances, such as when information indicates there are conditions that may threaten or result in harm to public health or the environment, indicates a pattern of noncompliance, indicates serious misconduct, or presents other circumstances warranting enforcement.

2. The Credible Evidence Revisions to 40 CFR parts 51, 52, 60, and 61 ("The CE Revisions")

See the CE Revisions as published in the **Federal Register** on February 24, 1997 (62 FR 8314) for discussion of that rulemaking history. During the many public comment periods for the CE Revisions and the CAM proposal, the Agency received numerous comments stating that the two rules are inextricably connected, impact each other, and should be proposed together in order for meaningful public comment from interested stakeholders. The Agency reviewed these comments but decided to proceed with the CE rulemaking separately from this rulemaking for several reasons. First, the Agency believes that there was sufficient opportunity for all interested parties to comment on any perceived relationship or any substantive issues regarding the proposed credible evidence revisions and the CAM proposal before the promulgation of the CE Revisions in February, 1997. The Agency released a public draft of the CAM approach in September, 1995, and then conducted a public meeting in April, 1996, on the credible evidence revisions. The Agency also accepted public comments on the credible evidence rulemaking and the CAM proposals between September, 1995, and the promulgation of the CE Revisions. Thus, all interested parties had the opportunity to comment on the two rulemakings and the Agency received numerous comments on this topic before the CE Revisions were promulgated. In addition, there was also ample opportunity for public comment on any perceived relationship after promulgation of the CE Revisions and before the finalization of part 64. The Agency released a public draft of the CAM approach in August, 1996, and held a public meeting regarding the 1996 part 64 Draft. The Agency also reopened the comment period on part 64 on April 25, 1997, (62 FR 20147) to allow for comments on the relationship between part 64 and the CE Revisions. See the Response to Comments Document (Part III) at section 14 for the Agency's response to these comments. Thus, all interested parties had the opportunity to comment on the relationship between part 64 and the CE Revisions before each of these rulemakings was promulgated.

Second, the Agency decided to promulgate the CE Revisions separate from part 64 because the two programs are different in scope. The CE Revisions are not limited to part 64 data or information collected pursuant to a part 70 permit generally. Other types of CE could include information from monitoring that is not required by regulation (such as monitoring conducted pursuant to a consent agreement or a specific section 114 request) or information from inspections by the permitting authority. In addition, the CE Revisions affect all sources regulated by 40 CFR parts 51, 52, 60, and 61, not just sources who will be covered by part 64. Thus, although sources covered by this rulemaking are regulated under the provisions amended by the CE Revisions, both the sources covered by this rulemaking and the data generated by this rulemaking are subsets of the sources and potential credible evidence addressed in the CE Revisions. Therefore, it was appropriate for the Agency to promulgate these two rulemakings separately. See 63 FR 8314 for a discussion of the scope of the CE Revisions.

Even though the CE Revisions and part 64 rulemakings are distinct regulatory actions, there are complementary aspects to the two rules. As noted above, consistent with the existing provisions of part 70, the CE revisions reiterate that data other than compliance test data can be used as a basis for title V compliance certifications. Most importantly, the CE rulemaking affects the potential consequences of identifying deviations, exceedances or excursions in a compliance certification based on data, such as part 64 data, that are from sources other than the compliance or reference test method. The CE revisions clarify the authority to rely on these data to prove that a source is in compliance or that a violation has occurred.

Finally, the CE Revisions and this rulemaking did not need to be promulgated together because these regulations have different statutory bases. The Agency promulgated the CE Revisions based primarily on section 113(a) of the Act, which authorizes the Agency to bring an administrative, civil or criminal action "on the basis of any information available to the Administrator." See 62 FR at 8320–23. The part 64 regulations, however, respond to the statutory mandates of the CAA Amendments of 1990, including but not limited to section 114(a)(3).

3. Potential Enforcement Consequences Related to CAM and CE

As a general matter, the Agency notes that it intends to apply its current enforcement policies in instances where the Agency believes, based on a review of CAM data, that a source has violated underlying emission limits. During the public comment period, commenters raised several issues about the relationship between the proposed part 64 monitoring information, the CE Revisions, and enforcement of violations of the Act. The following discussion generally addresses those concerns. See section 14.2 (Part III) of the Response to Comments Document (A–91–53–VII–C–3) for responses to specific issues raised.

First, these commenters suggested that compliance with indicator ranges under part 64 should act as a shield to enforcement actions. The Agency disagrees. Complete compliance with an approved part 64 monitoring plan does not shield a source from enforcement actions for violations of applicable requirements of the Act if other credible evidence proves violations of applicable emission limitations or standards. The Agency expects that a unit that is operating within appropriately established indicator ranges as part of approved monitoring will, in fact, be in compliance with its applicable limits. Part 64 does not prohibit the Agency, however, from undertaking enforcement where appropriate (such as cases where the part 64 indicator ranges may have been set improperly and other data such as information collected during an inspection provides clear evidence that enforcement is warranted).

Similarly, several commenters stated that if a source owner or operator identified excursions or exceedances of the applicable indicator ranges and conducted a prompt correction, with or without a QIP, then there should be a shield from enforcement for any potential violation of an underlying emissions limitation. This is also incorrect. If a source owner or operator identifies one or more excursions or exceedances of its indicator ranges established under part 64, prompt correction of the condition does not establish a shield. At the same time, the CAM excursions do not necessarily give rise to liability under part 64 or the Act (unless an excursion is specifically made an enforceable permit term). The Agency understands that many sources operate well within permitted limits over a range of process and pollution control device operating parameters. Depending on the nature of pollution control devices installed and the specific compliance strategy adopted by the source or the permitting authority, part 64 indicator ranges may be established that generally represent emission levels significantly below the applicable underlying emission limit. For this reason, and because the Agency anticipates a wide variance in CAM indicator range setting practices, the Agency intends to draw no firm inferences as to whether excursions from CAM parameter levels warrant enforcement of underlying emission levels without further investigation into the particular circumstances at the source. Thus, although staying within appropriately established indicator ranges gives a reasonable assurance of compliance, excursions from indicator ranges do not necessarily indicate noncompliance. The Agency may investigate such excursions for possible violations based on the general enforcement criteria identified above. A proper and prompt correction of the problem causing the excursion or exceedance, with or without a QIP, will factor into the Agency's decision on whether to investigate a source for potential violations but does not shield the source from an enforcement action by the Agency.

Second, several comments have stated that the use of CAM monitoring data as credible evidence to demonstrate the existence of a violation would increase the stringency of many standards. Although it is correct that the Agency, as well as states, public citizens, and sources, could potentially use CAM monitoring data as credible evidence of either compliance or noncompliance with an emission standard, the evidence could only be used if, as stated in the CE Revisions, the information is relevant to whether the source would have been in compliance with applicable requirements if the appropriate performance or compliance test had been performed. The CE Revisions and the use of CAM data as potential credible evidence do not change the stringency of any emission standard for the reasons set forth in the preamble to the CE Revisions. See 63 FR 8314.

Finally, it has been suggested during the part 64 and credible evidence rulemakings that a Title V permit may be written to limit the types of evidence used to prove violations of emissions standards. As mentioned in the CE Revisions, even if a Title V permit specifies that certain monitoring, CAM or other monitoring, be performed and that this monitoring is the sole or exclusive means of establishing compliance or non-compliance, EPA views such provisions as null and void. Such an attempt to eliminate the possible use of credible evidence other than the monitoring specified in a Title V permit is antithetical to the credible evidence rule and to section 113(e)(1). If such a provision is nonetheless included in a permit, the permit should be vetoed to avoid any ambiguity. If the provision is not vetoed, the provision is without meaning, as it is *ultra vires*, that is, beyond the authority of the permit writer to limit what evidence may be used to prove violations, just as if a permit writer were to attempt to write in a provision that a source may not be assessed a penalty of $25,000 per day of violation for each violation. Evidence that is permitted by statute to be used for enforcement purposes, fines that may be levied, and any other statutory provisions, may not be altered by a permit.

II. Detailed Discussion of Regulatory Provisions

A. Section 64.1—Definitions

Section 64.1 defines most of the key terms and phrases used in part 64. Certain definitions which were contained in § 64.2 of the 1993 EM proposal have been deleted from the final rule, while other definitions from the proposed rule have been considerably revised. In addition, a number of new definitions have been added to the final rule. The Agency believes these deletions, revisions, and additions accomplish the following goals: They reflect changes to the objectives and substantive provisions of part 64; they respond to concerns and comments made about the definitions in the 1993 EM proposal; and they bring part 64 more closely into accord with the regulatory language of part 70. The final definitions also reflect changes made in response to comments received on the 1995 and 1996 part 64 Drafts. These are discussed below.

1. Definitions Deleted from the Final Rule

The revisions to the substantive provisions of part 64 in the final rule have necessitated the deletion of certain definitions set forth in § 64.2 of the 1993 EM proposal. In some instances, these definitions have been superseded by new terminology relating to the same or similar concepts. In other cases, the deleted definitions related to matters which are inapplicable to the final rule. The eliminated definitions are as follows:

a. *Continuous Compliance and Intermittent Compliance.* The 1993 EM proposal would have required the use of data from an enhanced monitoring protocol to determine and certify whether an affected source or emissions unit complied with applicable emission limitations or standards and whether such compliance was "continuous" or "intermittent." Section 64.2 of the 1993 EM proposal defined the term "continuous compliance" as requiring the attainment of quality-assured data from an enhanced monitoring protocol for all required periods, the demonstration by such data that an owner or operator has complied with the applicable emission limitation or standard during all monitored periods, and a demonstration of compliance by any other data collected for the purpose of determining compliance during the monitored periods if such other data were collected. The 1993 EM proposal stated that a source or emissions unit was in "intermittent compliance" if, during the reporting period, either the data availability requirement was not satisfied because insufficient data was obtained from the enhanced monitoring protocol, or the owner or operator violated the applicable emission limitation or standard because a deviation occurred during a period for which no federally-approved or federally-promulgated excused period applied.

Many commenters objected to these definitions for various reasons, including a contention that EPA had merged the concept of achieving continuous compliance with the concept of demonstrating compliance. The definitions of continuous compliance and intermittent compliance in the proposed rule were also closely tied to the Agency's interpretation of section 114(a)(3) of the Act under the 1993 EM proposal. Section 114(a)(3) directs the Administrator to require certification of "whether compliance is continuous or intermittent." Under the 1993 EM proposal, this language was interpreted as requiring a certification that compliance was achieved during all averaging periods for a standard, and "intermittent" meant that one or more unexcused deviations occurred during the certification period. This interpretation was also the subject of much public comment. As described in greater detail above, the Agency has responded to these comments by adopting an alternative interpretation of section 114(a)(3). The Agency has therefore deleted the EM proposed definitions of continuous and intermittent compliance from the final rule. (See Section II.K.2. for additional discussion of the interpretation of compliance certifications.)

b. *Deviation.* The proposed rule stated that a "deviation" included any condition determined by enhanced monitoring or other collected data which identifies that an emissions unit has failed to meet an applicable emission limitation or standard. This definition included any conditions that either violated an applicable emission limitation or standard or would have violated such limitation or standard but for a federally-promulgated exemption.

A number of commenters raised concerns about the proposed definition of deviation. Some argued that the proposed definition was too closely tied to the violation of an emission limitation or standard. These commenters requested clarification that a deviation is not necessarily a violation of an emission limitation or standard. Other commenters objected to portions of the definition which would have allowed a deviation to be based on "data collected that can be used to certify compliance," such as the data obtained through a voluntary audit. These commenters argued that such a definition created a disincentive for owners and operators to engage in certain types of self-monitoring.

The final rule does not refer to "deviations" in part 64 and thus does not include a definition of "deviation." The 1996 part 64 Draft did contain a revised definition of "deviation" to be included in the part 71 provisions covering the federal operating permits program. This definition would have clarified that a deviation is not always a violation and that types of events that were to be considered deviations included "exceedances" and "excursions" as defined under part 64. The state operating permit programs authorized by part 70 of this chapter allow permitting authorities to define the term "deviation" in the context of their individual programs. The 1996 part 64 Draft did not include a definition of "deviation" to be included in part 70 because the Agency did not want to restrict the power of permitting authorities to define this term.

Public comments on the 1996 part 64 Draft pointed out that there are permitting authorities which define a "deviation" as a violation of the underlying emission limitation or standard. The provisions in the 1996 part 64 Draft which stated that exceedances and excursions are to be considered deviations without necessarily being violations arguably conflict with those definitions of "deviation." In response to these concerns, the Agency has eliminated all references to "deviations" from part 64.

c. *Other Deleted Definitions.* The proposed rule contained a definition for "established monitoring." This definition applied to certain types of monitoring methodologies which had been demonstrated to be a feasible means of assessing compliance with emissions limitations or standards. The concept of "established monitoring" was used in the monitoring selection process under the 1993 EM proposal. As discussed below in Section II.D., these provisions have been eliminated in part 64. Because the concept of "established monitoring" serves no function in the final rule, this definition has been deleted.

The proposed rule defined "fugitive emissions" as those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening. This definition was necessary because § 64.4(d) of the proposed rule would have established separate monitoring protocol requirements for fugitive emissions monitoring. As discussed below in Section II.B., fugitive emissions are not subject to any specific part 64 monitoring requirements. The Agency has therefore deleted this definition from the final rule.

Section 64.4(c) of the 1993 EM proposal established certain requirements for owners or operators who sought to use the monitoring of process or control device parameters as part of an enhanced monitoring protocol. In certain instances, the proposed rule required the establishment of a "demonstrated compliance parameter level" (DCPL) to determine which levels of the parameter being monitored correlated with a demonstration of compliance with the applicable emission limitation or standard. Under the requirements in the final rule, the Agency has modified its approach to parameter monitoring (see Section II.C. for a more detailed discussion). Accordingly, the definition of "demonstrated compliance parameter level" or DCPL has been deleted from the final rule.

Both the terms "enhanced monitoring" and "enhanced monitoring protocol" have been eliminated in the final rule. The 1993 EM proposal defined "enhanced monitoring" as the methodology used by an owner or operator to detect deviations with sufficient representativeness, accuracy, precision, reliability, frequency, and timeliness in order to determine if compliance is continuous during a reporting period. An "enhanced monitoring protocol" was defined as the monitoring methodology and all installation, equipment, performance, operation, and quality assurance requirements applicable to that methodology. The final part 64 establishes monitoring performance criteria in the body of the rule rather than in a definition; thus, the definitions of "enhanced monitoring" and "enhanced monitoring protocol" have been deleted. The 1996 part 64 Draft included a related concept, the "compliance assurance monitoring (CAM) plan," which distinguished monitoring for units with control devices subject to subpart B of that draft rule and monitoring for other units under subpart C of that draft rule. Because the final rule does not include subpart C, this term is not used in the final rule.

"Responsible official" was defined under the 1993 EM proposal as having the same meaning as provided under § 70.2. This term was used in § 64.5(c) of the 1993 EM proposal, which required that the personal certification of a responsible official be included in each enhanced monitoring report. In response to a number of objections to this requirement, the Agency has not included a part 64 report signature requirement in the final part 64 rule but generally relies on part 70 reporting procedures. Thus, there is no need to define "responsible official" in part 64. It should be noted that § 70.5(d) outlines the responsible official's duties with respect to submitting reports, including part 64 reports.

2. Revised Definitions

There are a number of definitions that were in the 1993 EM proposal that have been revised in the final rule. Some of these revisions are relatively minor, such as technical revisions designed to reflect changes to the substantive provisions of part 64 or to more closely parallel the definitions found in part 70. Other revisions are intended to address more significant concerns with the proposed definitions. The revised definitions are as follows:

a. *Emission Limitation or Standard and Applicable Requirement.* The 1993 EM proposal defined an "emission limitation or standard" as any federally enforceable emission limitation, emission standard, standard of performance or means of emission limitation as defined under the Act. This term is actually a hybrid of several terms used under the Act. The proposed definition stated that an emission limitation or standard may be expressed as a specific quantity, rate or concentration of emissions; as the relationship of controlled to uncontrolled emissions (e.g., control efficiency); as a work practice; as a process or control device parameter; or as another form of design, equipment, operational, or operation and maintenance requirement.

Section 64.2 of the 1993 EM proposal also defined an "applicable emission limitation or standard" as any emission limitation or standard subject to the requirements of part 64 including: (1) An emission limitation or standard applicable to a regulated hazardous air pollutant under 40 CFR part 61; or (2) an emission limitation or standard applicable to a regulated air pollutant other than a hazardous air pollutant under section 112 of the Act, for which the source is classified as a major source.

The definition of "applicable emission limitation or standard" was closely tied to the applicability provisions of the 1993 EM proposal. For example, the separate treatment of hazardous air pollutant emissions limitations or standards in the definition followed the proposed rule's separate applicability provisions for hazardous air pollutants. Those applicability provisions have been significantly revised in part 64. Commenters raised concerns that the meaning of the term "applicable emission limitation or standard" was unclear. The Agency agrees that the proposed definitions of "applicable emission limitation or standard" and "emission limitation or standard" could be confusing, especially when interpreted in conjunction with the pre-existing definition of "applicable requirement" in part 70. The final rule replaces the term "applicable emission limitation or standard" with the term "applicable requirement." Part 64 states that "applicable requirement" shall have the same meaning as provided under part 70. The Agency made this change in the final rule to avoid any potential confusion and to bring part 64 into closer agreement with the definitions of part 70.

Part 64 retains the basic definition of "emission limitation or standard" with several revisions. Several commenters requested clarification on the meaning of "federally enforceable" in this definition. The final rule eliminates the phrase "federally enforceable" in the definition and defines an emission limitation or standard as "any applicable requirement that constitutes an emission limitation, emission standard, standard of performance or means of emission limitation * * *" This adjustment reflects the addition of the term "applicable requirement" in the final rule. The term "applicable requirement" is used in part 70 permitting to refer to the standards, requirements, terms, and conditions that are contained in the part 70 permit as federally-enforceable requirements. Thus, the reference to "federally enforceable" was eliminated because, through the permitting process, all "applicable requirements" become federally enforceable.

Additional language in the part 64 definition of "emission limitation or standard" clarifies that, for purposes of part 64, the definition of "emission limitation or standard" does not include general operation requirements that an owner or operator may be required to meet, such as requirements to obtain a permit, to operate and maintain sources in accordance with good air pollution control practices, to develop and maintain a malfunction abatement plan, or to conduct monitoring, submit reports or keep records. As noted below (see detailed discussion of § 64.2), requirements of this type generally apply to an entire facility. The Agency has specifically excluded such requirements so that otherwise unregulated emissions units are not inappropriately subject to part 64 monitoring requirements.

A number of commenters requested that EPA further narrow the definition of emission limitation or standard so that it would not apply to work practice, design or similar types of requirements. The commenters argued that part 64 monitoring for these types of standards did not make sense and would be redundant. The Agency disagrees to the extent that a control device is used to achieve compliance with these types of standards. As discussed in Section II.B., the final rule applies only to pollutant-specific emissions units which achieve compliance by using a control device. The monitoring is designed to document that the control device is properly operated and maintained. Many work practice, design or similar standards will not apply to these types of units (i.e., with control devices), which addresses many of the commenters' concerns. For units that are subject to such requirements and that do use a control device (see, e.g., 40 CFR 60.692–5, which imposes a "design" standard that certain emissions be controlled by a control device with 95 percent design efficiency), the nature of the standard is immaterial to the assessment of whether the control device is properly operated and maintained. The Agency notes that in the example, the NSPS requires the owner or operator to monitor the control device to assure proper operation and maintenance (see § 60.695). Part 64 will act in a similar manner.

b. *Part 70/Part 71 Permit.* The term "permit" as defined in the 1993 EM proposal meant any applicable permit issued, renewed, amended, revised, or modified under part C or D of title I of the Act, or title V of the Act. Under the 1993 EM proposal, part 64 would have been implemented through both the part 70 operating permits program and the preconstruction permits programs developed under parts C and D of title I of the Act. Public commenters raised a variety of objections and concerns to this proposed implementation structure. The Agency has responded to these comments in part by limiting part 64 implementation under part 64 to permits covered by title V of the Act.

To reflect this change in the implementation approach, the Agency has replaced the proposed definition of "permit" with a definition for a "part 70 or 71 permit." Section 64.1 of the final rule states that "part 70 or 71 permit" shall have the same meaning as provided under part 70 (or part 71) of this chapter. The Agency believes this definition is consistent with the goal of bringing part 64 definitions into closer agreement with their part 70 (or part 71) counterparts.

The Agency has also added a related definition in part 64. The definition of a "part 70 or 71 permit application" includes any application that is submitted by an owner or operator in order to obtain a part 70 or 71 permit, including any supplement to a previously submitted application. The Agency believes the addition of this definition is necessary because the implementation provisions set forth in § 64.3 of part 64 are connected to the submission of a part 70 or 71 permit application.

c. *Major Source.* The 1993 EM proposal defined the term "major source" as including any major source meeting the definition in § 70.2, excluding any hazardous air pollutant (HAP) source included in paragraph (1) of that definition. One commenter requested clarification of why this definition excluded major HAP sources included in the major source definition of part 70. The form of the proposed definition was necessary because the 1993 EM proposal treated HAP requirements separately from other requirements. For HAP requirements, the 1993 EM proposal would have applied to any source required to obtain a part 70 operating permit or a preconstruction permit under part C or D of title I of the Act and not just to "major sources." As discussed below, the applicability provisions of part 64 have been substantially modified in the final rule such that there are no separate applicability provisions for HAP requirements (see Section II.B.). In the final rule, the definition of "major source" has been revised to reflect these changes. Part 64 simply states that "major source" shall have the same meaning as provided in part 70.

The U.S. Small Business Administration (SBA) submitted for discussion at the September 10, 1996 meeting a proposal to retain, in part 64, EPA's current practice of excluding from major source status those sources whose actual emissions are less than 50 percent of the major source threshold. SBA apparently was referring to EPA's policy issued in January 1995 to establish a two-year (extended until July 31, 1998) transition policy that guides EPA in applying the definition of "major source" in part 70. Because part 64 relies on part 70's definition of "major source," SBA's concern is met. As long as that policy remains in effect, it will be relevant to determining applicability under part 64. *See also National Mining Association* versus *U.S. EPA*, 59 F.3d 1351 (D.C. Cir. 1995).

d. Other Part 70 Related Definitions. Section 64.2 of the proposed rule contained a definition for "potential to emit" which tracked the language of the part 70 definition of "potential to emit" with technical edits to reflect the 1993 EM proposal's focus on emissions units as opposed to the focus on major sources in part 70. The text of the proposed rule did not make it clear, however, that part 70 was the source for the proposed definition. Under part 64, "potential to emit" is explicitly defined as having "the same meaning as provided under part 70 of this chapter, provided that it shall be applied with respect to an 'emissions unit' as defined under this part in addition to a 'stationary source' as provided under part 70 of this chapter." Although the text of the definition has been changed, the meaning of "potential to emit" in the final rule is effectively the same as in the proposed rule. The Agency made these revisions to clarify the connection of this term with the definitions of part 70.

The 1993 EM proposal defined "emissions unit" as any part or activity of a source that emits or has the potential to emit any regulated air pollutant for which an emission limitation or standard had been established. This definition was a modification of the definition of "emissions unit" set forth in part 70. The Agency received a variety of public comments on this definition. One commenter recommended using the part 70 definition of "emissions unit" in part 64. Several other commenters expressed concern over the use of the phrase "any part or activity" in the definition, stating that the definition was not clear as to whether an emissions unit is a single piece of equipment or a group of multiple units located together within a source. In response to these comments, the definition of "emissions unit" has been revised in the final rule to have the same meaning as provided under part

70. This approach clarifies potential ambiguity in the definition by relying on the established part 70 definition of the term and brings part 64 into closer agreement with the provisions of the operating permits program thorough which part 64 will be implemented.

The 1993 EM proposal contained a definition of "permitting authority" which tracked the language of the part 70 definition of "permitting authority" with technical edits to reflect the proposed EM rule's implementation through both title V permitting programs and title I preconstruction permit programs. The text of the proposed rule did not make it clear, however, that part 70 was the source for the proposed definition. In addition, the final rule is not implemented through title I preconstruction permits. The Agency has therefore revised the definition of "permitting authority" to have expressly the same meaning as provided under part 70.

3. Definitions Added in the Final Rule

Many of the definitions in § 64.1 of the final rule have been added to reflect changes in the substantive requirements of part 64 monitoring under part 64. These definitions are generally addressed in the detailed discussion of the appropriate substantive sections of the final rule. The following discussion provides a brief overview of some key terms added to the definitions section of the final rule.

The Agency has added definitions for the terms "monitoring" and "data" to the final rule. The rule defines "monitoring" as any form of collecting data on a routine basis to determine or otherwise assess compliance with emission limitations or standards. The rule also includes a non-exclusive list of data collection techniques which may be considered appropriate monitoring under part 64. This list is similar to the list included in § 64.6 of the 1993 EM proposal with minor changes in response to comments on that section. "Data" is defined as the results of any type of monitoring or compliance determination method. Some commenters had raised concerns that the use of the term "data" in the substantive provisions of proposed part 64 reflected a bias toward instrumental monitoring methods. The Agency believes that by adding these two definitions, the final rule reflects the Agency's intent that a wide variety of information and means of collecting information potentially can be used to satisfy the requirements of part 64.

Definitions for the terms "exceedance" and "excursion" have been added to the final rule. These terms are closely related. Section 64.1 defines an "exceedance" as a condition detected by monitoring which provides data in terms of an emission limitation or standard and which indicates that emissions or opacity are greater than that limitation or standard, consistent with the applicable averaging period. An "excursion" is defined as a departure from an indicator range established as part of part 64 monitoring, also as consistent with the applicable averaging period. As discussed above, the 1996 part 64 Draft would have stated that an exceedance or excursion would be considered a deviation in the part 70 compliance certification. This statement has been removed in response to comments that such conditions should not necessarily constitute deviations, especially since some permitting authorities equate a deviation with a violation. See Section II.K.2. of this preamble for additional discussion on the status of excursions for a part 70 compliance certification. The 1996 part 64 Draft also omitted reference to the applicable averaging period. That omission has been corrected in the final rule.

The final definition added to the final rule describes the meaning of a "predictive emissions monitoring system (PEMS)." Several commenters to the 1993 EM proposal suggested that a definition for this term should be added to part 64. The Agency agrees with this suggestion and has included an appropriate definition in § 64.1 of the final rule. This definition is included in the final part 64 rule because § 64.3(c) sets forth special criteria for the use of predictive monitoring systems when employed to fulfill part 64 monitoring requirements. The same section also provides special criteria for the use of continuous emission or opacity monitoring systems. Because these latter types of systems are well understood, no explicit definition was considered necessary for purposes of part 64.

B. Section 64.2—Applicability

1. Overview

The applicability provisions in § 64.2 reflect EPA's decision to focus part 64 requirements on units that use control devices to achieve compliance. The types of emission exceedance problems that can arise from poor operation and maintenance of a control device can be severe and represent a significant compliance concern. Moreover, although units with control devices represent a smaller percentage of the overall number of emissions units than other units, these controlled units represent a disproportionate share of the overall potential emissions from all emissions units. By concentrating the requirements of part 64 on these units with control devices, the Agency has focused the rule on units that represent a significant portion of the overall potential emissions regulated under the Act and that are generally most likely to raise compliance concerns.

The Agency notes that the term "pollutant-specific emissions unit," defined in § 64.1, is used in part 64 to clarify that applicability is determined with respect to each pollutant at an emissions unit separately. For example, a coal-fired boiler emitting through a single stack could constitute several pollutant-specific emissions units, such as for particulate matter, SO_2, NO_X, and CO. This term is used throughout the remainder of this document where appropriate.

2. Significant Changes in the Applicability Threshold and Related Definitions

Section 64.2(a) of the final rule requires the owner or operator to apply part 64 to significant pollutant-specific emissions units that use control devices to achieve compliance at major sources subject to part 70 permit requirements. The issues raised with respect to applicability during the development of the rule are described below.

a. *Applicability Options Presented in the 1993 EM Proposal.* The preamble to the 1993 EM proposal solicited comments on five options for determining which emissions units would be subject to enhanced monitoring requirements under part 64. These options set the threshold for applicability based on each unit's potential to emit the regulated air pollutant(s) for which a stationary source is classified as a major source. Option 1 set no percentage threshold, making all units with applicable requirements for the pollutant for which a source is major subject to part 64 monitoring. Options 2, 3, 4, and 5 would have made part 64 applicable to all units that have the potential to emit pollutants in an amount equal to or greater than 10, 30, 50, and 100 percent of the applicable major source definition, respectively. The 1993 EM proposal incorporated Option 3, setting the threshold at 30 percent. Under the proposed rule, the source of an air pollutant which is defined as being major at 100 tons per year would be required to conduct enhanced monitoring at all emissions units within its facility that had the potential to emit 30 tons or more of the pollutant per year.

Applicability under the 1993 EM proposal was based on an emission unit's "potential to emit." The proposal defined this term as an emission unit's maximum capacity to emit a regulated air pollutant under the unit's physical and operational design, taking into account such operating restrictions and control equipment as constitute federally-enforceable limitations. As noted above, the 1993 EM proposal also would have applied only to the pollutants for which a source is major. The 1993 EM proposal solicited comment on the applicability approach in the proposed rule, and specifically noted that one other option would be to use uncontrolled emissions rather than potential to emit to determine part 64 applicability. The Agency noted that such an approach arguably would better address the units with the greatest environmental risk. This request for comment was accompanied by an assertion that in a monitoring rule such as part 64, it may be appropriate to use a different definition of potential to emit than EPA has used for other purposes.

b. *Final Part 64 Applicability Provisions.* In response to the many comments received on the 1993 EM proposal, the Agency modified part 64 to bring about the CAM approach including a somewhat different approach to applicability. The Agency received numerous public comments on the applicability provisions of the 1993 EM proposal. Relatively few commenters supported the Option 3 (30 percent) threshold. Many of the comments critical of Option 3 argued that the benefits of increased pollutant monitoring obtained by covering additional emissions units at the 30 percent threshold was far outweighed by the additional costs and burdens of implementation at that threshold. Most industry and many State and local commenters supported Option 5 or a higher threshold. Many of the commenters also recommended that EPA exempt various types of units, especially uncontrolled units that are subject to design, work practice, or similar operational restrictions. In addition, a number of commenters suggested alternative approaches to determining the applicability threshold of part 64. Industry commenters generally favored the focus of the 1993 EM proposal on the pollutants for which a source is a major, while environmental groups opposed that approach.

The final part 64 retains the basic concept of an applicability threshold as contained in the 1993 EM proposal, but also narrows the focus so that part 64 applies only to those pollutant-specific emissions units that use a control device to achieve compliance with an applicable emission limitation or standard. In addition, units using control devices must have potential pre-control device emissions equal to or greater than 100 percent of the applicable major source definition to be subject to part 64. Since part 64 applies its size threshold only to the proportionally small number of emissions units that use control devices, the number of units required to meet part 64 monitoring requirements is lower than would have been subject to the 1993 EM proposal. The final RIA estimates that part 64 will affect fewer than 27,000 units as compared to the over 35,000 units which EPA had estimated would be affected under the 1993 EM proposal.

For part 64 to apply, § 64.2(a) specifies that a pollutant-specific emissions unit must meet the following three criteria: (1) The unit must be subject to an emission limitation or standard for the applicable regulated air pollutant (or a surrogate of that pollutant); (2) the unit must use a control device to achieve compliance with an emission limitation or standard; and (3) the unit must have "potential pre-control device emissions" in the amount, in tons per year, required to classify the unit as a major source under part 70.

i. *Emission Limitation or Standard Criterion.* For the first criterion, the Agency notes that part 64 applies only if an applicable emission limitation or standard applies because the purpose of part 64 is to provide a reasonable assurance of compliance with such requirements. Numerous comments on the 1993 EM proposal supported EPA's position that part 64 should apply only if an underlying applicable emission limitation or standard applies, but many commenters suggested that the final rule should contain explicit language concerning the necessity for an underlying standard to trigger part 64 applicability. The commenters believed inclusion of such language was critical because a part 70 operating permit will be required to include units without applicable requirements, and part 70 permits will be required for sources without any applicable requirements (so-called "hollow permits"). Their concern was that part 64 could be interpreted as applying to units and sources of this type and that determining compliance with the rule under such an interpretation would be exceedingly difficult. The Agency agrees that the rule should clearly state that part 64 applies only where a federally enforceable emission limitation or standard applies and thus has added this first criterion to the applicability determination. The Agency also notes that the applicability provisions in part 64 include a "surrogate" of a regulated air pollutant to address situations in which the emission limitation or standard is expressed in terms of a pollutant (or other surrogate) that is different from the regulated air pollutant that is being controlled. A common example would be emission limits expressed in terms of particulate matter and opacity rather than PM–10. Another example would be an emission limit expressed as a control device operating requirement rather than in terms of the applicable regulated air pollutant.

ii. *Control Devices Criterion.* Second, the final rule applies only to pollutant-specific emissions units that rely on a control device to achieve compliance. The final rule provides a definition of "control device" that reflects the focus of part 64 on those types of control devices that are usually considered as "add-on controls." This definition does not encompass all conceivable control approaches but rather those types of control devices that may be prone to upset and malfunction, and that are most likely to benefit from monitoring of critical parameters to assure that they continue to function properly. In addition, a regulatory obligation to monitor control devices is appropriate because these devices generally are not an inherent part of the source's process and may not be watched as closely as devices that have a direct bearing on the efficiency or productivity of the source.

The control device definition is based on similar definitions in State regulations (see, e.g., North Carolina Administrative Code, title 15A, chapter 2, subchapter 2D, section .0101 (definition of "control device"); Texas Administrative Code, title 30, section 101.1 (definition of "control device"). The definition is in contrast to broader definitions of "control device," "air cleaning equipment," "control measure," or similar terms included in some States' regulations (see, e.g., Codes, Rules, and Regulations of the State of New York, title 6, chapter III, section 200.1 (definition of "air cleaning device" or "control equipment")). These broader definitions often include any method, process or equipment which removes, reduces or renders less noxious air contaminants released to the ambient air. Those types of controls could include material substitution, process modification, operating restrictions and similar types of controls. The definition in part 64 relies on the narrow interpretation of a control device that focuses on control equipment that removes or destroys air pollutants.

Certain NSPS and NESHAP regulations also have targeted definitions of "control device" or "add-on control device" that apply to the specific type of affected facility covered by the applicable NSPS or NESHAP subpart (see, e.g., 40 CFR 60.581, 60.670, 60.691, 60.731, 61.171, 61.241, 63.161, 63.561, and 63.702). The part 64 control device definition generally is consistent with these prior Agency definitions, but without language targeted to a particular affected facility type.

The Agency notes that EPA's Aerometric Information Retrieval System (AIRS) contains a list of various air pollution control equipment codes that address a wide variety of possible control methods, processes and equipment; this list includes both active control devices and other types of controls. In conjunction with the release of the 1996 part 64 Draft, the Agency placed in the docket (item VI-I-3) a document that reflects EPA's position on which of those equipment codes refer to a "control device" as defined in the 1996 part 64 Draft and which refer to other types of controls. The Agency continues to believe that this document provides an appropriate list of the types of equipment which may constitute control devices.

For the final part 64 rule, the control device definition has been revised in response to public comments. In the discussion document accompanying the 1996 part 64 Draft, the Agency solicited comment on the appropriateness of the definition of control device and received numerous comments and requests for additional clarifications. Generally, commenters felt that the control device definition in the 1996 part 64 Draft was overly broad and that additional language was needed to clarify that EPA does not intend the rule to apply to inherent process equipment such as certain types of recovery devices.

The final rule defines a control device as "equipment, other than inherent process equipment, that is used to destroy or remove air pollutant(s) prior to discharge to the atmosphere." Thus, the Agency has specifically excluded inherent process equipment from the control device definition in the final rule. The EPA suggested in the discussion document accompanying the 1996 part 64 Draft a list of three criteria that would be used to distinguish inherent process equipment from control devices:

(1) Is the primary purpose of the equipment to control air pollution?

(2) Where the equipment is recovering product, how do the cost savings from the product recovery compare to the cost of the equipment?

(3) Would the equipment be installed if no air quality regulations are in place? (See letter from David Solomon, EPA, to Timothy J. Mohin, Intel Government Affairs, dated November 27, 1995. Included in the docket as Item VI-C-14.)

The Agency received a number of comments on these criteria, some of which supported including the criteria in the rule and others of which suggested other approaches. Based on the comments received, the final rule defines "inherent process equipment" as "equipment that is necessary for the proper or safe functioning of the process, or material recovery equipment that the owner or operator documents is installed and operated primarily for purposes other than compliance with air pollution regulations." If equipment must be operated at an efficiency higher than that achieved during normal process operations in order to comply with applicable requirements, that equipment will not qualify as inherent process equipment. In addition, the control device definition has been revised to include a list of several control techniques that do not constitute "control devices" as defined in part 64.

Finally, the definition also makes clear that part 64 does not override definitions in underlying requirements that may provide that certain equipment is not to be considered a control device for pollutant-specific emissions units affected by that regulation. Although not subject to part 64, an example of this type of provision is § 63.111 in subpart G to 40 CFR part 63 (NESHAP requirements for Synthetic Organic Chemical Manufacturing Industry for Process Vents, Storage Vessels, Transfer Operations, and Wastewater). The definition in that section states that recovery devices used in conjunction with process vents and primary condensers used in conjunction with a steam stripper do not constitute "control devices." Certain commenters asserted that part 64 should not override these types of existing rules and EPA agrees. The Agency notes, however, that if an emissions unit is regulated for another pollutant, and the control device also is used to comply with a limit that applies to that second pollutant, the equipment will be considered a "control device" for the second pollutant unless the standards for the second pollutant also explicitly establish that the equipment is not a control device.

The final rule also includes a definition of a "capture system" because the rule requires, where applicable, monitoring of a capture system associated with a control device. The monitoring requirements for control devices extend to capture systems as well because they are essential to assuring that the overall emission reduction goals associated with the control device are achieved. See Section II.C., below. The Agency notes that duct work, ventilation fans and similar equipment are not considered to be a capture system if the equipment is used to vent emissions from a source to the atmosphere without being processed through a control device. For instance, roof vents that remove air pollutants from inside a building but do not transport the pollutants to a control device to reduce or destroy emissions would not be subject to the rule.

The Agency notes that some commenters, especially environmental and other public interest organizations, opposed limiting the applicability of part 64 to emissions units that rely on control devices. They argued that other significant emissions units with other types of control measures, such as low NO_X burners or similar combustion modification controls, should be subject to part 64 requirements.

Low NO_X burner technology and certain other types of combustion control measures are not included in the definition of "control device" in the final rule. For most large emissions units that employ such measures, such as utility boilers, separate applicable requirements already require the use of CEMS or similar monitoring for such units. Under part 70, that monitoring will have to be included in the permit and considered in certifying compliance with applicable requirements. Some types of combustion units (e.g., package boilers) that may use low NO_X burner technology do not use the same types of technology used by utility and large industrial boilers. The technology used for many units with automatic combustion control does not provide significant operational flexibility that could afford the owner or operator with an opportunity or incentive to manipulate NO_X control levels. (See docket item A-91-52-VI-A-9) For these types of units, the recordkeeping of regular inspection and maintenance of the low NO_X burners (e.g., annular flow ratio adjustment settings, burner replacement, portable instrument readings, etc.) in combination with periodic checks of emission levels with appropriate test methods, as necessary, are very likely sufficient to ensure that the unit is being operated in a manner consistent with good air pollution control practices and that the low NO_x technology continues to reduce emissions at least to the level of the standard. The general monitoring requirements in part 70 are adequate to assure that this type of appropriate monitoring is employed.

For these reasons, EPA believes that monitoring for this control technology is best addressed through part 70 periodic monitoring requirements and not through expansion of part 64 to units with these types of control measures. Of course, if there are particular units which raise a significant continuous compliance concern, such as units with an historically poor compliance history, the permitting authority can require more detailed monitoring under the general part 70 monitoring provisions given that the permit must include appropriate monitoring for assuring compliance with the permit. In those cases, permitting authorities may want to consider elements of part 64 as potentially appropriate, but they would not be bound to satisfy each element of part 64.

iii. *Potential Pre-control Device Emissions Criterion.* Finally, for the third criterion for applicability, §64.2(a) relies on the concept of "potential pre-control device emissions." This term has the same meaning as "potential to emit." except that any emission reductions achieved by the control device are not taken into account, even if the owner or operator generally is allowed to do so under the regulatory definition of "potential to emit."

The Agency first notes that numerous commenters expressed objections to the 1993 EM proposal's definition of potential to emit, believing the definition resulted in unrealistically high emissions numbers. The EPA notes that, contrary to beliefs expressed in many of those comments, that definition does take into account enforceable operating hour restrictions, throughput restrictions, control system efficiency factors, and similar enforceable restrictions. The Agency also points out that the same definition has been used in the part 70 operating permits program as well as the part 63 NESHAP general provisions.

The Agency also notes that the majority of commenters did favor the use of potential to emit over uncontrolled emissions because the latter approach would not take into account any emissions reductions achieved through any means. However, the 1993 EM proposal noted that EPA was considering basing applicability on uncontrolled emissions and the potential pre-control emissions approach was suggested subsequently by State and local agencies (see docket items VI-D-42 and 49) during further consideration of part 64 options. As noted in the discussion document accompanying the 1996 part 64 Draft, the Agency agrees with this approach and believes that excluding the assumed efficiency of the control device from the calculation of potential to emit for purposes of part 64 applicability provides an appropriate means of distinguishing between units based on environmental significance. It allows the Agency to distinguish between units based on their true size and based on the degree of control required to achieve compliance. The Agency notes that this approach does take into account all federally-enforceable emissions reductions except for those resulting from control devices (e.g., emission reductions that occur as a result of operating hour or throughput restrictions would be taken into account in determining potential pre-control device emissions).

Many commenters objected to the reliance on potential pre-control device emissions, primarily because the use of the potential pre-control device emissions threshold would result in too many units being subject to the rule. Some commenters noted that the 1993 EM proposal similarly had requested comment on the use of uncontrolled emissions, and that the comments strongly objected to that idea.

The Agency first notes that, contrary to some commenters' assertions, EPA estimates that the final rule will apply to fewer units than the 1993 EM proposal because the final rule only applies to the proportionally small number of emissions units that use equipment meeting the "control device" definition. The final RIA estimates that fewer than 27,000 pollutant-specific emissions units will be subject to part 64, whereas the 30 percent option in the 1993 EM proposal would have covered over 35,000 such units. The EPA has also delayed implementation for those units subject to the rule that have the "potential to emit" (post-control device) less than the major source threshold. This delayed implementation will reduce the burdens of part 64 on the initial round of part 70 permitting. The Agency feels that these changes should alleviate the commenters' concerns and that further reductions in the number of units to which the rule applies are not appropriate.

The CAM approach is necessarily concerned with significant, controlled units even if the potential to emit after the control device is low. The reason for covering these units is two-fold. First, part 64 monitoring will be designed to detect long-term under-performance of control devices that periodic evaluations such as stack tests may be unable to document. For example, a unit may have the potential to emit 20 tons per year after a control device which is required to operate with a 99 percent control efficiency. The pre-control device potential to emit for that unit is 2,000 tons per year; if the required control device efficiency is 99.9 percent, that figure increases to 20,000 tons per year. If the long-term actual control performance of that device decreases to 95 percent, the actual emissions could increase to 100 or 1000 tons per year, respectively. Part 64 is aimed first at addressing this type of long-term, significant loss of control efficiency that can occur without complete failure of a control device. The second type of problem is short-term complete loss of control. As indicated in some of the comments, for many types of control devices this type of problem could be detected after the fact with monitoring less detailed than part 64. However, the goal of air pollution control is to prevent these types of problems before they occur, if possible, at a reasonable cost. The EPA believes that part 64 in many instances can be designed to provide early indications of control equipment problems that could be addressed prior to such catastrophic failures. For these reasons, EPA believes that the use of pre-control device potential to emit is a rational basis on which to evaluate whether specific units should be subject to part 64.

Some comments on the 1996 part 64 Draft also objected to the potential pre-control device emissions threshold based on the argument that the creation of a new size calculation that source owners or operators must perform to determine applicability will cause confusion and result in additional burdens. The Agency disagrees since owners will simply need to remove the design efficiency of the control device from the calculation of the applicable unit's potential to emit. Potential pre-control emissions will otherwise be calculated in exactly the same way as potential to emit. The two figures will both factor in enforceable operational restrictions, so only the effect of the control device's efficiency, a factor which has to be quantified for determining the standard meaning of "potential to emit," will be treated differently.

Commenters also noted that part 64 would expand the 1993 EM proposal by not limiting applicability to those pollutants for which the source is major. The final rule does limit applicability to the pollutants for which a pollutant-specific emissions unit would be major except for the emissions reductions assumed to occur as a result of a control device. As explained above, EPA believes that the focus of the rule on the potential to emit of units prior to a control device is an appropriate screening tool to determine which units should be monitored under part 64. For that reason, the focus of the 1993 EM proposal on major pollutants only would be inappropriate. In addition, as some commenters pointed out in response to the proposed rule, the Agency typically does not focus on only the major pollutants even where applicability of a program is focused solely on whether a source is a major source.

Finally, EPA believes it would be irrational to continue to focus solely on the pollutants for which a source is major when the Agency is focusing on units that have installed control devices. For instance, a source could be "major" for NO_X with no NO_X control devices (and even no NO_X requirements in an attainment area) but have a unit with the potential to emit 20 tons of particulate matter after a control device that has a rated removal efficiency of 99.9 percent. The post-control particulate potential to emit from this particular emissions unit would be less than the major source threshold of 100 tons/year; however, the precontrol potential to emit of 20,000 tons/year of particulate matter emissions would be greater than the 100 tons/year major source threshold. As noted in the example discussed above, small decreases in efficiency of that control device could lead to actual emission increases significantly above the major source threshold. Thus, while the source in this example may not have the potential to emit particulate matter (taking into account the control device) in amounts sufficient for the source to be classified as a major source for particulate matter, the pollutant-specific emissions unit for particulate matter, not for NO_X, in this example is clearly one which the Agency believes should be subject to part 64.

Other commenters questioned whether the applicability provisions were self-implementing. They argued that unit-by-unit negative declarations would be highly burdensome. The Agency agrees and part 64 does not require that owners or operators justify in a permit application why part 64 is not applicable, or that owners or operators apply for exemptions. However, the Agency notes that the permitting authority can request further explanation as to how a source owner or operator determined that part 64 did or did not apply for any pollutant-specific emissions unit for which there may be an issue about applicability. In addition, an owner or operator that wishes to take advantage of the exemption for certain municipally-owned utility units will have to provide the documentation required to satisfy that exemption (see the following discussion of this exemption).

3. Development of the Exemption Provisions

Part 64 exempts owners or operators with respect to certain emission limitations or standards for which the underlying requirements already establish adequate monitoring for the emission limits being monitored, and with respect to certain municipally-owned utility units.

a. *Exemptions in the 1993 EM proposal.* The 1993 EM proposal established exemptions for the following types of emission limits:

—Emission limitations or standards under the NESHAP program (pursuant to section 112 of the Act), except for standards established in part 61. This exemption reflected the Agency's intent that the provisions of part 63, the MACT standards, will include appropriate enhanced monitoring provisions pursuant to the authority in section 114(a)(3) of the Act.

—Stratospheric ozone protection requirements under title VI of the Act. The type of requirements that apply under that program are significantly different than typical emission limitations or standards, and the appropriate monitoring for such requirements will be handled under regulations implementing those requirements. The exemption is unchanged from the proposed rule but for a technical correction (substituting title VI of the Act for the original reference to section 603).

—Acid Rain Program emission limits under title IV of the Act. The Acid Rain monitoring requirements under 40 CFR part 75 already establish all appropriate compliance assurance monitoring for such requirements. The exemption is unchanged from the proposed rule but for a technical correction (to include emission limits applicable to opt-in units under section 410 of the Act).

—NESHAP standards for asbestos demolition and renovation projects. These sources are exempt under part 70 and are not required to obtain operating permits.

—NSPS standards for residential wood heaters. These sources are also exempt under part 70 and are not required to obtain operating permits.

b. *Exemptions in the Final Rule.* Issues raised by comments on the 1993 EM proposal prompted EPA to include certain additional exemption provisions in the final part 64 rule. The exemptions that were changed or added are:

—Emission limitations or standards under the NSPS program that are proposed after November 15, 1990. This expands on the proposed rule, which provided for only the NESHAP exemption. Commenters suggested that EPA exempt all NSPS, arguing that existing NSPS contain enhanced monitoring requirements. The EPA disagrees that this is the case for all NSPS. Existing monitoring of covered units and sources under some NSPS may be sufficient to meet part 64 requirements; however, the question of sufficiency of any particular monitoring requirement from a non-exempt standard will have to be determined in accordance with the requirements of part 64. Future federal rulemakings, including NSPS rulemakings, will satisfy the monitoring requirements of titles V and VII of the 1990 Amendments (see preamble to 40 CFR part 70, 57 FR 32278, July 21, 1992). The EPA intends to focus on including methods for directly determining continuous compliance in these new federal rulemakings where such methods are feasible. Only where such approaches are not feasible would the Agency consider using an approach similar to the CAM approach in such requirements. Since there will be no gaps in their monitoring provisions, EPA exempts future NSPS as well as NESHAP standards. The Agency notes that this exemption does not apply to State emission limits or standards developed under section 111(d) of the Act.

—Emission limits that apply solely under an emissions trading program approved or promulgated by EPA and emission cap requirements that meet the requirements of § 70.4(b)(12) or § 71.6(a)(13)(iii) are exempt from part 64. This exemption was developed in response to comments received on a provision in the 1993 EM proposal which made certain "group[s] of emissions units at a major source" subject to enhanced monitoring requirements. The 1993 EM proposal's preamble suggested that this provision applied to emissions units involved in some form of "bubbling" or trading plan within a single facility as well as to fugitive emission points for which compliance is evaluated on a process-wide or facility-wide basis.

The EPA received many comments on the 1993 EM proposal that opposed applying enhanced monitoring to groups of emissions units. Several industry commenters believed that applying part 64 to groups of emissions units would be too inclusive and would apply enhanced monitoring requirements to emissions units that otherwise would fall below the applicability threshold. Other commenters predicted that applying enhanced monitoring to groups of emissions units would discourage source owners or operators from participating in emissions trading, aggregating, or similar programs. Some industry representatives and State and local agencies also recommended providing an exemption in part 64 for source owners or operators who participate in programs such as RECLAIM in California's South Coast Air Quality Management District.

The final part 64 rule addresses these concerns in a number of ways. First, both emission limits that apply solely under an emissions trading program approved or promulgated by EPA and emission caps that meet the requirements of § 70.4(b)(12) or § 71.6(a)(13)(iii) are explicitly exempt from part 64 under § 64.2(b)(1)(iv) and (v). By their nature, these types of standards require methods to confirm trades or to calculate overall compliance with the cap, taking into account the contribution of emissions from all covered units. These types of emission limits also often cover all emissions units at a facility, including those with extremely low amounts of emissions, those without control devices, and those that are not subject to other applicable requirements. Because of the need to consider the interrelationships among units covered by this type of requirement, the type of monitoring in part 64 would not be appropriate. Instead, the Agency believes that the existing requirements for monitoring compliance with such standards should be followed.

For instance, the requirements for statutory economic incentive programs (40 CFR 51.490—.494) specify the quantification methods that must be included as part of any SIP economic incentive program developed pursuant to sections 182(g)(3), 182(g)(5), 187(d)(3), or 187(g) of the Act. In addition, EPA has proposed revisions to § 70.4(b)(12) to clarify that emission caps must include "replicable procedures and permit terms that ensure the emissions cap is enforceable and trades pursuant to it are quantifiable and enforceable." (59 FR 44460, August 29, 1994). These provisions highlight the need to include as part of any emission trading or cap requirement the appropriate methods for quantifying emissions and assuring that the trade or cap limitation is enforceable. The Agency believes that the imposition of part 64 on these types of standards would not provide any additional benefit.

In addition, other groups of emissions units are generally not subject to monitoring requirements under part 64. Part 64 requirements apply only to individual pollutant-specific emissions units that use a control device to achieve compliance and whose pre-control device emissions of an applicable pollutant are equal to or greater than the amount needed for a unit to be classified as a major source. Groups of emissions units are not aggregated for this determination, so such groups would not be subject to part 64. In addition, fugitive emissions are generally not controlled through the use of control devices, so there is no need for special applicability or monitoring provisions for fugitive emission sources.

—Emission limitations or standards for which a part 70 permit already includes monitoring that is used as a continuous compliance determination method. In these instances, there generally is no need to require any additional compliance assurance monitoring for that emission limitation or standard. There is one exception to using this exemption. In some instances a continuous compliance determination method may be contingent upon an assumed control device efficiency factor. For example, a VOC coating source that includes add-on control equipment that destroys VOC emissions may use an assumed control device efficiency factor for the control equipment together with coating records to calculate compliance with an NSPS requirement. In this example, a monthly calculation generally is made using coating records and an assumed destruction efficiency factor that is based on the last control system performance test. In this example, § 64.2(b)(1)(vi) does not allow the exemption from part 64 because the owner or operator must assure proper operation and maintenance of the control device for the destruction efficiency factor to remain valid. The Agency notes that this position is consistent with the NSPS, which generally require monitoring of the control equipment in addition to the monthly compliance calculation in this type of example. The Agency notes that the monitoring under part 64 does not have to be included or otherwise affect the existing continuous compliance determination method. In the coating example, direct compliance will still be calculated based on the approved continuous compliance method. Part 64 monitoring will be used to document that the control device continues to operate properly and to indicate the need to reestablish the destruction efficiency factor through a control device performance test.

This exemption also raises a question about what constitutes a "continuous compliance determination method." Section 64.1 defines this type of method as a means established in an applicable requirement or a part 70 permit for determining compliance on a continuous basis, consistent with the averaging period for the applicable requirement. The EPA has prepared initial guidance that includes some example of this type of monitoring. (See docket item A-91-52-VI-A-8 for a draft of this guidance.)

The Agency notes that if emission limitations or standards other than the exempt emission limits described above apply to the same pollutant-specific emissions unit, the owner or operator would still be subject to part 64 for that pollutant-specific emissions unit and may have to upgrade the existing monitoring or add other types of monitoring. The Agency believes that for many situations in which both exempt and non-exempt emission limits apply to a particular pollutant-specific emissions unit, the monitoring for the exempt limit may be adequate to satisfy part 64 for the other non-exempt emission limit(s). Section 64.4(b)(4) of the rule recognizes this possibility and allows the owner or operator to meet the obligation to explain the appropriateness of its proposed monitoring by stating that it is proposing monitoring for non-exempt limits that is based on the monitoring conducted for certain types of exempt emission limits.

Examples of situations that may involve both exempt and non-exempt limits for the same pollutant-specific emissions unit include the following. One example would be a pollutant-specific emissions unit that is subject to both a particulate matter limit and enforceable conditions to operate a control device within certain parameters. In this example, if compliance with the parameter conditions is determined by a continuous compliance determination method, that monitoring could be used to provide a reasonable assurance of compliance with the particulate matter limit, provided that the monitoring included all necessary parameters to satisfy § 64.3(a). In contrast, another example of multiple emission limitations or standards could be an emissions unit that is subject to a short term emission rate limit and an annual throughput limit that has a means for determining compliance with total annual throughput. In this example, demonstrating compliance with the annual throughput limit is unlikely to assure that a control device used to comply with the short term limit continues to perform properly, and the owner or operator may have to use different or supplemental monitoring to satisfy part 64.

As noted above, emission limits established under the Acid Rain Program are exempt from part 64. The Agency expects that the part 75 monitoring required for Acid Rain sources likely will generate the data necessary to comply with part 64 as applied to other standards applicable to the same unit. However, because part 64 requires that CEMS data be reported in terms of the applicable emission limit, the owner or operator may face some additional requirements in order to generate the data in terms of the other non-Acid Rain emission limits that apply (such as a lb/mmBtu SO_2 standard).

—Two exemptions provided for in the 1993 EM proposal have been eliminated in part 64. The 1993 EM proposal included exemptions for NESHAP standards for asbestos demolition and renovation projects and NSPS standards for residential wood heaters. These source categories are exempt under part 70 and are not required to obtain operating permits. Since part 64 explicitly applies only to sources required to obtain a part 70 permit, separate exemptions for these source categories are unnecessary in the final rule.

—In addition to exempting certain emission limitations or standards, the 1996 part 64 Draft also introduced an exemption for small municipal utility emissions units in response to the large number of comments received on this issue during the extended comment period on the 1993 EM proposal (over 80 municipal power utilities submitted comments on this issue). The exemption applies to small (under 25 megawatts) existing municipal utility emissions units that are exempt from the Acid Rain Program and that supply power for sale only in peak demand or emergency situations. As commenters pointed out, these units have historically low usage rates, but, because of their nature, owners or operators cannot accept enforceable restrictions on the operation of these units for any particular year without violating their contractual obligations. Thus, these units usually have extremely high potential to emit values in comparison to actual emissions. In addition, the Agency notes that these units often are owned and operated by small municipal authorities and that the actual emissions from these units are minimal in many cases. The Agency therefore believes that a limited exemption for these units is appropriate.

To qualify for the exemption, the owners or operators of these units must include in their part 70 permit applications documentation showing that the unit is exempt from all of the monitoring requirements in 40 CFR part 75, and showing that the emissions unit is operated only to provide electricity during peaking hours or emergencies. This documentation should consist of historical operating data and contractual information.

The owner or operator must also demonstrate that the emissions unit has low annual average emissions. The rule requires the owner or operator to document that average annual emissions over the last 3 calendar years of operation are less than 50 percent of the amount required to classify the unit as a major source. If less than 3 years of historical data are available, the owner or operator can use such shorter time period that is available as the appropriate look back period.

The Agency chose the 3-year period to be consistent with the time frame used under the Acid Rain Program to define a peaking unit (see § 72.2). The 3-year period used under the CAM approach recognizes the similar circumstances presented by these small municipal power sources. The use of a 50 percent threshold is consistent with EPA's January 1995 potential to emit transition policy setting forth EPA guidance under which sources that have actual emissions well below title V applicability thresholds may avoid title V permitting by documenting those low actual emissions (see docket item A–91–52–VI–I–5 for a copy of this policy). If actual emissions exceed that 50 percent value, then the policy requires a source to obtain an enforceable restriction to reduce its potential to emit below the title V applicability threshold. The Agency believes that the principle behind that policy is equally applicable for purposes of this part 64 exemption. Based on the information supplied in comments submitted by the affected municipal utility companies, EPA believes that the vast majority of the emissions units under 25 megawatts operated at these sources will qualify for this exemption.

In response to the 1996 part 64 Draft, the Agency again received many comments that argued for expansion of the municipal utility exemption to other units which have low actual emissions. For example, the U.S. Small Business Administration submitted for discussion at the September 10, 1996, meeting a proposal (SBA proposal) to exclude entirely from part 64 any unit with emissions between 50 percent and 90 percent of the major source threshold so that the resources that would otherwise be spent on implementing part 64 for those sources could be saved; further, the SBA comments included a recommendation that EPA give partial credit for emission control measures rather than determining applicability based on total potential pre-control device emissions. The SBA proposal stated that this would eliminate possibly thousands of sources that do not need to be covered by part 64 since the reasonable assurance can be obtained through the facilities' own records. A number of commenters specifically expressed their support for the SBA proposal and others stated generally that they were in favor of such an exemption, arguing that any unit that can demonstrate a history of limited usage and an expectation of continued limited usage should be exempted.

The EPA disagrees with the concept of using actual emissions as the overall basis for part 64 applicability or as the basis for expanding significantly the municipal utility exemption. First, actual emissions can vary with changes in production. More importantly, for units with control devices, calculations of actual emissions necessarily rely on assumptions about on-going performance that part 64 is intended to verify. Further, to assure that units remain under the major source threshold is not the goal of part 64, but, instead, the goal of part 64 is to assure that sources meet all applicable requirements. Finally, because the types of sources to which commenters referred are unlikely to meet the control device applicability criterion of the final rule, the Agency feels even more strongly that the final rule will not subject small units to inappropriate monitoring. The Agency notes, however, that such units will remain subject to the monitoring requirements in part 70, and may have to adopt new or modified monitoring to comply with those requirements, even though part 64 does not apply.

4. Hazardous Air Pollutant Requirements

Under the 1993 EM proposal, part 64 would have applied to all emission limitations or standards established under 40 CFR part 61 at any source that is required to obtain an operating permit under part 70. The proposed rule contained an exemption, retained in modified form in the final part 64 rule, for all hazardous air pollutant emissions standards promulgated pursuant to section 112 of the Clean Air Act except for those standards established in part 61 prior to the 1990 Amendments to the Act.

After receiving substantial public comment on the applicability of part 64 to hazardous air pollutants, the Agency has significantly modified its approach to HAPs under part 64. Hazardous air pollutant sources are no longer a separate category subject to a different applicability test. Instead, hazardous air pollutant emissions limitations and standards are treated the same as those for criteria air pollutants. Thus, a hazardous air pollutant-specific emissions unit is subject to part 64 only if it meets the applicability criteria set forth in § 64.2(a).

This approach is consistent with the Agency's overall goal of streamlining part 64. The EPA believes the final part 64, in conjunction with other regulatory provisions, provides for sufficient monitoring of hazardous air pollutant sources to both satisfy the statutory enhanced monitoring mandate and to meet the special concerns associated with regulating pollutants of this type. In addition, units and sources which do not meet the part 64 applicability threshold will still be subject to part 61 compliance monitoring and, if applicable, part 70 monitoring. For those units, EPA considers such monitoring sufficient to address the special concerns of regulating hazardous air pollutants.

With respect to emissions units subject to new hazardous air pollutant standards under amended section 112 of the Act, EPA will include appropriate monitoring requirements as part of those new hazardous air pollutant standards. Since part 64 monitoring for these standards would be needlessly duplicative, such standards are covered by the exemption in § 64.2(b)(1)(i). This approach is consistent with EPA's statement in the July 21, 1992 preamble to 40 CFR part 70 that all future rulemakings will have no gap in their monitoring provisions (see 57 FR 32278).

C. Section 64.3—Monitoring Design Criteria

Section 64.3 contains the design criteria for satisfying part 64. The selection and design of monitoring have undergone revision in the final rule. Some of these revisions were necessary to conform these provisions to applicability and implementation requirements under the final rule. Others have been made in response to public comments on the monitoring design and selection requirements in the 1993 proposed EM rule and subsequent drafts of part 64. These revisions reflect both the objective of providing a reasonable assurance of compliance with applicable requirements at lower cost than the 1993 proposed EM rule and the Agency's goal of developing a more simplified structure for part 64. The following section describes the specific revisions to these provisions and the Agency's rationale for making these changes.

1. General Criteria

a. *Overview.* The general purpose of the monitoring required by part 64 is to assure compliance with emission standards through requiring monitoring of the operation and maintenance of the control equipment and, if applicable, operating conditions of the pollutant-specific emissions unit. A basic assumption of EPA air pollution control rulemaking, at least under technology-based programs such as the NSPS program, is that an emission limit should be established at a point where a well operated and maintained source can achieve the limit under all expected operating conditions using control equipment that has been shown through a performance test to be capable of achieving the emission limit. This demonstration through a performance test is conducted under conditions specified by the applicable rule or, if not specified, generally under conditions representative of maximum emission potential under anticipated operating conditions (generally, but not always, at full load). Logically, therefore, once an owner or operator has shown that the installed control equipment can comply with an emission limit, there will be a reasonable assurance of ongoing compliance with the emission limit as long as the emissions unit is operated under the conditions anticipated and the control equipment is operated and maintained properly. This logical assumption is the basis of EPA standard-setting under the NSPS program and serves as the model for the CAM approach as well.

For example, under 40 CFR part 60, subpart NN, Phosphate Rock Plants, the standard for particulate matter is determined through Method 5 testing. The final preamble noted that certain commenters believed that the particulate emission limits "were too stringent to be achieved on a continuous basis." Upon review of the information, EPA revised the standard because its evaluation "indicated that the proposed emission limits . . . could not be achieved continuously under all operating conditions which are likely to occur." 47 FR 16584 (April 16, 1982). EPA then stated that "(a)s required by the Clean Air Act, the promulgated . . . emission limits are based on the performance of the best available control equipment on the worst case uncontrolled emission levels. The best control systems have been demonstrated to be continuously effective. Therefore, there should be no problems achieving the standards if the control equipment is properly maintained and operated." Id. at 16585. This example documents the close nexus of first demonstrating through a performance test that the installed control equipment is capable of achieving the standard on a continuous basis and then properly operating and maintaining that equipment so as to provide a reasonable assurance of continuous compliance with the standard.

In EPA's Response to Remand in *Portland Cement Association* v. *Ruckelshaus* (see docket item A–91–52–VI–I–11), EPA further emphasized, in its discussion on opacity, the important relationship between proper operation and maintenance and attainment of the standards. The Agency stated, "[T]he opacity standards and maintenance requirements were both promulgated, and work in tandem to guarantee that proper maintenance and operation of pollution control equipment, the sine qua non of continuous compliance with emission limits, can in fact be required and monitored." (Response to Remand, p. 87.) EPA discussed the fact that opacity standards provide enforcement agencies with a convenient indicator of whether pollution control devices are being properly operated and maintained, and therefore whether the standards are being met. (Response to Remand, p. 27–28.)

These examples point to the underlying assumption that there is a reasonable assurance of compliance with emission limits so long as the emission unit is operated under the conditions anticipated and the control equipment that has been proven capable of complying continues to be operated and maintained properly. In most cases, this relationship can be shown to exist through the performance testing without additional site-specific correlation of operational indicators with actual emission values. The monitoring design criteria in § 64.3(a) build on this fundamental premise of the regulatory structure.

Thus, § 64.3(a) states that units with control devices must meet certain general monitoring design criteria in order to provide a reasonable assurance of compliance with emission limitations or standards for the anticipated range of operations at a pollutant-specific emissions unit. These criteria mandate the monitoring of one or more indicators of the performance of the applicable control device, associated capture system, and/or any processes significant to achieving compliance. The owner or operator shall establish appropriate ranges or designated conditions for the selected indicators such that operating within the established ranges will provide a reasonable assurance of compliance for the anticipated range of operating conditions. The requirement to establish an indicator range provides the objective screening measure to indicate proper operation and maintenance of the emissions unit and the control technology, i.e., operation and maintenance such that there is a reasonable assurance of compliance with emission limitations or standards. Monitoring based on indicator ranges that establish expected operating conditions and the proper functioning of control technology should take into account reasonably anticipated operating conditions and the process and pollution control device parameters that significantly affect emission control performance. The Agency notes that monitoring which fails to take into account significant process or control device parameters is unlikely to provide the reasonable assurance of compliance with emissions limitations or standards. The Agency does not expect that such parameters would normally include records of regular maintenance practices (e.g., periodic inspection and replacement of parts); these records may or may not be addressed in separate permit conditions relative to part 70 requirements. The Agency also emphasizes that a failure to stay within the indicator range does not automatically indicate a failure to satisfy applicable requirements. The failure to stay within an indicator range (over the appropriate averaging period, as discussed below) does indicate the need for the owner or operator to evaluate and determine whether corrective action is necessary to return operations within design parameters, and to act upon that determination as appropriate.

The use of operational data collected during performance testing is a key element in establishing indicator ranges; however, other relevant information in establishing indicator ranges would be engineering assessments, historical data, and vendor data. Indicator ranges do not need to be correlated across the whole range of potential emissions. Criteria developed in the design of the control equipment for the emissions unit may be used in establishing operating indicator ranges. For example, the engineering specifications for a venturi scrubber installed to control particulate emissions from an affected unit may include design operational ranges for liquid flow rate and pressure drop across the venturi. Assume for this simplified example that the scrubber design conditions are intended to achieve the desired emission reduction for uncontrolled pollutant rates that correspond to 120 percent of the affected unit's process design rate. The results of a performance test during which the scrubber is operated within these design conditions and the process is operated at conditions representative of high load (near 100 percent of process design rate) would be used to confirm that operating within the design conditions, the design ranges for the liquid flow rate in conjunction with the pressure drop across the venturi, achieves the emission reduction desired and provides a reasonable assurance of compliance across the anticipated range of process conditions for ongoing operation.

Review of historical monitoring data may also be used in defining an indicator range that provides a reasonable assurance of compliance with emission limits. Consider the example of a process dryer equipped with a low-energy wet scrubber for particulate matter control. The scrubber exhaust gas temperature is indicative of adequate water flow (as a result of the heat exchange between the dryer effluent stream and the scrubber water). However, since the inlet scrubber water temperature is affected by ambient temperature, the resulting scrubber outlet temperature will be affected by ambient conditions. Since the scrubber outlet temperature will vary somewhat as a result of ambient temperature, it makes sense to consider historical data from different seasons of the year when establishing the indicator range (maximum allowable exhaust temperature). In other words, if the performance test were conducted in the spring, one should also consider the historical data from the summer months (when the exhaust temperature would be expected to be slightly higher) when establishing the indicator range.

b. *Possible Monitoring Methods.* Section 64.4(a)(2) of the 1993 proposed EM rule stated that an enhanced monitoring protocol could include existing, modified, or new monitoring systems. It also contained a list of possible monitoring methods which could satisfy the rule. The basic elements of this subsection have been moved in the final rule to the definition of "monitoring" in § 64.1. The Agency has made several technical changes to the list of monitoring methodologies in response to comments received. See Section II.A. and the Response to Comments Document for further discussion.

c. *Indicator Ranges or Designated Conditions.* Sections 64.3(a)(2) and (3) of the final rule require the owner or operator of an affected pollutant-specific emissions unit to establish ranges or designated conditions of the indicators to be monitored. These ranges (e.g., minimum to maximum parameter value) or conditions (e.g., specific fuel or raw material type or control device adjustment) must be established at a level where the monitoring can assess whether there is a reasonable assurance of compliance with applicable requirements.

The addition of indicator range requirements to the general monitoring design criteria serves the objectives of part 64 and provides the permitting authority and the owner or operator of an affected source with information about the operation and maintenance of control measures in order to address any problems with that operation and maintenance before an emissions unit fails to comply with applicable requirements. An excursion from an indicator range or designated condition indicates a potential problem in the operation and maintenance of the control device and a possible exception to compliance with applicable requirements. The excursion signals, at a minimum, that the owner or operator should take appropriate corrective action to return operations within the established ranges. However, an excursion from an indicator range does not necessarily constitute a failure to comply with the underlying emissions limitation or standard. See Section II.D. below for further discussion on the degree of documentation required to establish indicator ranges under the final rule.

Sections 64.3(a)(3)(i)-(iv) state that ranges may be set as follows: established as a single maximum or minimum value if appropriate or at different levels that vary depending on alternative operating conditions; expressed as a function of process variables; expressed as maintaining the applicable parameter in a particular operational status; or expressed as interdependent between more than one indicator. These sections also provide examples of how such different forms of ranges might be employed. The description of what type of indicators and indicator ranges may be employed under part 64 is designed to have a great deal of flexibility. This allows owners or operators to develop indicators and ranges that are most appropriate for their affected emissions units, so long as the basic design criteria of part 64 are met. The Agency is also developing guidance materials that will provide more specific examples of the various forms indicator ranges may take.

d. *Control Device Bypass.* Another monitor design requirement in the final rule addresses the possibility of control device bypass. Section 64.3(a)(2) requires that the monitoring be designed to detect any bypass of a control device or capture system, if such bypass can occur based on the design of the pollutant-specific emissions unit. The Agency believes this requirement is necessary under the CAM approach. Only pollutant-specific emissions units which use control devices to achieve regulatory compliance are subject to part 64. Part 64 monitoring generally will consist of monitoring parameters critical to the operation of those control devices. The monitoring will not be able to provide a reasonable assurance of compliance with applicable requirements if air pollutant emissions are potentially circumventing the control devices and/or capture systems being monitored. The Agency has therefore added this requirement to ensure that no emissions are bypassing the control device or capture system.

The Agency notes that certain comments on the 1996 part 64 Draft objected to this requirement. One objection was that it could be read to require monitoring of "bypass" that involves routine recycling of vent streams to a process where the control device is used as a backup in case such process recycling cannot occur. The final rule adds the phrase "to the atmosphere" to clarify that only bypasses which result in discharge to the atmosphere require monitoring. Another concern was that whether bypass monitoring should be required is often negotiated as part of underlying rulemakings and this requirement could undo agreements reached on those underlying rules. The Agency has added a provision to clarify that bypass monitoring is not required if an underlying rule specifically provides that it is not required for certain operations or units. Finally, a concern was raised that certain underlying rules provide for design features that obviate the need for monitoring (such as the use of locking car seals). The final rule requires bypass monitoring only if the bypass can occur based on the unit's design. Where features such as locking car seals are used, the design of the unit effectively prevents bypass and thus monitoring would not be required.

e. *Process and Capture System Monitoring.* Commenters on the 1996 part 64 Draft also objected to the requirement that the monitoring include process monitoring if necessary to assure proper operation and maintenance of the control device. The final rule retains this requirement, but the language has been rephrased to clarify that process monitoring must be conducted only as necessary to document that the control equipment is being operated properly. The simplest example would be throughput monitoring to assure that the design capacity of the control equipment is not exceeded. The Agency believes that this type of monitoring is essential to assuring that the control equipment is used in accordance with its design and in a manner that will provide a reasonable assurance of compliance.

Similarly, some commenters objected to the monitoring of capture systems. The Agency believes that this monitoring is essential for the same reasons as bypass and process monitoring may be critical to assuring proper operation and maintenance of control equipment and providing a reasonable assurance of compliance with emission limits. If emissions are not properly captured, those emissions will be released uncontrolled. That result likely would constitute a significant compliance problem even if the control equipment itself was being operated and maintained properly. It is essential that the emissions which a control device is supposed to be controlling are in fact sent to the device for control. Thus the Agency believes that assuring that the capture system is properly operated and maintained is also essential.

f. *Fugitive Emissions Monitoring.* Under the 1993 EM proposal, fugitive emission points for which compliance is evaluated on a process-wide or facility-wide basis were potentially subject to part 64 enhanced monitoring requirements. Section 64.4(d) of the proposed rule would have established enhanced monitoring protocol requirements for such fugitive emissions points. Many commenters raised objections to these provisions, arguing that § 64.4(d) required either burdensome monitoring of emissions from each fugitive emissions point or the use of costly monitoring devices to monitor fugitive emissions. The Agency does not necessarily agree with these comments, noting that proposed § 64.4(d) was intended to allow for cost-effective multi-point monitoring at affected fugitive emissions sources. The final rule, however, applies only to those emissions units for which emissions are vented to a control device. By definition, fugitive emissions are those emissions which cannot reasonably be vented through a stack, chimney, vent, or similar opening and thus will not be subject to part 64. Since there is no need for detailed fugitive emissions monitoring requirements under the final rule, the provisions in proposed § 64.4(d) have been eliminated.

2. Performance and Operating Criteria

The final part 64, like the 1993 EM proposal, requires that part 64 monitoring be subject to minimum performance specifications, quality assurance and control requirements, monitoring frequency requirements, and data availability requirements. These requirements assure that the data generated by the monitoring under part 64 present valid and sufficient information on the actual conditions being monitored. The final rule includes a series of performance and operating design criteria in §§ 64.3(b) through (d). The Agency received substantial public comment on the performance and operating criteria of the 1993 EM proposal, which were contained in a series of four appendices. Many commenters raised concerns that the organization of the appendices was confusing. A number of commenters suggested that the appendices required certain monitoring options to achieve inapplicable specifications or did not provide adequate guidance on the requirements for non-instrumental monitoring options. Commenters also raised a number of concerns specific to individual requirements. Finally, a great many commenters argued that the reliance on detailed specifications in the appendices which focused on the use of certain monitoring methodologies, such as CEMS, precluded the use of more cost-effective alternative methodologies, creating a strong bias for the use of continuous emission monitoring methodologies.

The Agency agrees with a number of those comments and has substantially revised the performance and operating criteria in the final rule to address the concerns they raised. Overall, these requirements have been greatly streamlined and simplified. There are no appendices to the final rule delineating more detailed performance and operating criteria. To assure consistency with existing monitoring programs, the performance criteria in the final rule also reflect other federal monitoring requirements, such as the NSPS general provisions in 40 CFR part

60 and the NESHAP general provisions in 40 CFR part 63. The following discussion addresses each of the key performance and operating criteria in the final rule.

a. *Data Representativeness.* Section 64.3(b)(1) of the final rule requires that the monitoring proposed by the owner or operator include location and installation specifications (if applicable) that allow for the obtaining of data which are representative of the emissions or parameters being monitored. Although this provision describes no specific tests for monitoring plan acceptability, it does establish an objective duty to insure that the data collected are representative of the operations being monitored. This provision is similar to the analogous requirements included in appendix B of the 1993 EM proposal. It is also analogous to the general monitoring provisions applicable to all monitoring under the NSPS program in § 60.13. The Agency has added the phrase "if applicable" to clarify that noninstrumental monitoring approaches may not require location or installation specifications.

The 1993 EM proposal would have required owners or operators to "[s]atisfy applicable performance, equipment, installation and calibration gas specifications in accordance with the specifications and procedures provided in appendices A and B of this part." The appendices then required all enhanced monitoring protocols to satisfy generally applicable performance specifications including relative accuracy requirements; maximum levels of calibration error; measurement span requirements; response time requirements; measurement technique procedures; and requirements for equipment design, installation, and location. Many commenters observed that the high level of specificity required in the proposed appendices would limit the types of monitoring protocols that could be approved, while many other commenters argued that the performance and operating requirements were too subjective when applied in the context of demonstrating compliance with the 1993 EM proposed rule's general monitoring requirements. The Agency believes that such detailed requirements are unnecessary for the type of monitoring that is required to satisfy the final rule, but does believe that the general obligation to assure that representative data are obtained is necessary in part 64 just as it is in other programs such as NSPS.

b. *Verification of Operational Status.* Section 64.3(b)(2) requires verification procedures to confirm the initial operational status of new or modified monitoring equipment. These requirements specify that the owner or operator must consider manufacturer requirements or recommendations for installation, calibration and start-up operation. Owners or operators must provide documentation where the manufacturer's procedures are not followed. The Agency notes that under the NSPS program such manufacturer requirements and recommendations must be followed. However, because of the breadth of part 64 applicability, the Agency believes that the more flexible language in § 64.3(b)(2) is appropriate, especially given that the submittal requirements in § 64.4 will require that the owner or operator document the changes it proposes.

Some comments on the 1996 part 64 Draft stated that the requirements to verify operational status were overly burdensome given that many units will rely on existing monitoring to satisfy part 64. The final rule clarifies that verification of operational status is required only for units with new or modified monitoring.

c. *Quality Assurance and Control.* Section 64.3(b)(3) of the final rule requires quality assurance and control practices which are "adequate to ensure the continuing validity of the data." This language ensures that monitoring under part 64 will have to include adequate procedures to document that the monitoring remains operational and can provide suitable readings for the purpose of measuring changes in control performance. Satisfying this general design criterion should not be confused with the detailed quality assurance provisions required for monitors that are used to determine direct emission limit compliance, such as appendix F to part 60. The 1993 EM proposal generally would have required compliance with appendix F for CEMS or comparable quality assurance requirements for other monitoring approaches. Numerous commenters expressed concerns about the burdens of quality assurance under the proposed EM rule. They pointed out several instances in the proposed appendices that appeared to establish presumptions of daily calibrations for all types of enhanced monitoring protocols or appeared to require overly frequent reverification of parametric correlations.

In contrast, the focus of the final rule's quality assurance requirements is on the minimum degree of ongoing quality checks that are necessary to rely on the data for purposes of indicating whether the unit remains in compliance and whether corrective action is necessary. The Agency recognizes that many types of monitoring which satisfy the final rule will not be based on the type of sophisticated equipment that is prone to calibration drift and loss of data quality over time, and the revised quality assurance provisions of the final rule reflect this understanding. The required level of quality assurance differs from certain existing quality assurance procedures such as appendix F of 40 CFR part 60 for a CEMS. With respect to a CEMS, the general requirements for assuring ongoing data quality that are contained in 40 CFR 60.13 and the performance specifications in appendix B of part 60 (such as zero and span checks) provide adequate quality control checks for the purpose of using the CEMS to indicate control performance for providing assurance of compliance. This approach of requiring only limited quality assurance is followed under the NSPS where a CEMS is not used as the compliance test method for direct continuous compliance monitoring. For types of monitoring other than CEMS, ongoing quality control measures must be adequate to ensure that the monitoring remains operational and can provide readings suitable for the purpose of measuring changes in control performance that indicate possible exceptions to compliance. An example of this type of requirement is the quarterly recalibration requirement in § 60.683(c) for wet scrubber parameter monitoring at wool fiberglass insulation manufacturing plants.

Again, the final § 64.3(b) directs owners or operators to consider manufacturer requirements or recommendations in developing quality assurance practices, and § 64.4 requires the owner or operator to document any changes in recommended quality assurance practices. The permitting authority and others can then evaluate the proposed procedures during the permitting process.

d. *Frequency of Monitoring.* Section 64.3(b)(4) of the final rule establishes the general criteria for monitoring frequency, data collection procedures (such as manual log entry, strip chart, or computerized collection procedures), and data averaging periods, if applicable to the proposed monitoring. The final rule requires that the monitoring frequency (including associated averaging periods) be designed to obtain data at such intervals that are, at a minimum, commensurate with the time period over which an excursion from an indicator range is likely to be observed based on the characteristics and typical variability of the pollutant-specific emissions unit (including the control device and associated capture system).

In addition, the final rule specifies minimum data collection frequency for pollutant-specific emissions units in accordance with their potential to emit. For "large" pollutant-specific emissions units (i.e., those units with the potential to emit the applicable pollutant emitted in an amount equivalent to or in excess of the amount established for classification as a major source), the monitoring frequency generally must satisfy a design criterion of four or more data values equally spaced over each hour of operation. This minimum data collection frequency is consistent with the frequency established by the Agency for continuous monitoring systems. Note that a permitting authority may reduce this minimum data collection frequency upon submission and approval of a request prepared by the owner or operator, and the rule provides a non-exclusive list of situations in which less frequent monitoring of certain parameters may be warranted. Other pollutant-specific emissions units are subject to a less frequent data collection requirement but some data must be collected for every unit subject to this rule at least once per day. The final rule thus sets a monitoring frequency standard appropriate to the focus on detecting changes in control device performance which could indicate possible noncompliance and for which corrective action is appropriate.

For example, many types of control devices are subject to rapid changes in performance and thus the frequency design criterion could result in frequent, near continuous collection of parametric data that are subsequently averaged over an appropriate period of time. Many NSPS subparts require continuous parametric control device data, which are then averaged over an appropriate interval (often consistent with the required minimum time for conducting a compliance test). Recent NESHAP have required control device parameter monitoring for direct compliance purposes. In these instances, a daily average of continuous data (i.e., data recorded at least every 15 minutes) is often used (see, e.g., § 63.152(b)(2)). For some control devices, the intervals between data collection points may be increased. The Agency is in the process of developing guidance for part 64 implementation, including example monitoring approaches. The guidance will indicate how the frequency of monitoring, data collection procedures, and averaging of data points can vary based on the type of emissions unit and the control device involved.

e. *Data Availability.* The 1996 part 64 Draft rule included a presumptive minimum data availability of 90 percent for the averaging periods in a reporting period. The final rule does not include such a presumptive requirement opting instead for affording the source owner or operator and the permitting authority flexibility in establishing appropriate site-specific conditions. Further, the final rule maintains the general duty requirement in § 64.7 that the owner or operator shall maintain and operate the monitoring at all times the pollutant-specific emissions unit is operating except for periods of monitoring malfunctions, associated repairs, and required quality assurance or control activities (such as calibration checks and (if applicable) required zero and span adjustments). This section of the final rule also requires that the owner or operator shall use all the data collected during all other periods in assessing the operation of the control device and associated control system. Under the savings provisions of § 64.10 of the final rule, source owners or operators must satisfy any existing data availability requirement established for monitoring associated with a particular emission limitation or standard.

The 1993 EM proposal would have required that an enhanced monitoring protocol satisfy any minimum data availability requirement that is applicable to the monitoring under a separate applicable emission limitation or standard pursuant to part 60 or 61 of this chapter. Where no existing data availability requirement would have applied, the proposed rule would have required the enhanced monitoring protocol to satisfy a data availability requirement that reflected obtaining quality-assured data for all emissions unit operating time periods excluding a fixed percentage of operating time that the owner or operator justified to the permitting authority as necessary to conduct quality assurance procedures. The preamble to the proposed rule stated that the only acceptable downtime under this requirement would be the time necessary to perform quality assurance testing and routine maintenance. The primary concern expressed in public comments on the data availability requirement was that the default requirement failed to take into account the likelihood that some repairs of instrumental components would be necessary even if the owner or operator performed all routine maintenance as appropriate. The Agency believes that the general duty requirement in the final rule effectively addresses the commenters' concerns, while still assuring that the owner or operator is responsible for collecting data at all required intervals, except where downtime is necessary to conduct required quality assurance or to respond to malfunctions that could not reasonably have been prevented.

A number of comments on the 1996 part 64 Draft objected to the 90 percent data availability presumption. Many pointed to a number of applicable requirements in which EPA has used 75 percent as the required minimum data availability. Others argued that EPA failed to present any data to document the reasonableness of the presumption. The Agency agrees with some of the commenters that a presumptive minimum data availability requirement may not be not generally applicable; although, the general obligations to operate the monitoring at all times with only specific exception periods and to collect and use all the data for reporting purposes are universal. The final rule reflects this position and allows the source owner or operator and the permitting authority the flexibility to specify a separate minimum data availability if justified or required under a separate rule.

3. Special Considerations for CEMS, COMS and PEMS

One method of assessing control performance is to calculate emission (or opacity) rates directly in order to track trends in emissions (or opacity) that document decreased control effectiveness. This type of monitoring could include a continuous emission or opacity monitoring system (CEMS or COMS) or a predictive emission monitoring system (PEMS) in which various process and control parameters are evaluated to predict emissions. (Where this type of monitoring is specified by the applicable standard to be used to determine compliance with an emission standard or limitation on a continuous basis, the requirements of part 64 do not apply to that emission standard or limitation. *See* § 64.2(b)(1)(vi).)

The EPA believes that these types of monitoring are preferable from a technical and policy perspective as a means of assuring compliance with applicable requirements because they can provide data directly in terms of the applicable emission limitation or standard. Therefore, where such systems are already required, § 64.3(d)(1) mandates that the design of the monitoring under part 64 incorporate such systems. This means that source owners and or operators whose emission units have had CEMS, COMS, and/or PEMS imposed by underlying regulations, emissions trading programs, judicial settlements, or through other circumstances must use those CEMS, COMS, and/or PEMS when complying with part 64 for those emissions units. Even where the use of such monitoring is not mandated, the use of any of these types of systems in accordance with general monitoring requirements and performance specifications (or comparable permitting authority requirements if there are no requirements specified for a particular system) will be sufficient for a CEMS, COMS or PEMS to satisfy generally the design criteria in § 64.3(a) and (b).

One exception to this general rule is that if a COMS is used as a control performance indicator, and both a particulate matter and opacity standard apply, the monitoring will have to include an indicator range satisfying § 64.3(a)(2) and (3). Comments received in response to the 1996 part 64 Draft included the suggestion that COMS not be subject to the requirement to establish indicator ranges. The Agency has decided to retain this requirement. A CEMS or PEMS will provide data in terms of the applicable pollutant and therefore the process of identifying and reporting exceedances serves the same purpose as an indicator range. For assuring compliance with an opacity standard, a COMS also achieves this objective. However, depending on the type of control equipment being used and the design of an emissions unit (especially stack diameter), opacity standards are often established at a level which represents a likely significant exceedance of the particulate matter standard. In those circumstances, an opacity level below a required opacity standard would be more appropriate as a CAM indicator. Therefore, the use of a COMS may require an appropriate indicator range to be established that is different than the applicable opacity standard. The Agency notes that the averaging period for such an indicator range would not necessarily have to be consistent with the typical averaging time of an opacity standard (i.e., six minutes).

The final special design criterion for a CEMS, COMS or PEMS is to design the system to allow for reporting of exceedances. Again, in many cases, the reporting requirements for exceedances (or excess emissions) will already be established in existing requirements. However, in some cases the owner or operator, prior to implementing part 64, will not have continuous monitoring associated with an applicable emission limit, and the underlying regulation may not specify an appropriate time period for averaging data to report excess emissions. For example, this situation could arise in the example provided above for a part 75 Acid Rain CEMS being used to monitor compliance with a SIP limit. In this circumstance, the owner or operator will have to design the system to include an appropriate period for defining exceedances consistent with the emission limitation or standard. If the underlying applicable requirement does not require use of a specific averaging period, the averaging period should be designed using the same criteria as used for other part 64 monitoring under § 64.3(b)(4).

There was a concern about a perceived bias towards continuous emission monitoring methodologies in many public comments on the monitoring design and selection provisions of the 1993 EM proposal. In addition, many comments supported the notion that existing monitoring should be used wherever possible to reduce the burdens of part 64. Section 64.3(d) addresses both of these comment areas. It emphasizes the use of existing monitoring where that monitoring on its face is able to meet the part 64 design criteria, but it clarifies that the rule does not mandate the use of CEMS in situations where such monitoring is not already required. See also Section II.D. below which discusses in further detail the potential use of existing monitoring to satisfy part 64.

Stakeholders commented that the 1996 part 64 Draft rule did not address procedures for approving alternatives to CEMS or COMS as per the procedures specified in the general provisions of 40 CFR parts 60, 61, and 63. The Agency already has procedures for documenting, reviewing, and approving alternatives to performance test methods and monitoring procedures. Part 64 need not address these procedures. The Agency recommends that source owners or operators wishing to pursue alternatives to CEMS or COMS follow existing alternative methods processes.

4. Monitor Failures

Section 64.4(g) of the 1993 EM proposal would have provided a defense to violations of the data availability requirement where an interruption of the normal operation of an enhanced monitoring protocol was the result of a monitor failure or malfunction. This section would have operated in conjunction with proposed § 64.5(e) to establish general notification and corrective action requirements in response to monitor failures and malfunctions. The proposed rule would have provided a defense to data availability violations where the following criteria were met: The monitoring failure was the result of a sudden and unforeseeable malfunction; the monitoring systems and procedures had been properly operated and maintained prior to and up to the time of the malfunction; and the owner or operator took all reasonable steps to minimize the period the monitoring system was inoperative.

This section has been eliminated in the final rule. The Agency does not believe that there is a need for a data availability violation defense in part 64. The final rule does not require that the permit establish a specific data availability requirement. Rather, the owner or operator is under a general duty to operate the monitoring at all required intervals whenever the emissions unit is operating. The only exception to this duty is if the inoperation of the monitoring is caused by a monitor malfunction, associated repairs or required quality assurance or control activities. Monitor malfunctions are limited to those breakdowns which occur as a result of a sudden, infrequent, and not reasonably preventable failure of the monitoring to provide valid data. Monitoring failures that are caused in part by poor maintenance or careless operation are not considered malfunctions. This approach is similar to the malfunction defense included in the proposed rule, but does not entail the elaborate procedural elements of the proposed rule. To the extent a particular data availability requirement cannot be achieved for reasons that are no fault of the owner or operator, EPA believes that the proper use of oversight discretion can account for those situations.

D. Section 64.4—Submittal Requirements

Section 64.4 of the final rule outlines what information the owner or operator must submit with a part 70 permit application to propose the monitoring approach selected by the owner or operator. The required information has two basic components: general information necessary to justify the appropriateness of the proposed monitoring; and information to justify the appropriateness of the indicator ranges to be used for reporting exceedances or excursions.

1. General Information on the Proposed Monitoring

Section 64.4(a) first requires that the owner or operator identify the basic monitoring approach and indicator ranges that will form the primary elements of the monitoring, as well as the key performance and operating specifications needed to meet the design criteria in § 64.3. In submitting proposed indicator ranges, the owner or operator can either submit the actual proposed ranges or the methodology that will be followed to establish the indicator ranges.

Section 64.4(b) then requires that the owner or operator submit relevant information to justify the proposed monitoring approach. The justification can rely on any available information, including appropriate reference materials and guidance documents. If an existing requirement already establishes monitoring for the pollutant-specific emissions unit, the justification can rely in part on that existing requirement. For certain types of monitoring, no extensive justification should be necessary because the final rule creates a rebuttable presumption that the monitoring satisfies part 64. When an owner or operator relies on one of these monitoring approaches, all that initially should be necessary is an explanation of why the monitoring is applicable to the unit in question. These types of monitoring include CEMS, COMS, or PEMS; excepted or alternative monitoring approaches allowed under part 75; and continuous compliance determination monitoring or monitoring for post-11/90 NSPS and NESHAP requirements that are exempt under § 64.2(b) but that may be applicable to the control equipment for other non-exempt emissions limitations at the same emissions unit. The reason for this presumption is similar to the reason for excepting from part 64 units that have such monitoring as their compliance determination method. The rule also notes that presumptively acceptable or required monitoring approaches established by rule by a State to achieve compliance with part 64 are deemed presumptively acceptable. This last option is included to promote the adoption of State programmatic rules designed to detail presumptively appropriate part 64 monitoring.

Finally, consistent with *Panhandle Producers & Royalty Owners Ass'n* v. *Economic Regulatory Administration*, 822 F.2d 1105 (D.C. Cir. 1987), the rule includes as presumptively acceptable monitoring, monitoring that is so designated by EPA through guidance documents. Such presumptively acceptable monitoring identified by EPA in guidance may also serve as models for permitting authorities to consider in programmatic rulemaking. Generally, EPA intends to issue such guidance only after providing notice and seeking comment on such monitoring. After considering comments received on the monitoring requirements for flares in 40 CFR 60.18, EPA is designating, at this time, that monitoring as presumptively acceptable. This designation is being made in recognition that some published monitoring practices or protocols provide sufficient design and monitoring performance specifications to satisfy CAM requirements while not fully satisfying the part 64 definition for a continuous compliance determination method. Some presumptively monitoring protocols may include procedures for calculating compliance with applicable emission limitations or standards but have some portions subject to CAM requirements (e.g., monitoring to indicate a reasonable assurance that control device efficiency is maintained at an assumed level) as indicated in § 64.2(b)(1)(vi) of the rule.

Reliance on presumptively acceptable monitoring will relieve owners and operators of the initial burden of justifying that the monitoring selected satisfies part 64. However, this presumption of acceptability is rebuttable, and, if information or evidence rebutting the presumption is brought forward, the owner or operator must bear the burden of justifying that the proposed monitoring complies with part 64. Final decisions as to the acceptability of monitoring rest with the informed discretion of the permitting authority, subject to permit review by EPA under 40 CFR 70.8, taking into account any appropriate presumption and all other relevant information and data.

Finally, § 64.4(b) requires the owner or operator to identify and explain any changes in manufacturer recommendations or requirements applicable to installation, verification and quality assurance of the monitoring. As explained above, the § 64.3(b) design criteria allow for these differences even though EPA generally requires the owner or operator to comply with such provisions. This documentation requirement is important to allow an appropriate evaluation of the reasons for changing these manufacturer specifications.

These submittal requirements streamline the similar requirements in the 1993 EM proposal. First, § 64.7 of the proposed rule would have required that a permit application incorporate a proposed enhanced monitoring protocol for every applicable emission limitation or standard at each emissions unit subject to the proposed rule. This protocol would have had to contain information about and supporting documentation for a number of elements, including proposed performance specifications, quality assurance procedures, test plans for conducting performance verification tests, and a list of all technologically feasible monitoring methodologies which could have been employed in the proposed protocol. Owners or operators of affected emissions units would have also been required to identify new technologically feasible monitoring methodologies when submitting a permit renewal application. Second, § 64.4(e)(3) of the proposed rule also covered permit application submittal requirements. That section would have required the owner or operator of an affected emissions unit to submit as part of a permit application all of the descriptions, explanations, justifications, and supporting data necessary to justify that a proposed enhanced monitoring protocol could satisfy the requirements of the proposed rule. This section explicitly placed the burden of proof on the owner or operator proposing an enhanced monitoring protocol to show that the protocol met the rule's requirements.

A number of commenters raised concerns about these permit application requirements. Some argued that the specific information requested, such as information pertaining to a parametric relationship, may not be available prior to installation of control technology and permit issuance. Others contended that the requirements to include information on all technologically feasible monitoring methodologies was an illustration of a perceived bias towards the use of costly continuous emission monitoring methods under the 1993 EM proposal. In response to some of these concerns and in furtherance of the goal of providing a reasonable assurance of compliance with applicable requirements, the Agency has replaced these detailed permit application requirements with the provisions described above in the final rule.

Third, many industry commenters opposed the enhanced monitoring protocol selection and proposal requirements in § 64.4(f) of the 1993 EM proposal. The proposal would have established a procedure for the selection of enhanced monitoring protocols that required owners or operators to justify the use of a proposed enhanced monitoring protocol over other available monitoring methodologies. Under this proposed procedure, owners or operators were first directed to consider "established monitoring," defined as monitoring that had been previously demonstrated as a feasible means of assessing compliance at a specific emissions unit. An owner or operator could propose to use the "best established monitoring." The determination of which established monitoring methodology was "best" was intended to be an evaluation of what type of monitoring was most appropriate to determine continuous compliance at a specific emissions unit. If no "established" monitoring methodology could satisfy the performance and operating requirements of the proposed rule, owners or operators could propose additions or modifications to an established form of monitoring. If no established monitoring methodology applied, or if the owner or operator considered the established monitoring inappropriate, then an alternative monitoring could be proposed. In these circumstances, the proposed rule required the owner or operator to identify all monitoring methodologies that were technologically feasible for the particular emissions unit, selecting from that list the "best" methodology for that unit based on a site-specific assessment.

Commenters argued that the requirement to select "best monitoring" would impose a "top-down" selection process with a bias towards selection of a CEMS or similar monitoring system. Several commenters contended that the legislative history of section 114(a)(3) did not support a requirement that the approved enhanced monitoring protocol be the "best" available. Industry commenters also stated that requiring an owner or operator who proposed alternative monitoring to list all technologically feasible monitoring methodologies would impose unnecessary costs and burdens. Most of those opposing the selection provisions suggested that the rule should allow the owner or operator to propose any monitoring that met the basic requirements of the rule. In the alternative, many commenters suggested making cost an explicit criterion in the monitoring selection process.

Under the CAM approach, the owner or operator may propose any monitoring that can meet the design criteria in § 64.3 of the final rule. Thus, the comments regarding whether 1993 EM proposal imposed a top-down selection hierarchy are no longer relevant.

In response to the 1996 draft part 64, some commenters objected to the need to submit a rationale or justification for the proposed monitoring. The Agency disagrees. This information will be necessary for the permitting authority, the public, and EPA to judge the appropriateness of the proposed monitoring for satisfying the design criteria in § 64.3. In addition, this requirement builds on similar regulatory precedents in the NSPS and NESHAP programs. Under those programs, EPA has routinely required the owner or operator to submit a proposed monitoring approach and supporting rationale where the owner or operator intends to use a control device for which the underlying standard does not contain specific monitoring procedures. (See, e.g., 40 CFR 60.473(c), 60.544(b), 60.563(e), 60.613(e) and 60.663(e).)

Commenters on the 1996 part 64 Draft also raised concerns that the rule did not contain any provisions promoting the use of existing monitoring to satisfy part 64. Clearly, many existing monitoring requirements include some degree of monitoring that is used to indicate compliance through documenting important operating variables. As such, these requirements are generally consistent with the CAM approach. Thus, §§ 64.3(b) and 64.4(b) specifically allow for the owner or operator to design and justify proposed part 64 monitoring applying or building on existing applicable requirements. The rule uses the phrase "in part" because there is no assurance that the existing monitoring necessarily satisfies all of the part 64 design criteria. As described above, for certain monitoring that the Agency believes already meets the part 64 design criteria categorically, the owner or operator is likely to be able to rely completely on those regulatory precedents to justify the monitoring proposed to satisfy part 64. The Agency believes these provisions adequately provide for the consideration of existing monitoring and build upon the "established monitoring" concept in the 1993 EM proposal without the cumbersome selection process hurdles included in that proposal.

Industry commenters on the 1996 part 64 Draft proposed that the cost of monitoring that will provide a reasonable assurance of compliance be considered in light of the reliability of the pollution control technology, the margin of compliance demonstrated for the emissions unit, the emissions variability, and the reliability of the monitoring. State and local agency commenters noted that a demonstration of a credible relationship between parameter monitoring and actual emissions was primary in determining a reasonable assurance of compliance. These agency commenters also listed reliability of monitoring, margin of compliance, and potential emissions variability as elements to consider in such a demonstration. The Agency agrees that part 64 should enable the owner or operator and the permitting authority to consider these factors in developing and approving monitoring in a manner that both allows flexibility in design and provides a reasonable assurance of compliance. As noted above, the rule specifically allows for the use and augmentation of existing monitoring in lieu of developing and installing completely new monitoring approaches. Further, §§ 64.3(c) and 64.6(a) of the final rule reference the evaluation factors mentioned by both groups of commenters to apply in developing and reviewing monitoring to meet part 64 requirements. The Agency believes that in this manner, the owner or operator and the permitting authority can agree on cost-effective monitoring that results in the reasonable assurance of compliance required by part 64.

2. Documentation and Justification for Indicator Ranges

Section 64.4(c) of the final rule requires that an owner or operator propose indicator ranges supported by data obtained during the conduct of the applicable compliance or performance testing at the pollutant-specific emissions unit and supplemented, as necessary, by engineering assessments and manufacturer's recommendations. An owner or operator can satisfy this requirement with existing compliance test method data, if applicable. The use of existing data is limited to circumstances in which no changes have occurred since the data were obtained that could significantly affect the conditions for which the indicator ranges were established since the performance testing was conducted. Such significant changes include, but are not limited to, an increase in process capacity, a modification to the control system operating conditions, or a change in fuel or raw material type or chemical content. Because of the assurances provided through representative performance testing in conjunction with documentation provided by the use of engineering and other information, the final rule also explicitly states that testing over the entire indicator range or range of potential emissions is not required.

If site-specific compliance testing method data are unavailable, § 64.4(c) gives an owner or operator two options. Indicator ranges can be based on testing to be conducted pursuant to a test plan and schedule for obtaining the necessary data. An owner or operator may also choose to rely on other forms of data to establish the proper indicator ranges. However, if the owner or operator proposes to rely on engineering assessments and other data without conducting site-specific compliance method testing, § 64.4(c)(2) requires submission of documentation to demonstrate that factors applicable to the owner or operator's specific circumstances make compliance method testing unnecessary. Section 64.6(b) gives the permitting authority the discretion to require compliance method testing where necessary to confirm the ability of the monitoring to provide data that are sufficient to satisfy part 64.

These provisions are similar to but are less prescriptive than the comparable provisions in the 1993 EM proposal as well as less contingent upon a statistical correlation between operational parameters and emission levels. Section 64.4(f) of the 1993 EM proposal would have operated with proposed § 64.4(b)(2) and appendix C to describe all requirements related to performance verification testing under the 1993 EM proposal. Section 64.4(b)(2) of the EM proposal established a duty under the proposed rule's general performance and operating criteria to conduct applicable performance verification test procedures in accordance with appendix C. Appendix C of the proposal contained specifications on the procedures to be used by an owner or operator for validating the representativeness of a monitoring protocol and the performance verification procedures for continuous monitoring systems. Section 64.4(f) would have required owners to submit with a permit application a test schedule and test plan that described the procedures, reference methods, test preparations, locations and other pertinent information for all required performance verification tests.

Section 64.4(b)(2) would have required an owner or operator who sought to include process or control device parameter monitoring in an enhanced monitoring protocol to conduct verification testing in accordance with appendix C. Section 7 of proposed appendix C described the required procedures for testing the correlation between the parameter(s) to be monitored and the applicable emission limitations or standards. Section 64.4(f)(1) of the proposed EM rule stated that a test plan for parameter monitoring correlation tests must describe any significant process or control device parameters not included in the proposed enhanced monitoring protocol and must demonstrate that excluding such parameters will not adversely affect the validity of the correlation. This section also would have required the owner or operator proposing the use of parameter monitoring to demonstrate the validity of the parameter correlation over the potential range of facility operations.

Industry commenters had a number of objections to and suggestions for improvement of the proposed rule's performance verification testing requirements and related permit application requirements. To reduce costs, some commenters suggested that performance verification tests should not need to be conducted under part 64 where adequate prior tests have been conducted pursuant to another applicable requirement. The Agency agrees and has adopted this approach in the final rule. A number of commenters expressed concerns about the level of detail which had to be included in the monitoring verification test plan. The EPA believes that the documentation provisions of the final rule will generally not require the same level of detail that would have been required under the proposed rule. Several commenters objected to the requirement to account in detail for all potentially significant parameters when documenting parameter range correlation testing. The Agency has not included a similar explicit requirement in the final rule's documentation and testing requirements for the establishment of indicator ranges. The Agency does note that an indicator range which fails to take into account significant control device parameters is unlikely to provide the reasonable assurance of compliance with emission limitations or standards required by § 64.3(a).

Finally, a number of commenters who supported the availability of parameter monitoring under the proposed rule stated that the correlation testing requirements would be difficult and expensive to meet and would discourage source owners or operators from using parameter monitoring. In addition, in response to the 1996 part 64 Draft, a number of commenters opposed the requirement to establish indicator ranges by conducting performance or compliance testing. They asserted that this either was an improper attempt to revive the correlation requirements in the 1993 EM proposal, or unnecessary to establish the appropriate range for most parameters.

As discussed above in Section II.C., the CAM approach builds on the premise that if an emissions unit is proven to be capable of achieving compliance as documented by a compliance or performance test and is thereafter operated under the conditions anticipated and if the control equipment is properly operated and maintained, then there will be a reasonable assurance that the emissions unit will remain in compliance. In most cases, this relationship can be shown to exist through results from the performance testing without additional site-specific correlation of operational indicators with actual emission values. The CAM approach builds on this fundamental premise of the regulatory structure.

However, as raised in the *Portland Cement* Response to Remand discussed in Section II.C., one difficult element of using "proper operation and maintenance" as a regulatory tool is the potential difficulty in determining whether proper operation and maintenance has in fact occurred. Thus, a critical issue that the CAM approach must address is establishing appropriate objective indicators of whether a source is "properly operated and maintained." In developing the final rule, EPA looked to past regulatory experience in developing a balanced approach to establishing indicator ranges and using the monitoring to assure compliance performance.

In proposing the operation and maintenance requirements in 40 CFR 60.11(d), EPA required that owners or operators maintain and operate their facilities "in a manner consistent with operations during the most recent performance test indicating compliance." 38 FR 10821, May 2, 1973. The obvious rationale behind this original language was that if the source was in compliance during the test, and it continued to operate its equipment as it was operated during the test, there was a reasonable assurance that the source would remain in compliance. This language, however, was revised when the rule was promulgated on October 15, 1973. In the preamble to the promulgated rule, EPA explained that the language was changed because of comments which questioned "whether it would be possible or wise to require that all of the operating conditions that happened to exist during the most recent performance test be continually maintained." 38 FR 28565. The EPA therefore revised § 60.11(d) to require that source owners or operators operate and maintain their pollution control devices "in a manner consistent with good air pollution control practices for minimizing emissions." Id.

This regulatory history argues against a strict requirement that part 64 require indicator ranges to be related exactly to the operating conditions that existed during a performance test. However, in many NSPS subparts, and more recently in MACT standards, EPA generally has required that operation and maintenance indicators be established during an initial performance test, with some allowance for adjusting the indicator values observed during the test. For instance, where a thermal incinerator is used to comply with a VOC emission limit, the NSPS subparts usually require the owner or operator to establish a baseline temperature value as an indication of whether the incinerator is properly operated and maintained. The baseline temperature value is established at a value 50 degrees Fahrenheit below the average temperature recorded during the most recent performance test (see, e.g., 40 CFR 60.615(c)(1).) In recent MACT examples, EPA has required the indicator ranges to be established during performance testing, but with an allowance to supplement the performance test data with engineering assessments; in addition, the MACT requirements often state that testing across the full range of operating conditions is not required where the indicator range is subject to review and approval. (See, e.g., 40 CFR 63.654(f)(3)(ii)(A) and 63.1334(c).)

Based on these NSPS and MACT examples, the presumptive approach for establishing indicator ranges in part 64 is to establish the ranges in the context of performance testing. To assure that conditions represented by performance testing are also generally representative of anticipated operating conditions, a performance test should be conducted under conditions specified by the applicable rule or, if not specified, generally under conditions representative of maximum emission potential under anticipated operating conditions. In addition, the rule allows for adjusting the baseline values recorded during a performance test to account for the inappropriateness of requiring that indicator conditions stay exactly the same as during a test. The use of operational data collected during performance testing is a key element in establishing indicator ranges; however, other relevant information in establishing indicator ranges would be engineering assessments, historical data, and vendor data. Indicator ranges do not need to be correlated across the whole range of potential emissions.

Finally, because the emissions units subject to part 64 will not necessarily be undergoing performance testing absent part 64 (unlike the comparable units subject to initial compliance testing under the NSPS and MACT programs), the rule does not require establishment of indicator ranges during compliance or performance testing but rather presumes the appropriateness of doing so. The Agency believes that this approach makes part 64 consistent with underlying regulations but with appropriate alternatives that reflect the different universe of emissions units subject to part 64.

E. Section 64.5—Deadlines for Submittal

The final rule establishes two alternative schedules for implementing part 64 depending on the size of the pollutant-specific emissions unit involved. Under § 64.5(a), "large" pollutant-specific emissions units are subject to the shortest implementation timetable. "Large" units are those that have the potential to emit (after controls) the applicable pollutant at or above the major source threshold. If the owner or operator has not submitted the permit application for the applicable source prior to April 20, 1998, the owner or operator must submit proposed part 64 monitoring in the next part 70 permit application. If a permit application has been submitted by the rule's effective date, but the permitting authority has not yet determined by that date that the application is complete, the owner or operator will have to supplement the application with the relevant information required under part 64. If the application has already been found complete, then the part 64 information will generally not have to be submitted until the next permit renewal application. In the interim, the monitoring requirements adopted by permitting authorities in response to the requirements in part 70 will continue to apply.

There are two circumstances where information must be submitted prior to the next permit renewal application. First, if the owner or operator submits an application for a significant permit modification after April 20, 1998, the owner or operator must submit the appropriate part 64 information for any pollutant-specific emissions unit(s) covered by the modification. This requirement will assure that significant permit revisions affecting particular emissions units are not considered in a piecemeal fashion and that part 64 is implemented as quickly as reasonably practicable. In response to comments on the 1996 part 64 Draft, the Agency has limited this provision to only significant permit revisions so that part 64 requirements will not impede permit revisions made under expedited permit revision processes, such as administrative amendments, notice only changes, or de minimis permit revision procedures that are under consideration by the Agency. Second, if the permit application has been found complete but the permit has not issued, and the owner or operator proposes to revise the application to include a change of a type that would have been subject to the significant permit revision process, had the permit been issued, then the owner or operator must include part 64 required information for the pollutant-specific emissions unit(s) identified in the application revision. This circumstance triggers part 64 implementation because this type of permit application revision would require a second completeness determination by the permitting authority, and the implementation provision of § 64.5(a)(1)(ii) would be applicable.

Also in response to comments, the final rule does not include a provision in the 1996 part 64 Draft that would have required implementation prior to permit renewal for certain permit applications being processed under a part 70 transition plan for initial permit issuance. The Agency believes that this provision unnecessarily complicates the part 64 implementation process. The Agency also notes that the current part 70 monitoring provisions will continue to apply in the interim if part 64 is not implemented until permit renewal.

For the remaining smaller pollutant-specific emissions units, part 64 implementation is delayed until permit renewal. This approach was suggested in many comments as one way to reduce the implementation burdens of the rule. Such an approach will also allow permitting authorities and owners or operators to gain experience with implementing part 64 for the largest emissions units before having to address the more numerous, but in terms of overall site emissions, less significant, smaller units. As noted above, permitting authorities can use the delay in implementation to develop programmatic requirements that can be relied on in proposing and approving part 64 monitoring; this approach will be of the most benefit for the smaller emissions units that can use these generic requirements to reduce the burdens of part 64.

The phased-in implementation approach embodied in the final part 64 rule is a departure from the implementation schedule in the 1993 EM proposal. The effective date of the proposed rule was to be 30 days after publication of the final rule in the **Federal Register**. The proposed rule did not specify how operating permits issued prior to the rule's effective date would be treated. The preamble to the proposed rule suggested that these situations would be covered by 40 CFR 70.7(f)(1)(i). Section 70.7(f)(1)(i) requires that an operating permit be reopened to address an applicable requirement which becomes applicable during the permit term if the permit has a remaining term of three or more years. Thus, under the proposed rule, the owner or operator of any facility with an operating permit that had a remaining term of three or more years after the effective date of part 64 would have been required to reopen the permit and provide the required part 64 information.

The Agency considered relying on this part 70 provision to set the implementation schedule for the rule, but chose to adopt the phased-in approach described above. Thus, the provisions in § 64.5(a) supersede the language of § 70.7(f)(1)(i). The part 70 approach would have required that a great many operating permits be reopened as soon as the rule became effective, while the phased-in approach initially focuses on new permit applications. The former is therefore more likely to cause initial burdens and delays in the permitting program. The Agency believes that the extended implementation timetable resulting from the phased-in approach is better suited to facilitating implementation through the operating permits program. In the December 1994 notice reopening the 1993 EM proposal for comment, EPA discussed the possibility of using a phased-in implementation approach as well as a "hammer" provision, which would have required enhanced monitoring to be implemented by all affected sources by January 1, 2000. Multiple commenters expressed concerns that an absolute deadline of this type would cause systemic logjams and delays in the operating permits program because it could require numerous permit revisions or reopenings outside of the normal permit renewal process.

In lieu of a "hammer" provision and to clarify that the monitoring requirements of part 70 apply irrespective of the part 64 requirements, the Agency has added explicit language to the rule stating that prior to approval and operation of part 64 monitoring, part 70 monitoring requirements apply. These part 70 monitoring requirements continue to apply even after approval and operation of part 64 monitoring; however, because part 64 contains applicable monitoring requirements sufficient to demonstrate compliance with applicable emission limitations or standards, the part 64 monitoring requirements can serve in the place of part 70 monitoring requirements.

F. Section 64.6—Approval of Monitoring

Consistent with the part 64 implementation approach, § 64.6 requires the permitting authority to approve or disapprove the monitoring proposed by the owner or operator. The following discussion highlights the key elements of this section and the key issues raised during development of the rule.

1. Approval and Permit Incorporation

If the monitoring is approved, the permitting authority must act in accordance with § 70.6(a)(3) to include appropriate permit terms that reflect the part 64 monitoring requirements. The requirements that must be reflected in the permit are: the monitoring approach (including the basic method, appropriate performance specifications, and required quality assurance checks), any specific data availability requirements, the indicator range(s), and a general statement that the owner or operator will conduct the monitoring, submit reports, maintain records, and, if applicable, identify any QIP obligations, all as required by §§ 64.7 through 64.9.

It is important to note that the rule provides for two different options for incorporating indicator range(s) in the permit. First, the actual range can be included (such as maintaining temperature of an incinerator at or above a specific number). Second, the permit can include a statement that describes how the indicator range will be established (such as "The incinerator will be maintained at a temperature at or above a temperature which is 50 degrees Fahrenheit lower than the baseline temperature recorded during the most recent performance test."). This latter type of condition would allow for reestablishment of the indicator range without the need for a permit modification. Several commenters raised concerns that there would be a need for changes to indicator ranges, especially near the beginning of the program, and that requiring permit modifications for all such changes would be burdensome and unwieldy. The Agency agrees and believes this latter option addresses the commenters' concerns while still providing adequate public comment and review on the establishment of indicator ranges at specific sources. If this type of approach is used, the permit would also need to specify how the permitting authority will be notified of the currently applicable indicator range(s).

These provisions are generally the same as required in § 64.8 of the 1993 EM proposal, although the requirements have been modified to reflect the changes in the design criteria for the monitoring required by part 64. The 1995 and 1996 part 64 Drafts included more elaborate conditions than are included in the final rule, including certain enforceability components that the Agency does not believe are necessary for effective implementation of part 64. These deleted components include provisions in the 1996 part 64 Draft that would have enabled a permitting authority to establish an indicator range as an enforceable condition and that would have established a second QIP during a permit term as a permit violation.

Whether the failure to meet an indicator range is an enforceable violation will be a matter of examining the relevant underlying applicable requirements, as well as the ability of the permitting authority to establish that type of requirement as a federally-enforceable element of a permit pursuant to approved SIP authority or as a State-only requirement pursuant to State law. As described above, for purposes of part 64, § 64.6 clarifies that the indicator ranges or the means by which they are to be established are to be included in the permit to indicate when an owner or operator is required to report excursions or exceedances. In addition, it should be noted that § 64.7 establishes the independent obligation for the owner or operator to take appropriate corrective action in response to excursions or exceedances that occur.

The Agency also decided to delete the draft requirement that a second QIP during a permit term constitutes a violation. This provision was widely criticized by both industry and State commenters. The Agency had specifically noted in the discussion accompanying the 1996 part 64 Draft that it was concerned that this approach may not be appropriate. As discussed in Sections II.G. and H., the final rule, consistent with the precedent of 40 CFR 60.11(d), provides for the general use of part 64 data and other information to document that the owner or operator has failed to operate and maintain an emission unit properly and provides for the QIP mechanism as one option for addressing situations in which such a failure has occurred. In that respect, any time a QIP is required there will be an underlying finding that the owner or operator has failed to take appropriate action and may be subject to enforcement for that violation. Thus, there is no need for the final rule to include separate enforcement consequences related to multiple QIPs.

The Agency notes that many commenters on the 1996 part 64 Draft suggested that the rule would impose too many permit requirements and that the permit should merely state that compliance with part 64 is required and that the owner or operator will take appropriate action in response to the data. Commenters pointed to the requirements for startup, shutdown, malfunction plans (SSMPs) under part 63 and section 112(r) risk management plans (RMPs) required under part 68 as examples of this approach to referencing applicable requirements in a part 70 permit.

The Agency disagrees with the approach suggested and the use of the SSMP and RMP examples cited in the comments. The two examples both involve plans which an owner or operator is required to develop in accordance with general criteria but which are not subject to approval, although there are provisions which allow EPA or the permitting authority to require changes in the plans under certain conditions. (See 40 CFR 63.6(e)(3) and 68.220.) The Agency notes that it proposed this concept to implementing part 64 in the 1995 part 64 Draft but that numerous commenters opposed this approach because there would be no final approval process for the monitoring. (See § 64.3(c) of the 1995 part 64 Draft and the comments in, for example, VI-D-38 and 45). Many commenters then seemed to request that EPA use the SSMP or RMP approach after reviewing the 1996 part 64 Draft.

After evaluating all of the comments, the Agency believes that part 64 monitoring should be incorporated into permits in the same fashion as all other required monitoring. The following discussion provides a list of the various components of the basic monitoring approach that need to be incorporated in the permit. To provide a practical example of what the "basic monitoring approach" entails, the following example is based on the use of incineration to control TRS emissions from certain affected facilities at kraft pulp mills (see 40 CFR 60.280 et seq.); the example is intended to indicate the level of detail required, and not necessarily the appropriateness of the example monitoring for satisfying part 64: "Company A will monitor the combustion temperature in the incinerator at the point of incineration of the effluent gases. Combustion temperature will be recorded continuously during all periods of incinerator operation using a strip chart recorder. Company A will use a 5-minute rolling average of combustion temperatures to determine whether an excursion from (combustion temperature limit or range) has occurred. The thermocouple used to determine the temperature will be accurate to within 1 percent of the temperature being measured. Company A will conduct daily operational checks of the thermocouple, strip chart recorder, and the temperature recording process system. Company A will conduct an annual accuracy check of the temperature measurement and recording system." This example mirrors the basic monitoring information required under the relevant portions of subpart BB. Another example that might apply in other cases could include a permit condition which: (1) Identifies the pollutant-specific emissions unit, (2) states that the owner or operator will install, operate, maintain and reduce data from a CEMS for that pollutant in accordance with both the general provisions in 40 CFR 60.13 and the applicable performance specifications in appendix B to 40 CFR part 60; and (3) specifies the appropriate period for averaging data to determine if an exceedance occurs. That type of permit condition would address the components of the basic monitoring approach identified above.

As noted in the above examples, there is no substantive difference for how an owner or operator will be required to address existing monitoring in a permit versus part 64 monitoring. For the one element of the monitoring (indicator ranges) which the owner or operator is most likely to need to adjust, especially at the beginning of the program, the final rule includes the option discussed earlier that can provide the necessary flexibility to adjust indicator ranges without the need for a permit revision. Thus, EPA believes that the level of detail required in the permit is appropriate and consistent with the level of detail originally included in the 1993 EM proposal and required for existing monitoring.

2. Approval Prior to Installation and/or Verification

A number of those commenting on the 1993 EM proposal expressed concerns about the costs of installing equipment and performing testing for proposed monitoring prior to approval in the permit. The Agency understands that an owner or operator may be unwilling to proceed with such installation, testing, or other monitor verification activities until after the proposed approach to complying with part 64 is approved. Under the final rule, these activities may be completed after approval of the monitoring. The owner or operator must propose a schedule for making the monitoring operational as expeditiously as practicable after approval (see § 64.4(e)) and then the permit must include an enforceable schedule with milestones that reflect the approved schedule. The schedule must provide for the monitoring being fully operational as expeditiously as practicable, but in no event more than 180 days from the date of issuance of the final permit. The general requirements in § 64.7 to operate the monitoring in accordance with part 64 will not apply until the final verification is complete.

3. Conditional Approval of the Monitoring

Under § 64.6(b), the permitting authority may condition the approval on the owner or operator collecting additional data on the indicators to be monitored for a pollutant-specific emissions unit, including required compliance or performance testing, to confirm the ability of the monitoring to provide data that are sufficient to satisfy the requirements of this part, and to confirm the appropriateness of an indicator range(s) or designated condition(s) proposed to satisfy the design criteria in the rule. Such conditional approval should also be consistent with the requirement in the rule that monitoring be designed, installed, and begin operation within 180 days of permit approval.

4. Disapproval of the Monitoring

If a permitting authority determines that the monitoring proposed by an owner or operator fails to satisfy part 64, the permit must include monitoring that at a minimum meets the monitoring provisions in part 70. Moreover, § 64.6(e)(2) requires the permitting authority to impose a compliance plan requirement in the permit which directs the owner or operator to repropose monitoring in accordance with §§ 64.3 and 64.4 within no more than 180 days after disapproval. Under § 64.6(e)(3), the owner or operator will be in noncompliance with part 64 if: (1) The owner or operator fails to submit monitoring within the required compliance schedule; or (2) the permitting authority disapproves the monitoring submitted, subject to the owner or operator's right to appeal any such disapproval. Note that the decision to disapprove the initially proposed monitoring would also constitute final agency action for purposes of appeal.

This disapproval process was implied but not explicitly addressed in the 1993 EM proposal or the subsequent drafts of part 64. However, comments on these earlier versions of the rule did raise concerns about when an owner or operator could appeal a decision as to the monitoring and whether a permitting authority could insert in the permit the monitoring which the permitting authority believes should be used. The Agency believes that in most cases, the permit process provides ample opportunity for the permitting authority and the owner or operator to confer about the appropriate monitoring to satisfy part 64 and agree upon an approach, with public and EPA review.

without having to reach the point of disapproving the monitoring in the final permit action. Nevertheless, the Agency also believes that the final rule should clarify how a monitoring disapproval will be handled.

The Agency notes further that, unlike the procedures for most applicable requirements, the part 70 permit process will be used as the process for approving the specific monitoring that is used to satisfy part 64. In that respect, the part 70 process will be essential to assuring adequate public, permitting authority, and, as necessary, EPA input on part 64 monitoring. The Agency believes that the approval/disapproval procedures in the final rule highlight this important aspect of part 64 and will provide for adequate public and EPA review of the monitoring used to satisfy part 64.

5. Permit Shield

The Agency notes that, after approval of the part 64 monitoring in a permit, the permit shield provisions in part 70 may extend to the part 64 monitoring approved in the permit. A significant area of comment on the 1993 proposed EM rule was the effect of implementing part 64 on these permit shield provisions. Some commenters were concerned that the linking of part 64 and the permitting process would hamper the timely processing of permits, and in some cases, result in the loss of the permit application shield. The Agency has addressed these concerns in the changes to the implementation schedule of the final rule. Other commenters suggested that the non-specific nature of part 64 monitoring requirements could lead to a situation where the permit shield could be lost even if the monitoring was originally developed in good faith and was approved by the permitting authority. These commenters argued that if such monitoring is later determined to be inadequate by the permitting authority or the owner or operator, there should be a process for correcting the monitoring without finding the owner or operator in violation of the general part 64 substantive requirements.

EPA believes that, if a permitting authority extends the permit shield to the monitoring requirements included in an operating permit, the owner or operator will be shielded from any retrospective action based on a claim that the monitoring approved in the permit fails to satisfy part 64 requirements. This protection is only available so long as the owner or operator conducts the monitoring in accordance with the permit. Also, the shield will not prevent the permitting authority or the EPA from reopening the permit if, after approval, the permitting authority or the Agency finds cause to reopen the permit based on a deficiency in the approved monitoring.

Where an owner or operator discovers that the originally approved monitoring is inadequate, the final rule does require the owner or operator to correct the defect in the monitoring expeditiously. Section 64.7(e) requires an owner or operator to promptly notify the permitting authority and submit a proposed modification to the source's part 70 permit under at least two circumstances. First, if the owner or operator documents that a violation of an emission limitation or standard occurs but the part 64 monitoring failed to indicate an excursion or exceedance for the same period, there will be a need to address that type of deficiency. Second, if the results of performance or compliance testing document a need to modify the approved indicator ranges, that type of correction will also be required. The appropriate permit modifications may include monitoring additional parameters, increasing monitoring frequency, reestablishing indicator ranges, or other changes appropriate for the circumstances.

G. Section 64.7—Operation of Approved Monitoring

1. General Conduct of Monitoring

As soon as the permitting authority has approved the operating permit, § 64.7(a) requires the owner or operator of an affected source to begin conducting monitoring of the source in accordance with the permit. If the permit includes a scheduled date for the completion of testing, installation, and final verification of the approved monitoring pursuant to § 64.6(d), then the owner or operator is not required to begin conducting monitoring until that completion date. This provision does not excuse the owner or operator from complying with monitoring required under separate authority if the monitoring being used to comply with part 64 is also required under that separate authority.

Section 64.7(b) requires an owner or operator to properly maintain the approved monitoring. The provision states that the maintenance and operation obligations include an obligation to maintain necessary parts for routine repairs of the monitoring equipment.

Under § 64.7(c), the monitoring must be conducted continuously or shall collect data at all required intervals during emissions unit operating periods unless the monitoring cannot be conducted because of monitor malfunctions, associated repairs or required quality assurance or control activities (including, as applicable, calibration checks and zero and span adjustments). Data collected during such periods is not to be used for purposes of part 64, including data averages and calculations, or fulfilling a data availability requirement. Data recorded during all other periods is to be used in assessing the operation of the control device and associated capture system.

The Agency notes that the requirements in §§ 64.7(b) and (c) are generally consistent with monitoring requirements promulgated under the NSPS program (see 40 CFR 60.13(e)) and the new NESHAP program (see 40 CFR 63.8(c)(1) and (4)). The obligation to keep parts necessary for routine repairs is based on a similar requirement in § 63.8(c)(1). The requirement that part 64 monitoring be operational during emissions unit operation except during monitor malfunctions and similar events is consistent with § 60.13(e) and § 63.8(c)(4). It is important to note that this provision does not excuse a failure to comply with a data availability requirement. Even if a data availability requirement is met, this provision requires an owner or operator to continue operating the monitoring unless it is technically infeasible to do so.

The Agency believes that these general operating requirements were implicit in the 1993 EM proposal, including proposed § 64.4(b)(4) which required the owner or operator to obtain quality-assured data from the monitoring sufficient to satisfy minimum data availability requirements. However, EPA notes that in comments on the subsequent drafts of part 64, certain commenters objected to these types of provisions, and specifically requested that the rule exempt the source owner or operator from having to conduct monitoring during periods when the source is not required to comply with the underlying standard (such as startup and shutdown conditions). The Agency disagrees with these comments, and notes that existing general monitoring requirements under NSPS and NESHAP do not provide for that type of exception to monitoring. In fact, EPA has previously rejected the idea of exempting sources from monitoring during startup and shutdown conditions in other rulemakings. (See, e.g., *Air Oxidation Processes in Synthetic Organic Chemical Manufacturing Industry—Background Information for*

Promulgated Standards, EPA–450/3–82–001b, June 1990, pp. 2–37 and 2–38. For a copy of this document, see EPA Air Docket A–81–22–V–B–1.) Although compliance with emission limitations may be exempted in some circumstances during conditions such as startup and shutdown, an owner or operator still is required to operate and maintain a source in accordance with good air pollution control practices for minimizing emissions during such periods. The monitoring under part 64 is essential to evaluate the extent to which this duty is fulfilled. Therefore, to clarify the intent of part 64 and assure that it is implemented consistently with other EPA monitoring programs, the final rule includes these general operating requirements in §§ 64.7(b) and (c).

2. Corrective Action Obligations

Section 64.7(d) of the final rule requires that, upon detecting an excursion or exceedance, the owner or operator will restore the pollutant-specific emissions unit to its normal or usual manner of operation as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions. This requires minimizing periods of startup, shutdown or malfunction, and taking corrective action to restore normal operation and prevent recurrence of the problem that led to the excursion or exceedance except where the excursion or exceedance was related to an excused startup or shutdown condition. Corrective action may include inspection and evaluation where operations returned to normal without operator action, or any appropriate follow up activities, including shutting down a pollutant-specific emissions unit until necessary repairs are completed, to return the operation to within the indicator range or below the applicable emission limitation or standard, as applicable. Consistent with existing general duty provisions such as § 60.11(d), determination of whether the owner or operator has used acceptable procedures in response to an excursion or exceedance will be based on available information, including monitoring data. A related provision found at § 64.8(a) of the final rule provides that a source owner or operator can be required to implement a quality improvement plan (QIP) after a determination by the permitting authority or the Administrator that the source owner has failed to conduct proper operation and maintenance as documented through part 64 monitoring and other available information (see Section II.H.).

Because the Agency's emphasis for part 64 monitoring shifted away from the direct compliance determination requirements of the 1993 EM proposal to the CAM approach, the Agency believes it is critical to underscore the need to maintain operation within the established indicator ranges. Therefore, the rule includes the requirement to take prompt and effective corrective action when the monitored indicators of compliance show that there may be a problem. Requiring that owners and operators are attentive and respond to the data gathered by part 64 monitoring has always been central to the CAM approach. Certain comments received on the 1996 part 64 Draft questioned the appropriateness of the corrective action provisions with some commenters finding the requirements unnecessary and others alleging that they were inadequate. The Agency reiterates its belief that part 64 monitoring can provide a reasonable assurance of compliance with applicable requirements. This is consistent with the approach suggested by many commenters throughout the development of part 64; however, because the data will not necessarily allow a direct determination of compliance, the Agency believes that it is essential to the CAM goal of ongoing compliance operation that part 64 require that owners or operators respond to the data so that any problems indicated by the monitoring are corrected as soon as possible. Without this corrective action obligation, owners or operators might tend to ignore excursions because such excursions may not necessarily allow a determination of a violation. Thus, EPA believes that the corrective action component of part 64 is critical to assuring that the information from the enhanced monitoring required by part 64 is heeded by owners or operators.

As described in the discussion accompanying the 1996 part 64 Draft, the Agency did consider requiring owners or operators to specify maximum periods for conducting various types of corrective action, but stakeholders raised concerns that it would be extremely difficult to establish the appropriate time frames for every possible contingency (see, e.g., docket items VI–D–45, p. 12; VI–E–9, p. 5–6). The Agency continues to agree that it would be difficult to establish appropriate time frames for all corrective action scenarios and therefore has adopted the general obligation requirement in the final rule. The Agency also believes, however, that as situations develop at a particular facility it may be possible in subsequent rounds of permitting to provide specific timetables for certain high priority concerns if a permitting authority desires to make this requirement more specific. In addition, if an existing site-specific plan, such as a malfunction abatement plan, already establishes required time frames for certain types of excursions, the owner or operator or the permitting authority could incorporate those specific time frames into the permit.

The obligation to correct excursions as expeditiously as practicable is the enforceable component associated with establishing an indicator range under part 64. Part 64 does not establish that an excursion from an indicator range constitutes an independent violation by itself. The 1996 part 64 Draft did provide that the permit may specify that an excursion could be considered a failure to satisfy an applicable permit term or condition in various situations. First, if existing requirements already require the owner or operator to comply with the indicator ranges, the 1996 Draft indicated that the ranges would be enforceable requirements. Second, the 1996 Draft indicated that an owner or operator could propose this approach. Finally, the 1996 Draft stated that, if consistent with existing authority, the permitting authority could specify in the permit that excursions from the indicator ranges will be considered enforceable permit deviations. In comments submitted during the development of the rule, State and local agency organizations stated their support for including control device performance indicator ranges as enforceable permit requirements even if such indicator ranges are not used directly to determine compliance or noncompliance with applicable emission limitations or standards. (See, for example, docket item VI–D–49 and IV–D–274). However, numerous industry commenters opposed the provisions in the 1996 part 64 Draft which addressed this issue.

The Agency has considered all of the relevant comments and has determined that part 64 need not address this issue. First, if an underlying requirement makes an indicator range enforceable, then that will have to be addressed in the permit under the existing requirements in part 70. Second, a source owner can always propose to make the indicator range enforceable and part 64 need not address this possibility. Third, if a State agency has independent authority to make indicator ranges enforceable, that can be done irrespective of the authority provided in part 64. Finally, as discussed in Section

I.E., the CE revisions clarify that an excursion from an indicator range in some circumstances may be sufficiently probative of compliance that it could be used to document a violation of an underlying requirement. Based on these considerations, the final rule simply requires the permit to establish an indicator range, and then imposes the obligation to take appropriate corrective action in response to an excursion and to report the excursion in applicable periodic reports and compliance certifications.

3. Monitoring Revisions

Section 64.3(d) of the 1993 EM proposal would have required a significant permit modification pursuant to § 70.7 whenever a change was made to an enhanced monitoring protocol or whenever a pollutant-specific emissions unit was modified in such a way as to make an existing protocol no longer appropriate. A great number of industry commenters objected to the permit modification provisions in the proposed rule. The vast majority objected to the scope of this provision, under which any change to an enhanced monitoring protocol triggered a requirement to obtain a significant permit modification. A number of commenters noted that the proposed rule would require significant permit modifications for changes that would not have triggered such a requirement under part 70 itself.

The Agency agrees with those commenters that believe the part 70 procedures generally should be relied on for determining when and what type of a permit change is required for different types of monitoring modifications. In keeping with this approach, EPA has removed the permit modification provisions from the final rule. Instead, the Agency intends that permit revisions involving part 64 requirements be made pursuant to part 70 permit revision procedures. The EPA has proposed revisions to part 70 in order to streamline the existing permit modification procedures (see 59 FR 44460, August 29, 1994, and 60 FR 45530, August 23, 1995). The preamble to those proposed revisions discusses what types of permit revisions would be appropriate for different types of monitoring changes. The EPA intends to promulgate permit revision procedures based on the proposed part 70 revisions that will clarify when and how a change in monitoring will trigger the need to modify the underlying operating permit.

As noted in the discussion of the permit shield above, § 64.7(e) does require an owner or operator to follow permit modification procedures upon discovery of deficiencies in approved part 64 monitoring. In addition, the part 70 procedures will apply if the owner or operator wants to change certain aspects of its approved monitoring, or if the owner or operator intends to make certain types of emissions unit modifications that could trigger the need for a permit revision to address part 64 requirements. For instance, if an owner or operator switched from a pollution prevention method of controlling emissions to a control device within the definition of part 64, that change could impose the part 64 monitoring requirements for a unit which had been subject only to part 70 monitoring before the change. In such a case, the revised part 70 procedures would require the owner or operator to submit a request for a part 70 permit modification which includes proposed part 64 monitoring and required supporting documentation.

H. Section 64.8—Quality Improvement Plans (QIPs)

Requirements for responding to the monitoring data if potential control problems are detected have been included in the final rule. Requiring that owners or operators are attentive to the data obtained by part 64 monitoring and take corrective action when problems are detected has always been part of the CAM approach. The discussions accompanying the 1995 and 1996 part 64 Drafts describe the CAM approach as promoting compliance by making the owner or operator pay attention and respond to the monitoring data. Because the approach of establishing indicator ranges and then imposing an obligation to respond to excursions could potentially allow owners or operators to comply with part 64 even though they may be in a near constant state of correcting excursions, the related concept of quality improvement plans (QIPs) was developed. This concept was designed to avoid perpetual corrective action which would frustrate the compliance promotion and compliance assurance goals of part 64.

1. QIPs in the 1995 Part 64 Draft

In the discussion accompanying the 1995 part 64 Draft, the requirements for responding to monitoring data were described as including: operating ranges for monitored parameters, time periods for corrective action in the event discrepancies from the established operating ranges occur, and a maximum number of discrepancies from the established operating ranges to occur in a reporting period. The 1995 part 64 Draft provided that source owners could establish this maximum number of discrepancies as a not-to-exceed limit or as a requirement that, initially, triggers implementation of a QIP. The QIP option would require evaluation of why the maximum number of discrepancies was exceeded. Based on that evaluation, the QIP would require the owner or operator to take steps to improve control performance including improved preventive maintenance procedures, process operation changes, control system improvements or similar actions.

The QIP option was described as a means of allowing an owner or operator to establish site-specific maximum discrepancy numbers without facing automatic enforcement exposure for failure to comply with those numbers during the early stages of part 64 applicability/implementation, while at the same time assuring that a large number of discrepancies would trigger additional steps to decrease the incidence of reduced control performance. In addition, the 1995 part 64 Draft contained limits to guard against the use of an ineffective QIP. Owners or operators would be allowed to exceed the maximum number of corrective actions trigger twice during a permit term. A third or subsequent exceedance of the trigger would have been treated as a failure to comply with the requirements of part 64 as well as still requiring a QIP to improve control performance. These situations potentially would have also required the QIP to be revised to more adequately serve its purpose of improved control performance.

The discussion accompanying the 1995 part 64 Draft noted that the provisions on the length of corrective action periods and the maximum number of corrective action periods per reporting period provided significant flexibility and solicited comment on whether the final rule should establish additional objective criteria such as a maximum length for corrective actions or a limit on the number of corrective actions permitted.

The Agency received a number of comments on the QIP concept after releasing the 1995 part 64 Draft. A number of industry commenters supported the QIP concept but raised concerns about the provisions limiting the number of allowable QIPs and about the specificity of certain requirements.

2. QIPs in the 1996 Part 64 Draft

In the 1996 part 64 Draft the owner or operator was required to implement a QIP if the duration of excursions occurring in any reporting period exceeded a set percentage of the operating time for the pollutant-specific emissions unit over that reporting period, or if the number of excursions exceeded a set percentage of the monitored averaging periods during the applicable reporting period. If the approved monitoring involved the use of a CEMS or PEMS, then the appropriate trigger for a QIP would be exceedances instead of excursions.

The appropriate percentage was to be set in the context of the permitting process. The permitting authority was to take into account all relevant factors, but the percentage of operating time was not to exceed 5 percent. The Agency solicited comment on whether that was an appropriate percentage and information that could support another percentage limit. An exception was provided in the 1996 part 64 Draft for circumstances in which specific applicable requirements established a higher percentage. Finally, the draft rule stated that the permit must include a condition that in the event that either percent trigger was exceeded, the owner or operator would develop and implement a QIP that met specific criteria.

Like the 1995 part 64 Draft, the 1996 part 64 Draft described two basic parts of a QIP. The first part would consist of evaluation procedures to determine the cause of the excessive number of excursions (or exceedances, if applicable). Based on that evaluation, the owner or operator would develop the second part of the QIP. The second part would detail the steps the owner or operator would take to improve the quality of control performance, and the schedule for taking those steps. Again, depending on the nature of the problem, the appropriate steps could include improved preventive maintenance procedures, process operation changes, control system improvements or similar types of steps. In conjunction with those procedures, the QIP also might include improved monitoring procedures.

The discussion accompanying the 1996 part 64 Draft described these requirements as assuring that the monitoring conducted under part 64 would result in owners or operators taking the necessary steps to prevent pollution through reasonable optimization of control performance. The Agency stated in that discussion and the draft itself that compliance with a QIP is not a substitute for compliance with underlying applicable requirements, including general duties to operate and maintain facilities in accordance with good air pollution control practices, and the 1996 part 64 Draft also required the owner or operator to report as a deviation any period during which a QIP is being implemented.

Again the Agency expressed concern about owners or operators performing repeated QIPs, and the 1996 part 64 Draft provided that the necessity to implement a second QIP for the same pollutant-specific emissions unit during the same permit term would constitute a specific permit term violation. The Agency acknowledged that an enforceable permit condition placing a limit on the number of QIPs might be perceived as an unnecessary restriction on the operation of highly efficient and well-operated control measures. The EPA noted that a high level of excursions could result from tightly set indicator ranges that are not at all indicative of potential excess emissions, and that the "second QIP as a violation" approach could inappropriately put an owner or operator in violation under such circumstances.

The Agency then noted that the second QIP as a deviation approach might encourage source owners to set unrepresentatively broad indicator ranges and thereby avoid excursions. The Agency sought comment on other means to encourage the setting of the indicator ranges in a manner consistent with the best level of emissions control that can be achieved. As one possible alternative, EPA suggested that instead of a permit violation associated with the need to implement a second QIP the final rule could instead require that the second QIP be implemented only through a permitting authority approval process. Such a plan could also include restricted process operations until completion of the approved QIP. The agency also suggested as a second possible alternative that the time period for limiting the owner or operator to one QIP could be reduced from the 5-year permit term to 3 years or other appropriate period.

In addition, the 1996 part 64 Draft contained a number of other QIP-related requirements. First, it required the owner or operator to notify the permitting authority within 2 days after determining that a QIP is necessary. Second, the QIP would not become part of the permit and would not require permitting authority approval. Third, the QIP was to be implemented as soon as practicable, and completed within 180 days from the date notice of the QIP was given to the permitting authority. Exceptions to the 180-day limit were to be granted only after the owner or operator obtained a site-specific resolution and affirmative approval from the permitting authority or, if necessary, the EPA of a plan to complete the improvement activities. An approved extension could include an enforceable, site-specific schedule with milestones and completion dates.

The 1996 part 64 Draft also required the owner or operator to report on the activities taken in conjunction with a QIP. QIP activities would be summarized in the semiannual report covering the period in which the QIP began, and in any subsequent semiannual reports covering periods during which the QIP continued. In addition, the owner or operator was required to maintain a copy of the QIP and records of QIP implementation activities for a period of five years in accordance with part 64 recordkeeping provisions.

Finally, a QIP could lead to changes in previously approved monitoring or other changes at the source that require a permit revision. Therefore, the 1996 part 64 Draft required the owner or operator to submit a proposed revision to the approved monitoring in these circumstances. Even if such changes did not require a permit revision, a source owner or operator who intended to retain the previously approved monitoring was required to reestablish the rationale that justified the monitoring.

3. QIPs in the Final Rule

In response to comments received on the 1995 and 1996 part 64 Drafts, § 64.8 of the final rule reflects a number of significant changes to the QIP requirements.

A number of commenters challenged the 5 percent QIP trigger in the 1996 part 64 Draft and some questioned whether a single percentage threshold was appropriate regardless of exactly where the threshold was set. Section 64.8(a) of the final rule provides that a QIP trigger may be set in the permit but does not require it. Where such a trigger is used, a level of 5 percent is suggested as a potentially appropriate threshold. The final rule also provides that a QIP can be required after a determination by the permitting authority or the Administrator that an owner or operator has failed to conduct proper operation and maintenance as documented through part 64 monitoring and other available information. In this respect, the QIP provisions are analogous to existing corrective action remedies available to address compliance problems.

Commenters also argued that the 180-day limit for completion of a QIP that was included in the 1996 draft part 64 was not reasonable, with various commenters arguing for more or less time. Some commenters also noted that QIPs that lead to the need for a permit modification would be particularly problematic in terms of meeting a specific deadline. Section 64.8(c) of the final rule requires owners or operators to complete any QIP as expeditiously as practicable and to notify the permitting authority if they determine that a QIP will take longer than 180 days rather than establishing a specific amount of time within which the QIP must be completed.

Many commenters objected to the requirement that a second QIP within a permit term be treated as a violation. A number of commenters pointed out that a subsequent QIP might be completely unrelated to the first QIP, that more room for error should be allowed in the early stages of part 64 applicability/implementation, and that the existence of such penalties would frustrate the goals of part 64 by discouraging source owners from setting indicator ranges at levels that would provide early warning of problems. Commenters also noted generally in other comments on part 64 that the Agency should consider the part 63 startup, shutdown, malfunction plan (SSMP) requirements as an appropriate precedent for implementing part 64. Based on EPA's consideration of the comments, EPA has deleted the concept that a second QIP during a permit term is a violation. Instead, the final rule allows permitting authorities to use recurring problems as an indication that a QIP should be required in order to bring about improvements in control device operation and maintenance. In addition, the final rule provides that the permitting authority or the Administrator may follow up on QIPs and make changes to the plan if the QIP has not addressed the problem adequately. This latter requirement is analogous to the comparable procedures for requiring changes to SSMPs pursuant to § 63.6(e)(3).

Other changes made in response to comments received on the 1996 part 64 Draft include deleting the requirement that source owners notify the permitting authority within two days of the need to implement a QIP, the requirement that periods during which an owner or operator is implementing a QIP be reported as deviations in monitoring reports and compliance certifications, and the requirement to report test method results after QIP implementation. The Agency does not believe that these draft requirements are necessary, especially given that under the final rule, QIPs generally will be implemented only after a determination that an owner or operator has failed to meet a general duty to properly operate and maintain a source.

Some commenters objected to the requirement that owners or operators state that a QIP has reduced the likelihood of similar problems occurring in the future. The Agency believes that this type of information is appropriate, but has changed the final rule so that rather than a certification-style requirement, the owner or operator is required to submit documentation that the QIP has been completed and reduced the likelihood of similar levels of excursions or exceedances occurring. This provision will provide the permitting authority with the information necessary to gauge the completion of a QIP and whether follow-up is necessary.

Commenters on the 1996 part 64 Draft also requested that an owner or operator be allowed to implement a QIP that involves only monitoring changes. The Agency notes that the final rule, like the 1996 part 64 Draft, does not provide for QIPs that address monitoring only. This type of change should not be made through a QIP. By its nature, a QIP focuses on situations where the owner or operator has failed to meet its obligation to properly operate and maintain a source. The QIP requirements in the final rule clarify this approach and no longer mandate that a QIP be implemented solely because a set duration of excursions or exceedances occurs. A source owner who needs to change approved part 64 monitoring can address any monitoring problems directly through the appropriate permit modification process. For indicator range changes, the final rule allows owners or operators to avoid the need for a permit modification by specifying in the permit the method by which such ranges will be established rather than the actual ranges. See Section II.F. for further discussion of that issue.

I. Section 64.9—Reporting and Recordkeeping Provisions

Part 64 generally relies on the requirements for reporting, compliance certification, and recordkeeping already established in part 70. Beyond general compliance with the part 70 requirements, § 64.9(a)(2) clarifies that part 70 reports that involve part 64 monitoring data must identify summary data on the number, duration and cause of: excursions from indicator ranges; emission limit exceedances; any corrective actions taken; and monitor downtime incidents other than those associated with daily calibration checks. If applicable, the report must also document QIP implementation and completion activities. See Section II.H. for further discussion of this QIP reporting provision.

The Agency believes that the additional information that is required to be reported under part 64 is consistent with streamlined reporting requirements under other monitoring programs (such as NSPS reporting under 40 CFR 60.7(d)). The Agency also believes that this information is necessary to allow permitting authorities to use part 64 data to track overall control performance and assure that owners or operators are operating part 64 monitoring appropriately and responding appropriately to excursions from established indicator ranges.

The recordkeeping requirements similarly require the owner or operator to maintain records in conformance with part 70. The provisions clarify what part 64 records need to be maintained and the acceptable formats for recordkeeping.

The Agency solicited and received comments on several aspects of the reporting and recordkeeping requirements that were included in the 1993 EM proposal. Those requirements, comments and the changes made by EPA in response to the comments are described below.

1. Commencement of Reporting Duty

Under the 1993 EM proposal, affected owners or operators were required to submit "enhanced monitoring reports." These enhanced monitoring reports would have fulfilled essentially the same function as the part 70 reports required by § 70.6(a)(3)(iii)(A), providing permitting authorities with more regular data on monitoring compliance than is required under other provisions. The 1993 EM proposal required submission of these reports "[o]n and after the effective date of this part * * *." Commenters were concerned that this language could be interpreted to require reporting prior to approval of a monitoring plan. They contended that it would be difficult, if not impossible, to fulfill the reporting requirement without knowledge of what monitoring would ultimately be required. The Agency agrees with these concerns. The final part 64 rule clarifies that the obligation to begin reporting does not commence until the specified date by which the owner or operator must begin monitoring under part 64.

2. Reporting Frequency

The 1993 EM proposal also required quarterly submission of the above-mentioned enhanced monitoring report for each enhanced monitoring protocol. Many commenters argued that quarterly reporting would be too costly and/or burdensome. The quarterly reporting requirement is eliminated in the final rule. By explicitly relying on part 70 reporting requirements, the Agency has adopted a requirement that reports be submitted at least semiannually. The EPA believes that the minimum part 70 reporting frequency is sufficient to meet the goals of compliance assurance monitoring without imposing undue costs or burdens on affected sources. The Agency also notes that the 1993 EM proposal justified quarterly reporting in part on the similar provision that existed at that time in part 60 for quarterly reporting of direct compliance data. The Agency has since modified part 60 reporting provisions and no longer requires quarterly reporting where the source remains in compliance. (See § 60.7(e) added at 59 FR 12417, March 16, 1994.) The Agency also notes that part 70 authorizes permitting authorities to require more frequent reporting of monitoring data, when appropriate.

A related provision in the 1993 EM proposal required that each enhanced monitoring report be postmarked no later than thirty days after the last day of the reporting period. A number of commenters objected to this due date provision, arguing that thirty days was insufficient time to analyze and verify the necessary data and to then assemble a report reflecting that data, especially where such data is received from independent laboratories. Although the Agency believes that thirty days is generally sufficient time to compile the reports required under the revised part 64, the due date provision has been eliminated. Instead, by relying on the reporting requirements of part 70, the Agency requires "prompt" submission of monitoring reports as defined by the permitting authority.

3. Report Signature Requirement

The 1993 EM proposal required that certification by a responsible official be included in each enhanced monitoring report. Under this requirement the official had to certify by his or her signature that he or she had personally examined the information contained in the report and its attachments, that the statements and information were true to the best of his or her knowledge and belief, and that he or she was aware of the penalties (including the possibility of fine or imprisonment) that could accrue for submitting false statements and information or omitting required statements and information. A number of commenters were concerned that the requirement that an official personally examine all information in the report and its attachments was impractical, given the amount of data that would have to be examined and the responsible official's probable lack of expertise in the specific areas of the documents. Commenters also expressed concerns that the penalty language of the proposed rule imposed liability on the responsible official instead of the persons who might be responsible for violations, or on the company itself.

The EPA has eliminated the proposed report signature requirement in the final rule. Instead, part 64 reporting will be subject to the same certification requirements as required for all reports submitted under § 70.5(d). The Agency believes the use of the part 70 signature requirements is appropriate given the general reliance on part 70 reporting requirements in part 64.

4. Confidentiality of Report Information

The 1993 EM proposal explicitly provided that an owner or operator could assert a confidentiality claim for information reported under part 64 to the extent such information was entitled to protection under section 114(c) of the Act. This provision received a generally favorable response from industry commenters, some of whom proposed that the confidentiality provisions be expanded. This provision is not included in § 64.9 of the final rule. As noted above, part 64 reporting is governed by part 70. Information submitted under part 70 reporting requirements is already subject to confidentiality protection pursuant to § 70.4(b)(3)(viii), as well as section 503(e) of the Act. Any such information accompanied by a claim of confidentiality will be treated in accordance with the regulations of 40 CFR part 2. The Agency believes that the inclusion of confidentiality provisions in part 64 is unnecessary due to the applicability of the protections contained in part 70.

5. Recordkeeping Requirements

Section 64.9(b)(1) requires owners and operators of affected sources to comply with the recordkeeping obligations set forth in § 70.6(a)(3)(ii). Part 70 requires that records of the required monitoring including the following information be maintained for a period of at least five years: The date, place, and time of sampling or measurements; the date(s) analyses were performed; the company or entity that performed the analyses; the analytical techniques or methods used; the results of such analyses; and the operating conditions as existing at the time of sampling or measurement. Section 64.9(b) clarifies that for purposes of part 64, the records to be maintained include: Monitoring data, monitor performance data, corrective actions taken, the written quality improvement plan and related implementation activities, and other supporting information required to be maintained under part 64. The Agency notes that the part 64 requirement to keep these records is not a separate recordkeeping requirement. The Agency believes all of these records are already required to be maintained under the general part 70 provisions, but includes these specific types of records in the final rule to clarify the general part 70 language.

Recordkeeping requirements under the final rule are not significantly different from those in the 1993 EM proposal. Although the 1993 EM proposal did not explicitly refer to part 70 recordkeeping provisions, its requirements were essentially a restatement of part 70 requirements in an enhanced monitoring context. Owners or operators would have been required to maintain the same general information required by part 70 for the same minimum period of five years. The preamble to the 1993 EM proposal did state that the requirements were "consistent with the minimum recordkeeping provisions in 40 CFR 70.6(a)(3)."

Both the requirements of the 1993 EM proposal and the currently applicable part 70 provisions require the maintenance of records for a period of at least five years from the date of the monitoring sample, measurement, report or application. A number of commenters expressed objections to the five year data retention period, arguing that the burden of retaining records for such an extended period was excessive. Among the proposed alternatives were a 3-year data retention period, consistent with the Acid Rain Program, or a shorter period for records covering periods for which there were no deviations. The EPA had included the 5-year period in the 1993 EM proposal to be consistent with the minimum requirements of § 70.6. The Agency continues to believe that this period is appropriate, as part 70 has established the 5-year retention period as the standard even where less than five years is required in underlying rules. For example, part 70 has changed the record retention time for NSPS and similar provisions, establishing the 5-year period for such provisions. By explicitly relying on part 70 recordkeeping requirements, the Agency has further affirmed the appropriateness of employing the 5-year period for part 64 records.

Section 64.6(b) of the 1993 EM proposal stated that records had to be available for inspection at the site of an affected source or at a different site approved by the permitting authority. In addition, the proposed rule required that such records be maintained so as to permit prompt submittal if requested by EPA or the permitting authority. A number of commenters on the 1993 EM proposal and the 1996 part 64 Draft recommended that owners or operators should be free to decide where facility records would be kept, arguing that permitting authority approval should not be required since most facilities cannot handle the storage of the data required by the rule. Because the final rule relies directly on the reporting and recordkeeping requirements of part 70, the requirement that source owners get permitting authority approval for off-site storage of part 64 records has been deleted.

The recordkeeping provisions of the 1993 EM proposal did not specifically address the form in which records must be maintained. Several commenters supported the idea of storing data in a non-paper media such as microfiche or a form of electronic data storage. They contended that such storage methods would reduce the costs and burdens associated with storing records for the minimum 5-year period. The Agency agrees with these comments and encourages the use of alternative recordkeeping, provided appropriate safeguards are adopted to insure the integrity and accessibility of the data over time. Section 64.9(b)(2) of the final rule therefore explicitly allows the maintenance of records on alternative media, such as microfilm, computer files, magnetic tape disks, or microfiche, so long as the data are readily available for inspection and review and the alternative format does not conflict with other applicable recordkeeping provisions. This approach is consistent with recent general recordkeeping provisions, such as the NESHAP general provisions in 40 CFR 63.10(b).

J. Section 64.10—Savings Provisions

Because part 64 requirements may overlap with many other applicable requirements, § 64.10 of the final rule clarifies that nothing in part 64 is intended to excuse the owner or operator from applicable requirements under the Act (including emission limitations or standards as well as other monitoring requirements) or to restrict the authority of the EPA or the permitting authority to impose additional monitoring under the Act or State law, as applicable. For example, it would be possible for a source to be in compliance with its QIP, but out of compliance with an applicable emission limitation or standard. The owner of such a source could expect enforcement action for violation of the applicable emission limitation or standard, even though there may not be a violation of part 64. Simply put, adherence to a QIP does not insulate an owner or operator against enforcement action for violations of an underlying emission limitation or standard. This section also clarifies that the requirements may not be used to justify the imposition of less stringent monitoring under other programs than would otherwise be required under those programs. For instance, in acting on a new source review permit under title I of the Act, the part 64 requirements may not be used to judge the adequacy of the monitoring in that permit; instead, the general procedures and practices under the title I permit program will be used.

The 1993 EM proposal contained specific savings provisions in the applicability section (then § 64.1) and the permit application section (then § 64.7). The applicability savings provision in proposed § 64.1(d) clarified that nothing in part 64 was intended to excuse owners or operators from other monitoring, recordkeeping and reporting requirements that apply pursuant to other provisions of the Act, or to restrict the authority of the Administrator or permitting authority to impose additional or more restrictive monitoring, recordkeeping or reporting requirements under other provisions of the Act. The permit application provision in proposed § 64.7(d) stated that owners or operators must still comply with all other permit application requirements and requirements established by federal regulations or by permitting authorities under federally-approved permit programs. These savings provisions are brought together in a single section of the final rule without significant changes from the original proposal.

Section 64.10 of the final rule also states that nothing in part 64 will interfere with the permitting authority's or EPA's ability to enforce against violations of applicable requirements under the Act or the authority of a citizen to enforce against violations pursuant to section 304. This savings provision was added to the final rule to clarify the Agency's position on the relationship of part 64 to certain enforcement issues. A number of commenters requested that EPA include a provision that would shield owners or operators who comply with part 64 from enforcement for violations of their emission limits. As discussed in Section I.E.3., the Agency disagrees with this concept. In cases where the part 64 data indicate noncompliance with emission limits, including exceedances, permitting authorities and the Agency will be able to take enforcement action. In other cases, where the part 64 monitoring indicates, but does not directly establish, the compliance status of a source, the reasonable assurance of compliance based on part 64 data does not prohibit the Agency from taking appropriate investigatory or enforcement steps when noncompliance is shown by other means. This same point was clarified in the discussions accompanying both the 1995 and 1996 part 64 Drafts.

K. Revisions to 40 CFR Part 70 and Part 71

The final rule includes revisions to parts 70 and 71 to clarify the relationship between part 64 and the operating permits program. These revisions are outlined below.

1. Monitoring Requirements

The revisions to part 70 allow for streamlining multiple monitoring requirements if the streamlined monitoring is able to assure compliance at least to the same extent as the applicable requirements not included as a result of the streamlining. The Agency notes that the language in these revisions is designed to be consistent with a discussion in section A.5. of White Paper 2 (See docket item VI–I–2) concerning the possibility of streamlining applicable monitoring and testing requirements ("§ 70.6(a)(3) appears to restrict streamlining by requiring that all "applicable" monitoring . . . requirements be placed in the permit. . . . The EPA intends to revise part 70 to reflect this understanding in a future rulemaking."). The Agency indicated in the 1996 part 64 Draft that it intended to fulfill its intent to modify part 70 as discussed in White Paper 2 by including the appropriate revisions to § 70.6(a)(3)(i) in conjunction with the part 64 rulemaking. Because the Agency received strong support for this proposed action and no negative comments, the Agency has proceeded to add this part 70 revision (and the corresponding revision to part 71) as part of this rulemaking.

2. Compliance Certification Requirements

To tailor compliance certification to the monitoring imposed by part 64, EPA has revised § 70.6(c)(5)(iii) (and § 71.6(c)(5)(iii)) so that a compliance certification includes the following elements.

First, the permit conditions being certified must be identified. Second, the method(s) and other information used to determine compliance status of each term and condition must be identified. These method(s) will have to include at a minimum any testing and monitoring methods identified in § 70.6(a)(3) that were conducted during the relevant time period. In addition, if the owner or operator knows of other material information (i.e., information beyond required monitoring that has been specifically assessed in relation to how the information potentially affects compliance status), that information must be identified and addressed in the compliance certification. This requirement merely emphasizes the general prohibition in section 113(c)(2) of the Act on knowingly making a false certification or omitting material information and the general criminal section on submitting false information to the government codified at 18 USC 1001. The revised part 70 provision does not impose a duty on the owner or operator to assess every possible piece of information that may have some undetermined bearing on compliance. The description of the methods relied on by the source owner also will have to indicate whether the methods provide continuous or intermittent data. In accordance with section 114 of the Act that specifies that the certification include whether compliance is continuous or intermittent, the Agency will interpret the compliance certification that is based on monitoring that provides intermittent data as compliance on an intermittent basis.

Third, the responsible official will have to certify compliance based on the results of the identified methods. The certification must state the compliance status with the part 70 permit, taking into account any deviations and noting as possible exceptions to compliance any deviations or excursions/exceedances as defined in part 64 or other underlying applicable requirements. Because "deviation" was defined under part 71 as originally promulgated, the revisions to part 71 incorporate the concepts of excursion and exceedance into the § 71.6(a)(3) definition of "deviation." Therefore, unlike the part 70 revisions, the revised compliance certification provision in part 71 refers only to "deviations."

The owner or operator may include information in the certification to document that compliance was achieved during any periods in which a possible exception is noted (such as information that an excursion or exceedance occurred during a period of startup or shutdown for which compliance with an emission limitation or standards was excused). The requirement to take into account deviations, excursions, and exceedances together with the requirement to identify whether the method used provides continuous or intermittent data ensures that the compliance certification will show whether compliance is continuous or intermittent. For example, a compliance certification based on a method providing intermittent data or that notes any deviations or certain possible exceptions to compliance as a result of exceedances or excursions based on monitoring required by this rule will be interpreted as showing intermittent compliance. The Agency does not interpret a certification of intermittent compliance to necessarily mean that the responsible official is certifying that there are periods of noncompliance. Such a certification can mean that there are periods of time in which the source's compliance status is unknown. When a responsible official certifies compliance based on a method providing continuous data and no deviations, excursions, or exceedances have occurred (or all such occurrences have been adequately addressed by other information, as explained above), this will be interpreted as a certification of continuous compliance. These provisions implement the requirements in section 114(a)(3)(B), (C), and (D) that the certification include the methods used to determine the compliance status and whether compliance is continuous or intermittent.

The certification also will have to include any other facts required by the permitting authority. This requirement is already included in parts 70 and 71 as promulgated. Finally, the Agency notes that the rule allows the owner or operator to cross-reference the permit or previous reports to identify the various information elements required in a certification. This provision allows the actual certification to be a short, concise compliance statement that is not burdened by restating detailed information that has already been provided.

The goal of part 64 is to provide improved compliance data for significant emissions units at title V major sources. This improvement will in turn provide additional data for the owner or operator to rely on in certifying compliance. As discussed in Section I.C. above, EPA believes that the part 64 data will provide a reliable means for owners or operators to reach a conclusion about their compliance status. However, since the part 64 data will not necessarily always provide unequivocal proof of compliance or noncompliance (as a performance or compliance test method would), there will be excursions or exceedances identified through part 64 which raise questions about compliance status but may not confirm conclusively that a source is in noncompliance. The existence of these occurrences only indicates the need to review the compliance information provided in order to determine what, if any, compliance or enforcement actions may be warranted.

These changes to parts 70 and 71 have been developed based on the provisions included in the 1993 EM proposal, as supplemented by the December 1994 reopened comment period, as well as based on the 1995 and 1996 part 64 Drafts. The reporting requirements of the 1993 EM proposal would have required that a responsible official for an affected source use enhanced monitoring data as the basis for the required title V compliance certification. The 1993 EM proposal also required the use of any other data collected for the purpose of determining compliance during the monitoring period. These provisions were the subject of significant public comment. Some of these comments seemed to be based on the belief that the proposed rule created a separate compliance certification requirement. The EPA always intended for these provisions to operate within the title V compliance certification process, establishing additional requirements that units subject to part 64 had to meet in order to satisfy title V compliance certification requirements. To clarify this approach, the compliance certification provisions in the final rule were removed from part 64. Instead, § 70.6(c)(5)(iii) of part 70 (and the corresponding section in part 71) has been amended to reflect the requirements of compliance certification for those units subject to part 64.

In addition, as discussed above in Section I.C., EPA reopened the public comment period on the 1993 EM proposal and stated EPA's intent that it may reconsider how to interpret the meaning of "continuous or intermittent" in the context of certifying compliance. The revisions to parts 70 and 71 in today's rulemaking reflect the position taken by EPA in that December 1994 notice. Finally, the revisions reflect the position taken in the final part 64 rule that monitoring data that do not constitute formal performance or compliance test method data may still be used by the owner or operator to determine compliance status and to note any possible exceptions to compliance that are indicated by the monitoring. This interpretation is consistent with the existing part 70 which specifically references the fact that a certification must consider all of the relevant data under § 70.6(a)(3), which includes non-test method monitoring data. Because of the possible misinterpretations of the existing language, EPA believes that clarifying the compliance certification requirements in conjunction with promulgating part 64 is appropriate.

III. Administrative Requirements

A. Docket

The EPA is relying on the procedural requirements of section 307(d) of the Act for the regulations. In accordance with those requirements, EPA has established docket A–91–52 for the regulations. The docket is an organized and complete file of all the information submitted to, or otherwise considered by, EPA in the development of this rulemaking. The principal purposes of the docket are: (1) To allow interested parties a means to identify and locate documents so that they can effectively participate in the rulemaking process, and (2) to serve as the record in case of judicial review. The docket is available for public inspection at EPA's Air Docket, which is listed under the ADDRESSES section of this notice.

B. Executive Order 12866

Under Executive Order 12866 (58 FR 51735, October 4, 1993), EPA must determine whether a regulatory action is "significant" and therefore subject to Office of Management and Budget (OMB) review and the requirements of the Executive Order. The order defines "significant regulatory action" as one that is likely to result in a rule that may:

(1) have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

(2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

(4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

EPA assumes as the baseline for its analysis of part 64 that affected emissions sources are currently in compliance with their underlying emission standards 100 percent of the time. Thus, there are no emissions reductions benefits (and health and welfare benefits), nor costs for additional control technology, operation and maintenance, associated with part 64. EPA believes that some sources, in response to monitoring data gathered under part 64, may indeed have to make investments in control equipment technology, operation and maintenance to reduce emissions to comply with their underlying emissions standards; however, EPA believes these emission reductions benefits and costs are not attributable to part 64—but to the underlying emissions standards. As such, EPA has not estimated the benefits or costs that may result from such actions to reduce emissions.

EPA has estimated the cost of part 64 to include the cost of development and implementation of CAM plans, $50 million per year. ($1995). This includes the cost of determining the monitoring approach and implementing the approved design, including reporting, recordkeeping, and certification activities.

Pursuant to the terms of Executive Order 12866, it has been determined that this rule is a "significant regulatory action" due to its policy implications and was submitted to OMB for review. Any written comments from OMB to EPA and any written EPA response to those comments are included in the docket. The docket is available for public inspection at EPA's Air Docket Section, which is listed in the ADDRESSES section of this preamble. The Regulatory Impact Analysis (RIA) for this rulemaking is included in the docket.

C. Unfunded Mandates Act

Section 202 of the Unfunded Mandates Reform Act of 1995 ("Unfunded Mandates Act") (signed into law on March 22, 1995) requires that the Agency must prepare a budgetary impact statement before promulgating a rule that includes a Federal mandate that may result in expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of $100 million or more in any one year. The budgetary impact statement must include: (i) Identification of the Federal law under which the rule is promulgated; (ii) a qualitative and quantitative assessment of anticipated costs and benefits of the Federal mandate and an analysis of the extent to which such costs to State, local, and tribal governments may be paid with Federal financial assistance; (iii) if feasible, estimates of the future compliance costs and any disproportionate budgetary effects of the mandate; (iv) if feasible, estimates of the effect on the national economy; and (v) a description of the Agency's prior consultation with elected representatives of State, local, and tribal governments and a summary and evaluation of the comments and concerns presented. Section 203 requires the Agency to establish a plan for obtaining input from and informing, educating, and advising any small governments that may be significantly or uniquely impacted by the rule.

Under section 205 of the Unfunded Mandates Act, EPA must identify and consider a reasonable number of regulatory alternatives before promulgating a rule for which a budgetary impact statement must be prepared. The Agency must select from those alternatives the most cost-effective and least burdensome alternative that achieves the objectives of the rule unless the Agency explains why this alternative is not selected or unless the selection of this alternative is inconsistent with law.

Because this rule is not estimated to result in the expenditure by State, local, and tribal governments and the private sector, in aggregate, of over $100 million per year, EPA is not required under UMRA to develop a budgetary impact statement or to undertake the analysis under section 205. However, because certain options considered by EPA would have resulted in a total cost in excess of $100 million, EPA did prepare such statement and analysis and they are included as part of the Regulatory Impact Analysis, which is included in the docket.

To the extent governmental entities are affected by the rule as permitting authorities, the costs of the rule are offset or mitigated by receipt of title V permit fees, since the rule affects only title V sources. Part 70 requires sources of pollution to pay permit fees sufficient to offset the costs incurred by the permitting authority in managing its operating permits program. Since part 64 introduces additional requirements for permitting authorities, these incremental costs must be incorporated into the operating permit fee. Because Permitting Authority costs may be transferred to sources of pollution through the permit fee, the administrative and recordkeeping cost of this rulemaking to State, local, and tribal governments is, for practical purposes, zero. EPA has also concluded that, to the extent small governments are impacted by this regulation because they are major stationary sources, the impact will not be significant. *See* Section III.E. As a result, UMRA requirements do not apply to this rulemaking.

D. Paperwork Reduction Act

The information collection requirements in this rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.* An Information Collection Request (ICR) document has been prepared by EPA (ICR No. 1663.02) and a copy may be obtained from Sandy Farmer, OPPE Regulatory Information Division; U.S. Environmental Protection Agency (2137); 401 M St., SW.; Washington, DC 20460 or by calling (202) 260–2740. The information requirements are not effective until OMB approves them.

The information is planned to be collected to fulfill requirements in both the title V operating permit program and part 64 programs. The operating permit program requires owners or operators of units that emit air pollutants to submit annual compliance certifications, to submit monitoring results at least semiannually, and to report deviations promptly. Part 64 requires monitoring for certain emissions units at major sources subject to the title V operating permits program. Therefore, the collection of information is mandated by the Act. Generally, emissions data cannot be considered confidential under the Act. However, to the extent allowable under the Act, the collection of information will be entitled to confidential treatment in accordance with EPA's procedures established in 40 CFR part 2.

The part 64 rulemaking requires monitoring, compliance certification, periodic reporting, and recordkeeping information collections by owners and operators of title V sources with controlled pollutant-specific emissions units that have a pre-control potential to emit major amounts of regulated air pollutants. Owners or operators of affected emissions units will use the information as the basis for the compliance certification required by the operating permit program, and as the basis for compliance assurance monitoring reports. Sources may also use the information to determine and maintain the efficiency of process or emissions control devices. Permitting authorities will use the information to determining acceptability of proposed compliance assurance monitoring, to assess compliance, to input into reports to other agencies, and, when necessary, in enforcement proceedings and Quality Improvement Plans (QIPs). The information may be used by other entities, including federal entities and citizens. EPA will use the information to perform activities such as providing oversight and guidance to State and local agencies, and to assess requests for alternative monitoring.

The implementation schedule for part 64 will phase-in implementation over a number of years, so that not all sources will have reporting and recordkeeping impacts in the first three years of implementation. The estimated annualized cost of CAM on a national level for the first three years of implementation is $7,891,000 (in 1995 dollars). The annual average total capital and operation and maintenance costs are estimated at $1,230,000 (in 1995 dollars) for the first three years of implementation. The annual average burden hours for the first three years of implementation are estimated at 147,560. The Agency estimated the incremental reporting burden for this collection to average 1 hour annually per response, and to require between 26 and 390 hours annually for recordkeeping per response. This includes time for conducting activities over and above the requirements of part 70 such as an accounting of the number, duration and cause of monitor downtime incidents and exceedances, a reporting of corrective actions, and keeping records of data used to document the adequacy of monitoring. Note that the average burden hours and costs represent those estimated for the first three years of the rule's implementation during which a relatively small percentage of the affected pollutant-specific emission units will be subject to part 64 requirements. More units will be affected per year in the six to eight years following the rule's publication and the reporting and recordkeeping burden will also increase. See the RIA for more discussion of the costs associated with years beyond the first three years.

Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; and transmit or otherwise disclose the information.

An Agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are listed in 40 CFR part 9 and 48 CFR Ch. 15.

Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, OPPE Regulatory Information Division; U.S. Environmental Protection Agency (2137), 401 M St., SW., Washington DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th St., NW., Washington, DC 20503, marked "Attention: Desk Officer for EPA." Comments are requested within November 21, 1997. Include the ICR number in any correspondence.

E. Regulatory Flexibility Act

The Agency has determined that it is not necessary to prepare a regulatory flexibility analysis in connection with this rule. A screening analysis was prepared to examine the potential for significant adverse impacts on small entities associated with specific monitoring and certification provisions. For small governmental entities that may own or operate affected sources, EPA determined that the most likely small government and organization sources affected by the rule are municipal power plants and hospitals. After analysis, EPA determined that, given the relatively low numbers of impacted sources(140 small government utilities and 70 small organizations (hospitals)), the low percentage of impacted sources out of the total number of similar sources (11—18 percent of small government utilities and 3 percent of hospitals), and the low cost impacts associated with CAM (assumed similar to the cost impact on small business as discussed below), there will not be a significant impact upon a substantial number of small governments and organizations. See Section V of the Regulatory Impact Analysis included in the docket. Nevertheless, in developing the rule, EPA did provide numerous opportunities for consultation with interested parties, including State, local, and tribal governments, at public conferences and meetings. The EPA evaluated the comments and concerns expressed, and the rule reflects, to the extent consistent with the Act, those comments and concerns. Most importantly, the Agency received comments from approximately 80 representatives of municipally-owned electric utilities that suggested exemptions for small municipal utility units. In response, the rule includes an exemption for certain municipally-owned electric utility units that could be affected by the rule. These procedures ensured State and local governments an opportunity to give meaningful and timely input and obtain information, education and advice on compliance.

EPA estimates 4,957 small firms nationwide could be affected by CAM. A total of 40 affected small firms within this group could have a potential impact over one percent of average annual revenues. The ratio is 0.0087, or less than one percent, which represents the percent of small affected firms that may experience greater than a 1 percent (but less than a 3 percent) increase in costs due to CAM. EPA believes that these estimates of the number of firms affected and the level of cost impact are overstated due to several conservative assumptions in the analysis. These assumptions are described in Chapter 5 of the Regulatory Impact Analysis. Given the conservativeness of this assessment and the fact that 99 percent of the affected small businesses are expected to have impacts of less than 1 percent and no small business is likely to experience costs exceeding 3 percent, the EPA concludes that CAM will not have a significant economic impact on a substantial number of small businesses. In addition, EPA also notes that the use of general permits under title V and assistance through the small business assistance program provisions of title V will assist in reducing the impacts of the part 64 requirements on small businesses.

Accordingly, considering all of the above information, EPA concludes that this rule will not have a significant economic impact on a substantial number of small entities.

F. Submission to Congress and the General Accounting Office

Under 5 U.S.C. 801(a)(1)(A) as added by the Small Business Regulatory Enforcement Fairness Act of 1996, EPA submitted a report containing this rule and other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the General Accounting Office prior to publication of the rule in today's **Federal Register**. This rule is not a "major rule" as defined by U.S.C. 804(2).

List of Subjects

40 CFR Part 64

Environmental protection, Air pollution control, Monitoring, Operating permits, Reporting and recordkeeping requirements.

40 CFR Part 70

Air pollution control, Monitoring, Operating permits, Reporting and recordkeeping requirements.

40 CFR Part 71

Air pollution control, Monitoring, Operating permits, Reporting and recordkeeping requirements.

Dated: October 3, 1997.

Carol M. Browner,

Administrator.

For the reasons set out in the preamble, title 40, chapter I of the Code of Federal Regulations is amended as follows:

1. Part 64 is added to read as follows:

PART 64—COMPLIANCE ASSURANCE MONITORING

Authority: 42 U.S.C. 7414 and 7661–7661f.

§ 64.1 Definitions.

The following definitions apply to this part. Except as specifically provided in this section, terms used in this part retain the meaning accorded them under the applicable provisions of the Act.

Act means the Clean Air Act, as amended by Pub.L. 101–549, 42 U.S.C. 7401, *et seq.*

Applicable requirement shall have the same meaning as provided under part 70 of this chapter.

Capture system means the equipment (including but not limited to hoods, ducts, fans, and booths) used to contain, capture and transport a pollutant to a control device.

Continuous compliance determination method means a method, specified by the applicable standard or an applicable permit condition, which:

(1) Is used to determine compliance with an emission limitation or standard on a continuous basis, consistent with the averaging period established for the emission limitation or standard; and

(2) Provides data either in units of the standard or correlated directly with the compliance limit.

Control device means equipment, other than inherent process equipment, that is used to destroy or remove air pollutant(s) prior to discharge to the atmosphere. The types of equipment that may commonly be used as control devices include, but are not limited to, fabric filters, mechanical collectors, electrostatic precipitators, inertial separators, afterburners, thermal or catalytic incinerators, adsorption devices (such as carbon beds), condensers, scrubbers (such as wet collection and gas absorption devices), selective catalytic or non-catalytic reduction systems, flue gas recirculation systems, spray dryers, spray towers, mist eliminators, acid plants, sulfur recovery plants, injection systems (such as water, steam, ammonia, sorbent or limestone injection), and combustion devices independent of the particular process being conducted at an emissions unit (e.g., the destruction of emissions achieved by venting process emission streams to flares, boilers or process heaters). For purposes of this part, a control device does not include passive control measures that act to prevent pollutants from forming, such as the use of seals, lids, or roofs to prevent the release of pollutants, use of low-polluting fuel or feedstocks, or the use of combustion or other process design features or characteristics. If an applicable requirement establishes that particular equipment which otherwise meets this definition of a control device does not constitute a control device as applied to a particular pollutant-specific emissions unit, then that definition shall be binding for purposes of this part.

Data means the results of any type of monitoring or method, including the results of instrumental or non-instrumental monitoring, emission calculations, manual sampling procedures, recordkeeping procedures, or any other form of information collection procedure used in connection with any type of monitoring or method.

Emission limitation or standard means any applicable requirement that constitutes an emission limitation, emission standard, standard of performance or means of emission limitation as defined under the Act. An emission limitation or standard may be expressed in terms of the pollutant, expressed either as a specific quantity, rate or concentration of emissions (e.g., pounds of SO_2 per hour, pounds of SO_2 per million British thermal units of fuel input, kilograms of VOC per liter of applied coating solids, or parts per million by volume of SO_2) or as the relationship of uncontrolled to controlled emissions (e.g., percentage capture and destruction efficiency of VOC or percentage reduction of SO_2).

An emission limitation or standard may also be expressed either as a work practice, process or control device parameter, or other form of specific design, equipment, operational, or operation and maintenance requirement. For purposes of this part, an emission limitation or standard shall not include general operation requirements that an owner or operator may be required to meet, such as requirements to obtain a permit, to operate and maintain sources in accordance with good air pollution control practices, to develop and maintain a malfunction abatement plan, to keep records, submit reports, or conduct monitoring.

Emissions unit shall have the same meaning as provided under part 70 of this chapter.

Exceedance shall mean a condition that is detected by monitoring that provides data in terms of an emission limitation or standard and that indicates that emissions (or opacity) are greater than the applicable emission limitation or standard (or less than the applicable standard in the case of a percent reduction requirement) consistent with any averaging period specified for averaging the results of the monitoring.

Excursion shall mean a departure from an indicator range established for monitoring under this part, consistent with any averaging period specified for averaging the results of the monitoring.

Inherent process equipment means equipment that is necessary for the proper or safe functioning of the process, or material recovery equipment that the owner or operator documents is installed and operated primarily for purposes other than compliance with air pollution regulations. Equipment that must be operated at an efficiency higher than that achieved during normal process operations in order to comply with the applicable emission limitation or standard is not inherent process equipment. For the purposes of this part, inherent process equipment is not considered a control device.

Major source shall have the same meaning as provided under part 70 or 71 of this chapter.

Monitoring means any form of collecting data on a routine basis to determine or otherwise assess compliance with emission limitations or standards. Recordkeeping may be considered monitoring where such records are used to determine or assess compliance with an emission limitation or standard (such as records of raw material content and usage, or records documenting compliance with work practice requirements). The conduct of compliance method tests, such as the procedures in appendix A to part 60 of this chapter, on a routine periodic basis may be considered monitoring (or as a supplement to other monitoring), provided that requirements to conduct such tests on a one-time basis or at such times as a regulatory authority may require on a non-regular basis are not considered monitoring requirements for purposes of this paragraph. Monitoring may include one or more than one of the following data collection techniques, where appropriate for a particular circumstance:

(1) Continuous emission or opacity monitoring systems.

(2) Continuous process, capture system, control device or other relevant parameter monitoring systems or procedures, including a predictive emission monitoring system.

(3) Emission estimation and calculation procedures (e.g., mass balance or stoichiometric calculations).

(4) Maintenance and analysis of records of fuel or raw materials usage.

(5) Recording results of a program or protocol to conduct specific operation and maintenance procedures.

(6) Verification of emissions, process parameters, capture system parameters, or control device parameters using portable or in situ measurement devices.

(7) Visible emission observations.

(8) Any other form of measuring, recording, or verifying on a routine basis emissions, process parameters, capture system parameters, control device parameters or other factors relevant to assessing compliance with emission limitations or standards.

Owner or operator means any person who owns, leases, operates, controls or supervises a stationary source subject to this part.

Part 70 or 71 permit shall have the same meaning as provided under part 70 or 71 of this chapter, provided that it shall also refer to a permit issued, renewed, amended, revised, or modified under any federal permit program promulgated under title V of the Act.

Part 70 or 71 permit application shall mean an application (including any supplement to a previously submitted application) that is submitted by the owner or operator in order to obtain a part 70 or 71 permit.

Permitting authority shall have the same meaning as provided under part 70 or 71 of this chapter.

Pollutant-specific emissions unit means an emissions unit considered separately with respect to each regulated air pollutant.

Potential to emit shall have the same meaning as provided under part 70 or 71 of this chapter, provided that it shall be applied with respect to an "emissions unit" as defined under this part in addition to a "stationary source" as provided under part 70 or 71 of this chapter.

Predictive emission monitoring system (PEMS) means a system that uses process and other parameters as inputs to a computer program or other data reduction system to produce values in terms of the applicable emission limitation or standard.

Regulated air pollutant shall have the same meaning as provided under part 70 or 71 of this chapter.

§ 64.2 Applicability.

(a) *General applicability.* Except for backup utility units that are exempt under paragraph (b)(2) of this section, the requirements of this part shall apply to a pollutant-specific emissions unit at a major source that is required to obtain a part 70 or 71 permit if the unit satisfies all of the following criteria:

(1) The unit is subject to an emission limitation or standard for the applicable regulated air pollutant (or a surrogate thereof), other than an emission limitation or standard that is exempt under paragraph (b)(1) of this section;

(2) The unit uses a control device to achieve compliance with any such emission limitation or standard; and

(3) The unit has potential pre-control device emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source. For purposes of this paragraph, "potential pre-control device emissions" shall have the same meaning as "potential to emit," as defined in § 64.1, except that emission reductions achieved by the applicable control device shall not be taken into account.

(b) *Exemptions*—. (1) *Exempt emission limitations or standards.* The requirements of this part shall not apply to any of the following emission limitations or standards:

(i) Emission limitations or standards proposed by the Administrator after November 15, 1990 pursuant to section 111 or 112 of the Act.

(ii) Stratospheric ozone protection requirements under title VI of the Act.

(iii) Acid Rain Program requirements pursuant to sections 404, 405, 406, 407(a), 407(b), or 410 of the Act.

(iv) Emission limitations or standards or other applicable requirements that apply solely under an emissions trading program approved or promulgated by the Administrator under the Act that allows for trading emissions within a source or between sources.

(v) An emissions cap that meets the requirements specified in § 70.4(b)(12) or § 71.6(a)(13)(iii) of this chapter.

(vi) Emission limitations or standards for which a part 70 or 71 permit specifies a continuous compliance determination method, as defined in § 64.1. The exemption provided in this paragraph (b)(1)(vi) shall not apply if the applicable compliance method includes an assumed control device emission reduction factor that could be affected by the actual operation and maintenance of the control device (such as a surface coating line controlled by an incinerator for which continuous compliance is determined by calculating emissions on the basis of coating records and an assumed control device efficiency factor based on an initial performance test; in this example, this part would apply to the control device and capture system, but not to the remaining elements of the coating line, such as raw material usage).

(2) *Exemption for backup utility power emissions units.* The requirements of this part shall not apply to a utility unit, as defined in § 72.2 of this chapter, that is municipally-owned if the owner or operator provides documentation in a part 70 or 71 permit application that:

(i) The utility unit is exempt from all monitoring requirements in part 75 (including the appendices thereto) of this chapter;

(ii) The utility unit is operated for the sole purpose of providing electricity during periods of peak electrical demand or emergency situations and will be operated consistent with that purpose throughout the part 70 or 71 permit term. The owner or operator shall provide historical operating data and relevant contractual obligations to document that this criterion is satisfied; and

(iii) The actual emissions from the utility unit, based on the average annual emissions over the last three calendar years of operation (or such shorter time period that is available for units with fewer than three years of operation) are less than 50 percent of the amount in tons per year required for a source to be classified as a major source and are expected to remain so.

§ 64.3 Monitoring design criteria.

(a) *General criteria.* To provide a reasonable assurance of compliance with emission limitations or standards for the anticipated range of operations at a pollutant-specific emissions unit, monitoring under this part shall meet the following general criteria:

(1) The owner or operator shall design the monitoring to obtain data for one or more indicators of emission control performance for the control device, any associated capture system and, if necessary to satisfy paragraph (a)(2) of this section, processes at a pollutant-specific emissions unit. Indicators of performance may include, but are not limited to, direct or predicted emissions (including visible emissions or opacity), process and control device parameters that affect control device (and capture system) efficiency or emission rates, or recorded findings of inspection and maintenance activities conducted by the owner or operator.

(2) The owner or operator shall establish an appropriate range(s) or designated condition(s) for the selected indicator(s) such that operation within the ranges provides a reasonable assurance of ongoing compliance with emission limitations or standards for the anticipated range of operating conditions. Such range(s) or condition(s) shall reflect the proper operation and maintenance of the control device (and associated capture system), in accordance with applicable design properties, for minimizing emissions over the anticipated range of operating conditions at least to the level required to achieve compliance with the applicable requirements. The reasonable assurance of compliance will be assessed by maintaining performance within the indicator range(s) or designated condition(s). The ranges shall be established in accordance with the design and performance requirements in this section and documented in accordance with the requirements in § 64.4. If necessary to assure that the control device and associated capture system can satisfy this criterion, the owner or operator shall monitor appropriate process operational parameters (such as total throughput where necessary to stay within the rated capacity for a control device). In addition, unless specifically stated otherwise by an applicable requirement, the owner or operator shall monitor indicators to detect any bypass of the control device (or capture system) to the atmosphere, if such bypass can occur based on the design of the pollutant-specific emissions unit.

(3) The design of indicator ranges or designated conditions may be:

(i) Based on a single maximum or minimum value if appropriate (e.g., maintaining condenser temperatures a certain number of degrees below the condensation temperature of the applicable compound(s) being processed) or at multiple levels that are relevant to distinctly different operating conditions (e.g., high versus low load levels).

(ii) Expressed as a function of process variables (e.g., an indicator range expressed as minimum to maximum pressure drop across a venturi throat in a particulate control scrubber).

(iii) Expressed as maintaining the applicable parameter in a particular operational status or designated condition (e.g., position of a damper controlling gas flow to the atmosphere through a by-pass duct).

(iv) Established as interdependent between more than one indicator.

(b) *Performance criteria.* The owner or operator shall design the monitoring to meet the following performance criteria:

(1) Specifications that provide for obtaining data that are representative of the emissions or parameters being monitored (such as detector location and installation specifications, if applicable).

(2) For new or modified monitoring equipment, verification procedures to confirm the operational status of the monitoring prior to the date by which the owner or operator must conduct monitoring under this part as specified in § 64.7(a). The owner or operator shall consider the monitoring equipment manufacturer's requirements or recommendations for installation, calibration, and start-up operation.

(3) Quality assurance and control practices that are adequate to ensure the continuing validity of the data. The owner or operator shall consider manufacturer recommendations or requirements applicable to the monitoring in developing appropriate quality assurance and control practices.

(4) Specifications for the frequency of conducting the monitoring, the data collection procedures that will be used (e.g., computerized data acquisition and handling, alarm sensor, or manual log entries based on gauge readings), and, if applicable, the period over which discrete data points will be averaged for the purpose of determining whether an excursion or exceedance has occurred.

(i) At a minimum, the owner or operator shall design the period over which data are obtained and, if applicable, averaged consistent with the characteristics and typical variability of the pollutant-specific emissions unit (including the control device and associated capture system). Such intervals shall be commensurate with the time period over which a change in control device performance that would require actions by owner or operator to return operations within normal ranges or designated conditions is likely to be observed.

(ii) For all pollutant-specific emissions units with the potential to emit, calculated *including* the effect of control devices, the applicable regulated air pollutant in an amount equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source, for each parameter monitored, the owner or operator shall collect four or more data values equally spaced over each hour and average the values, as applicable, over the applicable averaging period as determined in accordance with paragraph (b)(4)(i) of this section. The permitting authority may approve a reduced data collection frequency, if appropriate, based on information presented by the owner or operator concerning the data collection mechanisms available for a particular parameter for the particular pollutant-specific emissions unit (e.g., integrated raw material or fuel analysis data, noninstrumental measurement of waste feed rate or visible emissions, use of a portable analyzer or an alarm sensor).

(iii) For other pollutant-specific emissions units, the frequency of data collection may be less than the frequency specified in paragraph (b)(4)(ii) of this section but the monitoring shall include some data collection at least once per 24-hour period (e.g., a daily inspection of a carbon adsorber operation in conjunction with a weekly or monthly check of emissions with a portable analyzer).

(c) *Evaluation factors.* In designing monitoring to meet the requirements in paragraphs (a) and (b) of this section, the owner or operator shall take into account site-specific factors including the applicability of existing monitoring equipment and procedures, the ability of the monitoring to account for process and control device operational variability, the reliability and latitude built into the control technology, and the level of actual emissions relative to the compliance limitation.

(d) *Special criteria for the use of continuous emission, opacity or predictive monitoring systems.* (1) If a continuous emission monitoring system (CEMS), continuous opacity monitoring system (COMS) or predictive emission monitoring system (PEMS) is required pursuant to other authority under the Act or state or local law, the owner or operator shall use such system to satisfy the requirements of this part.

(2) The use of a CEMS, COMS, or PEMS that satisfies any of the following monitoring requirements shall be deemed to satisfy the general design criteria in paragraphs (a) and (b) of this section, provided that a COMS may be subject to the criteria for establishing indicator ranges under paragraph (a) of this section:

(i) Section 51.214 and appendix P of part 51 of this chapter;

(ii) Section 60.13 and appendix B of part 60 of this chapter;

(iii) Section 63.8 and any applicable performance specifications required pursuant to the applicable subpart of part 63 of this chapter;

(iv) Part 75 of this chapter;

(v) Subpart H and appendix IX of part 266 of this chapter; or

(vi) If an applicable requirement does not otherwise require compliance with the requirements listed in the preceding paragraphs (d)(2)(i) through (v) of this section, comparable requirements and specifications established by the permitting authority.

(3) The owner or operator shall design the monitoring system subject to this paragraph (d) to:

(i) Allow for reporting of exceedances (or excursions if applicable to a COMS used to assure compliance with a particulate matter standard), consistent with any period for reporting of exceedances in an underlying requirement. If an underlying requirement does not contain a provision for establishing an averaging period for the reporting of exceedances or excursions, the criteria used to develop an averaging period in (b)(4) of this section shall apply; and

(ii) Provide an indicator range consistent with paragraph (a) of this section for a COMS used to assure compliance with a particulate matter standard. If an opacity standard applies to the pollutant-specific emissions unit, such limit may be used as the appropriate indicator range unless the opacity limit fails to meet the criteria in paragraph (a) of this section after considering the type of control device and other site-specific factors applicable to the pollutant-specific emissions unit.

§ 64.4 Submittal requirements.

(a) The owner or operator shall submit to the permitting authority monitoring that satisfies the design requirements in § 64.3. The submission shall include the following information:

(1) The indicators to be monitored to satisfy §§ 64.3(a)(1)–(2);

(2) The ranges or designated conditions for such indicators, or the process by which such indicator ranges or designated conditions shall be established;

(3) The performance criteria for the monitoring to satisfy § 64.3(b); and

(4) If applicable, the indicator ranges and performance criteria for a CEMS, COMS or PEMS pursuant to § 64.3(d).

(b) As part of the information submitted, the owner or operator shall submit a justification for the proposed elements of the monitoring. If the performance specifications proposed to satisfy § 64.3(b)(2) or (3) include differences from manufacturer recommendations, the owner or operator shall explain the reasons for the differences between the requirements proposed by the owner or operator and the manufacturer's recommendations or requirements. The owner or operator also shall submit any data supporting the justification, and may refer to generally available sources of information used to support the justification (such as generally available air pollution engineering manuals, or EPA or permitting authority publications on appropriate monitoring for various types of control devices or capture systems). To justify the appropriateness of the monitoring elements proposed, the owner or operator may rely in part on existing applicable requirements that establish the monitoring for the applicable pollutant-specific emissions unit or a similar unit. If an owner or operator relies on presumptively acceptable monitoring, no further justification for the appropriateness of that monitoring should be necessary other than an explanation of the applicability of such monitoring to the unit in question, unless data or information is brought forward to rebut the assumption. Presumptively acceptable monitoring includes:

(1) Presumptively acceptable or required monitoring approaches, established by the permitting authority in a rule that constitutes part of the applicable implementation plan required pursuant to title I of the Act, that are designed to achieve compliance with this part for particular pollutant-specific emissions units;

(2) Continuous emission, opacity or predictive emission monitoring systems that satisfy applicable monitoring requirements and performance specifications as specified in § 64.3(d);

(3) Excepted or alternative monitoring methods allowed or approved pursuant to part 75 of this chapter;

(4) Monitoring included for standards exempt from this part pursuant to § 64.2(b)(1)(i) or (vi) to the extent such monitoring is applicable to the performance of the control device (and associated capture system) for the pollutant-specific emissions unit; and

(5) Presumptively acceptable monitoring identified in guidance by EPA. Such guidance will address the requirements under §§ 64.4(a), (b), and (c) to the extent practicable.

(c)(1) Except as provided in paragraph (d) of this section, the owner or operator shall submit control device (and process and capture system, if applicable) operating parameter data obtained during the conduct of the applicable compliance or performance test conducted under conditions specified by the applicable rule. If the applicable rule does not specify testing conditions or only partially specifies test conditions, the performance test generally shall be conducted under conditions representative of maximum emissions potential under anticipated operating conditions at the pollutant-specific emissions unit. Such data may be supplemented, if desired, by engineering assessments and manufacturer's recommendations to justify the indicator ranges (or, if applicable, the procedures for establishing such indicator ranges). Emission testing is not required to be conducted over the entire indicator range or range of potential emissions.

(2) The owner or operator must document that no changes to the pollutant-specific emissions unit, including the control device and capture system, have taken place that could result in a significant change in the control system performance or the selected ranges or designated conditions for the indicators to be monitored since the performance or compliance tests were conducted.

(d) If existing data from unit-specific compliance or performance testing specified in paragraph (c) of this section are not available, the owner or operator:

(1) Shall submit a test plan and schedule for obtaining such data in accordance with paragraph (e) of this section; or

(2) May submit indicator ranges (or procedures for establishing indicator ranges) that rely on engineering assessments and other data, provided that the owner or operator demonstrates that factors specific to the type of monitoring, control device, or pollutant-specific emissions unit make compliance or performance testing unnecessary to establish indicator ranges at levels that satisfy the criteria in § 64.3(a).

(e) If the monitoring submitted by the owner or operator requires installation, testing, or other necessary activities prior to use of the monitoring for purposes of this part, the owner or operator shall include an implementation plan and schedule for installing, testing and performing any other appropriate activities prior to use of the monitoring. The implementation plan and schedule shall provide for use of the monitoring as expeditiously as practicable after approval of the monitoring in the part 70 or 71 permit pursuant to § 64.6, but in no case shall the schedule for completing installation and beginning operation of the monitoring exceed 180 days after approval of the permit.

(f) If a control device is common to more than one pollutant-specific emissions unit, the owner or operator may submit monitoring for the control device and identify the pollutant-specific emissions units affected and any process or associated capture device conditions that must be maintained or monitored in accordance with § 64.3(a) rather than submit separate monitoring for each pollutant-specific emissions unit.

(g) If a single pollutant-specific emissions unit is controlled by more than one control device similar in design and operation, the owner or operator may submit monitoring that applies to all the control devices and identify the control devices affected and any process or associated capture device conditions that must be maintained or monitored in accordance with § 64.3(a) rather than submit a separate description of monitoring for each control device.

§ 64.5 Deadlines for submittals.

(a) *Large pollutant-specific emissions units.* For all pollutant-specific emissions units with the potential to emit (taking into account control devices to the extent appropriate under the definition of this term in § 64.1) the applicable regulated air pollutant in an amount equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source, the owner or operator shall submit the information required under § 64.4 at the following times:

(1) On or after April 20, 1998, the owner or operator shall submit information as part of an application for an initial part 70 or 71 permit if, by that date, the application either:

(i) Has not been filed; or

(ii) Has not yet been determined to be complete by the permitting authority.

(2) On or after April 20, 1998, the owner or operator shall submit information as part of an application for a significant permit revision under part 70 or 71 of this chapter, but only with respect to those pollutant-specific emissions units for which the proposed permit revision is applicable.

(3) The owner or operator shall submit any information not submitted under the deadlines set forth in paragraphs (a)(1) and (2) of this section as part of the application for the renewal of a part 70 or 71 permit.

(b) *Other pollutant-specific emissions units.* For all other pollutant-specific emissions units subject to this part and not subject to § 64.5(a), the owner or operator shall submit the information required under § 64.4 as part of an application for a renewal of a part 70 or 71 permit.

(c) The effective date for the requirement to submit information under § 64.4 shall be as specified pursuant to paragraphs (a)–(b) of this section and a permit reopening to require the submittal of information under this section shall not be required pursuant to § 70.7(f)(1)(i) of this chapter, provided, however, that, if a part 70 or 71 permit is reopened for cause by EPA or the permitting authority pursuant to § 70.7(f)(1)(iii) or (iv), or § 71.7(f) or (g), the applicable agency may require the submittal of information under this section for those pollutant-specific emissions units that are subject to this part and that are affected by the permit reopening.

(d) Prior to approval of monitoring that satisfies this part, the owner or operator is subject to the requirements of § 70.6(a)(3)(i)(B).

§ 64.6 Approval of monitoring.

(a) Based on an application that includes the information submitted in accordance with § 64.5, the permitting authority shall act to approve the monitoring submitted by the owner or operator by confirming that the monitoring satisfies the requirements in § 64.3.

(b) In approving monitoring under this section, the permitting authority may condition the approval on the owner or operator collecting additional data on the indicators to be monitored for a pollutant-specific emissions unit, including required compliance or performance testing, to confirm the ability of the monitoring to provide data that are sufficient to satisfy the requirements of this part and to confirm the appropriateness of an indicator range(s) or designated condition(s) proposed to satisfy § 64.3(a)(2) and (3) and consistent with the schedule in § 64.4(e).

(c) If the permitting authority approves the proposed monitoring, the permitting authority shall establish one or more permit terms or conditions that specify the required monitoring in accordance with § 70.6(a)(3)(i) of this chapter. At a minimum, the permit shall specify:

(1) The approved monitoring approach that includes all of the following:

(i) The indicator(s) to be monitored (such as temperature, pressure drop, emissions, or similar parameter);

(ii) The means or device to be used to measure the indicator(s) (such as temperature measurement device, visual observation, or CEMS); and

(iii) The performance requirements established to satisfy § 64.3(b) or (d), as applicable.

(2) The means by which the owner or operator will define an exceedance or excursion for purposes of responding to and reporting exceedances or excursions under §§ 64.7 and 64.8 of this part. The permit shall specify the level at which an excursion or exceedance will be deemed to occur, including the appropriate averaging period associated with such exceedance or excursion. For defining an excursion from an indicator range or designated condition, the permit may either include the specific value(s) or condition(s) at which an excursion shall occur, or the specific procedures that will be used to establish that value or condition. If the latter, the permit shall specify appropriate notice procedures for the owner or operator to notify the permitting authority upon any establishment or reestablishment of the value.

(3) The obligation to conduct the monitoring and fulfill the other obligations specified in §§ 64.7 through 64.9 of this part.

(4) If appropriate, a minimum data availability requirement for valid data collection for each averaging period, and, if appropriate, a minimum data availability requirement for the averaging periods in a reporting period.

(d) If the monitoring proposed by the owner or operator requires installation, testing or final verification of operational status, the part 70 or 71 permit shall include an enforceable schedule with appropriate milestones for completing such installation, testing, or final verification consistent with the requirements in § 64.4(e).

(e) If the permitting authority disapproves the proposed monitoring, the following applies:

(1) The draft or final permit shall include, at a minimum, monitoring that satisfies the requirements of § 70.6(a)(3)(i)(B);

(2) The permitting authority shall include in the draft or final permit a compliance schedule for the source owner to submit monitoring that satisfies §§ 64.3 and 64.4, but in no case shall the owner or operator submit revised monitoring more than 180 days from the date of issuance of the draft or final permit; and

(3) If the source owner or operator does not submit the monitoring in accordance with the compliance schedule as required in paragraph (e)(2) of this section or if the permitting authority disapproves the monitoring submitted, the source owner or operator shall be deemed not in compliance with part 64, unless the source owner or operator successfully challenges the disapproval.

§ 64.7 Operation of approved monitoring.

(a) *Commencement of operation.* The owner or operator shall conduct the monitoring required under this part upon issuance of a part 70 or 71 permit that includes such monitoring, or by such later date specified in the permit pursuant to § 64.6(d).

(b) *Proper maintenance.* At all times, the owner or operator shall maintain the monitoring, including but not limited to, maintaining necessary parts for routine repairs of the monitoring equipment.

(c) *Continued operation.* Except for, as applicable, monitoring malfunctions, associated repairs, and required quality assurance or control activities (including, as applicable, calibration checks and required zero and span adjustments), the owner or operator shall conduct all monitoring in continuous operation (or shall collect data at all required intervals) at all times that the pollutant-specific emissions unit is operating. Data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities shall not be used for purposes of this part, including data averages and calculations, or fulfilling a minimum data availability requirement, if applicable. The owner or operator shall use all the data collected during all other periods in assessing the operation of the control device and associated control system. A monitoring malfunction is any sudden, infrequent, not reasonably preventable failure of the monitoring to provide valid data. Monitoring failures that are caused in part by poor maintenance or careless operation are not malfunctions.

(d) *Response to excursions or exceedances.* (1) Upon detecting an excursion or exceedance, the owner or operator shall restore operation of the pollutant-specific emissions unit (including the control device and associated capture system) to its normal or usual manner of operation as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions. The response shall include minimizing the period of any startup, shutdown or malfunction and taking any necessary corrective actions to restore normal operation and prevent the likely recurrence of the cause of an excursion or exceedance (other than those caused by excused startup or shutdown conditions). Such actions may include initial inspection and evaluation, recording that operations returned to normal without operator action (such as through response by a computerized distribution control system), or any necessary follow-up actions to return operation to within the indicator range, designated condition, or below the applicable emission limitation or standard, as applicable.

(2) Determination of whether the owner or operator has used acceptable procedures in response to an excursion or exceedance will be based on information available, which may include but is not limited to, monitoring results, review of operation and maintenance procedures and records, and inspection of the control device, associated capture system, and the process.

(e) *Documentation of need for improved monitoring.* After approval of monitoring under this part, if the owner or operator identifies a failure to achieve compliance with an emission limitation or standard for which the approved monitoring did not provide an indication of an excursion or exceedance while providing valid data, or the results of compliance or performance testing document a need to modify the existing indicator ranges or designated conditions, the owner or operator shall promptly notify the permitting authority and, if necessary, submit a proposed modification to the part 70 or 71 permit to address the necessary monitoring changes. Such a modification may include, but is not limited to, reestablishing indicator ranges or designated conditions, modifying the frequency of conducting monitoring and collecting data, or the monitoring of additional parameters.

§ 64.8 Quality improvement plan (QIP) requirements.

(a) Based on the results of a determination made under § 64.7(d)(2), the Administrator or the permitting authority may require the owner or operator to develop and implement a QIP. Consistent with § 64.6(c)(3), the part 70 or 71 permit may specify an appropriate threshold, such as an accumulation of exceedances or excursions exceeding 5 percent duration of a pollutant-specific emissions unit's operating time for a reporting period, for requiring the implementation of a QIP. The threshold may be set at a higher or lower percent or may rely on other criteria for purposes of indicating whether a pollutant-specific emissions unit is being maintained and operated in a manner consistent with good air pollution control practices.

(b) Elements of a QIP:

(1) The owner or operator shall maintain a written QIP, if required, and have it available for inspection.

(2) The plan initially shall include procedures for evaluating the control performance problems and, based on the results of the evaluation procedures, the owner or operator shall modify the plan to include procedures for conducting one or more of the following actions, as appropriate:

(i) Improved preventive maintenance practices.

(ii) Process operation changes.

(iii) Appropriate improvements to control methods.

(iv) Other steps appropriate to correct control performance.

(v) More frequent or improved monitoring (only in conjunction with one or more steps under paragraphs (b)(2)(i) through (iv) of this section).

(c) If a QIP is required, the owner or operator shall develop and implement a QIP as expeditiously as practicable and shall notify the permitting authority if the period for completing the improvements contained in the QIP exceeds 180 days from the date on which the need to implement the QIP was determined.

(d) Following implementation of a QIP, upon any subsequent determination pursuant to § 64.7(d)(2) the Administrator or the permitting authority may require that an owner or operator make reasonable changes to the QIP if the QIP is found to have:

(1) Failed to address the cause of the control device performance problems; or

(2) Failed to provide adequate procedures for correcting control device performance problems as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions.

(e) Implementation of a QIP shall not excuse the owner or operator of a source from compliance with any existing emission limitation or standard, or any existing monitoring, testing, reporting or recordkeeping requirement that may apply under federal, state, or local law, or any other applicable requirements under the Act.

§ 64.9 Reporting and recordkeeping requirements.

(a) *General reporting requirements.* (1) On and after the date specified in § 64.7(a) by which the owner or operator must use monitoring that meets the requirements of this part, the owner or operator shall submit monitoring reports to the permitting authority in accordance with § 70.6(a)(3)(iii) of this chapter.

(2) A report for monitoring under this part shall include, at a minimum, the information required under § 70.6(a)(3)(iii) of this chapter and the following information, as applicable:

(i) Summary information on the number, duration and cause (including unknown cause, if applicable) of excursions or exceedances, as applicable, and the corrective actions taken;

(ii) Summary information on the number, duration and cause (including unknown cause, if applicable) for monitor downtime incidents (other than downtime associated with zero and span or other daily calibration checks, if applicable); and

(iii) A description of the actions taken to implement a QIP during the reporting period as specified in § 64.8. Upon completion of a QIP, the owner or operator shall include in the next summary report documentation that the implementation of the plan has been completed and reduced the likelihood of similar levels of excursions or exceedances occurring.

(b) *General recordkeeping requirements.* (1) The owner or operator shall comply with the recordkeeping requirements specified in § 70.6(a)(3)(ii) of this chapter. The owner or operator shall maintain records of monitoring data, monitor performance data, corrective actions taken, any written quality improvement plan required pursuant to § 64.8 and any activities undertaken to implement a quality improvement plan, and other supporting information required to be maintained under this part (such as data used to document the adequacy of monitoring, or records of monitoring maintenance or corrective actions).

(2) Instead of paper records, the owner or operator may maintain records on alternative media, such as microfilm, computer files, magnetic tape disks, or microfiche, provided that the use of such alternative media allows for expeditious inspection and review, and does not conflict with other applicable recordkeeping requirements.

§ 64.10 Savings provisions.

(a) Nothing in this part shall:

(1) Excuse the owner or operator of a source from compliance with any existing emission limitation or standard, or any existing monitoring, testing, reporting or recordkeeping requirement that may apply under federal, state, or local law, or any other applicable requirements under the Act. The requirements of this part shall not be used to justify the approval of monitoring less stringent than the monitoring which is required under separate legal authority and are not intended to establish minimum requirements for the purpose of determining the monitoring to be imposed under separate authority under the Act, including monitoring in permits issued pursuant to title I of the Act. The purpose of this part is to require, as part of the issuance of a permit under title V of the Act, improved or new monitoring at those emissions units where monitoring requirements do not exist or are inadequate to meet the requirements of this part.

(2) Restrict or abrogate the authority of the Administrator or the permitting authority to impose additional or more stringent monitoring, recordkeeping, testing, or reporting requirements on any owner or operator of a source under any provision of the Act, including but not limited to sections 114(a)(1) and 504(b), or state law, as applicable.

(3) Restrict or abrogate the authority of the Administrator or permitting authority to take any enforcement action under the Act for any violation of an applicable requirement or of any person to take action under section 304 of the Act.

PART 70—STATE OPERATING PERMIT PROGRAMS

1. The authority citation for part 70 continues to read as follows:

Authority: 42 U.S.C. 7401, *et seq.*

2. Section 70.6 is amended by revising paragraphs (a)(3)(i)(A) and (c)(5)(iii) and (c)(5)(iv), and by removing (c)(5)(v) to read as follows:

§ 70.6 Permit content.

* * * * *

(a) * * *

(3) * * *

(i) * * *

(A) All monitoring and analysis procedures or test methods required under applicable monitoring and testing requirements, including part 64 of this chapter and any other procedures and methods that may be promulgated pursuant to sections 114(a)(3) or 504(b) of the Act. If more than one monitoring or testing requirement applies, the permit may specify a streamlined set of monitoring or testing provisions provided the specified monitoring or testing is adequate to assure compliance at least to the same extent as the monitoring or testing applicable requirements that are not included in the permit as a result of such streamlining;

* * * * *

(c) * * *

(5) * * *

(iii) A requirement that the compliance certification include all of the following (provided that the identification of applicable information may cross-reference the permit or previous reports, as applicable):

(A) The identification of each term or condition of the permit that is the basis of the certification;

(B) The identification of the method(s) or other means used by the owner or operator for determining the compliance status with each term and condition during the certification period, and whether such methods or other means provide continuous or intermittent data. Such methods and other means shall include, at a minimum, the methods and means required under paragraph (a)(3) of this section. If necessary, the owner or operator also shall identify any other material information that must be included in the certification to comply with section 113(c)(2) of the Act, which prohibits knowingly making a false certification or omitting material information;

(C) The status of compliance with the terms and conditions of the permit for the period covered by the certification, based on the method or means designated in paragraph (c)(5)(iii)(B) of this section. The certification shall identify each deviation and take it into account in the compliance certification. The certification shall also identify as possible exceptions to compliance any periods during which compliance is required and in which an excursion or exceedance as defined under part 64 of this chapter occurred; and

(D) Such other facts as the permitting authority may require to determine the compliance status of the source.

(iv) A requirement that all compliance certifications be submitted to the Administrator as well as to the permitting authority.

* * * * *

PART 71—FEDERAL OPERATING PERMITS PROGRAMS

1. The authority citation for part 71 continues to read as follows:

Authority: 42 U.S.C. 7401, *et seq.*

2. Section 71.6 is amended by revising paragraphs (a)(3)(i)(A), (a)(3)(iii)(C), (c)(5)(iii) and (c)(5)(iv), and by removing (c)(5)(v) to read as follows:

§ 71.6 Permit content.

* * * * *

(a) * * *

(3) * * *

(i) * * *

(A) All monitoring and analysis procedures or test methods required under applicable monitoring and testing requirements, including part 64 of this chapter and any other procedures and methods that may be promulgated pursuant to sections 114(a)(3) or 504(b) of the Act. If more than one monitoring or testing requirement applies, the permit may specify a streamlined set of monitoring or testing provisions provided the specified monitoring or testing is adequate to assure compliance at least to the same extent as the monitoring or testing applicable requirements that are not included in the permit as a result of such streamlining;

* * * * *

(iii) * * *

(C) For purposes of paragraph (a)(3)(iii)(B) of this section, deviation means any situation in which an emissions unit fails to meet a permit term or condition. A deviation is not always a violation. A deviation can be determined by observation or through review of data obtained from any testing, monitoring, or recordkeeping established in accordance with paragraphs (a)(3)(i) and (a)(3)(ii) of this section. For a situation lasting more than 24 hours which constitutes a deviation, each 24 hour period is considered a separate deviation. Included in the meaning of deviation are any of the following:

(*1*) A situation where emissions exceed an emission limitation or standard;

(*2*) A situation where process or emissions control device parameter values indicate that an emission limitation or standard has not been met;

(*3*) A situation in which observations or data collected demonstrates noncompliance with an emission limitation or standard or any work practice or operating condition required by the permit;

(*4*) A situation in which an exceedance or an excursion, as defined in part 64 of this chapter, occurs.

* * * * *

(c) * * *

(5) * * *

(iii) A requirement that the compliance certification include all of the following (provided that the identification of applicable information may cross-reference the permit or previous reports, as applicable):

(A) The identification of each term or condition of the permit that is the basis of the certification;

(B) The identification of the method(s) or other means used by the owner or operator for determining the compliance status with each term and condition during the certification period, and whether such methods or other means provide continuous or intermittent data. Such methods and other means shall include, at a minimum, the methods and means required under paragraph (a)(3) of this section. If necessary, the owner or operator also shall identify any other material information that must be included in the certification to comply with section 113(c)(2) of the Act, which prohibits knowingly making a false certification or omitting material information;

(C) The status of compliance with the terms and conditions of the permit for the period covered by the certification, based on the method or means designated in paragraph (c)(5)(iii)(B) of this section. The certification shall identify each deviation and take it into account in the compliance certification; and

(D) Such other facts as the permitting authority may require to determine the compliance status of the source.

(iv) A requirement that all compliance certifications be submitted to the Administrator as well as to the permitting authority.

* * * * *

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ATTACHMENT D

SUMMARY OF PROPOSED SCHEDULED MONITORING EVENTS

ATTACHMENT D
SUMMARY OF SCHEDULED O&M EVENTS

First Year

- Manufacturer's Inspection
- QA/QC CEMS Data
- Stack Test
    - Influent
    - Effluent
    - TO-14 Inlet

Subsequent Years

- Continuous Monitoring of Temperature and Flow Rate
- Quarterly TO-14 Sampling and Analysis of Influent
- Annual Manufacturer's Inspection

ATTACHMENT E

COST ESTIMATE

ATTACHMENT E
COST ESTIMATE

Cost Estimate for Gas Collection and Treatment System
Inspection, Operation, Maintenance, and Monitoring

I. Annual Inspection, Operation and Maintenance Item	Unit	Unit Cost	Quantity	First Year Total	Subsequent Years Total
Operation		See Attached			
First Year				$ 840.00	
Subsequent Years					$ 840.00
Inspection		See Attached			
First Year				$ 4,410.00	
Subsequent Years					$ 4,410.00
Maintenance		See Attached			
First Year				$ 24,500.00	
Subsequent Years					$ 11,300.00
Monitoring		See Attached			
First Year				$ 26,100.00	
Subsequent Years					$ 8,000.00
Data Analysis, Report Preparation and Submission		See Attached			
First Year				$ 9,360.00	
Subsequent Years					$ 6,760.00
		Annual Total		**$ 65,210.00**	**$ 31,310.00**
		Overall Five Year Total		**$ 190,450.00**	

ATTACHMENT E
COST ESTIMATE

I. OPERATION

Item	Reference	Unit	Quantity	Unit Cost	Total	Notes
Periodic Operation					$ 840.00	Data BU, Alarm Reset....
		Hour	24	$ 35.00		

ANNUAL INSPECTION TOTAL $ 840.00

II. INSPECTION PLAN

Item	Reference	Unit	Quantity	Unit Cost	Total	Notes
Manufacturer's Inspection	Section 19.3	Event	1	$ 1,290.00	$ 1,290.00	
Component Inspections (Monthly)	Section 19.3	Event	12	$ 260.00	$ 3,120.00	

ANNUAL INSPECTION TOTAL $ 4,410.00

III. MAINTENANCE PLAN

Item	Reference	Unit	Quantity	Unit Cost	Total	Notes
Scheduled Maintenance	Section 19.4				$ 7,100.00	1x/yr: (5 days/2 laborers/HSO)
Labor		Hour	120	$ 55.00		
Equipment & Materials		Event	1	$ 500.00		
Unschedule Maintenance					$ 4,200.00	1x/yr: (3 days/2 laborers)
Labor		Hour	120	$ 35.00		
One Time Monitoring Costs					$ 13,200.00	1x: (2 weeks/2 laborers/HSO)
Vault and Pipe Sealing		Hour	240	$ 55.00		

FIRST YEAR ANNUAL MAINTENANCE TOTAL $ 24,500.00
SUBSEQUENT YEARS ANNUAL MAINTENANCE TOTAL $ 11,300.00

IV. MONITORING PLAN

Item	Reference	Unit	Quantity (2 Samples - 4x/yr)	Unit Cost	Total	Notes
TO-14 Sampling and Analysis		each			$ 6,960.00	
Equipment Rental		each	8	$ 130.00		
Sampling Labor		hour	48	$ 65.00		
Analysis		each	8	$ 350.00		
Periodic Calibrations (Flow and Temp)					$ 1,040.00	
		Hour	16	$ 65.00		
One Time Monitoring Costs					$ 18,100.00	
QA/QC of Existing CEMS Data		hours	40	$ 65.00		
DAS Upgrade		each	1	$ 14,000.00		
Stack Test		each	1	$ 1,500.00		

FIRST YEAR ANNUAL MONITORING TOTAL $ 26,100.00
SUBSEQUENT YEARS ANNUAL MONITORING TOTAL $ 8,000.00

ATTACHMENT E
COST ESTIMATE

V. DATA ANALYSIS, REPORT PREPARATION AND SUBMISSION

Item	Reference	Unit	Quantity	Unit Cost	Total	Notes
Reporting	Section 19.3 - 19.5				$ 6,760.00	
Monthly/Quarterly/Annual			104	$ 65.00		
One Time Submission					$ 2,600.00	
CAM Rule Application		Hour	40	$ 65.00		

FIRST YEAR ANNUAL REPORTING TOTAL $ 9,360.00
SUBSEQUENT YEARS ANNUAL REPORTING TOTAL $ 6,760.00

TRC

Customer-Focused Solutions

Draft Final Report

Compliance Emissions Testing of a Thermal Oxidizing Unit at the Industri-plex Site Remedial Trust in Woburn, Massachusetts

Prepared for:

Maverick Construction Management Services, Inc.
P.O. Box 2580
Woburn, MA 01888

Prepared by:

TRC Environmental Corporation
Boott Mills South
Foot of John Street
Lowell, Massachusetts 01852
(978) 970-5600

May 2003

TRC

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TRC Project No. 32754-0010-00000

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SECTION 1.0
INTRODUCTION

1.1 OVERVIEW

Maverick Construction Management Services, Inc. (Maverick) operates a gas treatment system at the Industri-plex Site Remedial Trust in Woburn, Massachusetts. The waste encapsulated within the landfill decomposes and creates a gas, which primarily consists of methane, carbon dioxide, and trace gases. To control air emissions, the landfill gas is directed to and combusted in a thermal oxidizing unit (TOU).

The purpose of the gas treatment system effluent monitoring is to ensure that ambient air quality is within the standards for nuisance odors which were established during the PreDesign Investigation Baseline Air Survey (Golder Associates Inc., 1991a).

TRC Environmental Corporation (TRC) of Lowell, Massachusetts was retained by Maverick to provide sampling and analytical support. The Maverick Compliance Test Program documents the performance of the TOU when firing landfill gas. The operation of the TOU was demonstrated at an operating temperature of approximately 1,550°F.

Sampling and analysis procedures described in this document were conducted following TRC's letter dated December 7, 2001. TRC was responsible for the collection and analysis of all flue gas samples.

1.2 SCOPE OF WORK

The compliance program consisted of a series of three test runs at the inlet and outlet of the TOU using EPA Reference Methods. Each inlet test run determined the concentrations of oxygen (O_2), carbon dioxide (CO_2), nitrogen (N_2), methane (CH_4), total reduced sulfur (TRS), volatile organic compounds (VOCs) and total non-methane organic compounds (TNMOCs). Each outlet test run determined the concentrations for O_2, CO_2, VOCs, and TNMOCs. Velocity and moisture were also determined at the outlet location.

1.3 REPORT SUMMARY

This report presents a summary of the test procedures and analytical results from the Compliance Test Program. Section 2 presents a summary and discussion of the results. Section 3 contains a brief description of the sampling locations. Section 4 presents a summary of the sampling methodologies that were utilized by TRC during test the program, and Section 5 presents a summary of analytical methodologies and example calculations. Section 6 contains descriptions of the QA/QC procedures that were followed by TRC. Included in the appendices are copies of sampling and analytical data sheets, equipment calibration sheets, and facility process data.

SECTION 2.0
SUMMARY AND DISCUSSION OF RESULTS

This section presents a summary of the emissions testing conducted at the Industri-plex Site facility. The field sampling data sheets are located in Appendix A. Facility process data can be found in Appendix B. Analytical data sheets can be found in Appendix C and equipment calibrations can be found in Appendix D.

2.1 OPERATIONAL PARAMETERS

The operational data for the TOU was recorded by Maverick. These data included the inlet landfill gas flow rate, in cubic feet per minute (cfm) and exit flue gas temperature in degrees Fahrenheit (°F). These data can be found in Appendix B.

2.2 FIXED GASES (Oxygen, Carbon Dioxide, Nitrogen, and Methane)

Samples for fixed gases were collected during all three test runs at the inlet location using a Modified EPA Method 3C/25C sampling train. These samples were collected from the landfill gas inlet duct using an evacuated SUMMA canister. Analyses were conducted in accordance with EPA Method 3C. These results are presented on a percent volume (%v) basis. Table 2-1 presents the results for all three test runs.

2.3 TOTAL REDUCED SULFUR

TRC collected Tedlar bag samples in accordance with EPA Method 18 (bag-in-drum technique) from the inlet and outlet sampling locations. Analyses were conducted in accordance with Modified ASTM D-5504 for TRS. These results are presented in parts per million (ppm). These results are summarized in Tables 2-2 and 2-3. The Tedlar bag sample for Run 3 at the outlet sampling location arrived at the laboratory damaged and was unable to be analyzed.

2.4 VOCs

Samples for targeted VOCs were collected at the inlet sampling location in conjunction with the Modified Method 3C/25C sampling train using an evacuated SUMMA canister. All of these analyses were conducted in accordance with Modified Method TO-14. These results are presented in parts per billion (ppb). These results are summarized in Table 2-4.

Samples for targeted VOCs were collected at the outlet sampling location using an EPA Method 0030 sampling train. All of these analyses were conducted in accordance with Modified SW-846 Methods 5041A/8260B. These results are summarized in Table 2-5. Compounds that were not detected on any of the tubes in a given run are indicated on the table by an "ND" beside the mass collected.

2.5 VOC DESTRUCTION AND REMOVAL EFFICIENCY

DREs were calculated for selected VOCs (benzene and toluene) during all three test runs. These compounds were selected because they were determined to be the most difficult compounds in the gas stream to destroy and because of their presence in the landfill gas based upon prior testing (TRC letter dated December 7, 2001). The results for the three test runs are presented in Table 2-6.

2.6 TNMOC AND H_2S EMISSIONS AND DRE

Samples for TNMOCs were collected at the inlet and outlet sampling locations in conjunction with the Modified EPA Method 3C/25C sampling train using an evacuated SUMMA canister. All of these analyses were conducted in accordance with Modified Method TO-12. The TNMOC results (as heptane) are presented in parts per million (ppm).

TRC collected Tedlar bag samples in accordance with EPA Method 18 (bag-in-drum technique) from the inlet and outlet sampling locations. Analyses were conducted in accordance with Modified ASTM D-5504 for H_2S. These results are presented in parts per million (ppm). The

Tedlar bag sample for Test Run 3 at the outlet sampling location arrived at the laboratory damaged, and was unable to be analyzed. Results from the Test Run 2 outlet location were used as the results for the Test Run 3 outlet location.

The emissions and DRE summary of results are presented in Table 2-7.

TABLE 2-1. INLET GASEOUS SUMMARY

Parameter	*Units*	*11/26/02 Run 1*	*11/26/02 Run 2*	*11/26/02 Run 3*	*Averages*
Sampling Location		Inlet Duct	Inlet Duct	Inlet Duct	
O_2 Concentration	%, wet	9.2	10	12	10
CO_2 Concentration	%, wet	13	12	9.2	11
N_2 Concentration	%, wet	59	59	61	60
CH_4 Concentration	%, wet	20	20	15	18

TABLE 2-2. INLET TRS SUMMARY

Parameter	*Units*	*11/26/02 Run 1*		*11/26/02 Run 2*		*11/26/02 Run 3*		*Averages*	
Sampling Location			Inlet Duct		Inlet Duct		Inlet Duct		
Hydrogen Sulfide	ppm		350		270		350		323
Carbonyl Sulfide	ppm	<	4	<	4	<	4	<	4
Methyl Mercaptan	ppm	<	4	<	4	<	4	<	4
Ethyl Mercaptan	ppm	<	4	<	4	<	4	<	4
Dimethyl Sulfide	ppm	<	4	<	4	<	4	<	4
Isopropyl Mercaptan	ppm	<	4	<	4	<	4	<	4
tert-Butyl Mercaptan	ppm	<	4	<	4	<	4	<	4
n-Propyl Mercaptan	ppm	<	4	<	4	<	4	<	4
Ethyl Methyl Sulfide	ppm	<	4	<	4	<	4	<	4
Thiophene	ppm	<	4	<	4	<	4	<	4
Isobutyl Mercaptan	ppm	<	4	<	4	<	4	<	4
Diethyl Sulfide	ppm	<	4	<	4	<	4	<	4
Butyl Mercaptan	ppm	<	4	<	4	<	4	<	4
Dimethyl Disulfide	ppm	<	4	<	4	<	4	<	4
3-Methylthiophene	ppm	<	4	<	4	<	4	<	4
Tetrahydrothiophene	ppm	<	4	<	4	<	4	<	4
2-Ethylthiophene	ppm	<	4	<	4	<	4	<	4
2,5-Dimethylthiophene	ppm	<	4	<	4	<	4	<	4
Diethyl Disulfide	ppm	<	4	<	4	<	4	<	4
Total Reduced Sulfur	ppm		350		270		350		323

< = indicates that the compound was not detected, reporting limit is reported.

TABLE 2-3. OUTLET TRS SUMMARY

Parameter	*Units*	*11/26/02 Run 1*	*11/26/02 Run 2*	*Averages*
Sampling Location		Exhaust Stack	Exhaust Stack	
Hydrogen Sulfide	ppm	< 0.8	< 0.8	< 0.8
Carbonyl Sulfide	ppm	< 0.8	< 0.8	< 0.8
Methyl Mercaptan	ppm	< 0.8	< 0.8	< 0.8
Ethyl Mercaptan	ppm	< 0.8	< 0.8	< 0.8
Dimethyl Sulfide	ppm	< 0.8	< 0.8	< 0.8
Isopropyl Mercaptan	ppm	< 0.8	< 0.8	< 0.8
tert-Butyl Mercaptan	ppm	< 0.8	< 0.8	< 0.8
n-Propyl Mercaptan	ppm	< 0.8	< 0.8	< 0.8
Ethyl Methyl Sulfide	ppm	< 0.8	< 0.8	< 0.8
Thiophene	ppm	< 0.8	< 0.8	< 0.8
Isobutyl Mercaptan	ppm	< 0.8	< 0.8	< 0.8
Diethyl Sulfide	ppm	< 0.8	< 0.8	< 0.8
Butyl Mercaptan	ppm	< 0.8	< 0.8	< 0.8
Dimethyl Disulfide	ppm	< 0.8	< 0.8	< 0.8
3-Methylthiophene	ppm	< 0.8	< 0.8	< 0.8
Tetrahydrothiophene	ppm	< 0.8	< 0.8	< 0.8
2-Ethylthiophene	ppm	< 0.8	< 0.8	< 0.8
2,5-Dimethylthiophene	ppm	< 0.8	< 0.8	< 0.8
Diethyl Disulfide	ppm	< 0.8	< 0.8	< 0.8
Total Reduced Sulfur	ppm	0.0	0.0	0.0

* Note: Run 3 outlet bag sample was received damaged and unable to be analyzed.

< = indicates that the compound was not detected, reporting limit is reported.

TABLE 2-4. INLET VOCs SUMMARY

Parameter	*Units*	*11/26/02 Run 1*	*11/26/02 Run 2*	*11/26/02 Run 3*	*Averages*
Freon 12	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
Freon 114	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
Chloromethane	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
Vinyl Chloride	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
Bromomethane	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
Chloroethane	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
Freon 11	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
1,1-Dichloroethene	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
Freon 113	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
Methylene Chloride	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
1,1-Dichloroethane	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
cis-1,2-Dichloroethene	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
Chloroform	ppbv	24	< 4.5	< 3.1	< 11
1,1,1-Trichloroethane	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
Carbon Tetrachloride	ppbv	5.8	< 4.5	< 3.1	< 4.5
Benzene	ppbv	1,400	1,200	790	1,130
1,2-Dichloroethane	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
Trichloroethene	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
1,2-Dichloropropane	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
cis-1,3-Dichloropropene	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
Toluene	ppbv	580	580	400	520
trans-1,3-Dichloropropene	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
1,1,2-Trichloroethane	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
Tetrachloroethene	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
1,2-Dibromoethane (EDB)	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
Chlorobenzene	ppbv	7.4	14	7.3	9.6
Ethyl Benzene	ppbv	14	16	13	14
m,p-Xylene	ppbv	70	81	68	73
o-Xylene	ppbv	8.4	8.2	7.8	8.1
Styrene	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
1,1,2,2-Tetrachloroethane	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
1,3,5-Trimethylbenzene	ppbv	< 5.3	< 4.5	< 3.1	< 4.3
1,2,4-Trimethylbenzene	ppbv	< 5.3	< 4.5	< 3.1	< 4.3

TABLE 2-4. INLET VOCs SUMMARY

Parameter	*Units*		*11/26/02 Run 1*		*11/26/02 Run 2*		*11/26/02 Run 3*		*Averages*
1,3-Dichlorobenzene	ppbv	<	5.3	<	4.5	<	3.1	<	4.3
1,4-Dichlorobenzene	ppbv	<	5.3	<	4.5	<	3.1	<	4.3
alpha-Chlorotoluene	ppbv	<	5.3	<	4.5	<	3.1	<	4.3
1,2-Dichlorobenzene	ppbv	<	5.3	<	4.5	<	3.1	<	4.3
1,2,4-Trichlorobenzene	ppbv	<	21	<	18	<	12	<	17
Hexachlorobutadiene	ppbv	<	21	<	18	<	12	<	17
Propylene	ppbv	<	21	<	18	<	12	<	17
1,3-Butadiene	ppbv	<	21	<	18	<	12	<	17
Acetone	ppbv		99		110		100		103
Carbon Disulfide	ppbv		78		94		49		74
2-Propanol	ppbv	<	21	<	18	<	12	<	17
trans-1,2-Dichloroethene	ppbv	<	21	<	18	<	12	<	17
Vinyl Acetate	ppbv	<	21	<	18	<	12	<	17
2-Butanone (Methyl Ethyl Ketone)	ppbv	<	21	<	18	<	12	<	17
Hexane	ppbv	<	21	<	18	<	12	<	17
Tetrahydrofuran	ppbv	<	21	<	18	<	12	<	17
Cyclohexane	ppbv	<	21	<	18	<	12	<	17
1,4-Dioxane	ppbv	<	21	<	18	<	12	<	17
Bromodichloromethane	ppbv	<	21	<	18	<	12	<	17
4-Methyl-2-pentanone	ppbv	<	21	<	18	<	12	<	17
2-Hexanone	ppbv	<	21	<	18	<	12	<	17
Dibromochloromethane	ppbv	<	21	<	18	<	12	<	17
Bromoform	ppbv	<	21	<	18	<	12	<	17
4-Ethyltoluene	ppbv	<	21	<	18	<	12	<	17
Ethanol	ppbv	<	21	<	18	<	12	<	17
Methyl tert-Butyl Ether	ppbv	<	21	<	18	<	12	<	17
Heptane	ppbv		41		36		27		35

< = indicates that the compound was not detected, reporting limit is reported.

TABLE 2-5. OUTLET VOCs SUMMARY

Parameter		Units	Run 1[b]	Run 2[b]	Run 3[b]	Average
Sampling Location				Exhaust Stack		
Date			26-Nov-02	26-Nov-02	26-Nov-02	
Start Time			1020	1705	0910	
Stop Time			1445	2110	1308	
Net Sampling Time		minutes	40	40	40	40
Sample Volume (1 tube pair)		liters	18.94	18.93	18.82	18.90
Stack Gas Flow Rate [a]		dscfm	1,127	1,091	1,089	1,102
Chloromethane (Methyl Chloride)	Total Catch	ng	< 20 ND	< 28	< 20 ND	< 23
	Concentration	µg/dscm	< 1.1	< 1.5	< 1.1	< 1.2
	Emission Rate	lbs/hr	< 4.46E-06	< 6.04E-06	< 4.34E-06	< 4.95E-06
Vinyl Chloride	Total Catch	ng	< 20 ND	< 20 ND	< 20 ND	< 20 ND
	Concentration	µg/dscm	< 1.1	< 1.1	< 1.1	< 1.1
	Emission Rate	lbs/hr	< 4.46E-06	< 4.32E-06	< 4.34E-06	< 4.37E-06
Bromomethane (Methyl Bromide)	Total Catch	ng	< 22	< 22	< 20 ND	< 21
	Concentration	µg/dscm	< 1.2	< 1.2	< 1.1	< 1.1
	Emission Rate	lbs/hr	< 4.90E-06	< 4.75E-06	< 4.34E-06	< 4.66E-06
Chloroethane (Ethyl Chloride)	Total Catch	ng	< 20 ND	< 20 ND	< 20 ND	< 20 ND
	Concentration	µg/dscm	< 1.1	< 1.1	< 1.1	< 1.1
	Emission Rate	lbs/hr	< 4.46E-06	< 4.32E-06	< 4.34E-06	< 4.37E-06
Trichlorofluoromethane (Freon 11)	Total Catch	ng	< 20 ND	< 20 ND	< 20 ND	< 20 ND
	Concentration	µg/dscm	< 1.1	< 1.1	< 1.1	< 1.1
	Emission Rate	lbs/hr	< 4.46E-06	< 4.32E-06	< 4.34E-06	< 4.37E-06
1,1-Dichloroethene	Total Catch	ng	< 20 ND	< 20 ND	< 20 ND	< 20 ND
	Concentration	µg/dscm	< 1.1	< 1.1	< 1.1	< 1.1
	Emission Rate	lbs/hr	< 4.46E-06	< 4.32E-06	< 4.34E-06	< 4.37E-06

Parameter		Units		Run 1[b]		Run 2[b]		Run 3[b]		Average
Carbon Disulfide	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	µg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
Acetone	Total Catch	ng	<	100 ND	<	109	<	100 ND	<	103
	Concentration	µg/dscm	<	5.3	<	5.8	<	5.3	<	5.5
	Emission Rate	lbs/hr	<	2.23E-05	<	2.35E-05	<	2.17E-05	<	2.25E-05
Methylene Chloride	Total Catch	ng	<	57	<	20 ND	<	20 ND	<	32
	Concentration	µg/dscm	<	3.0	<	1.1	<	1.1	<	1.7
	Emission Rate	lbs/hr	<	1.27E-05	<	4.32E-06	<	4.34E-06	<	7.12E-06
trans-1,2-Dichloroethene	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	µg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
1,1-Dichloroethane	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	µg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
Vinyl Acetate	Total Catch	ng	<	100 ND	<	100 ND	<	100 ND	<	100 ND
	Concentration	µg/dscm	<	5.3	<	5.3	<	5.3	<	5.3
	Emission Rate	lbs/hr	<	2.23E-05	<	2.16E-05	<	2.17E-05	<	2.19E-05
2-Butanone (Methyl Ethyl Ketone)	Total Catch	ng	<	100 ND	<	100 ND	<	100 ND	<	100 ND
	Concentration	µg/dscm	<	5.3	<	5.3	<	5.3	<	5.3
	Emission Rate	lbs/hr	<	2.23E-05	<	2.16E-05	<	2.17E-05	<	2.19E-05
Chloroform	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	µg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
1,1,1-Trichloroethane	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	µg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
Carbon Tetrachloride	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	µg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06

Parameter		Units		Run 1[b]		Run 2[b]		Run 3[b]		Average
Benzene	Total Catch	ng	<	41	<	20 ND	<	20 ND	<	27
	Concentration	μg/dscm	<	2.2	<	1.1	<	1.1	<	1.4
	Emission Rate	lbs/hr	<	9.14E-06	<	4.32E-06	<	4.34E-06	<	5.93E-06
1,2-Dichloroethane	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	μg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
Trichloroethene	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	μg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
1,2-Dichloropropane	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	μg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
	Emission Rate	g/sec	<	5.62E-07	<	5.44E-07	<	5.46E-07	<	5.51E-07
Bromodichloromethane	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	μg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
trans-1,3-Dichloropropene	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	μg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
4-Methyl-2-pentanone	Total Catch	ng	<	100 ND	<	100 ND	<	100 ND	<	100 ND
	Concentration	μg/dscm	<	5.3	<	5.3	<	5.3	<	5.3
	Emission Rate	lbs/hr	<	2.23E-05	<	2.16E-05	<	2.17E-05	<	2.19E-05
Toluene	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	μg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
cis-1,3-Dichloropropene	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	μg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06

Parameter		Units		Run 1[b]		Run 2[b]		Run 3[b]		Average
1,1,2-Trichloroethane	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	µg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
Tetrachloroethene	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	µg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
2-Hexanone	Total Catch	ng	<	100 ND	<	100 ND	<	100 ND	<	100 ND
	Concentration	µg/dscm	<	5.3	<	5.3	<	5.3	<	5.3
	Emission Rate	lbs/hr	<	2.23E-05	<	2.16E-05	<	2.17E-05	<	2.19E-05
Dibromochloromethane	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	µg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
Chlorobenzene	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	µg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
Ethyl Benzene	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	µg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
m,p-Xylene	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	µg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
o-Xylene	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	µg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
Styrene	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
(Volatile POHC)	Concentration	µg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06

Parameter		Units		Run 1[b]		Run 2[b]		Run 3[b]		Average
Bromoform	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	μg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
1,1,2,2-Tetrachloroethane	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	μg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
1,3-Dichlorobenzene	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	μg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
1,4-Dichlorobenzene	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	μg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
1,2-Dichlorobenzene	Total Catch	ng	<	20 ND	<	20 ND	<	20 ND	<	20 ND
	Concentration	μg/dscm	<	1.1	<	1.1	<	1.1	<	1.1
	Emission Rate	lbs/hr	<	4.46E-06	<	4.32E-06	<	4.34E-06	<	4.37E-06
Freon 12	Total Catch	ng	<	27	<	20 ND	<	20 ND	<	22
	Concentration	μg/dscm	<	1.4	<	1.1	<	1.1	<	1.2
	Emission Rate	lbs/hr	<	6.02E-06	<	4.32E-06	<	4.34E-06	<	4.89E-06

Note:
No blank corrections have been made to these data. If undetected in the analysis, the detection limit is reported.

Footnote:
(a) - Taken from the flow rates measured by the M4 trains.
(b) - A single condensate sample was collected for all three runs. Results are not included above, but indicated detected quantities for certain compounds that are common field and lab contaminants.

Abbreviations:
< = Indicates that the compound was not detected in at least one of the tubes.
dscfm = dry standard cubic feet per minute
dscm = dry standard cubic meter
lbs/hr = pounds per hour
ND = Indicates the compound was not detected in the trap pair, nor in the average of the three runs
ng = nanograms

TABLE 2-6. TARGET VOCS EMISSIONS AND DRE SUMMARY

Parameter	*Units*	*11/26/2002 Run 1*	*11/26/2002 Run 2*	*11/26/2002 Run 3*	*Average*
Sampling Location		Inlet Duct	Inlet Duct	Inlet Duct	
Inlet Gas Flow Rate[1]	cfh	10,500	10,500	10,500	10,500
Benzene	ppm, wet	1.40	1.20	0.79	1.13
Benzene Emission Rate	lbs/hr	2.98E-03	2.55E-03	1.68E-03	2.41E-03
Benzene Emission Rate	tons/yr	1.31E-02	1.12E-02	7.37E-03	1.05E-02
Toluene	ppm, wet	0.58	0.58	0.40	0.52
Toluene Emission Rate	lbs/hr	1.46E-03	1.46E-03	1.00E-03	1.31E-03
Toluene Emission Rate	tons/yr	6.38E-03	6.38E-03	4.40E-03	5.72E-03

1 - Inlet gas flow rate based upon blower manufacturer's rating of 175 cfm as provided by Maverick.

Parameter	*Units*	*11/26/2002 Run 1*	*11/26/2002 Run 2*	*11/26/2002 Run 3*	*Average*
Sampling Location		Exhaust Stack	Exhaust Stack	Exhaust Stack	
Sample Volume	liters	18.94	18.93	18.82	
Stack Gas Flow Rate[2]	dscfh	67,620	65,460	65,340	66,140
Benzene	ng	< 41	< 20	< 20	< 27
Benzene Emission Rate	lbs/hr	< 9.14E-06	< 4.32E-06	< 4.34E-06	< 5.93E-06
Benzene Emission Rate	tons/yr	< 4.00E-05	< 1.89E-05	< 1.90E-05	< 2.60E-05
Toluene	ng	< 20	< 20	< 20	< 20
Toluene Emission Rate	lbs/hr	< 4.46E-06	< 4.32E-06	< 4.34E-06	< 4.37E-06
Toluene Emission Rate	tons/yr	< 1.95E-05	< 1.89E-05	< 1.90E-05	< 1.91E-05

Destruction Efficiency					
Benzene	%	> 99.7	> 99.8	> 99.7	> 99.8
Toluene	%	> 99.7	> 99.7	> 99.6	> 99.7

2 - data taken from Methods 1-4 sampling parameters

< = Indicates that the compound was not detected in at least one of the trap pairs or condensate

TABLE 2-7. TNMOC AND H_2S EMISSIONS AND DRE SUMMARY

Parameter	*Units*	*11/26/2002 Run 1*	*11/26/2002 Run 2*	*11/26/2002 Run 3*	*Average*
Sampling Location		Inlet Duct	Inlet Duct	Inlet Duct	
Inlet Gas Flow Rate[1]	cfh	10,500	10,500	10,500	10,500
Hydrogen Sulfide (H_2S)	ppm, wet	350	270	350	323
H_2S Emission Rate	lbs/hr	3.25E-01	2.51E-01	3.25E-01	3.00E-01
H_2S Emission Rate	tons/yr	1.42E+00	1.10E+00	1.42E+00	1.32E+00
TNMOC (as heptane)	ppm, wet	4.4	4.3	3.0	3.9
TNMOC Emission Rate	lbs/hr	1.20E-02	1.17E-02	8.18E-03	1.06E-02
TNMOC Emission Rate	tons/yr	5.25E-02	5.13E-02	3.58E-02	4.66E-02

[1] - Inlet gas flow rate based upon blower manufacturer's rating of 175 cfm as provided by Maverick.

Parameter	*Units*	*11/26/2002 Run 1*	*11/26/2002 Run 2*	*11/26/2002 Run 3*	*Average*
Sampling Location		Exhaust Stack	Exhaust Stack	Exhaust Stack	
Stack Gas Flow Rate[2]	scfh	74,220	72,900	72,420	73,180
Hydrogen Sulfide (H_2S)	ppm, wet	< 0.8	< 0.8	< 0.8 *	< 0.8
H_2S Emission Rate	lbs/hr	< 5.25E-03	< 5.16E-03	< 5.12E-03	< 5.18E-03
H_2S Emission Rate	tons/yr	< 2.30E-02	< 2.26E-02	< 2.24E-02	< 2.27E-02
TNMOC (as heptane)	ppm, wet	0.23	0.24	0.23	0.23
TNMOC Emission Rate	lbs/hr	4.43E-03	4.54E-03	4.32E-03	4.43E-03
TNMOC Emission Rate	tons/yr	1.94E-02	1.99E-02	1.89E-02	1.94E-02

Destruction Efficiency					
Hydrogen Sulfide (H_2S)	%	> 98.4	> 97.9	> 98.4	> 98.3
TNMOC (as heptane)	%	63.1	61.2	47.1	57.1

[2] - data taken from Method 1-4 sampling parameters.

* - Using Run 2 data due to damaged sample

< = indicates that the compound was not detected, reporting limit is reported.

SECTION 3.0
SAMPLING LOCATIONS

3.1 GAS FEED LINE

As shown in Figure 3-1, inlet samples were collected from an individual feed line to the TOU. Inlet flow data were provided to TRC by Maverick.

3.2 OUTLET EXHAUST STACK

The TOU has an exhaust stack that is approximately 30 feet in height with an internal diameter of 24 inches. As shown in Figure 3-1, two sample ports, located 90° apart on the same plane, are present on the exhaust stack. These ports are located 4 inches downstream from the nearest disturbance and 18 inches upstream from the stack exit.

In accordance with EPA Method 1, a 16-point traverse (8-points on each radius) was conducted during each test run. Table 3-1 presents these traverse points.

TABLE 3-1. TOU EXHAUST STACK TRAVERSE SAMPLING POINTS

Point	Percent of Stack Diameter	Distance From Wall (in.)
1	3.2	0.77
2	10.5	2.52
3	19.4	4.66
4	32.3	7.75
5	67.7	16.25
6	80.6	19.34
7	89.5	21.48
8	96.8	23.23

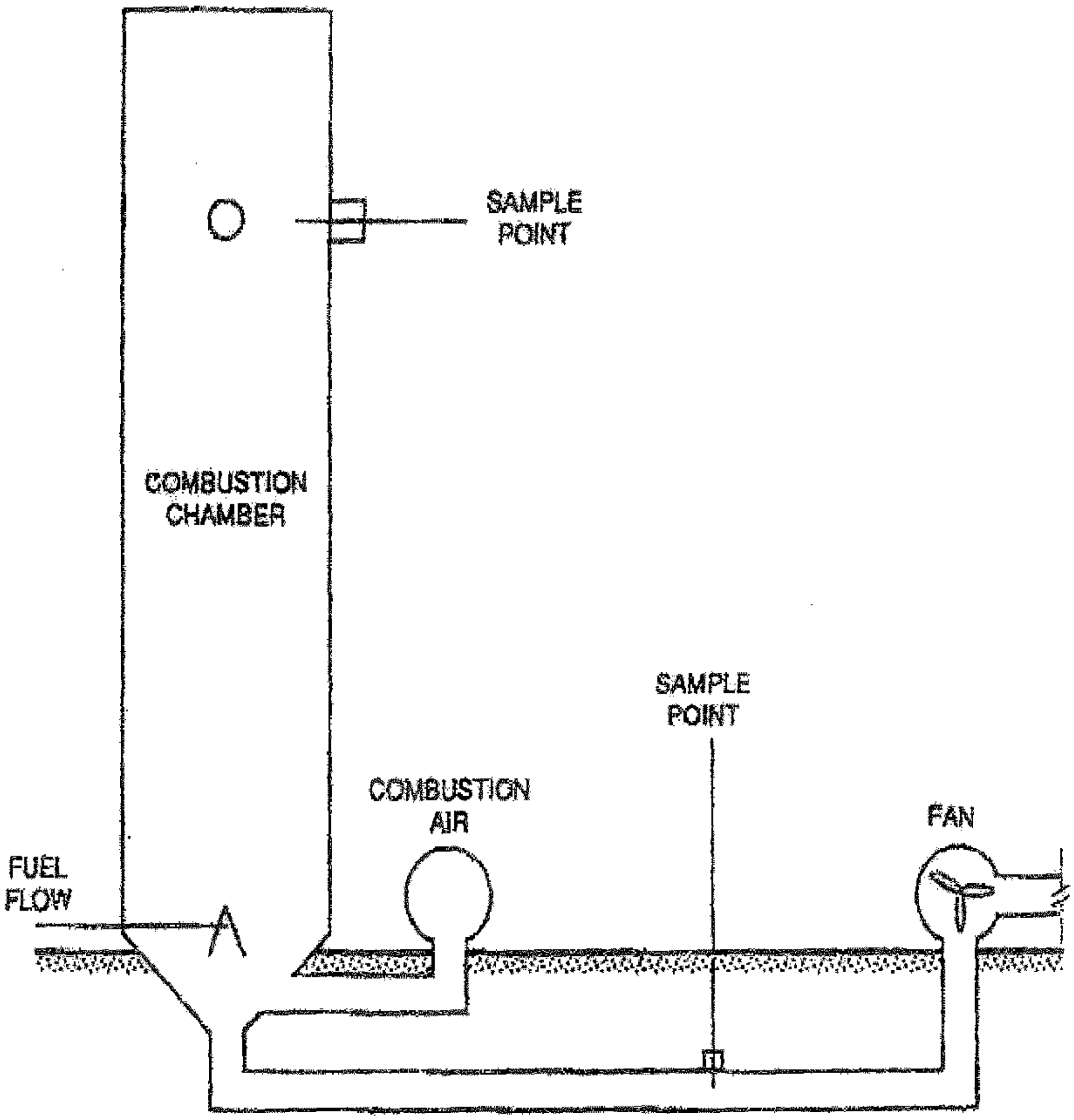


FIGURE 3-1. TOU PROCESS DIAGRAM

SECTION 4.0
SAMPLING PROCEDURES

4.1 OVERVIEW

This section describes the procedures were followed by TRC personnel during the field sampling program. Sampling was conducted on November 26, 2002. Throughout the program TRC followed EPA Reference Methods 40 CFR Part 60 Appendix A.

The remainder of this section is divided into several subsections: Field Program Description, Presampling Activities and Onsite Sampling Activities.

4.2 FIELD PROGRAM DESCRIPTION

The field sampling was conducted by TRC personnel over a two-day period. On the first day equipment was set up and preliminary measurements were made. On the second day, TRC collected samples for the parameters listed below:

- Outlet Location

  O_2 and CO_2
  Velocity and percent moisture
  Total Reduced Sulfur (TRS)
  Total Non-Methane Organic Compounds (TNMOCs)
  Volatile Organic Compounds (VOCs)

- Inlet location

  O_2, CO_2, N_2, and CH_4
  Total Reduced Sulfur (TRS)
  Volatile Organic Compounds (VOCs)

TRC personnel utilized the following EPA Methods as listed in 40 CFR Part 60, Appendix A:

- Method 1 and 2 - Velocity Profile
- Method 3 - O_2 and CO_2
- Method 3C - O_2, CO_2, N_2, and CH_4

- Method 4 - Percent Moisture
- Method 18 - Total Reduced Sulfur
- Method 25C - Total Non-Methane Organic Compounds
- Method 0030 - Volatile Organic Compounds

4.3 PRESAMPLING ACTIVITIES

Presampling activities included equipment calibration, precleaning of the sample train glassware, and other miscellaneous tasks. Each of these activities are described or referenced in the following subsections. Other presampling activities included team meetings, equipment packing, and finalization of all details leading up to the coordinated initiation of the sampling program.

4.3.1 Equipment Calibration

TRC follows an orderly program of positive actions to prevent the failure of equipment or instruments during use. This preventative maintenance and careful calibration helps to ensure accurate measurements from field and laboratory instruments.

Once the equipment has gone through the cleaning and repair process it was then calibrated. All equipment that is scheduled for field use is cleaned and checked prior to calibration. Once the equipment had been calibrated, it was packed and stored to ensure the integrity of the equipment.

Inspection and calibration of the equipment is a crucial step in ensuring the successful completion of the field effort. All equipment was inspected for proper operation and durability prior to calibration. Calibration of the following equipment was conducted in accordance with the procedures outlined in EPA documents entitled "*Quality Assurance Handbook for Air Pollution Measurement Systems; Volume III - Stationary Source Specific Methods*" (EPA-600/4-77-027b) and 40 CFR Part 60 Appendix A. All calibrations were performed prior to test program.

- Pitot tubes (QA Handbook, Vol III, Section 3.1.2, pp. 1-13) - measured for appropriate spacing and dimensions or calibrated in a wind tunnel. Rejection criteria given on the calibration sheet. Post-test check - inspect for damage.

- Thermocouples (QA Handbook, Vol III, Section 3.4.2, pp. 12-18) - verified against a mercury-in-glass thermometer at three points including the anticipated measurement range. Acceptance limits - impinger ± 2°F; DGM ± 5.4°F; stack ± 1.5 percent of stack temperature.

- Dry gas meters (EPA 40 CFR Part 60, Method 5, Section 5.3) - calibrated against a wet test meter. Acceptance criteria - pretest $Y_i = Y = \pm 0.02$; post test $Y = \pm 0.05\ Y_i$.

4.3.2 Glassware Preparation

Sample train glassware and sample containers require specialized precleaning to avoid contamination of the sample from the collection container or devices. Note that all bottle caps were fitted with Teflon liners which were cleaned in the same manner as the bottles themselves. Cleaning and storage procedures for sample train glassware are summarized below:

- The Method 4 sampling train glassware was precleaned with an alconox soap and water wash. Deionized water was used for rinsing followed by air drying. The glassware was then sealed with parafilm.

- The Method 0030 sampling train glassware was precleaned with an alconox soap and water wash. Deionized water was used for rinsing followed by oven drying at 150°C for two hours. The glassware was sealed with precleaned aluminum foil. Sorbent traps were prepared in accordance with the procedures called out in SW-846, Method 0030.

4.3.3 Sample Media Preparation

All reagents were checked in accordance with TRC's existing QC Program to minimize the probability of using contaminated solvents. This included the use of spectro-grade solvents from the same lot and the collection and analysis of the appropriate blanks.

The Method 0030 VOST traps were conditioned by the laboratory in accordance with procedures called out in SW-846 Method 0030. Laboratory preparation steps met or exceeded all QC requirements.

4.4 ONSITE SAMPLING ACTIVITIES

Onsite sampling activities included the emissions testing of the inlet and outlet sampling locations and the collection of operational data.

4.4.1 EPA Methods 1 and 2 for Velocity Measurements and Cyclonic Flow

At the inlet sampling location, TRC obtained flow data from Maverick. This is presented in Appendix B.

Velocity traverses were conducted at the thermal oxidizer exhaust stack with an S-type pitot assembly in accordance with 40 CFR Part 60, Appendix A, Method 1, "*Sample Velocity Traverse for Stationary Sources*" and EPA Method 2, "*Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)*". An attached Type-K thermocouple with remote digital display was used to determine the flue gas temperature. The required number of velocity measurements points for each sampling location was determined following EPA Method 1.

A cyclonic flow check was conducted at the outlet stack prior to sampling in accordance with Section 2.4 of EPA Method 1. This procedure is referred to as the nulling technique. An S-type pitot tube connected to an inclined manometer was used in this method. The pitot tube was positioned at each traverse point so that the face openings of the pitot tube are perpendicular to the stack cross-sectional plane. This position is called the "0° reference". The velocity pressure (ΔP) measurement was noted. If the ΔP reading is zero, the cyclonic angle was recorded as 0°. If the ΔP reading is not zero, the pitot tube was rotated clockwise or counter clockwise until the ΔP reading became zero. This angle was then measured with a leveled protractor and reported to the nearest degree. After this null technique was applied at each traverse point, the average of the cyclonic angles was calculated. If this average was less than 20°, the flow condition in the outlet stack was acceptable to test. Cyclonic flow was not present at the sampling location.

4.4.2 EPA Method 3 for Flue Gas Molecular Weight

Oxygen and carbon dioxide concentrations were determined at the outlet sampling location for each test run according to EPA Reference Method 3, "*Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight*". A bag-in-drum (lung) sampling system in accordance with EPA Method 3 was used to collect the integrated fixed gas samples for O_2 and CO_2. The sample gas was drawn through a stainless steel probe and through Teflon^R sampling line. The gas sample was then drawn through a glass condenser unit to remove excess moisture which would interfere with the operation of the pump and flowmeter. The gas sample was then drawn into an evacuated Tedlar^R bag which was contained in a rigid sampling lung. Following the lung system the gas sample was drawn through a leak-free diaphragm-type sample pump. Sampling was conducted from a single point positioned at the point of average velocity with the collection of approximately 20 liters of sample gas.

Analysis was conducted using an Orsat combustion gas analyzer. A sample from the Tedlar bag was drawn into the analyzer and immediately analyzed for percent CO_2 and percent O_2. The percentage of the gas that was N_2 and CO was determined by subtracting the sum of the percent CO_2 and percent O_2 from 100 percent.

Analysis and calculation procedures were repeated until the individual dry molecular weights for any three analyses differed from their mean by no more than 0.3 g/g-mole (0.3 lb/lb mole). These three molecular weights were averaged and the results were reported to the nearest 0.1 g/g-mole (0.1 lb/lb-mole).

These concentrations were needed to calculate the molecular weight of the gas stream for calculating the volumetric flow of the outlet sampling location.

4.4.3 EPA Method 3C for Oxygen, Carbon Dioxide, Nitrogen, and Methane

Sampling at the inlet sampling location for O_2, CO_2, N_2, and CH_4 was conducted in accordance with 40 CFR Part 60, Appendix A, Method 3C, "*Determination of Carbon Dioxide, Methane, Nitrogen, and Oxygen from Stationary Sources*".

A sample of flue gas was drawn over a 1-hour time frame through a stainless steel sample probe, through a Teflon^R sample line, through a calibrated regulator, and into a pre-evacuated passivated

SUMMA canister. Prior to sampling, each canister was evacuated at the analytical laboratory. The integrity of each canister that was used was verified by measuring the vacuum and ensuring that it is was less than -29.0 inches of mercury. After the flue gas sample was collected, the canister valve was closed and the vacuum measured again, which ensured the collection of the sample. The SUMMA canister was affixed with the appropriate sample label and logged onto a chain of custody form prior to shipment to the laboratory.

4.4.4 EPA Method 4 for Moisture Determination

Moisture was determined at the outlet location for each test run according to EPA Reference Method 4, "*Determination of Moisture Content in Stack Gases*". The principle of this method is to remove the moisture from the sample stream and determined the moisture either volumetrically or gravimetrically. Sampling was conducted at a single point during three test runs on the flare outlet stack.

The sampling train consisted of an inconel probe with a thermocouple and S-type pitot tube attached to the probe for the measurement of gas temperature and velocity. The sample gas passed through the probe assembly to a series of four ice-cooled impingers kept below 68°F to enable condensation of entrained moisture. The first two impingers contained 100 mL of deionized water. The third impinger was empty. The fourth impinger contained a preweighed amount of silica gel. The impingers were followed by a dry gas meter, pump, and a calibrated orifice meter.

Leak checks of the entire Method 4 sampling train were performed before and after each sampling run. All leak checks and leakage rates were documented on the relevant field test data sheets. The acceptance criteria for the Method 4 train was a leak rate of $\leq$ 0.02 cfm at the highest vacuum obtained during the test run.

Following the completion of each test run, the Method 4 train was transported to a recovery area onsite. The sample recovery sequence was as follows:

- Removed the sampling train to the recovery area.

- Noted the condition of the train (i.e., impinger contents color, silica gel color, etc.).
- The contents of the first three impingers were measured for volume only and the contents were discarded.
- Returned the silica gel to its original container and weighed to obtain a final weight.

4.4.5 EPA Method 18 for Total Reduced Sulfur

Sampling at the inlet and outlet sampling locations for total reduced sulfur was conducted in accordance with EPA Method 18, *"Measurement of Gaseous Organic Compound Emissions by Gas Chromatography"*.

TRC collected integrated gas samples using the bag-in-drum technique. In this procedure, a Tedlar bag was placed inside a rigid container. The bag was then evacuated and attached to a ¼-inch Teflon sample line, which was placed in the gas stream to be sampled. The sample line was purged with landfill gas and the rigid container was placed under a slight vacuum. To equalize the pressure in the container, landfill gas was drawn through the sample line and into the Tedlar bag. Three 1-hour samples were collected simultaneously with the Method 0030 sampling train. All fittings and valves in the sample line were Teflon, no metal was used.

4.4.6 EPA Method 25C for TNMOC and VOCs

The inlet sampling location was sampled for VOCs and the outlet sampling location was sampled for TNMOCs utilizing EPA Method 25C, *"Determination of Nonmethane Organic Compounds (NMOC) in MSW Landfill Gases"*.

A sample of flue gas was drawn over a 1-hour time frame through a stainless steel sample probe, through a Teflon® sample line, through a calibrated regulator, and into a pre-evacuated SUMMA passivated canister. Prior to sampling each canister was evacuated at the analytical laboratory. The integrity of each canister that was used was verified by measuring the vacuum and ensuring that it was less than -29.0 inches of mercury. After the flue gas sample was collected, the canister valve was closed and the vacuum measured again which ensured the collection of the sample. The SUMMA canister was affixed with the appropriate sample label and logged onto a chain of custody form prior to shipment to the laboratory.

4.4.7 SW-846 Method 0030 for Volatile Organic Compounds

The Volatile Organic Sampling Train (VOST) train was used to determine emission rates of volatile organic compounds (VOCs) in the thermal oxidizer's exhaust stack. VOST procedures and QA/QC requirements as described in SW-846 Method 0030, "*Volatile Organic Sampling Train* and the *Protocol for the Collection and Analysis of Volatile POHCs Using VOST*," (EPA 600/8-85-003) were followed.

The sampling system is a non-isokinetic sampling train and sampling rates were predetermined based on desired run times. Twenty liters were collected through each set of traps at a sampling rate of 0.5 liters/min for 40 minutes. One set of traps were collected for each test run. The condensate was collected at the end of the test runs. The sampling probe had a water-cooled jacket and a heated quartz liner maintained at 135°C.

Strict handling precautions were followed to eliminate the potential for contamination of the resin. Tenax resin is very susceptible to contamination. The resin stock was thermally desorbed under helium and stored either sealed in the collection traps or under helium. A packed trap was desorbed to serve as a laboratory blank prior to placing the batch of Tenax traps in the field. The laboratory prepared sufficient sealed blank traps in sealed containers for the VOST sampling. One pairs of traps were collected during each test run. One pair of field blanks were collected for the shipping container containing VOST samples being shipped to the laboratory. The traps were maintained at 4°C prior to subsequent sampling.

SECTION 5.0
ANALYTICAL PROCEDURES AND CALCULATIONS

This section delineates the analytical procedures and calculations used by TRC during the test program. TRC utilized the services of Air Toxics Ltd, of Folsom, California for all laboratory analyses.

5.1 ANALYTICAL PROCEDURES

5.1.1 EPA Method 3C

Sampling and analysis for O_2, CO_2, N_2, and CH_4 was conducted according to Method 3C, "*Determination of Carbon Dioxide, Methane, Nitrogen, and Oxygen from Stationary Sources*".

A portion of the sample was injected into a gas chromatograph (GC) and the O_2, CO_2, N_2, and CH_4 concentrations were determined by using a thermal conductivity detector (TCD) and integrator.

5.1.2 Modified Method TO-12

Sampling TNMOCs was conducted according to EPA Method 25C, "*Determination of Nonmethane Organic Compounds (NMOC) in MSW Landfill Gases*". Analysis was conducted according to Modified Method TO-12. The TNMOCs content of the gas was determined by injecting a portion of the gas into a gas chromatographic column to separate the TNMOCs from carbon monoxide (CO) and carbon dioxide (CO_2). The TNMOCs were oxidized separately to CO_2, reduced to heptane, and measured by a flame ionization detection (FID). In this manner, the variable response of the FID associated with different types of organics was eliminated.

5.1.3 Modified Method TO-14

Sampling for VOCs was conducted according to Modified Method 3C/25C. Analysis for VOCs was conducted according to Modified Method TO-14 using GC/MS in the full scan mode. The method involves concentrating up to 0.5 liters of air. The concentrated aliquot is then flash vaporized and swept through a water management system to remove water vapor. Following dehumidification, the sample passes directly into the GC/MS for analysis.

5.1.4 SW-846 Method 5041A and 8260A

Sampling for volatile organic compounds (VOCs) was accomplished by SW-846 Method 0030. Analysis of the VOST tubes was in accordance with SW-846 Method 5041A and the condensate by Method 8260A using GC/MS. The laboratory performed the analysis via SW-846 Method 5041A using GC/MS in the full scan mode. VOST sorbent tubes were thermally desorbed at 180 degrees centrigrade for ten minutes by UHP helium carrier gas. The gas stream is then bubbled through 5 mL of organic free water and trapped on the sorbent trap of the purge and trap system. The trap is thermal desorbed to elute the components into the GC/MS system for further separation.

5.1.5 ASTM D-5504

Sampling of the bag samples for TRS was accomplished in accordance with EPA Method 18 techniques. Analysis for TRS was conducted according to Modified ASTM D-5504. The laboratory performed the analysis of sulfur compounds using GC/SCD. The method involves direct injection of the air sample into the GC via a fixed 1.0 mL sampling loop. Three point calibration curves were prepared for all samples and utilized for quantitation.

5.2 CALCULATIONS

5.2.1 Flowrates

Calculations for the determination of dry gas sampled at standard conditions (dscf), gas velocity at stack conditions (afpm), and gas volumetric flow rate at standard conditions (dscfm) were as follows.

5.2.2 Volume of Dry Gas Sampled at Standard Conditions

Volume of dry gas sampled at standard conditions, dscf [a]

$$\text{dscf}^{a} = \frac{528 \times (Y) \times (VM) \times (PB + PM)}{29.92 \times (TM + 460)}$$

where:

a	=	Dry standard cubic feet at 68°F (528°R) and 29.92 inches of Hg
Y	=	Dry gas meter calibration factor
VM	=	Sample gas Volume, ft^3
PB	=	Barometric Pressure
PM	=	Average Orifice Pressure Drop, inches of Hg
TM	=	Average Dry Gas Temperature at meter, °F

5.2.3 Velocity of the Exhaust Gas

Stack gas velocity at stack conditions, afpm

$$\text{afpm} = 5130^{c} \times Cp \times SDE_{avg} \times \left[\frac{1}{PS \times MW}\right]^{1/2}$$

where:

c	=	$5130 = \frac{85.5\,\text{ft}}{\text{sec}}\left[\frac{(\text{lb/lb-mole})\times(\text{in. Hg})}{(°R)\times(\text{in. } H_2O)}\right] \times 60\,\text{sec/min}$
Cp	=	Pitot tube coefficient
SDE_{avg}	=	$\left(\sqrt{\Delta P}\right)_{avg} \times \sqrt{TS_{avg} + 460}$
PS	=	Stack Pressure, absolute inches of Hg = Barometric Pressure ± Avg Stack Static Pressure
MW	=	Molecular Weight of Wet Stack Gas, lb/lb mole wet

5.2.4 Volumetric Flow Rate of the Gas

Gas volumetric flow rate at standard conditions, dscfm [c]

$$\text{dscfm}^{c} = \frac{\text{acfm} \times 528 \times MD \times PS}{(29.92) \times (TS_{avg} + 460)}$$

where:

c	=	Dry standard cubic feet per minute at 68°F (528°R) and 29.92 in.Hg
MD	=	Mole Fraction of Dry Gas (dimensionless)
PS	=	Stack Pressure, absolute, inches of Hg
TS_{avg}	=	Average Stack Temperature

5.2.5 Percent Destruction Efficiency

The percent of destruction efficiency of the TOU was calculated by the following equation:

$$\% \text{ DRE} = \frac{\text{Inlet} - \text{Outlet}}{\text{Inlet}} \times 100$$

SECTION 6.0
QUALITY ASSURANCE

6.1 OVERVIEW

TRC Environmental Corporation management is fully committed to an effective Quality Assurance/Quality Control Program whose objective is the delivery of a quality product. For much of TRC's work, that product is data resulting from field measurements, sampling and analysis activities, engineering assessments, and the analysis of gathered data for planning purposes. The Quality Assurance Program works to provide complete, precise, accurate, representative data in a timely manner for each project, considering both the project's needs and budget constraints.

This section highlights the specific QA/QC procedures that were followed on this Test Program.

6.2 FIELD QUALITY CONTROL SUMMARY

6.2.1 Calibration Procedures

Calibration of the field sampling equipment was performed prior to the field sampling effort. Calibrations were performed as described in the EPA publications "*Quality Assurance Handbook for Air Pollution Measurement Systems; Volume III - Stationary Source Specific Methods*" (EPA-600/4-77-027b) and EPA 40 CFR Part 60 Appendix A. Equipment calibrated included the sample metering system, thermocouples, and pitot tubes. Copies of the equipment calibration forms can be found in Appendix D.

6.2.4 Equipment Leak Checks

Prior to sampling, each Method 4 sampling train was leak checked according to the procedures outlined in EPA Reference Method 5. During the course of a test run, a leak check was conducted before and after every test.

6.2.5 Cyclonic Flow Check

The presence of cyclonic flow within the outlet stack was checked during preliminary traverses prior to sampling, in accordance with Section 2.4 of EPA Method 1. Cyclonic flow was not present.

6.3 DATA REDUCTION, VALIDATION, AND REPORTING

Specific QC measures were used to ensure the generation of reliable data from sampling and analysis activities. Proper collection and organization of accurate information followed by clear and concise reporting of the data is a primary goal on all projects.

6.3.1 Field Data Reduction

Appendix A this report present the field sampling data. The data collected was reviewed in the field by the Field Team Leader.

6.3.2 Laboratory Analysis Data Reduction

Analytical results were reduced to concentration units specified by the analytical procedures, using the equations provided in the analytical procedures.

6.3.3 Data Validation

TRC supervisory and QC personnel used validation methods and criteria appropriate to the type of data and the purpose of the measurement. Records of all data were maintained, including that judged to be an "outlying" or spurious value. The persons validating the data had sufficient knowledge of the technical work to identify questionable values.

Field sampling data was validated by the Field Team Leader and the QC Coordinator based on their review of the adherence to an approved sampling protocol and written sample collection procedure.

Analytical data was validated by the subcontractor laboratory QC or supervisory personnel using criteria outlined below. TRC utilized results from field and laboratory method blanks to further validate analytical results. Furthermore, TRC QC personnel has reviewed all subcontractor laboratory raw analytical data to verify calculated results presented.

The following criteria was used to evaluate the field sampling data:

- Use of approved test procedures;
- Proper operation of the process being tested;
- Use of properly operating and calibrated equipment;
- Leak checks conducted before and after tests;
- Proper chain-of-custody maintained.

The criteria listed below was used to evaluate the analytical data:

- Use of approved analytical procedures;
- Use of properly operating and calibrated instrumentation;
- Acceptable results from analyses of QC samples (i.e., the reported values should fall within the 95 percent confidence interval for these samples).

6.3.4 Data Reporting

All data was reported in standard units depending on the measurement and the ultimate use of the data.

6.4 DEVIATIONS

There were no deviations from procedures stated in the TRC's letter dated December 7, 2001.

APPENDIX A

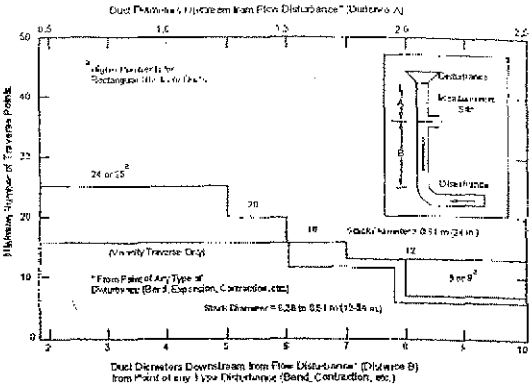
FIELD SAMPLING DATA SHEETS

MAVERICK INDUSTRI-FLEX, Thermal Oxidizing Unit
SAMPLING PARAMETERS - Runs 1 through 3

Run No.		Cal. Check	1	2	3	
Date:		26-Nov-02	26-Nov-02	26-Nov-02	26-Nov-02	
Start Time		00:00	10:15	12:23	13:17	
Stop Time		00:00	11:04	12:53	13:47	AVERAGES
Nozzle Diameter, (inches)			0.000	0.000	0.000	0.000
Barometric Pressure, (inches of mercury)		30.1	30.10	30.10	30.10	30.10
Net Sampling Time, (minutes)		0	30.0	30.0	30.0	30.0
Volume Metered, (cubic feet)		0	22.953	21.911	22.081	22.315
Average Dry Gas Meter Temperature, (°F)		0	57	58	62	59
Average ΔH, (inches of water)			2.00	2.00	2.00	2.00
Average ΔH, (inches of mercury)			0.1471	0.1471	0.1471	0.1471
Dry Gas Meter Calibration Factor (Y) Meterbox #	90337	0.987	0.987	0.987	0.987	0.987
Dry Gas Meter ΔH @		1.901	1.901	1.901	1.901	1.901
Volume of Gas Collected, (dscf)			23.390	22.285	22.285	22.653
Total Water Collected, (mL)			48.3	54.0	51.1	51.1
Volume of Water Vapor, (scf)			2.277	2.546	2.409	2.411
Moisture, (percent)			8.9	10.3	9.8	9.6
Dry Mole Fraction			0.9113	0.8975	0.9024	0.9037
CO_2 Concentration, (percent dry)			6.30	6.40	6.50	6.40
O_2 Concentration, (percent dry)			14.00	14.00	13.70	13.90
CO and N_2, (percent dry)			79.70	79.60	79.80	79.70
Dry Molecular Weight, (lb/lb mole)			29.57	29.58	29.59	29.58
Wet Molecular Weight, (lb/lb mole)			28.54	28.40	28.46	28.47
Excess Air at Stack, (percent)			198.8	199.6	186.0	194.8
Stack Area, (square inches) ID(inches) =	24		452.4	452.4	452.4	452.4
Static Pressure, (inches of water)			-0.35	-0.37	-0.34	-0.35
Stack Pressure, (inches of mercury)			30.07	30.07	30.08	30.07
Average Stack Temperature, (°F)			1772	1786	1787	1782
Average Sqroot of ΔP			0.2383	0.2343	0.2329	0.2352
SDB Average			11.258	11.104	11.040	11.134
Pitot Coefficient			0.84	0.84	0.84	0.84
Stack Gas Velocity, (actual feet per minute - afpm)			1,656	1,637	1,626	1,640
Stack Flowrate, (actual cubic feet per minute - acfm)			5,202	5,144	5,109	5,152
Stack Flowrate, (standard cubic feet per minute - scfm)			1,237	1,215	1,207	1,220
Stack Flowrate, (dry standard cubic feet per minute - dscfm)			1,127	1,091	1,089	1,102

TRAVERSE POINT LOCATION FOR CIRCULAR AND RECTANGULAR DUCTS

Project No.: 37887
Client: Maverick, Industries Plex Site
Date: 11/26/02
Sampling Location: Flare Outlet
Internal Stack Diameter: 24"
Nipple Length: –
Total Stack Diameter: 24"
Nearest Upstream Disturbance (A): 18"
Nearest Downstream Disturbance (B): 6"
Calculator: M. Meehan



Rectangular Duct Equivalent Diameter Determination = $\frac{2 \times L \times W}{L + W}$

	1	2	3	4	5
Traverse Point Number	Fraction of Stack ID (1/100)	Stack ID	Traverse Point (1 x 2 = Point)	Nipple Length	Traverse Point Inside of Far Wall to Outside of Port Nipple (3 + 4 = Point)
1	.032	24"	.768		0.77
2	.105	24"	2.52		2.52
3	.194	24"	4.66		4.66
4	.323	24"	7.75		7.75
5	.677	24"	16.25		16.25
6	.806	24"	19.34		19.34
7	.895	24"	21.48		21.50
8	.968	24"	23.23		23.23
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					

Location of Traverse Points in Circular Stacks
[Percent of stack diameter from inside wall to traverse point]

	Number of traverse points on a diameter											
	2	4	6	8	10	12	14	16	18	20	22	24
1	14.6	5.7	4.4	3.2	2.6	2.1	1.3	1.6	1.4	1.3	1.1	1.1
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8
13							94.3	87.5	81.2	75.0	68.5	60.2
14							98.2	91.5	85.4	79.6	73.8	67.7
15								95.1	89.1	83.5	78.2	72.8
16								98.4	92.5	87.1	82.0	77.0
17									95.6	90.3	85.4	80.6
18									98.6	93.3	88.4	83.9
19										96.1	91.3	86.8
20										98.7	94.3	89.5
21											96.5	92.1
22											98.9	94.5
23												96.8
24												98.9

Location of Traverse Points in Rectangular Stacks

	Number of traverse points on a diameter										
	2	3	4	5	6	7	8	9	10	11	24
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	15.7	15.0	13.6	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5				90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50.0	45.8
7						92.9	81.3	72.2	65.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	85.4	79.2
11										95.5	87.5
12											95.8

STACK GEOMETRY AND GAS VELOCITY DATA

Date: 11/26/02	Project No.: 37387
Client: MAVERICK MANAGEMENT SERV.	Sample Location: OUTLET
Facility: WOBURN	Load Condition: NORMAL
Run No.: 1	Operator: KU/mm
Barometric Pressure (in. Hg): 30.10	Meterbox No.: 90337
% Moisture:	Static (in. H_2O): - 0.35
Pitot Tube ID: LOW-1	Pitot Tube Coefficient: 0.84
Post Leak Check: ✓ GOOD	Stack Diameter (in.): 24"
Measurement Device:	Schematic of Stack Cross Section:
Micromanometer:	
10" Manometer:	
Magnehelic:	
Other:	
Explain:	Stack Diameters Upstream:
	Stack Diameters Downstream:

Time (24 hr. clock)	Sample Point	Stack Temp °F or °C	Manom. Reading in H_2O	Cyclonic Flow Null Angle
11:07	A 1	1800	.05	4
	2	1806	.06	3
	3	1806	.06	2
	4	1789	.06	2
	5	1790	.06	5
	6	1805	.06	5
	7	1795	.06	4
	8	1705	.06	7

Time (24 hr. clock)	Sample Point	Stack Temp °F or °C	Manom. Reading in H_2O	Cyclonic Flow Null Angle
	B 1	1799	.05	3
	2	1800	.05	2
	3	1780	.06	1
	4	1782	.06	1
	5	1800	.05	0
	6	1802	.05	2
	7	1799	.06	6
11:17	8	1700	.06	6

TRC

Field Moisture Determination

Client: Maverick Management Services Project No.: 37887
Location: Woburn, MA Date: 11/25/02
Run No.: 1 Operator: M. Meehan

Data

Minutes	Clock Time	Gas Meter cf vm	TM In	TM Out	Orifice In. H_2O (+)	Vac. Gage In. Hg (-)
0	10:15	870.618	56	55	6.0	2.0
5		874.31	55	55	~~6.0~~ 2.0	6.0
10		878.45	58	55	2.0	6.0
15		881.99	57	55	2.0	6.0
20		----	61	55	2.0	6.0
25		889.75	62	55	2.0	6.0
30	11:04	893.571				
Total/ Avg						

initial leak check .002 @ 60sec in 12in Hg final leak check .003in 60sec @ 7 in Hg

* 10:28 Moisture train stopped 10:46 restarted moisture train

Impingers

	1	2	3
Final mL	759.4	677.3	590.5
Initial mL	718.3	675.6	590.0
Net mL	41.1	1.7	0.5

Total Moisture (Net mL + Net gm) = 48.3

Silica Gel

Container No. ______
Final gm 757.8
Intial gm 752.8
Net gm 5.0

Calculations

(1) PB = 30.10 Meterbox No.: 90337
(2) VM Net = ______ Y = DGM Calibration Factor = 0.987
(3) TM Avg = ______ TM + 460 = ______

(4) PM Avg = + ______ Orifice in. H_2O $\times \frac{1}{13.6}$ = + ______ orifice in.Hg.
= - ______ Vacuum gage In. Hg (when meter is before pump)

(5) VMSTD = $\frac{528 \times VM \times (PB + PM) \times (Y)}{29.92 \times (TM + 460)}$ = ______

(6) VW = mL H_2O + gm Silica Gel = ______

(7) VW Gas = VW × 0.04715 = ______

(8) %M = $\frac{100 \times VW\ Gas}{VMSTD + VW\ Gas} = \frac{100 \times (\quad)}{(\quad) + (\quad)} = \frac{(\quad)}{(\quad)}$ =

ORSAT ANALYSIS

Project No.	37887	Date	11/26/02
Client	Marston	Run	Run #1
Facility	Woburn	Operator	ej
Source	THERMOX	Comments	
Location			

Orsat Leak Checked (yes) / no

Purge System with Sample Gas (yes) / no

Ambient Air Check CO_2 0 O_2 20.9

Audit Gas Check (measured/actual): CO_2 / O_2 / CO /

Expiration Date of Reagents / /

Sample Point	Time	CO_2 Reading 1	O_2 Reading 2 Actual	O_2 Reading 2 Net	CO Reading 3 Actual	CO Reading 3 Net	F_o
	1517	6.4	20.6	14.2			
		6.3	20.5	14.2			
		6.3	19.9	13.6			
	Avg =	6.3		14.0			

Net O_2 Reading = Reading 2 - Reading 1 (Actual)
Net CO Reading = Reading 3 - Reading 2 (Actual)

QC Validation

Calculate F_o

$$F_o = \frac{20.9 - \%O_2}{\%CO_2}$$

Fuel ________

Reported F_o ________

Expected F_o Ranges

Anthracite/Lignite	1.015 - 1.130
Bituminous	1.083 - 1.230
Distillate Oil	1.260 - 1.413
Residual Oil	1.210 - 1.370
Natural Gas	1.600 - 1.836
Wood Bark	1.000 - 1.120
Municipal Garbage	1.043 - 1.177

Other ________

STACK GEOMETRY AND GAS VELOCITY DATA

Date: 11/26/02
Client: MAVERICK MGT SERVICES
Facility: FLARE
Run No.: 2
Barometric Pressure (in. Hg): 30.10
% Moisture:
Pitot Tube ID: LOW-1
Post Leak Check: ✓ GOOD
Measurement Device:
Micromanometer:
10" Manometer:
Magnehelic:
Other:
Explain:

Project No.: 37887
Sample Location: OUTLET
Load Condition: NORMAL
Operator: KH /MM
Meterbox No.: 90337
Static (in. H_2O): - 0.37
Pitot Tube Coefficient: 0.84
Stack Diameter (in.): 24"
Schematic of Stack Cross Section:

Stack Diameters Upstream:
Stack Diameters Downstream:

Time (24 hr. clock)	Sample Point	Stack Temp (°F) or °C	Manom. Reading in H_2O	Cyclonic Flow Null Angle
1255	A 1	1802	.06	
	2	1800	.06	
	3	1752	.05	
	4	1790	.05	
	5	1800	.06	
	6	1807	.05	
	7	1791	.05	
	8	1748	.05	

Time (24 hr. clock)	Sample Point	Stack Temp (°F) or °C	Manom. Reading in H_2O	Cyclonic Flow Null Angle
	B 1	1801	.06	
	2	1800	.06	
	3	1761	.05	
	4	1782	.05	
	5	1792	.06	
	6	1804	.06	
	7	1783	.05	
1307	8	1762	.06	

TRC

Field Moisture Determination

Client: MAVERICK MANAGEMENT
Project No.: 37837
Location: WOBURN, MA
Date: 11/26/02
Run No.: 2
Operator: KH

Data

Minutes	Clock Time	Gas Meter cf vm	TM In	TM Out	Orifice In. H_2O (+)	Vac. Gage In. Hg (-)
0	1223	893.674	56	55	2.0	6.0
5		897.38	57	55	2.0	6.0
10		901.32	60	56	2.0	6.0
15		905.12	62	55	2.0	6.0
20		908.38	65	57	2.0	6.0
25		912.31	67	57	2.0	6.0
30	1253	915.585				
Total/ Avg						

initial leak check .001 in 60 sec @ 11 in Hg FINAL LEAK CHECK .001 in 60 sec @ 7 in Hg

Impingers

	1	2	3
Final mL	805.0	678.7	590.8
Initial mL	759.4	677.3	590.5
Net mL	46.4	1.4	0.3

Total Moisture (Net mL + Net gm) = 54.0

Silica Gel

Container No.:
Final gm 763.7
Intial gm 757.8
Net gm 5.9

Calculations

(1) PB = 30.10
Meterbox No.: 90337
(2) VM Net =
Y = DGM Calibration Factor = 0.987
(3) TM Avg =
TM + 460 =

(4) PM Avg = + ______ Orifice in. H_2O $\times \frac{1}{13.6}$ = + ______ orifice in.Hg.
= - ______ Vacuum gage In. Hg (when meter is before pump)

(5) $VMSTD = \frac{528 \times VM \times (PB + PM) \times (Y)}{29.92 \times (TM + 460)}$ =

(6) VW = mL H_2O + gm Silica Gel =

(7) VW Gas = VW × 0.04715 =

(8) $\%M = \frac{100 \times VW\ Gas}{VMSTD + VW\ Gas} = \frac{100 \times (\quad)}{(\quad) + (\quad)} = \frac{(\quad)}{(\quad)} =$

Lowell19.wpd

ORSAT ANALYSIS

Project No.	37887	Date	11/26/02
Client	Mavertek	Run	Run #2
Facility	Woburn	Operator	SJ
Source	Thermox	Comments	
Location			

Orsat Leak Checked yes / no

Purge System with Sample Gas yes / no

Ambient Air Check CO_2 0 O_2 20.9

Audit Gas Check (measured/actual): CO_2 / O_2 / CO /

Expiration Date of Reagents / /

Sample Point	Time	CO_2 Reading 1	O_2 Reading 2 Actual	O_2 Reading 2 Net	CO Reading 3 Actual	CO Reading 3 Net	F_o
		6.6	20.4	13.8			
		6.5	20.6	14.1			
		6.2	20.2	14			
	Ave =	6.4		14			

Net O_2 Reading = Reading 2 - Reading 1 (Actual)
Net CO Reading = Reading 3 - Reading 2 (Actual)

QC Validation

Calculate F_o

$$F_o = \frac{20.9 - \% O_2}{\% CO_2}$$

Fuel

Reported F_o

Expected F_o Ranges

Anthracite/Lignite	1.015 - 1.130
Bituminous	1.083 - 1.230
Distillate Oil	1.260 - 1.413
Residual Oil	1.210 - 1.370
Natural Gas	1.600 - 1.836
Wood Bark	1.000 - 1.120
Municipal Garbage	1.043 - 1.177

Other

STACK GEOMETRY AND GAS VELOCITY DATA

Date: 11/26/02	Project No.: 37887
Client: MAVERICK MGT SERVICES	Sample Location: OUTLET
Facility: FLARE, WOBURN MA	Load Condition: NORMAL
Run No.: 3	Operator: KU/MM
Barometric Pressure (in. Hg): 30.10	Meterbox No.: 90337
% Moisture:	Static (in. H_2O): - 0.34
Pitot Tube ID: LOW-1	Pitot Tube Coefficient: 0.84
Post Leak Check: ✓ GOOD	Stack Diameter (in.): 24"
Measurement Device:	Schematic of Stack Cross Section:
Micromanometer:	
10" Manometer:	
Magnehelic:	
Other:	
Explain:	Stack Diameters Upstream:
	Stack Diameters Downstream:

Time (24 hr. clock)	Sample Point	Stack Temp °F or °C	Manom. Reading in H_2O	Cyclonic Flow Null Angle
1352	A 1	1803	.05	
	2	1799	.05	
	3	1748	.06	
	4	1800	.06	
	5	1800	.06	
	6	1803	.05	
	7	1801	.06	
	8	1752	.05	

Time (24 hr. clock)	Sample Point	Stack Temp °F or °C	Manom. Reading in H_2O	Cyclonic Flow Null Angle
	B 1	1803	.05	
	2	1800	.06	
	3	1758	.06	
	4	1787	.06	
	5	1795	.05	
	6	1803	.06	
	7	1792	.05	
1401	8	1748	.05	

TRC

Field Moisture Determination

Client: MAVERICK MGT SRV. Project No.: 37887
Location: WOBURN MA Date: 11/26/02
Run No.: 3 Operator: KH

Data

Minutes	Clock Time	Gas Meter cf vm	TM In	TM Out	Orifice In. H_2O (+)	Vac. Gage In. Hg (-)
0	13:17	915.984	60	58	2.0	6.0
5		919.72	61	58	2.0	6.0
10		- - -	63	58	2.0	6.0
15		- - - -	68	59	2.0	6.0
20		930.58	68	59	2.0	6.0
25		- - - -	70	60		
30	1347	938.065				
Total/ Avg						

initial leak check .003 in 60sec @ 12 in Hg Final leak check .002 in 60sec @ 7 in Hg

Impingers

	1	2	3
Final mL	848.2	680.5	590.8
Initial mL	805.0	678.7	590.8
Net mL	43.2	1.8	0.0

Total Moisture (Net mL + Net gm) = 51.1

Silica Gel

Container No. ______
Final gm 769.8
Intial gm 763.7
Net gm 6.1

Calculations

(1) PB = 30.10 Meterbox No.: 90337
(2) VM Net = ______ Y = DGM Calibration Factor = 0.987
(3) TM Avg = ______ TM + 460 = ______

(4) PM Avg = + ______ Orifice in. H_2O $\times \frac{1}{13.6}$ = + ______ orifice in.Hg.
= - ______ Vacuum gage In. Hg (when meter is before pump)

(5) $VMSTD = \frac{528 \times VM \times (PB + PM) \times (Y)}{29.92 \times (TM + 460)}$ = ______
(6) VW = mL H_2O + gm Silica Gel = ______
(7) VW Gas = VW × 0.04715 = ______

(8) $\%M = \frac{100 \times VW\ Gas}{VMSTD + VW\ Gas} = \frac{100 \times (\quad)}{(\quad) + (\quad)} = \frac{(\quad)}{(\quad)} =$

ORSAT ANALYSIS

Project No. 87867

Client Manersola

Facility Woburn

Source Thermox

Location

Date 11/26/02

Run # 3

Operator SJ

Comments

Orsat Leak Checked yes / no

Purge System with Sample Gas yes / no

Ambient Air Check CO_2 0 O_2 20.9

Audit Gas Check (measured/actual): CO_2 / O_2 / CO /

Expiration Date of Reagents / /

Sample Point	Time	CO_2 Reading 1	O_2 Reading 2 Actual	O_2 Reading 2 Net	CO Reading 3 Actual	CO Reading 3 Net	F_o
		6.7	20.0	13.3			
		6.3	20.3	14			
		6.5	20.3	13.8			
	Ave =	6.5		13.7			

Net O_2 Reading = Reading 2 - Reading 1 (Actual)

Net CO Reading = Reading 3 - Reading 2 (Actual)

QC Validation

Calculate F_o

$$F_o = \frac{20.9 - \%O_2}{\%CO_2}$$

Fuel

Reported F_o

Expected F_o Ranges

Anthracite/Lignite	1.015 - 1.130
Bituminous	1.083 - 1.230
Distillate Oil	1.260 - 1.413
Residual Oil	1.210 - 1.370
Natural Gas	1.600 - 1.836
Wood Bark	1.000 - 1.120
Municipal Garbage	1.043 - 1.177
Other	

EXHAUST GAS SAMPLING SUMMARY FOR SW-846 METHOD 0030

Parameter	Units	Run 1			Run 2			Run 3		
Sampling Location		Exhaust Stack			Exhaust Stack			Exhaust Stack		
Date		26-Nov-02			26-Nov-02			26-Nov-02		
Start Time		1015			1215			1315		
Stop Time		1110			1255			1355		
Net Sampling Time	minutes	40			40			40		
Barometric Pressure	in. Hg	30.10			30.10			30.10		
Meter Calibration Factor		1.026			1.026			1.026		
Tube Pairs		**Sample**	**Temp**	**Corrected**	**Sample**	**Temp**	**Corrected**	**Sample**	**Temp**	**Corrected**
Tube A		20.04	47.0	**18.94**	20.10	48.0	**18.93**	20.10	50.0	**18.82**
TOTALS		20.04		**18.94**	20.10		**18.93**	20.10		**18.82**

dsL = Dry standard liters.
dsL = (DGM Y * BP * Vol. * 293)/29.92 *(Temp + 273)

VOST DATA SHEET

Project No.: 37887
Client: Maverick
Facility: Woburn
Source: Flare
Sample Location: Outlet
DGM No.: 28006087
Run No. 1

Date: 26 Nov 02
Flow Rate (Lpm): 0.5
DGM Y at Lpm: 1.026
Barometric Pressure: 30.10
Operator: T. Senger
Sample Point Location
Port: A Point: 1

Train Leak Check - Initial: VAC 10.0 in/Hg, 0.0 Δ in/Hg, 60 sec

Train Leak Check - Final: VAC 8.0 in/Hg, 0.0 Δ in/Hg, 60 sec

Clock Time (24 hr)	Sampling Time (min)	Rotameter Reading L/min.	Gas Sample Volume liters	1st Cond. Outlet temp. °F	Gas Sample Temp At Dry Inlet °F	Gas Sample Temp Gas Meter Outlet °F	Probe Temp. °F	Pump Vacuum in. Hg Gauge
1015	0	0.5	5686.060	34	47	47	≅1600	6.0
	5		5688.600	36	47	47	≅1600	6.0
	10		5691.100	37	48	48	≅1600	6.0
* 1030/1045	15		5693.600	37	48	48	≅1600	6.0
	20		5696.100	38	47	47	≅1600	6.0
	25		5698.600	38	46	46	≅1600	6.0
	30		5701.100	38	47	47	≅1600	6.0
	35		5703.600	38	47	47	≅1600	6.0
1110 ~~1055~~	40		5706.101					
			20.041					

Sample Trap I.D.

Field Blank
TENAX:
TENAX/CHARCOAL:

Sample
TENAX: Run 1 - TX
TENAX/CHARCOAL: Run 1 - TX/C

COMMENTS:

Purged 5 min

* 1030 Stopped train - blower shut off
1045 Blower back on

AF-070

TRC

VOST DATA SHEET

Project No.: 37887
Client: Maverick
Facility: Woburn
Source: Flare
Sample Location: Outlet
DGM No.: 2806087
Run No. 2

Date: 26 Nov 02
Flow Rate (Lpm): 0.5
DGM Y at Lpm: 1.026
Barometric Pressure: 30.10
Operator: T. Senger
Sample Point Location
Port: A Point: 1

Train Leak Check - Initial: VAC 10.0 in/Hg, 0.0 Δ in/Hg, 60 sec

Train Leak Check - Final: VAC 7.0 in/Hg, 0.0 Δ in/Hg, 60 sec

Clock Time (24 hr)	Sampling Time (min)	Rotameter Reading L/min.	Gas Sample Volume liters	1st Cond. Outlet temp. °F	Gas Sample Temp At Dry Inlet °F	Gas Sample Temp Gas Meter Outlet °F	Probe Temp. °F	Pump Vacuum in. Hg Gauge
1215	0	0.5	5712.010	39	48	48	≥1600	5.0
	5		5714.600	39	48	48	≥1600	5.0
	10		5717.100	40	48	48	≥1600	5.0
	15		5719.600	40	49	49	≥1600	5.0
	20		5722.100	40	49	49	≥1600	5.0
	25		5724.600	39	48	48	≥1600	5.0
	30		5727.100	39	49	49	≥1600	5.0
	35		5729.600	40	49	49	≥1600	5.0
1255	40		5732.105					
			20.095					

Sample Trap I.D.

Field Blank
TENAX:
TENAX/CHARCOAL:

Sample
TENAX: Run #2 - Tx
TENAX/CHARCOAL: Run #2 - Tx/C

COMMENTS:
Purged 5 min.

AF-070

TRC

VOST DATA SHEET

Project No.: 37387
Client: Maverick
Facility: Woburn
Source: Flare
Sample Location: Outlet
DGM No.: 2806087
Run No. 3

Date: 26 Nov 02
Flow Rate (Lpm): 0.5
DGM Y at Lpm: 1.026
Barometric Pressure: 30.10
Operator: T. Senger
Sample Point Location
Port: A Point: 1

Train Leak Check - Initial: VAC 10.0 in/Hg, 0.0 Δ in/Hg, 60 sec

Train Leak Check - Final: VAC 8.0 in/Hg, 0.0 Δ in/Hg, 60 sec

Clock Time (24 hr)	Sampling Time (min)	Rotameter Reading L/min.	Gas Sample Volume liters	1st Cond. Outlet temp. °F	Gas Sample Temp At Dry Inlet °F	Gas Sample Temp Gas Meter Outlet °F	Probe Temp. °F	Pump Vacuum in. Hg Gauge
1315	0	0.5	5735.408	40	49	49	≥1600	6.0
	5		5737.900	40	49	49	≥1600	6.0
	10		5740.400	41	50	50	≥1600	6.0
	15		5742.900	41	50	50	≥1600	6.0
	20		5745.500	41	49	49	≥1600	6.0
	25		5748.000	41	50	50	≥1600	6.0
	30		5750.500	42	50	50	≥1600	6.0
	35		5753.000	42	50	50	≥1600	6.0
1355	40		5755.503					
			20.095					

Sample Trap I.D.

Field Blank
TENAX:
TENAX/CHARCOAL:

Sample
TENAX: Run #3 - TX
TENAX/CHARCOAL: Run #3 - TX/C

COMMENTS:
Purged 5 min

AF-070

TD

APPENDIX B
FACILITY PROCESS DATA

James, Scott

From: Ken Lafferty [lafferty@maverick-cm.com]

Sent: Tuesday, November 26, 2002 7:49 PM

To: James, Scott

Cc: Senger, Tim

Subject: TOU Temp Data Nov 26.xls

Attached is the TOU temperature data from the source test conducted earlier today. Please contact me if you require additional information. As provided earlier, the blower is run at normal operating speed. According to manufacter's documentation, the 3HP motor on that blower pulls 175 CFM.

Ken Lafferty
Maverick Construction Management Services, Inc.

	Time	Date	Temp (F)
	9:45:04	11/26/02	136.1
	9:50:00	11/26/02	879.1
	9:55:00	11/26/02	1084.4
	10:00:01	11/26/02	1144.8
	10:05:01	11/26/02	1592.1
	10:10:01	11/26/02	1564.1
	10:15:02	11/26/02	1556.9
	10:20:02	11/26/02	1560.4
Run #1	10:45:00	11/26/02	1521
	10:50:00	11/26/02	1497
	10:55:00	11/26/02	1579
	11:00:00	11/26/02	1545
	11:05:00	11/26/02	1531
	11:10:00	11/26/02	1517
	11:15:00	11/26/02	1539
	11:20:00	11/26/02	1574

SYSTEM RESTARTED

	12:20:00	11/26/02	1560.4
Run #2	12:25:01	11/26/02	1557.4
	12:30:01	11/26/02	1552.1
	12:35:01	11/26/02	1553.3
	12:40:02	11/26/02	1550.9
	12:45:02	11/26/02	1558.2
	12:50:03	11/26/02	1546.9
	12:55:03	11/26/02	1549.7
	13:00:03	11/26/02	1543.6
	13:05:04	11/26/02	1554.5
	13:10:04	11/26/02	1542.5
	13:15:04	11/26/02	1554.4
	13:20:00	11/26/02	1549.1
	13:25:00	11/26/02	1542.2
	13:30:00	11/26/02	1535.5
Run #3	13:35:01	11/26/02	1553.6
	13:40:01	11/26/02	1550.3
	13:45:02	11/26/02	1540.6
	13:50:02	11/26/02	1550.5
	13:55:02	11/26/02	1538.7
	14:00:03	11/26/02	1551.9
	14:05:03	11/26/02	1557.5

TESTING COMPLETED

14:10:04	11/26/02	1551.3
14:15:04	11/26/02	1549
14:20:04	11/26/02	1548.3
14:25:00	11/26/02	1545.2

14:30:00 11/26/02 1520

SYSTEM SHUTDOWN

APPENDIX C
ANALYTICAL DATA

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

COMPREHENSIVE VALIDATION PACKAGE

MODIFIED METHOD 3C

INVENTORY SHEET

Work Order #: 0211669C

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b. Target Compound Raw Data		
-Internal Standard Area and Retention Time Summary (If Applicable)		
-Surrogate Recovery Summary (If Applicable)		
-Chromatogram(s) and Ion Profiles (If Applicable)		
3. QC Results and Raw Data		
a. Method Blank (Results + Raw Data)	24	27
b. Surrogate Recovery Summary Form (If Applicable)	-	-
c. Internal Standard Summary Form (If Applicable)	-	-
d. Duplicate Results Summary Sheet	28	28
e. Matrix Spike/Matrix Spike Duplicate (Results + Raw Data)	-	-
f. Initial Calibration Data (Summary Sheet + Raw Data)	29	59
g. MDL Study (If Applicable)	-	-
h. Continuing Calibration Verification Data (Summary Sheet + Raw Data)	60	65
i. Second Source LCS (Summary + Raw Data)	66	69
j. Extraction Logs	-	-
k. Instrument Run Logs/Software Verification	70	71
l. GC/MS Tune (Results + Raw Data)	-	-
4. Shipping/Receiving Documents:		
a. Login Receipt Summary Sheet	72	73
b. Chain-of-Custody Records	74	74
c. Sample Log-In Sheet	75	75
d. Misc. Shipping/Receiving Records (list individual records)		
Sample Receipt Discrepancy Report	-	-
5. Other Records (describe or list)		
a. Manual Spectral Defense	-	-
b. Manual Intergrations	-	-
c. Manual Calculations	-	-
d. Canister Dilution Factors	-	-
e. Laboratory Corrective Action Request	-	-
f. CAS Number Reference	76	77
g. Variance Table	-	-
h. Canister Certification	-	-
i. Data Review Check Sheet	78	78

Completed by:

Judy Lee	Judy Lee/Document Control	12/16/02
(Signature)	(Print Name & Title)	(Date)

AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 0211669C

Work Order Summary

CLIENT:	Mr. Scott James TRC Environmental Corporation Boott Mills South, Foot of John St. Lowell, MA 01852	**BILL TO:**	Mr. Scott James TRC Environmental Corporation Boott Mills South, Foot of John St. Lowell, MA 01852
PHONE:	978-970-5600	**P.O. #**	40894
FAX:	978-453-1995	**PROJECT #**	37887-0040-00000 MAVERICK MGT WOBURN
DATE RECEIVED:	11/27/2002	**CONTACT:**	Betty Chu
DATE COMPLETED:	12/12/2002		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.
01A	Run 1-INLET	Modified Method 3C	11.0 "Hg
01AA	Run 1-INLET Duplicate	Modified Method 3C	11.0 "Hg
02A	Run 2-INLET	Modified Method 3C	7.5 "Hg
03A	Run 3-INLET	Modified Method 3C	4.0 "Hg
07A	FIELD BLANK	Modified Method 3C	29.0 "Hg
08A	Lab Blank	Modified Method 3C	NA
09A	LCS	Modified Method 3C	NA

CERTIFIED BY: Linda L. Freeman   DATE: 12/12/02

Laboratory Director

Certification numbers: CA NELAP - 02110CA, NY NELAP - 11291, UT NELAP - 9166389892, LA NELAP/LELAP- AI 30763, AR DEQ

Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act, Accreditation number: E87680, Effective date: 07/01/02, Expiration date: 06/30/03

Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified Method 3C
TRC Environmental Corporation
Workorder# 0211669C

Four 6 Liter Summa Canister samples were received on November 27, 2002. The laboratory performed analysis via Modified EPA Method 3C for Oxygen, Nitrogen, Carbon Dioxide and Methane using GC/TCD. The method involves direct injection of 1.0 mL of landfill gas. See the data sheet for the reporting limits.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:
B - Compound present in laboratory blank greater than reporting limit.
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Table 1								
Client Sample ID	Lab Sample ID	Date Collected	Date Received	Date Extracted	Sample Holding Time (Days)	Date Analyzed	Sample Extract Holding Time (Days)	Sample Condition
Run 1-INLET	0211669C-01A	11/26/2002	11/27/2002	NA	9	12/ 5/2002	NA	Good
Run 1-INLET Duplicate	0211669C-01AA	11/26/2002	11/27/2002	NA	9	12/ 5/2002	NA	Good
Run 2-INLET	0211669C-02A	11/26/2002	11/27/2002	NA	9	12/ 5/2002	NA	Good
Run 3-INLET	0211669C-03A	11/26/2002	11/27/2002	NA	9	12/ 5/2002	NA	Good
FIELD BLANK	0211669C-07A	NA	NA	NA	NA	12/ 5/2002	NA	Good
Lab Blank	0211669C-08A	NA	NA	NA	NA	12/ 5/2002	NA	Good

Sample Results and Raw Data

AIR TOXICS LTD.

ID#: 0211669C-01A

Modified EPA Method 3C
GC/TCD

Sample Name:	Run 1-INLET	Date of Collection:	11/26/02
Dil. Factor:	2.12	Date of Analysis:	12/05/02

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.21	9.2
Nitrogen	0.21	59
Methane	0.21	20
Carbon Dioxide	0.21	13

AIR TOXICS LTD.

ID#: 0211669C-01AA

Modified EPA Method 3C
GC/TCD

Sample Name:	**Run 1-INLET Duplicate**	**Date of Collection:**	**11/26/02**
Dil. Factor:	**2.12**	**Date of Analysis:**	**12/05/02**

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.21	9.1
Nitrogen	0.21	58
Methane	0.21	20
Carbon Dioxide	0.21	13

AIR TOXICS LTD.

ID#: 0211669C-02A

Modified EPA Method 3C
GC/TCD

Sample Name: Run 2-INLET		**Date of Collection: 11/26/02**
Dil. Factor:	**1.79**	**Date of Analysis: 12/05/02**

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.2	10
Nitrogen	0.2	59
Methane	0.2	20
Carbon Dioxide	0.2	12

AIR TOXICS LTD.

ID#: 0211669C-03A

Modified EPA Method 3C
GC/TCD

Sample Name:	**Run 3-INLET**	**Date of Collection:**	**11/26/02**
Dil. Factor:	**1.55**	**Date of Analysis:**	**12/05/02**

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.16	12
Nitrogen	0.16	61
Methane	0.16	15
Carbon Dioxide	0.16	9.2

AIR TOXICS LTD.

ID#: 0211669C-07A

Modified EPA Method 3C
GC/TCD

Sample Name:	**FIELD BLANK**	**Date of Collection:**	**NA**
Dil. Factor:	**1.00**	**Date of Analysis:**	**12/05/02**

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.10	Not Detected
Nitrogen	0.10	Not Detected
Methane	0.10	Not Detected
Carbon Dioxide	0.10	Not Detected

QC Results and Raw Data

AIR TOXICS LTD.

ID#: 0211669C-08A

Modified EPA Method 3C
GC/TCD

Sample Name:	Lab Blank	Date of Collection:	NA
Dil. Factor:	1.00	Date of Analysis:	12/05/02

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.10	Not Detected
Nitrogen	0.10	Not Detected
Methane	0.10	Not Detected
Carbon Dioxide	0.10	Not Detected

AIR TOXICS LTD.

ID#: 0211669C-09A

Modified EPA Method 3C
GC/TCD

Sample Name:	**LCS**	**Date of Collection:**	**NA**
Dil. Factor:	**1.00**	**Date of Analysis:**	**12/05/02**

Compound	Rpt. Limit (%)	% Recovery
Oxygen	0.10	87
Nitrogen	0.10	103
Methane	0.10	91
Carbon Dioxide	0.10	102

AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

COMPREHENSIVE VALIDATION PACKAGE

Modified TO-12

INVENTORY SHEET

Work Order #: 0211669B

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b. Target Compound Raw Data		
-Internal Standard Area and Retenetion Time Summary		
-Surrogate Recovery Summary (If Applicable)		
-Chromatogram(s) and Ion Profiles (If Applicable)		
3. QC Results and Raw Data		
a. Method Blank (Results+ Raw Data)	34	37
b. Surrogate Recover Summary Form (If Applicable)	--	--
c. Internal Standard Summary Form (If Applicable)	--	--
d. Duplicate Results Summary Sheet	--	--
e. Matrix Spike/Matrix Spike Duplicate (Results + Raw Data	--	--
f. Initial Calibration Data (Summary Sheet + Raw Data)	38	92
g. MDL Study (If Applicable)	--	--
h. Continuing Calibration Verification Data (Summary Sheet	93	100
i. Second Source LCS(Summary + Raw Data)	101	104
j. Extraction Logs	--	--
k. Instrument Run Logs/Software Verification	105	105
l. GC/MS Tune (Results + Raw Data)	--	--
4. Shipping/Receiving Documents		
a. Login Receipt Summary Sheet	107	107
b. Chain-of-Custody Records	108	108
c. Sample Log-In Sheet	109	109
d. Misc Shipping/Receiving Records (list of individual records)		
Sample Receipt Discrepancy Report	--	--
5. Other Records (describe or list)		
a. Manual Spectral Defense	--	--
b. Manual Integrations	111	113
c. Manual Calculations	--	--
d. Canister Dilution Factors	114	115
e. Laboratory Corrective Action Request	--	--
f. CAS Number Reference	116	116
g. Variance Table	--	--
h. Canister Certification	--	--
i. Data Review Check Sheet	117	117

Comments:

Completed by:

Judy Lee	Judy Lee / Document Control	12/11/02
(Signature)	(Print Name & Title)	(Date)

AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 0211669B

Work Order Summary

CLIENT:	Mr. Scott James TRC Environmental Corporation Boott Mills South, Foot of John St. Lowell, MA 01852	**BILL TO:**	Mr. Scott James TRC Environmental Corporation Boott Mills South, Foot of John St. Lowell, MA 01852
PHONE:	978-970-5600	**P.O. #**	40894
FAX:	978-453-1995	**PROJECT #**	37887-0040-00000 MAVERICK MGT WOBURN
DATE RECEIVED:	11/27/2002	**CONTACT:**	Betty Chu
DATE COMPLETED:	12/9/2002		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.
01A	Run 1-INLET	Modified TO-12	11.0 "Hg
02A	Run 2-INLET	Modified TO-12	7.5 "Hg
03A	Run 3-INLET	Modified TO-12	4.0 "Hg
04A	Run 1-OUTLET	Modified TO-12	11.0 "Hg
05A	Run 2-OUTLET	Modified TO-12	16.5 "Hg
06A	Run 3-OUTLET	Modified TO-12	9.5 "Hg
07A	FIELD BLANK	Modified TO-12	29.0 "Hg
08A	Lab Blank	Modified TO-12	NA
09A	LCS	Modified TO-12	NA

CERTIFIED BY: Linda L. Freeman DATE: 12/11/02

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, NY NELAP - 11291, UT NELAP - 9166389892,
LA NELAP/LELAP- AI 30763, AR DEQ
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/02, Expiration date: 06/30/03
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified Method TO-12
TRC Environmental Corporation
Workorder# 0211669B

Six 6 Liter Summa Canister and one 6 Liter Summa Canister (100% Certified) samples were received on November 27, 2002. The laboratory performed analysis via modified EPA Method TO-12 for Total Non-Methane Organic Compounds (TNMOC). TNMOC was analyzed via GC/FID. The TNMOC results are calculated using the response of Heptane. The method involves concentrating up to 200 mL of air samples. The concentrated aliquot is then dry purged to remove water vapor prior to entering the chromatographic system. See the data sheets for the reporting limit for TNMOC.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Six qualifiers may have been used on the Analysis sheets and indicate as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated Peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

Table 1

Client Sample ID	Lab Sample ID	Date Collected	Date Received	Date Extracted	Sample Holding Time (Days)	Date Analyzed	Sample Extract Holding Time (Days)	Sample Condition
Run 1-INLET	0211669B-01A	11/26/2002	11/27/2002	NA	8	12/ 4/2002	NA	Good
Run 2-INLET	0211669B-02A	11/26/2002	11/27/2002	NA	8	12/ 4/2002	NA	Good
Run 3-INLET	0211669B-03A	11/26/2002	11/27/2002	NA	8	12/ 4/2002	NA	Good
Run 1-OUTLET	0211669B-04A	11/26/2002	11/27/2002	NA	8	12/ 4/2002	NA	Good
Run 2-OUTLET	0211669B-05A	11/26/2002	11/27/2002	NA	8	12/ 4/2002	NA	Good
Run 3-OUTLET	0211669B-06A	11/26/2002	11/27/2002	NA	8	12/ 4/2002	NA	Good
FIELD BLANK	0211669B-07A	NA	NA	NA	NA	12/ 4/2002	NA	Good
Lab Blank	0211669B-08A	NA	NA	NA	NA	12/ 4/2002	NA	Good
LCS	0211669B-09A	NA	NA	NA	NA	12/ 4/2002	NA	Good

Sample Results and Raw Data

AIR TOXICS LTD.

SAMPLE NAME: Run 1-INLET

ID#: 0211669B-01A

MODIFIED EPA METHOD TO-12 GC/FID

File Name:	d120407	Date of Collection:	11/26/02
Dil. Factor:	2.12	Date of Analysis:	12/4/02

Compound	Rpt. Limit (ppmv)	Amount (ppmv)
TNMOC ref. to Heptane (MW=100)	0.021	4.4

Container Type: 6 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: Run 2-INLET

ID#: 0211669B-02A

MODIFIED EPA METHOD TO-12 GC/FID

File Name:	g120408	Date of Collection:	11/26/02
Dil. Factor:	1.79	Date of Analysis:	12/4/02

Compound	Rpt. Limit (ppmv)	Amount (ppmv)
TNMOC ref. to Heptane (MW=100)	0.018	4.3

Container Type: 6 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: Run 3-INLET

ID#: 0211669B-03A

MODIFIED EPA METHOD TO-12 GC/FID

File Name: d120410 Date of Collection: 11/26/02
Dil. Factor: 1.55 Date of Analysis: 12/4/02

Compound	Rpt. Limit (ppmv)	Amount (ppmv)
TNMOC ref. to Heptane (MW=100)	0.016	3.0

Container Type: 6 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: Run 1-OUTLET

ID#: 0211669B-04A

MODIFIED EPA METHOD TO-12 GC/FID

File Name: a120411 Date of Collection: 11/26/02
Dil. Factor: 2.12 Date of Analysis: 12/4/02

Compound	Rpt. Limit (ppmv)	Amount (ppmv)
TNMOC ref. to Heptane (MW=100)	0.021	0.23

Container Type: 6 Liter Summa Canister (100% Certified)

AIR TOXICS LTD.

SAMPLE NAME: Run 2-OUTLET

ID#: 0211669B-05A

MODIFIED EPA METHOD TO-12 GC/FID

File Name: d120412 Date of Collection: 11/26/02
Dil. Factor: 2.98 Date of Analysis: 12/4/02

Compound	Rpt. Limit (ppmv)	Amount (ppmv)
TNMOC ref. to Heptane (MW=100)	0.030	0.24

Container Type: 6 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: Run 3-OUTLET

ID#: 0211669B-06A

MODIFIED EPA METHOD TO-12 GC/FID

File Name: d120413 Date of Collection: 11/26/02
Dil. Factor: 1.96 Date of Analysis: 12/4/02

Compound	Rpt. Limit (ppmv)	Amount (ppmv)
TNMOC ref. to Heptane (MW=100)	0.020	0.23

Container Type: 6 Liter Summa Canister

AIR TOXICS LTD.

SAMPLE NAME: FIELD BLANK

ID#: 0211669B-07A

MODIFIED EPA METHOD TO-12 GC/FID

File Name: d120414	Date of Collection: NA
Dil. Factor: 1.00	Date of Analysis: 12/4/02

Compound	Rpt. Limit (ppmv)	Amount (ppmv)
TNMOC ref. to Heptane (MW=100)	0.010	0.042

Container Type: 6 Liter Summa Canister

QC Results and Raw Data

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 0211669B-08A

MODIFIED EPA METHOD TO-12 GC/FID

File Name:	a120405	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 12/4/02

Compound	Rpt. Limit (ppmv)	Amount (ppmv)
TNMOC ref. to Heptane (MW=100)	0.010	Not Detected

Container Type: NA - Not Applicable

AIR TOXICS LTD.

SAMPLE NAME: LCS

ID#: 0211669B-09A

MODIFIED EPA METHOD TO-12 GC/FID

File Name:	a120404	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 12/4/02	

Compound	Rpt. Limit (ppmv)	%Recovery
TNMOC ref. to Heptane (MW=100)	0.010	103

Container Type: NA - Not Applicable

AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

COMPREHENSIVE VALIDATION PACKAGE

Modified ASTM D-5504

INVENTORY SHEET

Work Order #: 0211656R1

	Page Nos. From	Page Nos. To
1. Work Order Cover Page & Laboratory Narrative	1	4
2. Sample Results and Raw Data (Organized by Sample)	6	29
a. ATL Sample Results Form		
b. Target Compound Raw Data		
-Internal Standard Area and Retenetion Time Summary		
-Surrogate Recovery Summary (If Applicable)		
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Comments:

Completed by:

Judy Lee	Judy Lee / Document Control	2/14/03
(Signature)	(Print Name & Title)	(Date)

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 0211656R1

Work Order Summary

CLIENT:	Mr. Scott James TRC Environmental Corporation Boott Mills South, Foot of John St. Lowell, MA 01852	**BILL TO:**	Mr. Scott James TRC Environmental Corporation Boott Mills South, Foot of John St. Lowell, MA 01852
PHONE:	978-970-5600	**P.O. #**	40894
FAX:	978-453-1995	**PROJECT #**	37887-0040-00000 MAVERICK MGT WOBURN
DATE RECEIVED:	11/27/2002	**CONTACT:**	Betty Chu
DATE COMPLETED:	12/11/2002		
DATE REISSUED:	2/13/03		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.
01A	RUN 1 - INLET (BAG SAMPLE)	Modified ASTM D-5504	Tedlar Bag
02A	RUN 2 - INLET (BAG SAMPLE)	Modified ASTM D-5504	Tedlar Bag
03A	RUN 3 - INLET (BAG SAMPLE)	Modified ASTM D-5504	Tedlar Bag
04A	RUN 1 - OUTLET (BAG SAMPLE)	Modified ASTM D-5504	Tedlar Bag
05A	RUN 2 - OUTLET (BAG SAMPLE)	Modified ASTM D-5504	Tedlar Bag
06A(cancelled)	RUN 3 - OUTLET (BAG SAMPLE)	Modified ASTM D-5504	Tedlar Bag
07A	FIELD BLANK (BAG SAMPLE)	Modified ASTM D-5504	Tedlar Bag
08A	Lab Blank	Modified ASTM D-5504	NA
09A	LCS	Modified ASTM D-5504	NA

CERTIFIED BY: Linda L. Freeman DATE: 02/14/03

Laboratory Director

Certfication numbers: AR DEQ, CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763, NJ NELAP - CA004
NY NELAP - 11291, UT NELAP - 9166389892
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/02, Expiration date: 06/30/03
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified ASTM D-5504
TRC Environmental Corporation
Workorder# 0211656R1

Seven 1 Liter Tedlar Bag samples were received on November 27, 2002. The laboratory performed the analysis of sulfur compounds via Modified ASTM D-5504 using GC/SCD. The method involves direct injection of the air sample into the GC via a fixed 1.0 mL sampling loop. See the data sheets for the reporting limits for each compound.

Requirement	*ASTM D-5504*	*ATL Modifications*
Detection	Less than 5 pg S/sensitivity	4 ppbv
Standards	Permeation tube Compressed cylinder gas	Standards may also be formulated from liquid stock and blended in a Tedlar bag
Initial Calibration	External Standard Single point at least once per day; The RF of each compound should be within 10 % of RF for Dimethyl Sulfide.	External Standard Multi points (3 - 5) Average % RSD for all compounds </= 30%; %RSD </= 30 % for Hydrogen Sulfide. The low point of the curve is the same as the Reporting Limit.
Dilution	Via split injection	Bag or syringe dilution with N2

Receiving Notes

The Tedlar bag for sample RUN 3 - OUTLET (BAG SAMPLE) arrived flat. The client was notified that analysis was not possible.

Samples RUN 1 - INLET (BAG SAMPLE), RUN 2 - INLET (BAG SAMPLE), RUN 1 - OUTLET (BAG SAMPLE) and RUN 2 - OUTLET (BAG SAMPLE) were received past the recommended hold time of 24 hours. The discrepancy was noted in the Login email and the analysis proceeded.

Analytical Notes

Ethyl Methyl Sulfide and n-Butyl Mercaptan coelute with 3-Methyl Thiophene. The corresponding peak is reported as 3-Methyl Thiophene.

Sample RUN 3 - INLET (BAG SAMPLE) was received with insufficient time remaining to analyze samples within the method specified 24 hour hold time.

THE WORKORDER WAS RE-ISSUED ON FEBRUARY 13, 2003 TO REMOVE CARBON DISULFIDE RESULTS FOR SAMPLES RUN 1 - INLET (BAG SAMPLE), RUN 2 - INLET (BAG SAMPLE), RUN 3 - INLET (BAG SAMPLE), RUN 1 - OUTLET (BAG SAMPLE) AND RUN 2 - OUTLET (BAG SAMPLE). EVALUATION OF ASSOCIATED GC/MS RESULTS INDICATED THAT A NON-TARGET PEAK WAS MISIDENTIFIED AS CARBON DISULFIDE. THIS NON-TARGET PEAK INTERFERED WITH THE DETECTION AND QUANTIFICATION OF CARBON DISULFIDE AND NO RESULTS FOR CARBON DISULFIDE COULD BE REPORTED FOR THESE SAMPLES.

Definition of Data Qualifying Flags

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:

B - Compound present in laboratory blank greater than reporting limit.

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the detection limit.

M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

Table 1								
Client Sample ID	Lab Sample ID	Date Collected	Date Received	Date Extracted	Sample Holding Time (Days)	Date Analyzed	Sample Extract Holding Time (Days)	Sample Condition
RUN 1 - INLET (BAG SAM	0211656R1-01A	11/26/2002	11/27/2002	NA	1	11/27/2002	NA	Good
RUN 2 - INLET (BAG SAM	0211656R1-02A	11/26/2002	11/27/2002	NA	1	11/27/2002	NA	Good
RUN 3 - INLET (BAG SAM	0211656R1-03A	11/26/2002	11/27/2002	NA	1	11/27/2002	NA	Good
RUN 1 - OUTLET (BAG S	0211656R1-04A	11/26/2002	11/27/2002	NA	1	11/27/2002	NA	Good
RUN 2 - OUTLET (BAG S	0211656R1-05A	11/26/2002	11/27/2002	NA	1	11/27/2002	NA	Good
FIELD BLANK (BAG SAM	0211656R1-07A	11/26/2002	11/27/2002	NA	1	11/27/2002	NA	Good
Lab Blank	0211656R1-08A	NA	NA	NA	NA	11/27/2002	NA	Good
LCS	0211656R1-09A	NA	NA	NA	NA	11/27/2002	NA	Good

Sample Results and Raw Data

AIR TOXICS LTD.

SAMPLE NAME: RUN 1 - INLET (BAG SAMPLE)

ID#: 0211656R1-01A

SULFUR GASES BY MODIFIED ASTM D-5504 GC/SCD

File Name:	b112721r	Date of Collection:	11/26/02
Dil. Factor:	1000	Date of Analysis:	11/27/02

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	4000	350000
Carbonyl Sulfide	4000	Not Detected
Methyl Mercaptan	4000	Not Detected
Ethyl Mercaptan	4000	Not Detected
Dimethyl Sulfide	4000	Not Detected
Isopropyl Mercaptan	4000	Not Detected
tert-Butyl Mercaptan	4000	Not Detected
n-Propyl Mercaptan	4000	Not Detected
Ethyl Methyl Sulfide	4000	Not Detected
Thiophene	4000	Not Detected
Isobutyl Mercaptan	4000	Not Detected
Diethyl Sulfide	4000	Not Detected
Butyl Mercaptan	4000	Not Detected
Dimethyl Disulfide	4000	Not Detected
3-Methylthiophene	4000	Not Detected
Tetrahydrothiophene	4000	Not Detected
2-Ethylthiophene	4000	Not Detected
2,5-Dimethylthiophene	4000	Not Detected
Diethyl Disulfide	4000	Not Detected

Container Type: 1 Liter Tedlar Bag

AIR TOXICS LTD.

SAMPLE NAME: RUN 2 - INLET (BAG SAMPLE)

ID#: 0211656R1-02A

SULFUR GASES BY MODIFIED ASTM D-5504 GC/SCD

File Name: b112722r   Date of Collection: 11/26/02

Dil. Factor: 1000   Date of Analysis: 11/27/02

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	4000	270000
Carbonyl Sulfide	4000	Not Detected
Methyl Mercaptan	4000	Not Detected
Ethyl Mercaptan	4000	Not Detected
Dimethyl Sulfide	4000	Not Detected
Isopropyl Mercaptan	4000	Not Detected
tert-Butyl Mercaptan	4000	Not Detected
n-Propyl Mercaptan	4000	Not Detected
Ethyl Methyl Sulfide	4000	Not Detected
Thiophene	4000	Not Detected
Isobutyl Mercaptan	4000	Not Detected
Diethyl Sulfide	4000	Not Detected
Butyl Mercaptan	4000	Not Detected
Dimethyl Disulfide	4000	Not Detected
3-Methylthiophene	4000	Not Detected
Tetrahydrothiophene	4000	Not Detected
2-Ethylthiophene	4000	Not Detected
2,5-Dimethylthiophene	4000	Not Detected
Diethyl Disulfide	4000	Not Detected

Container Type: 1 Liter Tedlar Bag

AIR TOXICS LTD.

SAMPLE NAME: RUN 3 - INLET (BAG SAMPLE)

ID#: 0211656R1-03A

SULFUR GASES BY MODIFIED ASTM D-5504 GC/SCD

File Name:	b112723	Date of Collection:	11/26/02
Dil. Factor:	1000	Date of Analysis:	11/27/02

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	4000	350000
Carbonyl Sulfide	4000	Not Detected
Methyl Mercaptan	4000	Not Detected
Ethyl Mercaptan	4000	Not Detected
Dimethyl Sulfide	4000	Not Detected
Isopropyl Mercaptan	4000	Not Detected
tert-Butyl Mercaptan	4000	Not Detected
n-Propyl Mercaptan	4000	Not Detected
Ethyl Methyl Sulfide	4000	Not Detected
Thiophene	4000	Not Detected
Isobutyl Mercaptan	4000	Not Detected
Diethyl Sulfide	4000	Not Detected
Butyl Mercaptan	4000	Not Detected
Dimethyl Disulfide	4000	Not Detected
3-Methylthiophene	4000	Not Detected
Tetrahydrothiophene	4000	Not Detected
2-Ethylthiophene	4000	Not Detected
2,5-Dimethylthiophene	4000	Not Detected
Diethyl Disulfide	4000	Not Detected

Container Type: 1 Liter Tedlar Bag

AIR TOXICS LTD.

SAMPLE NAME: RUN 1 - OUTLET (BAG SAMPLE)

ID#: 0211656R1-04A

SULFUR GASES BY MODIFIED ASTM D-5504 GC/SCD

File Name: b112724c	Date of Collection: 11/26/02
Dil. Factor: 200	Date of Analysis: 11/27/02

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	800	Not Detected
Carbonyl Sulfide	800	Not Detected
Methyl Mercaptan	800	Not Detected
Ethyl Mercaptan	800	Not Detected
Dimethyl Sulfide	800	Not Detected
Isopropyl Mercaptan	800	Not Detected
tert-Butyl Mercaptan	800	Not Detected
n-Propyl Mercaptan	800	Not Detected
Ethyl Methyl Sulfide	800	Not Detected
Thiophene	800	Not Detected
Isobutyl Mercaptan	800	Not Detected
Diethyl Sulfide	800	Not Detected
Butyl Mercaptan	800	Not Detected
Dimethyl Disulfide	800	Not Detected
3-Methylthiophene	800	Not Detected
Tetrahydrothiophene	800	Not Detected
2-Ethylthiophene	800	Not Detected
2,5-Dimethylthiophene	800	Not Detected
Diethyl Disulfide	800	Not Detected

Container Type: 1 Liter Tedlar Bag

AIR TOXICS LTD.

SAMPLE NAME: RUN 2 - OUTLET (BAG SAMPLE)

ID#: 0211656R1-05A

SULFUR GASES BY MODIFIED ASTM D-5504 GC/SCD

File Name:	b112725r	Date of Collection: 11/26/02
Dil. Factor:	200	Date of Analysis: 11/27/02

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	800	Not Detected
Carbonyl Sulfide	800	Not Detected
Methyl Mercaptan	800	Not Detected
Ethyl Mercaptan	800	Not Detected
Dimethyl Sulfide	800	Not Detected
Isopropyl Mercaptan	800	Not Detected
tert-Butyl Mercaptan	800	Not Detected
n-Propyl Mercaptan	800	Not Detected
Ethyl Methyl Sulfide	800	Not Detected
Thiophene	800	Not Detected
Isobutyl Mercaptan	800	Not Detected
Diethyl Sulfide	800	Not Detected
Butyl Mercaptan	800	Not Detected
Dimethyl Disulfide	800	Not Detected
3-Methylthiophene	800	Not Detected
Tetrahydrothiophene	800	Not Detected
2-Ethylthiophene	800	Not Detected
2,5-Dimethylthiophene	800	Not Detected
Diethyl Disulfide	800	Not Detected

Container Type: 1 Liter Tedlar Bag

AIR TOXICS LTD.

SAMPLE NAME: FIELD BLANK (BAG SAMPLE)

ID#: 0211656R1-07A

SULFUR GASES BY MODIFIED ASTM D-5504 GC/SCD

File Name:	b112706	Date of Collection:	11/26/02
Dil. Factor:	1.00	Date of Analysis:	11/27/02

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	4.0	Not Detected
Carbonyl Sulfide	4.0	Not Detected
Methyl Mercaptan	4.0	Not Detected
Ethyl Mercaptan	4.0	Not Detected
Dimethyl Sulfide	4.0	Not Detected
Carbon Disulfide	4.0	Not Detected
Isopropyl Mercaptan	4.0	Not Detected
tert-Butyl Mercaptan	4.0	Not Detected
n-Propyl Mercaptan	4.0	Not Detected
Ethyl Methyl Sulfide	4.0	Not Detected
Thiophene	4.0	Not Detected
Isobutyl Mercaptan	4.0	Not Detected
Diethyl Sulfide	4.0	Not Detected
Butyl Mercaptan	4.0	Not Detected
Dimethyl Disulfide	4.0	Not Detected
3-Methylthiophene	4.0	Not Detected
Tetrahydrothiophene	4.0	Not Detected
2-Ethylthiophene	4.0	Not Detected
2,5-Dimethylthiophene	4.0	Not Detected
Diethyl Disulfide	4.0	Not Detected

Container Type: 1 Liter Tedlar Bag

QC Results and Raw Data

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 0211656R1-08A

SULFUR GASES BY MODIFIED ASTM D-5504 GC/SCD

File Name:	b112704	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 11/27/02

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	4.0	Not Detected
Carbonyl Sulfide	4.0	Not Detected
Methyl Mercaptan	4.0	Not Detected
Ethyl Mercaptan	4.0	Not Detected
Dimethyl Sulfide	4.0	Not Detected
Carbon Disulfide	4.0	Not Detected
Isopropyl Mercaptan	4.0	Not Detected
tert-Butyl Mercaptan	4.0	Not Detected
n-Propyl Mercaptan	4.0	Not Detected
Ethyl Methyl Sulfide	4.0	Not Detected
Thiophene	4.0	Not Detected
Isobutyl Mercaptan	4.0	Not Detected
Diethyl Sulfide	4.0	Not Detected
Butyl Mercaptan	4.0	Not Detected
Dimethyl Disulfide	4.0	Not Detected
3-Methylthiophene	4.0	Not Detected
Tetrahydrothiophene	4.0	Not Detected
2-Ethylthiophene	4.0	Not Detected
2,5-Dimethylthiophene	4.0	Not Detected
Diethyl Disulfide	4.0	Not Detected

Container Type: NA - Not Applicable

AIR TOXICS LTD.

SAMPLE NAME: LCS

ID#: 0211656R1-09A

SULFUR GASES BY MODIFIED ASTM D-5504 GC/SCD

File Name:	b112702	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 11/27/02	

Compound	Rpt. Limit (ppbv)	%Recovery
Hydrogen Sulfide	4.0	93
Carbonyl Sulfide	4.0	85
Methyl Mercaptan	4.0	90
Ethyl Mercaptan	4.0	96
Dimethyl Sulfide	4.0	76
Carbon Disulfide	4.0	113
Isopropyl Mercaptan	4.0	91
tert-Butyl Mercaptan	4.0	88
n-Propyl Mercaptan	4.0	96
Ethyl Methyl Sulfide	4.0	88
Thiophene	4.0	80
Isobutyl Mercaptan	4.0	100
Diethyl Sulfide	4.0	82
Butyl Mercaptan	4.0	88
Dimethyl Disulfide	4.0	87
3-Methylthiophene	4.0	88
Tetrahydrothiophene	4.0	84
2-Ethylthiophene	4.0	85
2,5-Dimethylthiophene	4.0	74
Diethyl Disulfide	4.0	95

Container Type: NA - Not Applicable

AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

COMPREHENSIVE VALIDATION PACKAGE

Modified ASTM D-5504

INVENTORY SHEET

Work Order #: 0211656B

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4. Shipping/Receiving Documents		
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c. Sample Log-In Sheet	69	69
d. Misc Shipping/Receiving Records (list of individual records)		
Sample Receipt Discrepancy Report	--	--
5. Other Records (describe or list)		
a. Manual Spectral Defense	--	--
b. Manual Integrations	--	--
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Comments:

Completed by:

Judy Lee	Judy Lee / Document Control	12/13/02
(Signature)	(Print Name & Title)	(Date)

AIR TOXICS LTD.
AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 0211656B

Work Order Summary

CLIENT:	Mr. Scott James TRC Environmental Corporation Boott Mills South, Foot of John St. Lowell, MA 01852	**BILL TO:**	Mr. Scott James TRC Environmental Corporation Boott Mills South, Foot of John St. Lowell, MA 01852
PHONE:	978-970-5600	**P.O. #**	40894
FAX:	978-453-1995	**PROJECT #**	37887-0040-00000 MAVERICK MGT WOBURN
DATE RECEIVED:	11/27/2002	**CONTACT:**	Betty Chu
DATE COMPLETED:	12/12/2002		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.
01A	Recovery	Modified ASTM D-5504	Tedlar Bag
02A	Lab Blank	Modified ASTM D-5504	NA
03A	LCS	Modified ASTM D-5504	NA

CERTIFIED BY: Linda L. Freeman DATE: 12/12/02

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, NY NELAP - 11291, UT NELAP - 9166389892, LA NELAP/LELAP- AI 30763, AR DEQ
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act, Accreditation number: E87680, Effective date: 07/01/02, Expiration date: 06/30/03
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified ASTM D-5504
TRC Environmental Corporation
Workorder# 0211656B

The laboratory performed the analysis of sulfur compounds via Modified ASTM D-5504 using GC/SCD. The method involves direct injection of the air sample into the GC via a fixed 1.0 mL sampling loop. See the attached data sheets for the percent recovered of each compound.

Receiving Notes

NA

Analytical Notes

A Holding Time study on Tedlar bag media was performed at Air Toxics Ltd. by client request. A 1-Liter Tedlar bag was spiked with 40 ppmv of Hydrogen Sulfide, Carbonyl Sulfide, and Methyl Mercaptan on December 10, 2002 at 0830 hours. The spiked bag was allowed to equilibrate for 30 hours and analysis was performed on December 11, 2002 at 1443 hours.

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:
B - Compound present in laboratory blank greater than reporting limit.
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.
File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Table 1								
Client Sample ID	Lab Sample ID	Date Collected	Date Received	Date Extracted	Sample Holding Time (Days)	Date Analyzed	Sample Extract Holding Time (Days)	Sample Condition
Recovery	0211656B-01A	12/10/2002	11/27/2002	NA	1	12/11/2002	NA	Good
Lab Blank	0211656B-02A	NA	NA	NA	NA	12/11/2002	NA	Good
LCS	0211656B-03A	NA	NA	NA	NA	12/11/2002	NA	Good

Sample Results and Raw Data

AIR TOXICS LTD.

SAMPLE NAME: Recovery

ID#: 0211656B-01A

SULFUR GASES BY MODIFIED ASTM D-5504 GC/SCD

File Name:	b121110	Date of Collection: 12/10/02
Dil. Factor:	200	Date of Analysis: 12/11/02

Compound	Rpt. Limit (ppbv)	%Recovery
Hydrogen Sulfide	800	115
Carbonyl Sulfide	800	116
Methyl Mercaptan	800	94
Ethyl Mercaptan	800	Not Spiked
Dimethyl Sulfide	800	Not Spiked
Carbon Disulfide	800	Not Spiked
Isopropyl Mercaptan	800	Not Spiked
tert-Butyl Mercaptan	800	Not Spiked
n-Propyl Mercaptan	800	Not Spiked
Ethyl Methyl Sulfide	800	Not Spiked
Thiophene	800	Not Spiked
Isobutyl Mercaptan	800	Not Spiked
Diethyl Sulfide	800	Not Spiked
Butyl Mercaptan	800	Not Spiked
Dimethyl Disulfide	800	Not Spiked
3-Methylthiophene	800	Not Spiked
Tetrahydrothiophene	800	Not Spiked
2-Ethylthiophene	800	Not Spiked
2,5-Dimethylthiophene	800	Not Spiked
Diethyl Disulfide	800	Not Spiked

Container Type: 1 Liter Tedlar Bag

QC Results and Raw Data

AIR TOXICS LTD.

SAMPLE NAME: Run #3-TX

ID#: 0211663-03A

MODIFIED VOST 5041A/8260B

File Name:	z120312	Date of Collection:	11/26/02
Dil. Factor:	1.00	Date of Analysis:	12/1/02

Surrogates	%Recovery	Method Limits
Dibromofluoromethane	104	70-130
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	93	70-130
4-Bromofluorobenzene	94	70-130

AIR TOXICS LTD.

SAMPLE NAME: Run #3-TX/C

ID#: 0211663-03B

MODIFIED VOST 5041A/8260B

File Name: 2120711 Date of Collection: 11/26/02
Dil. Factor: 1.00 Date of Analysis: 12/7/02

Compound	Rpt. Limit (ng)	Amount (ng)
Chloromethane	10	Not Detected
Vinyl Chloride	10	Not Detected
Bromomethane	10	Not Detected
Chloroethane	10	Not Detected
Freon 11	10	Not Detected
1,1-Dichloroethene	10	Not Detected
Carbon Disulfide	10	Not Detected
Acetone	50	Not Detected
Methylene Chloride	10	Not Detected
trans-1,2-Dichloroethene	10	Not Detected
1,1-Dichloroethane	10	Not Detected
Vinyl Acetate	50	Not Detected
2-Butanone (Methyl Ethyl Ketone)	50	Not Detected
Chloroform	10	Not Detected
1,1,1-Trichloroethane	10	Not Detected
Carbon Tetrachloride	10	Not Detected
Benzene	10	Not Detected
1,2-Dichloroethane	10	Not Detected
Trichloroethene	10	Not Detected
1,2-Dichloropropane	10	Not Detected
Bromodichloromethane	10	Not Detected
trans-1,3-Dichloropropene	10	Not Detected
4-Methyl-2-pentanone	50	Not Detected
Toluene	10	Not Detected
cis-1,3-Dichloropropene	10	Not Detected
1,1,2-Trichloroethane	10	Not Detected
Tetrachloroethene	10	Not Detected
2-Hexanone	50	Not Detected
Dibromochloromethane	10	Not Detected
Chlorobenzene	10	Not Detected
Ethyl Benzene	10	Not Detected
m,p-Xylene	10	Not Detected
o-Xylene	10	Not Detected
Styrene	10	Not Detected
Bromoform	10	Not Detected
1,1,2,2-Tetrachloroethane	10	Not Detected
1,3-Dichlorobenzene	10	Not Detected
1,4-Dichlorobenzene	10	Not Detected
1,2-Dichlorobenzene	10	Not Detected
Freon 12	10	Not Detected

Container Type: VOST 0030 Tube

AIR TOXICS LTD.

SAMPLE NAME: Run #3-TX/C

ID#: 0211663-03B

MODIFIED VOST 5041A/8260B

File Name:	a120711	Date of Collection:	11/26/02
Dil. Factor:	1.00	Date of Analysis:	12/7/02

Surrogates	%Recovery	Method Limits
Dibromofluoromethane	100	70-130
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	94	70-130
4-Bromofluorobenzene	92	70-130

AIR TOXICS LTD.

SAMPLE NAME: Condensate Runs 1-3

ID#: 0211663-04A

MODIFIED VOST 5041A/8260B

File Name:	2120806	Date of Collection:	11/26/02
Dil. Factor:	1.00	Date of Analysis:	12/8/02

Compound	Rpt. Limit (ng)	Amount (ng)
Chloromethane	50	Not Detected
Vinyl Chloride	50	Not Detected
Bromomethane	50	Not Detected
Chloroethane	50	Not Detected
Freon 11	50	Not Detected
1,1-Dichloroethene	50	Not Detected
Carbon Disulfide	50	Not Detected
Acetone	250	Not Detected
Methylene Chloride	50	1800
trans-1,2-Dichloroethene	50	Not Detected
1,1-Dichloroethane	50	Not Detected
Vinyl Acetate	250	Not Detected
2-Butanone (Methyl Ethyl Ketone)	250	Not Detected
Chloroform	50	Not Detected
1,1,1-Trichloroethane	50	Not Detected
Carbon Tetrachloride	50	Not Detected
Benzene	50	Not Detected
1,2-Dichloroethane	50	Not Detected
Trichloroethene	50	Not Detected
1,2-Dichloropropane	50	Not Detected
Bromodichloromethane	50	Not Detected
trans-1,3-Dichloropropene	50	Not Detected
4-Methyl-2-pentanone	250	Not Detected
Toluene	50	Not Detected
cis-1,3-Dichloropropene	50	Not Detected
1,1,2-Trichloroethane	50	Not Detected
Tetrachloroethene	50	Not Detected
2-Hexanone	250	Not Detected
Dibromochloromethane	50	Not Detected
Chlorobenzene	50	Not Detected
Ethyl Benzene	50	Not Detected
m,p-Xylene	50	Not Detected
o-Xylene	50	Not Detected
Styrene	50	Not Detected
Bromoform	50	Not Detected
1,1,2,2-Tetrachloroethane	50	Not Detected
1,3-Dichlorobenzene	50	Not Detected
1,4-Dichlorobenzene	50	Not Detected
1,2-Dichlorobenzene	50	Not Detected
Freon 12	50	Not Detected

Container Type: Vial

AIR TOXICS LTD.

SAMPLE NAME: Condensate Runs 1-3

ID#: 0211663-04A

MODIFIED VOST 5041A/8260B

File Name:	z120806	Date of Collection:	11/26/02
Dil. Factor:	4.00	Date of Analysis:	12/8/02

Surrogates	%Recovery	Method Limits
Dibromofluoromethane	101	70-130
1,2-Dichloroethane-d4	97	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	100	70-130

AIR TOXICS LTD.

SAMPLE NAME: Field Blank-TX

ID#: 0211663-05A

MODIFIED VOST 5041A/8260B

File Name:	z120706	Date of Collection: 11/26/02
Dil. Factor:	1.00	Date of Analysis: 12/7/02

Compound	Rpt. Limit (ng)	Amount (ng)
Chloromethane	10	Not Detected
Vinyl Chloride	10	Not Detected
Bromomethane	10	Not Detected
Chloroethane	10	Not Detected
Freon 11	10	Not Detected
1,1-Dichloroethene	10	Not Detected
Carbon Disulfide	10	Not Detected
Acetone	50	Not Detected
Methylene Chloride	10	17
trans-1,2-Dichloroethene	10	Not Detected
1,1-Dichloroethane	10	Not Detected
Vinyl Acetate	50	Not Detected
2-Butanone (Methyl Ethyl Ketone)	50	Not Detected
Chloroform	10	Not Detected
1,1,1-Trichloroethane	10	Not Detected
Carbon Tetrachloride	10	Not Detected
Benzene	10	Not Detected
1,2-Dichloroethane	10	Not Detected
Trichloroethene	10	Not Detected
1,2-Dichloropropane	10	Not Detected
Bromodichloromethane	10	Not Detected
trans-1,3-Dichloropropene	10	Not Detected
4-Methyl-2-pentanone	50	Not Detected
Toluene	10	Not Detected
cis-1,3-Dichloropropene	10	Not Detected
1,1,2-Trichloroethane	10	Not Detected
Tetrachloroethene	10	Not Detected
2-Hexanone	50	Not Detected
Dibromochloromethane	10	Not Detected
Chlorobenzene	10	Not Detected
Ethyl Benzene	10	Not Detected
m,p-Xylene	10	Not Detected
o-Xylene	10	Not Detected
Styrene	10	Not Detected
Bromoform	10	Not Detected
1,1,2,2-Tetrachloroethane	10	Not Detected
1,3-Dichlorobenzene	10	Not Detected
1,4-Dichlorobenzene	10	Not Detected
1,2-Dichlorobenzene	10	Not Detected
Freon 12	10	Not Detected

Container Type: VOST 0030 Tube

AIR TOXICS LTD.

SAMPLE NAME: Field Blank-TX

ID#: 0211663-05A

MODIFIED VOST 5041A/8260B

File Name: z120706	Date of Collection: 11/26/02
Dil. Factor: 1.00	Date of Analysis: 12/7/02

Surrogates	%Recovery	Method Limits
Dibromofluoromethane	102	70-130
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	95	70-130

AIR TOXICS LTD.

SAMPLE NAME: Field Blank-TX/C

ID#: 0211663-05B

MODIFIED VOST 5041A/8260B

File Name:	z120705	Date of Collection:	11/26/02
Dil. Factor:	1.00	Date of Analysis:	12/7/02

Compound	Rpt. Limit (ng)	Amount (ng)
Chloromethane	10	Not Detected
Vinyl Chloride	10	Not Detected
Bromomethane	10	Not Detected
Chloroethane	10	Not Detected
Freon 11	10	Not Detected
1,1-Dichloroethene	10	Not Detected
Carbon Disulfide	10	Not Detected
Acetone	50	Not Detected
Methylene Chloride	10	Not Detected
trans-1,2-Dichloroethene	10	Not Detected
1,1-Dichloroethane	10	Not Detected
Vinyl Acetate	50	Not Detected
2-Butanone (Methyl Ethyl Ketone)	50	Not Detected
Chloroform	10	Not Detected
1,1,1-Trichloroethane	10	Not Detected
Carbon Tetrachloride	10	Not Detected
Benzene	10	Not Detected
1,2-Dichloroethane	10	Not Detected
Trichloroethene	10	Not Detected
1,2-Dichloropropane	10	Not Detected
Bromodichloromethane	10	Not Detected
trans-1,3-Dichloropropene	10	Not Detected
4-Methyl-2-pentanone	50	Not Detected
Toluene	10	Not Detected
cis-1,3-Dichloropropene	10	Not Detected
1,1,2-Trichloroethane	10	Not Detected
Tetrachloroethene	10	Not Detected
2-Hexanone	50	Not Detected
Dibromochloromethane	10	Not Detected
Chlorobenzene	10	Not Detected
Ethyl Benzene	10	Not Detected
m,p-Xylene	10	Not Detected
o-Xylene	10	Not Detected
Styrene	10	Not Detected
Bromoform	10	Not Detected
1,1,2,2-Tetrachloroethane	10	Not Detected
1,3-Dichlorobenzene	10	Not Detected
1,4-Dichlorobenzene	10	Not Detected
1,2-Dichlorobenzene	10	Not Detected
Freon 12	10	Not Detected

Container Type: VOST 0030 Tube

AIR TOXICS LTD.

SAMPLE NAME: Field Blank-TX/C

ID#: 0211663-05B

MODIFIED VOST 5041A/8260B

File Name:	2120705	Date of Collection:	11/26/02
Dil. Factor:	1.00	Date of Analysis:	12/7/02

Surrogates	%Recovery	Method Limits
Dibromofluoromethane	100	70-130
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	99	70-130

AIR TOXICS LTD.

SAMPLE NAME: Trip Blank-TX

ID#: 0211663-06A

MODIFIED VOST 5041A/8260B

File Name:	z120707	Date of Collection:	11/26/02
Dil. Factor:	1.00	Date of Analysis:	12/7/02

Compound	Rpt. Limit (ng)	Amount (ng)
Chloromethane	10	Not Detected
Vinyl Chloride	10	Not Detected
Bromomethane	10	Not Detected
Chloroethane	10	Not Detected
Freon 11	10	Not Detected
1,1-Dichloroethene	10	Not Detected
Carbon Disulfide	10	Not Detected
Acetone	50	Not Detected
Methylene Chloride	10	Not Detected
trans-1,2-Dichloroethene	10	Not Detected
1,1-Dichloroethane	10	Not Detected
Vinyl Acetate	50	Not Detected
2-Butanone (Methyl Ethyl Ketone)	50	Not Detected
Chloroform	10	Not Detected
1,1,1-Trichloroethane	10	Not Detected
Carbon Tetrachloride	10	Not Detected
Benzene	10	Not Detected
1,2-Dichloroethane	10	Not Detected
Trichloroethene	10	Not Detected
1,2-Dichloropropane	10	Not Detected
Bromodichloromethane	10	Not Detected
trans-1,3-Dichloropropene	10	Not Detected
4-Methyl-2-pentanone	50	Not Detected
Toluene	10	Not Detected
cis-1,3-Dichloropropene	10	Not Detected
1,1,2-Trichloroethane	10	Not Detected
Tetrachloroethene	10	Not Detected
2-Hexanone	50	Not Detected
Dibromochloromethane	10	Not Detected
Chlorobenzene	10	Not Detected
Ethyl Benzene	10	Not Detected
m,p-Xylene	10	Not Detected
o-Xylene	10	Not Detected
Styrene	10	Not Detected
Bromoform	10	Not Detected
1,1,2,2-Tetrachloroethane	10	Not Detected
1,3-Dichlorobenzene	10	Not Detected
1,4-Dichlorobenzene	10	Not Detected
1,2-Dichlorobenzene	10	Not Detected
Freon 12	10	Not Detected

Container Type: VOST 0030 Tube

AIR TOXICS LTD.

SAMPLE NAME: Trip Blank-TX

ID#: 0211663-06A

MODIFIED VOST 5041A/8260B

File Name:	2120707	Date of Collection:	11/26/02
Dil. Factor:	1.00	Date of Analysis:	12/7/02

Surrogates	%Recovery	Method Limits
Dibromofluoromethane	104	70-130
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	97	70-130

AIR TOXICS LTD.

SAMPLE NAME: Trip Blank-TX/C

ID#: 0211663-06B

MODIFIED VOST 5041A/8260B

File Name:	z120708	Date of Collection: 11/26/02
Dil. Factor:	1.00	Date of Analysis: 12/7/02

Compound	Rpt. Limit (ng)	Amount (ng)
Chloromethane	10	Not Detected
Vinyl Chloride	10	Not Detected
Bromomethane	10	Not Detected
Chloroethane	10	Not Detected
Freon 11	10	Not Detected
1,1-Dichloroethene	10	Not Detected
Carbon Disulfide	10	Not Detected
Acetone	50	Not Detected
Methylene Chloride	10	Not Detected
trans-1,2-Dichloroethene	10	Not Detected
1,1-Dichloroethane	10	Not Detected
Vinyl Acetate	50	Not Detected
2-Butanone (Methyl Ethyl Ketone)	50	Not Detected
Chloroform	10	Not Detected
1,1,1-Trichloroethane	10	Not Detected
Carbon Tetrachloride	10	Not Detected
Benzene	10	Not Detected
1,2-Dichloroethane	10	Not Detected
Trichloroethene	10	Not Detected
1,2-Dichloropropane	10	Not Detected
Bromodichloromethane	10	Not Detected
trans-1,3-Dichloropropene	10	Not Detected
4-Methyl-2-pentanone	50	Not Detected
Toluene	10	Not Detected
cis-1,3-Dichloropropene	10	Not Detected
1,1,2-Trichloroethane	10	Not Detected
Tetrachloroethene	10	Not Detected
2-Hexanone	50	Not Detected
Dibromochloromethane	10	Not Detected
Chlorobenzene	10	Not Detected
Ethyl Benzene	10	Not Detected
m,p-Xylene	10	Not Detected
o-Xylene	10	Not Detected
Styrene	10	Not Detected
Bromoform	10	Not Detected
1,1,2,2-Tetrachloroethane	10	Not Detected
1,3-Dichlorobenzene	10	Not Detected
1,4-Dichlorobenzene	10	Not Detected
1,2-Dichlorobenzene	10	Not Detected
Freon 12	10	Not Detected

Container Type: VOST 0030 Tube

AIR TOXICS LTD.

SAMPLE NAME: Trip Blank-TX/C

ID#: 0211663-06B

MODIFIED VOST 5041A/8260B

File Name: 2120708	Date of Collection: 11/26/02
Dil. Factor: 1.00	Date of Analysis: 12/7/02

Surrogates	%Recovery	Method Limits
Dibromofluoromethane	102	70-130
1,2-Dichloroethane-d4	107	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	104	70-130

AIR TOXICS LTD.

SAMPLE NAME: Trip Blank-Condensate

ID#: 6211663-07A

MODIFIED VOST 5041A/8260B

File Name: 2120805	Date of Collection: 11/26/02
Dil. Factor: 1.00	Date of Analysis: 12/8/02

Compound	Rpt. Limit (ng)	Amount (ng)
Chloromethane	50	Not Detected
Vinyl Chloride	50	Not Detected
Bromomethane	50	Not Detected
Chloroethane	50	Not Detected
Freon 11	50	Not Detected
1,1-Dichloroethene	50	Not Detected
Carbon Disulfide	50	Not Detected
Acetone	250	Not Detected
Methylene Chloride	50	2000
trans-1,2-Dichloroethene	50	Not Detected
1,1-Dichloroethane	50	Not Detected
Vinyl Acetate	250	Not Detected
2-Butanone (Methyl Ethyl Ketone)	250	Not Detected
Chloroform	50	Not Detected
1,1,1-Trichloroethane	50	Not Detected
Carbon Tetrachloride	50	Not Detected
Benzene	50	Not Detected
1,2-Dichloroethane	50	Not Detected
Trichloroethene	50	Not Detected
1,2-Dichloropropane	50	Not Detected
Bromodichloromethane	50	Not Detected
trans-1,3-Dichloropropene	50	Not Detected
4-Methyl-2-pentanone	250	Not Detected
Toluene	50	Not Detected
cis-1,3-Dichloropropene	50	Not Detected
1,1,2-Trichloroethane	50	Not Detected
Tetrachloroethene	50	Not Detected
2-Hexanone	250	Not Detected
Dibromochloromethane	50	Not Detected
Chlorobenzene	50	Not Detected
Ethyl Benzene	50	Not Detected
m,p-Xylene	50	Not Detected
o-Xylene	50	Not Detected
Styrene	50	Not Detected
Bromoform	50	Not Detected
1,1,2,2-Tetrachloroethane	50	Not Detected
1,3-Dichlorobenzene	50	Not Detected
1,4-Dichlorobenzene	50	Not Detected
1,2-Dichlorobenzene	50	Not Detected
Freon 12	50	Not Detected

Container Type: Vial

AIR TOXICS LTD.

SAMPLE NAME: Trip Blank-Condensate

ID#: 0211663-07A

MODIFIED VOST 5041A/8260B

File Name:	7120805	Date of Collection:	11/26/02
Dil. Factor:	1.00	Date of Analysis:	12/8/02

Surrogates	%Recovery	Method Limits
Dibromofluoromethane	99	70-130
1,2-Dichloroethane-d4	95	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	100	70-130

QC Results and Raw Data

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 0211663-08A

MODIFIED VOST 5041A/8260B

File Name:	z120704	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 12/7/02	

Compound	Rpt. Limit (ng)	Amount (ng)
Chloromethane	10	Not Detected
Vinyl Chloride	10	Not Detected
Bromomethane	10	Not Detected
Chloroethane	10	Not Detected
Freon 11	10	Not Detected
1,1-Dichloroethene	10	Not Detected
Carbon Disulfide	10	Not Detected
Acetone	50	Not Detected
Methylene Chloride	10	Not Detected
trans-1,2-Dichloroethene	10	Not Detected
1,1-Dichloroethane	10	Not Detected
Vinyl Acetate	50	Not Detected
2-Butanone (Methyl Ethyl Ketone)	50	Not Detected
Chloroform	10	Not Detected
1,1,1-Trichloroethane	10	Not Detected
Carbon Tetrachloride	10	Not Detected
Benzene	10	Not Detected
1,2-Dichloroethane	10	Not Detected
Trichloroethene	10	Not Detected
1,2-Dichloropropane	10	Not Detected
Bromodichloromethane	10	Not Detected
trans-1,3-Dichloropropene	10	Not Detected
4-Methyl-2-pentanone	50	Not Detected
Toluene	10	Not Detected
cis-1,3-Dichloropropene	10	Not Detected
1,1,2-Trichloroethane	10	Not Detected
Tetrachloroethene	10	Not Detected
2-Hexanone	50	Not Detected
Dibromochloromethane	10	Not Detected
Chlorobenzene	10	Not Detected
Ethyl Benzene	10	Not Detected
m,p-Xylene	10	Not Detected
o-Xylene	10	Not Detected
Styrene	10	Not Detected
Bromoform	10	Not Detected
1,1,2,2-Tetrachloroethane	10	Not Detected
1,3-Dichlorobenzene	10	Not Detected
1,4-Dichlorobenzene	10	Not Detected
1,2-Dichlorobenzene	10	Not Detected
Freon 12	10	Not Detected

Container Type: NA - Not Applicable

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 0211663-08A

MODIFIED VOST 5041A/8260B

File Name:	z120704	Date of Collection: NA	
Dil. Factor:	500	Date of Analysis: 12/7/02	

Surrogates	%Recovery	Method Limits
Dibromofluoromethane	101	70-130
1,2-Dichloroethane-d4	105	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	97	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 0211663-08B

MODIFIED VOST 5041A/8260B

File Name:	z120804	Date of Collection:	NA
Dil. Factor:	1.00	Date of Analysis:	12/8/02

Compound	Rpt. Limit (ng)	Amount (ng)
Chloromethane	10	Not Detected
Vinyl Chloride	10	Not Detected
Bromomethane	10	Not Detected
Chloroethane	10	Not Detected
Freon 11	10	Not Detected
1,1-Dichloroethene	10	Not Detected
Carbon Disulfide	10	Not Detected
Acetone	50	Not Detected
Methylene Chloride	10	Not Detected
trans-1,2-Dichloroethene	10	Not Detected
1,1-Dichloroethane	10	Not Detected
Vinyl Acetate	50	Not Detected
2-Butanone (Methyl Ethyl Ketone)	50	Not Detected
Chloroform	10	Not Detected
1,1,1-Trichloroethane	10	Not Detected
Carbon Tetrachloride	10	Not Detected
Benzene	10	Not Detected
1,2-Dichloroethane	10	Not Detected
Trichloroethene	10	Not Detected
1,2-Dichloropropane	10	Not Detected
Bromodichloromethane	10	Not Detected
trans-1,3-Dichloropropene	10	Not Detected
4-Methyl-2-pentanone	50	Not Detected
Toluene	10	Not Detected
cis-1,3-Dichloropropene	10	Not Detected
1,1,2-Trichloroethane	10	Not Detected
Tetrachloroethene	10	Not Detected
2-Hexanone	50	Not Detected
Dibromochloromethane	10	Not Detected
Chlorobenzene	10	Not Detected
Ethyl Benzene	10	Not Detected
m,p-Xylene	10	Not Detected
o-Xylene	10	Not Detected
Styrene	10	Not Detected
Bromoform	10	Not Detected
1,1,2,2-Tetrachloroethane	10	Not Detected
1,3-Dichlorobenzene	10	Not Detected
1,4-Dichlorobenzene	10	Not Detected
1,2-Dichlorobenzene	10	Not Detected
Freon 12	10	Not Detected

Container Type: NA - Not Applicable

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 0211663-08B

MODIFIED VOST 5041A/8260B

File Name:	z120804	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 12/8/02

Surrogates	%Recovery	Method Limits
Dibromofluoromethane	99	70-130
1,2-Dichloroethane-d4	100	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	100	70-130

AIR TOXICS LTD.

SAMPLE NAME: LCS

ID#: 0211663-09A

MODIFIED VOST 5041A/8260B

File Name:	z120703	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 12/7/02	

Compound	Rpt. Limit (ng)	%Recovery
Chloromethane	10	82
Vinyl Chloride	10	81
Bromomethane	10	78
Chloroethane	10	96
Freon 11	10	98
1,1-Dichloroethene	10	89
Carbon Disulfide	10	75
Acetone	50	104
Methylene Chloride	10	92
trans-1,2-Dichloroethene	10	92
1,1-Dichloroethane	10	83
Vinyl Acetate	50	Not Spiked
2-Butanone (Methyl Ethyl Ketone)	50	96
Chloroform	10	87
1,1,1-Trichloroethane	10	84
Carbon Tetrachloride	10	89
Benzene	10	86
1,2-Dichloroethane	10	90
Trichloroethene	10	83
1,2-Dichloropropane	10	82
Bromodichloromethane	10	94
trans-1,3-Dichloropropene	10	90
4-Methyl-2-pentanone	50	90
Toluene	10	88
cis-1,3-Dichloropropene	10	87
1,1,2-Trichloroethane	10	88
Tetrachloroethene	10	85
2-Hexanone	50	88
Dibromochloromethane	10	92
Chlorobenzene	10	86
Ethyl Benzene	10	89
m,p-Xylene	10	94
o-Xylene	10	90
Styrene	10	90
Bromoform	10	85
1,1,2,2-Tetrachloroethane	10	90
1,3-Dichlorobenzene	10	88
1,4-Dichlorobenzene	10	82
1,2-Dichlorobenzene	10	82
Freon 12	10	97

Container Type: NA - Not Applicable

AIR TOXICS LTD.

SAMPLE NAME: LCS

ID#: 0211663-09A

MODIFIED VOST 5041A/8260B

File Name:	z120703	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 12/7/02	

Surrogates	%Recovery	Method Limits
Dibromofluoromethane	103	70-130
1,2-Dichloroethane-d4	107	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	99	70-130

AIR TOXICS LTD.

SAMPLE NAME: LCS

ID#: 0211663-09B

MODIFIED VOST 5041A/8260B

File Name:	z120803	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 12/8/02

Compound	Rpt. Limit (ng)	%Recovery
Chloromethane	10	94
Vinyl Chloride	10	93
Bromomethane	10	82
Chloroethane	10	98
Freon 11	10	104
1,1-Dichloroethene	10	100
Carbon Disulfide	10	86
Acetone	50	126
Methylene Chloride	10	103
trans-1,2-Dichloroethene	10	106
1,1-Dichloroethane	10	97
Vinyl Acetate	50	Not Spiked
2-Butanone (Methyl Ethyl Ketone)	50	114
Chloroform	10	98
1,1,1-Trichloroethane	10	95
Carbon Tetrachloride	10	98
Benzene	10	101
1,2-Dichloroethane	10	95
Trichloroethene	10	97
1,2-Dichloropropane	10	98
Bromodichloromethane	10	107
trans-1,3-Dichloropropene	10	110
4-Methyl-2-pentanone	50	107
Toluene	10	102
cis-1,3-Dichloropropene	10	103
1,1,2-Trichloroethane	10	98
Tetrachloroethene	10	97
2-Hexanone	50	120
Dibromochloromethane	10	104
Chlorobenzene	10	100
Ethyl Benzene	10	104
m,p-Xylene	10	112
o-Xylene	10	110
Styrene	10	108
Bromoform	10	100
1,1,2,2-Tetrachloroethane	10	98
1,3-Dichlorobenzene	10	104
1,4-Dichlorobenzene	10	98
1,2-Dichlorobenzene	10	101
Freon 12	10	104

Container Type: NA - Not Applicable

AIR TOXICS LTD.

SAMPLE NAME: LCS

ID#: 0311663-09B

MODIFIED VOST 5041A/8260B

File Name:	z120803	Date of Collection:	NA
Dil. Factor:	1.00	Date of Analysis:	12/8/02

Surrogates	%Recovery	Method Limits
Dibromofluoromethane	100	70-130
1,2-Dichloroethane-d4	100	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	98	70-130

APPENDIX D

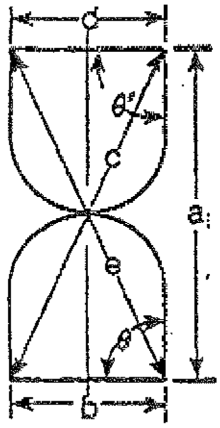
EQUIPMENT CALIBRATION DATA SHEETS

S-TYPE PITOT GEOMETRIC CALIBRATION
PART 2 - PITOT ALIGNMENT

Procedure No. T/S-811
Revision No. 1
Date December 9, 1980
Page 1 of 1

TRC Probe Identification Low (60)
Pitot Identification PITOT ONLY
Technical Specialist S. J.
Date 12/2/02

A. Transverse Tube Axis



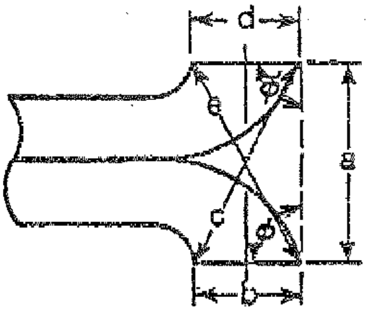
a 0.899
b 0.372
c 0.949
d 0.375
e 0.957

$$\frac{a^2 + b^2 - c^2}{2ab} = \cos\theta$$

$$\frac{a^2 + d^2 - e^2}{2ad} = \cos\theta'$$

θ 86.1°   (80° < θ < 100°)
θ' 88.9°   (80° < θ' < 100°)

B. Longitudinal Tube Axis



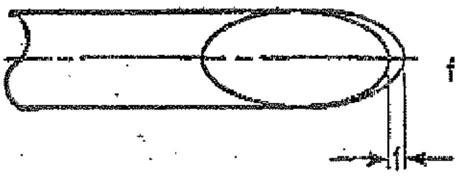
a 0.899
b 0.568
c 1.065
d 0.535
e 1.023

$$\frac{a^2 + b^2 - c^2}{2ab} = \cos\phi$$

$$\frac{a^2 + d^2 - e^2}{2ad} = \cos\phi'$$

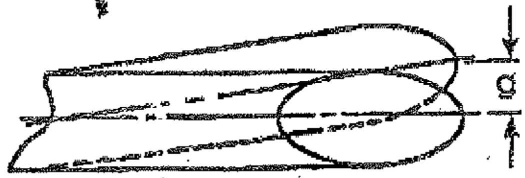
φ 90.2°   (85° < φ < 95°)
φ' 88.5°   (85° < φ' < 95°)

C. (f < 1/8")



f 0°

D. (g < 1/32")



g 0°

NOTE: Values in parentheses are EPA Method 2 specifications.

PROBE THERMOCOUPLE CALIBRATION

TOLERANCES
°R = °F + 460

Thermocouple Identification N/A
Expected Stack Temperature (T_s) 1800° °R
Reference Thermometer (T_{ref}) Ref Thermocouple °R   (T_s ± 10%)
Thermocouple Readout Cal sheet attached °R   (T_{ref} ± 1.5%)

Technician [signature] Date 12/2/02
Reviewed By [signature] Date 12/2/02

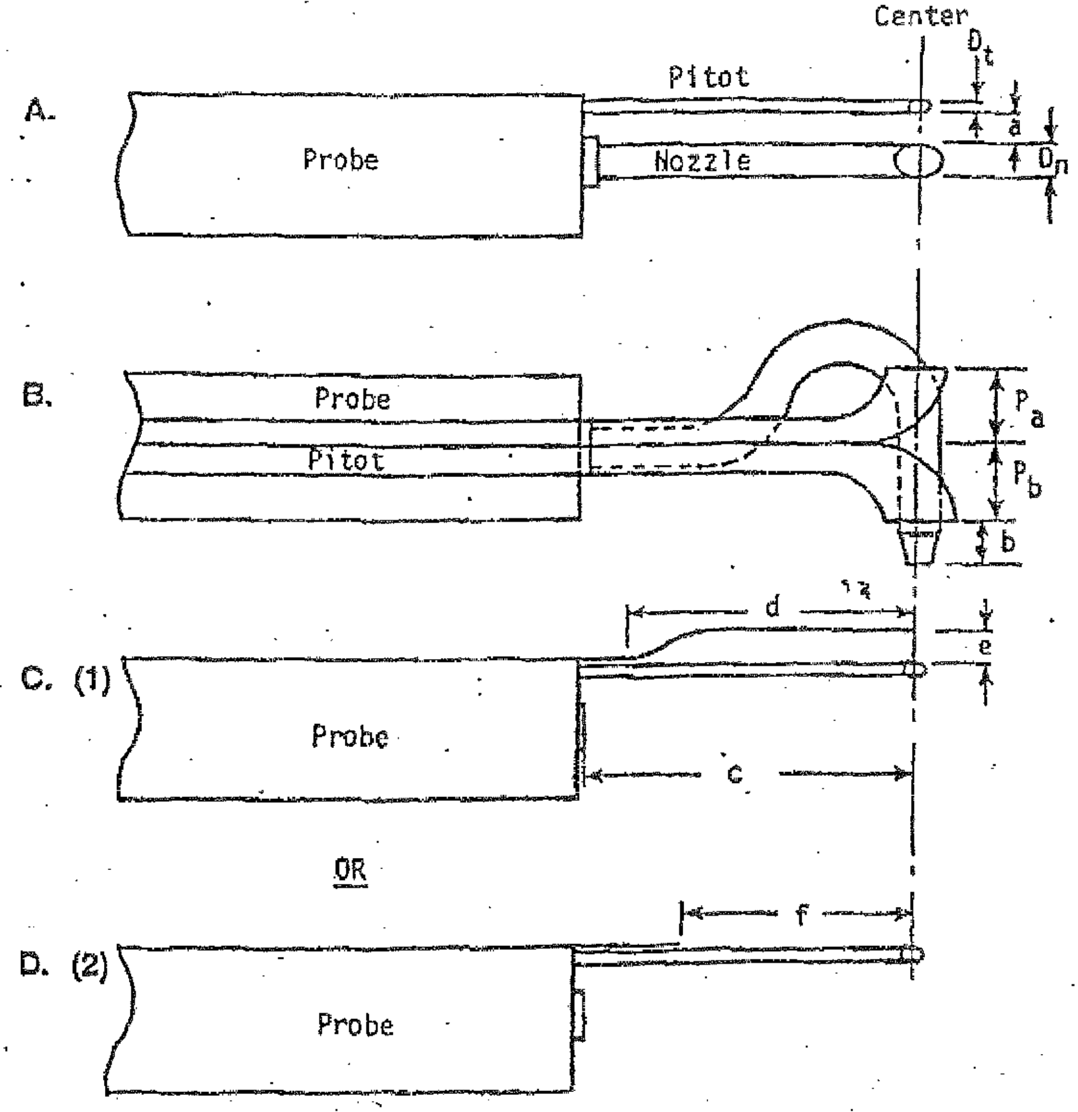
TRC
TRC Environmental Consultants, Inc.

FORM 811-2

S-TYPE PITOT GEOMETRIC CALIBRATION
PART 1 - PROBE CONFIGURATION

Procedure No. T/S-811
Revision No. 1
Date December 9, 1980
Page 2 of 2

TRC Probe Identification LOW-1 (60) Technical Specialist [signature]
Pitot Identification PITOT ONLY Date 12/2/02



D_t ______
D_n ______
a ______

P_a ______
P_b ______
b ______

c PITOT ONLY
d 3.108
e 0.829

or

c ______
f ______

SPECIFICATIONS (EPA METHOD 2)

D_t = 3/16" to 3/8"	c ≥ 3"	$P_a = P_b$
D_n = 1/2"	d ≥ 3"	
a ≥ 3/4"	e ≥ 3/4"	$1.05\ D_t \le P \le 1.50\ D_t$
b ≥ 0	f ≥ 2"	

If these specifications are met, proceed with Part 2 Pitot alignment.

TRC
TRC Environmental Consultants, Inc.

low-1

			Squared			
Transverse tube Axis	a	0.899	0.808201			
	b	0.372	0.138384			
	c	0.949	0.900601	0.06875	1.501992	86.1
	d	0.375	0.140625	0.019165	1.55163	88.9
	e	0.957	0.915849			
Longitudinal Tube Axis	a	0.899	0.808201			
	b	0.568	0.322624			
	c	1.065	1.134225	-0.00333	1.574126	90.2
	d	0.535	0.286225	0.02604	1.544753	88.5
	e	1.023	1.046529			

p-4

			Squared			
Transverse tube Axis	a	0.866	0.749956			
	b	0.5	0.25			
	c	1.37	1.8769	-1.01264	#NUM!	#NUM!
	d	0.612	0.374544	-0.27027	1.844469	105.7
	e	1.32	1.7424			
Longitudinal Tube Axis	a	0.866	0.749956			
	b	0.5	0.25			
	c	1.57	2.4649	-1.69162	#NUM!	#NUM!
	d	0.612	0.374544	-0.27027	1.844469	105.7
	e	1.32	1.7424			

PITOT LOW-1 (60)

A. Transverse Tube Axis

PITOT LC01 CALIPERS

a	0.899
b	0.372
c	0.949
d	0.875
e	0.957

Ø
Ø

B. Longitudinal Tube Axis

a	0.899
b	0.568
c	1.065
d	0.535
e	1.023

Ø
Ø

Page 2.

c ___	Pitot Only
d ___	3.108
e ___	0.829

METHOD 5 DRY GAS METER CALIBRATION

Calibrated by: Matt Viscovich

Barometric Pressure, 30.12 in. Hg

Date: 09/27/02

Meter Box No.: 90337

Orifice Manometer Setting delta H in. H_2O	Gas Volume Wet Test Meter Vw ft^3	Gas Volume Dry Test Meter Vd ft^3	Temperature: Wet Test Meter tw °F	Dry gas meter: Inlet td_i °F	Dry gas meter: Outlet td_o °F	Dry gas meter: Average td_a °F	Time T min.	Y	delta H @	Deviation: Y	Deviation: delta H @
0.5	5.920	6.043	74.0	82	79	81	15.0	0.990	1.799	0.003	0.102
1.0	8.200	8.395	74.0	83	79	81	15.0	0.987	1.875	0.000	0.026
1.5	9.780	10.012	74.0	86	79	83	15.0	0.989	1.977	0.001	0.077
2.0	11.310	11.573	74.0	85	78	82	15.0	0.986	1.975	0.001	0.074
3.0	14.220	14.531	74.0	85	77	81	15.0	0.984	1.877	0.003	0.023
							AVERAGE	0.987	1.901		

CALCULATIONS

Y	delta H @
$\dfrac{Vw \times Pb \times (td_o + 460)}{Vd \times (Pb + dH/13.6) \times (tw + 460)}$	$\dfrac{0.0319 \times dH}{Pb \times (td_c + 460)} \times \left[\dfrac{(tw + 460) \times T}{Vw}\right]^2$

Y = Ratio of reading of wet test meter to dry gas meter;
Tolerance for individual value ± 0.02 from average

QA/QC Check By: ________
Date: ________

delta H @ = Orifice pressure differential that equates to 0.75 cfm of air at 68°F and 29.92 inches of mercury, in. H2O;
Tolerance for individual values ± 0.20 from average

FORM AM-101B

VOST/M6 METERBOX CALIBRATIONS

(Non-Isokinetic Meter Box Calibrations - Buck Calibrator)

Meterbox No.:	280-6087		
Buck Model No.:		Serial No.:	280-6097
Date:	10/14/2002	Run Time (Min.)	10.0
Calibrated By:	Glen Capra	Bar. Press. (in. Hg):	30.00
		Target Rate (LPM):	1

	Run 1	Run 2	Run 3
Ambient Temperature, °C	21.1	21.1	22.2
Ambient Temperature, °R	530.0	530.0	532.0
Calibrator Readings (LPM):			
1	1.050	0.937	1.190
2	1.050	1.040	1.020
3	1.120	1.070	1.000
4	0.921	0.959	0.997
5	0.897	0.948	1.020
6	0.901	0.972	0.950
7	0.898	0.925	1.050
8	0.898	0.900	0.985
9	0.900	0.945	1.030
10	0.976	0.932	1.010
11	0.951	0.992	
Average	0.960	0.965	1.023
Average at Std. Conditions	0.959	0.964	1.018
MeterBox Temperature, °C			
1	19.4	21.7	22.8
2	20.0	21.7	22.8
3	20.0	21.7	22.8
4	20.6	21.7	23.3
5	20.6	21.7	23.3
6	20.6	21.7	23.3
7	20.6	22.2	23.9
8	20.6	22.2	23.9
9	20.6	22.2	23.3
10	20.6	22.2	23.3
11			
Average Temperature, °C	20.3	21.9	23.3
Average Temperature, °R	528.6	531.4	533.9
Meterbox Readings:			
Final Meter Reading, L	4941.640	4956.220	5967.870
Initial Meter Reading, L	4932.010	4947.000	5958.000
Total Volume, L	9.630	9.220	9.870
Average Volume at Std. Conditions	9.685	9.186	9.787
Average Rate at Std. Conditions, LPM	0.964	0.919	0.979
Rotameter Setting (SS or Sapphire Ball)			
Y_i at Rotameter Setting	0.994	1.050	1.040
AVG. Y AT ROTAMETER SETTING		1.028	

QA/QC Check By:__________________ Date: __________

Each $Y_i \leq 0.02$ of Average Y.	Rerun	Rerun	Pass

Vostbox And Method 6 Box Calibration

Box Type Nutech Vost S/N 280-6087

Calibration Device Bubble Mac Date 12/3/02

Test Run		#1	#2	#3
PB		30.20	30.20	30.20
Ambient Temp F		72	72	72
	R	532	532	532
Runtime Min.		5 MIN	5 MIN	5 MIN
Rotometer Set		0.5 LPM	0.5 LPM	0.5 LPM
Flowrate Set				
	1	12.21	12.38	12.42
	2	12.45	12.53	12.52
	3	12.40	12.46	12.39
	4	12.50	12.42	12.43
	5	12.30	12.36	12.34
Ave Rate		12.372	12.43	12.42
Box Volume Final		5866.44	5868.98	5871.73
Box Volume Initial		5863.96	5866.52	5869.27
Box Volume Total		2.48	2.46	2.46
Box Temp	0	84	84	84
	1	84	84	84
	2	84	84	84
	3	84	84	85
	4	84	84	85
	5	84	84	85
Box Temp Ave F		84	84	84.5
	R	544	544	544.5
Y at ~~1 LPM~~ 0.5 LPM =		0.9999	1.0038	1.0048

Ave Y at 0.5 LPM = 1.003

TRC

METHOD 5 DRY GAS METER CALIBRATION

Calibrated by: Matthew Viscovich

Barometric Pressure, 30.35 in. Hg

Date: 01/03/03

Meter Box No.: 90337

Orifice Manometer Setting delta H in. H_2O	Gas Volume Wet Test Meter Vw ft³	Gas Volume Dry Test Meter Vd ft³	Temperature: Wet Test Meter tw °F	Temperature: Dry gas meter Inlet td_i °F	Temperature: Dry gas meter Outlet td_o °F	Temperature: Dry gas meter Average td_a °F	Time T min.	Y	delta H @	Deviation Y	Deviation delta H @
0.5	5.847	6.160	72.0	88	84	86	15.0	0.973	1.799	0.002	0.120
1.0	8.089	8.539	72.0	90	84	87	15.0	0.972	1.880	0.003	0.039
1.5	9.629	10.136	72.0	91	83	87	15.0	0.973	1.994	0.001	0.074
2.0	11.204	11.748	72.0	92	83	88	15.0	0.977	1.964	0.002	0.044
3.0	13.756	14.350	72.0	93	81	87	15.0	0.979	1.961	0.004	0.042
							AVERAGE	0.975	1.920		

CALCULATIONS

Y	delta H @
$\dfrac{Vw \times Pb \times (td_a + 460)}{Vd \times (Pb + dH/13.6) \times (tw + 460)}$	$\dfrac{0.0319 \times dH}{Pb \times (td_a + 460)} \times \left[\dfrac{(tw + 460) \times T}{Vw}\right]^2$

Y = Ratio of reading of wet test meter to dry gas meter;
Tolerance for individual value ± 0.02 from average

QA/QC Check By: ________
Date: ________

delta H @ = Orifice pressure differential that equates to 0.75 cfm of air at 68°F and 29.92 inches of mercury, in. H2O;
Tolerance for individual values ± 0.20 from average

FORM AM-101B

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 0211656B-02A

SULFUR GASES BY MODIFIED ASTM D-5504 GC/SCD

File Name:	b121404	Date of Collection:	NA
Dil. Factor:	1.00	Date of Analysis:	12/11/02

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	4.0	Not Detected
Carbonyl Sulfide	4.0	Not Detected
Methyl Mercaptan	4.0	Not Detected
Ethyl Mercaptan	4.0	Not Detected
Dimethyl Sulfide	4.0	Not Detected
Carbon Disulfide	4.0	Not Detected
Isopropyl Mercaptan	4.0	Not Detected
tert-Butyl Mercaptan	4.0	Not Detected
n-Propyl Mercaptan	4.0	Not Detected
Ethyl Methyl Sulfide	4.0	Not Detected
Thiophene	4.0	Not Detected
Isobutyl Mercaptan	4.0	Not Detected
Diethyl Sulfide	4.0	Not Detected
Butyl Mercaptan	4.0	Not Detected
Dimethyl Disulfide	4.0	Not Detected
3-Methylthiophene	4.0	Not Detected
Tetrahydrothiophene	4.0	Not Detected
2-Ethylthiophene	4.0	Not Detected
2,5-Dimethylthiophene	4.0	Not Detected
Diethyl Disulfide	4.0	Not Detected

Container Type: NA - Not Applicable

AIR TOXICS LTD.

SAMPLE NAME: LCS

ID#: 0211656B-03A

SULFUR GASES BY MODIFIED ASTM D-5504 GC/SCD

File Name:	6121103	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 12/11/02	

Compound	Rpt. Limit (ppbv)	%Recovery
Hydrogen Sulfide	4.0	117
Carbonyl Sulfide	4.0	110
Methyl Mercaptan	4.0	116
Ethyl Mercaptan	4.0	124
Dimethyl Sulfide	4.0	108
Carbon Disulfide	4.0	143 Q
Isopropyl Mercaptan	4.0	115
tert-Butyl Mercaptan	4.0	113
n-Propyl Mercaptan	4.0	123
Ethyl Methyl Sulfide	4.0	118
Thiophene	4.0	108
Isobutyl Mercaptan	4.0	122
Diethyl Sulfide	4.0	115
Butyl Mercaptan	4.0	118
Dimethyl Disulfide	4.0	114
3-Methylthiophene	4.0	118
Tetrahydrothiophene	4.0	126
2-Ethylthiophene	4.0	116
2,5-Dimethylthiophene	4.0	106
Diethyl Disulfide	4.0	127

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

COMPREHENSIVE VALIDATION PACKAGE

Modified TO-14

INVENTORY SHEET

Work Order #: 0211669A

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b. Target Compound Raw Data		
-Internal Standard Area and Retenetion Time Summary		
-Surrogate Recovery Summary (If Applicable)		
-Chromatogram(s) and Ion Profiles (If Applicable)		
3. QC Results and Raw Data		
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d. Duplicate Results Summary Sheet	--	--
e. Matrix Spike/Matrix Spike Duplicate (Results + Raw Data	--	--
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g. MDL Study (If Applicable)	--	--
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k. Instrument Run Logs/Software Verification	487	490
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Comments:

Completed by:

Judy Lee	Judy Lee / Document Control	12/13/02
(Signature)	(Print Name & Title)	(Date)

@ AIR TOXICS LTD.
AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 0211669A

Work Order Summary

CLIENT:	Mr. Scott James TRC Environmental Corporation Boott Mills South, Foot of John St. Lowell, MA 01852	**BILL TO:**	Mr. Scott James TRC Environmental Corporation Boott Mills South, Foot of John St. Lowell, MA 01852
PHONE:	978-970-5600	**P.O. #**	40894
FAX:	978-453-1995	**PROJECT #**	37887-0040-00000 MAVERICK MGT WOBURN
DATE RECEIVED:	11/27/2002	**CONTACT:**	Betty Chu
DATE COMPLETED:	12/12/2002		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.
01A	Run 1-INLET	Modified TO-14	11.0 "Hg
02A	Run 2-INLET	Modified TO-14	7.5 "Hg
03A	Run 3-INLET	Modified TO-14	4.0 "Hg
07A	FIELD BLANK	Modified TO-14	29.0 "Hg
08A	Lab Blank	Modified TO-14	NA
08B	Lab Blank	Modified TO-14	NA
09A	LCS	Modified TO-14	NA
09B	LCS	Modified TO-14	NA

CERTIFIED BY: Linda L. Freeman DATE: 12/12/02

Laboratory Director

Certification numbers: CA NELAP - 02110CA, NY NELAP - 11291, UT NELAP - 9166389892, LA NELAP/LELAP- AI 30763, AR DEQ
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act, Accreditation number: E87680, Effective date: 07/01/02, Expiration date: 06/30/03
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified Method TO-14
TRC Environmental Corporation
Workorder# 0211669A

Four 6 Liter Summa Canister samples were received on November 27, 2002. The laboratory performed analysis via modified EPA Method TO-14 using GC/MS in the full scan mode. The method involves concentrating up to 0.5 liters of air. The concentrated aliquot is then flash vaporized and swept through a water management system to remove water vapor. Following dehumidification, the sample passes directly into the GC/MS for analysis. See the data sheets for the reporting limits for each compound.

Method modifications taken to run these samples include:

Requirement	*TO-14*	*ATL Modifications*
Internal standard retention times.	Not specified.	Within 0.33 minutes of most recent daily CCV internal standards
Internal standard recoveries.	Not specified.	Within 40% of the daily CCV internal standard area for blanks and samples.
Initial calibration criteria.	Not specified.	RSD of 30% or less for standard compounds, 40% or less for non-standard and polar compounds

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Seven qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction no performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

Table 1								
Client Sample ID	Lab Sample ID	Date Collected	Date Received	Date Extracted	Sample Holding Time (Days)	Date Analyzed	Sample Extract Holding Time (Days)	Sample Condition
Run 1-INLET	0211669A-01A	11/26/2002	11/27/2002	NA	13	12/ 9/2002	NA	Good
Run 2-INLET	0211669A-02A	11/26/2002	11/27/2002	NA	13	12/ 9/2002	NA	Good
Run 3-INLET	0211669A-03A	11/26/2002	11/27/2002	NA	13	12/ 9/2002	NA	Good
FIELD BLANK	0211669A-07A	NA	NA	NA	NA	12/11/2002	NA	Good
Lab Blank	0211669A-08A	NA	NA	NA	NA	12/ 9/2002	NA	Good
Lab Blank	0211669A-08B	NA	NA	NA	NA	12/11/2002	NA	Good
LCS	0211669A-09A	NA	NA	NA	NA	12/ 9/2002	NA	Good
LCS	0211669A-09B	NA	NA	NA	NA	12/10/2002	NA	Good

Sample Results and Raw Data

AIR TOXICS LTD.

SAMPLE NAME: Run 1-INLET

ID#: 0211669A-01A

MODIFIED EPA METHOD TO-14 GC/MS FULL SCAN

File Name:	1120917	Date of Collection:	11/26/02
Dil. Factor:	10.6	Date of Analysis:	12/9/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Freon 12	5.3	27	Not Detected	Not Detected
Freon 114	5.3	38	Not Detected	Not Detected
Chloromethane	5.3	11	Not Detected	Not Detected
Vinyl Chloride	5.3	14	Not Detected	Not Detected
Bromomethane	5.3	21	Not Detected	Not Detected
Chloroethane	5.3	14	Not Detected	Not Detected
Freon 11	5.3	30	Not Detected	Not Detected
1,1-Dichloroethene	5.3	21	Not Detected	Not Detected
Freon 113	5.3	41	Not Detected	Not Detected
Methylene Chloride	5.3	19	Not Detected	Not Detected
1,1-Dichloroethane	5.3	22	Not Detected	Not Detected
cis-1,2-Dichloroethene	5.3	21	Not Detected	Not Detected
Chloroform	5.3	26	24	120
1,1,1-Trichloroethane	5.3	29	Not Detected	Not Detected
Carbon Tetrachloride	5.3	34	5.8	37
Benzene	5.3	17	1400	4500
1,2-Dichloroethane	5.3	22	Not Detected	Not Detected
Trichloroethene	5.3	29	Not Detected	Not Detected
1,2-Dichloropropane	5.3	25	Not Detected	Not Detected
cis-1,3-Dichloropropene	5.3	24	Not Detected	Not Detected
Toluene	5.3	20	580	2200
trans-1,3-Dichloropropene	5.3	24	Not Detected	Not Detected
1,1,2-Trichloroethane	5.3	29	Not Detected	Not Detected
Tetrachloroethene	5.3	36	Not Detected	Not Detected
1,2-Dibromoethane (EDB)	5.3	41	Not Detected	Not Detected
Chlorobenzene	5.3	25	7.4	35
Ethyl Benzene	5.3	23	14	62
m,p-Xylene	5.3	23	70	310
o-Xylene	5.3	23	8.4	37
Styrene	5.3	23	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	5.3	37	Not Detected	Not Detected
1,3,5-Trimethylbenzene	5.3	26	Not Detected	Not Detected
1,2,4-Trimethylbenzene	5.3	26	Not Detected	Not Detected
1,3-Dichlorobenzene	5.3	32	Not Detected	Not Detected
1,4-Dichlorobenzene	5.3	32	Not Detected	Not Detected
alpha-Chlorotoluene	5.3	28	Not Detected	Not Detected
1,2-Dichlorobenzene	5.3	32	Not Detected	Not Detected
1,2,4-Trichlorobenzene	21	160	Not Detected	Not Detected
Hexachlorobutadiene	21	230	Not Detected	Not Detected
Propylene	21	37	Not Detected	Not Detected
1,3-Butadiene	21	48	Not Detected	Not Detected
Acetone	21	51	99	240

AIR TOXICS LTD.

SAMPLE NAME: Run 1-INLET

ID#: 0211669A-01A

MODIFIED EPA METHOD TO-14 GC/MS FULL SCAN

File Name:	f120917	Date of Collection:	11/26/02
Dil. Factor:	10.6	Date of Analysis:	12/9/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Carbon Disulfide	21	67	78	240
2-Propanol	21	53	Not Detected	Not Detected
trans-1,2-Dichloroethene	21	85	Not Detected	Not Detected
Vinyl Acetate	21	76	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	21	64	Not Detected	Not Detected
Hexane	21	76	Not Detected	Not Detected
Tetrahydrofuran	21	64	Not Detected	Not Detected
Cyclohexane	21	74	Not Detected	Not Detected
1,4-Dioxane	21	78	Not Detected	Not Detected
Bromodichloromethane	21	140	Not Detected	Not Detected
4-Methyl-2-pentanone	21	88	Not Detected	Not Detected
2-Hexanone	21	88	Not Detected	Not Detected
Dibromochloromethane	21	180	Not Detected	Not Detected
Bromoform	21	220	Not Detected	Not Detected
4-Ethyltoluene	21	100	Not Detected	Not Detected
Ethanol	21	41	Not Detected	Not Detected
Methyl tert-Butyl Ether	21	78	Not Detected	Not Detected
Heptane	21	88	41	170

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	80	70-130
Toluene-d8	91	70-130
4-Bromofluorobenzene	108	70-130

AIR TOXICS LTD.

SAMPLE NAME: Run 2-INLET

ID#: 0211669A-02A

MODIFIED EPA METHOD TO-14 GC/MS FULL SCAN

File Name:	1120918	Date of Collection:	11/26/02
Dil. Factor:	8.95	Date of Analysis:	12/9/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Freon 12	4.5	22	Not Detected	Not Detected
Freon 114	4.5	32	Not Detected	Not Detected
Chloromethane	4.5	9.4	Not Detected	Not Detected
Vinyl Chloride	4.5	12	Not Detected	Not Detected
Bromomethane	4.5	18	Not Detected	Not Detected
Chloroethane	4.5	12	Not Detected	Not Detected
Freon 11	4.5	26	Not Detected	Not Detected
1,1-Dichloroethene	4.5	18	Not Detected	Not Detected
Freon 113	4.5	35	Not Detected	Not Detected
Methylene Chloride	4.5	16	Not Detected	Not Detected
1,1-Dichloroethane	4.5	18	Not Detected	Not Detected
cis-1,2-Dichloroethene	4.5	18	Not Detected	Not Detected
Chloroform	4.5	22	Not Detected	Not Detected
1,1,1-Trichloroethane	4.5	25	Not Detected	Not Detected
Carbon Tetrachloride	4.5	29	Not Detected	Not Detected
Benzene	4.5	14	1200	4000
1,2-Dichloroethane	4.5	18	Not Detected	Not Detected
Trichloroethene	4.5	24	Not Detected	Not Detected
1,2-Dichloropropane	4.5	21	Not Detected	Not Detected
cis-1,3-Dichloropropene	4.5	21	Not Detected	Not Detected
Toluene	4.5	17	580	2200
trans-1,3-Dichloropropene	4.5	21	Not Detected	Not Detected
1,1,2-Trichloroethane	4.5	25	Not Detected	Not Detected
Tetrachloroethene	4.5	31	Not Detected	Not Detected
1,2-Dibromoethane (EDB)	4.5	35	Not Detected	Not Detected
Chlorobenzene	4.5	21	14	64
Ethyl Benzene	4.5	20	16	73
m,p-Xylene	4.5	20	81	360
o-Xylene	4.5	20	8.2	36
Styrene	4.5	19	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	4.5	31	Not Detected	Not Detected
1,3,5-Trimethylbenzene	4.5	22	Not Detected	Not Detected
1,2,4-Trimethylbenzene	4.5	22	Not Detected	Not Detected
1,3-Dichlorobenzene	4.5	27	Not Detected	Not Detected
1,4-Dichlorobenzene	4.5	27	Not Detected	Not Detected
alpha-Chlorotoluene	4.5	24	Not Detected	Not Detected
1,2-Dichlorobenzene	4.5	27	Not Detected	Not Detected
1,2,4-Trichlorobenzene	18	140	Not Detected	Not Detected
Hexachlorobutadiene	18	190	Not Detected	Not Detected
Propylene	18	31	Not Detected	Not Detected
1,3-Butadiene	18	40	Not Detected	Not Detected
Acetone	18	43	110	260

AIR TOXICS LTD.

SAMPLE NAME: Rm 2-INLET

ID#: 0211669A-02A

MODIFIED EPA METHOD TO-14 GC/MS FULL SCAN

File Name:	f120918	Date of Collection:	11/26/02
Dil. Factor:	[illegible]	Date of Analysis:	12/9/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Carbon Disulfide	18	57	94	300
2-Propanol	18	45	Not Detected	Not Detected
trans-1,2-Dichloroethene	18	72	Not Detected	Not Detected
Vinyl Acetate	18	64	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	18	54	Not Detected	Not Detected
Hexane	18	64	Not Detected	Not Detected
Tetrahydrofuran	18	54	Not Detected	Not Detected
Cyclohexane	18	63	Not Detected	Not Detected
1,4-Dioxane	18	66	Not Detected	Not Detected
Bromodichloromethane	18	120	Not Detected	Not Detected
4-Methyl-2-pentanone	18	74	Not Detected	Not Detected
2-Hexanone	18	74	Not Detected	Not Detected
Dibromochloromethane	18	150	Not Detected	Not Detected
Bromoform	18	190	Not Detected	Not Detected
4-Ethyltoluene	18	89	Not Detected	Not Detected
Ethanol	18	34	Not Detected	Not Detected
Methyl tert-Butyl Ether	18	66	Not Detected	Not Detected
Heptane	18	74	36	150

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	80	70-130
Toluene-d8	92	70-130
4-Bromofluorobenzene	108	70-130

AIR TOXICS LTD.

SAMPLE NAME: Run 3-INLET

ID#: 0211669A-03A

MODIFIED EPA METHOD TO-14 GC/MS FULL SCAN

File Name:	f120919	Date of Collection:	11/26/02
Dil. Factor:	6.20	Date of Analysis:	12/9/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Freon 12	3.1	16	Not Detected	Not Detected
Freon 114	3.1	22	Not Detected	Not Detected
Chloromethane	3.1	6.5	Not Detected	Not Detected
Vinyl Chloride	3.1	8.0	Not Detected	Not Detected
Bromomethane	3.1	12	Not Detected	Not Detected
Chloroethane	3.1	8.3	Not Detected	Not Detected
Freon 11	3.1	18	Not Detected	Not Detected
1,1-Dichloroethene	3.1	12	Not Detected	Not Detected
Freon 113	3.1	24	Not Detected	Not Detected
Methylene Chloride	3.1	11	Not Detected	Not Detected
1,1-Dichloroethane	3.1	13	Not Detected	Not Detected
cis-1,2-Dichloroethene	3.1	12	Not Detected	Not Detected
Chloroform	3.1	15	Not Detected	Not Detected
1,1,1-Trichloroethane	3.1	17	Not Detected	Not Detected
Carbon Tetrachloride	3.1	20	Not Detected	Not Detected
Benzene	3.1	10	790	2600
1,2-Dichloroethane	3.1	13	Not Detected	Not Detected
Trichloroethene	3.1	17	Not Detected	Not Detected
1,2-Dichloropropane	3.1	14	Not Detected	Not Detected
cis-1,3-Dichloropropene	3.1	14	Not Detected	Not Detected
Toluene	3.1	12	400	1500
trans-1,3-Dichloropropene	3.1	14	Not Detected	Not Detected
1,1,2-Trichloroethane	3.1	17	Not Detected	Not Detected
Tetrachloroethene	3.1	21	Not Detected	Not Detected
1,2-Dibromoethane (EDB)	3.1	24	Not Detected	Not Detected
Chlorobenzene	3.1	14	7.3	34
Ethyl Benzene	3.1	14	13	56
m,p-Xylene	3.1	14	68	300
o-Xylene	3.1	14	7.8	34
Styrene	3.1	13	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	3.1	22	Not Detected	Not Detected
1,3,5-Trimethylbenzene	3.1	15	Not Detected	Not Detected
1,2,4-Trimethylbenzene	3.1	15	Not Detected	Not Detected
1,3-Dichlorobenzene	3.1	19	Not Detected	Not Detected
1,4-Dichlorobenzene	3.1	19	Not Detected	Not Detected
alpha-Chlorotoluene	3.1	16	Not Detected	Not Detected
1,2-Dichlorobenzene	3.1	19	Not Detected	Not Detected
1,2,4-Trichlorobenzene	12	94	Not Detected	Not Detected
Hexachlorobutadiene	12	130	Not Detected	Not Detected
Propylene	12	22	Not Detected	Not Detected
1,3-Butadiene	12	28	Not Detected	Not Detected
Acetone	12	30	100	240

AIR TOXICS LTD.

SAMPLE NAME: Run 3-INLET

ID#: 0211669A-03A

MODIFIED EPA METHOD TO-14 GC/MS FULL SCAN

File Name:	1120919	Date of Collection:	11/26/02
Dil. Factor:	6.20	Date of Analysis:	12/9/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Carbon Disulfide	12	39	49	150
2-Propanol	12	31	Not Detected	Not Detected
trans-1,2-Dichloroethene	12	50	Not Detected	Not Detected
Vinyl Acetate	12	44	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	12	37	Not Detected	Not Detected
Hexane	12	44	Not Detected	Not Detected
Tetrahydrofuran	12	37	Not Detected	Not Detected
Cyclohexane	12	43	Not Detected	Not Detected
1,4-Dioxane	12	45	Not Detected	Not Detected
Bromodichloromethane	12	84	Not Detected	Not Detected
4-Methyl-2-pentanone	12	52	Not Detected	Not Detected
2-Hexanone	12	52	Not Detected	Not Detected
Dibromochloromethane	12	110	Not Detected	Not Detected
Bromoform	12	130	Not Detected	Not Detected
4-Ethyltoluene	12	62	Not Detected	Not Detected
Ethanol	12	24	Not Detected	Not Detected
Methyl tert-Butyl Ether	12	45	Not Detected	Not Detected
Heptane	12	52	27	110

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	76	70-130
Toluene-d8	93	70-130
4-Bromofluorobenzene	109	70-130

AIR TOXICS LTD.

SAMPLE NAME: FIELD BLANK

ID#: 0211669A-07A

MODIFIED EPA METHOD TO-14 GC/MS FULL SCAN

File Name:	a121024	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 12/11/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Freon 12	0.50	2.5	Not Detected	Not Detected
Freon 114	0.50	3.6	Not Detected	Not Detected
Chloromethane	0.50	1.0	Not Detected	Not Detected
Vinyl Chloride	0.50	1.3	Not Detected	Not Detected
Bromomethane	0.50	2.0	Not Detected	Not Detected
Chloroethane	0.50	1.3	Not Detected	Not Detected
Freon 11	0.50	2.8	Not Detected	Not Detected
1,1-Dichloroethene	0.50	2.0	Not Detected	Not Detected
Freon 113	0.50	3.9	Not Detected	Not Detected
Methylene Chloride	0.50	1.8	Not Detected	Not Detected
1,1-Dichloroethane	0.50	2.0	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.50	2.0	Not Detected	Not Detected
Chloroform	0.50	2.5	Not Detected	Not Detected
1,1,1-Trichloroethane	0.50	2.8	Not Detected	Not Detected
Carbon Tetrachloride	0.50	3.2	Not Detected	Not Detected
Benzene	0.50	1.6	Not Detected	Not Detected
1,2-Dichloroethane	0.50	2.0	Not Detected	Not Detected
Trichloroethene	0.50	2.7	Not Detected	Not Detected
1,2-Dichloropropane	0.50	2.3	Not Detected	Not Detected
cis-1,3-Dichloropropene	0.50	2.3	Not Detected	Not Detected
Toluene	0.50	1.9	Not Detected	Not Detected
trans-1,3-Dichloropropene	0.50	2.3	Not Detected	Not Detected
1,1,2-Trichloroethane	0.50	2.8	Not Detected	Not Detected
Tetrachloroethene	0.50	3.4	Not Detected	Not Detected
1,2-Dibromoethane (EDB)	0.50	3.9	Not Detected	Not Detected
Chlorobenzene	0.50	2.3	Not Detected	Not Detected
Ethyl Benzene	0.50	2.2	Not Detected	Not Detected
m,p-Xylene	0.50	2.2	Not Detected	Not Detected
o-Xylene	0.50	2.2	Not Detected	Not Detected
Styrene	0.50	2.2	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.50	3.5	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.50	2.5	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.50	2.5	Not Detected	Not Detected
1,3-Dichlorobenzene	0.50	3.0	Not Detected	Not Detected
1,4-Dichlorobenzene	0.50	3.0	Not Detected	Not Detected
alpha-Chlorotoluene	0.50	2.6	Not Detected	Not Detected
1,2-Dichlorobenzene	0.50	3.0	Not Detected	Not Detected
1,2,4-Trichlorobenzene	2.0	15	Not Detected	Not Detected
Hexachlorobutadiene	2.0	22	Not Detected	Not Detected
Propylene	2.0	3.5	Not Detected	Not Detected
1,3-Butadiene	2.0	4.5	Not Detected	Not Detected
Acetone	2.0	4.8	Not Detected	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: FIELD BLANK

ID#: 0211669A-07A

MODIFIED EPA METHOD TO-14 GC/MS FULL SCAN

File Name:	1121024	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 12/11/02	

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Carbon Disulfide	2.0	6.3	Not Detected	Not Detected
2-Propanol	2.0	5.0	Not Detected	Not Detected
trans-1,2-Dichloroethene	2.0	8.0	Not Detected	Not Detected
Vinyl Acetate	2.0	7.2	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.0	6.0	Not Detected	Not Detected
Hexane	2.0	7.2	Not Detected	Not Detected
Tetrahydrofuran	2.0	6.0	Not Detected	Not Detected
Cyclohexane	2.0	7.0	Not Detected	Not Detected
1,4-Dioxane	2.0	7.3	Not Detected	Not Detected
Bromodichloromethane	2.0	14	Not Detected	Not Detected
4-Methyl-2-pentanone	2.0	8.3	Not Detected	Not Detected
2-Hexanone	2.0	8.3	Not Detected	Not Detected
Dibromochloromethane	2.0	17	Not Detected	Not Detected
Bromoform	2.0	21	Not Detected	Not Detected
4-Ethyltoluene	2.0	10	Not Detected	Not Detected
Ethanol	2.0	3.8	Not Detected	Not Detected
Methyl tert-Butyl Ether	2.0	7.3	Not Detected	Not Detected
Heptane	2.0	8.3	Not Detected	Not Detected

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	86	70-130
4-Bromofluorobenzene	96	70-130

QC Results and Raw Data

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 0211669A-08A

MODIFIED EPA METHOD TO-14 GC/MS FULL SCAN

File Name:	1120911	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 12/9/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Freon 12	0.50	2.5	Not Detected	Not Detected
Freon 114	0.50	3.6	Not Detected	Not Detected
Chloromethane	0.50	1.0	Not Detected	Not Detected
Vinyl Chloride	0.50	1.3	Not Detected	Not Detected
Bromomethane	0.50	2.0	Not Detected	Not Detected
Chloroethane	0.50	1.3	Not Detected	Not Detected
Freon 11	0.50	2.8	Not Detected	Not Detected
1,1-Dichloroethene	0.50	2.0	Not Detected	Not Detected
Freon 113	0.50	3.9	Not Detected	Not Detected
Methylene Chloride	0.50	1.8	Not Detected	Not Detected
1,1-Dichloroethane	0.50	2.0	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.50	2.0	Not Detected	Not Detected
Chloroform	0.50	2.5	Not Detected	Not Detected
1,1,1-Trichloroethane	0.50	2.8	Not Detected	Not Detected
Carbon Tetrachloride	0.50	3.2	Not Detected	Not Detected
Benzene	0.50	1.6	Not Detected	Not Detected
1,2-Dichloroethane	0.50	2.0	Not Detected	Not Detected
Trichloroethene	0.50	2.7	Not Detected	Not Detected
1,2-Dichloropropane	0.50	2.3	Not Detected	Not Detected
cis-1,3-Dichloropropene	0.50	2.3	Not Detected	Not Detected
Toluene	0.50	1.9	Not Detected	Not Detected
trans-1,3-Dichloropropene	0.50	2.3	Not Detected	Not Detected
1,1,2-Trichloroethane	0.50	2.8	Not Detected	Not Detected
Tetrachloroethene	0.50	3.4	Not Detected	Not Detected
1,2-Dibromoethane (EDB)	0.50	3.9	Not Detected	Not Detected
Chlorobenzene	0.50	2.3	Not Detected	Not Detected
Ethyl Benzene	0.50	2.2	Not Detected	Not Detected
m,p-Xylene	0.50	2.2	Not Detected	Not Detected
o-Xylene	0.50	2.2	Not Detected	Not Detected
Styrene	0.50	2.2	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.50	3.5	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.50	2.5	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.50	2.5	Not Detected	Not Detected
1,3-Dichlorobenzene	0.50	3.0	Not Detected	Not Detected
1,4-Dichlorobenzene	0.50	3.0	Not Detected	Not Detected
alpha-Chlorotoluene	0.50	2.6	Not Detected	Not Detected
1,2-Dichlorobenzene	0.50	3.0	Not Detected	Not Detected
1,2,4-Trichlorobenzene	2.0	15	Not Detected	Not Detected
Hexachlorobutadiene	2.0	22	Not Detected	Not Detected
Propylene	2.0	3.5	Not Detected	Not Detected
1,3-Butadiene	2.0	4.5	Not Detected	Not Detected
Acetone	2.0	4.8	Not Detected	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 0211669A-08A

MODIFIED EPA METHOD TO-14 GC/MS FULL SCAN

File Name: f120911	Date of Collection: NA
Dil. Factor: 1.00	Date of Analysis: 12/9/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Carbon Disulfide	2.0	6.3	Not Detected	Not Detected
2-Propanol	2.0	5.0	Not Detected	Not Detected
trans-1,2-Dichloroethene	2.0	8.0	Not Detected	Not Detected
Vinyl Acetate	2.0	7.2	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.0	6.0	Not Detected	Not Detected
Hexane	2.0	7.2	Not Detected	Not Detected
Tetrahydrofuran	2.0	6.0	Not Detected	Not Detected
Cyclohexane	2.0	7.0	Not Detected	Not Detected
1,4-Dioxane	2.0	7.3	Not Detected	Not Detected
Bromodichloromethane	2.0	14	Not Detected	Not Detected
4-Methyl-2-pentanone	2.0	8.3	Not Detected	Not Detected
2-Hexanone	2.0	8.3	Not Detected	Not Detected
Dibromochloromethane	2.0	17	Not Detected	Not Detected
Bromoform	2.0	21	Not Detected	Not Detected
4-Ethyltoluene	2.0	10	Not Detected	Not Detected
Ethanol	2.0	3.8	Not Detected	Not Detected
Methyl tert-Butyl Ether	2.0	7.3	Not Detected	Not Detected
Heptane	2.0	8.3	Not Detected	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	70	70-130
Toluene-d8	88	70-130
4-Bromofluorobenzene	98	70-130

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 0211669A-08B

MODIFIED EPA METHOD TO-14 GC/MS FULL SCAN

File Name:	a121006	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 12/10/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Freon 12	0.50	2.5	Not Detected	Not Detected
Freon 114	0.50	3.6	Not Detected	Not Detected
Chloromethane	0.50	1.0	Not Detected	Not Detected
Vinyl Chloride	0.50	1.3	Not Detected	Not Detected
Bromomethane	0.50	2.0	Not Detected	Not Detected
Chloroethane	0.50	1.3	Not Detected	Not Detected
Freon 11	0.50	2.8	Not Detected	Not Detected
1,1-Dichloroethene	0.50	2.0	Not Detected	Not Detected
Freon 113	0.50	3.9	Not Detected	Not Detected
Methylene Chloride	0.50	1.8	Not Detected	Not Detected
1,1-Dichloroethane	0.50	2.0	Not Detected	Not Detected
cis-1,2-Dichloroethene	0.50	2.0	Not Detected	Not Detected
Chloroform	0.50	2.5	Not Detected	Not Detected
1,1,1-Trichloroethane	0.50	2.8	Not Detected	Not Detected
Carbon Tetrachloride	0.50	3.2	Not Detected	Not Detected
Benzene	0.50	1.6	Not Detected	Not Detected
1,2-Dichloroethane	0.50	2.0	Not Detected	Not Detected
Trichloroethene	0.50	2.7	Not Detected	Not Detected
1,2-Dichloropropane	0.50	2.3	Not Detected	Not Detected
cis-1,3-Dichloropropene	0.50	2.3	Not Detected	Not Detected
Toluene	0.50	1.9	Not Detected	Not Detected
trans-1,3-Dichloropropene	0.50	2.3	Not Detected	Not Detected
1,1,2-Trichloroethane	0.50	2.8	Not Detected	Not Detected
Tetrachloroethene	0.50	3.4	Not Detected	Not Detected
1,2-Dibromoethane (EDB)	0.50	3.9	Not Detected	Not Detected
Chlorobenzene	0.50	2.3	Not Detected	Not Detected
Ethyl Benzene	0.50	2.2	Not Detected	Not Detected
m,p-Xylene	0.50	2.2	Not Detected	Not Detected
o-Xylene	0.50	2.2	Not Detected	Not Detected
Styrene	0.50	2.2	Not Detected	Not Detected
1,1,2,2-Tetrachloroethane	0.50	3.5	Not Detected	Not Detected
1,3,5-Trimethylbenzene	0.50	2.5	Not Detected	Not Detected
1,2,4-Trimethylbenzene	0.50	2.5	Not Detected	Not Detected
1,3-Dichlorobenzene	0.50	3.0	Not Detected	Not Detected
1,4-Dichlorobenzene	0.50	3.0	Not Detected	Not Detected
alpha-Chlorotoluene	0.50	2.6	Not Detected	Not Detected
1,2-Dichlorobenzene	0.50	3.0	Not Detected	Not Detected
1,2,4-Trichlorobenzene	2.0	15	Not Detected	Not Detected
Hexachlorobutadiene	2.0	22	Not Detected	Not Detected
Propylene	2.0	3.5	Not Detected	Not Detected
1,3-Butadiene	2.0	4.5	Not Detected	Not Detected
Acetone	2.0	4.8	Not Detected	Not Detected

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank

ID#: 0211669A-08B

MODIFIED EPA METHOD TO-14 GC/MS FULL SCAN

File Name:	a121006	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 12/10/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	Amount (ppbv)	Amount (uG/m3)
Carbon Disulfide	2.0	6.3	Not Detected	Not Detected
2-Propanol	2.0	5.0	Not Detected	Not Detected
trans-1,2-Dichloroethene	2.0	8.0	Not Detected	Not Detected
Vinyl Acetate	2.0	7.2	Not Detected	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.0	6.0	Not Detected	Not Detected
Hexane	2.0	7.2	Not Detected	Not Detected
Tetrahydrofuran	2.0	6.0	Not Detected	Not Detected
Cyclohexane	2.0	7.0	Not Detected	Not Detected
1,4-Dioxane	2.0	7.3	Not Detected	Not Detected
Bromodichloromethane	2.0	14	Not Detected	Not Detected
4-Methyl-2-pentanone	2.0	8.3	Not Detected	Not Detected
2-Hexanone	2.0	8.3	Not Detected	Not Detected
Dibromochloromethane	2.0	17	Not Detected	Not Detected
Bromoform	2.0	21	Not Detected	Not Detected
4-Ethyltoluene	2.0	10	Not Detected	Not Detected
Ethanol	2.0	3.8	Not Detected	Not Detected
Methyl tert-Butyl Ether	2.0	7.3	Not Detected	Not Detected
Heptane	2.0	8.3	Not Detected	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	106	70-130
Toluene-d8	92	70-130
4-Bromofluorobenzene	97	70-130

AIR TOXICS LTD.

SAMPLE NAME: LCS

ID#: 0211669A-09A

MODIFIED EPA METHOD TO-14 GC/MS FULL SCAN

File Name: 9120904a | Date of Collection: NA
Dil. Factor: 1.00 | Date of Analysis: 12/9/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	%Recovery
Freon 12	0.50	2.5	109
Freon 114	0.50	3.6	106
Chloromethane	0.50	1.0	110
Vinyl Chloride	0.50	1.3	112
Bromomethane	0.50	2.0	117
Chloroethane	0.50	1.3	102
Freon 11	0.50	2.8	99
1,1-Dichloroethene	0.50	2.0	99
Freon 113	0.50	3.9	89
Methylene Chloride	0.50	1.8	88
1,1-Dichloroethane	0.50	2.0	95
cis-1,2-Dichloroethene	0.50	2.0	102
Chloroform	0.50	2.5	92
1,1,1-Trichloroethane	0.50	2.8	86
Carbon Tetrachloride	0.50	3.2	94
Benzene	0.50	1.6	104
1,2-Dichloroethane	0.50	2.0	100
Trichloroethene	0.50	2.7	95
1,2-Dichloropropane	0.50	2.3	97
cis-1,3-Dichloropropene	0.50	2.3	106
Toluene	0.50	1.9	95
trans-1,3-Dichloropropene	0.50	2.3	118
1,1,2-Trichloroethane	0.50	2.8	105
Tetrachloroethene	0.50	3.4	103
1,2-Dibromoethane (EDB)	0.50	3.9	96
Chlorobenzene	0.50	2.3	95
Ethyl Benzene	0.50	2.2	102
m,p-Xylene	0.50	2.2	102
o-Xylene	0.50	2.2	100
Styrene	0.50	2.2	101
1,1,2,2-Tetrachloroethane	0.50	3.5	96
1,3,5-Trimethylbenzene	0.50	2.5	109
1,2,4-Trimethylbenzene	0.50	2.5	104
1,3-Dichlorobenzene	0.50	3.0	94
1,4-Dichlorobenzene	0.50	3.0	88
alpha-Chlorotoluene	0.50	2.6	81
1,2-Dichlorobenzene	0.50	3.0	92
1,2,4-Trichlorobenzene	2.0	15	120
Hexachlorobutadiene	2.0	22	85
Propylene	2.0	3.5	84
1,3-Butadiene	2.0	4.5	105
Acetone	2.0	4.8	89

AIR TOXICS LTD.

SAMPLE NAME: LCS

ID#: 0211669A-09A

MODIFIED EPA METHOD TO-14 GC/MS FULL SCAN

File Name: t120904a	Date of Collection: NA
Dil. Factor: 1.00	Date of Analysis: 12/9/02

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	%Recovery
Carbon Disulfide	2.0	6.3	95
2-Propanol	2.0	5.0	99
trans-1,2-Dichloroethene	2.0	8.0	96
Vinyl Acetate	2.0	7.2	88
2-Butanone (Methyl Ethyl Ketone)	2.0	6.0	76
Hexane	2.0	7.2	87
Tetrahydrofuran	2.0	6.0	83
Cyclohexane	2.0	7.0	77
1,4-Dioxane	2.0	7.3	81
Bromodichloromethane	2.0	14	82
4-Methyl-2-pentanone	2.0	8.3	86
2-Hexanone	2.0	8.3	87
Dibromochloromethane	2.0	17	88
Bromoform	2.0	21	86
4-Ethyltoluene	2.0	10	139
Ethanol	2.0	3.8	90
Methyl tert-Butyl Ether	2.0	7.3	77
Heptane	2.0	8.3	80

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	99	70-130

AIR TOXICS LTD.

SAMPLE NAME: LCS

ID#: 0211669A-09B

MODIFIED EPA METHOD TO-14 GC/MS FULL SCAN

File Name:	a121004	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 12/10/02	

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	%Recovery
Freon 12	0.50	2.5	114
Freon 114	0.50	3.6	103
Chloromethane	0.50	1.0	108
Vinyl Chloride	0.50	1.3	104
Bromomethane	0.50	2.0	144 Q
Chloroethane	0.50	1.3	107
Freon 11	0.50	2.8	105
1,1-Dichloroethene	0.50	2.0	98
Freon 113	0.50	3.9	96
Methylene Chloride	0.50	1.8	87
1,1-Dichloroethane	0.50	2.0	96
cis-1,2-Dichloroethene	0.50	2.0	104
Chloroform	0.50	2.5	99
1,1,1-Trichloroethane	0.50	2.8	100
Carbon Tetrachloride	0.50	3.2	118
Benzene	0.50	1.6	109
1,2-Dichloroethane	0.50	2.0	114
Trichloroethene	0.50	2.7	102
1,2-Dichloropropane	0.50	2.3	104
cis-1,3-Dichloropropene	0.50	2.3	111
Toluene	0.50	1.9	102
trans-1,3-Dichloropropene	0.50	2.3	109
1,1,2-Trichloroethane	0.50	2.8	104
Tetrachloroethene	0.50	3.4	106
1,2-Dibromoethane (EDB)	0.50	3.9	93
Chlorobenzene	0.50	2.3	97
Ethyl Benzene	0.50	2.2	99
m,p-Xylene	0.50	2.2	92
o-Xylene	0.50	2.2	90
Styrene	0.50	2.2	90
1,1,2,2-Tetrachloroethane	0.50	3.5	89
1,3,5-Trimethylbenzene	0.50	2.5	99
1,2,4-Trimethylbenzene	0.50	2.5	88
1,3-Dichlorobenzene	0.50	3.0	81
1,4-Dichlorobenzene	0.50	3.0	76
alpha-Chlorotoluene	0.50	2.6	83
1,2-Dichlorobenzene	0.50	3.0	78
1,2,4-Trichlorobenzene	2.0	15	111
Hexachlorobutadiene	2.0	22	77
Propylene	2.0	3.5	86
1,3-Butadiene	2.0	4.5	97
Acetone	2.0	4.8	109

AIR TOXICS LTD.

SAMPLE NAME: LCS

ID#: 0211669A-09B

MODIFIED EPA METHOD TO-14 GC/MS FULL SCAN

File Name:	a121004	Date of Collection: NA	
Dil. Factor:	1.00	Date of Analysis: 12/10/02	

Compound	Rpt. Limit (ppbv)	Rpt. Limit (uG/m3)	%Recovery
Carbon Disulfide	2.0	6.3	110
2-Propanol	2.0	5.0	113
trans-1,2-Dichloroethene	2.0	8.0	113
Vinyl Acetate	2.0	7.2	111
2-Butanone (Methyl Ethyl Ketone)	2.0	6.0	96
Hexane	2.0	7.2	101
Tetrahydrofuran	2.0	6.0	100
Cyclohexane	2.0	7.0	97
1,4-Dioxane	2.0	7.3	107
Bromodichloromethane	2.0	14	110
4-Methyl-2-pentanone	2.0	8.3	98
2-Hexanone	2.0	8.3	94
Dibromochloromethane	2.0	17	109
Bromoform	2.0	21	102
4-Ethyltoluene	2.0	10	119
Ethanol	2.0	3.8	99
Methyl tert-Butyl Ether	2.0	7.3	91
Heptane	2.0	8.3	103

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	100	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	97	70-130

AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

COMPREHENSIVE VALIDATION PACKAGE

VOST 5041A/8260B

INVENTORY SHEET

Work Order #: 0211663

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Comments:

Completed by:

Judy Lee	Judy Lee / Document Control	12/18/02
(Signature)	(Print Name & Title)	(Date)

AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 0211663

Work Order Summary

CLIENT:	Mr. Scott James TRC Environmental Corporation Boott Mills South, Foot of John St. Lowell, MA 01852	**BILL TO:**	Mr. Scott James TRC Environmental Corporation Boott Mills South, Foot of John St. Lowell, MA 01852
PHONE:	978-970-5600	**P.O. #**	40894
FAX:	978-453-1995	**PROJECT #**	Maverick
DATE RECEIVED:	11/27/2002	**CONTACT:**	Betty Chu
DATE COMPLETED:	12/12/2002		

FRACTION #	NAME	TEST
01A	Run #1-TX	VOST 5041A/8260B
01B	Run #1-TX/C	VOST 5041A/8260B
02A	Run #2-TX	VOST 5041A/8260B
02B	Run #2-TX/C	VOST 5041A/8260B
03A	Run #3-TX	VOST 5041A/8260B
03B	Run #3-TX/C	VOST 5041A/8260B
04A	Condensate Runs 1-3	VOST 5041A/8260B
05A	Field Blank-TX	VOST 5041A/8260B
05B	Field Blank-TX/C	VOST 5041A/8260B
06A	Trip Blank-TX	VOST 5041A/8260B
06B	Trip Blank-TX/C	VOST 5041A/8260B
07A	Trip Blank-Condensate	VOST 5041A/8260B
08A	Lab Blank	VOST 5041A/8260B
08B	Lab Blank	VOST 5041A/8260B
09A	LCS	VOST 5041A/8260B
09B	LCS	VOST 5041A/8260B

CERTIFIED BY: Linda L. Frieman DATE: 12/12/02

Laboratory Director

Certfication numbers: AR DEQ, CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763, NJ NELAP - CA004
NY NELAP - 11291, UT NELAP - 9166389892
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/02, Expiration date: 06/30/03
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
VOST 5041A
TRC Environmental Corporation
Workorder# 0211663

Ten VOST 0030 Tube and two Vial samples were received on November 27, 2002. The laboratory performed the analysis via EPA SW-846 Method 5041A using GC/MS in the full scan mode. VOST sorbent tubes are thermally desorbed at 180 degrees centrigrade for ten minutes by UHP helium carrier gas. The gas stream is then bubbled through 5 mL of organic free water and trapped on the sorbent trap of the purge and trap system. The trap is thermally desorbed to elute the components into the GC/MS system for further separation. See the data sheets for the reporting limits for each compound.

Requirement	*VOST 5041A*	*ATL Modifications*
Batch certification	Blanks from the same media as samples	Analysis of set of cartridges prior to onset of any project;Sampling media provided by the client is batch certified ahead of time, only if client provides blank cartridges.
Tenax/tenax charcoal tube analysis	Separate tube analysis	Tubes are desorbed and analyzed simultaneously, unless specified by client
Method blank	Cartridges from the same media batches as the samples	Cartridges used for daily method blank may or may not be from the same batch or sampling media.
Connection between cartridge thermal desorption apparatus & sample purge vessel	PTFE 1/16" Teflon tubing	Heated, 1/16" silica-lined stainless steel tubing
Flow rates	40 mL/min	40-45 mL/min
Storage of standards	Amber bottles with PTFE-lined screw caps	Clear vials capped with PTFE mininert valves
Calibration criteria for non-CCCs	RSD </= 15% for all non-CCCs	RSD </= 30% for some compounds: acetone, bromoform, vinyl acetate, bromomethane, chloromethane, 1,1,2,2-tetracholoroethane, & 1,2,3-trichloropropane; for some non-5041A compounds
BFB injection	Method 5041A - purge through water; Method 8260B - direct injection	Direct injection onto the column
Saturation level concentrations	Not specified	Samples desorbed into Tedlar bags

Receiving Notes

A Temperature Blank was included with the shipment. Temperature was measured and was not within 4 degrees C. +/- 2 degrees. Coolant in the form of blue ice was present. The client was notified via the login fax/email and the analysis proceeded.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:

B - Compound present in laboratory blank or tube certification greater than reporting limit (background subtraction not performed).

J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Table 1								
Client Sample ID	Lab Sample ID	Date Collected	Date Received	Date Extracted	Sample Holding Time (Days)	Date Analyzed	Sample Extract Holding Time (Days)	Sample Condition
Run #1-TX	0211663-01A	11/26/2002	11/27/2002	NA	11	12/ 7/2002	NA	Good
Run #1-TX/C	0211663-01B	11/26/2002	11/27/2002	NA	11	12/ 7/2002	NA	Good
Run #2-TX	0211663-02A	11/26/2002	11/27/2002	NA	11	12/ 7/2002	NA	Good
Run #2-TX/C	0211663-02B	11/26/2002	11/27/2002	NA	11	12/ 7/2002	NA	Good
Run #3-TX	0211663-03A	11/26/2002	11/27/2002	NA	11	12/ 7/2002	NA	Good
Run #3-TX/C	0211663-03B	11/26/2002	11/27/2002	NA	11	12/ 7/2002	NA	Good
Condensate Runs 1-3	0211663-04A	11/26/2002	11/27/2002	NA	12	12/ 8/2002	NA	Good
Field Blank-TX	0211663-05A	11/26/2002	NA	NA	11	12/ 7/2002	NA	Good
Field Blank-TX/C	0211663-05B	11/26/2002	NA	NA	11	12/ 7/2002	NA	Good
Trip Blank-TX	0211663-06A	11/26/2002	NA	NA	11	12/ 7/2002	NA	Good
Trip Blank-TX/C	0211663-06B	11/26/2002	NA	NA	11	12/ 7/2002	NA	Good
Trip Blank-Condensate	0211663-07A	11/26/2002	NA	NA	12	12/ 8/2002	NA	Good
Lab Blank	0211663-08A	NA	NA	NA	NA	12/ 7/2002	NA	Good
Lab Blank	0211663-08B	NA	NA	NA	NA	12/ 8/2002	NA	Good
LCS	0211663-09A	NA	NA	NA	NA	12/ 7/2002	NA	Good
LCS	0211663-09B	NA	NA	NA	NA	12/ 8/2002	NA	Good

Sample Results and Raw Data

AIR TOXICS LTD.

SAMPLE NAME: Rm #1-TX

ID#: 0211663-01A

MODIFIED VOST 5041A/8260B

File Name:	2120714	Date of Collection: 11/26/02
Dil. Factor:	1.00	Date of Analysis: 12/7/02

Compound	Rpt. Limit (ng)	Amount (ng)
Chloromethane	10	Not Detected
Vinyl Chloride	10	Not Detected
Bromomethane	10	Not Detected
Chloroethane	10	Not Detected
Freon 11	10	Not Detected
1,1-Dichloroethene	10	Not Detected
Carbon Disulfide	10	Not Detected
Acetone	50	Not Detected
Methylene Chloride	10	Not Detected
trans-1,2-Dichloroethene	10	Not Detected
1,1-Dichloroethane	10	Not Detected
Vinyl Acetate	50	Not Detected
2-Butanone (Methyl Ethyl Ketone)	50	Not Detected
Chloroform	10	Not Detected
1,1,1-Trichloroethane	10	Not Detected
Carbon Tetrachloride	10	Not Detected
Benzene	10	31
1,2-Dichloroethane	10	Not Detected
Trichloroethene	10	Not Detected
1,2-Dichloropropane	10	Not Detected
Bromodichloromethane	10	Not Detected
trans-1,3-Dichloropropene	10	Not Detected
4-Methyl-2-pentanone	50	Not Detected
Toluene	10	Not Detected
cis-1,3-Dichloropropene	10	Not Detected
1,1,2-Trichloroethane	10	Not Detected
Tetrachloroethene	10	Not Detected
2-Hexanone	50	Not Detected
Dibromochloromethane	10	Not Detected
Chlorobenzene	10	Not Detected
Ethyl Benzene	10	Not Detected
m,p-Xylene	10	Not Detected
o-Xylene	10	Not Detected
Styrene	10	Not Detected
Bromoform	10	Not Detected
1,1,2,2-Tetrachloroethane	10	Not Detected
1,3-Dichlorobenzene	10	Not Detected
1,4-Dichlorobenzene	10	Not Detected
1,2-Dichlorobenzene	10	Not Detected
Freon 12	10	Not Detected

Container Type: VOST 0030 Tube

AIR TOXICS LTD.

SAMPLE NAME: Run #1-TX

ID#: 0211663-01A

MODIFIED VOST 5041A/8260B

File Name: z120[illegible] Date of Collection: 11/26/02
Dil. Factor: 1.00 Date of Analysis: 12/[illegible]/02

Surrogates	%Recovery	Method Limits
Dibromofluoromethane	102	70-130
1,2-Dichloroethane-d4	106	70-130
Toluene-d8	92	70-130
4-Bromofluorobenzene	88	70-130

AIR TOXICS LTD.

SAMPLE NAME: Run #1-TX/C

ID#: 0211663-01B

MODIFIED VOST 5041A/8260B

File Name:	z120709	Date of Collection:	11/26/02
Dil. Factor:	1.00	Date of Analysis:	12/7/02

Compound	Rpt. Limit (ng)	Amount (ng)
Chloromethane	10	Not Detected
Vinyl Chloride	10	Not Detected
Bromomethane	10	12
Chloroethane	10	Not Detected
Freon 11	10	Not Detected
1,1-Dichloroethene	10	Not Detected
Carbon Disulfide	10	Not Detected
Acetone	50	Not Detected
Methylene Chloride	10	47
trans-1,2-Dichloroethene	10	Not Detected
1,1-Dichloroethane	10	Not Detected
Vinyl Acetate	50	Not Detected
2-Butanone (Methyl Ethyl Ketone)	50	Not Detected
Chloroform	10	Not Detected
1,1,1-Trichloroethane	10	Not Detected
Carbon Tetrachloride	10	Not Detected
Benzene	10	Not Detected
1,2-Dichloroethane	10	Not Detected
Trichloroethene	10	Not Detected
1,2-Dichloropropane	10	Not Detected
Bromodichloromethane	10	Not Detected
trans-1,3-Dichloropropene	10	Not Detected
4-Methyl-2-pentanone	50	Not Detected
Toluene	10	Not Detected
cis-1,3-Dichloropropene	10	Not Detected
1,1,2-Trichloroethane	10	Not Detected
Tetrachloroethene	10	Not Detected
2-Hexanone	50	Not Detected
Dibromochloromethane	10	Not Detected
Chlorobenzene	10	Not Detected
Ethyl Benzene	10	Not Detected
m,p-Xylene	10	Not Detected
o-Xylene	10	Not Detected
Styrene	10	Not Detected
Bromoform	10	Not Detected
1,1,2,2-Tetrachloroethane	10	Not Detected
1,3-Dichlorobenzene	10	Not Detected
1,4-Dichlorobenzene	10	Not Detected
1,2-Dichlorobenzene	10	Not Detected
Freon 12	10	17

Container Type: VOST 0030 Tube

AIR TOXICS LTD.

SAMPLE NAME: Run #1-TX/C

ID#: 0211663-01B

MODIFIED VOST 5041A/8260B

File Name:	2120709	Date of Collection:	11/26/02
Dil. Factor:	1.00	Date of Analysis:	12/7/02

Surrogates	%Recovery	Method Limits
Dibromofluoromethane	102	70-130
1,2-Dichloroethane-d4	107	70-130
Toluene-d8	93	70-130
4-Bromofluorobenzene	88	70-130

AIR TOXICS LTD.

SAMPLE NAME: Run #2-TX

ID#: 0211663-02A

MODIFIED VOST 5041A/8260B

File Name:	z120713	Date of Collection:	11/26/02
Dil. Factor:	1.00	Date of Analysis:	12/7/02

Compound	Rpt. Limit (ng)	Amount (ng)
Chloromethane	10	Not Detected
Vinyl Chloride	10	Not Detected
Bromomethane	10	Not Detected
Chloroethane	10	Not Detected
Freon 11	10	Not Detected
1,1-Dichloroethene	10	Not Detected
Carbon Disulfide	10	Not Detected
Acetone	50	59
Methylene Chloride	10	Not Detected
trans-1,2-Dichloroethene	10	Not Detected
1,1-Dichloroethane	10	Not Detected
Vinyl Acetate	50	Not Detected
2-Butanone (Methyl Ethyl Ketone)	50	Not Detected
Chloroform	10	Not Detected
1,1,1-Trichloroethane	10	Not Detected
Carbon Tetrachloride	10	Not Detected
Benzene	10	Not Detected
1,2-Dichloroethane	10	Not Detected
Trichloroethene	10	Not Detected
1,2-Dichloropropane	10	Not Detected
Bromodichloromethane	10	Not Detected
trans-1,3-Dichloropropene	10	Not Detected
4-Methyl-2-pentanone	50	Not Detected
Toluene	10	Not Detected
cis-1,3-Dichloropropene	10	Not Detected
1,1,2-Trichloroethane	10	Not Detected
Tetrachloroethene	10	Not Detected
2-Hexanone	50	Not Detected
Dibromochloromethane	10	Not Detected
Chlorobenzene	10	Not Detected
Ethyl Benzene	10	Not Detected
m,p-Xylene	10	Not Detected
o-Xylene	10	Not Detected
Styrene	10	Not Detected
Bromoform	10	Not Detected
1,1,2,2-Tetrachloroethane	10	Not Detected
1,3-Dichlorobenzene	10	Not Detected
1,4-Dichlorobenzene	10	Not Detected
1,2-Dichlorobenzene	10	Not Detected
Freon 12	10	Not Detected

Container Type: VOST 0030 Tube

AIR TOXICS LTD.

SAMPLE NAME: Run #2-TX

ID#: 0211663-02A

MODIFIED VOST 5041A/8260B

File Name:	2120713	Date of Collection:	11/26/02
Dil. Factor:	1.00	Date of Analysis:	12/7/02

Surrogates	%Recovery	Method Limits
Dibromofluoromethane	103	70-130
1,2-Dichloroethane-d4	106	70-130
Toluene-d8	93	70-130
4-Bromofluorobenzene	93	70-130

AIR TOXICS LTD.

SAMPLE NAME: Run #2-TX/C

ID#: 0211663-02B

MODIFIED VOST 5041A/8260B

File Name: 7120710 | Date of Collection: 11/26/02

Dil. Factor: 1.00 | Date of Analysis: 12/7/02

Compound	Rpt. Limit (ng)	Amount (ng)
Chloromethane	10	18
Vinyl Chloride	10	Not Detected
Bromomethane	10	12
Chloroethane	10	Not Detected
Freon 11	10	Not Detected
1,1-Dichloroethene	10	Not Detected
Carbon Disulfide	10	Not Detected
Acetone	50	Not Detected
Methylene Chloride	10	Not Detected
trans-1,2-Dichloroethene	10	Not Detected
1,1-Dichloroethane	10	Not Detected
Vinyl Acetate	50	Not Detected
2-Butanone (Methyl Ethyl Ketone)	50	Not Detected
Chloroform	10	Not Detected
1,1,1-Trichloroethane	10	Not Detected
Carbon Tetrachloride	10	Not Detected
Benzene	10	Not Detected
1,2-Dichloroethane	10	Not Detected
Trichloroethene	10	Not Detected
1,2-Dichloropropane	10	Not Detected
Bromodichloromethane	10	Not Detected
trans-1,3-Dichloropropene	10	Not Detected
4-Methyl-2-pentanone	50	Not Detected
Toluene	10	Not Detected
cis-1,3-Dichloropropene	10	Not Detected
1,1,2-Trichloroethane	10	Not Detected
Tetrachloroethene	10	Not Detected
2-Hexanone	50	Not Detected
Dibromochloromethane	10	Not Detected
Chlorobenzene	10	Not Detected
Ethyl Benzene	10	Not Detected
m,p-Xylene	10	Not Detected
o-Xylene	10	Not Detected
Styrene	10	Not Detected
Bromoform	10	Not Detected
1,1,2,2-Tetrachloroethane	10	Not Detected
1,3-Dichlorobenzene	10	Not Detected
1,4-Dichlorobenzene	10	Not Detected
1,2-Dichlorobenzene	10	Not Detected
Freon 12	10	Not Detected

Container Type: VOST 0030 Tube

AIR TOXICS LTD.

SAMPLE NAME: Run #2-TX/C

ID#: 0211663-02B

MODIFIED VOST 5041A/8260B

File Name:	z120710	Date of Collection:	11/28/02
Dil. Factor:	1.00	Date of Analysis:	12/7/02

Surrogates	%Recovery	Method Limits
Dibromofluoromethane	103	70-130
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	91	70-130

AIR TOXICS LTD.

SAMPLE NAME: Run #3-TX

ID#: 0211663-03A

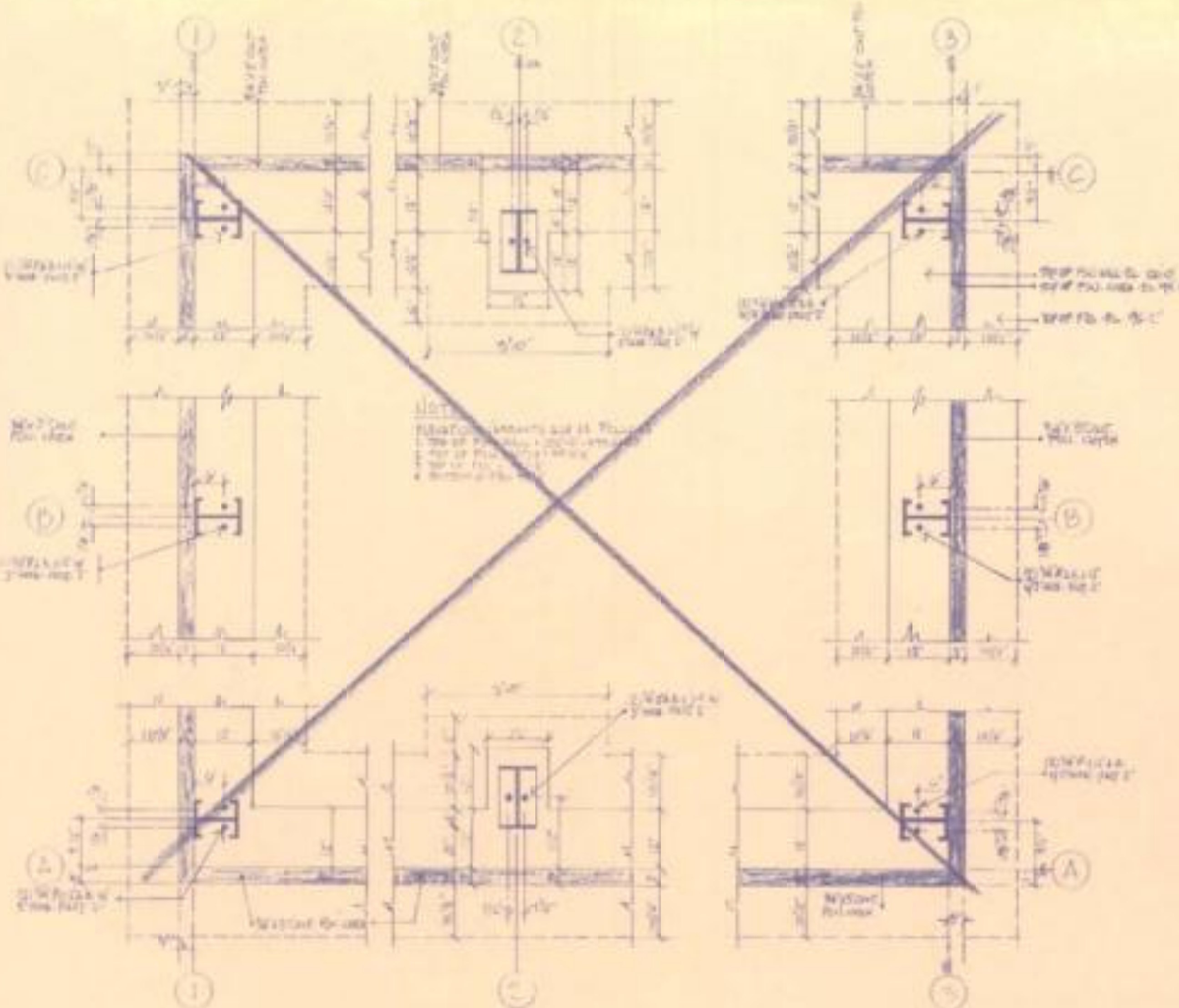
MODIFIED VOST 5041A/8260B

File Name: z120712	Date of Collection: 11/26/02
Dil. Factor: 1.00	Date of Analysis: 12/7/02

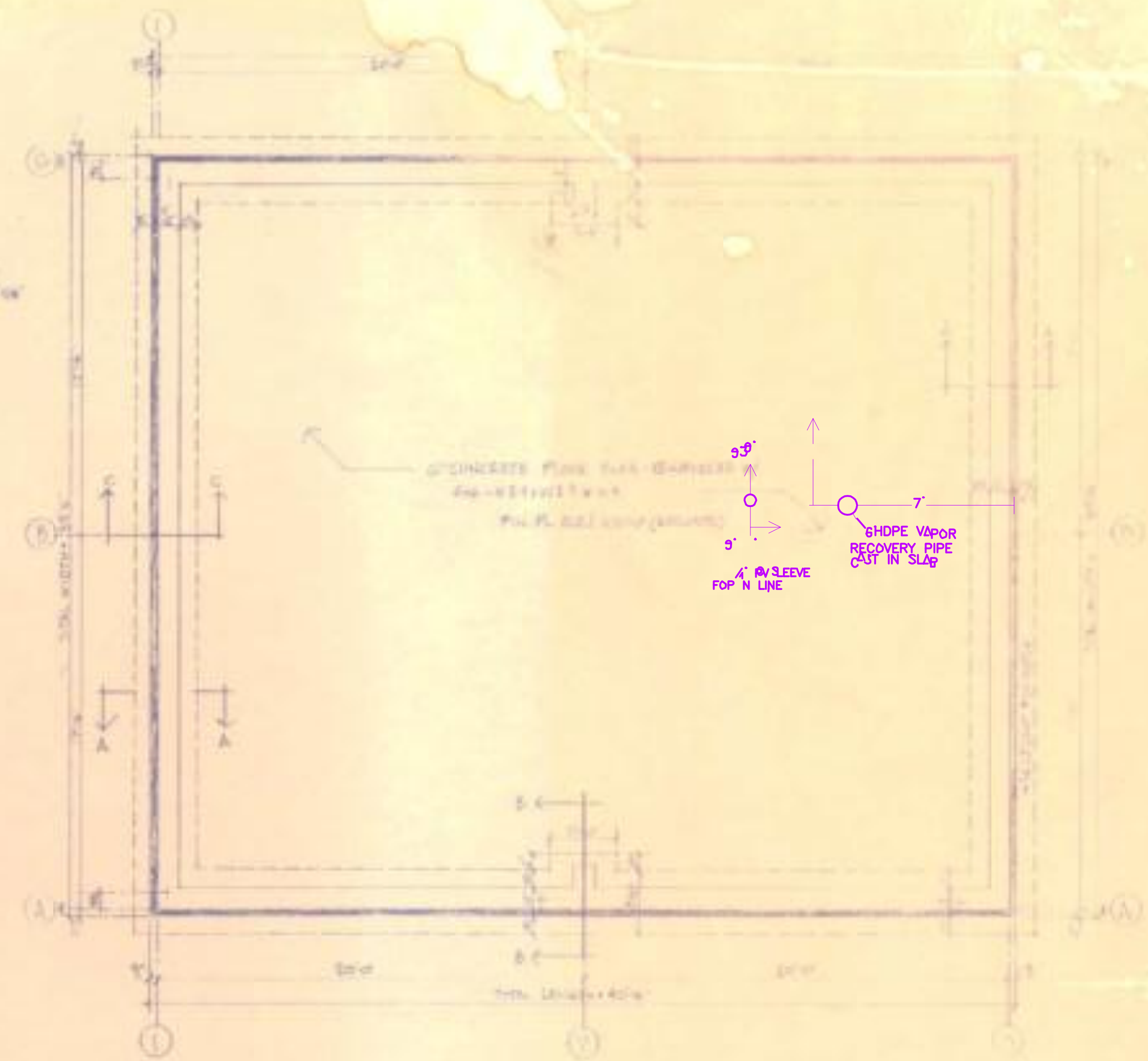
Compound	Rpt. Limit (ng)	Amount (ng)
Chloromethane	10	Not Detected
Vinyl Chloride	10	Not Detected
Bromomethane	10	Not Detected
Chloroethane	10	Not Detected
Freon 11	10	Not Detected
1,1-Dichloroethene	10	Not Detected
Carbon Disulfide	10	Not Detected
Acetone	50	Not Detected
Methylene Chloride	10	Not Detected
trans-1,2-Dichloroethene	10	Not Detected
1,1-Dichloroethane	10	Not Detected
Vinyl Acetate	50	Not Detected
2-Butanone (Methyl Ethyl Ketone)	50	Not Detected
Chloroform	10	Not Detected
1,1,1-Trichloroethane	10	Not Detected
Carbon Tetrachloride	10	Not Detected
Benzene	10	Not Detected
1,2-Dichloroethane	10	Not Detected
Trichloroethene	10	Not Detected
1,2-Dichloropropane	10	Not Detected
Bromodichloromethane	10	Not Detected
trans-1,3-Dichloropropene	10	Not Detected
4-Methyl-2-pentanone	50	Not Detected
Toluene	10	Not Detected
cis-1,3-Dichloropropene	10	Not Detected
1,1,2-Trichloroethane	10	Not Detected
Tetrachloroethene	10	Not Detected
2-Hexanone	50	Not Detected
Dibromochloromethane	10	Not Detected
Chlorobenzene	10	Not Detected
Ethyl Benzene	10	Not Detected
m,p-Xylene	10	Not Detected
o-Xylene	10	Not Detected
Styrene	10	Not Detected
Bromoform	10	Not Detected
1,1,2,2-Tetrachloroethane	10	Not Detected
1,3-Dichlorobenzene	10	Not Detected
1,4-Dichlorobenzene	10	Not Detected
1,2-Dichlorobenzene	10	Not Detected
Freon 12	10	Not Detected

Container Type: VOST 0030 Tube

Gas Collection System
and
Thermal Oxidizer Unit
Record Drawings



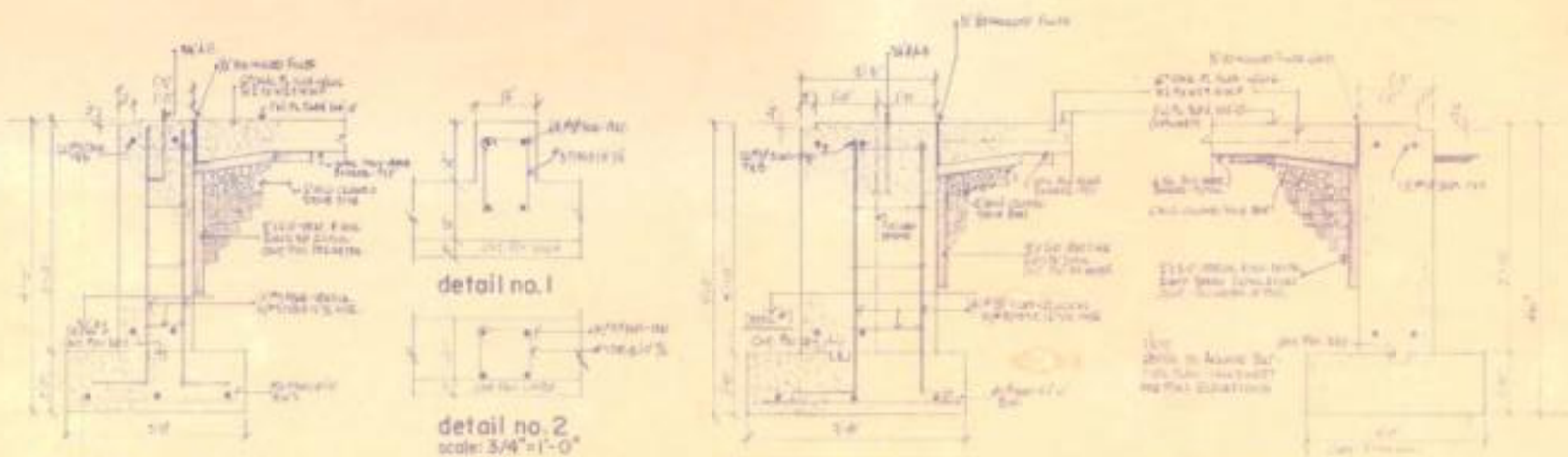
ANCHOR BOLT/PIER PLAN scale: 3/4" = 1'-0"



FOUNDATION PLAN scale: 1/4" - 1'-0"

foundation notes:

REVISED BY ROUX ASSOCIATES, INC. SEPTEMBER 30, 2008
TO SHOW LOCATIONS OF PIPE PENETRATIONS.



detail no. 1

detail no. 2
scale: 3/4" = 1'-0"

SECTION C-C
scale: 3/4" = 1'-0"

SECTION B-B
scale: 3/4" = 1'-0"

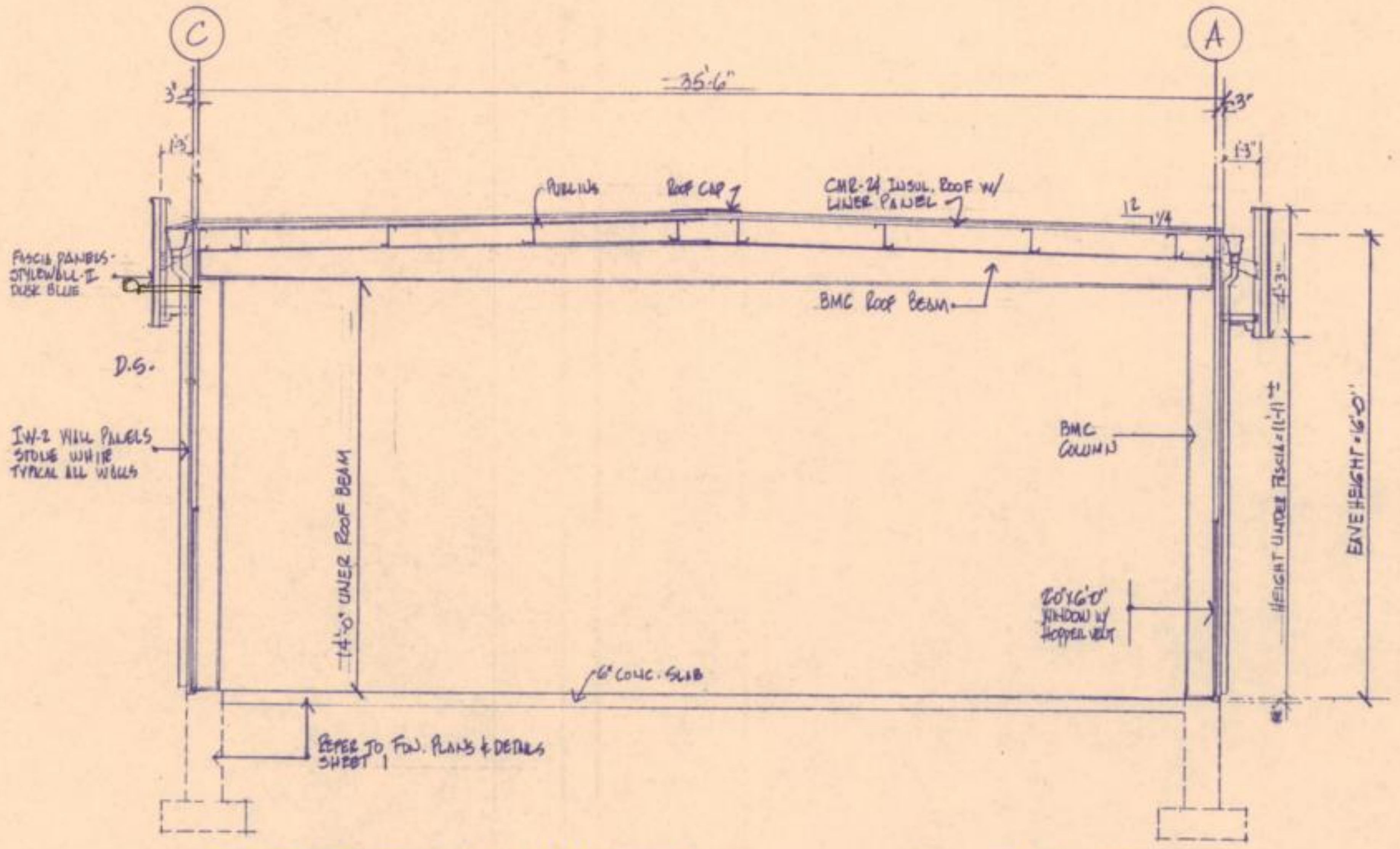
SECTION A-A
scale: 3/4" = 1'-0"

ELGIN BUILDERS, INC.
sherborn, ma

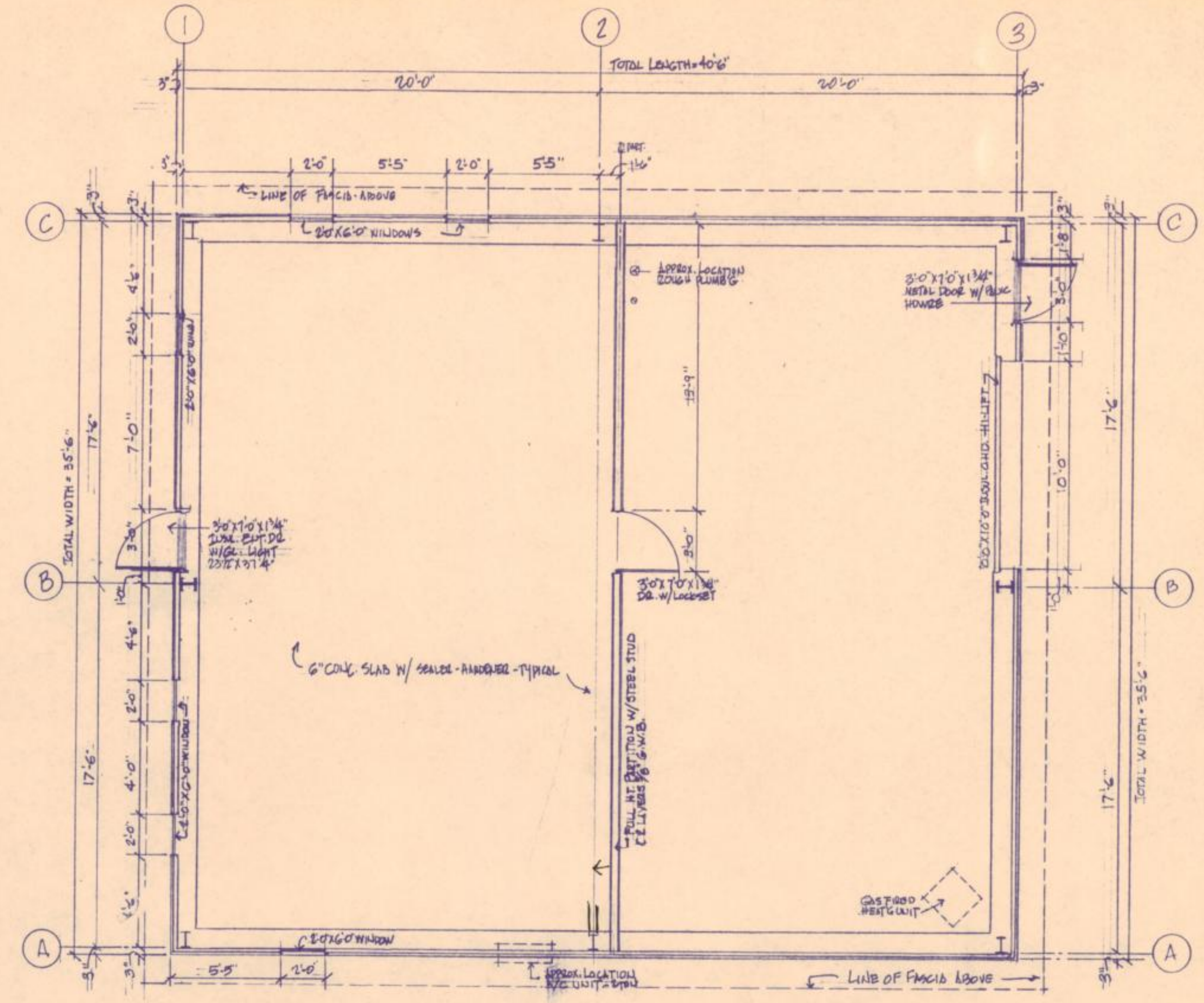
I.S.R.T. no. 2
41 atlantic ave. woburn, ma

1

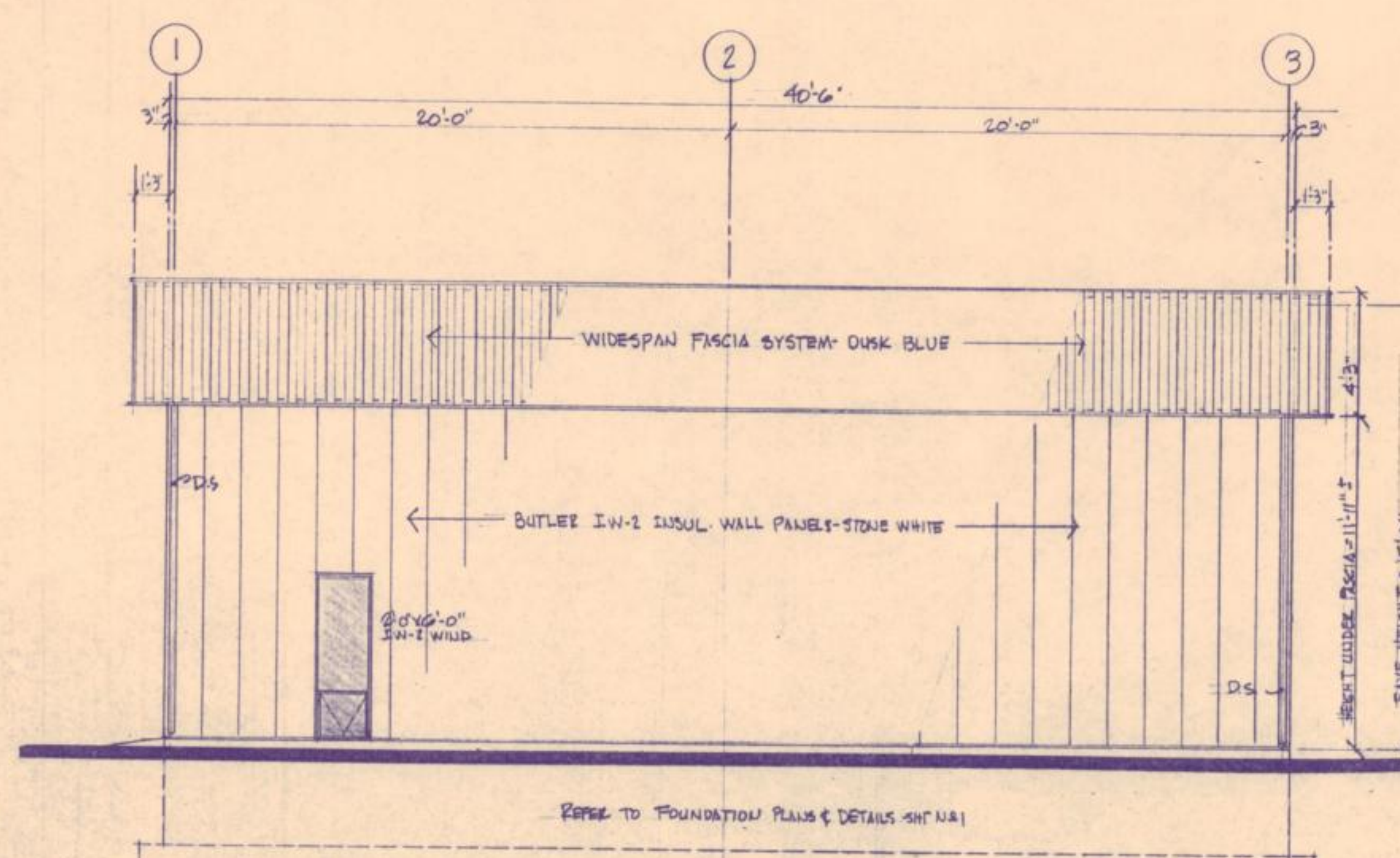
NOTE:
COMPLETE STRUCTURAL PLANS, DRAWINGS AND DETAILS SHALL BE THE RESPONSIBILITY OF BUTLER MANUFACTURING CO. AND SHALL BE CERTIFIED TO MEET THE MASS. BUILDING CODE BY A REGISTERED STRUCTURAL ENGINEER LICENSED TO PRACTICE IN THIS STATE - SECTION AS SHOWN IS ILLUSTRATIVE ONLY.



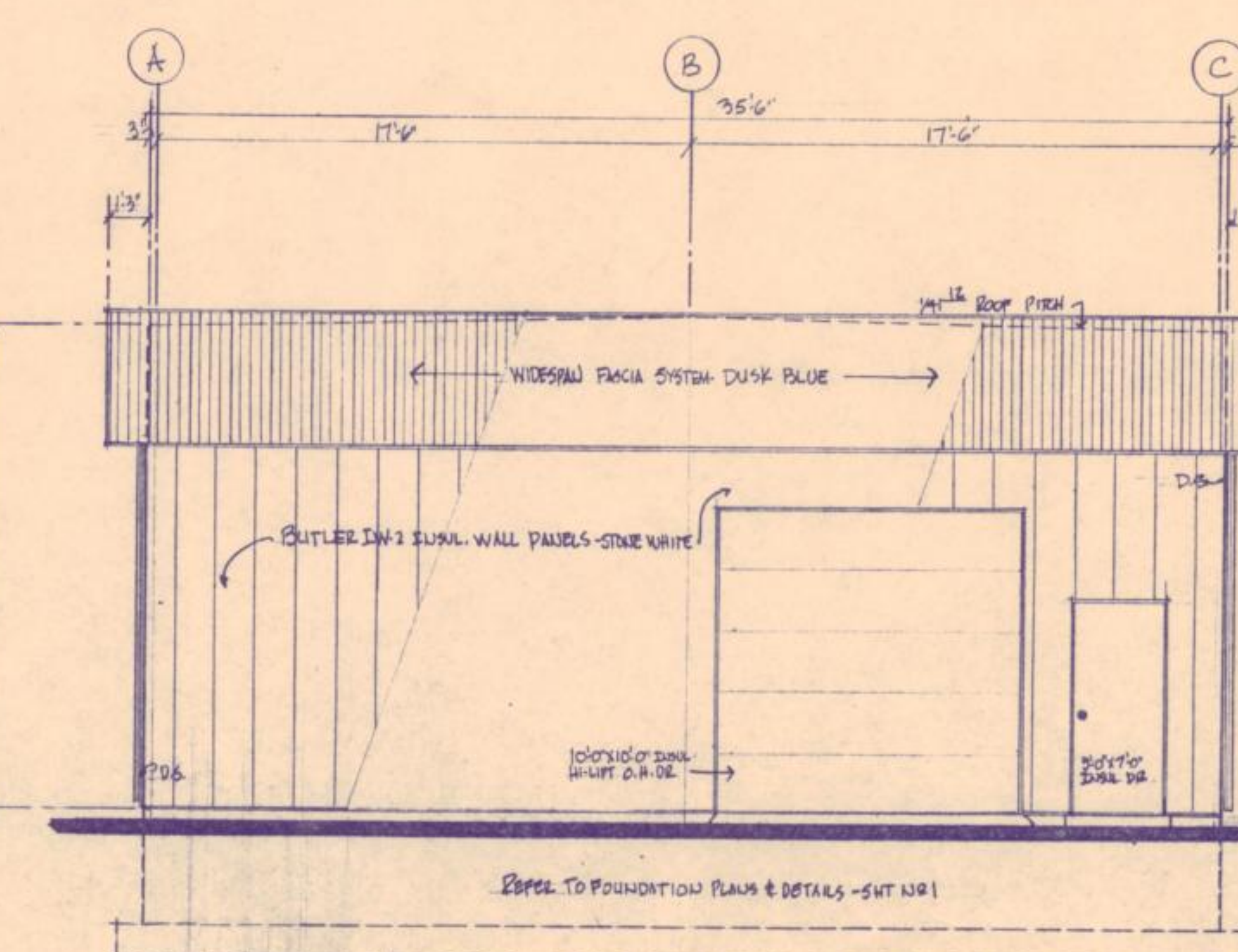
SECTION THRU BUILDING scale: 1/4"=1'-0"



FLOOR PLAN scale: 1/4"=1'-0"



RIGHT SIDEWALL ELEVATION scale: 1/4"=1'-0"



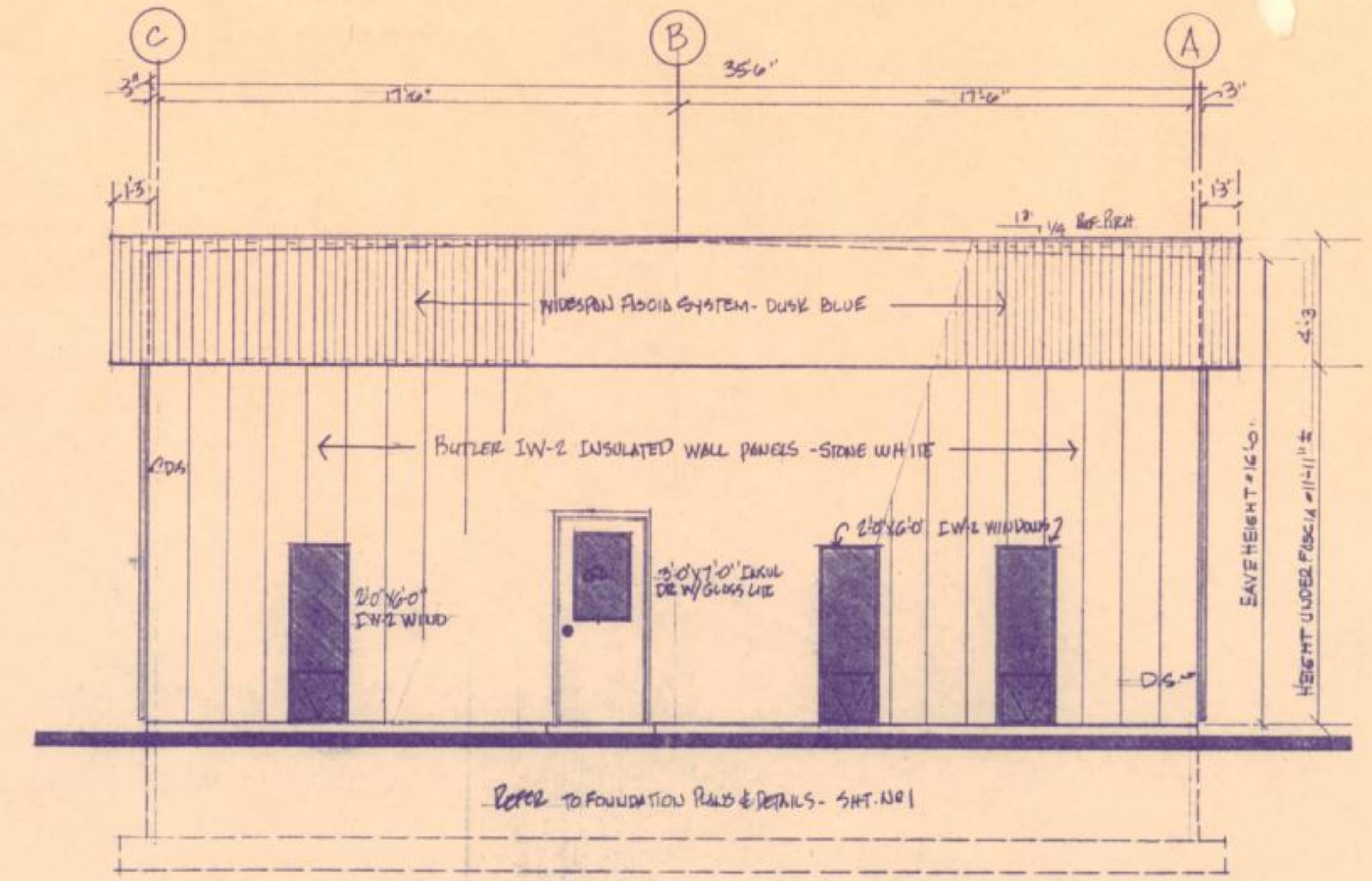
REAR ENDWALL ELEVATION scale: 1/4"=1'-0"

REVISED	COLUMN	
10/27/94	LOCATIONS	

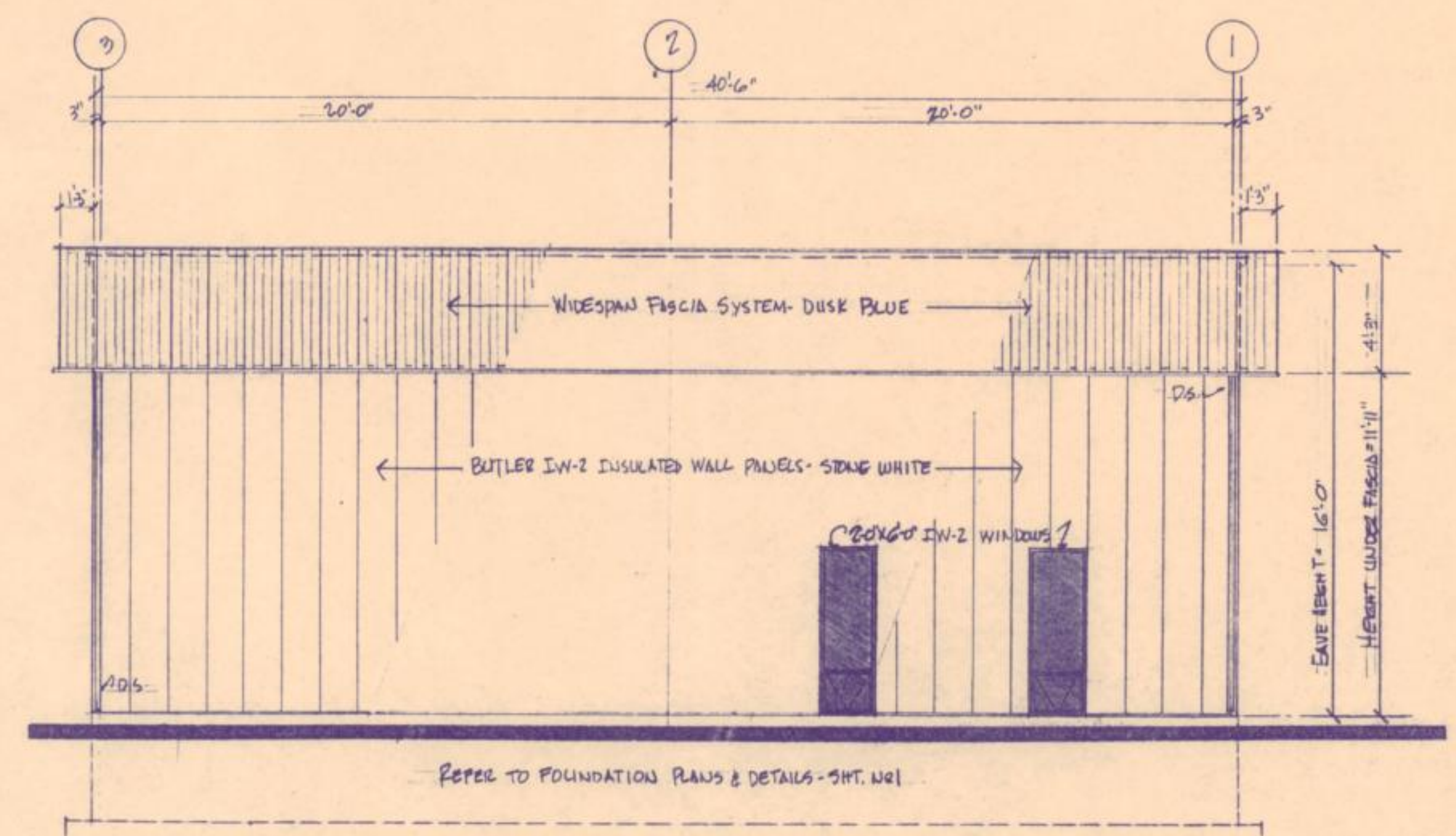
ELGIN BUILDERS, INC.
sherborn, ma

I.S.R.T. no.2
41 atlantic ave. woburn, ma

DRAWN BY: dL
CHECKED BY: JTE
DATE: OCT. 1994
SCALE: AS NOTED
JOB NO.
SHEET NO. 2



FRONT ENDWALL ELEVATION scale: 1/4"=1'-0"

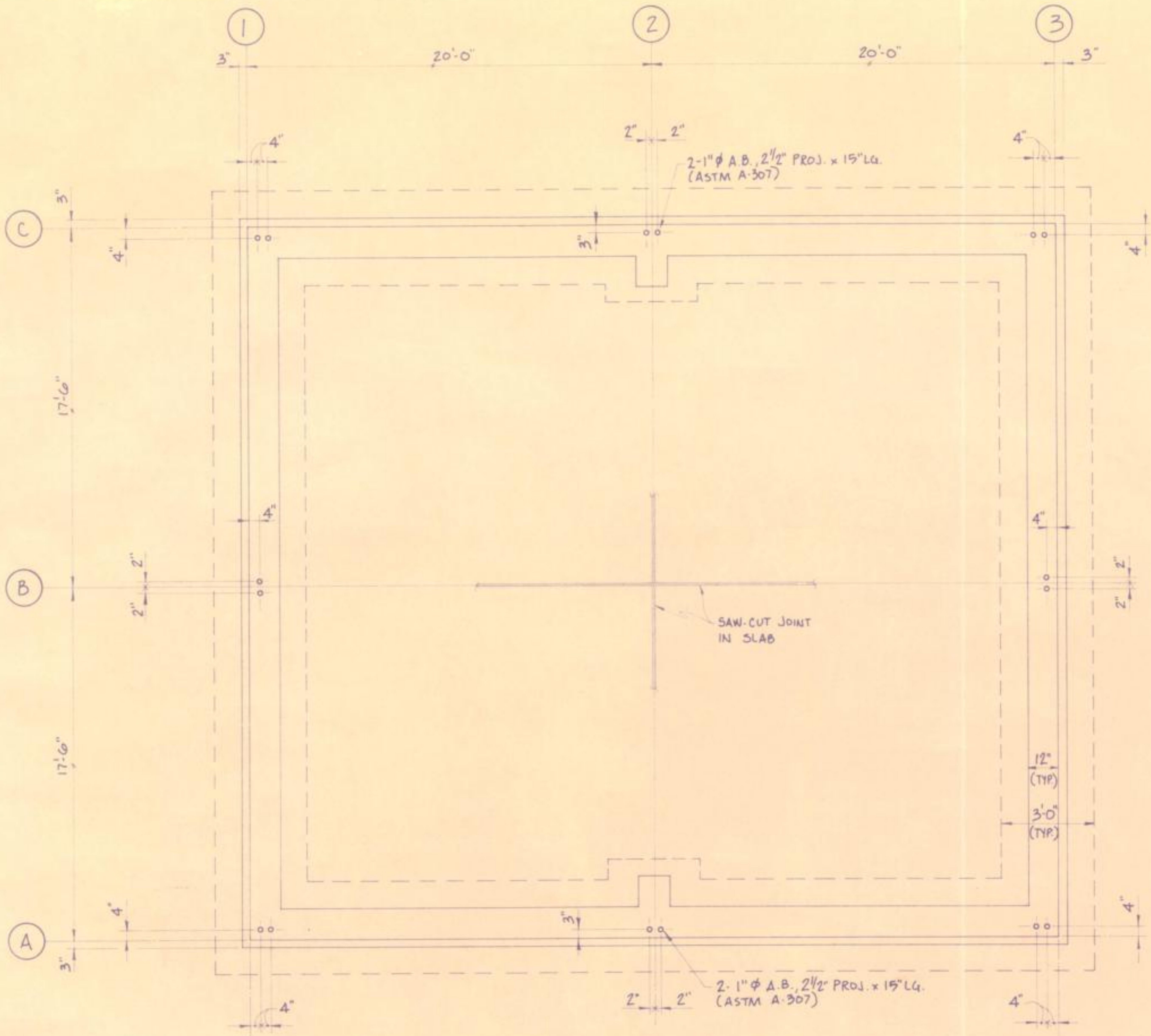


LEFT SIDEWALL ELEVATION scale: 1/4"=1'-0"

ELGIN BUILDERS, INC.
sherborn, ma

I.S.R.T. no. 2
41 atlantic ave. woburn, ma

DRAWN BY:
CHECKED BY: JTE
DATE: OCT. 1994
SCALE: AS NOTED
JOB NO
SHEET NO.
3



ANCHOR BOLT PLAN

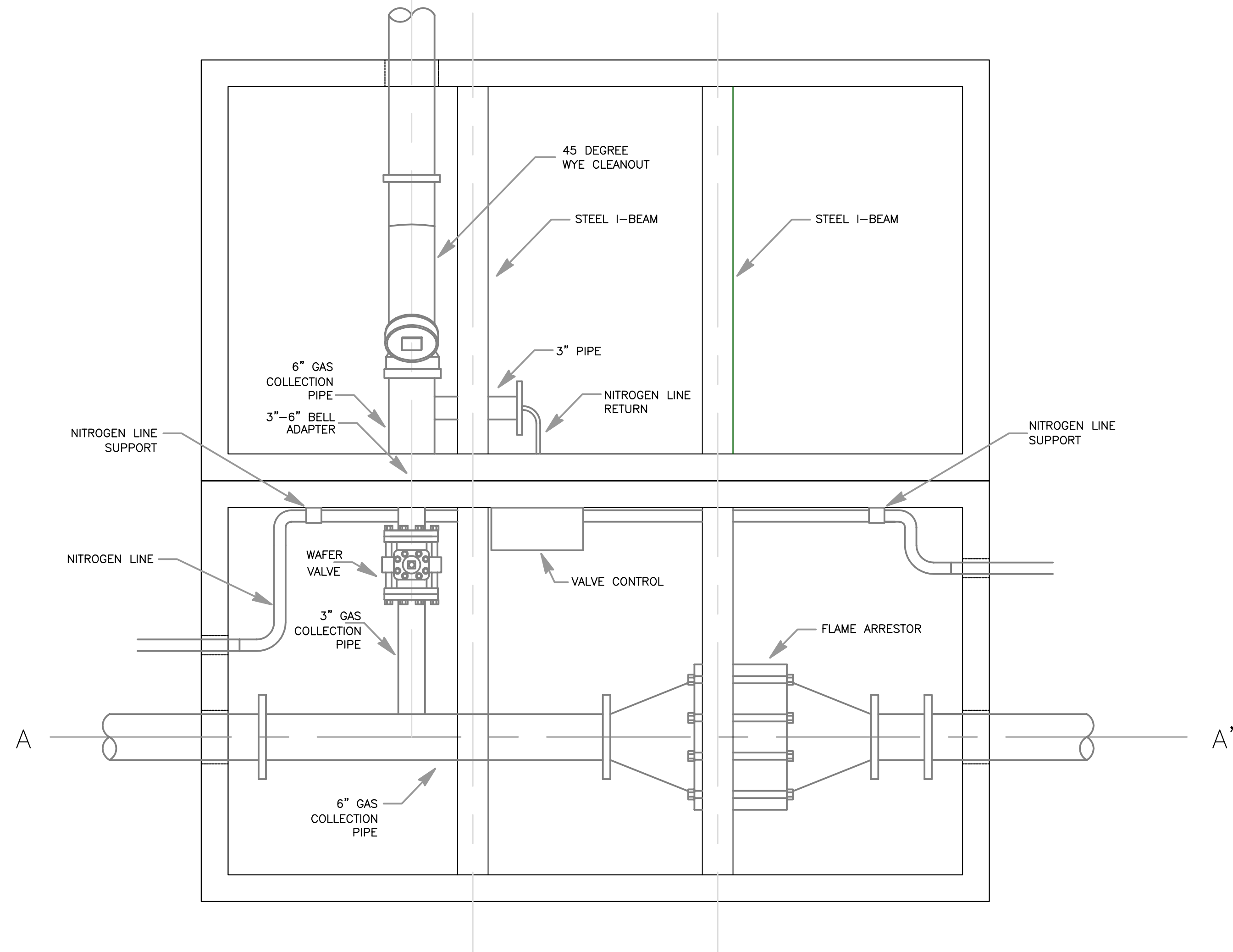
SCALE 3/8" = 1'-0"

NOTES:

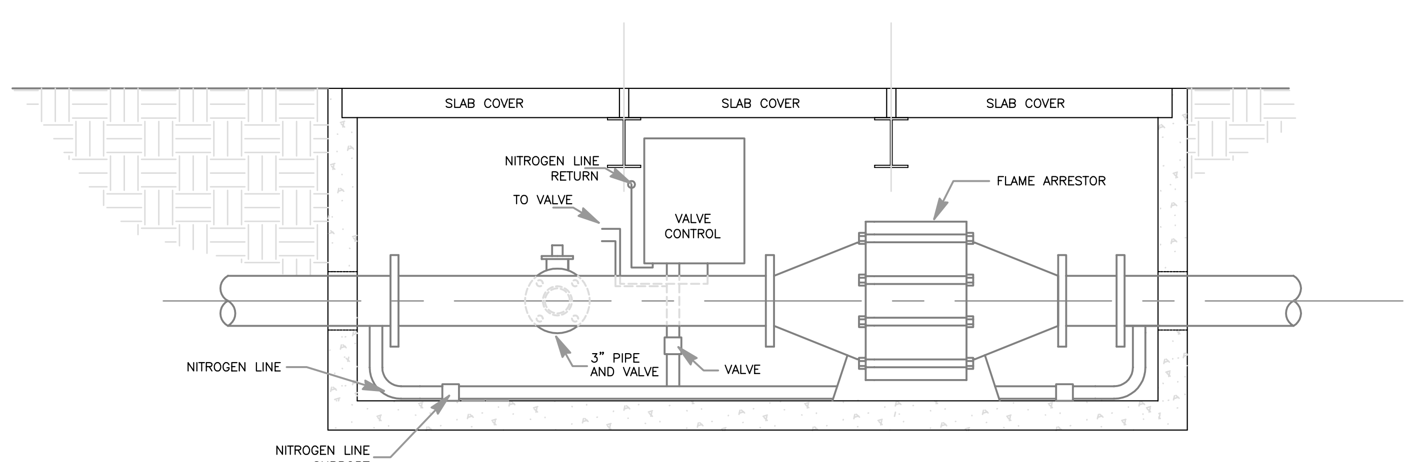
1.) ALL ANCHOR BOLTS SHALL BE 3/4" DIA. x 1'-3" LONG (ASTM A-307) WITH 2" PROJ. UNLESS OTHERWISE NOTED ON PLAN.

2.) ALL ANCHOR BOLTS SHALL BE SET WITH TEMPLATE ONLY.

ANCHOR BOLT PLAN	
ISRT OFFICE & STORAGE 41 ATLANTIC AVE. WOBURN MASSACHUSETTS	
CONSTRUCTION ENGINEERING SERVICES 12 PLEASANT STREET NEWBURYPORT, MASSACHUSETTS (508) 465-2210 01950	STR 94-210-1 of 1 NOVEMBER 4, 1994



PLAN VIEW
1"=2'



SECTION A–A'
1"=2'

NO.	DATE	REVISION DESCRIPTION	INT.

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF STATE LAW.
THESE DOCUMENTS (OR COPIES OF ANY THEREOF) PREPARED BY OR BEARING THE SEAL OF THE ENGINEER, SHALL NOT BE REUSED FOR ANY EXTENSIONS OF THE PROJECT OR ANY OTHER PROJECT WITHOUT THE WRITTEN CONSENT OF THE ENGINEER.

PROJECT ENGINEER: G.G.
DESIGNED BY:
DRAWN BY: J.S.
CHECKED BY: G.G.

PROJECT NO. 1194.0001M006
FILE NO. LUC0237602
SCALE: 1"=2'
DATE: SEP 2008

ROUX ASSOCIATES, INC.
67 South Bedford St., Suite 101W
Burlington, MA 01803 (781) 270–6600

PROJECT NAME: INDUSTRI–PLEX SITE
WOBURN, MASSACHUSETTS
PROJECT FOR: INDUSTRI–PLEX SITE REMEDIAL TRUST

TITLE: GAS COLLECTION VAULT TYPICAL DETAIL

DRAWING NO. A-1
DRAWING 1 OF 1

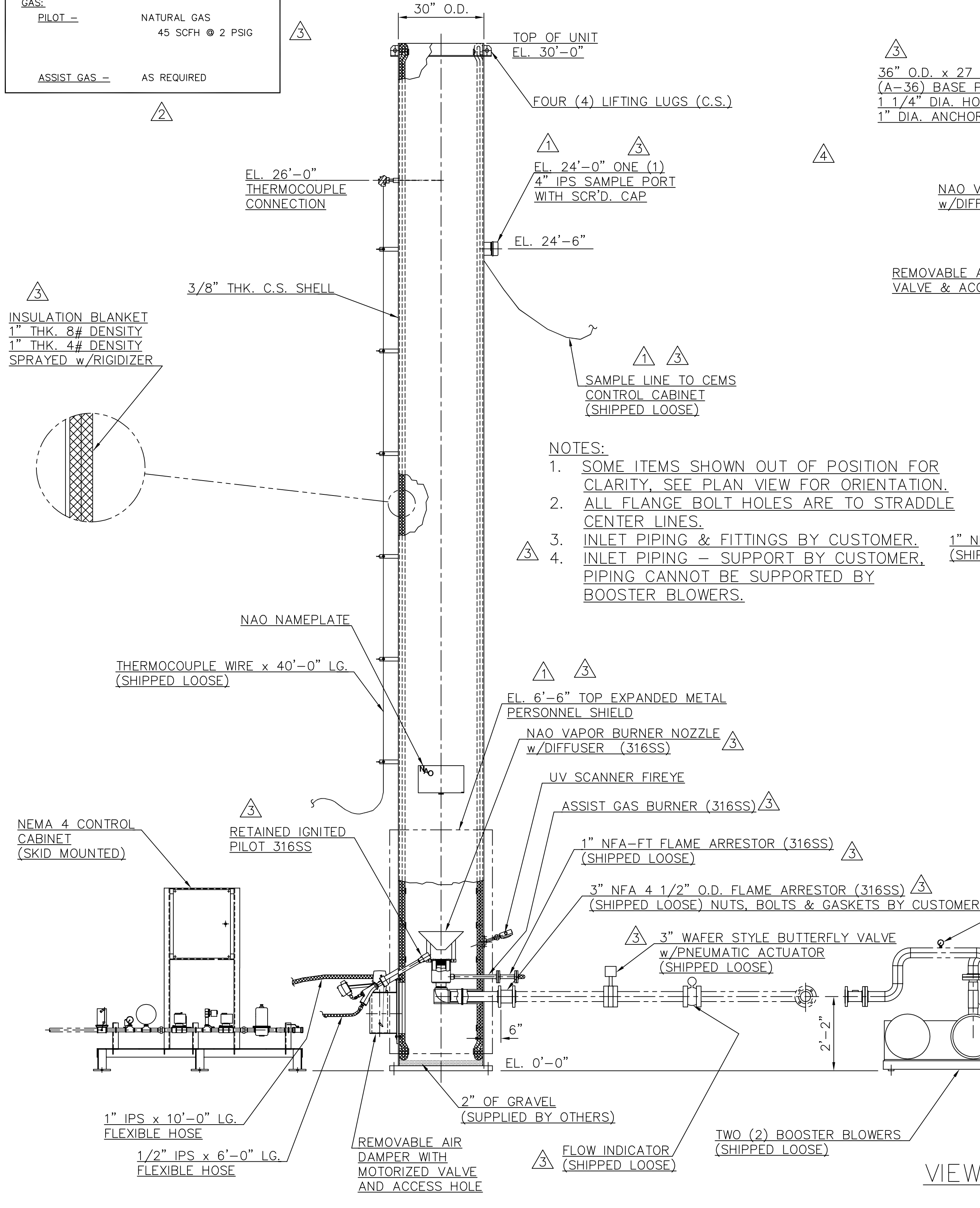
UTILITIES:

ELECTRIC:

PANEL –	110V / 60HZ / 1PH
CEMS –	110V / 60HZ / 1PH
BLOWER –	460V / 60HZ / 3PH

GAS:

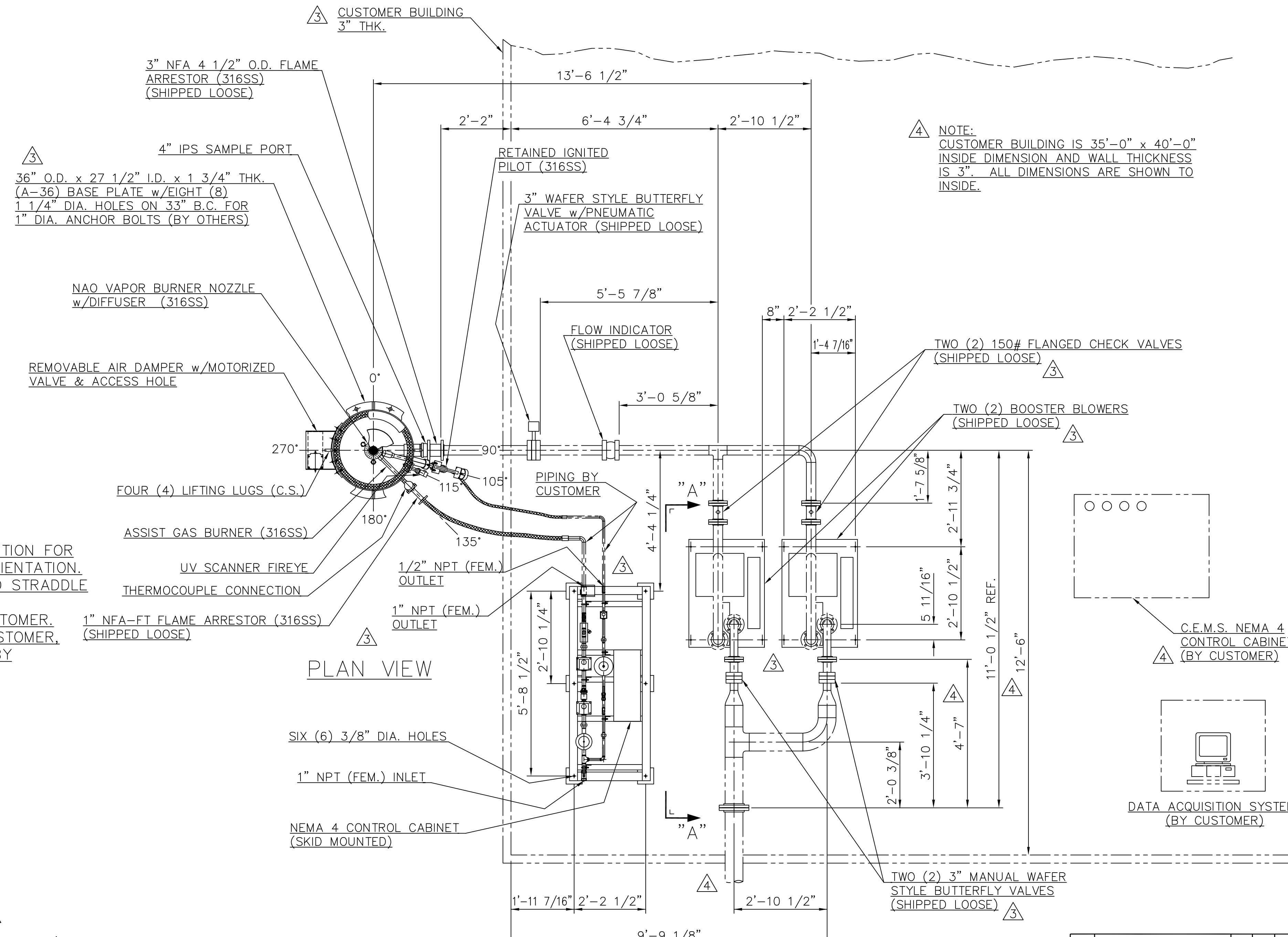
PILOT –	NATURAL GAS 45 SCFH @ 2 PSIG
ASSIST GAS –	AS REQUIRED



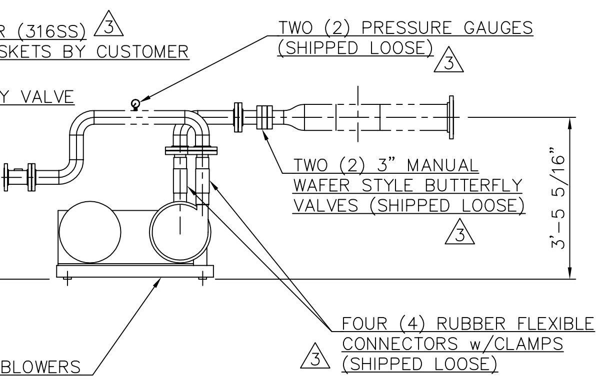
NOTES:

1. SOME ITEMS SHOWN OUT OF POSITION FOR CLARITY, SEE PLAN VIEW FOR ORIENTATION.
2. ALL FLANGE BOLT HOLES ARE TO STRADDLE CENTER LINES.
3. INLET PIPING & FITTINGS BY CUSTOMER.
4. INLET PIPING – SUPPORT BY CUSTOMER, PIPING CANNOT BE SUPPORTED BY BOOSTER BLOWERS.

ELEVATION



PLAN VIEW



VIEW "A–A"

	SHIPPING COMPONENTS	EST. DIMENSIONS	EST. SHIPPING WGT.
1	COMBUSTION CHAMBER	30'-0" x 4'-4" x 3'-2"	5,400 LBS.
2	PIPING SKID W/ CONTROL CABINETS	7'-5" x 5'-6" x 5'-0"	620 LBS.
3	BLOWERS (2)	6'-4" x 2'-4" x 3'-4"	880 LBS.
4	FLAME ARRESTOR SPOOL PC., MISC. ETC.	4'-0" x 4'-0" x 6'-0"	500 LBS.

STACK LOADING DATA

WINDSPEED – 100 MPH   EXPOSURE – TYPE C

AREA – MASSACHUSETTS   EARTHQUAKE – ZONE 1

BASE LOADING DATA

DEAD WEIGHT –	5,400 LBS.
SHEAR –	2,100 LBS.
TOTAL DOWN LOAD –	–
MOMENT –	29,515 FT-LBS.

GENERAL DESIGN DATA

MAXIMUM TEMPERATURE –	300°F
CORROSION ALLOWANCE –	1/8"
INLET LOADING –	1000 LBS.
RECOMMENDED ANCHOR BOLT PROJECTION–	6.5"

TAG: SERIAL NO. 45602

RUST REMEDIAL SERVICES INC.
P.O. #4 842658

REV	DESCRIPTION	APPD.	BY	DATE
4	CUSTOMER REVISIONS– ADDED NOTE; ADDED THICKNESS TO CUSTOMER BUILDING; CEMS WAS BY NAO; ADDED CUSTOMER PIPING THROUGH BUILDING; REMOVED DIM 5'-6"; ADDED DIMENSIONS		NC	10-31-94
3	ADDED NOTES; EL. FOR PERSONNEL SHIELD WAS 7'-0"; UPDATE UTILITIES BLOCK; NEC RELOCATED; VENT ASSEMBLY DELETED; DIMENSIONS ADDED; WATER SEAL DELETED; STORAGE TANK DELETED; SAMPLE PORTS WERE QTY (4); BOOSTER BLOWERS RELOCATED; PANEL RELOCATED; CUSTOMER BUILDING ADDED; WIND SPEED WAS 80 MPH; 4# DENSITY INSULATION WAS 2" THK.; RETAINED IGNITED PILOT WAS SPARKER; ASSIST GAS REDESIGNED; BURNER NOZZLE REDESIGNED; TITLE FORMAT UPDATED; CUSTOMER NAME WAS CHEMICAL WASTE; MOUNTING FLANGE DRILLING WAS (12) 1 1/16" DIA. HOLES		NC	10-21-94
2	REVISED UTILITIES BLOCK; REVISED SAMPLE LINES, ADDED NIBCO VALVE, REVISED 3" & 6" VALVES		JS	2-10-93
1	EL. PERSONNEL SHIELD WAS 6'-6", VENT WAS 12'-0", ADDED DIMS. IN PLAN VIEW, REVISED ASSIST GAS RING & CONN., PILOT WAS @ 270°, SAMPLE PORTS WERE 2" IPS, REVISED SAMPLE LINES, ADDED VALVES IN PLAN VIEW		JS	2-5-93

Unless otherwise specified, all tolerances shall be to NAO DWG. R-11150 Rev.6, finish & paint shall be to NAO DWG. R-10332-ST Rev.20, all hardware shall be to NAO DWG. R-11160 Rev.1, all welding to be per NAO Weld Prodedures

REFERENCE DRAWINGS

THIS DRAWING REMAINS THE PROPERTY OF
NAO Inc.
PHILADELPHIA, PENNSYLVANIA 19134
PHONE: (215) 743-5300 FAX: (215) 743-3018
E-Mail: drafting@nao.com

THE EQUIPMENT AND DESIGNS SHOWN ARE COVERED BY PATENTS AND PATENTS PENDING

ISO 9001 QUALITY SYSTEM CERTIFIED

DATA

DWN.	CKD.	APPD.	
JS			
DATE 12-8-92	SCALE 1/2"=1'-0"		

GENERAL ARRANGEMENT
NEC-TAC 2.26C30
(NAO ENCLOSED COMBUSTOR– TEMPERATURE/AIR CONTROL)

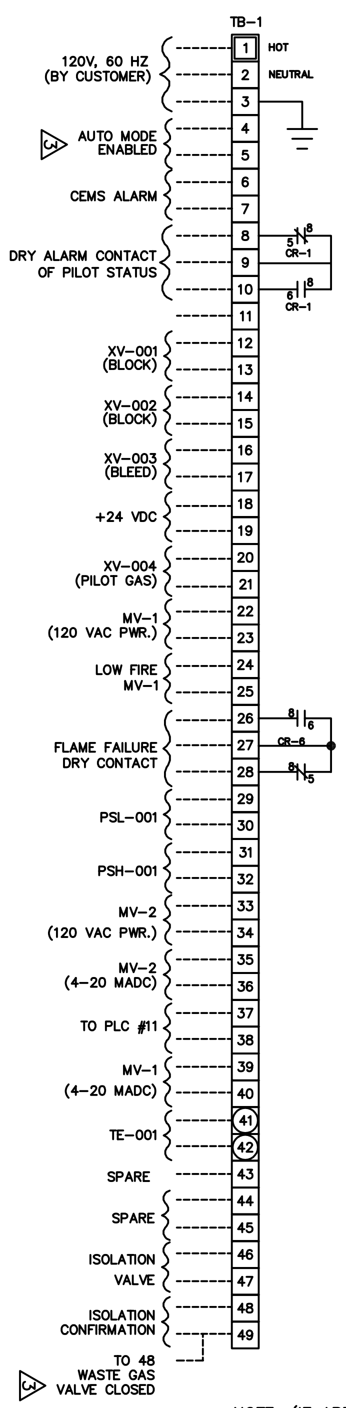
12 HOURS

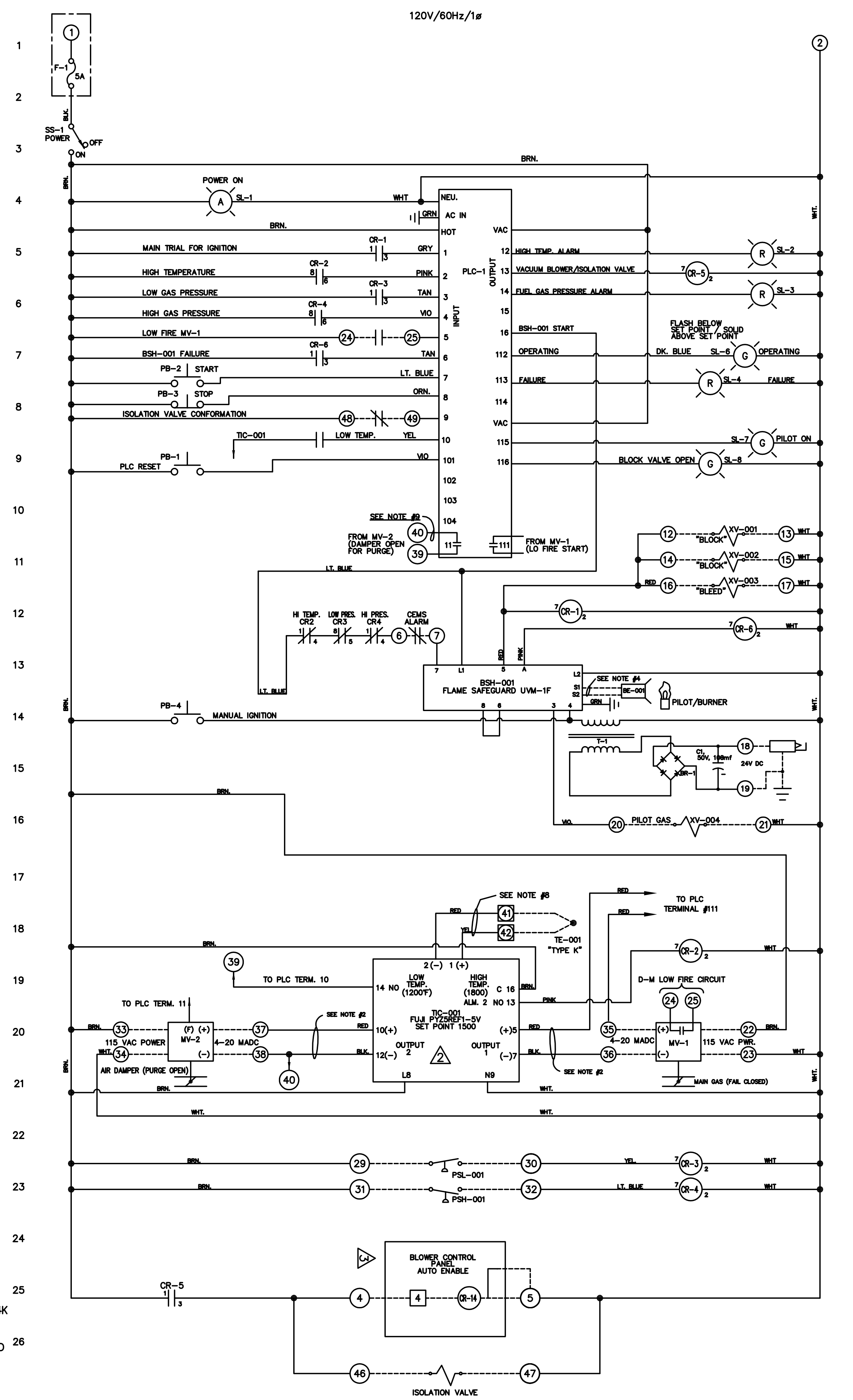
ORDER NO. 45602

DWG.NO. A-10142   REV. 4

ITEM	LINE	DESCRIPTION
PLC-1	5	PLC, ALLEN BRADLEY, SLC150, #1745-LP151
BSH-001	14	FIREYE FLAME CONTROLLER, #UVM-IF, BASE #61-3060
XV-001	11	SOLENOID VALVE, 120VAC/ 60Hz, NORMALLY CLOSED
XV-002	11	SOLENOID VALVE, 120VAC/ 60Hz, NORMALLY CLOSED
XV-003	12	SOLENOID VALVE, 120VAC/ 60Hz, NORMALLY OPEN
XV-004	16	SOLENOID VALVE, 120VAC, 60 Hz, NORMALLY CLOSED
T-1	2	SIGNAL TRANSFORMER, #DP 241 8 16, NAO #90 01000 004 00 00 10
BR-1	25	BRIDGE RECTIFIER, #RS2761185, NAO #92 09912 024 00 00 10
C-1	14	CAPACITOR, 100mf, 50 VOLT NAO #92 09912 026 00 00 10
TIC-001	21	PROCESS CONTROLLER, FUJI #PYZ5REF1-5V
PSH-001	25	PRESSURE SWITCHES, DWYER, TYPE 1950-50 HIGH PRESSURE
		SET @ 25 PSI, LOW PRESSURE SET @ 15 PSI
PB-1	13	PUSH BUTTON, CUTLER-HAMMER #10250T101 w/ 2 CONTACT BLOCKS
		ONE (1NO), CUTLER HAMMER #10250T53 & ONE (2 NO) #10250T2
PB-2	9	PUSH BUTTON, CUTLER-HAMMER #10250T101 w/ 1 CONTACT BLOCK
		(1NO), CUTLER HAMMER #10250T53.
PB-3	9	PUSH BUTTON, CUTLER-HAMMER #10250T102 w/ 1 CONTACT BLOCK
		(1NC), CUTLER HAMMER #10250T51
SS-1	2	SELECTOR SWITCH, 2 POS., MAINTAIN, CUTLER HAMMER #10250T20LB
PB-4		PUSH BUTTON, CUTLER-HAMMER #10250T101 w/ 1 CONTACT BLOCK
	9	(1NO), CUTLER HAMMER #10250T53.

ITEM	LINE	DESCRIPTION
CR1-6	14,18,31,26	CONTROL RELAY, 8-PIN, DPDT, IDEC #RR2PULAC120, 120 VAC
MV-1	22	MOTOR VALVE, GAS VALVE, HONEYWELL MODUTROL #M744T1004
MV-2	22	MOTOR VALVE, AIR DAMPER, HONEYWELL MODUTROL #M744T1004
BE-001	14	UV SCANNER, FIREYE UV-2
TE-001	20	THERMOCOUPLE "TYPE K" DUPLEX
TB-1		CONTA-CLIP #RK2.5-4, TYPE #1001.2 (52 PCS.), CONTA-CLIP #TSK2.5-4K,
		TYPE #1203.2 (1 PC.), ENTRELEC FUSE TERM. #115-131.06 (1 PC.) W/ END SECTION #118 624.27
F-1	2	FUSE, 5 AMP, ENTRELEC #8 292.01
SL-1	25	SIGNAL LIGHT, AMBER CUTLER HAMMER #10250TC9N
	14	30 VOLT LAMP "POWER PRESENT" NAO #90 02004 001 00 00 10
SL2-4	14	SIGNAL LIGHT, RED NAO #90 02004 003 00 00 10
	2	120 VOLT LAMP
SL-6	25	SIGNAL LIGHT, APPLETON VAPOR TIGHT FIXTURE #VPA75 w/ VPGL-2GRPL GLOBE
SL7-8	14	SIGNAL LIGHT, GREEN NAO #90 02004 003 00 00 10
	2	120 VOLT LAMP





NOTE: (IF APPLICABLE)

1. WIRE UNIT WITH #16 GA STRANDED, TINNED, COPPER WIRE, TYPE MTW, UNLESS OTHERWISE INDICATED.
2. USE SHIELDED, TWISTED PAIR CABLE BELDEN #8762 OR EQUIV., SHIELDS ARE TO BE GROUNDED AT ONE END ONLY.
3. ---------- EXTERNAL OR FIELD WIRING.
4. PUT PRESSURE RELIEF PAD ON WIRES TO CABINET COVER.
5. USE EXTENSION GRADE, TYPE "K" THERMOCOUPLE CABLE.
6. AUXILIARY CONTACTS WILL BE OPEN WHEN STARTERS ARE OFF
7. CUSTOMER TO SUPPLY MOTOR FUSING AND DISCONNECT.
8. TERMINAL BLOCK DESCRIPTIONS:
   - = FUSE BLOCK, ENTRELEC #115-131.06 W/ END SECTION ENTRELEC #118 624.27
   - = TERMINAL BLOCK, CONTA-CLIP #RK2.5-4
   - = TERMINAL BLOCK, CONTA-CLIP #TSK2.5-4K (THERMOCOUPLES)
9. THE 30 SEC. OF UNIT PURGE IS CARRIED OUT BY THE PLC.

RUST REMEDIAL SERVICES INC.

WIRING DIAGRAM
NVCU CONTROL PANEL

DWN. DM DATE 3/25/93 CKD. JG CAS APPD. CAS SCALE N/A

REFERENCE DRAWINGS: A-10224

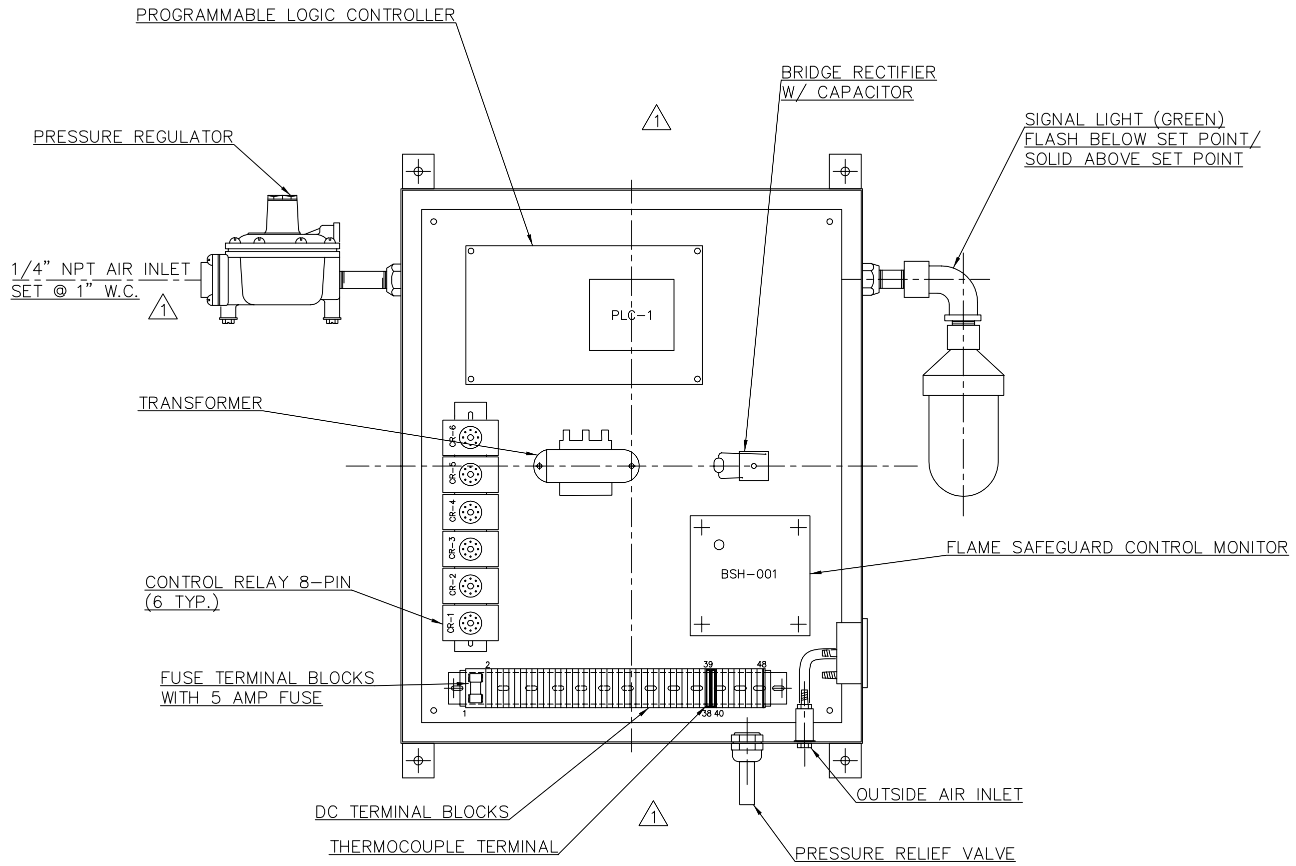
NAO Inc.

ISO 9001 QUALITY SYSTEM CERTIFIED

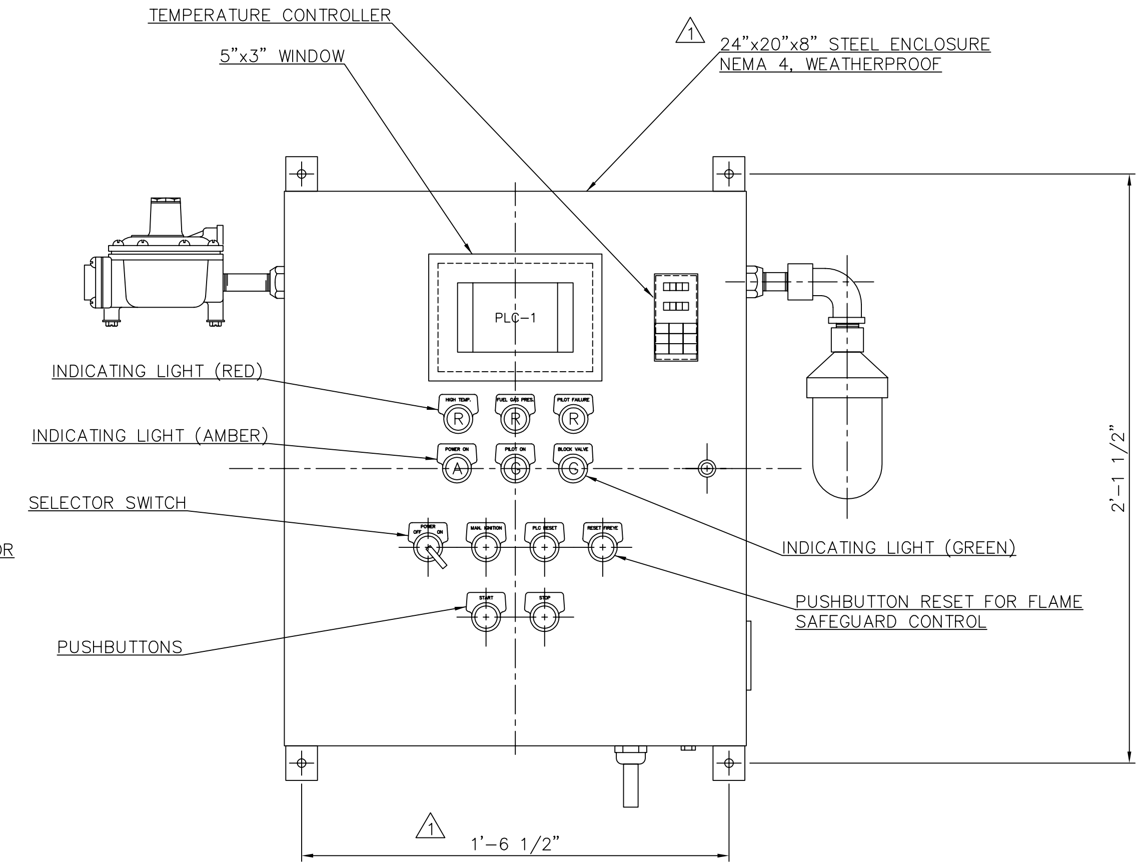
REV	DESCRIPTION	APPD.	BY	DATE
3	TERMINALS 4 & 5 WERE TO BLOWER STARTER CONTACTS. ADDED TO 48 WASTE GAS VALVE CLOSED AT TERMINAL 48. ADDED BLOWER CONTROL PANEL AUTO ENABLED.		DLH	8/22/95
2	TIC-001 WAS ... SL 1-5 & SL 7-8 ...	CAS	BC	12-12-94
	NAO REDESIGN	CAS	BC	9/21/94

ORDER NO. 45602

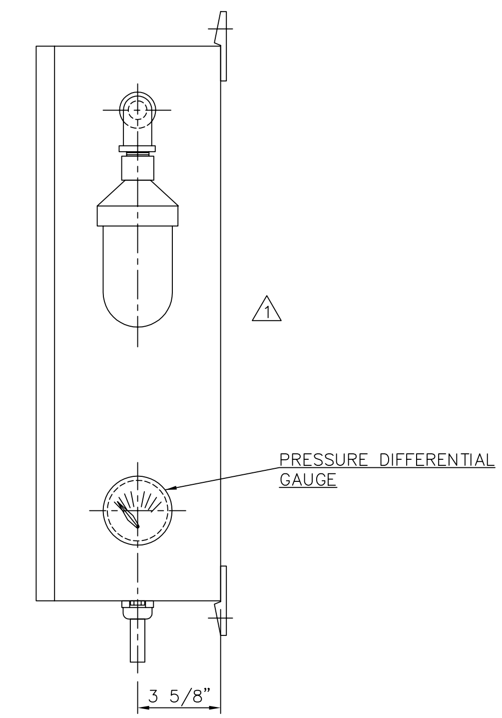
DWG. NO. A-10223 REV. 3



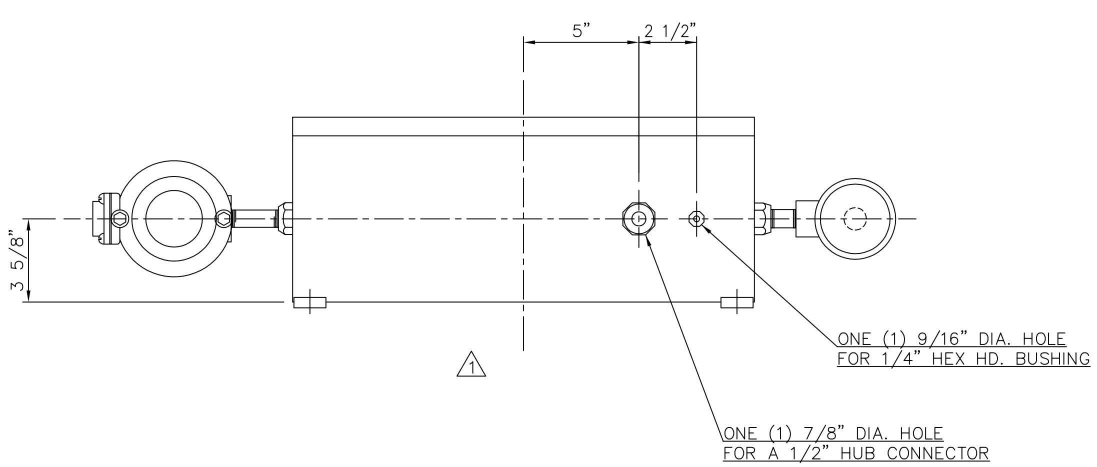
FRONT VIEW WITHOUT COVER



FRONT VIEW



RIGHT SIDE VIEW



BOTTOM VIEW

RUST REMEDIAL SERVICES INC.
P.O. #482658

Unless otherwise specified, all tolerances shall be to NAO DWG. R-11150 Rev.6, finish & paint shall be to NAO DWG. R-10332-ST Rev.20, all hardware shall be to NAO DWG. R-11160 Rev.1, all welding to be per NAO Weld Prodedures

REV	DESCRIPTION	APPD.	BY	DATE
1	CHANGED MATERIAL OF ENCLOSURE FROM A.B.S. ADDED MOUNTING FEET TO ENCLOSURE		BC	11-16-94

REFERENCE DRAWINGS
A-10223 WIRING

THIS DRAWING REMAINS THE PROPERTY OF
NAO Inc.
PHILADELPHIA, PENNSYLVANIA 19134
PHONE: (215) 743-5300 FAX: (215) 743-3018
E-Mail: drafting@nao.com

THE EQUIPMENT AND DESIGNS SHOWN ARE COVERED BY PATENTS AND PATENTS PENDING

ISO 9001 QUALITY SYSTEM CERTIFIED

DATA
HRS-6

DWN.	CKD.	APPD.
BKC		

DATE: 10-12-94
SCALE: 3"=1'-0"

GENERAL ARRANGEMENTS
NVCU (NAO VAPOR CONTROL PANEL WITH EXPLOSIONPROOF Z TYPE PURGE)

ORDER NO. 45602
DWG.NO. A-10224
REV. 1

TAG: SERIAL NO. 45602

APPENDIX L

EPA Comments