SERV

Willbros Government Services, LLC
2087 E. 71st ST
TULSA, OKLAHOMA 74136

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name: Kotry, Justin Stamp: D

Test WPS No.: 1-S-6L Rev.: 0 WPQ No.: JK-S Date: 1/26/2012

Welding process(es) / type(s) used: SMAW / Manual

Type of joint welded: Plate Groove weld Joint type(s) qualified: Groove and Fillet Welds

Base metal(s) welded: SA-36 to SA-36

Welder Variables (QW-350)	Actual Values Used	Range Qualified
P- or S-Number to P- or S-Number	P-No. 1 to P-No. 1	P-1 thru P-15F,P-34 & P-4X
Base metal thickness (in.)	0.375	WPS Limits
Pipe diameter (in.)	N/A	2.875" minimum (n1)
	SMAW / Manual	**SMAW / Manual**
Backing **	No backing used	With or without backing
AWS classification	E6010	
Filler metal specification (SFA)	5.1	5.xx
Filler metal F-No.	3	F 3 (F 1 - F 2 w/backing)
Filler metal product form	N/A	N/A
Consumable insert	N/A	N/A
Deposit thickness (in.) [>= 3 layers]	0.375 [N/A]	0.7500" maximum
Welding position	2G, 3G, & 4G	All Positions
Weld progression	Vertical up and down	Vertical up or down
Backing gas	N/A	N/A

Machine Welding Variables (QW-360)	Actual Values Used	Range Qualified
Direct / remote visual control	N/A	N/A
Automatic voltage control	N/A	N/A
Automatic joint tracking	N/A	N/A
Welding position	N/A	N/A
Consumable insert	N/A	N/A
Backing **	N/A	N/A
Single / multiple pass per side	N/A	N/A

Fillet Welds: Qualified to make fillet welds of any size on all base material thicknesses and pipe diameters of any size.
** Welds with backing include fillets and double-welded groove welds.
Notes: (n1) Pipe with O.D. <= 24" limited to flat rotated & horizontal.

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.2 Side bend	Satisfactory	QW-462.2 Side bend	Satisfactory
QW-462.2 Side bend	Satisfactory	QW-462.2 Side bend	Satisfactory
QW-462.2 Side bend	Satisfactory	QW-462.2 Side bend	Satisfactory

Visual examination results: Visual exam satisfactory per QW-302.4 and QW-194

Volumetric test results: None

Welding test conducted by: Willbros Government Services, LLC

Mechanical/Radiographic tests conducted by: INSERV Lab test no.: W20120201

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Organization: INTEGRATED SERVICE COMPANY, L.L.C.

Certified By: D. Glaves 2/1/2012 Quality Control

David S. Glaves Date

Willbros Government Services, LLC
2087 E. 71st St
TULSA, OKLAHOMA 74136

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name: **Kotry, Justin** Stamp: **D**

Test WPS No.: **1-S-1** Rev.: **0** WPQ No.: **JK-S1** Date: **2/21/2012**

Welding process(es) / type(s) used: SMAW / Manual

Type of joint welded: Plate Groove weld Joint type(s) qualified: Groove and Fillet Welds

Base metal(s) welded: SA-516, Grade 70 to SA-516, Grade 70

Welder Variables (QW-350)	Actual Values Used	Range Qualified
P- or S-Number to P- or S-Number	P-No. 1 to P-No. 1	P-1 thru P-11,P-34 & P-4X
Base metal thickness (in.)	0.5	WPS Limits
Pipe diameter (in.)	N/A	2.875" minimum (n1)
	SMAW / Manual	**SMAW / Manual**
Backing **	No backing used	With or without backing
AWS classification	E7018	
Filler metal specification (SFA)	5.1	5.xx
Filler metal F-No.	4	F 4 (F 1 - F 3 w/backing)
Filler metal product form	N/A	N/A
Consumable insert	N/A	N/A
Deposit thickness (in.) [>= 3 layers]	0.5 [No]	1.0000" maximum
Welding position	2G, 3G, & 4G	All Positions
Weld progression	Vertical up	Vertical up (n4)
Backing gas	N/A	N/A

Machine Welding Variables (QW-360)	Actual Values Used	Range Qualified
Direct / remote visual control	N/A	N/A
Automatic voltage control	N/A	N/A
Automatic joint tracking	N/A	N/A
Welding position	N/A	N/A
Consumable insert	N/A	N/A
Backing **	N/A	N/A
Single / multiple pass per side	N/A	N/A

Fillet Welds: Qualified to make fillet welds of any size on all base material thicknesses and pipe diameters of any size.
** Welds with backing include fillets and double-welded groove welds.
Notes: (n1) Pipe with O.D. <= 24" limited to flat rotated & horizontal.
(n4) The root pass, when removed to sound weld metal in preparation for welding the second side, and the cover or wash pass may be up or down.

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
None		None	
None		None	
None		None	

Visual examination results: Visual exam satisfactory per QW-302.4 and QW-194

Radiographic test results: Acceptable Per QW-302.2 and QW-191

Welding test conducted by: Willbros Government Services, LLC

Mechanical/Radiographic tests conducted by: Pacific Island Inspection Lab test no.: JSO3272012C

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Organization: Willbros Government Services, LLC

Certified By: T. Anderson 3/27/2012 Date Quality Control

VISUAL INSPECTION & TESTING (VT) LEVEL II CERTIFICATION

THIS IS TO CERTIFY THAT:

Justin Kotry

HAS SUCCESSFULLY COMPLETED

Visual Inspection & Testing (VT) Level II Technician / Competent Person

THE CANDIDATE HAS SUCCESSFULLY COMPLETED ALL OF THE REQUIREMENTS FOR API650/653 & ASNT SNT-TC-1A TRAINING.

WILLBROS

Corporate ASNT Lvl III
Willbros Government Services, LLC

2/29/2012
Date

PENETRANT TESTING (PT)
LEVEL II CERTIFICATION

THIS IS TO CERTIFY THAT:

Justin Kotry

HAS SUCCESSFULLY COMPLETED

Liquid Color Contrast Dye Penetrant Testing (PT) Level II Technician / Competent Person

THE CANDIDATE HAS SUCCESSFULLY COMPLETED ALL OF THE REQUIREMENTS FOR API 650/653 & ASNT SNT-TC-1A TRAINING.

WILLBROS

Corporate ASNT LvL III
Willbros Government Services, LLC

2/29/2012
Date

SERV

Willbros Government Services, LLC
2087 E. 71st St
TULSA, OKLAHOMA 74136

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name: Clark, Donald Stamp: C

Test WPS No.: 1-M-1L Rev.: 0 WPQ No.: DC-M Date: 12/14/2011

Welding process(es) / type(s) used: GMAW / Semiautomatic

Type of joint welded: Plate Groove weld Joint type(s) qualified: Groove and Fillet Welds

Base metal(s) welded: SA-36 to SA-36

Welder Variables (QW-350)	Actual Values Used	Range Qualified
P- or S-Number to P- or S-Number	P-No. 1 to P-No. 1	P-1 thru P-15F,P-34 & P-4X
Base metal thickness (in.)	0.5	WPS Limits
Pipe diameter (in.)	N/A	2.875" minimum (n1)
	GMAW / Semiauto	GMAW / Semiauto
Backing **	No backing used	With or without backing
AWS classification	ER70S-3	
Filler metal specification (SFA)	5.18	5.xx
Filler metal F-No.	6	F-No. 6
Filler metal product form	N/A	N/A
Consumable insert	N/A	N/A
Deposit thickness (in.) [>= 3 layers]	0.5 [No]	1.0000" maximum
Welding position	2G, 3G, & 4G	All Positions
Weld progression	Vertical up	Vertical up (n4)
Backing gas	No backing gas used	With or Without backing gas
GMAW / FCAW transfer mode	Spray arc	Spray, Pulsed, or Globular

Machine Welding Variables (QW-360)	Actual Values Used	Range Qualified
Direct / remote visual control	N/A	N/A
Automatic voltage control	N/A	N/A
Automatic joint tracking	N/A	N/A
Welding position	N/A	N/A
Consumable insert	N/A	N/A
Backing **	N/A	N/A
Single / multiple pass per side	N/A	N/A

Fillet Welds: Qualified to make fillet welds of any size on all base material thicknesses and pipe diameters of any size.
** Welds with backing include fillets and double-welded groove welds.
Notes: (n1) Pipe with O.D. <= 24" limited to flat rotated & horizontal.
(n4) The root pass, when removed to sound weld metal in preparation for welding the second side, and the cover or wash pass may be up or down.

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.2 Side bend	Satisfactory	QW-462.2 Side bend	Satisfactory
QW-462.2 Side bend	Satisfactory	QW-462.2 Side bend	Satisfactory
QW-462.2 Side bend	Satisfactory	QW-462.2 Side bend	Satisfactory

Visual examination results: Visual exam satisfactory per QW-302.4 and QW-194

Volumetric test results: None

Welding test conducted by: Willbros Government Services, LLC

Mechanical/Radiographic tests conducted by: INSERV Lab test no.: W20120104

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Organization: INTEGRATED SERVICE COMPANY, L.L.C.

Certified By: D. Glaves 1/4/2012 Quality Control
David S. Glaves Date

INSERV

A WILLBROS COMPANY

Willbros Government Services, LLC
2087 E. 71st St
TULSA, OKLAHOMA 74136

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name: **Clark, Donald** Stamp: **C**

Test WPS No.: **1-S-1** Rev.: **0** WPQ No.: **DC-S1** Date: **2/21/2012**

Welding process(es) / type(s) used: SMAW / Manual

Type of joint welded: Plate Groove weld Joint type(s) qualified: Groove and Fillet Welds

Base metal(s) welded: SA-516, Grade 70 to SA-516, Grade 70

Welder Variables (QW-350)	**Actual Values Used**	**Range Qualified**
P- or S-Number to P- or S-Number	P-No. 1 to P-No. 1	P-1 thru P-11,P-34 & P-4X
Base metal thickness (in.)	0.5	WPS Limits
Pipe diameter (in.)	N/A	2.875" minimum (n1)
	SMAW / Manual	**SMAW / Manual**
Backing **	No backing used	With or without backing
AWS classification	E7018	
Filler metal specification (SFA)	5.1	5.xx
Filler metal F-No.	4	F 4 (F 1 - F 3 w/backing)
Filler metal product form	N/A	N/A
Consumable insert	N/A	N/A
Deposit thickness (in.) [>= 3 layers]	0.5 [No]	1.0000" maximum
Welding position	2G & 4G	Flat, Horizontal, & Overhead
Weld progression	N/A	N/A
Backing gas	N/A	N/A

Machine Welding Variables (QW-360)	**Actual Values Used**	**Range Qualified**
Direct / remote visual control	N/A	N/A
Automatic voltage control	N/A	N/A
Automatic joint tracking	N/A	N/A
Welding position	N/A	N/A
Consumable insert	N/A	N/A
Backing **	N/A	N/A
Single / multiple pass per side	N/A	N/A

Fillet Welds: Qualified to make fillet welds of any size on all base material thicknesses and pipe diameters of any size.
** Welds with backing include fillets and double-welded groove welds.
Notes: (n1) Pipe with O.D. <= 24" limited to flat rotated & horizontal.

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
None		None	
None		None	
None		None	

Visual examination results: Visual exam satisfactory per QW-302.4 and QW-194

Radiographic test results: Acceptable Per QW-302.2 and QW-191

Welding test conducted by: Willbros Government Services, LLC

Mechanical/Radiographic tests conducted by: Pacific Island Inspection Lab test no.: JSO3272012B

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Organization: Willbros Government Services, LLC

Certified By: T. Anderson 3/27/2012 Date Quality Control

VISUAL INSPECTION & TESTING (VT) LEVEL II CERTIFICATION

THIS IS TO CERTIFY THAT:

Donald Clark

HAS SUCCESSFULLY COMPLETED

Visual Inspection & Testing (VT) Level II Technician / Competent Person

THE CANDIDATE HAS SUCCESSFULLY COMPLETED ALL OF THE REQUIREMENTS FOR API650/653 & ASNT SNT-TC-1A TRAINING.

WILLBROS

Corporate ASNT LvL III
Willbros Government Services, LLC

9/30/2011
Date

PENETRANT TESTING (PT)
LEVEL II CERTIFICATION

THIS IS TO CERTIFY THAT:

Donald Clark

HAS SUCCESSFULLY COMPLETED

Liquid Color Contrast Dye Penetrant Testing (PT) Level II Technician / Competent Person

THE CANDIDATE HAS SUCCESSFULLY COMPLETED ALL OF THE REQUIREMENTS FOR API650/653 & ASNT SNT-TC-1A TRAINING.

WILLBROS

Corporate ASNT LvL III
Willbros Government Services, LLC

9/30/2011
Date

SERV

Willbros Government Services, LLC
2087 E. 71st St
TULSA, OKLAHOMA 74136

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name: Chapman, Robert Stamp: B
Test WPS No.: 1-M-1L Rev.: 0 WPQ No.: RC-M Date: 12/14/2011
Welding process(es) / type(s) used: GMAW / Semiautomatic
Type of joint welded: Plate Groove weld Joint type(s) qualified: Groove and Fillet Welds
Base metal(s) welded: SA-36 to SA-36

Welder Variables (QW-350)	Actual Values Used	Range Qualified
P- or S-Number to P- or S-Number	P-No. 1 to P-No. 1	P-1 thru P-15F,P-34 & P-4X
Base metal thickness (in.)	0.5	WPS Limits
Pipe diameter (in.)	N/A	2.875" minimum (n1)
	GMAW / Semiauto	**GMAW / Semiauto**
Backing **	No backing used	With or without backing
AWS classification	ER70S-3	
Filler metal specification (SFA)	5.18	5.xx
Filler metal F-No.	6	F-No. 6
Filler metal product form	N/A	N/A
Consumable insert	N/A	N/A
Deposit thickness (in.) [>= 3 layers]	0.5 [No]	1.0000" maximum
Welding position	2G, 3G, & 4G	All Positions
Weld progression	Vertical up	Vertical up (n4)
Backing gas	No backing gas used	With or Without backing gas
GMAW / FCAW transfer mode	Spray arc	Spray, Pulsed, or Globular

Machine Welding Variables (QW-360)	Actual Values Used	Range Qualified
Direct / remote visual control	N/A	N/A
Automatic voltage control	N/A	N/A
Automatic joint tracking	N/A	N/A
Welding position	N/A	N/A
Consumable insert	N/A	N/A
Backing **	N/A	N/A
Single / multiple pass per side	N/A	N/A

Fillet Welds: Qualified to make fillet welds of any size on all base material thicknesses and pipe diameters of any size.
** Welds with backing include fillets and double-welded groove welds.
Notes: (n1) Pipe with O.D. <= 24" limited to flat rotated & horizontal.
(n4) The root pass, when removed to sound weld metal in preparation for welding the second side, and the cover or wash pass may be up or down.

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
QW-462.2 Side bend	Satisfactory	QW-462.2 Side bend	Satisfactory
QW-462.2 Side bend	Satisfactory	QW-462.2 Side bend	Satisfactory
QW-462.2 Side bend	Satisfactory	QW-462.2 Side bend	Satisfactory

Visual examination results: Visual exam satisfactory per QW-302.4 and QW-194
Volumetric test results: None
Welding test conducted by: Willbros Government Services, LLC
Mechanical/Radiographic tests conducted by: INSERV Lab test no.: W20120104

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Organization: INTEGRATED SERVICE COMPANY, L.L.C.

Certified By: D. Galves 1/4/2012 QC Manager
David S. Galves Date

INSERV

Willbros Government Services, LLC
2087 E. 71st St
TULSA, OKLAHOMA 74136

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name: **Chapman, Robert** Stamp: **B**

Test WPS No.: **1-S-1** Rev.: **0** WPQ No.: **RC-S1** Date: **2/21/2012**

Welding process(es) / type(s) used: SMAW / Manual

Type of joint welded: Plate Groove weld Joint type(s) qualified: Groove and Fillet Welds

Base metal(s) welded: SA-516, Grade 70 to SA-516, Grade 70

Welder Variables (QW-350)	Actual Values Used	Range Qualified
P- or S-Number to P- or S-Number	P-No. 1 to P-No. 1	P-1 thru P-15F,P-34 & P-4X
Base metal thickness (in.)	0.5	WPS Limits
Pipe diameter (in.)	N/A	2.875" minimum (n1)
	SMAW / Manual	**SMAW / Manual**
Backing **	No backing used	With or without backing
AWS classification	E7018	
Filler metal specification (SFA)	5.1	5.xx
Filler metal F-No.	4	F 4 (F 1 - F 3 w/backing)
Filler metal product form	N/A	N/A
Consumable insert	N/A	N/A
Deposit thickness (in.) [>= 3 layers]	0.5 [No]	1.0000" maximum
Welding position	2G, 3G, & 4G	All Positions
Weld progression	Vertical up	Vertical up (n4)
Backing gas	N/A	N/A

Machine Welding Variables (QW-360)	Actual Values Used	Range Qualified
Direct / remote visual control	N/A	N/A
Automatic voltage control	N/A	N/A
Automatic joint tracking	N/A	N/A
Welding position	N/A	N/A
Consumable insert	N/A	N/A
Backing **	N/A	N/A
Single / multiple pass per side	N/A	N/A

Fillet Welds: Qualified to make fillet welds of any size on all base material thicknesses and pipe diameters of any size.

** Welds with backing include fillets and double-welded groove welds.

Notes: (n1) Pipe with O.D. <= 24" limited to flat rotated & horizontal.

(n4) The root pass, when removed to sound weld metal in preparation for welding the second side, and the cover or wash pass may be up or down.

Guided Bend Test (QW-160)

Figure Number and Type	Result	Figure Number and Type	Result
None		None	
None		None	
None		None	

Visual examination results: Visual exam satisfactory per QW-302.4 and QW-194

Volumetric test results: Acceptable Per QW-302.2 and QW-191

Welding test conducted by: Willbros Government Services, LLC

Mechanical/Radiographic tests conducted by: Pacific island Inspection - RT Lab test no.: JSO3272012A

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Organization: Willbros Government Services, LLC

Certified By: T. Anderson 3/27/2012 Date Quality Control

PENETRANT TESTING (PT)
LEVEL II CERTIFICATION

THIS IS TO CERTIFY THAT:

Robert Chapman

HAS SUCCESSFULLY COMPLETED

Liquid Color Contrast Dye Penetrant Testing (PT) Level II Technician / Competent Person

THE CANDIDATE HAS SUCCESSFULLY COMPLETED ALL OF THE REQUIREMENTS FOR API650/653 & ASNT SNT-TC-1A TRAINING.

WILLBROS

Corporate ASNT Lvl III
Willbros Government Services, LLC

11/30/2010
Date

VISUAL INSPECTION & TESTING (VT) LEVEL II CERTIFICATION

THIS IS TO CERTIFY THAT:

Robert Chapman

HAS SUCCESSFULLY COMPLETED

Visual Inspection & Testing (VT) Level II Technician / Competent Person

THE CANDIDATE HAS SUCCESSFULLY COMPLETED ALL OF THE REQUIREMENTS FOR API650/653 & ASNT SNT-TC-1A TRAINING.

WILLBROS

Corporate ASNT Lvl III
Willbros Government Services, LLC

10/29/2010
Date

Willbros Government Services, LLC.
DAILY PRODUCTON REPORT
(ATTACH ADDITIONAL SHEETS IF NECESSARY)

				DATE:	16 January 2013
CONTRACT #: WGS PROJECT #:	N 62583-09-D-0132/0003 54118	TITLE AND LOCATION: Tank 5 & 17	Red Hill Complex – Pearl Harbor NAVSTA Pearl Harbor, HI	REPORT NO.:	54118
SITE MANAGER:	James Hagen		REPRESENTATIVE:	Marc Steinhebel (NFEXWC – NTR)	
AM WEATHER:	Cloudy	PM WEATHER: Sunny	MAX. TEMP:	79	MIN. TEMP: 70

WORK PERFORMED TODAY

TASK

Willbros Government Services, LLC (WGS) continued performing work activities / task per the NAVFAC Contract N62583-09-D-0132/ Task Order 0003 and approved contract modifications.

TK5 – Fabrication of the new 4" drain line and 3/4 sample line on the exterior of TK 5 is on hold until coating activities are completed.
- A&S began abrasive blasting in TK 5
- NACE inspector Frank Bringas performed final inspection on areas where grinding was done for coating process.
- API inspection was performed by Tim Anderson on areas where grinding was done for coating process.
- WGS continued prepping for TK 5 commissioning once coating activities are complete.

TK 17 – No work in TK 17 today.

SAFETY

SAFETY							
	WAS A JOB SAFETY MEETING HELD THIS DATE?	X	YES		NO	TOTAL WORK HOURS ON THE JOB SITE FOR THIS DATE:	131
	WERE THERE ANY LOST TIME ACCIDENTS THIS DATE?		YES	X	NO		
	WAS CRANE/TRENCHING/SCAFFOLD/HV ELECTRICAL/HIGH WORK DONE?	X	YES		NO	CUMULATIVE TOTAL OF WORK HOURS FROM PREVIOUS REPORTS:	49,965
	WAS HAZARDOUS MATERIAL/WASTE RELEASED INTO THE ENVIRONMENT?		YES	X	NO	TOTAL WORK HOURS FROM START OF CONSTRUCTION:	50,096

LIST SAFETY ACTIONS TAKEN TODAY / SAFETY INSPECTIONS CONDUCTED	Yes	SAFETY REQUIREMENTS HAVE BEEN MET.

WGS observed and monitored the proper PPE was utilized and all expected safety procedures followed.
Federal Fire Dept. has issued hot work permits for designated areas. WGS performed gas testing and continuous monitoring in relevant work areas.

CONCERNS

REMARKS / UNRESOLVED ISSUES / ANY SCHEDULE IMPACTS / PROJECT DELAYS

WGS LABOR SITE SUMMARY

CRAFT / TRADE NAME	EMPLOYER		TIME On Site	TIME Off Site	TOTAL HOURS
Site Manager / Supt.	WGS	James Hagen / John Sebok	12	0	12
Health & Safety Officer (HSO)	WGS	John Sebok / James Hagen	6	0	6
Quality Control Manager (QCM)	WGS	James Hagen	6	0	6
Quality Control Inspector	WGS		0	0	0
Laborer – Cleaning / Civil / Mechanical	WGS		94	0	94
Boilermaker – Fitter / Welder	WGS		0	0	0
Piping - Fitter / Welder	WGS		0	0	0
Clerical	WGS		8	0	8
API / QC Inspector	WGS		5	0	5
NDE Inspector / Tech	WGS		0	0	0

EQUIPMENT / MATERIAL RECEIVED TODAY TO BE INCORPORATED INTO WORK

DESCRIPTION	QUANTITY	SHIPPING DOCUMENTS
Consumable / Tools / Supplies	Lot	Onsite

WGS CONSTRUCTION AND PLANT EQUIPMENT ON THE JOB SITE TODAY

DESCRIPTION	IDLE	RENTED /OWNED	QUANTITY	On Site HRS	Off Site HRS	TOTAL HOURS
Trucks / Vehicles / Golf Cart		O-4/R-2	6	10		10
Office Trailer & Conexes (2) & Hand Tools & Equipment		O	Lot	10		10
Booms & Jacking Stands		O	Lot	10		10
Air Compressors		R	2	10		10
Forklift		R	1	10		10
Welding machines		O	2	10		10

SUBCONTRACTORS ONSITE TODAY

COMPANY	# OF PERSONNEL	WORK PERFORMED
Abhe & Svoboda	5	Dust collection fabrication
CSI	1	NACE Inspector

GENERAL COMMENTS / REMARKS

Site Visitor's – [redacted]

A&S began abrasive blasting in TK 5
NACE inspector Frank Bringas performed final inspection on areas where grinding was done for coating process to ensure all weld spatter had been removed. Two areas of concern were noted and Abhe & Svoboda addressed these areas prior to starting the abrasive blasting.
API inspection was performed by Tim Anderson on areas where grinding was done for coating process to ensure wall thickness was acceptable. No concerns were noted.

James Hagen	Joe Gilbert	16 January 2013
Printed Name – Site Manager	Printed Name – Project Manager	Date

CONTRACT ORDER NO.:	CONTRACTOR QUALITY CONTROL REPORT (ATTACH ADDITIONAL SHEETS)	REPORT NO.:	DATE:
N 62583-09-D-0132/0003 Tank 5 & 17		54118	16 January 2013

PHASE	Y=YES, N=NO, SEE REMARKS; BLANK-NOT APPLICABLE		IDENTIFY DEFINABLE FEATURE OF WORK LOCATION AND LIST PERSONNEL PRESENT
PREPARATORY	THE PLANS AND SPECS HAVE BEEN REVIEWED	Y	Work Location: ADIT 4 & 5 / Tank 5 & 17 Pre-Work Evaluation/Site Preparation: **TK 5** – LOTO of piping connections and tie-ins **TK 17** – -LOTO of piping connections and tie-ins -Ventilation of tank
	THE SUBMITTALS HAVE BEEN APPROVED.	Y	
	MATERIALS COMPLY WITH APPROVED SUBMITTALS.	Y	
	MATERIALS ARE STORED PROPERLY.	Y	
	PRELIMINARY WORK WAS DONE CORRECTLY.	Y	
	TESTING PLAN HAS BEEN REVIEWED.	Y	
	WORK METHOD AND SCHEDULE DISCUSSED	Y	

PHASE	Y=YES, N=NO, SEE REMARKS; BLANK-NOT APPLICABLE		Work Location & Task:	TESTING PERFORMED & WHO PERFORMED TEST
INITIAL	PRELIMINARY WORK WAS DONE CORRECTLY	Y	**Tank 5 –** Abrasive Blasting Grinding weld spatter **Tank 17 –** Tell-tale repairs	NACE pre blast ins. Frank Bringas CSI API final ins. before coating. Tim Anderson WGS None
	SAMPLE HAS BEEN PREPARED / APPROVED.	X		
	WORKMANSHIP IS SATISFACTORY.	Y		
	TEST RESULTS ARE ACCEPTABLE.	Y		
	WORK IS IN COMPLIANCE WITH THE CONTRACT.	Y		

PHASE	Y=YES, N=NO, SEE REMARKS; BLANK-NOT APPLICABLE			TESTING PERFORMED & WHO PERFORMED TEST
FOLLOW UP	WORK COMPLIES WITH CONTRACT AS APPROVED IN INITIAL PHASE.			None
	NO REPAIRS OR REWORK NECESSARY			

REWORK ITEMS IDENTIFIED TODAY
(NOT CORRECTED BY CLOSE OF BUSINESS)

REWORK ITEMS CORRECTED TODAY
(FROM REWORK ITEMS LIST)

Remarks:

ON BEHALF OF THE CONTRACTOR, I CERTIFY THIS REPORT IS COMPLETE AND CORRECT AND EQUIPMENT AND MATERIAL USED AND WORK PERFORM DURING THIS REPORTING PERIOD IS IN COMPLIANCE WITH THE CONTRACT DRAWINGS AND SPECIFICATIONS TO THE BEST OF KNOWLEDGE EXCEPT IN THIS REPORT.

James Hagen	James Hagen	16 January 2013
PRINT NAME OF SITE MANAGER	PRINTED NAME OF AUTHORIZED QC MANAGER	DATE

GOVERNMENT QUALITY ASSURANCE REPORT | DATE

QUALITY ASSURANCE REPRESENTATIVE'S REMARKS AND/OR EXCEPTIONIS TO THE REPORT

PRINT NAME OF GOVERNMENT QA REPRESENTATIVE	GOVERNMENT QA REPRESENTATIVE	DATE

PROJECT TITLE
Clean, Inspect and Repair Fuel Tanks
Redhill Complex, Pearl Harbor HI

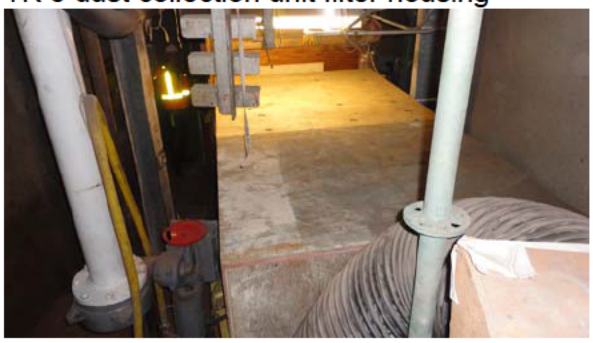
SITE PHOTOGRAPHS

.

TK 5 dust collection unit blower motor

Lower tunnel conditions during blasting

TK 5 dust collection unit filter housing



Lower tunnel conditions during blasting

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING AND EXPEDITIONARY WARFARE CENTER
1000 23RD AVENUE
PORT HUENEME CA 93043-4301

N REPLY REFER TO:
4200/AQ71
SER 0228
4 FEB 2014

WILLBROS GOVERNMENT SERVICES (U.S.), LLC
Attn: Rick Grossman
2087 E 71ST STE 101
Tulsa, OK, 74136-5462

Dear Mr. Grossman:

Subject: CONTRACT N62583-09-D-0132 TASK ORDER 0003, CLEAN, INSPECT, REPAIR TANKS 5 AND 17, REDHILL, PEARL HARBOR HAWAII

There is an apparent loss of product in Tank 5 which was repaired under the subject contract task order. After preliminary investigation the Government has determined that the loss of product most likely resulted from a leak caused by defects in material or workmanship in the performance of the task order. I am therefore evoking my remedies under the Warranty of Construction Clause (FAR 52.246-21) and directing Willbros to identify and correct the deficiency(ies) in Tank 5.

Within ten calendar days of receipt of this letter, Willbros shall provide an written work plan that identifies the means, methods and proposed schedule for re-entering Tank 5. Willbros shall also identify any requirements necessary for Willbros to provide Tank 5 access to government personnel, and/or representatives of the Government. Willbros shall not proceed to mobilize or enter the tank until the Work Plan is accepted by the Government and a Notice to Proceed is issued by the contracting officer.

The preliminary investigation has provided the following information:

- The operators of the tank reported a loss of product during initial filling operations, and the gauging logs show a loss of product over the 30-day period.
- There was a re-appearance of fuel on the lower tunnel wall after the tank was refueled.
- The monitoring well nearest to Tank 5 has shown a significant spike in petroleum products.
- The Government has determined that proper procedures were followed when refilling the tank.
- The Government has determined that the SPAWAR contractor that installed the Automated Fuel Handling Equipment was not performing work that could have damaged the tank.

4200/AQ71
SER 0228
4 Feb 2014

If, during the course of any inspections or other work on the tank, Willbros determines that the leak was caused by reasons other than defective materials or workmanship provided by Willbros, you are directed to stop all further inspections and immediately notify the contracting officer.

If you have any questions please contact me at (b) (6) [redacted] or (805)382-3140.

Sincerely,

[redacted] (b) (6) [redacted]

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING AND EXPEDITIONARY WARFARE CENTER
1000 23RD AVENUE
PORT HUENEME CA 93043-4301

IN REPLY REFER TO:

4200/AQ72
SER 0016
16 Oct 2014

WILLBROS GOVERNMENT SERVICES (U.S.), LLC
Attn: Rick Grossman
2087 E 71ST STE 101
Tulsa, OK, 74136-5462

Subject: CONTRACT N62583-09-D-0132 TASK ORDER 0003, CLEAN, INSPECT, REPAIR TANKS 5 AND 17, REDHILL, PEARL HARBOR HAWAII; NOTICE TO PROCEED

This notice constitutes a Notice To Proceed (NTP) for the subject project, effective 20 Oct 2014. No work may proceed before that date. This NTP is for the warranty work, specifically the search for free product and inspection of repairs, as detailed in Revision 12 of the work plan.

You are reminded that the work plan has a hold-point (Activity ID #17) for Government review of your findings. No work on repairs may proceed until expressly authorized by the undersigned.

You are requested to submit a CPM schedule update that reflects the change of the start date.

If there are any questions pertaining to this matter, please contact me at [redacted] or via email at [redacted].

[redacted]

WILLBROS GOVERNMENT SERVICES (U.S.), LLC

A WILLBROS COMPANY

12 February 2015

To Whom It May Concern:

Willbros Government Services has completed the Modified API 653 Visual Inspection of TK 5 as described in Section 4.5 PROJECT TASK AND SEQUENCES of the TK 5 Warranty Work Plan. The inspection was performed by WGS QC Manager Matt Halderman, who currently holds API 653 Certification #42276 as well as AWS CWI Certification #08110741.

The results of this Visual Inspection are as follows:

A total of Six Hundred Seventy-Seven (677) previous repair locations were checked in TK 5 per the procedures outlined in the TK 5 Warranty Work Plan Scope of Work (SOW). Five Hundred Sixteen (516) of the previous repair locations failed to meet the acceptance criteria outlined in the SOW.
The remaining One Hundred Sixty-One (161) previous repair locations passed per the acceptance/rejection criteria as described in the SOW. During this process the entire tank was inspected for any other rejectable conditions. Six (6) new locations were flagged for possible rejection and one (1) previous weld repair (WR165) was found in the tank, but was discovered to be missing from the QC Log. The six (6) new locations have been added to the QC Log for future repair and the one (1) old WR has also been inserted into the log in its proper location. The six (6) new locations added to the QC Log are as follows:

Repair Number	Row/Plate	Indication
1. WWP 013	A/28	Gouge needs Plate
2. WWP 014	A/28	Gouge needs Plate
3. WWP 015	B/01	Old Repair (not WGS) needs Plate
4. WWP 016	15/12	Old Repair (not WGS) needs Re-Welded
5. WWP 017	E2/P4	Dent needs Plate
6. WWR 018	C/47	Original Grout Nozzle needs Re-Welded

In summary, WGS rejected 76% of our previous repairs based on our Visual Inspection. The criteria used for rejecting these locations include causes such as Undercut, Underfill, Lack of Fusion, and Excessive Reinforcement or Grinding. As the inspection continues with MT and LT, any new information concerning the currently failed locations will be addressed in future reports.

Should you need more information please feel free to contact me at the number or email below.

Very Respectfully,

James Hagen
Project Manager
Cell: 808-738-6396
E-mail: james.hagen@willbros.com

Matt Halderman
QC Manager
Cell: 918-556-3603
E-mail: matt.halderman@willbros.com

james.hagen@willbros.com

Digitally signed by james.hagen@willbros.com
DN: cn=james.hagen@willbros.com
Date: 2015.02.17 08:53:26 -10'00'

WILLBROS GOVERNMENT SERVICES (U.S.), LLC

A WILLBROS COMPANY

20 August 2015

To Whom It May Concern:

Willbros Government Services has completed the Mag Particle (MT) and Vacuum Box (LT) Inspection of TK 5 as described in Section 4.5 PROJECT TASK AND SEQUENCES of the TK 5 Warranty Work Plan. The inspection was performed by WGS Level II NDE Technicians under the direction of QC Manager Matt Halderman.

The results of this MT and LT Inspection are as follows:

A total of Six Hundred Eighty Two (682) previous repair locations were checked in TK 5 per the procedures outlined in the TK 5 Warranty Work Plan Scope of Work (SOW).Reconciliations were made to the QC Log as discrepancies in numbering were found in comparison to the log dated 12 February 2015. All Six Hundred Eighty Two (682) of the previous repair locations failed to meet the acceptance criteria outlined in the SOW for the MT examination. Four Hundred Fifteen (415) of Four Hundred Seventy Nine (479) locations Passed Vacuum Box Leak Testing (LT), Two Hundred Three (203) locations were unable to be tested due to geometry of the repair. Sixty Four (64) locations failed the Vacuum Bok Leak Test. During this process other welds in close proximity to the WGS repairs were also tested and inspected for any other rejectable conditions. Some locations showed linear indications in the adjacent existing welds; none of these failed the vacuum box test.
All failed locations will be repaired per the API 653 Code specifications as outlined in the WP and all indications in adjacent welds will be covered in this process. Some of the previous repair plates will be completely removed and replaced and some will be repaired by removing a portion of the existing weld and re-welding to an acceptable condition per the code.

In summary, WGS rejected 100% of our previous repairs based on our Mag Particle Inspection.
The upcoming repairs will be made per API 653 Code specifications and weld spacing/plate shape will be addressed on a case by case basis as there are several different configurations that will require different methods to address criteria used for accepting or rejecting these locations.

Should you need more information please feel free to contact me at the number or email below.

Very Respectfully,

James Hagen
Project Manager
Cell: 808-738-6396
E-mail: james.hagen@willbros.com

james.hagen@willbros.com

Digitally signed by james.hagen@willbros.com
DN: cn=james.hagen@willbros.com
Date: 2015.08.20 10:28:51 -10'00'

Matt Halderman
QC Manager
Cell: 918-556-3603
E-mail: matt.halderman@willbros.com

APPENDIX M

PROJECT DATA –
POTENTIAL FREE PRODUCT RECLAMATION PLAN

Distribution is limited to US Government agencies and their contractors; administrative/operational use within the context of this project. Other request shall be referred to the Naval Facilities Engineering Service Center.

RED HILL COMPLEX PROJECT
TANK 5 WARRANTY WORK
IDENTIFICATION / REMOVAL OF POTENTIAL FREE PRODUCT

1.0 IDENTIFICATION / REMOVAL OF POTENTIAL FREE PRODUCT SUMMARY

Willbros Government Services has prepared this procedure under Contract No. N62583-09-D-0132 / TO 003 for warranty work on Tank 5 located at Red Hill Pearl Harbor, HI. This procedure will be utilized to identify potential free product and provide guidance for the removal, storage, and disposal of any potential reclaimed free product thought to have been lost during Tank 5 filling activities.

Note – For any additional information not listed in this document see the WGS WP, specifically the Repair Procedure.

2.1 POTENTIAL FREE PRODUCT- INDENTIFICATION SUMMARY

Due to the underground construction of Tank 5, some of the exterior surfaces are inaccessible for gas free testing and permitting. Areas of the tank's internal steel liner appear to have separated from the concrete encasement surrounding the tank. This condition can allow water, fuel, liquid or vapor, to be trapped in a localized area between the two surfaces. WGS intends to identify potential trapped free product in these areas via Vacuum Box Testing (VBT). This will be conducted to verify the integrity of the repair plate seal welds made to the tanks interior surface, as well as, identifying the existence of free product trapped in that location. All previous repairs performed by WGS will be VBT'd during this process including the 17 failed locations previously identified in the initial inspection. Any area suspected of holding trapped free product, that does not have a repair location suitable for VBT, will be addressed using an alternate method requiring WGS to drill a new inspection port to conduct the test.

The tank is divided into 4 quadrants (A, B, C, D) which identify the tank left to right. The tank is also divided from bottom to top by Lower Dome, Shell or Barrel, Extension Rings, and Upper Dome. WGS intends to drill and/or expose a minimum of 12 inspection ports in the tank liner; 1 port per quadrant for the Extension Rings, Shell or Barrel, and Lower Dome. Due to initial tank filling procedures and gravity WGS does not expect free product to be located in the Upper Dome. Coating will be removed and replaced as-needed on the lower dome.

2.2 FREE PRODUCT IDENTIFICATION PROCEDURE

<u>Free Product Identification – Steps & Sequence</u>

2.2.1 Vacuum Box Testing- During VBT the presence of product being pulled from behind the repair plate or the odor of product after the Vacuum Box is removed from the test area will be recorded in the QC log by the NDE technicians performing the test.

2.2.2 Inspection Port Determination- WGS QC Manager will review the NDE data collected to determine locations for the minimum 12 additional inspection ports, distributed in the tank as described in Section 2.1, based on the NDE data and tank conditions. If the QC manager is unable to satisfy the criteria using existing repairs, he will determine locations for new inspection ports, using the alternate method described in Section 2.1, based on the NDE data and tank conditions e.g., liner separation, leak path, presence of product or odor etc.

2.2.3 Tracking Inspection Ports- WGS will use the QC Log to track the location of each plate removed and/or port drilled for the purpose of identifying potential free product.

2.3 FREE PRODUCT RECLAMATION PROCEDURE

Product Reclamation – Steps & Sequence

2.3.1 Repair Plate Location – If liquid is detected behind a repair plate, a port will be drilled in close proximity to drain any product found at the location.
(See 2.2.3.2 for draining procedure)

2.3.2 Alternate Method: New Inspection Port Location – New locations will be determined by the QC Manager based on Section 2.1, Section 2.2.2 and the NDE data and conditions found in the tank. A port, 1/4" in diameter, will be created in the designated location with a pneumatic drill.

2.3.3 Product Reclamation-

2.2.3.1- **If no liquid is present-** WGS will test the area through the port with a gas monitor and record the readings on the QC log to be reviewed by the QC Manager to determine if further action is required.

2.2.3.2- **Liquid present-** Inspection port will be drilled and tapped to install a threaded valve to allow WGS to perform controlled draining of liquids. During tapping and threading of inspection port WGS will place oil absorbent rags below inspection port to catch any seeping liquid. A 15 gallon DOT drum will be located inside of the man basket and will be the temporary storage container until personnel return to the catwalk and material can be relocated into a larger drum or container. Once gravity flow through the valve has stopped, WGS will attempt to extract any additional accessible liquid with a small vacuum pump (5-10 Hg psig). Liquids will be collected in containers or drums to be evacuated from the tank thru the access tunnel.

2.2.3.3- WGS will track and record the amount collected and disposed of in the QC log. Testing will be performed on any collected liquids to characterize and determine proper disposal procedures, e.g., fuel reclamation or waste. Disposal location and test results will be noted in the QC log. Photos and visual characterizations will be documented in the QC daily reports.

Note –This process will begin at the top of the tank and proceed downward to limit or control the amount of liquids drained from any location where they are encountered. Based on the construction methods and historical data relating to the tank WGS does not expect to find large quantities of product in any single location of the tank. During the process described above, if WGS encounters a quantity of product that is not feasible to drain in the described method, the test/drain port will be plugged and another procedure will be developed based on the location and condition of the area where the product is found.

2.4 Product Inspection Port Repairs

Product inspection port repairs will conform to WGS Work Plan Tank 5 Repair Procedure rev 1D and the following. An area will be marked or laid out a minimum of 1" beyond the inspection port peripheral edge. The entire surface of the marked area will be cleaned to remove all existing coating or debris from the weld area. A groove will be ground into the port in accordance with the WPS joint limits, and then filled with weld, back to base metal thickness. After cleaning the filled groove, a weld overlay will be performed on the repair location. All weld overlays should extend a minimum of 1" horizontally and 1/2" vertically on either side of the affected area designated for overlay.

2.5 Summary

Willbros will perform the above procedures to identify, reclaim, or dispose of any potential free product thought to have been lost during Tank 5 filling activities. Areas identified as inspection ports during the performance of this procedure will be tracked in the QC log, which will be submitted to EXWC with the Inspection Report prior to beginning any tank repairs.

WILLBROS GOVERNMENT SERVICES (U.S.), LLC

A WILLBROS COMPANY

06 November 2014

To Whom It May Concern:

Willbros Government Services has completed the Free Product Reclamation Procedure described in Appendix M of the TK 5 Warranty Work Plan. No free product was located or collected during this recovery operation. A total of thirteen (13) locations were checked in TK 5 per the procedures outlined in Appendix M. Twelve (12) were new locations created in each quadrant and elevation of the tank and one (1) was an existing location uncovered, by the previous removal of a repair plate, during the initial leak investigation inspection. The results of this operation have been recorded in the QC Log and the details are described in the following pages with field notes, sketches and photographs. If free product is encountered in the future, as we continue our inspection and repairs in TK 5, the procedures outlined in Appendix M will be utilized to recover and collect said product and should it occur, this activity will be documented and recorded in the same fashion as described above.

Should you need more information please feel free to contact me at the number or email below.

Very Respectfully,

James Hagen
Project Manager
Willbros Government Services, LLC
Cell: [redacted]
Fax: 918-481-4317
E-mail: james.hagen@willbros.com

Willbros Government Services, (U.S.) LLC
A Willbros Company

Date: 10/30/14
Subject: Potential Free Product Recovery Notes

Summary:

WGS used various criteria to identify and locate Potential Free Product Recovery ports including previous LT testing results, sounding for hollow spots indicating voids between the steel liner and concrete encasement, and the location of previous repairs.

Steps taken were as follows:

1) Determine Port Location
2) Drill Port
3) Test port for presence of hydrocarbons
4) Vacuum drilled port
5) Re-test port for presence of hydrocarbons

*Please see notes below for each port.

001- C1-P2 Lower Dome Quadrant A:
This area was chosen because of its relation to 32” issue / receipt lines exiting the tank to lower level. Sounding located a hollow spot.

1) Course C1 Plate 2
2) Dry / no liquid (1/8” clearance behind plate)
3) Readings: LEL- 4%, O2- 12% VOC- 895 ppm
4) Dry / no liquid
5) Readings: LEL- 0%, O2- 20.9% VOC- 0 ppm

002- C1-P20 Lower Dome Quadrant B:
This area was chosen because of its relation to 18” issue / receipt lines exiting the tank to lower level. Sounding located a hollow spot.

1) Course C1 Plate 20
2) Dry / no liquid (1/8” clearance behind plate)
3) Readings: LEL- 8%, O2- 7% VOC- 963 ppm
4) Dry / no liquid
5) Readings: LEL- 0%, O2- 20.9% VOC- 0 ppm

003- C2-P42 Lower Dome Quadrant C:
This area was chosen because of its position in the tank and sounding located a hollow spot.

1) Course C2 Plate 42
2) Dry / no liquid (1/8” clearance behind plate)
3) Readings: LEL- 7%, O2- 9% VOC- 907 ppm
4) Dry / no liquid
5) Readings: LEL- 0%, O2- 20.9% VOC- 0 ppm

004- C3-P60 Lower Dome Quadrant D:
This area was chosen because of its position in the tank and sounding located a hollow spot.

1) Course C3 Plate 60
2) Dry / no liquid (3/4” clearance behind plate)
3) Readings: LEL- 6%, O2- 13% VOC- 748 ppm
4) Dry / no liquid
5) Readings: LEL- 0%, O2- 20.9% VOC- 0 ppm

005- R8-P12 Barrel Quadrant C/D:
This area was chosen because of its position in the tank, sounding located a hollow spot, plate bulging and relation to previous repair WP403.

1) Course 8 Plate 12
2) Dry / no liquid (1/8” clearance behind plate)
3) Readings: LEL- 7%, O2- 14% VOC- 813 ppm
4) Dry / no liquid
5) Readings: LEL- 0%, O2- 20.9% VOC- 0 ppm

006- R26-P15 Barrel Quadrant D:
This area was chosen because of its position in the tank; sounding located a hollow spot, and relation to previous repairs WP383, WP379, and WP381.

1) Course 26 Plate 15
2) Dry / no liquid (1/4” clearance behind plate)
3) Readings: LEL- 5%, O2- 11% VOC- 827 ppm
4) Dry / no liquid
5) Readings: LEL- 0%, O2- 20.9% VOC- 0 ppm

007- E2-P16 Extension Ring Quadrant D:
This area was chosen because of its position in the tank; sounding located a hollow spot, and relation to previous repairs WP076, WP077, and WP078.

1) Course E2 Plate 16
2) Dry / no liquid (3/4” clearance behind plate)
3) Readings: LEL- 9%, O2- 12% VOC- 984 ppm
4) Dry / no liquid
5) Readings: LEL- 0%, O2- 20.9% VOC- 0 ppm

008- E4-P13 Extension Ring Quadrant C/D:
This area was chosen because of its position in the tank, sounding located a hollow spot, and growth out of WP075.

1) Course E4 Plate 13
2) Dry / no liquid (1/16” clearance behind plate)
3) Readings: LEL- 0%, O2- 19% VOC- 40 ppm
4) Mist of dust & moisture- volume not relevant or collectable
5) Readings: LEL- 0%, O2- 20.9% VOC- 0 ppm

009- A-P68 Upper Dome Quadrant D:
This area was chosen because of previously failed LT which indicated the possible presence of fuel.

1) Course A Plate 68
2) Dry / no liquid (1/16” clearance behind plate)
3) Readings: LEL- 2%, O2- 18% VOC- 300 ppm
4) Mist of dust & moisture- volume not relevant or collectable
5) Readings: LEL- 0%, O2- 20.9% VOC- 0 ppm

010- R3-P3 Barrel Quadrant A:
This area was chosen because of its position in the tank, sounding located a hollow spot, and relation to previous repairs.

1) Course 3 Plate 3
2) Dry / no liquid (1/16” clearance behind plate)
3) Readings: LEL- 7%, O2- 13% VOC- 780 ppm
4) Dry / no liquid
5) Readings: LEL- 0%, O2- 20.9% VOC- 0 ppm

011- R11-P6 Barrel Quadrant B:
This area was chosen because of previous failed LT and repair plate (WP301) had been removed.

1) Course 11 Plate 6
2) Dry / no liquid (1/16” clearance behind plate)
3) Readings: LEL- 6%, O2- 11% VOC- 800 ppm
4) Dry / no liquid
5) Readings: LEL- 0%, O2- 20.9% VOC- 400 ppm

012- E3-P6 Extension Ring Quadrant B:
This area was chosen because of its position in the tank, sounding located a hollow spot, plate bulging and relation to previous repair.

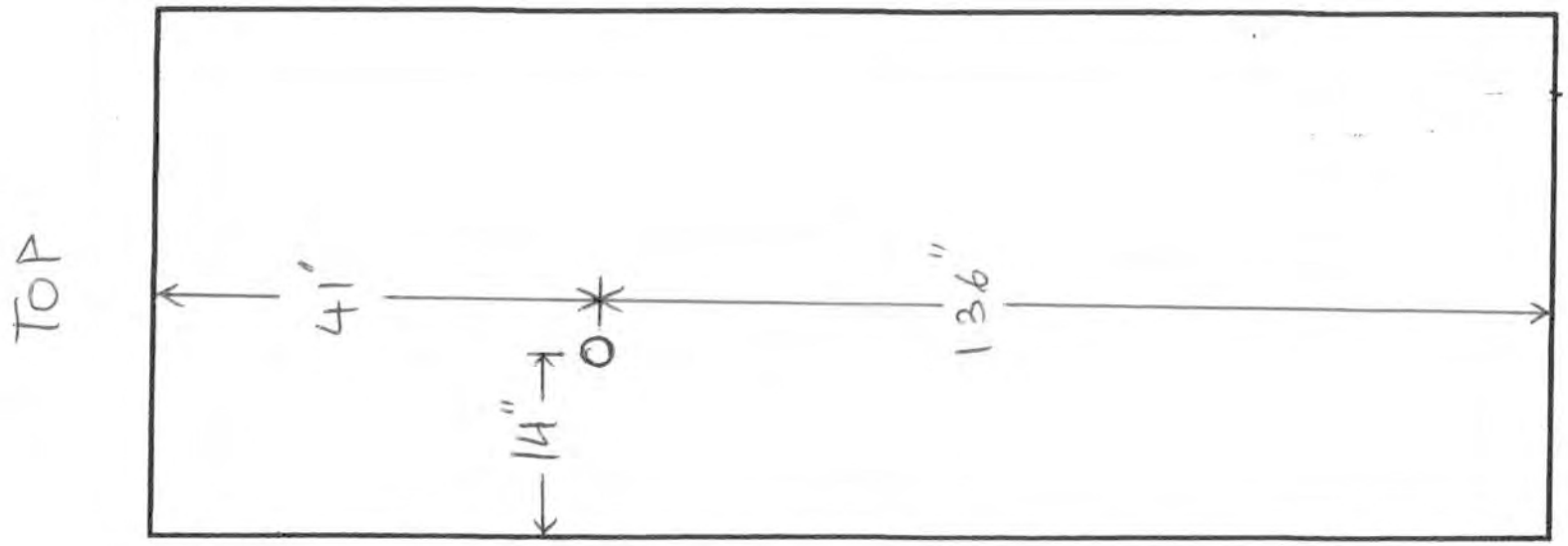
1) Course 11 Plate 6
2) Dry / no liquid (1/8” clearance behind plate)
3) Readings: LEL- 9%, O2- 7% VOC- 1000 ppm
4) Dry / no liquid
5) Readings: LEL- 0%, O2- 20.9% VOC- 39 ppm

013- E2-P13 Extension Ring Quadrant A:
This area was chosen because of its position in the tank, sounding located a hollow spot and relation to previous repair.

1) Course E2 Plate 3
2) Dry / no liquid (1/4” clearance behind plate)
3) Readings: LEL- 4%, O2- 16% VOC- 850 ppm
4) Dry / no liquid
5) Readings: LEL- 0%, O2- 20.9% VOC- 37 ppm

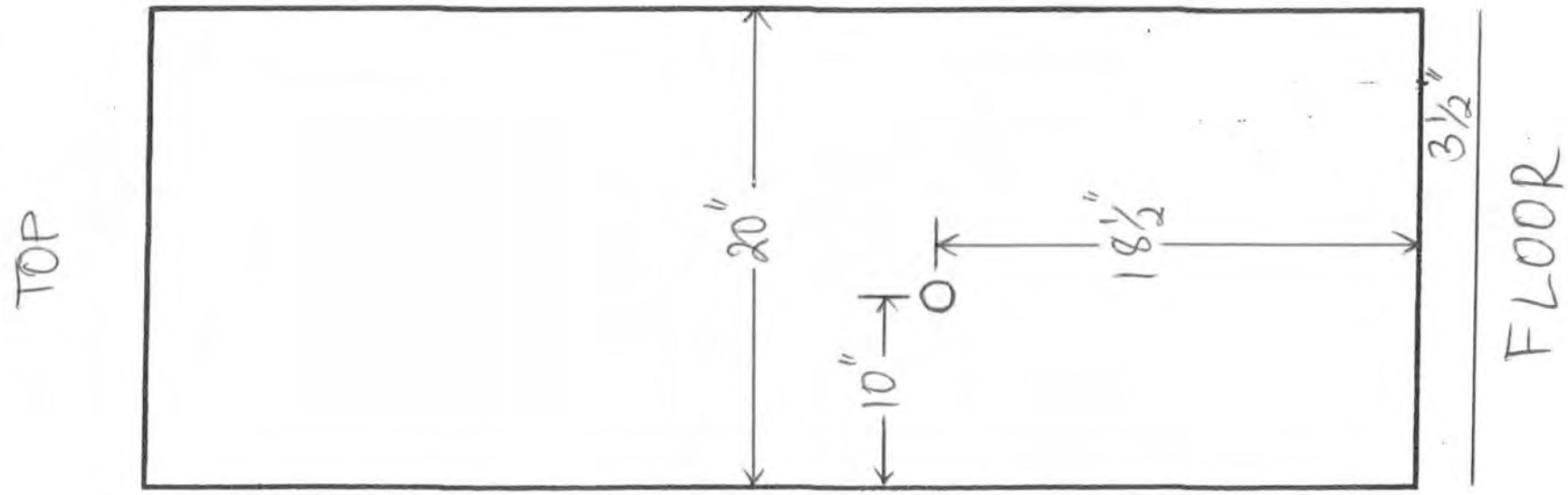
Willbros Government Services

Location:	Red Hill - Tank 5 WW
Location:	Free Product Reclamation Test Ports
Description:	Tank # 5 Row or Course - LOWER DOME C1 Sheet No - 001 Plate 2



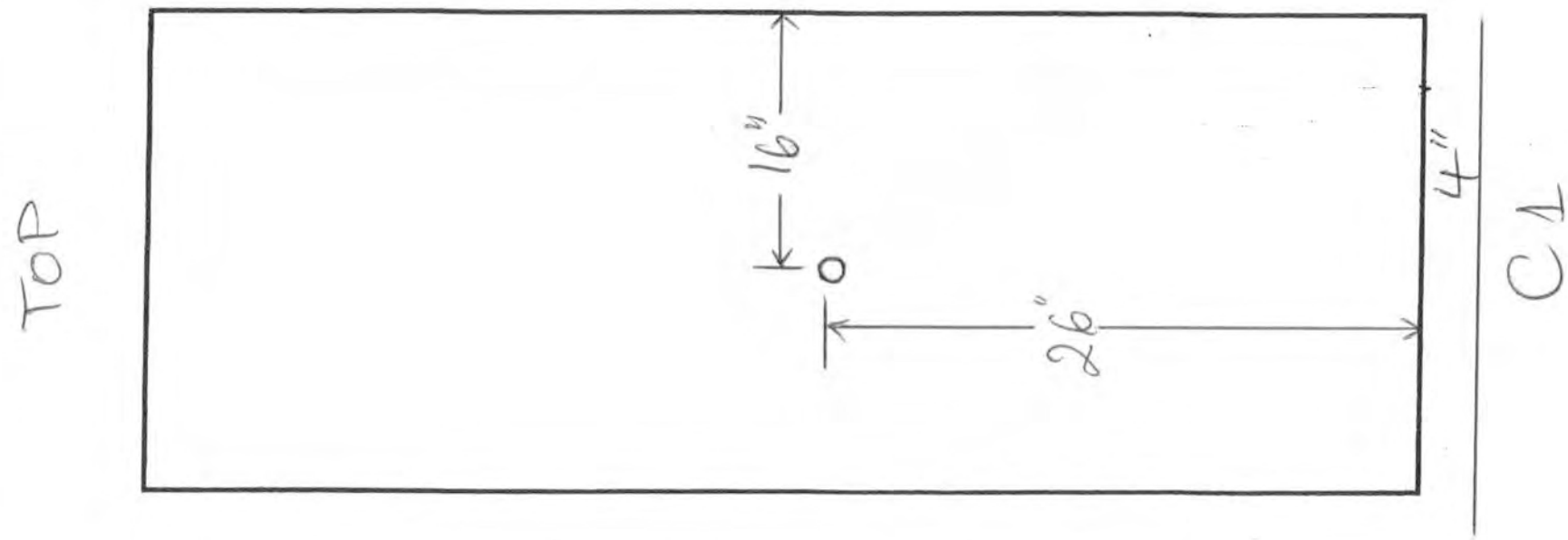
Willbros Government Services

Location:	Red Hill - Tank 5 WW
Location:	Free Product Reclamation Test Ports
Description:	Tank # 5 Row or Course - LOWER DOME C1 Sheet No - 002 Plate 20



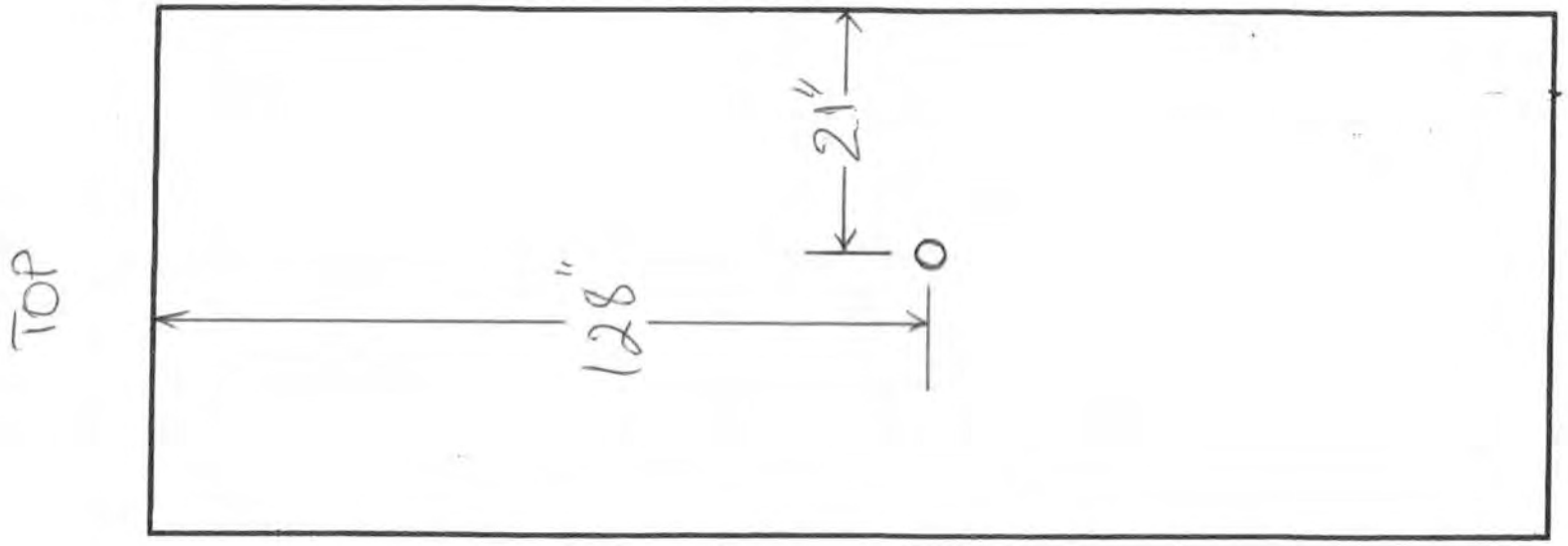
Willbros Government Services

Location:	Red Hill - Tank 5 WW
Location:	Free Product Reclamation Test Ports
Description:	Tank # 5 Row or Course - LD C2 Sheet No - 003 Plate 42



Willbros Government Services

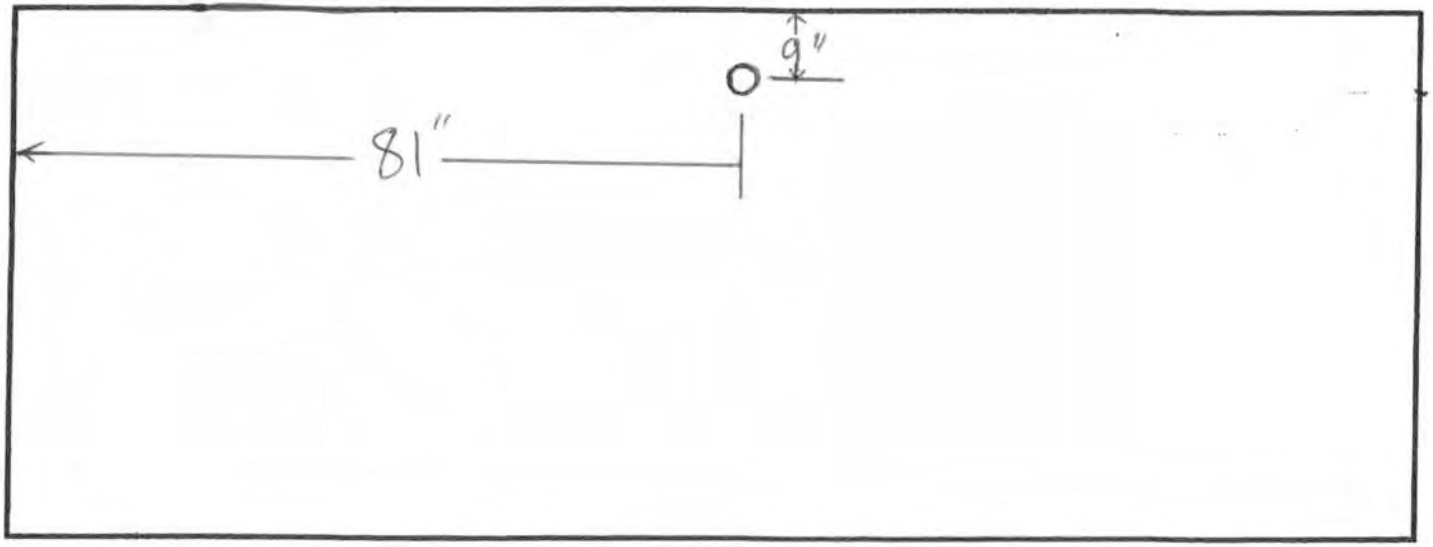
Location:	Red Hill - Tank 5 WW
Location:	Free Product Reclamation Test Ports
Description:	Tank # 5 Row or Course - LOWER DOME C3 Sheet No - 004 Plate 60



Willbros Government Services

Location:	Red Hill - Tank 5 WW
Location:	Free Product Reclamation Test Ports
Description:	Tank # 5 Row or Course - # 8 Sheet No - 005 Plate 12

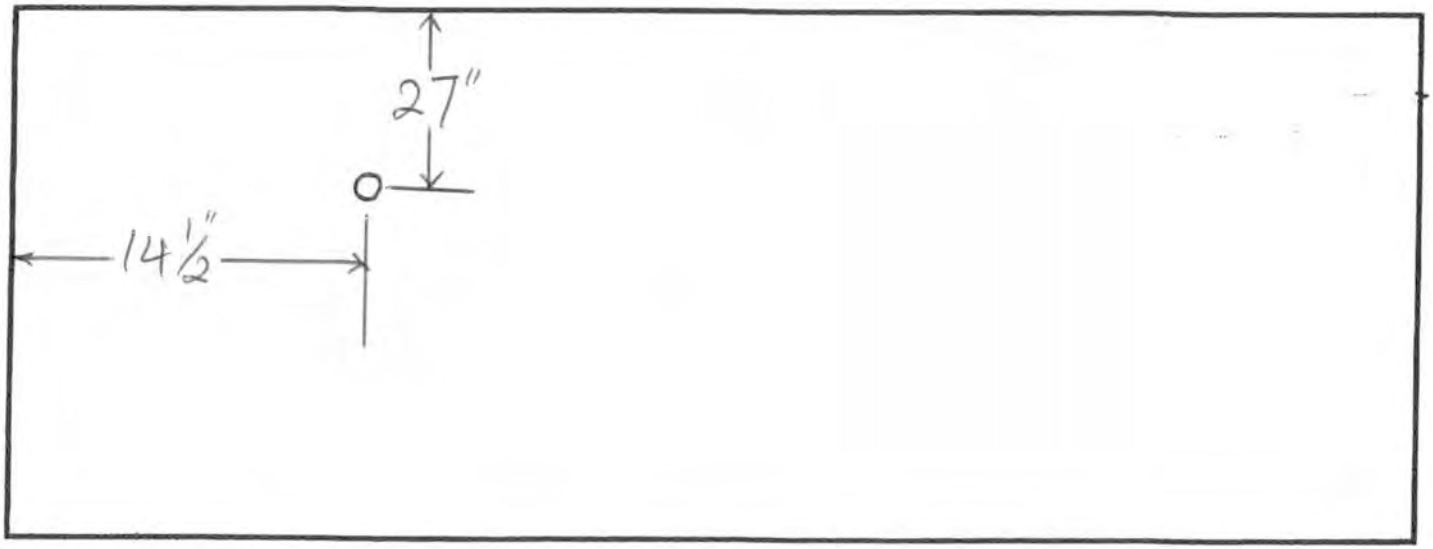
TOP



Willbros Government Services

Location:	Red Hill - Tank 5 WW
Location:	Free Product Reclamation Test Ports
Description:	Tank # 5 Row or Course - # 26 Sheet No - 006 Plate 15

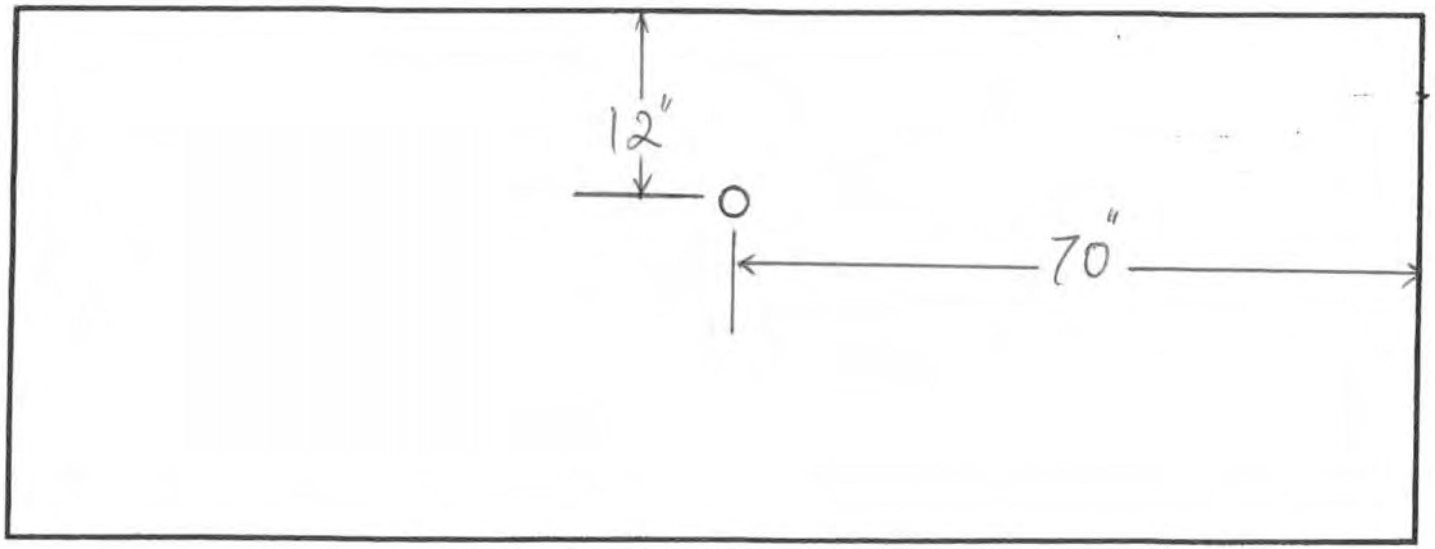
TOP



Willbros Government Services

Location:	Red Hill – Tank 5 WW
Location:	Free Product Reclamation Test Ports
Description:	Tank # 5 Row or Course - E2 Sheet No - 007 Plate 16

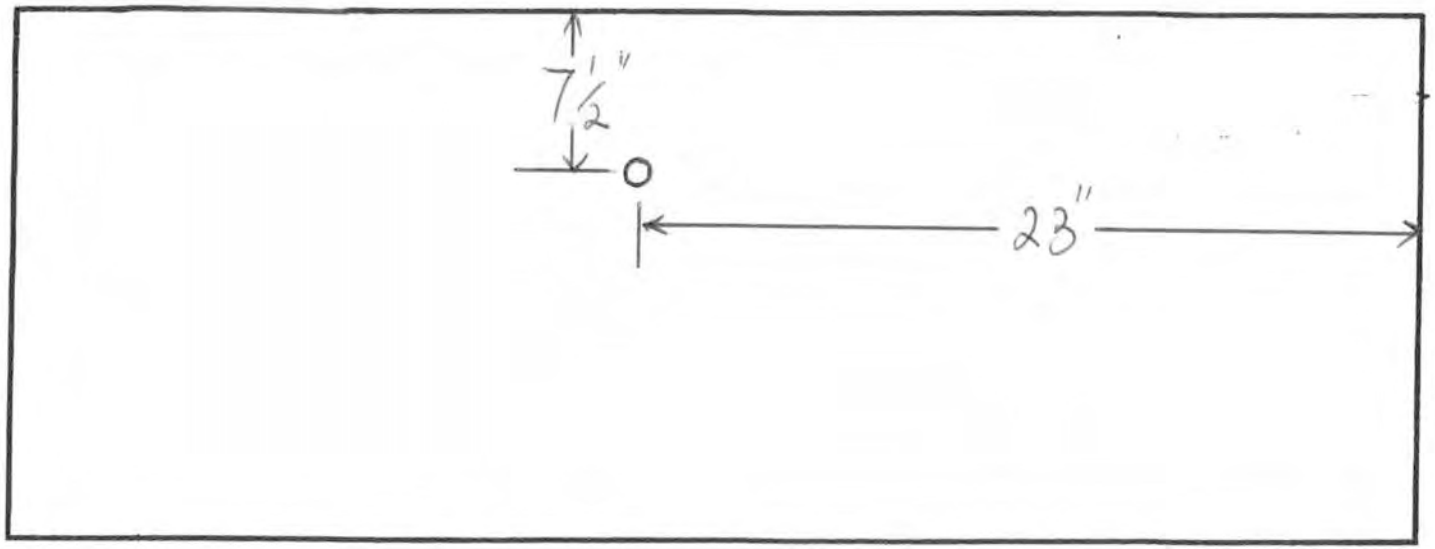
TOP



Willbros Government Services

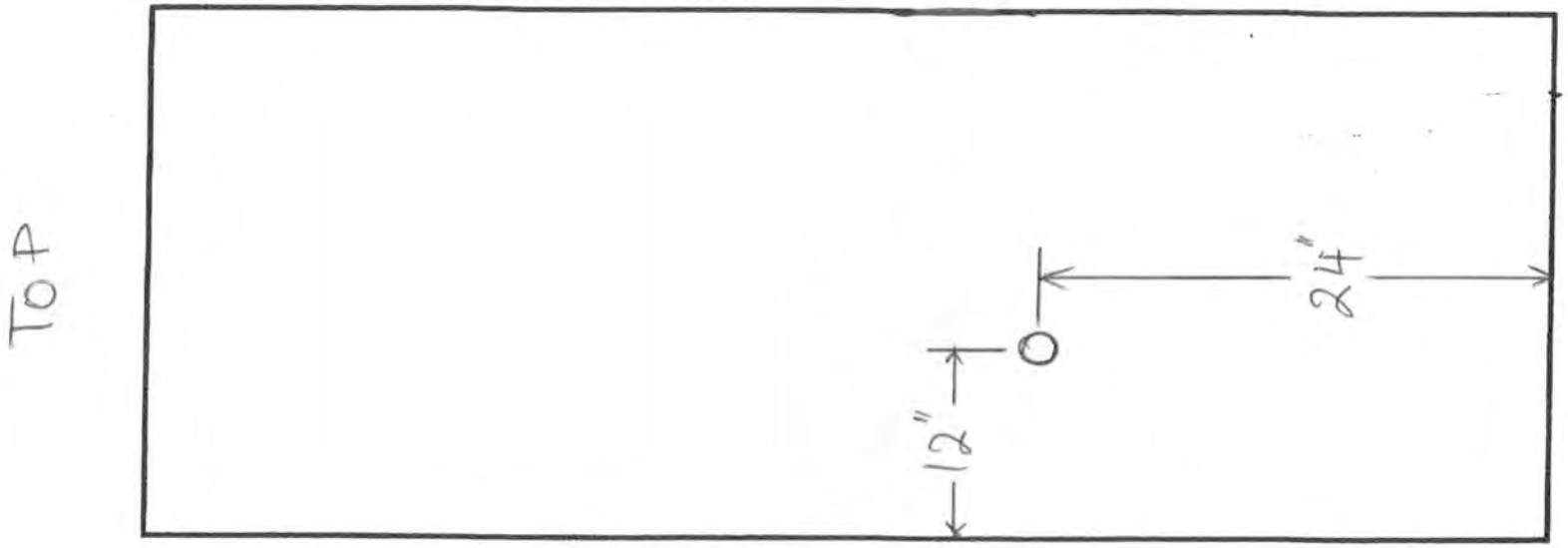
Location:	Red Hill - Tank 5WW
Location:	Free Product Reclamation Test Ports
Description:	Tank # 5 Row or Course - E 4 Sheet No - 008 Plate 13

TOP



Willbros Government Services

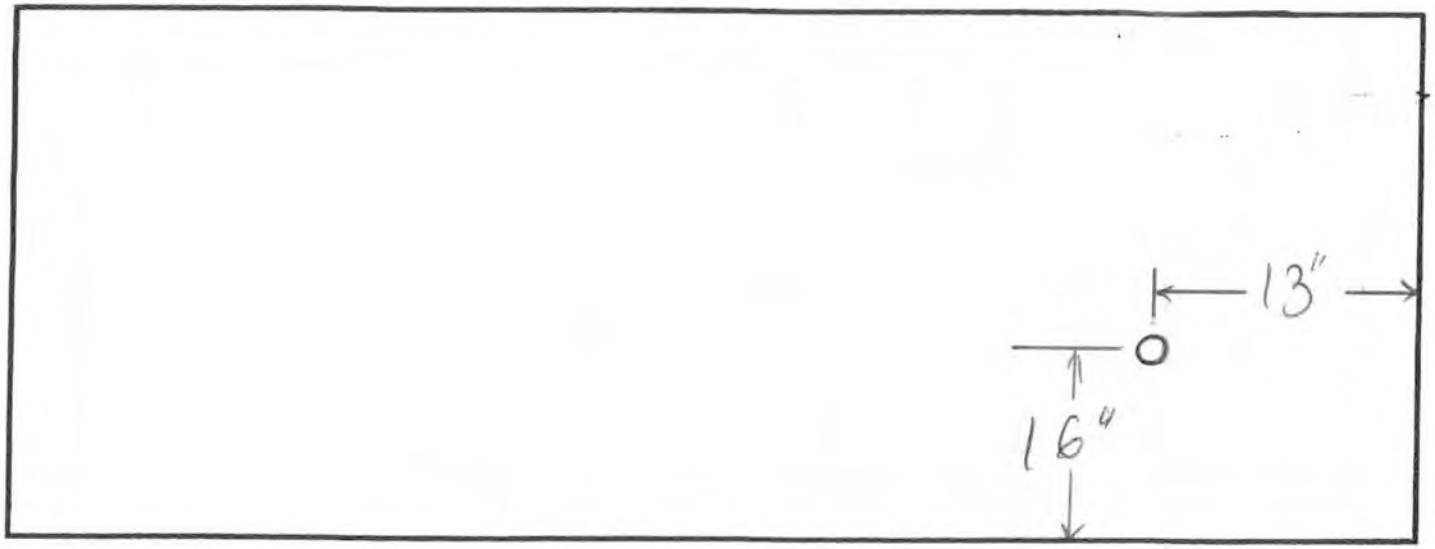
Location:	Red Hill - Tank 5 WW
Location:	Free Product Reclamation Test Ports
Description:	Tank # 5 Row or Course - A Sheet No - 009 Plate 68



Willbros Government Services

Location:	Red Hill - Tank 5 NW
Location:	Free Product Reclamation Test Ports
Description:	Tank # 5 Row or Course - # 3 Sheet No - 010 Plate 3

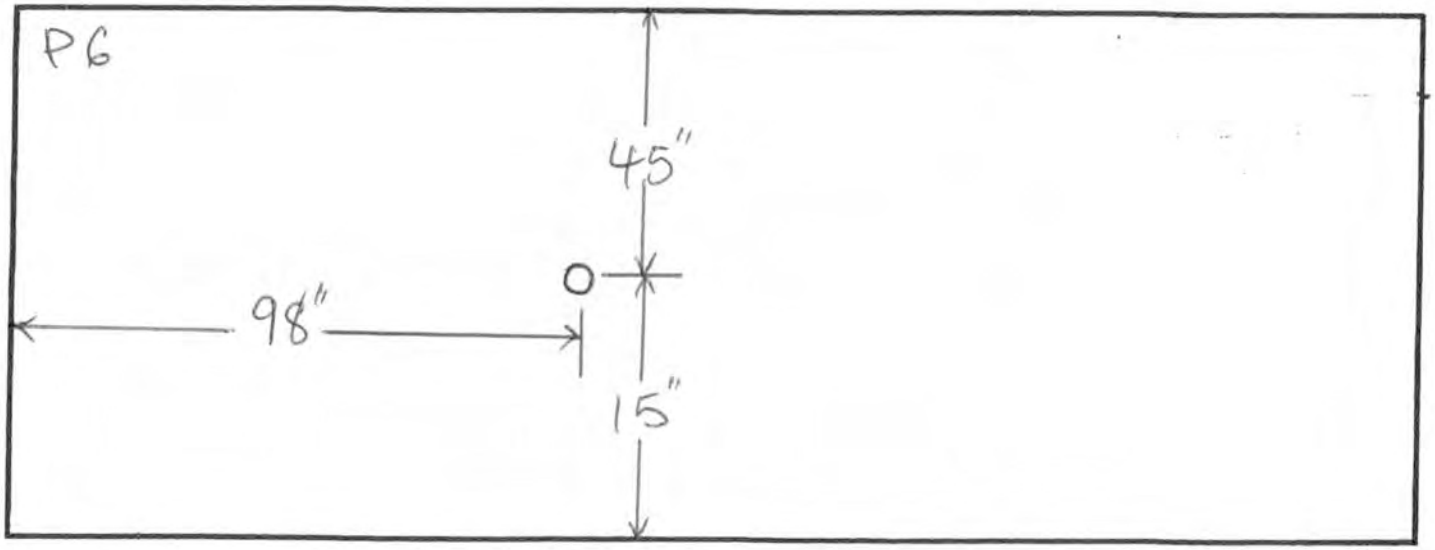
TOP



Willbros Government Services

Location:	Red Hill - Tank 5 WW
Location:	Free Product Reclamation Test Ports
Description:	Tank # 5 Row or Course - ~~3~~ 11 Sheet No - 011 Plate 6

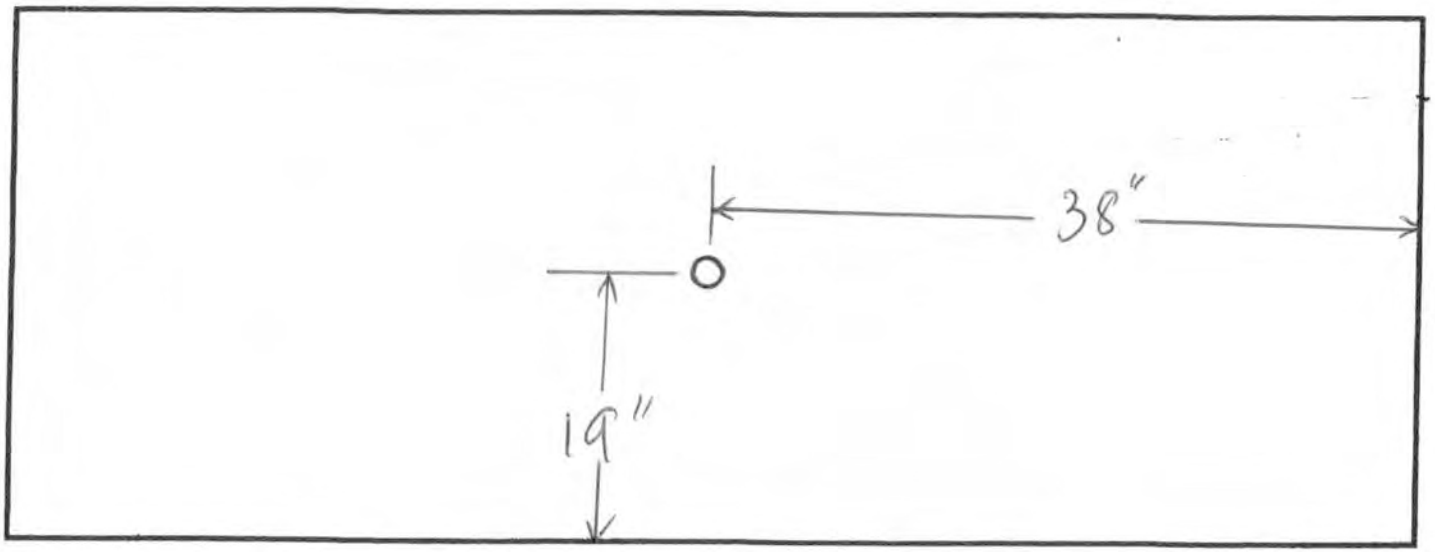
TOP



Willbros Government Services

Location:	Red Hill - Tank 5 WW
Location:	Free Product Reclamation Test Ports
Description:	Tank # 5 Row or Course - E3 Sheet No - 012 Plate 6

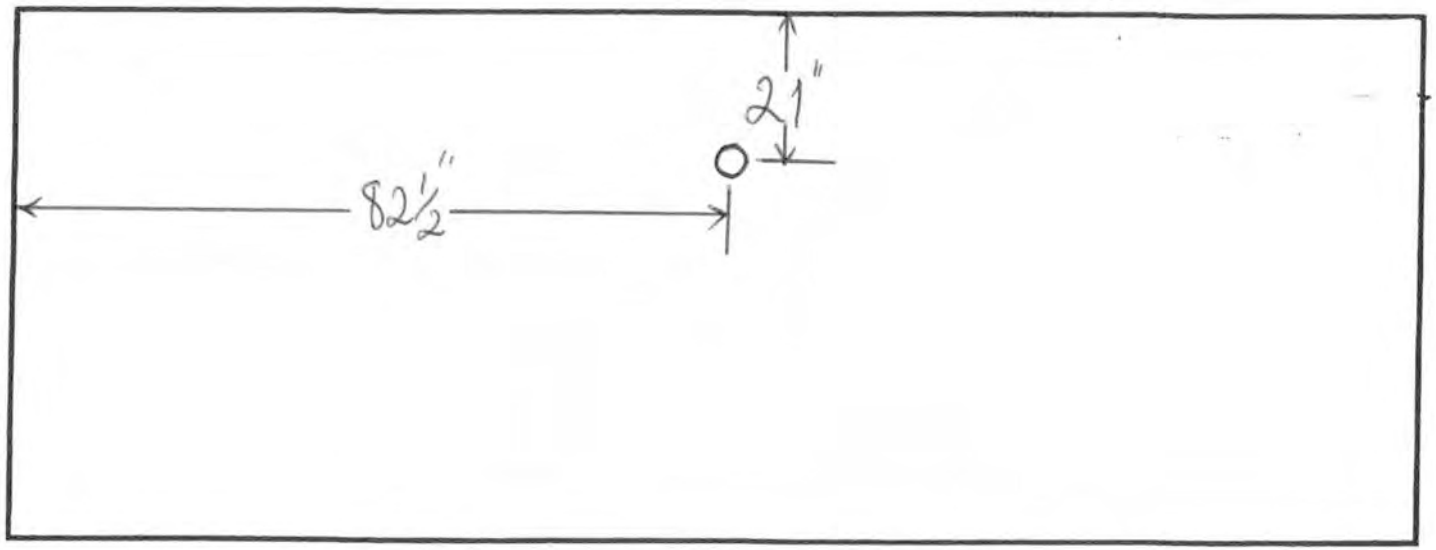
TOP



Willbros Government Services

Location:	Red Hill - Tank 5WW
Location:	Free Product Reclamation Test Ports
Description:	Tank # 5 Row or Course - E 2 Sheet No - 013 Plate 3

TOP



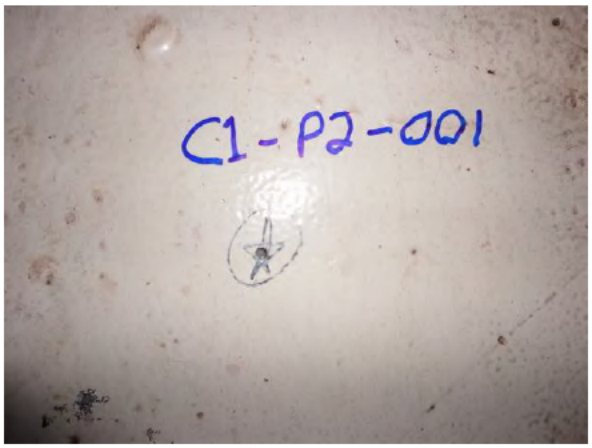
Potential Free Product Reclamation Photo's

TASK ORDER #:	N 62583-09-D-0132/003	PROJECT TITLE:	CLEAN, INSPECT & REPAIR TANKS 5 & 17 RED HILL COMPLEX
WGS PROJECT #:	54118 WW	DATE:	OCTOBER 28 & 29, 2014

SITE PHOTOGRAPHS

Port 001- C1 Plate 2; Located

Port 001- C1 Plate 2; Vacuumed

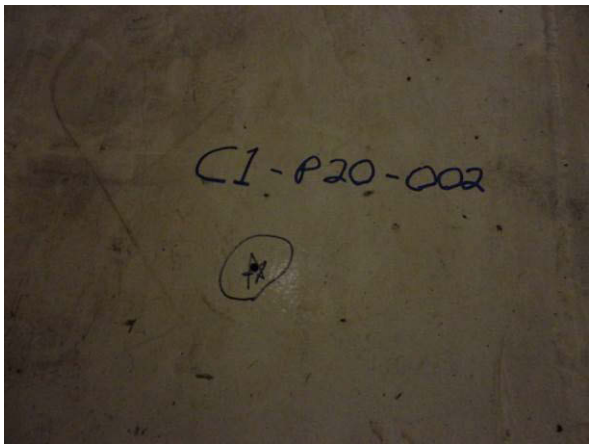


Port 001- C1 Plate 2; Drilled

Port 001- C1 Plate 2; Air Monitoring

Port 002- C1 Plate 20; Located

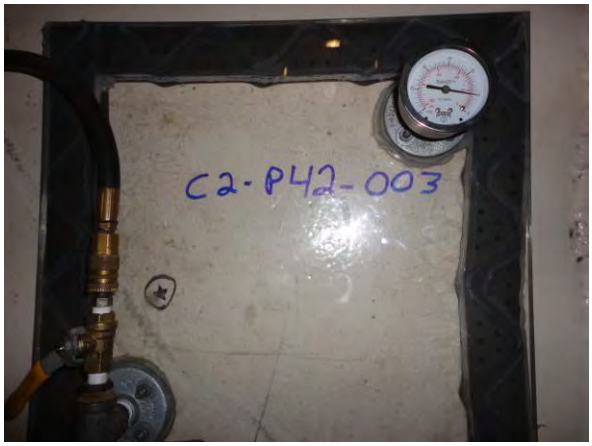
Port 002- C1 Plate 20; Vacuumed



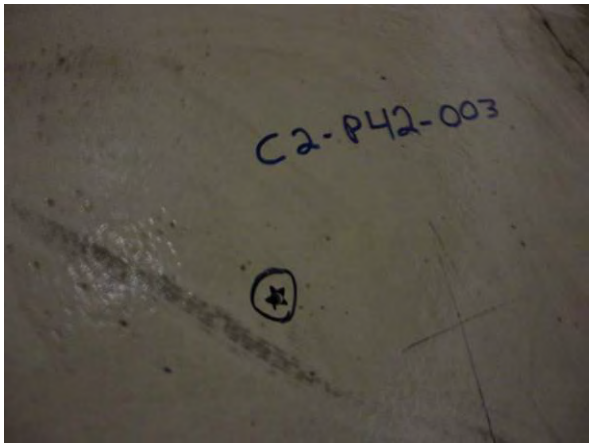
Port 002- C1 Plate 20; Drilled

Port 002- C1 Plate 20; Air Monitoring

Port 003- C2 Plate 42; Located

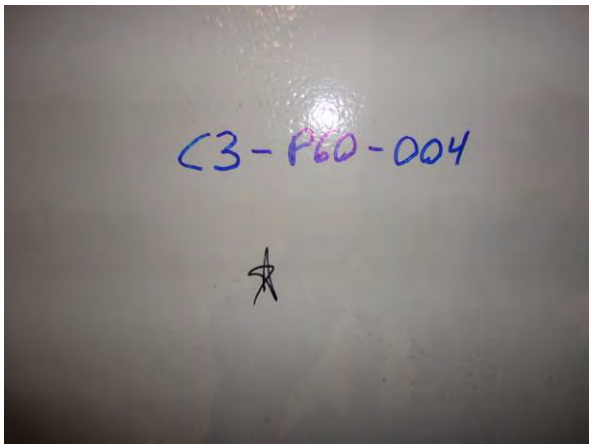


Port 003- C2 Plate 42; Vacuumed

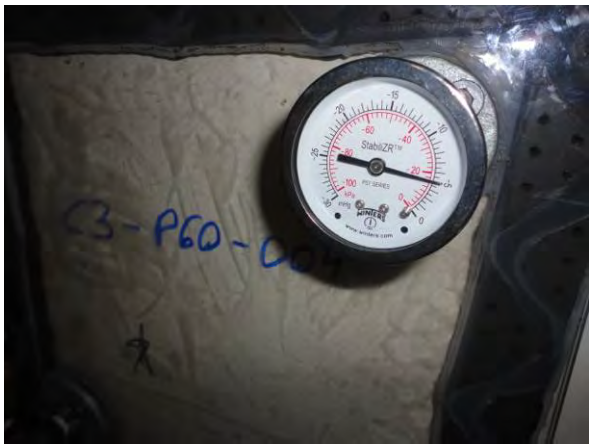


Port 003- C2 Plate 42; Drilled

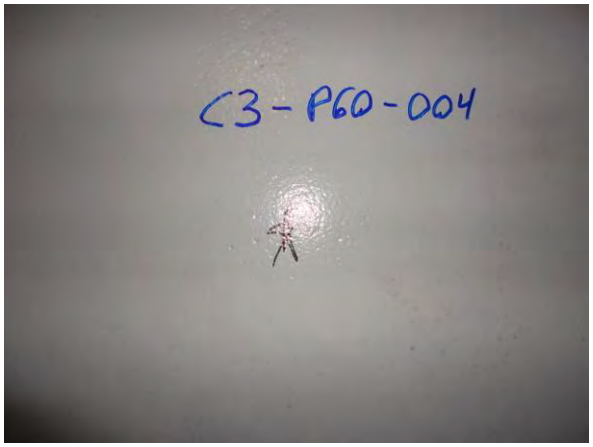
Port 003- C2 Plate 42; Air Monitoring



Port 004- C3 Plate 60; Located



Port 004- C3 Plate 60; Vacuumed



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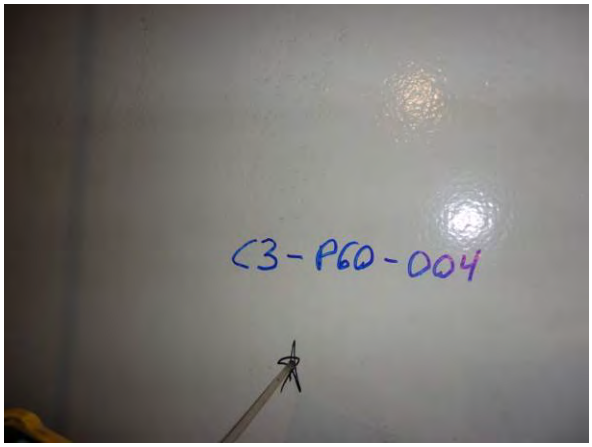
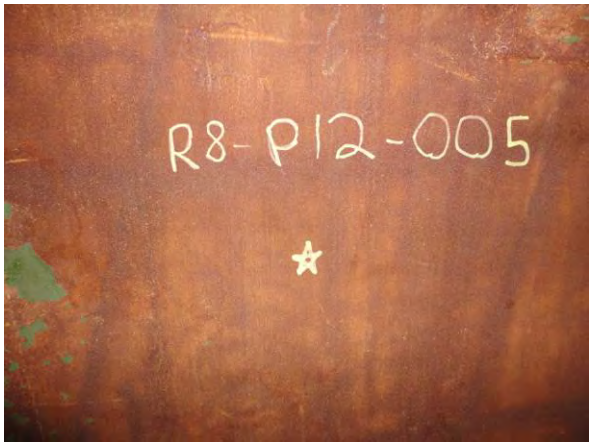


Port 004- C3 Plate 60; Air Monitoring



Port 005- R8 Plate 12; Located

Port 006- R26 Plate 15; Located

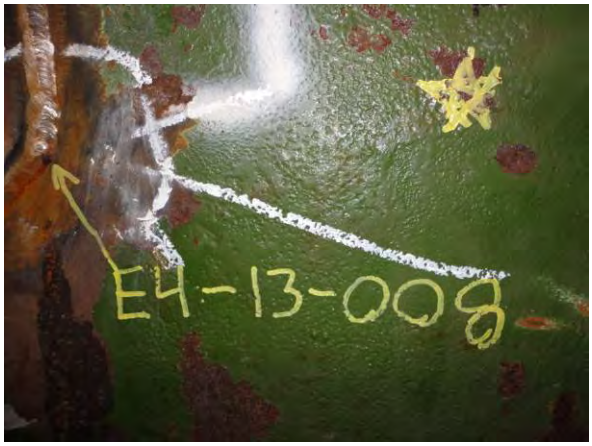
Port 005- R8 Plate 12; Drilled

Port 006- R26 Plate 15; Drilled

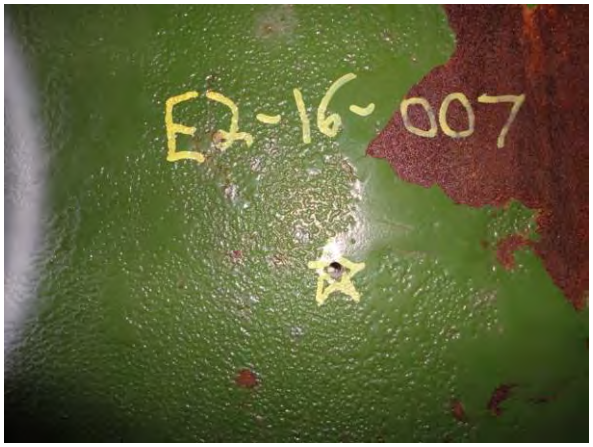
Port 005- R8 Plate 12; Vacuumed

Port 006- R26 Plate 15; Vacuumed

Port 007- E2 Plate 16; Located



Port 008- E4 Plate 13; Located



Port 007- E2 Plate 16; Drilled

Port 008- E4 Plate 13; Drilled

Port 007- E2 Plate 16; Vacuumed

Port 008- E4 Plate 13; Vacuumed

Port 009- A Plate 68; Located

Port 010- R3 Plate 3; Located

Port 009- A Plate 68; Drilled

Port 010- R3 Plate 3; Drilled

Port 009- A Plate 68; Vacuumed

Port 010- R3 Plate 3; Vacuumed

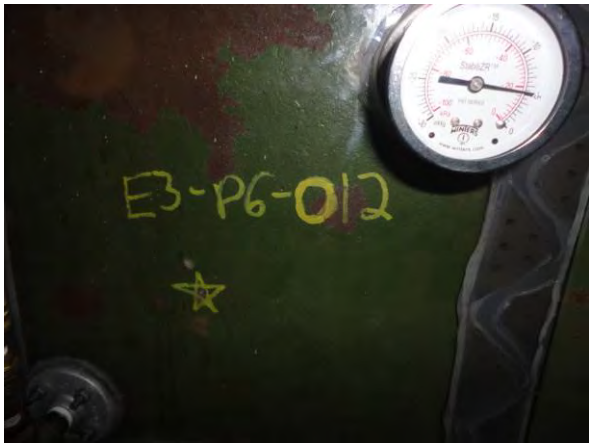
Port 011- R11 Plate 6; Located

Port 012- E3 Plate 6; Located

Port 011- R11 Plate 6; Under WP301

Port 012- E3 Plate 6; Drilled

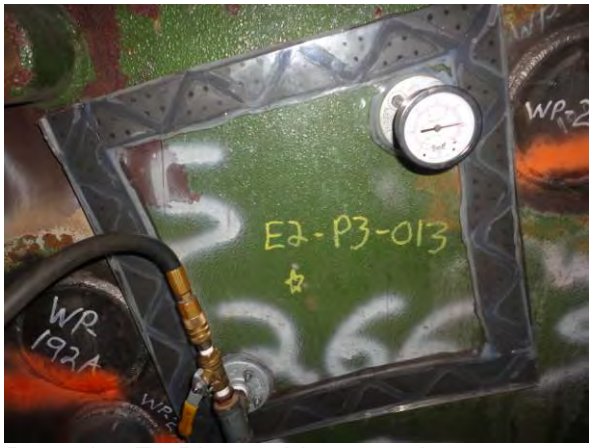
Port 011- R11 Plate 6; Vacuumed



Port 012- E3 Plate 6; Vacuumed

Port 013- E2 Plate 3; Located

Port 013- E2 Plate 3; Drilled



Port 013- E2 Plate 3; Vacuumed

WILLBROS GOVERNMENT SERVICES (U.S.), LLC

A WILLBROS COMPANY

PRESSURE TEST PROCEDURE
NDT-3

Revision 9 June 5, 2014

Rev	Description	Reviewed	Approved
0	Approved	IQC	DG
1	General	IQC	DG
2	General	IQC	DG
3	General	IQC	DG
4	General	IQC	DG
5	General	IQC	DG
6	General	IQC	TDA
7	General	IQC	RGG
8	General	IQC	RGG
9	General	IQC	RGG

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II. Responsibility

III. Requirements

IV. Procedure

V. Calibrations

VI. Records

HYDROSTATIC TEST PROCEDURE

I. SCOPE:

This procedure is to insure that all the requirements of the applicable sections of the ASME Code are met and to insure the safety of all personnel which are involved in performing the hydrostatic test.

II. RESPONSIBILITIES:

The Site Manager or Field Superintendent is responsible for the safe performance of the hydrostatic test. Only trained personnel, aware of these procedural steps, shall be used to conduct the test.

The Quality Control Manager or his designee is responsible for witnessing and documenting the results of the hydrostatic test and assuring that it is performed safely in accordance with this procedure.

For hydrostatic tests performed to meet ASME Code requirements, the Quality Control Manager or his designee is responsible for notifying the Authorized Inspector in advance of the test so that he may be present.

NOTE: The Authorized Inspector must witness and accept all hydrostatic test performed to meet Code requirements.

III. REQUIREMENTS:

All welds shall be satisfactorily completed and the vessel and or piping released by Quality Control for hydrostatic testing.

NOTE: All fabrication shall have been completed, except for operations which cannot be performed prior to the test such as weld end preparation, seal welding of vent plugs or cosmetic grinding on the base material which does not affect the required thickness. All examinations shall have been performed, except those required after the test.

IV. PROCEDURE:

1.0 The hydrostatic test pressure will be 162 PSI. This number is based on the maximum pressure a tank full of water will produce on the piping. The formula $PSI_{max}=1.5((0.433xSp\ Gr)(H))$ was used to determine the final pressure. The height was assumed at 250 ft and the Specific Gravity at 1. 162=1.5((0.433x1)(250)).

2.0 Flanges and nozzles which are not utilized during the hydrostatic test shall be blanked and plugged using material approved for the job or standard approved material in the hydrostatic test area.

2.1 Material (blinds, threaded plugs, bolting, etc.) shall be compatible for the design pressure of the vessel and or piping and for use with the specified test pressure. Only material in good physical condition shall be used.

2.2 Material used for welded closures shall be as specified on the vessel/piping drawing and identified by "P" number or by material specification.

2.3 Welded connections made to temporary closures shall have the minimum weld sizes as specified on the vessel/piping drawing.

2.4 Any additional NDE specified on the drawing for welded temporary closure shall be performed and any necessary repairs made.

2.5 These connections must be visually inspected for verification of proper material, preparation, welding, threading, or bolting as specified on the vessel/piping drawing.

2.6 The design and capacity of test plugs will be verified by Super- vision and Quality Control. The plugs will be secured by chain or other means to assure containment if they slip.

2.7 Visual inspection by Quality Control of all closures is required before pressure application.

3.0 Hydro Trees will be engineered and constructed to WGS Engineering specifications or better. All Hydro Trees will be marked with their rated capacity. Temporary drains and vents will use the same or higher schedule pipe as the Hydro Tree.

4.0 The testing medium shall be clear city tap water with less than 50 ppm Chloride content unless otherwise specified in the vessel/piping design specifications. This report will include the latest city water quality report. Other liquid mediums may be used if there is a danger of freezing or water would cause adverse effects on the vessel/piping. After testing is completed, the water will be drained into totes for disposal off-site.

5.0 A calibrated gauge shall be selected with a dial range of at least 1 1/2 times and not more than 4 times the hydrostatic test pressure. The increments between graduations will be 1 psig or less such that the Quality Control Inspector and the operator controlling the test shall be able to determine when the required test pressure has been applied.

5.1 Digital reading pressure gauges having a wider range of pressure may be used provided the readings give the same or greater degree of accuracy as obtained with dial pressure gauges.

5.2 The indicating gauge shall be mounted inside the tank and directly to the piping as near as practical on the top most part undergoing the hydrostatic test. Hydrostatic head on the gauge shall be considered depending on the location of the gauge.

5.3 The indicating gauge will be readily visible to the operator controlling the pressure applied. For large vessels, consideration shall be given to the use of a recording gauge in addition to indicating gauges.

5.4 Using a thermocouple, we will measure temperature to 0.1°F, throughout the test.

5.5 A pressure chart recorder will be used to continuously plot pressure over the duration of the entire test.

5.6 The official pressure sensing device will be a deadweight tester capable of measuring in at least 1 psi increments.

6.0 Connect all fill and vent connections as necessary.

6.1 Open vents must be located at the high point of the vessel/piping during the fill up to purge the air from the system.

6.2 A hose or some other means to control water release should be installed on the high point vent.

7.0 Prior to filling the vessel, all personnel not involved with the hydrostatic test shall be kept at a safe distance from the testing area. The item to be hydro tested, the pump and the high pressure hose will be roped off at a safe distance with red barricade tape.

8.0 The temperature of the testing medium shall be as specified in the vessel / piping design specifications.

8.1 The testing medium shall be at least ambient temperature but in no case less than 70 degrees F for Section I items. For NBIC repairs, the metal temperature should not be less than 60 degrees F preferably at least 30 degrees above the MDMT but not more than 120 degrees F for section VIII Division 1 items. The temperature for B31.3 Piping is limited by the stress value at test pressure-temperature.

8.2 The test pressure shall not be applied until the vessel and its contents are at about the same temperature.

9.0 The vessel shall be filled with the testing medium until all air pockets have been expelled. The vent valve shall be closed when it is determined that venting is completed.

9.1 Vents shall be provided at all high points of the vessel/piping in the position in which it is to be tested to purge possible air pockets while the vessel is filling. If the operator or the Quality Control Inspector determines the vent arrangement is inadequate, the test shall be aborted until the problem is resolved.

CAUTION: The venting of air at ALL high points must be checked IMMEDIATELY prior to the pressure test. As the temperature of the testing medium increases, air may be released. It must be vented.

9.2 If the pressure does not come up readily when pumping, stop. This could be an indication of air in the system. Depressurize and re-purge to assure the removal of air.

10.0 The operator of the hydrostatic pump shall have a clear view of the test pressure gauge, so that he will be aware of the test pressure at all times.

10.1 The pump operator will be stationed away from the immediate vicinity of the vessel/piping being tested as deemed necessary to provide for his safety. A means of observing the pressure gauge will be provided.

10.2 If the operator or the Quality Control Inspector suspects any gauge to be in error, the test will be aborted until such gauge has been replaced or recalibrated.

11.0 At this time and until the conclusion of the hydrostatic test, the pump operator will not leave the pump station for any purpose except when relieved by an individual competent in the performance of this operation.

12.0 The hydrostatic pressure shall be applied gradually until the required test pressure of 162 psig is reached. The pressure application will be witnessed by the Quality Control Inspector. A close visual inspection WILL NOT BE conducted at this time.

12.1 The test pressure shall never be more than 170 psig.

12.2 NO FITTINGS OR CONNECTIONS WILL BE TIGHTENED WHILE THE SYSTEM OR VESSEL IS UNDER PRESSURE.

12.3 If a leak is detected during testing, the pressure is to be removed prior to approaching the vessel.

12.3.1 Leakage of temporary gaskets or plugs installed for the purpose of conducting the hydrostatic test and which will be replaced later may be permitted unless the leakage exceeds the ability to maintain the vessel/ piping test pressure for the required amount of time or interferes with the evaluation of the test results.

13.0 Once the line is pressurized to 162 psig, that pressure will be maintained for 4 hours.

13.1 The holding time shall be a minimum of four (4) hours or a greater time if specified on the vessel/piping drawing or requested by the Inspector to complete the visual inspection of joints or components.

14.0 A close visual examination will then be conducted of all joints and connections at this time. Since some of the piping is not accessible for visual inspection DV/DP calculations will be performed. There will be two (2) DV/DP values. One DV/DP value will be theoretically calculated using the ambient temperature within the tank. The other DV/DP value will be read from actual field measurements. If the calculated and measured DV/DP values are within the limits specified by the California State Fire Marshal's Office, the tested section of piping will be determined acceptable (PASS).

15.0 Upon completion of the hydrostatic test, the pressure will be dropped. The pressure gauge will be checked to verify it has returned to zero.

16.0 Drain and vent valves will be opened to allow the vessel to drain. Never open the drains on a large vessel without first opening the vent. Open lines shall be elevated in order to be free of any standing water.

V. Calibrations

The test gauge(s) shall be calibrated within a (1) year current time frame and in accordance with NIST standards. A copy of the gauge(s) calibration will be present during the test.

VI. Records

The Hydrostatic/Pneumatic Pressure Test will be recorded on the appropriate form as determined by the QC Inspector at the completion of the test. The test record will be maintained for the duration as specified by the applicable code.

1.0 Approved Test Forms

- 1.1 Record of Hydrostatic/Pneumatic Test
- 1.2 Pressure Test Certificate

A copy of the test gauge calibration(s) shall be attached to the test report for final records. All test records or reports will be submitted in the project final report or data book.

Test data and results will be forwarded for review to NAVFAC EXWC within 24 hours of test completion. Forwarded test data and results will include a statement of PASS or FAIL and reasoning.

Record of Hydrostatic / Pneumatic Test

Job Number _____ Location_____

Sheet Number_____ Mark Number_____

Date of Test_____ Gage Number_____ Calibration _____

Chart Recorder Number_____

Calibration Date _____

Hydrostatic Test Pressure_____PSIG

Test Medium _____

Duration of Test _____

Witness and Accepted by:

Inspector:_____ Date: _____

Customer Representative _____ Date:_____

WILLBROS GOVERNMENT SERVICES (U.S.), LLC

A WILLBROS COMPANY

Pressure Test Certificate

PROJECT	LOCATION JOB NUMBER
CONTRACTOR	P & ID No.
SERVICE	
TEST PACK NUMBER.	DRAWING No.
SYSTEM NUMBER	
MARK No.	ISO No.
LINE No.	
LINE SPECIFICATION	TEST MEDIUM
DESIGN PRESSURE (MAWP) PSI	TEST PRESSURE PSI

STRESS RELIEVED YES NO INTERNAL LINING YES NO

ALL PRE- TEST NDE COMPLETE AND ACCEPTED	SIGNATURE	DATE
MATERIAL RECORDS COMPLETE	SIGNATURE	DATE
WELDING HISTORY RECORDS COMPLETE	SIGNATURE	DATE
PRE-TEST INSPECTION	FOREMAN SIGNATURE	DATE

WELDING OF PRESSURE PARTS COMPLETE		SYSTEM FILLED AND PURGED OF AIR	
PROPER GASKETS, BOLTS AND BLINDS		TEMPERATURE WITHIN SPECIFICATION	
TEMPORARY VENTS AND DRAINS INSPECTED		HYDRO EQUIPMENT AND GAGES INSPECTED	
TEST PLUGS INSPECTED AND SECURED		OPERATORS PROPERLY INSTRUCTED	
INSTUMENTATION BLOCKED OR REMOVED		BARRACADES IN PLACE	
VALVES IN THE RIGHT POSITION (OPEN/CLOSED)		AREA CLEARED OF PERSONEL	
TEST MEDIUM WITHIN SPECIFICATION			

QUALITY CONTROL SIGNATURE DATE

PRESSURE TEST DURATION	DATE OF TEST	AMBIENT TEMP.	START	FINISH

COMMENTS (TO INCLUDE GAGE NUMBER AND CALIBRATION DATE)

	Inspected by	Witnessed by
COMPANY		
SIGNATURE		
PRINT NAME		
DATE		

POST HYDRO RESTORATION

HYDRO BLOWN DOWN & DRY		CONTROL & CHECK VALVES INSTALLED	
HYDRO BLINDS PULLED		HIGH POINT PLUGS SEAL WELDED & INSPECTED	
PROPER GASKETS INSTALLED		NDE ON PLUG SEAL WELDS COMPLETE	
PROPER BOLTING & TIGHTNESS		DRAIN / VENT VALVES CLOSED & PLUGGED	

	Inspected by	Witnessed by
COMPANY		
SIGNATURE		
PRINT NAME		
DATE		

STRESS CALCULATIONS FOR 3/4" SA106-GR B PIPE
t-12.5% for pipe with no Corrosion Allowance

ASME PG-27.2.1 TUBING PRESSURE CALCS. <=5"OD

$P = S [2t - 0.01D - 2e / D - (t - 0.005D - e)]$

Thickness	Diameter	Stress	Exp tubes
0.135	1.05	17100	0
t	D	S	e

Pressure	
2218.725	Sch 80

ASME PG-27.2.1 TUBING PRESSURE CALCS. <=5"OD

$P = S [2t - 0.01D - 2e / D - (t - 0.005D - e)]$

Thickness	Diameter	Stress	Exp tubes
0.192	1.05	17100	0
t	D	S	e

Pressure	
3193.425	Sch 160

ASME PG-27.2.1 TUBING PRESSURE CALCS. <=5"OD

$P = S [2t - 0.01D - 2e / D - (t - 0.005D - e)]$

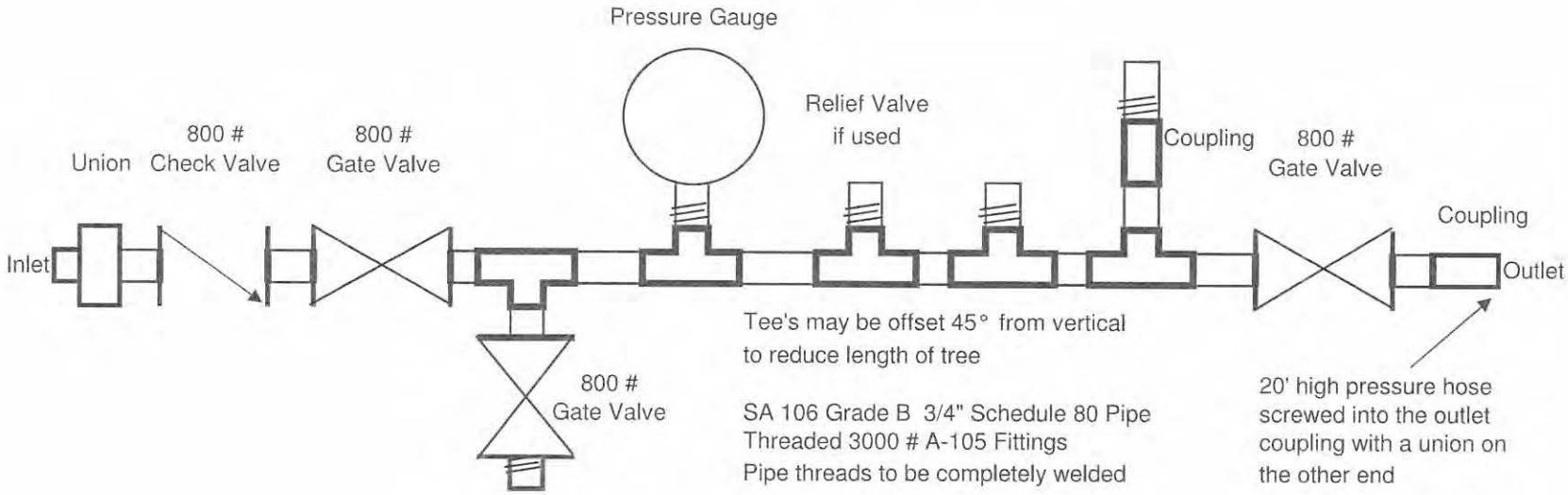
Thickness	Diameter	Stress	Exp tubes
0.269	1.05	17100	0
t	D	S	e

Pressure	
4510.125	Sch XXS

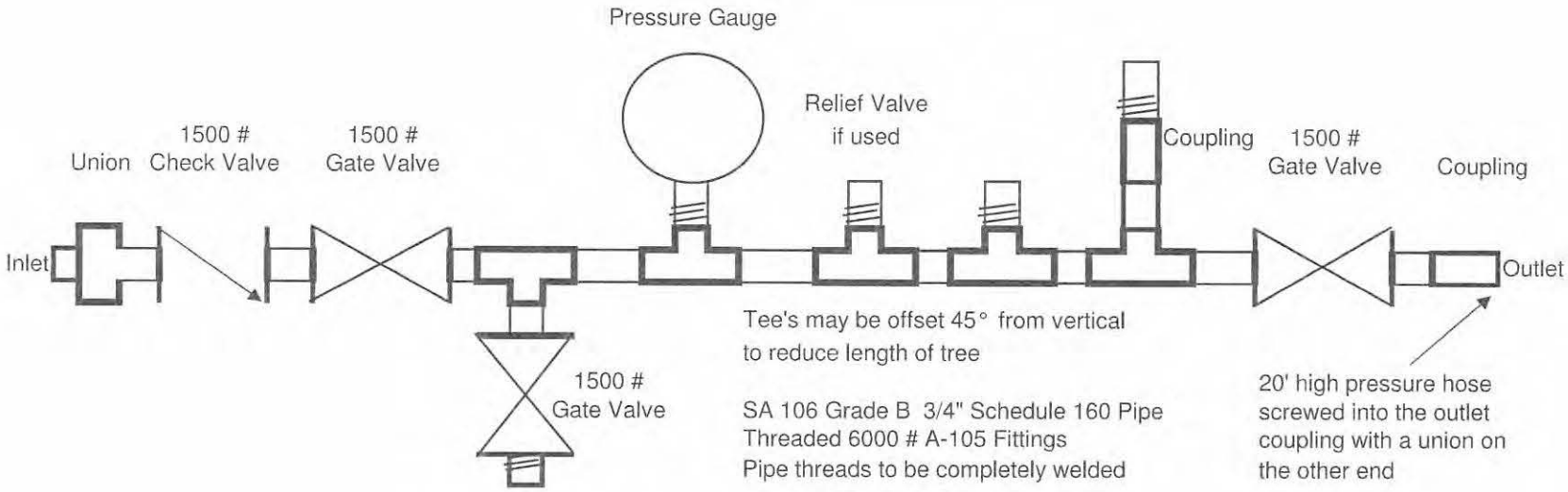
MAWP FOR HYDRO TREE VALVES:

TYPE	PRESSURE
800#	2000#
1500#	3750#
2500#	6250#

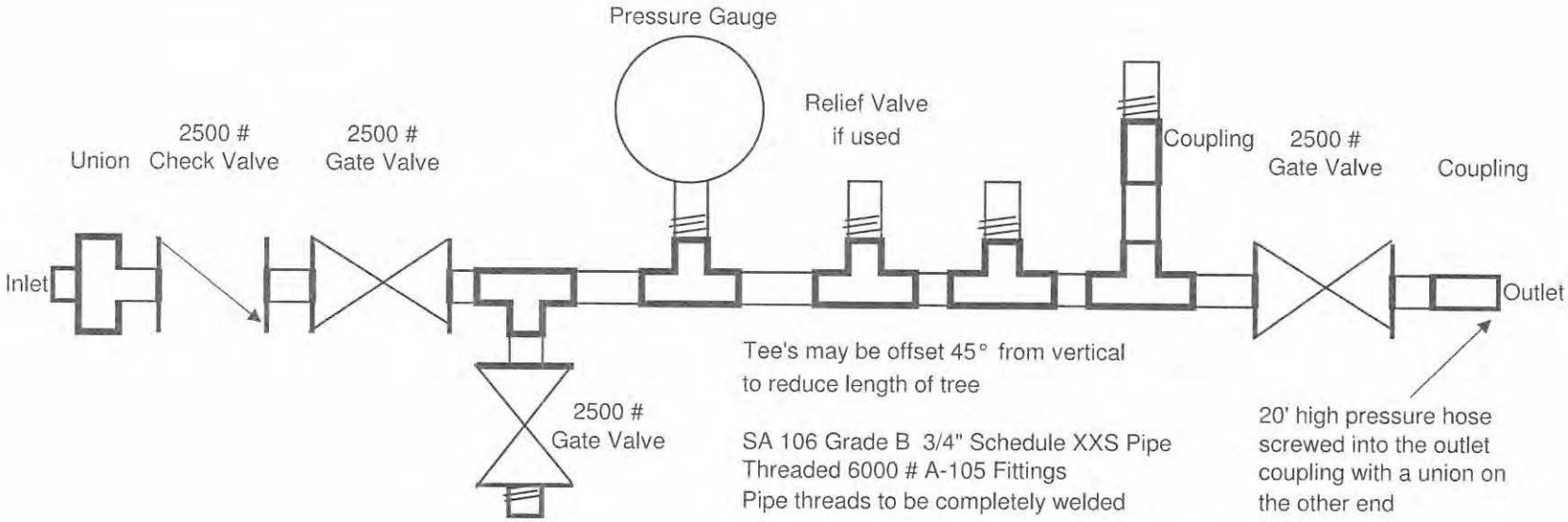
Hydro Tree Rated to 1500 PSI



Hydro Tree Rated to 3000 PSI



Hydro Tree Rated to 4500 PSI



1. WILLBROS CONCLUSIONS AND RECOMMENDATIONS

The preliminary report completed by Pipeline Petroleum Services, Inc. and issued to the Navy concluded that the both the 18-inch and 32-inch lines for Tank-5 at Red Hill passed the contract required volume correction calculations as set forth by the California State Fire Marshal's office. Pipeline Petroleum Services stated that the entire test was considered inconclusive in their opinion because each test failed the temperature – pressure evaluation and their thoughts were that there is trapped air into the system and that is why the system failed the temperature – pressure evaluation.

During Willbros review of the report prepared by Pipeline Petroleum Services, it was noted that during testing, the temperature probe in the tunnel recorded a 0.1 °F drop in temperature and the temperature probe in the tank recorded a 2.0 °F rise in temperature.

James Hagen the Project Manager for the Red Hill Tank-5 work informed us that there can easily be a 2.0 °F temperature change in the tank from the tunnel based on air movement from the ventilation system.

Based on the fact that the majority of these pipes are installed where the temperature of the tunnel would have more of an effect on the temperature – pressure evaluation than the area inside the tank, Willbros asked Pipeline Petroleum Services to re-run their calculations and re-evaluate their inconclusive opinion on the 18-inch and 32-inch lines for Tank-5 by removing the temperature recorded from the tank, in their temperature – pressure evaluation. Petroleum Pipeline Services did that and stated that their conclusions are the same as before. The 18-inch and 32-inch lines passed the volume correction calculations as set forth by the California State Fire Marshal's office but were inconclusive based on the temperature – pressure evaluation.

Willbros spoke to the management of Pipeline Petroleum Services about their conclusions and Pipeline Petroleum Services told Willbros that because of the scrutiny and liability that they would accept with passing these tests, they would not pass if there were any interpretations to be made.

Pipeline Petroleum Services recommendation was to perform a pneumatic test on the lines, to determine if their inconclusive evaluation was correct or not. Willbros was informed by the Navy that a pneumatic test would not be allowed.

Willbros then began analyzing the data supplied by Pipeline Petroleum Services, to determine if the tests were indeed inconclusive or an error was made.

Willbros performed an analysis of the data and determined the accuracy of the testing equipment to determine if the un-explained $\Delta P/\Delta T$ is within the accuracy of the testing equipment.

Based on the accuracy of the equipment used during the test and applying these accuracies to the test data, we feel that any test should be deemed acceptable if the unexplained pressure loss or gain that falls within ¼ degree.

Test ID Number: 14-332-02 had an unexplained pressure loss of (-3.2 +1.73) - 1.47 psig and is within ¼ degree ΔT accuracy of 3.57 psig.

Test ID Number 14-332-01A had an unexplained pressure loss of (-3.2 +1.63) -1.57 psig and is within ¼ degree ΔT accuracy of 5.104 psig.

Test ID Number 14-332-01B had an unexplained pressure loss of - 0.10 psig and is within ¼ degree ΔT accuracy of 5.104 psig.

Based on the fact that Pipeline Petroleum Services found that all tests passed the volume correction calculations established by the California State Fire Marshal's office and Willbros determined that all three test performed by Pipeline Petroleum Services falls within ¼ degree of the accuracy of the equipment, Willbros deems that the three tests passed and no test should be considered inconclusive.

It is Willbros recommendation that no further testing of these lines need to be conducted, until the next API 653 examination of Tank-5 is due.

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Naval Facilities Engineering Command
ENGINEERING SERVICE CENTER

Prepared for

NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING SERVICE CENTER
Port Hueneme, California

Technical Submittal for Project:

Project Title: CLEAN, INSPECT, AND REPAIR STORAGE TANKS 5 & 17
Location: PEARL NAVAL BASE – REDHILL COMPLEX, Pearl Harbor, HI
Task Order No.: N62583-09-D-0132/0003
WGS Project Number: 54118
Date: August 19, 2014

TANK 5 HYDROSTATIC TEST RESULTS FOR 18-INCH AND 32-INCH LINES

Submitted By:
Willbros Government Services, LLC
2087 E. 71st Street
Tulsa, OK 74136

Rev	Date	Description	Reviewed	Approved
A	8/19/2014	For Approval	TDA	RGG

WILLBROS

Distribution and use is limited to US Government agencies and their contractors; administrative/operational use within the context of this project. Other request shall be referred to the Naval Facilities Engineering Service Center. All Willbros plans and procedures are Confidential and Proprietary information; and the sole property of Willbros.

1. WILLBROS CONCLUSIONS AND RECOMMENDATIONS

The preliminary report completed by Pipeline Petroleum Services, Inc. and issued to the Navy concluded that the both the 18-inch and 32-inch lines for Tank-5 at Red Hill passed the contract required volume correction calculations as set forth by the California State Fire Marshal's office. Pipeline Petroleum Services stated that the entire test was considered inconclusive in their opinion because each test failed the temperature – pressure evaluation and their thoughts were that there is trapped air into the system and that is why the system failed the temperature – pressure evaluation.

During Willbros review of the report prepared by Pipeline Petroleum Services, it was noted that during testing, the temperature probe in the tunnel recorded a 0.1 °F drop in temperature and the temperature probe in the tank recorded a 2.0 °F rise in temperature.

James Hagen the Project Manager for the Red Hill Tank-5 work informed us that there can easily be a 2.0 °F temperature change in the tank from the tunnel based on air movement from the ventilation system.

Based on the fact that the majority of these pipes are installed where the temperature of the tunnel would have more of an effect on the temperature – pressure evaluation than the area inside the tank, Willbros asked Pipeline Petroleum Services to re-run their calculations and re-evaluate their inconclusive opinion on the 18-inch and 32-inch lines for Tank-5 by removing the temperature recorded from the tank, in their temperature – pressure evaluation. Petroleum Pipeline Services did that and stated that their conclusions are the same as before. The 18-inch and 32-inch lines passed the volume correction calculations as set forth by the California State Fire Marshal's office but were inconclusive based on the temperature – pressure evaluation.

Willbros spoke to the management of Pipeline Petroleum Services about their conclusions and Pipeline Petroleum Services told Willbros that because of the scrutiny and liability that they would accept with passing these tests, they would not pass if there were any interpretations to be made.

Pipeline Petroleum Services recommendation was to perform a pneumatic test on the lines, to determine if their inconclusive evaluation was correct or not. Willbros was informed by the Navy that a pneumatic test would not be allowed.

Willbros then began analyzing the data supplied by Pipeline Petroleum Services, to determine if the tests were indeed inconclusive or an error was made.

Willbros performed an analysis of the data and determined the accuracy of the testing equipment to determine if the un-explained $\Delta P/\Delta T$ is within the accuracy of the testing equipment.

Based on the accuracy of the equipment used during the test and applying these accuracies to the test data, we feel that any test should be deemed acceptable if the unexplained pressure loss or gain that falls within ¼ degree.

Test ID Number: 14-332-02 had an unexplained pressure loss of (-3.2 +1.73) - 1.47 psig and is within ¼ degree ΔT accuracy of 3.57 psig.

Test ID Number 14-332-01A had an unexplained pressure loss of (-3.2 +1.63) -1.57 psig and is within ¼ degree ΔT accuracy of 5.104 psig.

Test ID Number 14-332-01B had an unexplained pressure loss of - 0.10 psig and is within ¼ degree ΔT accuracy of 5.104 psig.

Based on the fact that Pipeline Petroleum Services found that all tests passed the volume correction calculations established by the California State Fire Marshal's office and Willbros determined that all three test performed by Pipeline Petroleum Services falls within ¼ degree of the accuracy of the equipment, Willbros deems that the three tests passed and no test should be considered inconclusive.

It is Willbros recommendation that no further testing of these lines need to be conducted, until the next API 653 examination of Tank-5 is due.

14-332: PRESSURE TESTING REPORT OF TANK 5 FUEL LINES

Red Hill Underground Fuel Storage Facility

OAHU, HI

Prepared for:

Willbros Government Services (USA), LLC
Tulsa, OK

Prepared under:

Willbros Contract Number: N62583-08-D-0132/003

Prepared by:

PIPELINE PETROLEUM SERVICES, INC.
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June 23-27, 2014

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LIST OF APPENDICES

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LIST OF ABBREVIATIONS AND ACRONYMS

- MAOP: Maximum Allowable Operating Pressure
- PRV: Pressure Relief Valve
- DBB: Double Block & Bleed Valve
- LPD: Low Point Drain
- CS: Carbon Steel
- UG: Underground
- PSI: Pounds / Square Inch
- CP: Cathodic Protection
- UST: Underground Storage Tank
- MAWP: Maximum Allowable Working Pressure
- MOV: Motor Operated Valve
- HPV: High Point Vent
- SS: Stainless Steel
- AG: Aboveground
- NPT: National Pipe Thread
- WOG: Water or Gas
- AST: Aboveground Storage Tank
- PIT: Pressure Indicating Transmitter

1.0 EXECUTIVE SUMMARY

The scope of this project is to perform point-in-time hydrostatic pressure testing of the Tank 5 fuel lines at the Red Hill Underground Fuel Farm, Oahu, HI. The testing was performed and documented in accordance with the Willbros Pressure Test Procedure NDT-3, Revision 9, Dated June 5, 2014, as well as "Pressure Testing Requirements for Hazardous Liquid Pipelines in California", Office of the State Fire Marshal, Pipeline Safety Division, May 2011 Revision (CSFM) and "Operation & Maintenance: Maintenance of Petroleum Systems" United Facilities Criteria (UFC) UFC 3-460-03F, January 2003, which is the jurisdictional Government regulation of Military Petroleum Facilities. The tested lines were tested to cross-country and process hazardous liquid pipeline testing standards since an API-653 hydrostatic test was not feasible at this time.

The Tank 5 lines are actually classified as tank nozzles from the skin valve flange to the wall of the tank and consisted of one 32"Ø F-76 line and one 18"Ø JP-8 line, each between 50-70 feet in length located directly beneath the tank. The lines were hydrostatically pressure tested between the dates of June 23, 2014 and June 27, 2014 at 1.5 times (150%) the maximum allowable operating pressure of 108 psi for four hours. The test pressure was calculated by factoring the maximum head of a full tank calculated by (.433)(SG)(Height): (.433 (psi / ft head – fresh water))(1.0 (Specific gravity of fresh water))(250'(Height of Tank 5)) = 108.25 psi x 150% = 162.375 psi.

The CSFM pass / fail criteria was chosen by the Navy to determine the success of each test base on volume gain / loss calculations based on temperature change. Strictly based on the volume loss criteria established by the CSFM both tests passed, however neither line fully stabilized and the temperature / pressure evaluation of expected pressure change vs the actual pressure change, while very close, did not achieve a passing result. Because of the conflicting calculation results, both test attempts are inconclusive pending the result of the recommended pneumatic test.

The recommendation from PPSI at this time is to perform pneumatic testing of both lines to positively confirm or deny the existence of trapped vapor preventing a successful hydrotest.

2.0 INTRODUCTION

Willbros Government Services (WGS) contracted Pipeline Petroleum Services, Inc. (PPSI) to perform temperature compensated hydrostatic pressure testing of the Tank 5 issue / receipt lines located at the Red Hill Underground Fuel Facility, Oahu, HI.
The testing under this cover was performed to determine integrity of these lines in the absence of an API-653 hydrotest.

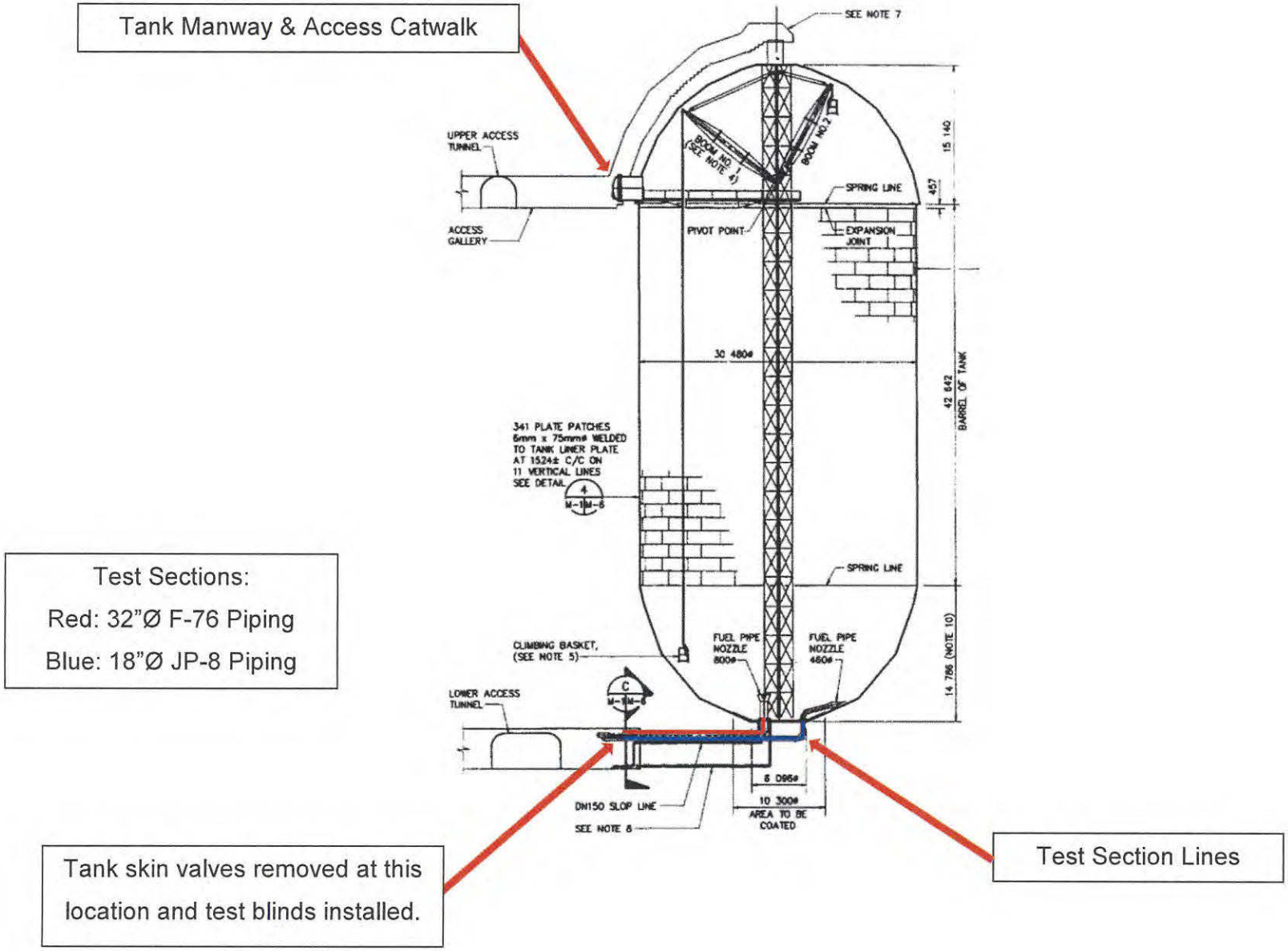
3.0 SITE DESCRIPTION

The Red Hill Underground Fuel Facility is located on the island of Oahu, HI approximately 3 miles due east of Pearl Harbor. The Red Hill fuel farm is a classified facility and consists of 20 underground tanks approximately 250' tall x 100' in diameter with an estimated capacity of 12.5 million gallons each, as well as underground pumping facilities, line networks, and multiple access points. The facility receives jet propulsion fuel (JP-8 & JP-5), as well as marine diesel fuel (DFM / F-76) from tankers as well as from a trans-island line and dispenses to trucks at the truck rack and to navy ships from

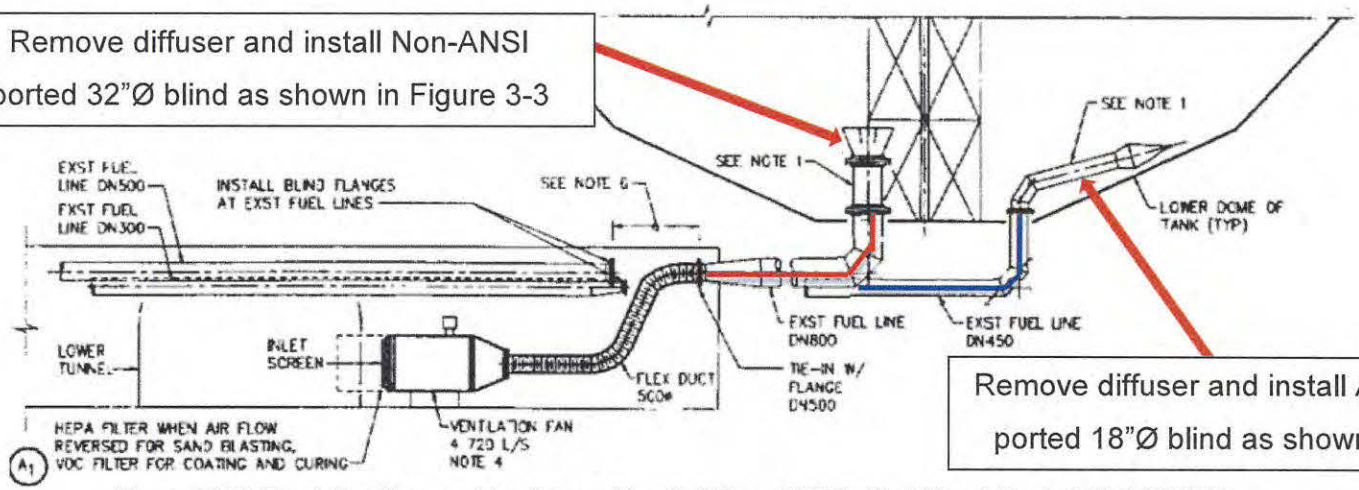
several piers. The facility issues to Pearl Harbor by gravity and pumps located in PH 59 are used to recirculate or pump back up to Red Hill.

Testing was performed on the Tank 5 dual purpose issue / receipt lines for F-76 & JP-8. Refer to Figure 3-1 on the following page: Tank 5 Layout.

Figure 3-1: Tank 5 Layout (Identical to all Red Hill Tanks)



Remove diffuser and install Non-ANSI ported 32"Ø blind as shown in Figure 3-3



Remove diffuser and install ANSI Class 150 ported 18"Ø blind as shown in Figure 3-3

Figure 3-2: Test Sections at bottom of tank. Blue: 18"Ø JP-8 line / Red: 32"Ø F-76 line.

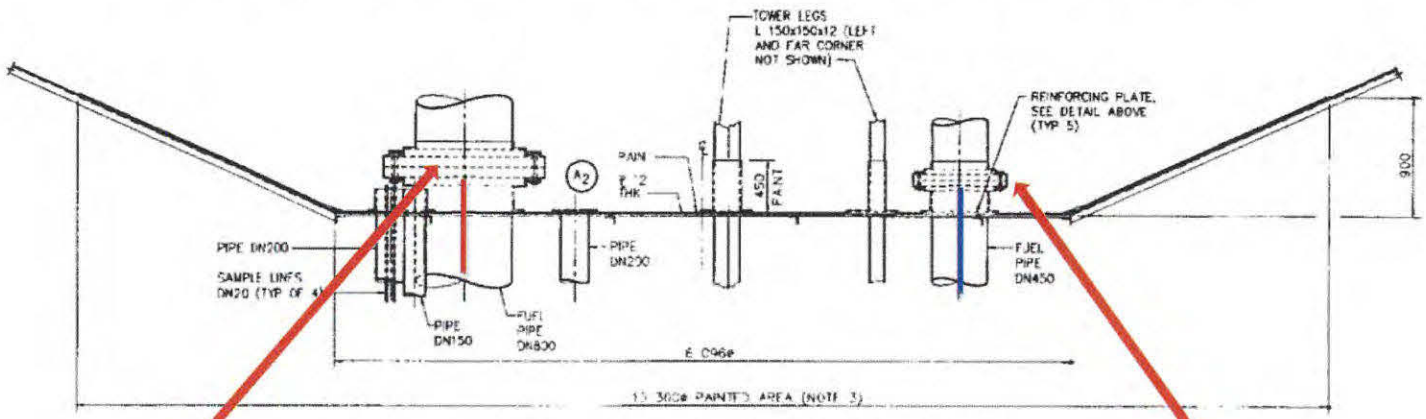


Figure 3-3: Test Sections: Inside of tank detail.

Remove diffuser and install Non-ANSI ported 32"Ø blind here

Remove diffuser and install ANSI Class 150 ported 18"Ø blind here

4.0 TESTING PROTOCOL

4.1 Test Procedure

Testing procedures used were performed in conformance (In part) with United Facilities Criteria (UFC) UFC 3-460-03F (Reference 7.1), California State Fire Marshal's (CSFM's) Pressure Testing Requirements for Hazardous Liquid Pipelines (Reference 7.2), American Society of Mechanical Engineers (ASME) B31.3: Process Piping (Reference 7.3) & ASME B31.4: Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids (Reference 7.4) and with Section 3.4 of American Petroleum Institute's Recommend Practice 1110 (API RP-1110): Pressure Testing of Liquid Petroleum Pipelines (Reference 7.5).

These testing procedures are not normally applied to tanks, but cross country and process pipelines. Since a normal API-653 hydrostatic test was not feasible, these procedures were chosen.

The procedure on site also satisfies the Willbros Pressure Test Procedure NDT-3, Revision 9, Dated June 5, 2014. (Reference 7.6)

4.2 Test Criteria

The acceptance criteria for this project is based on criteria established (In part) in API RP-1110, CSFM, test volume and temperature compensation calculations, no visual evidence of leaks, and accepted industry practice.

This testing satisfies the requirements of UFC 3 460 03F for a five-year hydrostatic test.

The requirements for UFC are listed below:

> *2.3.3. Pipeline Testing. Pipelines must be tested annually for leaks. The MAJCOM fuels engineer may authorize an equivalent methodology as long as state environmental requirements are met. Pressure tests are affected by weather, so it is best to do them in the spring or fall when fuel, ground, and air temperatures are similar. An overcast day or early in the morning would be preferable to lessen the solar effects on aboveground lines. Maintain all leak test records in the LFM shop for five years unless environmental requirements dictate longer. Send copies of these records to the MAJCOM fuels engineer if requested. Use the following testing approach unless state requirements are more stringent:*
>
> > *2.3.3.1. Annual Pressure Testing. Pressure-test all on-base fuel piping systems annually using existing system pumps. Pressurize unloading, loading, transfer, and hydrant dispensing piping systems by running the appropriate pumps against a closed system until deadhead pressure is reached. Close appropriate valves to trap this pressure in the system, then turn off the pumps.* ***NOTE:*** *Some ball valves do not provide isolation and require a differential pressure (DP) to seat, so blind flanges may be required. Take pressure gauge readings within fifteen minutes after allowing sufficient time for the fuel pressure to stabilize. Visually check all aboveground piping and piping in concrete pits for leaks. Audibly check closed valves for sound as evidence of an internal valve leak. If no visible or audible leaks occur, then take pressure gauge readings every fifteen minutes for the first hour, and once every half-hour for the next hour. Total time for the pressure test will be two hours. Document all pressure tests by recording the following:*
> >
> > > *2.3.3.1.1. Name of system test (i.e., refuel header, defuel header, lateral pipelines). Provide facility number.*
> > >
> > > *2.3.3.1.2. Date of test and weather conditions (e.g., sunny and 27 □C [80 °F]; cloudy and 18° C [64 °F]).* ***NOTE:*** *Record any weather change during the test period.*
> > >
> > > *2.3.3.1.3. Pressure readings:*
> > >
> > > > *2.3.3.1.3.1. Start (approximate local time) pressure.*

2.3.3.1.3.2. Fifteen minutes (approximate local time) pressure.

2.3.3.1.3.3. Thirty minutes (approximate local time) pressure.

2.3.3.1.3.4. Forty-five minutes (approximate local time) pressure.

2.3.3.1.3.5. One hour (approximate local time) pressure.

2.3.3.1.3.6. One and one-half hours (approximate local time) pressure.

2.3.3.1.3.7. Two hours (approximate local time) pressure.

2.3.3.2. Five-Year Hydrostatic Test. Perform a hydrostatic pressure test every five years on all underground fuel transfer pipelines (product is typically the test media for this test). The MAJCOM fuels engineer sets the specific year. A hand-operated hydraulic pump, or equivalent with a built-in reservoir tank supplies hydrostatic pressure. This takes the place of the annual pressure test. The hydrostatic test may be conducted using a dual-pressure, temperature-compensating pressure test conducted at the same pressure specified in paragraph 2.3.3.2.2 with MAJCOM fuels engineer approval. The test vendor must have an independent third-party review of the test.

2.3.3.2.1. To test the pipe, first isolate the section being tested with blind or spectacle flanges. If DBB valves will hold the pressure, blind flanging is not required. ***NOTE:*** *filter/separators (F/Ss), thermal relief valves, safety valves, and sight glasses may have to be removed or isolated by blind/skillets.*

2.3.3.2.2. Using a hand-operated hydrostatic pump, perform a static pressure test to the lesser of 1.5 times the system dead head pressure or 1.896 megapascals (275 pounds per square inch gauge) maximum. Use fuel to perform all tests. Pressure may also be applied with a dead- weight tester or suitable motor-driven pump.

2.3.3.2.3. Once the pressure is stabilized, record the pressure every 15 minutes for the first hour, every 30 minutes the second hour, then every hour thereafter. If at the end of the minimum four-hour test (the longest test possible is recommended preferably overnight) no leaks are found, further testing is not required. (Use the procedure described in paragraph 2.3.3.1.) If a leak or excessive pressure change is observed, perform a flow test by repressurizing the line with the hydrostatic pump. Measure and record the amount of fluid required to maintain this pressure for four hours. If a leak is found, contact the environmental flight and take action to repair it. Also, promptly notify the command fuels engineer and DESC if additional funding is required for repairs, leak detection, and or location. A drop in pressure could be the result of a decrease in product temperature or absorption by the product of air in the line. To rule this out, you may repressurize the line and extend the test period to at least 24 hours.

The requirement and the intent of the Regulation(s) is not just to strength test the pipeline or system; it is to confirm the tightness of the system to the extent possible, which is the reason we feel the test results under this cover are inconclusive at this time. (See test results)

The procedure and criteria used under this report cover is to calculate the tightness of the system by reconciling any pressure loss / gain with pipeline temperature, compressibility of the test media, pipeline material coefficient of expansion, and by converting fluid gain / loss into equivalent pressure change to ensure that the test results actually confirm or deny that the pipeline is suspected of leaking.

The calculations used are based on the CSFM Appendix C Standard Pressure / Temperature Formulas as shown below:

Appendix C – Standard Formulas used for Pressure / Temperature Calculations

CSFM Standardized formula for performing pressure – temperature calculations to determine volume change.

Basic Formula: $\Delta V / V = Kp\,\Delta P + Kt\,\Delta T$

Where: $Kp = [(D / t)(5 / 4 - \mu) / E] + 1 / \beta = (1.9\,D / 2\,E\,t) + 1 / \beta$

And: $Kt = 3a - g$

ΔP	=	Liquid Pressure Change
ΔT	=	Liquid Temperature Change
ΔV	=	Liquid Volume added to that inside the pipe (negative if flows out)
V	=	Nominal Pipe Volume = $\pi D^2 L / 4$
D	=	Inside Pipe Diameter
L	=	Pipe Length
t	=	Pipe wall thickness
μ	=	Poisson's ratio = 0.3
E	=	Young's Modulus = 30 * 10^6 psi
β	=	Liquid Bulk Modulus, a function of Pressure and Temperature
g	=	Liquid Volumetric expansion coefficient, a function of Pressure and Temperature
a	=	Linear coefficient of Thermal Expansion = 6.5 * 10^ -6 1/ ^{0}F

4.3 Tester Qualifications

The supervisor on site (Dennis Cobb) during testing has over twenty (20) years of pressure testing experience with a working knowledge of applicable regulations and test standards.

4.4 Test Section Descriptions

Testing on the Tank 5 fuel issue / receipt lines was conducted on the dates indicated. Table 4-1: Test Sections and Appendix C provide details of each test section and configuration.

Table 4-1: Test Sections

Test Section Identification	Designation	Diameter (Inches)	Length (Feet)	Volume (Gallons)	Comments
14-332-01A & B	32"Ø F-76	32" / 20"	48	1838	Length was calculated by using the total volume pumped into the line sections as well as using the head pressure to determine the vertical rise, therfore the length is estimated.
14-332-02	18"Ø JP-8	18" / 12"	65 (Estimate 61' of 18"Ø & 4' of 12"Ø)	764	Length calculated same as the 32" line.

Note: Test sections could not be physically measured during testing because they are encased in concrete.

5.0 TESTING RESULTS

Detailed test results for the 18"Ø & 32"Ø test sections are provided in Appendix C. The 32"Ø test results are from the 4 hour test period on 6/26/14 from 20:00 to 24:00 and the theoretical test using the last 45 minutes of data from the following morning. The 18"Ø test results are from a test period derived from the datalogger data that was recorded overnight from 10:37 PM on 6/25/14 to 01:37 AM on 6/26/14. The result for both tests from the CSFM volume correction calculations is a passed test, however the result from

the temperature evaluation is a failed test. We feel that based on the conflicting results of the test calculations, the margin of error with the unknown variables such as actual volume of the reducers in the line and the actual pipe specification and grade, and the inherent margin of error with hydrotesting, that the result is inconclusive at this time. The rate of decay and non-stabilization could be the result of trapped air or a leak and it is impossible to determine which at this time.

Test results are listed in Table 5-1.

Table 5-1: Test Results

Test Section Identification	Designation	Length (Feet)	Volume (Gallons)	Test Date	Result
14-332-01A	32"Ø F-76	48	1838	6/26/14	Passed CSFM Volume Correction Calculations / Failed temperature – pressure evaluation. Inconclusive – Recommend Pneumatic testing to confirm presence of trapped vapor.
14-332-01B	32"Ø F-76	48	1838	6/27/14	Passed CSFM Volume Correction Calculations. Temperature – pressure evaluation results much closer than in Test A due to apparent stabilization overnight, however the final result remains inconclusive.
14-332-02	18"Ø JP-8	65	764	6/25/14 & 6/26/14	Passed CSFM Volume Correction Calculations / Failed temperature – pressure evaluation. Inconclusive – Recommend Pneumatic testing to confirm presence of trapped vapor.

5.1 Testing Activities

We attempted to pressurize, stabilize, and test both test sections several times and exhausted all known methods to obtain a successful hydrotest. We ensured that there were no leaks on any external feature that we could control and even modified our test equipment to ensure no air was trapped at that point that would affect the tests. Excessive amounts of time were expended trying to re-pressurize and stabilize to try and compress any trapped air in both test sections.

The following is the official test charts from the dataloggers for both test periods. The charts clearly show all pressurizations, depressurizations, logger movements to replace the flange gaskets, and the relative stability of the temperature in the tunnel while the temperature inside the tank fluctuated between 2-4°F indicating it was affected by the ambient air differences in the tank. Also seen clearly is the relative stability of all lines towards the end of the logging period for the 32"Ø test.

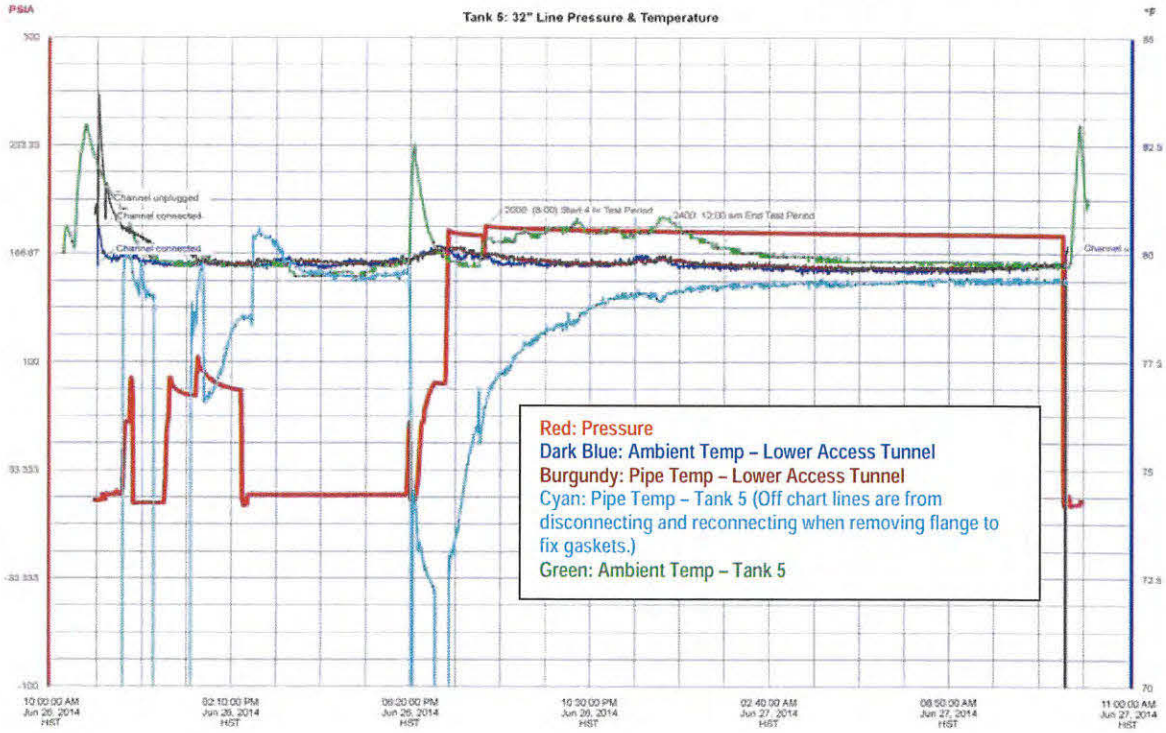


Figure 5-1: Test data chart from the 32"Ø testing attempts.

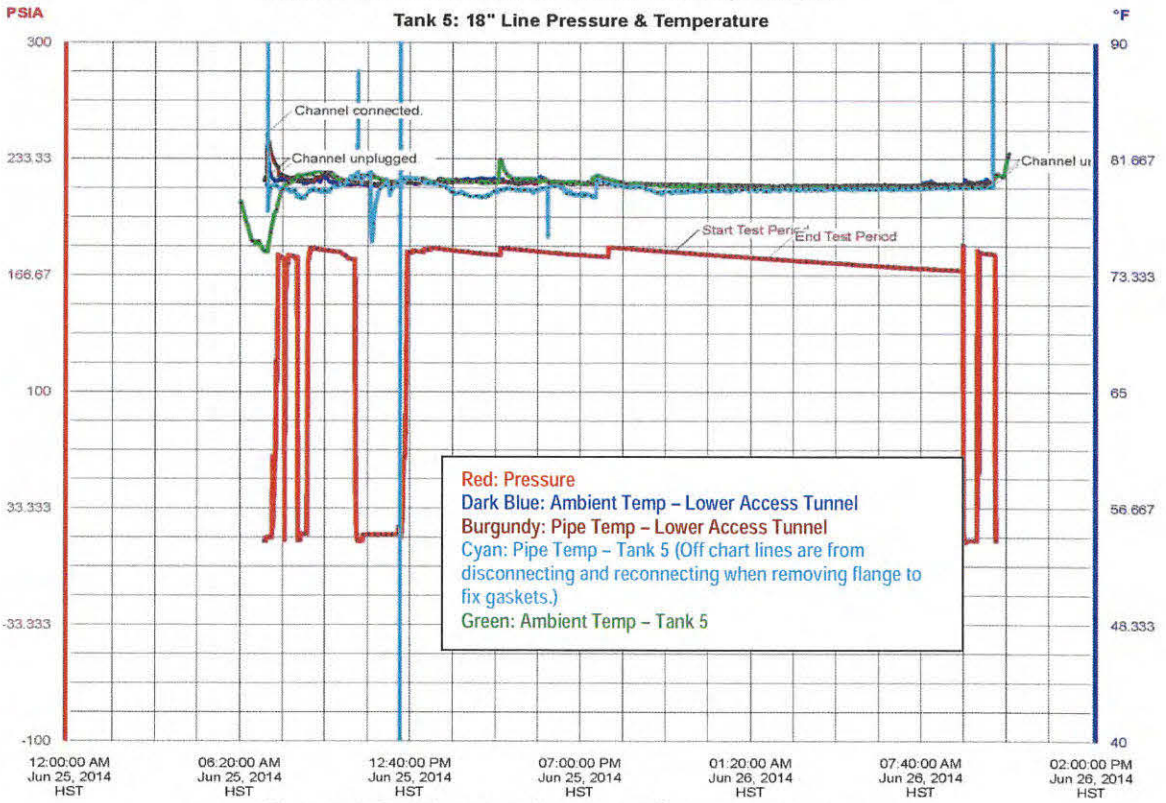


Figure 5-2: Test data chart from the 18"Ø testing attempts.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

This hydrostatic pressure testing of the subject lines are not considered precision volumetric leak detection testing. The testing performed is classified as a point-in-time, pressure decay combination strength / stress / leak test of the line system against the test blinds to determine if there is a suspected leak to the extent possible.

Testing was performed per the jurisdictional regulatory requirements of United Facilities Criteria (UFC) UFC 3-460-03F (United Facilities Criteria) and the test procedures used were performed in conformance with (In part) API-RP-1110, CSFM (California State Fire Marshall – State Lands Commission Hydrotesting Procedures), and the Willbros Pressure Test Procedure: NDT-3.

The lines passed the CSFM volume correction calculations, however experienced pressure loss that could be attributed to trapped air in the test sections, which caused the pressure / temperature evaluation to fail. Because of this both tests are considered inconclusive at this time.

This determination is based on criteria established (In part) in API-RP-1110, CSFM, as well as, test volume and temperature compensation calculations, no visual evidence of leaks on exposed portions of the lines in the tunnel and inside of the tank, and accepted industry practice.

We were unable to stabilize either line due to suspected trapped vapor in the lines. We are forced to conclude at this time that trapped vapor is the cause of the pressure loss observed because of the extremely small rate of pressure loss and the rate of pressure loss decreased as time passed. It should be noted that a leak, if present, would also experience a decrease in the leak rate as the pressure decreased in the same manner as dissolution of trapped air into the test medium.

While this loss of pressure could be attributed to a small leak, a pneumatic test must be performed to rule exclude the possibility of trapped air before the line(s) can be considered a failure.

If the pneumatic test is successful then an engineering evaluation can be performed to accept the lines as a successful test using tracer testing or another method of leak detection that is not affected by trapped vapor.

If the pneumatic testing is not successful, the line(s) would then be considered a failure and must be repaired or taken out of service.

In addition, if the pneumatic testing proves successful and the determination is that the lie(s) are tight, that determination does not guarantee that the line(s) will

not leak in the future. This is important because there has been some visual evidence of pitting on the interior surface of the 32"Ø line prior to our arrival.

See the Section 6.2 titled "Recommendations" for a sample procedure used by PPSI on other projects to confirm or deny the existence of trapped air.

Figures 6-1 and 6-2 on the following two pages illustrate possible locations of trapped air in each test section for consideration. They are not meant to depict the actual configuration of the pipe sections.

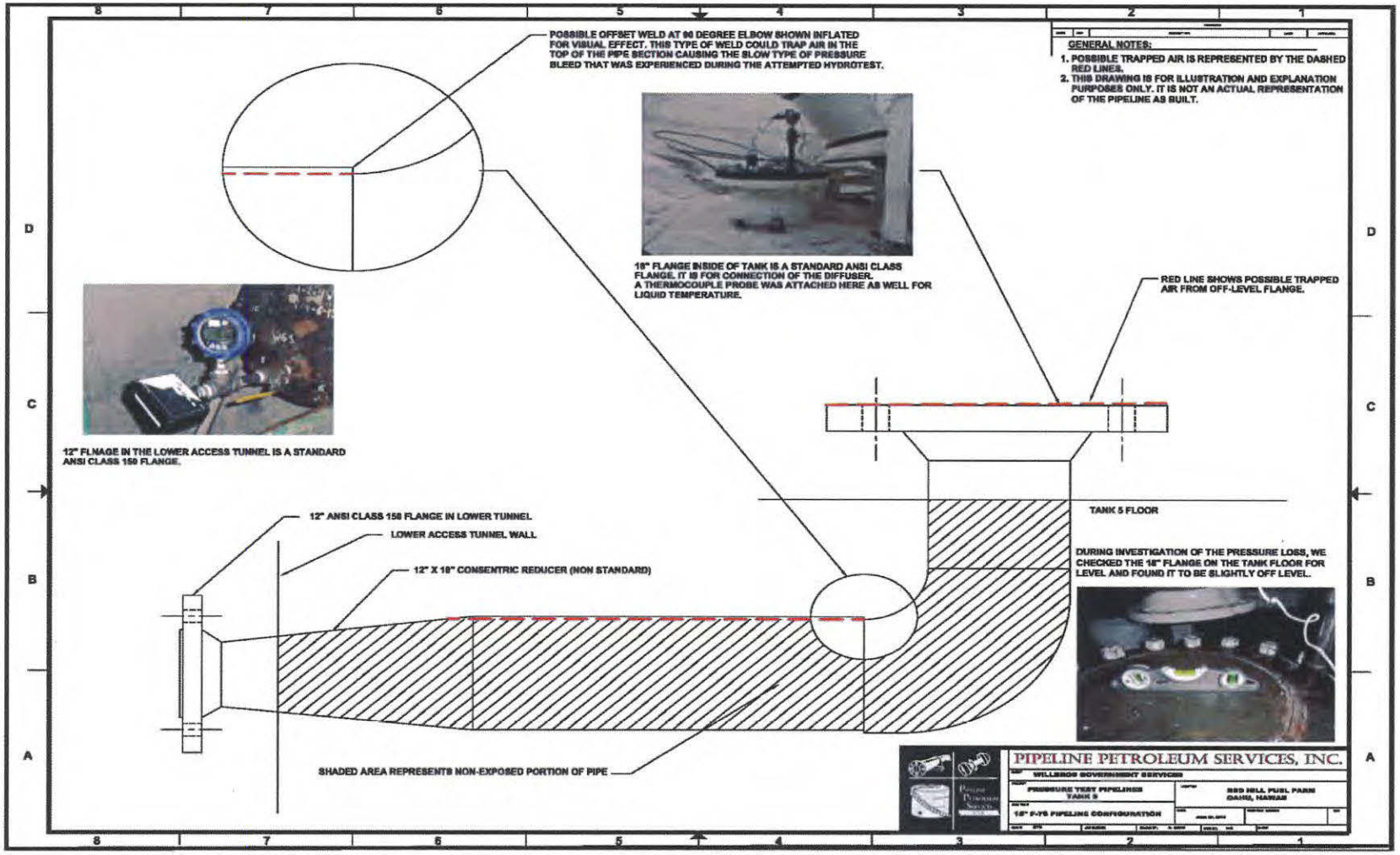


Figure 6-1: Drawing of the 18"Ø line explaining possible trapped air scenarios.

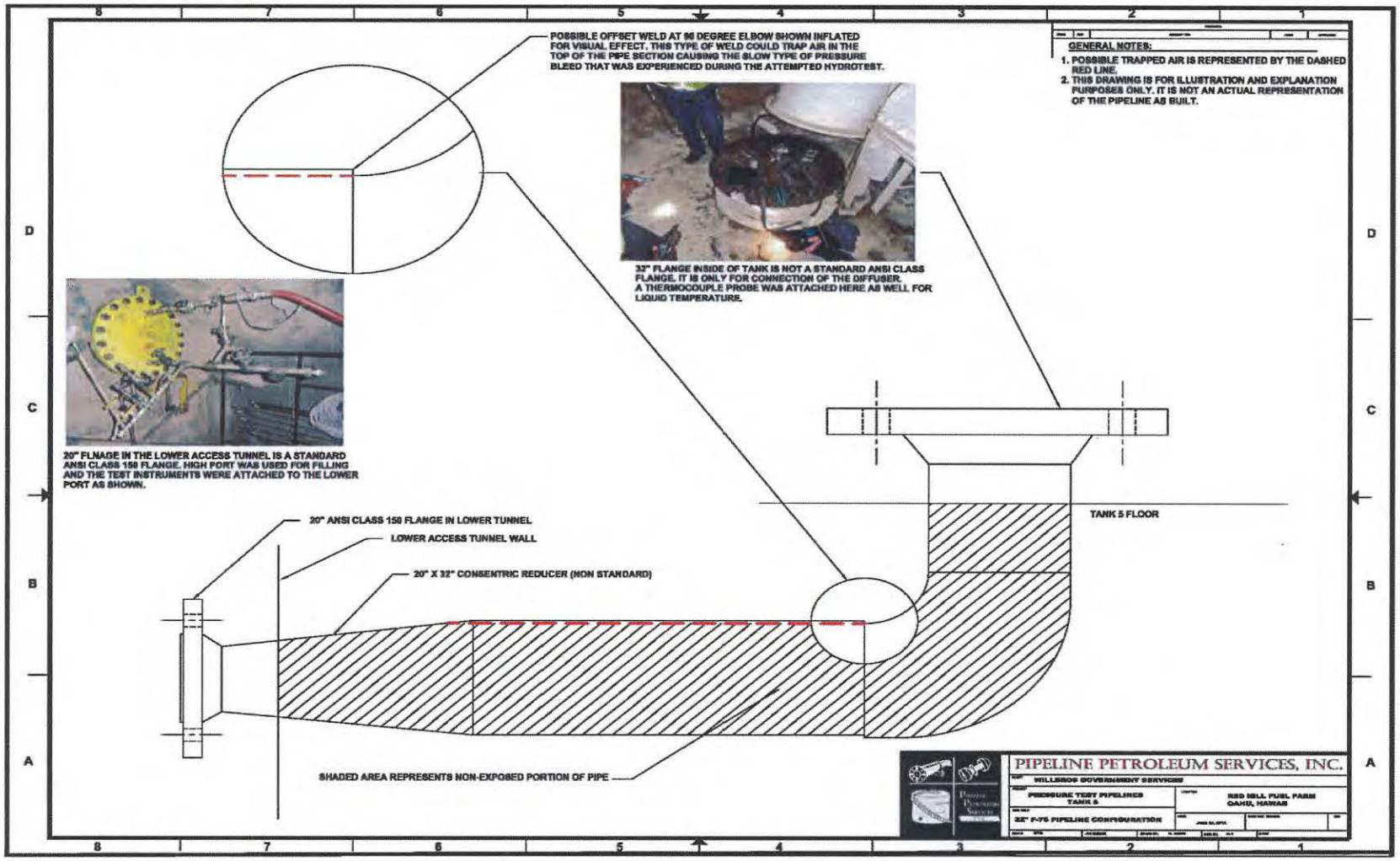


Figure 6-2: Drawing of the 32"Ø line explaining possible trapped air scenarios.

6.2 Recommendations

Due to our inability to stabilize the test sections at the Red Hill, Tank 5 site with trapped air hindering our hydro testing attempts, we recommend to use preliminary pneumatic tests to verify in the field if the lines were leaking or if the pressure loss was due to trapped air.

During the pressurization attempts and hydrostatic testing attempts, we followed an order of operations developed by PPSI using past experience to follow in case of pressure loss to determine in a logical order if the cause is a leaking valve, trapped air, or an actual leak in the line. We knew in this instance there was only two causes for the pressure loss; trapped air in the line or a leak. On each line test section we used the following order of operations in troubleshooting the loss of pressure:

1. Initial pressurization and air bleed. Allow reasonable stabilization period and repressurize if necessary.
2. Identify any suspect fittings or flanges / gaskets. Repressurize and stabilize.
3. Identify any other areas that could possibly trap air.
4. Repressurize final time.
5. **Next Recommendation:** Pump line down to extent possible and pressurize with compressed air to 25 psi and hold. If line does not experience a decrease in pressure with the compressed air, the problem is trapped air in the line and steps need to be taken to further modify the line so a successful hydro-test can be accomplished if that is the final desire.

Proposed Pneumatic Test Procedure

The following pneumatic test procedure has been developed and has been used by PPSI successfully several times at other sites.
ASME B 31.3 Section 345.5 addresses pneumatic testing as does ASME B 31.4 Section 437.4.3. Only the B 31.4 standard specifies a duration of one hour for a leak check.

I. Hydrostatic Testing Discontinue Criteria

1. Line is 100% isolated either by DBB valves (Check cavities for leaks), installation of skillets, or removal of valves and blinding. **Completed – testing up against ported test blinds.**
2. Air has been bled to extent possible and system investigated for other possible causes of pressure loss. **Completed – see notes in this report.**
3. Line has been pressurized up to 5 times in an attempt to stabilize and left overnight at least one night for stabilization. **Completed with no real success.**

II. Pneumatic Test Criteria

ASME B31.4 only allows for pneumatic testing for piping operated at a hoop stress less than 20% of the SMYS of the pipe. Since we don't know what the SMYS of this piping is, we will limit any pneumatic test pressures to 25 psi (IAW ASME B31.3). The purpose of this test is not to specifically satisfy ASME B31.4; it is to confirm the line is subjected to trapped air preventing a successful hydrotest and to confirm that the line is not actually leaking causing the loss of pressure in the initial hydrostatic test.

1. Pump as much liquid as possible from line after removal of the test blinds.
2. Test line at determined pressure for 4 hours. Soap all joints, flanges, and threaded fittings during test period. Test pressure as described in ASME documents is 110% of the design pressure or MAOP. Again, we feel a 25 psi test is more than sufficient to confirm trapped air in the hydrotest.

   Under the circumstances that we are proposing a pneumatic test and the intent that the pneumatic testing will be utilized, we feel that a 25 psi test would suffice for determining if the lines are leaking or not. Pneumatic testing is inherently dangerous and that risk factor is multiplied as the pressure increases.

3. Testing gas shall be compressed air as there is no petroleum in the line and the tank is currently out of service.
4. Pass / Fail criteria shall be no loss of pressure for duration. All visual inspection requirements remain the same.
5. All parties must concur with the test result.
6. ASME PCC-2 should be used to calculate a safe distance from the piping during testing. This area will be physically isolated for the test duration.

Should any questions about this report or the information contained herein arise, contact Mr. Dennis Cobb, Vice President / Owner at (757) 544-0831 or by email at dcobb@pipelinepsi.com.

7.0 REFERENCES

7.1 "Operation & Maintenance: Maintenance of Petroleum Systems" United Facilities Criteria (UFC) UFC 3-460-03F, January 2003

7.2 "Pressure Testing Requirements for Hazardous Liquid Pipelines in California", Office of the State Fire Marshal, Pipeline Safety Division, May 2011 Revision

7.3 American Society of Mechanical Engineers, "Standard B31.3: Process Piping", 2009

7.4 American Society of Mechanical Engineers, "Standard B31.4: Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids", 2009

7.5 American Petroleum Institute, "Recommended Practice 1110: Pressure Testing of Steel Pipelines for the Transportation of Gas, Petroleum Gas, Hazardous Liquids, or Carbon Dioxide", Sixth Edition, February 2013

7.6 Willbros Government Services, "Pressure Test Procedure: NDT-3", Revision 9, June 5, 2014

APPENDIX A –

PROJECT PHOTOGRAPHS

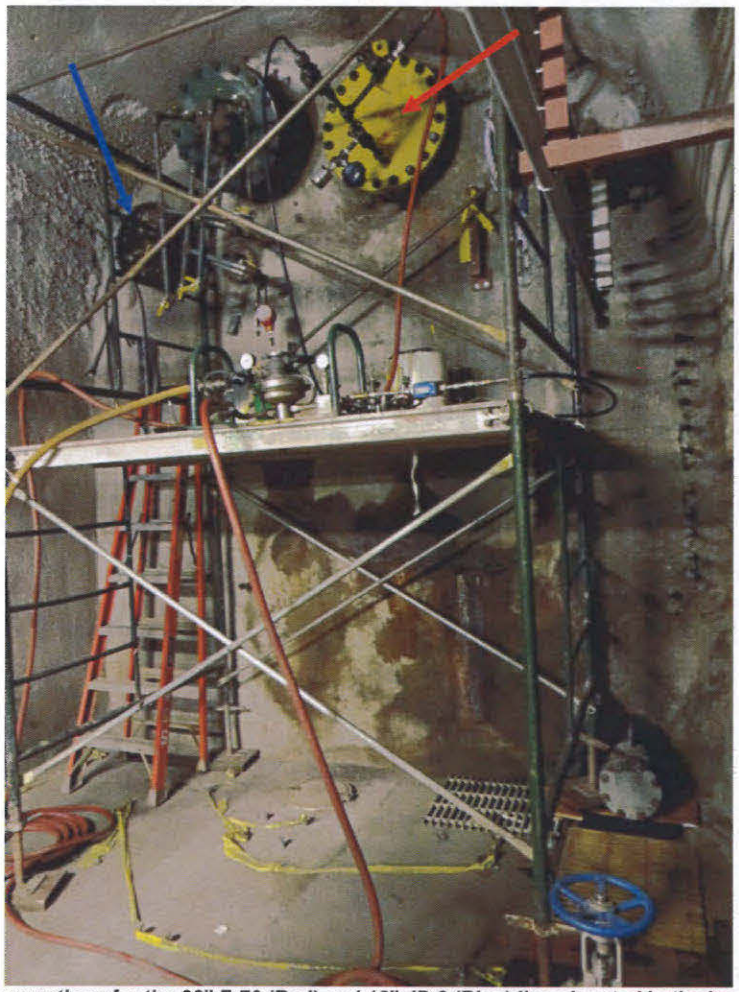


Figure 1.0: Test connections for the 32" F-76 (Red) and 18" JP-8 (Blue) lines located in the lower access tunnel.

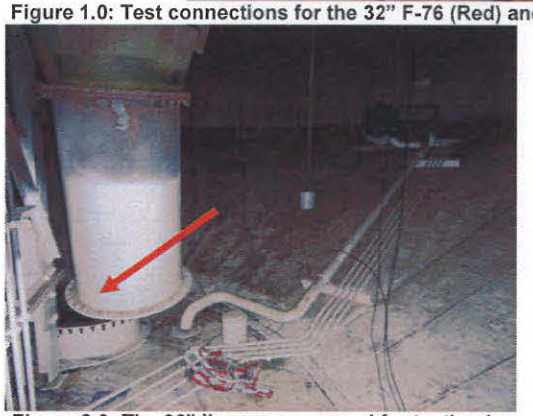


Figure 2.0: The 32" line was prepared for testing by removing the diffuser and installing a ported blind on the pipe flange as indicated. This connection was not a standard ANSI flange and required a custom ported blind to be fabricated. This flange was also not even and required several attempts to seal using different combinations of gaskets of various materials.

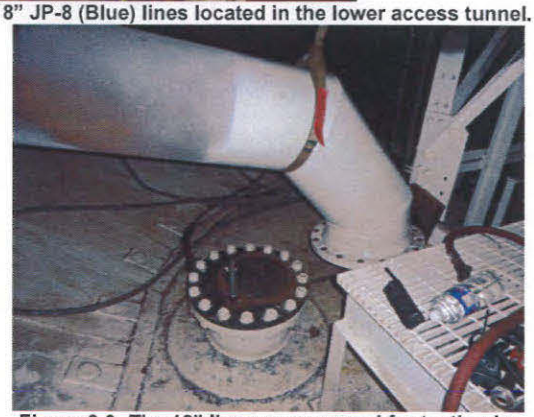


Figure 3.0: The 18" line was prepared for testing by removing the diffuser and installing a ported blind on the pipe flange as indicated. This connection was a standard ANSI Class 150 flange.

Figure 4.0: Test tree on the 12"Ø flange in the lower access tunnel for the 18"Ø line.

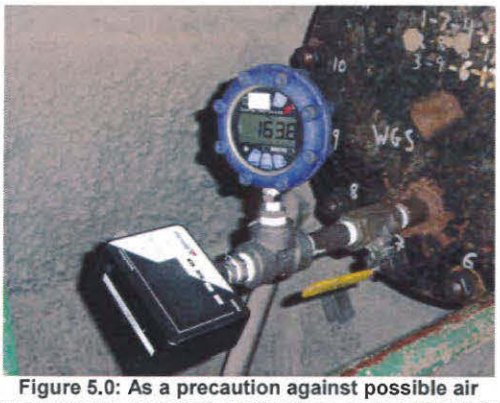


Figure 5.0: As a precaution against possible air entrapment, we removed our test tree and connected the test instruments directly to the pipe in an effort to stabilize the pipe. The efforts were not successful.

Figure 6.0: The 18"Ø line inside of Tank 5. Note temperature probe connected to the port on the blind flange.

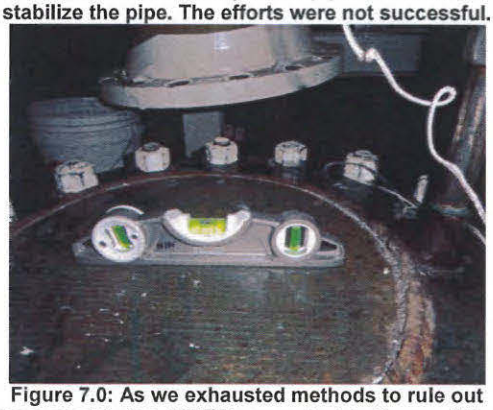


Figure 7.0: As we exhausted methods to rule out trapped air in the 18"Ø line, we decided to see if the level of the flange inside of the tank could trap a small amount of air and the conclusion is yes.
(See drawing 6-1)

Figure 8.0: There was a small notch cut from the flange of the 32"Ø line inside of the tank. This notch was the source of some of the leaks that proved difficult to overcome on the 32"Ø flange.

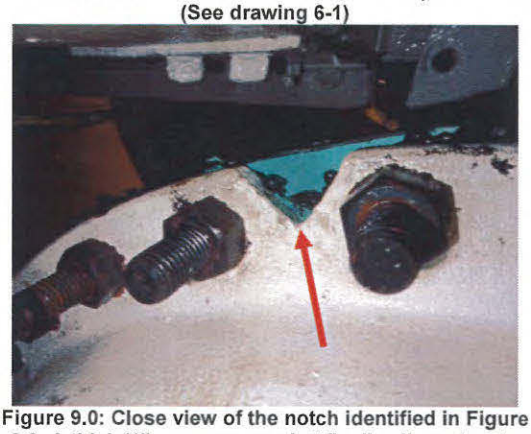


Figure 9.0: Close view of the notch identified in Figure 8.0. A thick ¼" neoprene gasket finally allowed us to seal the flange.

Figure 10.0: The 32"Ø pipe was drained just enough to remove the flange to change the gasket. We confirmed that there was little room for trapped air at this point.

Figure 11.0: The custom fabricated 32"Ø ported flange supplied by WGS is shown here.

Figure 12.0: One of the failed attempts at pressurizing the 32"Ø line. Note active leaks form the bolts due to the gasket not ssealing.

Figure 13.0: 910 ml was drained from the 32" line during the DV / DP check.

APPENDIX B –

FIELD NOTES & DAILY ACTIVITIES

Willbros - Red Hill – Tank 5 Daily Notes Day 1 and 2

6/23/14 – ***0600*** – Onsite. We met with James Hagen (Willros). Take a tour of upper and lower tunnels and Tank 5 to familiarize ourselves with the site. ***0800*** – Meeting with NAVFAC, Navy, and Willbros personnel to discuss scope of work and safety. ***0900*** – Site walk through and evaluation with all personnel. ***1200*** – Connect test equipment to 20" flange (for 32" pipe) inside the lower access tunnel while connecting a temperature probe and bleeder equipment inside tank. ***1323*** – Start pumping water into line with 1" hose from water main inside of the lower access tunnel. ***1546*** – Pumped in approximately **1832.99** gals in thus far and 3.3 psi on the line. Personnel from inside the tank indicate that there are leaks coming from the bolts of the flange inside the tank. We stopped pumping water and secured. Crew decided to get a new gasket for the flange and change it tomorrow. ***1700*** – Left site for the day.

6/24/14 – ***0600*** – Onsite. Sign in and Safety briefing. ***0700*** – Wilbros personnel make up gasket for 32" flange from garlok material supplied by the facility (Per Scott Hedricks) and install it. There was estimated 3 gallons of water on tank floor due to leaking bolts the day before. Dry up water using buckets and rags. ***0839*** – Start pumping water into the line. ***0842*** – We have **1839.03** gals in and 48.7 psi on the line from the normal water main pressure. We bled off 2.12 gals (All Pressure – down to 0 psi) to allow crew inside of tank to put temp probe on line. Cut on water again from the main, added 2 gals and pressure went back up to 48.3 psi. ***1022*** – Start pressurizing line with pressure pump supplied by Willbros. Again, there were leaks inside tank from several bolts. We stopped operations. D. Cobb and James Hagen go into the tank to identify the leaks. ***1111*** – Bleed off pressure. It was confirmed that the gasket needed to be replaced with a different combination. ***1245*** – Crew went to get silicone and Willbros personnel make up 2 more gaskets. ***1330*** – D. Cobb, James and Willbros personnel entered tank to install new gaskets and apply silicone. Let sit overnight to fully cure. ***1500*** – Drain approximately 20 gallons from 32" line so flange can be removed. ***1530*** – Connect fittings and water hose to 12" flange (for 18" pipe). ***1542*** – Start pumping water into line. ***1642*** – Add **761.69** gallons to the line. Bleed air from the ported blind inside of tank. We disconnected the water hose and attached our pressure testing equipment / sensors to the pipe. ***1700*** – All personnel met upper level tunnel at Tank 5 and discuss the next day plan of work. ***1745*** – Left site for the day.

Willbros - Red Hill – Tank 5 Daily Notes Day 3

6/25/14 – ***0600*** – Onsite. Sign in and Safety briefing. ***0700*** – Start pressurizing 18" line from 0 psi to 47 psi with head pressure from water hose thru the pump (1.65 gals in). ***0742*** – Start pressuring up using pump. ***0745*** – Pressure at 102.2 psi (total 2.3 gals in). Bleed down 10 psi to 92.2 psi into measuring cup (340mil) for DV / DP check. Resume pressurizing line. ***0747*** – Pressure at 163.0 psi. (2.66 gals in) Let stabilize. ***0800*** – Pressure at 161.1 psi. Bleed air to 157.8 psi and re-pressurized. ***0810*** – Pressure at 162.8 psi (2.67 gals in total). Let Stabilize. We tightened up our pressure recorder (Madgetech Unit 1) after a minor drip was observed. Pressure is still decreasing. ***0852*** – Pressure at 160.2 psi. Re-pressurize again. ***0857*** – Pressure at 166.5 psi (2.68 gals in total). Let Stabilize. ***0920*** – **START TEST**.... Take first readings. ***0921*** – Crew inside of the tank called on radio, we have several more leaks from bolts on the flange inside the tank. Crew attempted to stop the leaks with hammer wrenches. ***0935*** – **STOP TEST!** D. Cobb and James Hagen went into the tank and identify leaks. They used hammer wrenches again to try to stop the leaks. ***1030*** – Pressure at 160.2 psi. ***1035*** – Pressure at 160.0 psi and still dropping. ***1040*** – Bleed off pressure and change gasket. ***1220*** – Start pressurizing line by using water thru the pump. ***1235*** – Pressure at 48.0 psi (3.95 gals in). Start using pump to pressure up line. ***1238*** – Pressure at 164.7 psi (4.29 gals in total). Let Stabilize. ***1243*** – Pressure at 164.2 psi. Re-pressurize to 165.3 (4.29 gals in total). Let Stabilize. ***1308*** – Pressure at 164.8 psi. Re-pressurize to 166.2 psi (4.29 gals in total). Let stabilize. ***1325*** – Pressure at 164.4 psi. Re-pressurize to 166.9 psi (4.29 gals in total). Let stabilize. ***1559*** – Pressure at 162.7 psi. ***1600*** – Re-pressurize to 166.9 psi (5.31 gals in total). Let stabilize. ***1720*** – Pressure at 164.9 psi. ***1740*** - Pressure at 164.5 psi. ***1800*** - Pressure at 163.9 psi. ***1820*** - Pressure at 163.6 psi. ***1845*** - Pressure at 163.1 psi. ***1900*** - Pressure at 162.7 psi. ***1915*** - Pressure at 162.5 psi. ***1930*** - Pressure at 162.3 psi. ***1945*** - Pressure at 161.9 psi. ***2000*** - Pressure at 161.6 psi. ***2004*** – Re-pressurize to 167.4 psi (5.33 gals in total). Let stabilize and left pressure on pipe overnight. ***2030*** – Secured for the day and left site.

Willbros - Red Hill – Tank 5 Daily Notes Day 4

6/26/14 – ***0600*** – Onsite. Sign in and Safety briefing. ***0635*** – Met with NAVFAC, Navy and Willbros personnel to discuss yesterday's actions and todays plan of work. ***0725*** – Descend into the lower tunnel to tank 5 and checked pressure gauges on 12" flange (for 18" line). ***0735*** – Ambient Temp: 79.9; Pipe Temp: 79.8 and Pressure was at 155.1 psi. ***0802*** – Ambient Temp: 79.9; Pipe Temp: 79.9 and Pressure was at 154.6 psi. ***0830*** – Inside tank Probe temp was 79.6. ***0915*** – Pressure at 153.5 psi. Pipe Temp: 79.9, and Ambient Temp: 79.9. We pressurized line to 170.1 psi. Closed off valve to the pipe and removed our test

equipment from the pipe. We also took the filters off our pressure recorder and digital gauge and directly installed into the pipe to make sure there was no source of air in our test tree. Bleed air and let stabilize at ***0945***. ***0950*** – Pressure at 163.9 psi. ***1005*** - Pressure at 163.5 psi. ***1020*** - Pressure at 163.3 psi. Inside tank Probe Temp: 79.7. ***1025*** – Line still losing pressure, bleed off pressure and stop all meters from running. ***1035*** - Switch out Aux temp recorder with crew inside the tank to move back to the 32" line. ***1100*** – Back in lower tunnel, activate our meters and set up our pressure recorder and digital gauge and directly installed into the 20" flange (for 32"line). ***1115*** – Crew inside of tank begin bleeding air from ported blind. ***1138*** – Start pressurizing line with water thru the pump. ***1143*** – Pressure at 48.1 psi (15.98 gals in total). ***1147*** – Start pressurizing line by using pump. ***1150*** – Pressure at 75.0 psi but decreasing. Got call from crew inside of the tank on radio. There are more leaks from 32" flange inside of tank. Bleed off pressure. ***1155*** – D. Cobb and James Hagen went to identify leaks in the tank. Attempt to tighten up bolts using knock wrenches. ***1235*** – Cut on water and pressurized the pipe thru the pump using only the main pressure. ***1241*** – Pressure at 48.0 psi (16.45 gals in total) ***1242*** – Start using the pump. ***1244*** – Pressure at 75.0 psi but decreasing. ***1320*** – Pressure at 64.0 psi. Start pressurizing. ***1322*** – Pressure at 75.0 psi (17.55 gals in total). Continue pumping. ***1323*** - Pressure at 87.5 psi (18.46 gals in total). Crew is still trying to tighten up bolts inside tank. ***1327*** - Pressure at 77.4 psi. Pressurize back up to 80.0 psi (19.16 gals in total). ***1423*** – Depressurize line – gasket is leaking from a triangle notch cut out of the flange inside of the tank. Drained out 5 gallons from line. Willbros crew went to get more material to make up thicker, more pliable gasket. ***1520*** – Drained out 5 gallons from line. ***1545*** – Crew makes up ¼ " gasket and install it on 32" flange inside tank. ***1806*** – Start filling up pipe with water thru the pump using water main pressure. ***1815*** – Pressure at 48.6 psi (10.25 gals in total). Stop the water. Bleed off pressure. ***1824*** – D. Cobb and James back in lower tunnel. Use the water to pressurize line thru the pump. ***1838*** – Pressure at 48.2 psi. (17.88 gals in total) Start pump up. ***1857*** – Pressure at 71.6 psi. (18.00 gals in total). We had to stop pumping and take the flow meter out and clean the turbine. ***1907*** – Place flow meter back in service and start pressurizing back up with pump. ***1912*** – Pressure at 165.0 psi (19.5 gals in total). Let stabilize. ***1935*** – Pressure at 163.0 psi. ***1950*** – Pressure at 162.5 psi. ***1956*** –Pressure at 162.2 psi. Bleed down to 152.2 psi for the DV / DP check. (910 mil drained out) ***1958*** – Pressure up line to 168.1 psi. (0.15 gals added in) ***2000*** – **START TEST**. Take readings every 15 mins for the 1st hr and 30 mins thereafter. (See gauge sheet). ***2400*** – **TEST COMPLETE**. Leave pressure on line over night because line never fully stabilized, even though the rate of decrease slowed.
0045 – Secure for the day and Left site.

Willbros - Red Hill – Tank 5 Daily Notes Day 5

6/27/14 – ***0900*** – Onsite. Sign in and Safety briefing. Met with Willbros personnel to discuss today's plan of work. ***0915*** – Descend into lower tunnel to tank 5 and checked pressure gauges on 20" flange (for 32" line). ***0930*** – Ambient Temp: 79.9; Pipe Temp: 79.9 and Pressure was at 162.3 psi. De-pressurize line and download data from dataloggers. Load up equipment in pelican case for shipping. 1020 – Mob to upper tunnel and secure tank. ***1120*** – Mob outside of upper tunnel. Review site actions over the past week. ***1200*** – Secure for the day. Left site.

APPENDIX C –

TEST ID 14-332-01A DETAILED TEST RESULTS
TEST ID 14-332-01B DETAILED TEST RESULTS
TEST ID 14-332-02 DETAILED TEST RESULTS

APPENDIX C –

TEST ID 14-332-01A DETAILED TEST RESULTS
TEST ID 14-332-01B DETAILED TEST RESULTS
TEST ID 14-332-02 DETAILED TEST RESULTS

PIPELINE PETROLEUM SERVICES, INC.
1324 Cavalier Blvd / PO BOX 6808
Chesapeake, VA 23323
Phone: (757) 544-0831

Pipeline Pressure Test Report - Test Summary

Form Revision Number: 6
Form Revision Date: 4-Jan-14

Note: Green cells that are blank indicate a value of 0 (Zero).
Note: Fill in blue cells with required information / Green cells are calculated values.

I. GENERAL TEST INFORMATION

Test ID No:	14-332-01A	Job No:	14-332	Type of Test:	Hydrostatic Pressure Decay (Hydrostatic x 150% MAWP, Hydraulic x 125% or 150% MAWP) (Hydro-Pneumatic x 110% or 150% MAWP, Pneumatic x 110% MAWP) (Pressure Decay, Strength Test, Leak Test, Spike Test, Ect.)
Minimum Test Duration: (Hrs)	4				
Date:	6/26/2014	Customer:	Willbros Government Services	Dwg Color Code:	None
Contract Number:	Willbros Contract # N62583-08-D-0132/003	System:	Tank 5 Fuel Piping - 32"	Location:	Red Hill Fuel Farm, Oahu, HI
Test Medium:	Water				
Test Medium Source:	Water Line in Lower Access Tunnel	Tank #:	5	AST / UST:	UST
Product:	Water				
Test Medium Additives:	None	Specific Gravity: 141.5/(131.5 + Degrees API)	1	API Gravity:(141.5/SG)-131.5	10.00
Flash Point:	N/A				
Included Pipe Sections or Laterals: (Test Section)	32" - F-76 service lateral to Tank 5 from the 20" flange at the wall of the Lower Access Tunnel to the 32" flange inside of the tank where the diverter was connected. (Diverter removed for the test)	Test Connection: (Location / Size / Type)	Ported test blind on the 20" flange located in the lower yard tunnel. Temp probe also placed inside of tank.		
Time Zone:	Hawaii	Country:	USA	Purpose of Test: (Annual Or Five-Year Requalification, New Commissioning, Post Repair, Other)	Possible Suspected Leak
Test Criteria: (Jurisdictional Regulation)	CSFM / UFC 3-460-03	Skillets Installed:	☐ Yes ☑ No		
(49 CFR 195.300, 49 CFR 192, 33 CFR 156.170, 33 CFR 154, 9-VAC-25-91, UFC 3-460-03, CCR: CA Code Regulations, State Code, Customer Policy, Project Specifications, Other)		Location(s): (List valve / tank number / ect.)		Size:	
Test Procedure:	API RP-1110 / CSFM Guidelines / Willbros Test Procedure, Revision 9: June 5, 2014				
(API RP 1110, API-570, ASME B.31.1, ASME B31.3, ASME B31.4, ASME B B31.8, NFPA 329, CSFM, 49 CFR 195)		Valves and diffusers removed and test blinds installed.			
Test Medium Disposal:	☐ Yes ☑ No	Disposal Company:	N/A		
Disposal Type & Amount (Gals):	Willbros will drain pipeline into portable totes for disposal outside of the tunnel.				

II. PIPE DESIGN DATA

System Design Data Code: (ASME B 31.1 (Power Piping) / B 31.3 (Process Piping) / B 31.4 (Liquid Fuels Transportation) / B 31.8 (Gas Transmission) / Other)	UNK - Assume ASME B31.3				
Pipe Specification: (ASTM A53 (CS-Welded & Seamless) / A135 (ERW Pipe) / A312 (SS-Welded & Seamless) / API 5L (Welded & Seamless for Fuel Piping) / Other)	UNK - Assume API 5L ERW				
Pipe Grade: (Pipe Grade A & B / Strength X42 - X60)	UNK	SMYS: (psi)	35,000	Pipe Information Source:	No pipe information was readily available from the facility.
Year Installed:	Circa 1943				

Known Repairs / Modifications:	Date:	Known Repairs / Modifications:	Date:
None known			

W_{JF} (Weld Joint Factor)	0.8	(Range (.6 - 1.0) per ASME B 31.4 Table 402.4.3) / Source:	Assumption
D_F (Design Factor):	0.72	(.72 for Haz Liquid Pipelines per ASME B31.4 or State Other Criteria):	N/A

III. TEST SECTIONS (If Loading Arm Present in Test Section Include Total Length & Volume from attachment I)

Pipe Section (Identification)	MP To (Location)	MP From (Location)	Nominal Pipe Ø (In)	Wall Thickness (In)	Outside Ø (In)	Inside Ø (In)	Pipe Material	Configuration (Buried-BG / Exposed-AG / Inside IN)	Length (Ft)	Section as % Total Pipe Length	Volume (Gallons)	Volume per Foot Pipe ID (Gal)	Length AG (%)(Ft)	Length BG (%)(Ft)	Length Inside (%)(Ft)
Non Exposed			32	0.375	32.000	31.25	CS / STD	Buried	44.0	91.67%	1753.12	39.84		44.0	
Nozzle Inside Tank			32	0.375	32.000	31.25	CS / STD	Inside	1.0	2.08%	39.84	39.84			1.0
Nozzle Outside Tank			20	0.375	20.000	19.25	CS / STD	Inside	3.0	6.25%	45.36	15.12			3.0
Total Pipe Sections in Test Section:		3	Averages:	0.375	31.250	27.250		Sum Of Factors:		1.00	Weight Of Factors: (=100%)			0.92	0.08
Total Volume Test Section (Gal):		1638.32	Total Volume Test Section (CF):		245.76	Total Length Test Section: (Ft)			48.0	Total Length AG / BG / Inside: (ft)				44.0	4.0
								Use Factoring For Volume Change & Pressure / Temperature Calculations				Total Number Factors:			2

Hydrostatic Pipeline Pressure Test Report 2014
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Pipeline Pressure Test Report (Continued)

IV. TEST PRESSURE INFORMATION

Test Pressure:(psi): 162.375 | % SMYS: 19.33% | MAWP: (psi) 108.25 | Stated MAOP:(psi) 108.25 | Max System Design Pressure: (100% SMYS x WJF x DF)(Pipe Only - Does Not Include Fittings & Components): 484

How MAWP Determined: *(Customer Provided / Pipeline Questionnaire / SPCC Plan / Calculated / Pump Deadhead / PRV Settings / Other):* Max head from a full tank calculated by (.433)(SG)(Height) = 250' high x 1 (SG of water) x .433 = 108.25 x 1.5 = 162.375

Does pipeline have a elevation difference of 100' or greater? ☐ Yes ☑ No

(If yes then attach profile drawing of the pipeline indicating locations of pressure sensors IAW 49 CFR 195 if applicable)

HP Elevation: (Ft)	9.5	Min Pressure @ High Point:	162.375	% SMYS:	19.33%
LP Elevation: (Ft)		Max Pressure @ Low Point:	166	% SMYS:	19.82%
Difference: (Ft)	9.5	Pressure at TE Elevation:	162	% SMYS:	19.33%
Test Equipment (TE) Elevation: (Ft)	9.24	*See Test Pressure Calculation Sheet*			

Flange Class: 150 lb

150 lb Class Flanges Max Test Pressure = 425 psi (MAOP: 275 psi) / 300 lb Class Flange Max Test Pressure = 1100 psi (MAOP: 720 psi)

Is Test Pneumatic or Hydro-Pneumatic? (Yes or No): No | Joints / Welds Soaped? (Yes or No): N/A

If Yes Use The Following Information if Test is Performed With Nitrogen:

Estimated Volume of Nitrogen Needed From 0 psi to Test Pressure: (If Line Empty)(CF): N/A | Equivalent Bottles: N/A

+ 1 ATM) / 1 ATM = Volume CF of Nitrogen Needed (Note: 1 ATM = 14.7 psi) | Note: 1 Bottle = 300 CF

Estimated Pipe Fill at Start of Pressurization: (%)(Existing product): N/A

Estimated Volume of Nitrogen Needed: (At Estimated Line Fill): N/A | Equivalent Bottles: N/A

Pressure Relief Valves: ☐ Yes ☑ No

ID	Size	Set Pressure	Location	Serial Number	Manufacturer

V. TEST SUMMARY

Weather (Test Start): Test Section Inside - Weather Not A Factor | Weather (Test End): N/A | Weather Comments: None

Note: Only Use Volume Calculations & Temperature Evaluation for Underground Hydrostatic or Hydraulic Testing (Not Applicable 100% AG Pipe for Pneumatic or Hydro-Pneumatic Testing).

Does Test Section Have UG Pipe? (Yes or No): Yes

Test Volume Calculation Summary: (See Attachment B)

Volume Calculated to Fill Pipeline: (DV / DP)(Gal)(If Empty): 1838.32 | Actual Volume to Fill Pipeline: (Gallon): 1836.03 | Difference: -2.29 | Difference: (%): -0.12%

Volume Calculated to Reach Test Pressure from 0 PSI: (Pipeline must be full)(From Pre-Test Calculation Page): 1.6972 Gal | Difference: 17.7128 Gal | Pressurization DV/DP Diff (%) Volume: 91.26%

Actual Volume Required to Reach Test Pressure: (From Pre-Test Calculation Page): 19.41 Gal | Equivalent % Pipe Fill (At Pressurization >100% = Pipe Full)(<100% = Pipe has Trapped Vapor): 8.74%

Test Volume Correction Calculation Summary: (See Attachment B)

AVG Calculated DV / DP for Test Section: (Gal / psi): 0.0104524

dV/dP: Change in volume with respect to pressure.

dP/dV (=1/dV/dP) (From Pre-Test Calcs)(psi/gal) = 95.67 PSI / Gal

dP/dV: Change in pressure with respect to volume.

dV/dT (From Pre-Test Calcs - Sum of all pipe sections)(gal/°F) = 0.203 Gal / °F

dV/dT: Change in volume with respect to temperature

dP/dT: =(dP/dV)x(dV/dT)(psi/°F): 19.44 PSI / °F

Change in pressure with respect to temperature

Equivalent Pressure Loss From Drained Amount: (Calculated DP / DV)

1 | Gallons = 95.67 PSI | Total Gal Drained = PSI

Equivalent Pressure Loss From Drained Amount: (Field DP / DV)

N/A | Gallons = 41.67 PSI | Total Gal Drained = PSI

Pressure & Temperature Evaluation (From Attachment E)

	dP / dT		FChg T		Chg P	
Chg P expected = *(°C converted to °F)*	19.44	(psi / °F) x	-0.08	°F =	-1.63	Change of Pressure Expected ▲P

Pressure increases (Chg P > 0): If Chg P observed > Chg P expected test is successful.

Pressure decreases (Chg P < 0): If Abs (Chg P observed) < Abs (Chg P expected) test is successful.

Test Successful: (Pass / Fail): Fail | Expected ▲ P: (Calculated Chg P) -1.6333

Total pressure differential (TPD) from Attachment A (Log Sheet) → | Observed ▲ P: (From Log Sheet) -3.2000

Note: The sign (+/-) of the observed pressure change should be consistent with the sign of the temperature change (FChg T).

Calculating Fluid Volume Gain / Loss (From Attachment F)

dV =Total Pipeline Volume*K_T* dT+ dV/dP*dP	dV		Net Volume Removed (Accountable Loss(-) / Gain(+) - From Log Sheet)		Unaccountable Gain	Actual Gain(+) / Loss(-)
Volume. Gain/8hrs	0.01	+		=	0.01	
Volume. Gain/hour	0.00	+		=	0.00	

Added or Subtracted During Test

CSFM Loss Allowable Gal./hour 1.03 Gal./8hours 8.22 | Test Conclusion IAW CSFM / hr: Pass | Test Conclusion IAW CSFM / 8 hrs: Pass

Test Acceptable: ☑ Yes ☐ No

(IAW Applicable Test Criteria & Regulation)

Test Readings Recap:

Start Test	Time:	2000	Start Pressure:	168	Average AG/IN Temp Start:	79.90	Average BG Temp Start:	79.90
End Test	Time:	2400	End Pressure:	164.8	Average AG/IN Temp End:	79.80	Average BG Temp End:	79.80
			Difference:	-3.2	Difference:	-0.10	Difference:	-0.10

Any Leaks or Weeps Detected During Pressurization or Test Period: ☑ Yes ☐ No

Remarks & Leak Corrections (Include Repairs Made Prior To Test): No visual leaks were identified on the test section after the 32" flange gasket inside of the tank was properly sealed. There was at least three periods of pressurization to allow for the gasket to be changed / replaced.

Hydrostatic Pipeline Pressure Test Report 2014
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Pipeline Pressure Test Report (Continued)

VI: ATTACHMENTS TO THIS REPORT: (All May Not Be Included or Required)

- [x] Attachment A / Test Pressure Calculations
- [x] Attachment B / Pre-Test Calculations & Pressurization Log
- [x] Attachment C / Pressure / Volume Plot
- [x] Attachment D / Pressure & Temp Log
- [x] Attachment E / Pressure & Temperature Evaluation
- [x] Attachment F / Volume Change Calculations
- [ ] Attachment G / Test Procedure & Valve Line-Up Sheet
- [ ] Attachment H / Loading Arm Information
- [ ] Attachment I / Photograph Page(s)
- [x] Pressure Graph
- [x] Temperature Graph
- [ ] Pipeline Elevation Drawing
- [x] Pipeline Test Section Drawing
- [ ] Test Equipment Drawing
- [ ] Disposal Manifest

VII: GENERAL TEST REMARKS: (List General Pipeline Condition / Recommendations from Visual Inspection)

Test considered inconclusive IAW applicable jurisdictional regulation, applied industry standards, and the intent of the test.

This is not a precision leak detection test and should not be considered as such. This hydrotest is considered a point-in-time, pressure decay, strength / stress / leak test against installed test blinds to determine if there are possible leaks at the stated MAOP / MAWP.

Test results are based on criteria established by (In Part) API-RP-1110; California State Fire Marshall Office (CSFM); as well as, calculated thermal pressure loss / gain, calculated volume loss / gain, no visual leaks identified in exposed piping during the test period, good engineering practice, and accepted industry practice. The pass/fail criteria may or may not be the required regulation however the criteria used is the accepted industry practice and is greater than or equal to the requirements in the jurisdictional regulation.

Initial pressurization attempted on 6/23/14 and the flange gasket inside of the tank began leaking at 60 psi when the pressurization pump was started. Attempts at tightening flange was unsuccessful. Remove flange and remove defective gasket. Install a rubber full faced gasket in conjunction with a new Garlok full faced gasket. Repressurize and this gasket combination began to leak at 75 psi. Remove flange for the second time and install two Garlok gaskets with high pressure / temperature silicone sealant between the flange face and gaskets and between the gaskets themselves.

The flange face is coated and uneven making proper sealing difficult. This combination leaked as well from a triangular notch that was cut out of the flange on the tank side of the pipe. The final configuration of a 1/4" thick neoprene gasket proved successful at sealing the flange for the test.

Interior of the pipe section was reported to be affected by corrosion pitting by the customer prior to our arrival and filling. This did not affect the test procedure and is added to this report only as additional information.

The line pressure never truly stabilized during the official test period, however the last 45 minutes of the following day (After the dataloggers were removed and the data recovered) appeared to achieve stabilization.

Evidence of the amount of trapped air in the line is the calculated volume to reach test pressure was approximately 1.7 gallons and it required over 19.4 gallons to reach test pressure which is equivalent to approximately 8.74% air by volume in the line.

We highly recommend a pneumatic test to confirm the existence of trapped air in the test section.

VIII: TEST EQUIPMENT INFORMATION:

(See drawing of testing apparatus if required and Calibration Certificates)

All calibrations are performed third-party and are traceable to NIST.

Equipment Description:	PPSI Unit Number:	Manufacturer:	Serial Number:	Calibration Date:	Calibrated By:
Pipe Pressure Datalogger	Unit 1	MadgeTech	N84154	4/11/2014	Madgetech
4 Channel Temperature Datalogger (Thermocouple)	Unit 1	MadgeTech	N82430	8/21/2013	Madgetech
2 Channel Temperature Datalogger (Thermocouple)	Aux Unit 1	MadgeTech	N84147	8/20/2013	Madgetech
Digital Flowmeter / Totalizer (1/2")	Unit 3	GPI Industries	3206877	6/16/2014	Angels Instruments
Digital Flowmeter / Totalizer (1")	Unit 4	GPI Industries	3710745	6/16/2014	Angels Instruments
0-5000 psi Digital Deadweight Accurate Test Gauge	Unit 1	Crystal	870422	5/5/2014	Angels Instruments

IX: SIGNATURES

Tested By:	Dennis Cobb	Report Prepared By:	Dennis Cobb	Reviewed & Approved:	Dennis Cobb	Customer Witness:	James Hagen
Title:	Vice President	Title:	Vice President	Title	Vice President	Title:	Project Manager
Signed:		Signed:		Signed:		Company:	Willbros Government Services
						Signed: (If Required)	
Date:	6/26/2014	Date:	6/26/2014	Date:	6/26/2014	Date:	6/26/2014

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Piping Test Pressure Calculations (Attachment A)

Note: Green cells that are blank indicate a value of 0 (Zero).
Note: Fill in blue cells with required information / Green cells are calculated values.

Test ID Number:	14-332-01A	Test Section:	Tank 5 Fuel Piping - 32"
Dwg Code Color:	None	Customer:	Willbros Government Services
Date:	6/26/2014	Location:	Red Hill Fuel Farm
			Oahu, HI

TEST CALCULATIONS INPUT

NPS		32.000	in.	NPS=	Nominal Pipe Size (Diameter Inches)
D	=	31.250	in.	D =	Outside Diameter of pipe (in)(Avg of all sections x % total length)
t	=	0.375	in.	t =	Pipe wall Thickness (in)(Avg of all sections x % total length)
W_{JF}	=	0.8		W_{JF} =	Weld Joint Factor (From Report Page 1)(Range (.6 - 1.0) per ASME B 31.4 Table 402.4.3)
D_F	=	0.72		D_F =	Design Factor (From Report Page 1)(.72 for Haz Liquid Pipelines per ASME B31.4)
SMYS	=	35,000	psi	SMYS =	Specified Minimum Yield Strength (From Report Page 1)
P_{WP}	=	108.25	psi	P_{WP} =	Maximum Working Pressure (psi)
G	=	1		G =	Product (Test Medium) Specific Gravity
LE	=		feet	LE =	Lowest elevation
HE	=	9.5	feet	HE =	Highest elevation
TE	=	9.24	feet	TE =	Test equipment elevation
▲E	=	9.5	feet	▲E =	Elevation Difference (If pipeline has an elevation difference >100' attach pipeline profile dwg)

Describe How Elevations Determined: (Line of sight estimation, known data, current survey, information source, ect.)

Foot of hydrostatic head was calculated at 9.5' based on 4 psi static head pressure x .433 psi / ft (=9.24') + 6" at bottom of pipe not recorded by the gauge due to location of the gauge itself relative to the center of the pipe.

TEST PRESSURE CALCULATIONS RESULTS

Nominal Test Pressure: (PSI) 162.375

162.4	psi	Min. Pressure at High Point
166.5	psi	Max. Pressure at Low Point
162.5	psi	Pressure at Test Equipment Point
19.3%		Test Pressure as % SMYS
840.0	psi	100% SMYS
483.8	psi	Design Pressure (Calculated - Pipe Only)

Calculate Max Low Point Pressure:

(Factor .433 psi / ft for water or Total Ft x .433 (Specific Gravity: 1.0) or correct factor for other test medium):

Test Medium: Water

(Use Formula: p=.433(h)(SG) where p: Pressure / h: Head in Ft / SG: Specific Gravity Test Medium)

h: (Ft) 9.5

SG: 1

TEST RESULTS

P_{MAX}	=	168.0	psi	P_{MAX} =	Maximum test gauge pressure
P_{MIN}	=	164.9	psi	P_{MIN} =	Minimum test gauge pressure
Difference	=	-3.1	psi		

Remarks & Assumptions: We have to assume that the weld joint factor for this pipe is .08 for steel, however no data was available. We also have to assume that the design factor of .72 from ASME is the same because the line is in combustible liquid service.

Test pressure determined by max head from a full tank calculated by (.433)(SG)(Height) = 250' high x 1 (SG of water) x .433 = 108.25 x 1.5 = 162.375

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Pre-Test Calculations & Pressurization Log (Attachment B)

Note: Green cells that are blank indicate a value of 0 (Zero).

Note: Fill in blue cells with required information / Green cells are calculated values.

Test ID Number:	14-332-01A	**Dwg Code Color:**	None
Customer:	Willbros Government Services	**Date:**	6/26/2014
System Under Evaluation:	Tank 5 Fuel Piping - 32"	**Location:**	Red Hill Fuel Farm

Use this form to establish the pre-test DV/DP, line fill volume, and test pressure volume, as well as plot the actual DV/DP and fill volumes.

Calculated DV / DP Data

DV / DP (Change in Volume / Change in Pressure): DV / DP is defined as the change in volume for an associated change in pressure of a known volume under pressure. Two DV/DP calculations are used in these guidelines, a theoretical and a field value. A theoretical DV/DP will give the expected volume change for an associated change in pressure for the specified volume under test assuming that the volume under pressure is free of entrained gas. The field value of DV/DP is the actual volume change for an associated change in pressure for the specified volume under test. If air exists within the line under pressure, this value will be different than the theoretical value.

The theoretical DV/DP for aboveground (unrestrained) pipe is calculated through the following equation:

$$\frac{DV}{DP} = V * \left[\left(\frac{D}{E * t}\right)\left(\frac{5}{4} - \nu\right) + C\right]$$

The theoretical DV/DP for buried (restrained) pipe is calculated through the following equation:

$$\frac{DV}{DP} = V * \left[\left(\frac{D}{E * t}\right)\left(1 - \nu^2\right) + C\right]$$

where,

V = volume of the segment for the individual pipe diameter, D (gallons),
D = outside diameter of pipe (in),
E = elastic modulus of steel pipe (psi),
t = wall thickness of pipe (in),
ν = poisson's ratio of steel pipe,
C = compressibility of test media ($in^3/in^3/psi$).

NOTE: For a test segment with multiple diameters, sum the individual DV/DP's of each pipe diameter to obtain a total DV/DP for the entire test section.

Restrained Pipe (Underground) (Volume = 0.0408 x d² x L)

From Formula at Left (CSFM)

V=	1753.12
D=	31.25
E=	2.95E+07
t=	0.375
ν=	0.3
c=	3.11E-06
DV/DP=	0.000958616

Weight of Restrained Pipe: 0.92

Unrestrained Pipe (Aboveground & Inside) (Volume = 0.0408 x d² x L)

From Formula at Left (CSFM)

V=	85.20
D=	31.25
E=	2.95E+07
t=	0.375
ν=	0.3
c=	3.11E-06
DV/DP=	0.000493618

Weight of Unrestrained Pipe: 0.08 (Values from Report Page 1)

AVG DV / DP for Test Section: (Gal): 0.0104524 (Use Avg DV/DP in Fill Chart - Page 3)

dV/dP: Change in volume with respect to pressure.

Use the Following Information for DV / DP Calculations - Values From Properties Charts Below

Test Medium:		Water	
B= Coef of Expansion:	1.23E-04	C=Compressibility of Test Media:	3.11E-06
Pipe Material #1:		Carbon Steel	
E = Elastic Modulus of Pipe #1 (PSI):			2.95E+07
ν = Poisson's Ratio of Pipe #1:			0.3
α = Linear Coefficient of Expansion: Pipe #1:			6.10E-06
Pipe Material #2:		N/A	
E = Elastic Modulus of Pipe #1 (PSI):			
ν = Poisson's Ratio of Pipe #1:			
α = Linear Coefficient of Expansion: Pipe #2:			
Number of Different Pipe Materials:			1
E Avg For Pipe Materials:			2.95E+07
ν Avg For Pipe Materials:			0.3
α Avg For Pipe Materials:			6.10E-06

Property Chart for Pipe Material

Pipe Material	Elastic Modulus: E	Coefficient of Expansion: a	Linear Coefficient of Expansion: α	Poisson's Ratio: ν
Carbon Steel	2.95E+07	6.50E-06	6.10E-06	.27-.30
Stainless Steel	2.8E+07	9.60E-06		.30-.31
FRP	2.3E+06	1.16E-05	1.16E-05	0.33
Aluminum	1.00E+07			0.33

Property Chart for Test Medium

Test Medium	Compressibility: C = (1/β)	Bulk Modulus: (β)	Coefficient of Expansion: B	SG @ 60°F
JP-5 / JP-8	5.85E-06	1.71E+05	4.98E-04	0.81
Diesel	5.21E-06	1.92E+05	4.59E-04	0.85
Gasoline	5.29E-06	1.89E+05	4.57E-04	0.84
Water	3.11E-06	3.22E+05	1.23E-04	1.00

Test Sections

Pipe Section (Identification)	Pipe Material	Nominal Pipe Ø (in)	Outside Ø (in)	Wall Thickness (in)	AVG Wall Thickness Exposed (AG)	AVG Wall Thickness Buried (BG)	AVG Wall Thickness Inside (IN)	dV/dT: Unrestrained (AG & IN) Pipe: Vx(B-3x) Restrained (Buried) Pipe: Vx(B-2α) (Total Last Cell)	Configuration Buried-BG / Exposed-AG / Inside-IN	Length (Ft)	Volume (Gallons)	Volume per Foot Pipe ID	Length AG (% Total Length)(Ft)	Length BG (% Total Length)(Ft)	Length Inside (% Total Length)(Ft)	Volume AG (% Total Length)(Ft)	Volume BG (% Total Length)(Ft)	Volume Inside (% Total Length)(Ft)
Non Exposed	CS / STD	32	32	0.375		0.375		0.194	Buried	44	1753.12	39.84		44			1753.12	
Nozzle Inside Tank	CS / STD	32	32	0.375			0.375	0.004	Inside	1	39.84	39.84			1			39.84
Nozzle Outside Tank	CS / STD	20	20	0.375			0.375	0.005	Inside	3	45.36	15.12			3			45.36
Total # AG Pipe Sections:						0.375	0.375	0.203	Total Length:	48	1838.32	Totals:		44	4		1753.12	85.20

Total # BG Pipe Sections:	1	AVG Wall AG & IN:	0.375
Total # IN Pipe Sections:	2	AVG Wall Buried:	0.375
Total # Pipe Sections:	3	Number Exposed Factors:	1

Note: AG & IN pipe is calculated as unrestrained.

Note: Buried (UG) pipe is calculated as restrained.

Total Exposed Pipe Length: (AG & IN)	4	(Ft)	Total Exposed Volume: (AG & IN)	85.20	(Gal)
Total Non-Exposed Pipe Length: (UG)	44	(Ft)	Total Non-Exposed Volume: (UG)	1753.12	(Gal)

dP/dV (=1/dV/dP) (dV/dP calculated above)(psi/gal) = 95.67

dP/dV: Change in pressure with respect to volume.

dV/dT (From above table - Sum of all pipe sections)(gal/°F) = 0.203

dV/dT: Change in volume with respect to temperature

dP/dT: =(dP/dV)x(dV/dT)(psi/°F) 19.44

Change in pressure with respect to temperature

Total Volume to Fill Test Section (If Line Empty)(Gal): 1838.32

Test Pressure (From Report Page 1)(PSI): 162.375

Total Volume to Reach Test Pressure From 0 psi (Use DV / DP Chart Below)(Gal): 1.69721

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Pre-Test Calculations & Pressurization Log (Attachment B)(Page 2)

Field DV / DP Data

Field DV /DP: Before the test section is under full test pressure, a field value of DV / DP should be obtained. This value of DV/DP can be compared with the theoretical value of DV/DP calculated under section 3.5 (completed during pre-test calculations). A field value of DV/DP that is smaller than the theoretical DV/DP indicates an incorrect pressure reading, incorrect DV/DP calculation, or incorrect measurement of the volume under test. A field value of DV/DP that is greater than the theoretical DV/DP indicates the presence of entrapped air or other gas in the pipe section.

Obtaining Field DV / DP: During initial pressurization, the test section should be pressurized to approximately 50 psi and allowed to stabilize. Take an accurate pressure reading. Then bleed approximately 10 psi and allow the test section to stabilize. Take another accurate pressure reading. Carefully, measure the volume of the fluid that was bled and convert this to gallons if necessary. Take the volume bled and divide this number by the difference in the pressure readings. This is the field value of DV/DP.

Beginning Pressure: (psi)	162.2	**Volume Bled** (Gallons):	0.24		**Field DV / DP:**	0.024	**Field DV/DP Acceptable (Must be Greater Than or Equal To Calculated):** Yes
Ending Pressure: (psi)	152.2	Equivalent Gallon / Unit Pressure (psi):	4.17	Gallon	**Calculated DV / DP:**	0.0104524	% Diff =(Difference/subtrahend)*Difference
Difference: (psi)	10	Field Equivalent dP/dV (=1/dV/dP):	41.67	psi / Gal	**Difference:**	0.0135476	**Air Entrapment Percentage:** 0.18%
		Calculated dP/dV (=1/dV/dP):	95.67	psi / Gal			
		Percentage Difference:	0.44%				

(Air entrapment percentage should be kept below 2% of total line volume if possible to increase the accuracy of the test. (API-RP-1110)(Pipe may be full or partially full at the beginning of pressurization. Bleed trapped vapor if possible or re-pack the line. Percentages over 100% = Line is packed or calculation error as described above.

Equivalent Pressure Loss From Drained Amount: (Calculated DP / DV)				Equivalent Pressure Loss From Drained Amount: (Field DP / DV)			
1	Gallons =	95.67	PSI	1	Gallons =	41.67	PSI
	Total Gal Drained =		PSI		Total Gal Drained =		PSI

PRESSURIZATION DATA

Final Pressurization Log

DATE (mm/dd/yy)	TIME (24 hr) hr - min	Dead Weight Reading (psig)	Change in Pressure (psig)	Volume Metered (gal)	Volume Increment (gal)	Filling Totalizer Reading (gal)	Remarks
06/26/14	1838	48.7		17.88	17.88	17.88	Initial fill from main.
	1857	71.6	22.9	0.12	18.00	18.00	Pressurize with pump
	1912	165.0	93.4	1.50	19.50	19.50	
	1956	162.2	-2.8		19.50		
	1957	152.2	-10.0	-0.24	19.26		DV/DP check
	1958	168.1	15.9	0.15	19.41		
	2000	168.0	-0.1		19.41		Start Test
					19.41		
Start Test (Time & Press) (From Test Log)	2000	168		19.41	Final Volume Injected		

Is Pipeline Full? ☐ Yes ☑ No

Volume To Fill or Pack Pipeline: (Gal) 1836.03

Volume Fill Comments: See notes below for initial pressure.

Pressurize From 48.7 psi

Source of Initial Pressure:
Fill line with existing water main in the lower access tunnel. The maximum pressure from the water main is 48 psi. Allow water main to pressurize line after air was bled inside of tank.

General Pressurization Comments: (List any reasons for repressurization)(List injection media temp if different from the pipe temp at time of pressurization)
The listed values for pressurization are from the period of the evening of 6/26/14 even though initial filling took place on 6/23/14. There were several depressurizations and re-pressurizations due to the leaking gasket inside of the tank.

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Theoretical DV/DP (Test Pressure Fill Chart)(0-453 psi)

Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)
		51	0.53307417	101	1.0556959	151	1.578317627	201	2.100993867	252	2.634013523	302	3.159635254	352	3.679259984	403	4.21233115
1	0.010452435	51	0.53307417	101	1.0556959	151	1.578317627	202	2.111391792	252	2.634013523	302	3.159635254	353	3.689709419	404	4.222783584
2	0.020904869	52	0.5435266	102	1.06614833	152	1.588770061	203	2.121844227	253	2.644468957	303	3.170087688	354	3.700161853	405	4.233236019
3	0.031357304	53	0.55397903	103	1.0766077	153	1.599222496	204	2.132296661	254	2.654918392	304	3.177540123	355	3.710614288	406	4.243688453
4	0.041809738	54	0.56443147	104	1.0870532	154	1.609674931	205	2.142749096	255	2.665370827	305	3.187992557	356	3.721066723	407	4.254140888
5	0.052262173	55	0.5748839	105	1.09750563	155	1.620127365	206	2.153201531	256	2.675823261	306	3.198444992	357	3.731519157	408	4.264593323
6	0.062714608	56	0.58533634	106	1.10795807	156	1.6305798	207	2.163653965	257	2.686275696	307	3.208897427	358	3.741971592	409	4.275045757
7	0.073167042	57	0.59578877	107	1.1184105	157	1.641032234	208	2.1741064	258	2.69672813	308	3.219349861	359	3.752424027	410	4.285498192
8	0.083619477	58	0.60624121	108	1.12886294	158	1.651484669	209	2.184558834	259	2.707180565	309	3.229802296	360	3.762876461	411	4.295950626
9	0.094071912	59	0.61669364	109	1.13931537	159	1.661937104	210	2.195011269	260	2.717633	310	3.24025473	361	3.773328896	412	4.306403061
10	0.104524346	60	0.62714608	110	1.14976781	160	1.672389538	211	2.205463704	261	2.728085434	311	3.250707165	362	3.78378133	413	4.316855496
11	0.114976781	61	0.63759851	111	1.16022024	161	1.682841973	212	2.215916138	262	2.738537869	312	3.2611596	363	3.794233765	414	4.32730293
12	0.125429215	62	0.64805095	112	1.17067268	162	1.693294408	213	2.226368573	263	2.748990304	313	3.271612034	364	3.8046862	415	4.337760365
13	0.13588165	63	0.65850338	113	1.18112511	163	1.703746842	214	2.236821007	264	2.759442738	314	3.282064469	365	3.815138634	416	4.3482128
14	0.146334085	64	0.66895582	114	1.19157755	164	1.714199277	215	2.247273442	265	2.769895173	315	3.292516904	366	3.825591069	417	4.358665234
15	0.156786519	65	0.67940825	115	1.20202998	165	1.724651711	216	2.257725877	266	2.780347607	316	3.302969338	367	3.836043503	418	4.369117669
16	0.167238954	66	0.68986068	116	1.21248242	166	1.735104146	217	2.268178311	267	2.790800042	317	3.313421773	368	3.846495938	419	4.379570103
17	0.177691388	67	0.70031312	117	1.22293485	167	1.745556581	218	2.278630746	268	2.801252477	318	3.323874207	369	3.856948373	420	4.390022538
18	0.188143823	68	0.71076555	118	1.23338728	168	1.756009015	219	2.289083181	269	2.811704911	319	3.334326642	370	3.867400807	421	4.400474973
19	0.198596258	69	0.72121799	119	1.24383972	169	1.76646145	220	2.299535615	270	2.822157346	320	3.344779077	371	3.877853242	422	4.410927407
20	0.209048692	70	0.73167042	120	1.25429215	170	1.776913884	221	2.309988050	271	2.83260978	321	3.355231511	372	3.888305677	423	4.421379842
21	0.219501127	71	0.74212286	121	1.26474459	171	1.787366319	222	2.320440484	272	2.843062215	322	3.365683946	373	3.898758111	424	4.431832276
22	0.229953562	72	0.75257529	122	1.27519702	172	1.797818754	223	2.330892919	273	2.85351465	323	3.37613638	374	3.909210546	425	4.442284711
23	0.240405996	73	0.76302773	123	1.28564946	173	1.808271188	224	2.341345354	274	2.863967084	324	3.386588815	375	3.91966298	426	4.452737146
24	0.250858431	74	0.77348016	124	1.29610189	174	1.818723623	225	2.351797788	275	2.874419519	325	3.39704125	376	3.930115415	427	4.46318958
25	0.261310865	75	0.7839326	125	1.30655433	175	1.829176058	226	2.362250223	276	2.884871954	326	3.407493684	377	3.940568785	428	4.473642015
26	0.2717633	76	0.79438503	126	1.31700676	176	1.839628492	227	2.372702657	277	2.895324388	327	3.417946119	378	3.951020284	429	4.48409445
27	0.282215735	77	0.80483747	127	1.3274592	177	1.850080927	228	2.383155092	278	2.905776823	328	3.428398554	379	3.961472719	430	4.494546884
28	0.292668169	78	0.8152899	128	1.33791163	178	1.860533361	229	2.393607527	279	2.916229257	329	3.438850988	380	3.971925153	431	4.504999319
29	0.303120604	79	0.82574233	129	1.34836407	179	1.870985796	230	2.404059961	280	2.926681692	330	3.449303423	381	3.982377588	432	4.515451753
30	0.313573038	80	0.83619477	130	1.3588165	180	1.881438231	231	2.414512396	281	2.937134127	331	3.459755857	382	3.992830023	433	4.525904188
31	0.324025473	81	0.8466472	131	1.36926893	181	1.891890665	232	2.424964831	282	2.947586561	332	3.470208292	383	4.003282457	434	4.536356623
32	0.334477908	82	0.85709964	132	1.37972137	182	1.9023431	233	2.435417265	283	2.958038996	333	3.480660727	384	4.013734892	435	4.546809057
33	0.344930342	83	0.86755207	133	1.3901738	183	1.912795534	234	2.4458697	284	2.968491143	334	3.491113161	385	4.024187327	436	4.557261492
34	0.355382777	84	0.87800451	134	1.40062624	184	1.923247969	235	2.456322134	285	2.978943865	335	3.501565596	386	4.034639761	437	4.567713926
35	0.365835212	85	0.88845694	135	1.41107867	185	1.933700404	236	2.466774569	286	2.9893963	336	3.51201803	387	4.045092196	438	4.578166361
36	0.376287646	86	0.89890936	136	1.42153111	186	1.944152838	237	2.477227004	287	2.999848734	337	3.522470465	388	4.055544631	439	4.588618796
37	0.386740081	87	0.90936181	137	1.43198354	187	1.954605273	238	2.487679438	288	3.010301169	338	3.5329229	389	4.065997065	440	4.59907123
38	0.397192515	88	0.91981425	138	1.44243598	188	1.965057707	239	2.498131873	289	3.020753604	339	3.543375334	390	4.0764495	441	4.609523665
39	0.40764495	89	0.93026668	139	1.45288841	189	1.975510142	240	2.508584307	290	3.031206038	340	3.553827769	391	4.086901934	442	4.6199761
40	0.418097385	90	0.94071912	140	1.46334085	190	1.985962577	241	2.519036742	291	3.041658473	341	3.564280203	392	4.097354369	443	4.630428534
41	0.428549819	91	0.95117155	141	1.47379328	191	1.996415011	242	2.529489177	292	3.052110907	342	3.574732638	393	4.107806803	444	4.640880969
42	0.439002254	92	0.96162398	142	1.48424572	192	2.006867446	243	2.539941611	293	3.062563342	343	3.585185073	394	4.118259238	445	4.651333403
43	0.449454688	93	0.97207642	143	1.49469815	193	2.017319881	244	2.550394046	294	3.073015777	344	3.595637507	395	4.128711673	446	4.661785838
44	0.459907123	94	0.98252885	144	1.50515058	194	2.027772315	245	2.560846481	295	3.083468211	345	3.606089942	396	4.139164107	447	4.672238273
45	0.470359558	95	0.99298129	145	1.51560302	195	2.03822475	246	2.571298915	296	3.093920646	346	3.616542377	397	4.149616542	448	4.682690707
46	0.480811992	96	1.00343372	146	1.52605545	196	2.048677184	247	2.58175135	297	3.10437308	347	3.626994811	398	4.160068977	449	4.693143142
47	0.491264427	97	1.01388616	147	1.53650789	197	2.059129619	248	2.592203784	298	3.114825515	348	3.637447246	399	4.170521411	450	4.703595576
48	0.501716861	98	1.02433859	148	1.54696032	198	2.069582054	249	2.602656219	299	3.12527795	349	3.64789968	400	4.180973846	451	4.714048011
49	0.512169296	99	1.03479103	149	1.55741276	199	2.080034488	250	2.613108654	300	3.135730384	350	3.658352115	401	4.19142628	452	4.724500446
50	0.522621731	100	1.04524346	150	1.56786519	200	2.090486923	251	2.623561088	301	3.146182819	351	3.66880455	402	4.201878715	453	4.73495288

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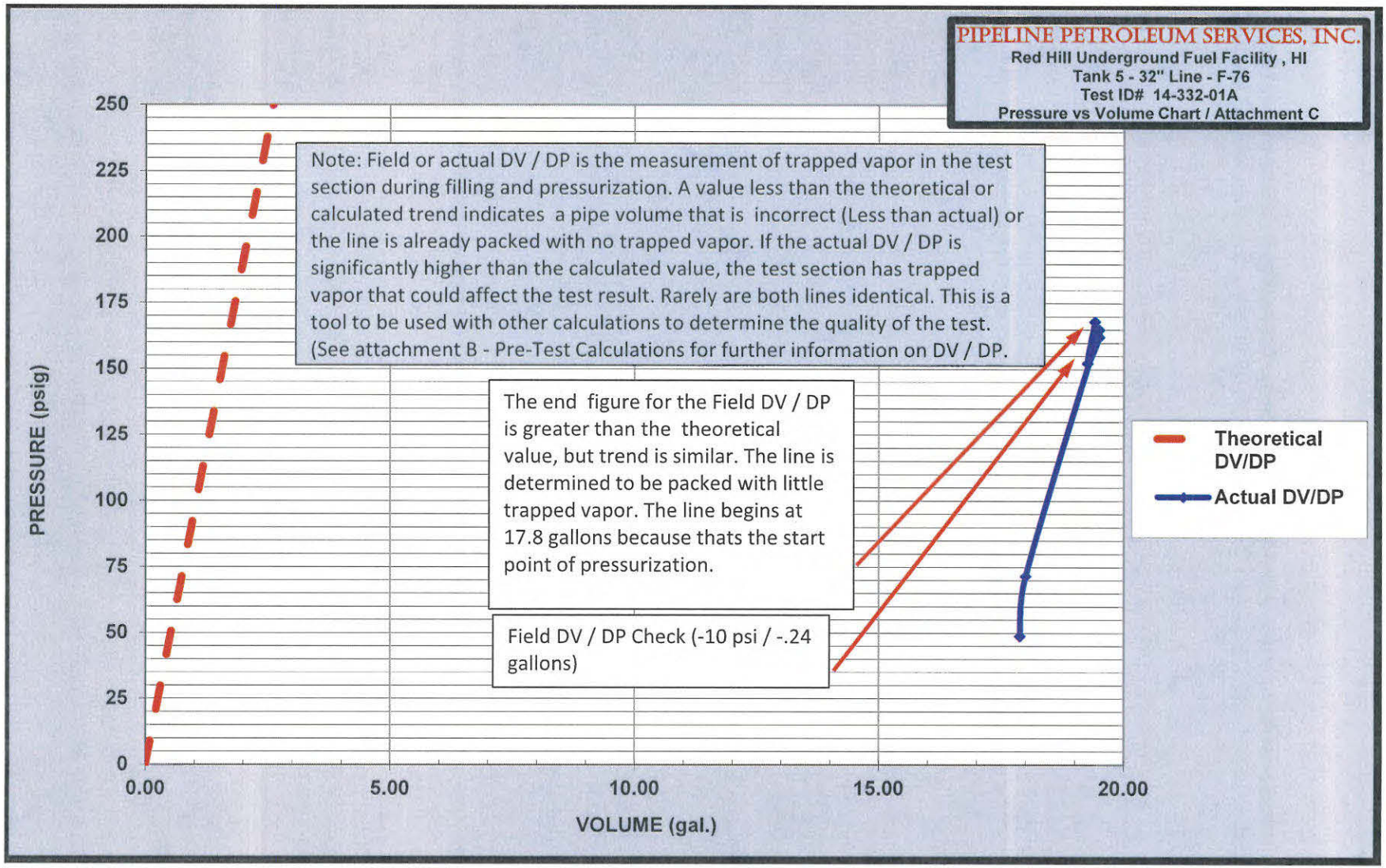
PIPELINE PETROLEUM SERVICES, INC.
Red Hill Underground Fuel Facility , HI
Tank 5 - 32" Line - F-76
Test ID# 14-332-01A
Pressure vs Volume Chart / Attachment C
Note: Field or actual DV / DP is the measurement of trapped vapor in the test section during filling and pressurization. A value less than the theoretical or calculated trend indicates a pipe volume that is incorrect (Less than actual) or the line is already packed with no trapped vapor. If the actual DV / DP is significantly higher than the calculated value, the test section has trapped vapor that could affect the test result. Rarely are both lines identical. This is a tool to be used with other calculations to determine the quality of the test. (See attachment B - Pre-Test Calculations for further information on DV / DP.
The end figure for the Field DV / DP is greater than the theoretical value, but trend is similar. The line is determined to be packed with little trapped vapor. The line begins at 17.8 gallons because thats the start point of pressurization.
Field DV / DP Check (-10 psi / -.24 gallons)
Theoretical DV/DP
Actual DV/DP
PRESSURE (psig)
250
225
200
175
150
125
100
75
50
25
0
0.00
5.00
10.00
15.00
20.00
VOLUME (gal.)

PIPELINE PETROLEUM SERVICES, INC.

Pipeline Pressure & Temperature Log (Attachment D)

Date: 6/26/2014
Test ID No: 14-332-01A
Dwg Color Code: N/A

Note: Enter readings every 15 minutes for first hour of test (Entries 1-5) and every 30 minutes for each hour there after.

Customer: Willbros Government Services
Location: Red Hill Fuel Farm
System: Tank 5 Fuel Piping - 32"

Pressure Location & Unit #: Location 1 & Unit #: Lower Yard Tunnel (Tank 5) | Location 2 & Unit #: Lower Yard Tunnel (Tank 5) | Location 3 & Unit #: | Location 4 & Unit #:

Number AG/IN Sensors: 1
Number BG Sensors: 1
Initial Pressurization From: 48.7 PSI

Entry ID Number	Time	Deadweight Pressure (psi)	Chart / Gauge Pressure (psig)	Aboveground / Exposed Pipe Temp (F) Location 1	Belowground / Non-Exposed Pipe Temp (F) Location 1	Aboveground / Exposed Pipe Temp (F) Location 2	Belowground / Non-Exposed Pipe Temp (F) Location 2	Aboveground / Exposed Pipe Temp (F) Location 3	Belowground / Non-Exposed Pipe Temp (F) Location 3	Aboveground / Exposed Pipe Temp (F) Location 4	Belowground / Non-Exposed Pipe Temp (F) Location 4	Inside Pipe Temp (F)	Ambient Temp (F)	Volume Added (Gal)	Volume Drained (Gal)	Percent Cloud Cover (0-100%)	Remarks (Weather Conditions)
1	2000	168.0	*	79.90	79.90								79.90				Start Test Time: 2000
2	2015	167.2		79.90	79.90								79.80				No weather effects - all piping is not exposed to the elements.
3	2030	166.8		79.90	79.90								79.70				
4	2045	166.6		79.90	79.90								79.80				
5	2100	166.3		79.90	79.90								79.80				
6	2130	165.9		79.80	79.80								79.80				
7	2200	165.7		79.80	79.80								79.70				
8	2230	165.3		79.70	79.70								79.70				
9	2300	165.1		79.80	79.80								79.80				
10	2330	164.9		79.80	79.80								79.90				
11	2400	164.8		79.80	79.80								79.80				
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
	Final	164.8		79.80	79.80								79.80				End Test Time: 2400
		PSI Diff		Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Total Added	Total Drained		Note: Average Temperatures are used in the calculations for the
	Net Change	-3.2		-0.10	-0.10								-0.10				press / temp eval sheet and volume change calculations.

Average AG/IN Temp Start:	79.90	Average AG/IN Temp End:	79.80	Average Temperature for Test AG/IN:	79.85
Average BG Temp Start:	79.90	Average BG Temp End:	79.80	Average Temperature for Test BG:	79.85

Net Volume Loss(+) / Gain (-):

Equivalent Pressure Loss From Drained Amount: (Field DP / DV)(Hydrotest Only)

1	Gallons =	41.67	PSI
	Total Gal Drained =		PSI

PSI Diff + PSI / Gal Equivalent from Drained Product (Calculated) = Total Pressure Differential (TPD)

TPD = -3.20 (Use on Evaluation Sheet - Attachment E)(Hydrotest Only)

Remarks: (Explanation of Any Pressure Discontinuities)

* See attached recorder chart. Average AG Temperature includes both Inside and Aboveground / Exposed Temperatures. (If needed)

Used the same temperatures for AG & BG pipe from the dataloggers in the tunnel and inside of the tank because there was no practical way to actually measure the temperature of the piping as it was encased in concrete. Due to the non-exposed nature of all of the piping we feel the temperatures should be very close to each other given the amount of stabilization time allowed.

Left pressure on the line from 1200 AM (Pressure 164.8 psi / Pipe temp: 79.07 + 79.1) to 0930 AM the next morning (June 27) and the pressure was at 163.4 psi with a pipe temperature of 79.34+ 79.718.

Note: Line never fully stabilized.

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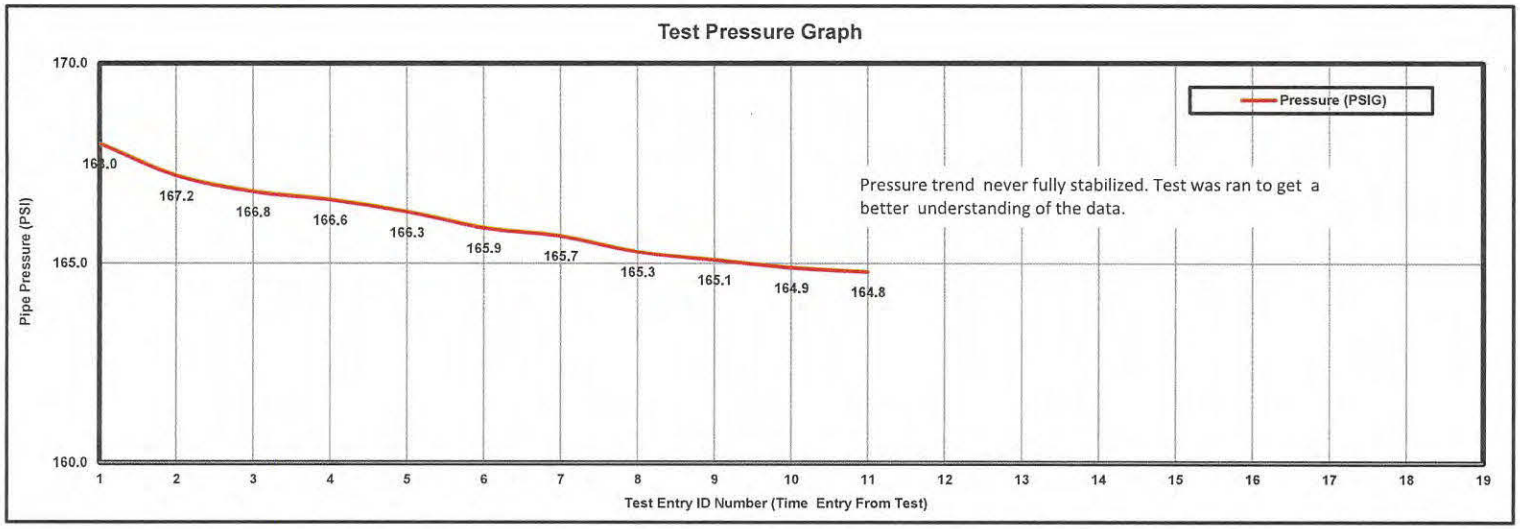

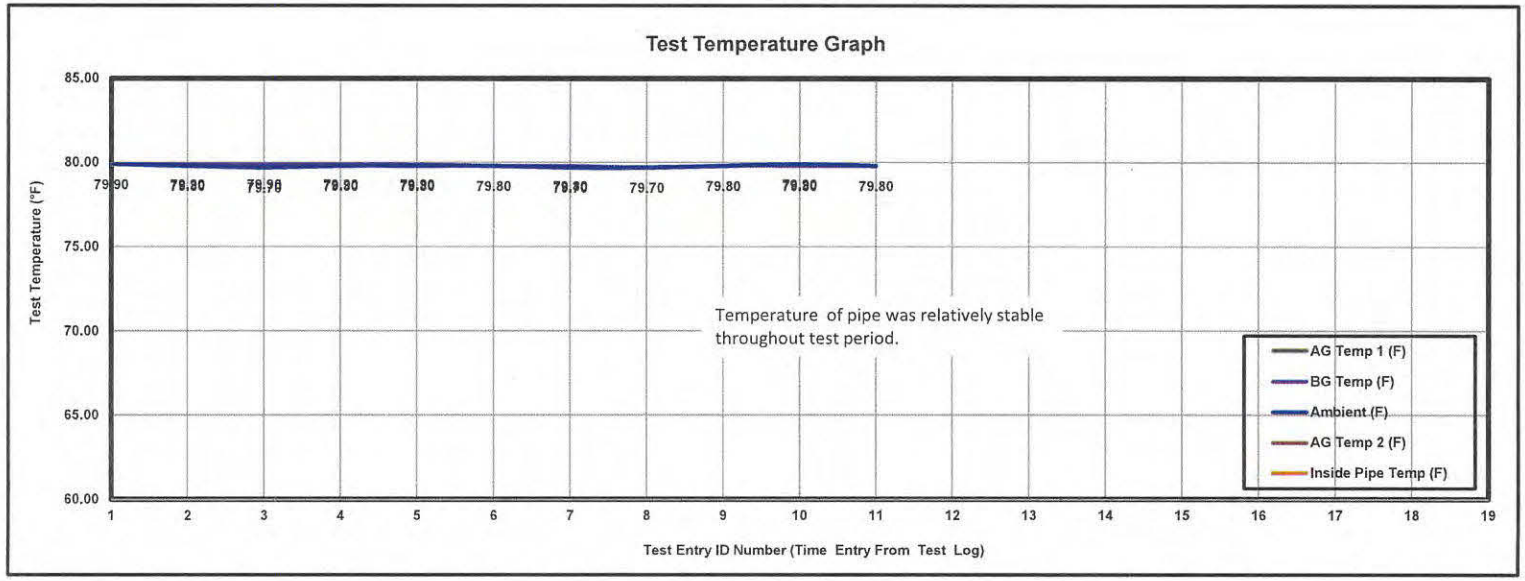

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PIPELINE PETROLEUM SERVICES, INC.

Hydrostatic Test Pressure and Temperature Evaluation Form (Attachment E)

Test ID Number:	14-332-01A	**Dwg Color Code:**	None	**Date:**	6/26/14
Customer:	Willbros Government Services	**Location:**	Red Hill Fuel Farm		
System Under Evaluation:	Tank 5 Fuel Piping - 32"				

Test Data:

Test Medium: (Water, Diesel, Gasoline, JP-5, JP-8, Kerosene, Other):	Water	IN: Inside Pipe Temp
Pipeline Total Length: ("L"): (All Test Sections)	48	AG: Aboveground Pipe Temp
Pipe Outside Diameter: ("*D*"): (Average From All Test Sections)	31.250	BG: Below Ground Pipe Temp
Pipe Wall Thickness: ("*t*"): (Average From All Test Sections)	0.375	TL: Total Length
D/t Ratio: (Pipe Ø / "t"): (Average From All Test Sections)	83.33	▲P: Pressure Change
Pipeline Total Volume: (From Report Page 1)	1838.32	▲T: Temperature Change
		All temp in degrees Fahrenheit unless noted
		All pressure in lb/in² (psi) unless noted

Beginning Test Pressure: ("*Pb*"):	168	**Ending Test Pressure: ("*Pe*"):**	164.8
Observed Pressure Change (Attachment A): (*Change P observed = Pe - Pb*):		-3.2	▲P (PSI)
Beginning Test Temperature AG: ("*Tb AG*"):	79.90	**Ending Test Temp AG: ("*Te AG*"):**	79.80
Length AG:		**Percent Total Length: (Length AG / Total Length): % TL AG:**	
Beginning Test Temperature BG: ("*Tb BG*"):	79.90	**Ending Test Temp BG: ("*Te BG*"):**	79.80
Length BG:	44	**Percent Total Length: (Length BG / Total Length): % TL BG:**	92%
Beginning Test Temperature Inside: ("*Tb IN*"):		**Ending Test Temp IN: ("*Te IN*"):**	
Length IN:	4	**Percent Total Length: (Length IN / Total Length): % TL *IN*:**	8%

▲T-AG: (Chg T=Te -Tb)	-0.10	**x %TL AG:**		**= Adjusted Average AG ▲T:**	
▲T-BG: (Chg T=Te -Tb)	-0.10	**x %TL BG:**	92%	**= Adjusted Average BG ▲T:**	-0.09
▲T-IN: (Chg T=Te -Tb)		**x %TL IN:**	8%	**= Adjusted Average IN ▲T:**	

(Final (FChg T) = Adjusted Avg AG ▲T + Adjusted Avg BG ▲T + Adjusted Avg IN ▲T / 3) **FChg T:** -0.08 **▲T (° F)**

Average Temp (T avg)	(Tb AG + Tb BG + Tb IN) / 3 =	76.20	**Tb**	Note: IN & AG are averaged together based on weighting factors.
	(Te AG + Te BG + Te IN) / 3 =	76.10	**Te**	
Average Fluid / Pipe Temperature (*T avg = (Te + Tb) / 2*):			**T avg:**	76.15 (For Test Duration)

Using T avg and D/t, find dP / dT from temperature compensation charts (exhibit 100,101,102, 103, 104, or 105) or calculate for the appropriate test medium:

dP / dT = 19.44 psi / ° F From Pre-Test Calculations - Attachment B

Formula for dP / dT Chart Development or Calculation used in Attachment B:

$$dP = \frac{[B-2a]/[Dx(1-v^2)/Et+C]}{T}$$

Formula and Results Validated by UFC 3-460-03 Section 9-3.5 / Pressure Relief Valves and CA State Hydrostatic Testing Worksheet. (Different Formula Variation)

dP=psig change per degree C or F
B=Coefficient of expansion of test medium
D=Pipe OD in inches
E=Modulus of elasticity for pipe material
v=Poisson's ratio, 0.3 for steel pipe
C=Compressibility factor for water (Or other test med), cu in/cu in/psig
a=Coefficient of expansion for steel,
t=Pipe wall thickness, in
T=Temperature, degrees C or F (20°C)(Or Tavg for test duration above)
Note: Modulus of Elasticity = Young's Modulus = Elastic Modulus

Test Medium:	Water	B=	1.23E-04	Bulk Modulus (β):	321,543
		C= (1/β)	3.11E-06	(Reciprocal of the Bulk Modulus (β) in lb/in²)	
Pipe Material #1:	Carbon Steel	E=	2.95E+07	a =	6.50E-06
Pipe Material #2:	N/A	E=		a =	
Pipe Material #3:	N/A	E=		a =	

List all Pipe Material & Test Medium Assumptions Made for Test Calculations: The type and grade of pipe material was assumed because no hard data was available from the original construction of the facility.

Test Variables for Calculations (Pipe Material Physical Properties from (*in part*) Appendix C, ASME B 31.3)

Pipe Material	E	a (in/in/per°F)	α (Linear)	Test Medium	C = (1/β)	Bulk Modulus (β):	B (° F)	SG @ 60°F
Carbon Steel	2.95E+07	6.50E-06	6.10E-06	JP-5 / JP-8 / Jet-A / Kerosene	5.18E-06	1.93E+05	4.98E-04	0.81
Stainless Steel	2.8E+07	9.60E-06		Diesel - LSD / ULSD / Dyed	5.21E-06	1.92E+05	4.59E-04	0.85
FRP	2.3E+06	1.16E-05		Gasoline	5.29E-06	1.89E+05	4.57E-04	0.84
Aluminum	1.00E+07			Water	3.11E-06	3.22E+05	1.23E-04	1.00
Other				Other				

Calculate the expected pressure change: *Chg P expected = dP / dT x FChg T*

Figure corrected for various diameters of pipe within test section.

Chg P expected =	*dP / dT*		*FChg T*		*Chg P*	
(°C converted to °F)	19.44	(psi / °F) x	-0.08	°F =	-1.63	psi - Expected ▲P

Pressure increases (Chg P > 0): If Chg P observed > Chg P expected test is successful.
Pressure decreases (Chg P < 0): If Abs (Chg P observed) < Abs (Chg P expected) test is successful.

Test Successful: (Pass / Fail):	Fail	**Expected ▲ P:** (Calculated Chg P)	-1.6333
Total pressure differential (TPD) from Attachment A (Log Sheet) →		**Observed ▲ P:** (From Log Sheet)	-3.2000

Note: The sign (+/-) of the observed pressure change should be consistent with the sign of the temperature change (FChg T).

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Hydrostatic Test Volume Change Calculations (Attachment F) Page 1 of 2

Test ID Number:	14-332-01A	**Dwg Code Color:**	None
Customer:	Willbros Government Services	**Date:**	6/26/2014
System Under Evaluation:	Tank 5 Fuel Piping - 32"	**Location:**	Red Hill Fuel Farm

Volume Change Calculations for Pipeline Hydrostatic Test (Calculated Volume/Pressure Slope Method)

Standard Formula: ▲V / V = Kp▲P + Kt▲T

▲P = Liquid Pressure Change
▲T = Liquid Temperature Change
▲V = Liquid Volume Added to Inside of Pipe
(Negative if Flows Out)
V= Nominal Pipeline Volume ($\pi D^2 L/4$)
D= Inside Pipe Diameter

Where: Kp = [(D/t)(5/4 -μ) / E] + 1/β = (1.9D / 2Et) + 1/β
And: Kt = 3a - g
L= Pipe Length
t = Pipe Wall Thickness
μ = Poisson's Ratio = 0.3
E = Young's Modulus = 30x10^6 psi
β = Liquid Bulk Modulus, a function of Press & Temp
g = Liquid Volumetric Expansion Coefficient, a Function of Press & Temp
a = Linear Coefficient of Thermal Expansion
Note: Modulus of Elasticity = Young's Modulus = Elastic Modulus

Test Medium:	Water				**Pipe Material:**	Carbon Steel
API Gravity: (141.5/SG)-131.5	Specific Gravity: SG 141.5/(131.5+Degrees API)	ρ (SG x 1000)	(Liquid Coefficient of Expansion) B & g =	Compressibility: C = (1/β)	(Young's Modulus) E=	Linear Coefficient of Expansion: a=
10.00	0.9990	999.012	1.23E-04	3.11E-06	2.95E+07	6.50E-06

Pipe Data			**Test Date**	6/26/2014	**API Gravity**	10.00
Pipe Segment	**Ø Outside (In)**	**Ø Inside (In)**	**Wall (In)**	**Length (Ft)**	**Volume (Gal)**	**Configuration**
Non Exposed	32	31.250	0.375	44	1753.12	Buried
Nozzle Inside Tank	32	31.250	0.375	1	39.84	Inside
Nozzle Outside Tank	20	19.250	0.375	3	45.36	Inside
			Totals	**48**	**1838.32**	

Weighting for Pipeline Segment	**% Total Length**	**Configuration**	**Buried**	**Exposed**	**Inside**
Non Exposed	0.95	Buried	0.95		
Nozzle Inside Tank	0.02	Inside			0.02
Nozzle Outside Tank	0.02	Inside			0.02
Sum of Factors	**1.00**		**Weight Factors**	**0.95**	**0.05**

The above factors are used for weighting segment temperatures.

Corrected Temperatures

Initial Test Temperatures

Buried	**Exposed**	**Inside**	**Initial Corrected T1**	**DT1**	
79.9	79.9		**76.20**	16.1900118	**AVG. T**
					76.15

Final Test Temperatures

Buried	**Exposed**	**Inside**	**Final Corrected T2**	**DT2**
79.8	79.8		**76.10**	16.0946465

Corrected Temperature Difference	***-0.10***

NOTE: PIPE TYPE

	E	**a**
Carbon Steel	2.95E+07	6.50E-06
Stainless Steel	2.8E+07	9.60E-06
FRP	2.3E+06	1.16E-05
Aluminum	1.00E+07	

Test Pressure Difference

Initial Pressure P1	**Final Pressure P2**	**dPressure**
168	164.8	**-3.2**

Calculate (Kp)=(1.9D/2Et)+1β weighted value	Kp (1/P)		Compressability Factor (1/BETA) or (1β)	
Calculating C_{PL}	C_{PL} 1	C_{PL} 2	F_P 1	F_P 2
C_{PL} = 1/(1-F_P*P) or Kp (1/P)=	**1.0006114**	**1.0005996**	3.637E-06	3.636E-06

Calculate (Kt)=(3a-g) a=constant

Calculating C_{TL}	C_{TL} 1	C_{TL} 2	Coefficient Of Linear Expansion	Temperature Correction Factor (c)	**Test/Duration**
C_{TL} = Exp(-α_{60}*DT*(1+0.8*α_{60}*(DT+δ_{60}))) or Kt(1/F)=	**0.9946333**	**0.9946650**	a	α_{60}	**Hours**
			6.50E-06	**3.31E-04**	4.00

Calculating Fluid Volume Gain / Loss

dV =V2-V1=V0/(C_{PL}2*C_{TL}2)-V0/(C_{PL}1*C_{TL}1))	dV=Total Pipeline Volume*(Kp*dP+Kt*dT) ▲V / V = Total Pipeline Volume Kp▲P + Kt▲T		Net Volume Removed (Accountable Loss(-) / Gain(+) - From Log Sheet)		Unaccountable Loss	*Actual Gain(+) / Loss(-)*
Volume. Loss/8hrs	***-0.04***	+		=	**-0.04**	
Volume. Loss/hour	***0.00***	+		=	**0.00**	
			Added or Subtracted During Test			

CSFM Loss Allowable			
Gal./hour	**1.03**	**Gal./8hours**	**8.22**

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Hydrostatic Test Volume Change Calculations (Attachment C) Page 2 of 2

Test ID Number:	14-332-01A	Code Color:	None
Customer:	Willbros Government Services	Date:	6/26/2014
System Under Evaluation:	Tank 5 Fuel Piping - 32"	Location:	Red Hill Fuel Farm

Volume Change Calculations for Jet Fuel Pipeline (measured volume/pressure slope method)

Pipe Data			Test Date	6/26/2014	API Gravity	10
Pipe Segment	Ø Outside (In)	Ø Inside (In)	Wall (In)	Length (Ft)	Volume (Gal)	Configuration
Non Exposed	32	31.250	0.375	44	1753.12	Buried
Nozzle Inside Tank	32	31.250	0.375	1	39.84	Inside
Nozzle Outside Tank	20	19.250	0.375	3	45.36	Inside
			Totals	48	1838.32	

Weighting for segment	% Total Length	Configuration	Buried	Exposed	Inside
Non Exposed	0.95	Buried	0.95		
Nozzle Inside Tank	0.02	Inside			0.02
Nozzle Outside Tank	0.02	Inside			0.02
Sum of Factors	1.00	Weight Factors	0.95		0.05

The above factors are used for weighting segment temperatures.

Corrected Temperatures

Initial Test Temperatures

Buried	Exposed	Inside	Initial Corrected	DT1	AVG. T
79.9	79.9		76.20	16.1900118	76.15

Final Test Temperatures

Buried	Exposed	Inside	Final Corrected	DT2
79.8	79.8		76.10	16.0946465

Corrected Temperature Difference	*-0.10*

Test Pressure Difference

Initial Pressure	Final Pressure	dPressure	AVG. Pressure
168	164.8	-3.2	166.4
			Use Reference from Test Data

dV/dP Slope Calculations (Values are From Test Data)

Initial Pressure	Final Pressure	Initial Vol.	Final Vol.	dV/dP
48.7	168	17.88	19.41	0.012824811

Calculating K_T	K_T	Coefficient Of Linear Expansion	Temperature Correction Factor	Test Duration
$K_T = 3a\text{-}\alpha_{60}$	-0.0003115	a	α_{60}	Hours
		6.50E-06	3.31E-04	4.00

Calculating Fluid Volume Gain / Loss

dV =Total Pipeline Volume*K_T* dT+dV/dP*dP	dV		Net Volume Removed (Accountable Loss(-) / Gain(+) - From Log Sheet)		Unaccountable Gain	*Actual Gain(+) / Loss(-)*
Volume. Gain/8hrs	*0.01*	+		=	0.01	
Volume. Gain/hour	*0.00*	+		=	0.00	
			Added or Subtracted During Test			

CSFM Loss Allowable				Test Conclusion IAW CSFM / hr	Pass
Gal./hour	1.03	Gal./8hours	8.22	Test Conclusion IAW CSFM / 8 hrs	Pass

Note: Use this pass/fail criteria to assist in determining a successful test with the temperature evaluation.

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PIPELINE PETROLEUM SERVICES, INC.
1324 Cavalier Blvd / PO BOX 6808
Chesapeake, VA 23323
Phone: (757) 544-0831

Pipeline Pressure Test Report - Test Summary

Form Revision Number: 6
Form Revision Date: 4-Jan-14

Note: Green cells that are blank indicate a value of 0 (Zero).
Note: Fill in blue cells with required information / Green cells are calculated values.

I. GENERAL TEST INFORMATION

Test ID No:	14-332-01B	Job No:	14-332	Type of Test:	Hydrostatic Pressure Decay (Hydrostatic x 150% MAWP, Hydraulic x 125% or 150% MAWP) (Hydro-Pneumatic x 110% or 150% MAWP, Pneumatic x 110% MAWP) (Pressure Decay, Strength Test, Leak Test, Spike Test, Ect.)
Minimum Test Duration: (Hrs)	4				
Date:	6/27/2014	Customer:	Willbros Government Services	Dwg Color Code:	None

Contract Number:	Willbros Contract # N62583-08-D-0132/003	System:	Tank 5 Fuel Piping - 32"	Location:	Red Hill Fuel Farm, Oahu, HI
Test Medium:	Water				
Test Medium Source:	Water Line in Lower Access Tunnel	Tank #:	5	AST / UST:	UST
Test Medium Additives:	None	Specific Gravity: 141.5/(131.5 + Degrees API)	1	Product:	Water
API Gravity:(141.5/SG)-131.5	10.00	Flash Point:	N/A		

Included Pipe Sections or Laterals: (Test Section): 32" - F-76 service lateral to Tank 5 from the 20" flange at the wall of the Lower Access Tunnel to the 32" flange inside of the tank where the diverter was connected. (Diverter removed for the test)

Test Connection: (Location / Size / Type): Ported test blind on the 20" flange located in the lower yard tunnel. Temp probe also placed inside of tank.

Time Zone:	Hawaii	Country:	USA	Purpose of Test: (Annual Or Five-Year Requalification, New Commissioning, Post Repair, Other)	Possible Suspected Leak

Test Criteria: *(Jurisdictional Regulation)* 49 CFR 195.300 / CSFM / UFC 3-460-03
(49 CFR 195.300, 49 CFR 192, 33 CFR 156.170, 33 CFR 154, 9-VAC-25-91, UFC 3-460-03, CCR; CA Code Regulations, State Code, Customer Policy, Project Specifications, Other)

Test Procedure: API RP-1110 / CSFM Guidelines / 49 CFR 195
(API RP 1110, API 570, ASME B.31.1, ASME B31.3, ASME B31.4, ASME B31.8, NFPA 329, CSFM, 49 CFR 195)

Test Medium Disposal: ☐ Yes ☑ No — Disposal Company: N/A

Disposal Type & Amount (Gals): Willbros will drain pipeline into portable totes for disposal outside of the tunnel.

Skillets Installed: ☐ Yes ☑ No

Location(s): (List valve / tank number / ect.)	Size:
Valves and diffusers removed and test blinds installed.	

II. PIPE DESIGN DATA

System Design Data Code: *(ASME B 31.1 (Power Piping) / B 31.3 (Process Piping) / B 31.4 (Liquid Fuels Transportation) / B 31.8 (Gas Transmission) / Other)*	UNK - Assume ASME B31.3
Pipe Specification: *(ASTM A53 (CS-Welded & Seamless) / A135 (ERW Pipe) / A312 (SS-Welded & Seamless) / API 5L (Welded & Seamless for Fuel Piping) / Other)*	UNK - Assume API 5L ERW
Pipe Grade: (Pipe Grade A & B / Strength X42 - X60)	UNK
SMYS: (psi)	35,000
Pipe Information Source:	No pipe information was readily available from the facility.
Year Installed:	Circa 1943

Known Repairs / Modifications:	Date:	Known Repairs / Modifications:	Date:
None known			

W_{JF} (Weld Joint Factor)	0.8	(Range (.6 - 1.0) per ASME B 31.4 Table 402.4.3) / Source:	Assumption
D_F (Design Factor):	0.72	(.72 for Haz Liquid Pipelines per ASME B31.4 or State Other Criteria):	N/A

III. TEST SECTIONS (If Loading Arm Present in Test Section Include Total Length & Volume from attachment I)

Pipe Section (Identification)	MP To (Location)	MP From (Location)	Nominal Pipe Ø (In)	Wall Thickness (In)	Outside Ø (In)	Inside Ø (In)	Pipe Material	Configuration (Buried-BG / Exposed-AG / Inside IN)	Length (Ft)	Section as % Total Pipe Length	Volume (Gallons)	Volume per Foot Pipe ID (Gal)	Length AG (%)(Ft)	Length BG (%)(Ft)	Length Inside (%)(Ft)
Non Exposed			32	0.375	32.000	31.25	CS / STD	Buried	44.0	91.67%	1753.12	39.84		44.0	
Nozzle Inside Tank			32	0.375	32.000	31.25	CS / STD	Inside	1.0	2.08%	39.84	39.84			1.0
Nozzle Outside Tank			20	0.375	20.000	19.25	CS / STD	Inside	3.0	6.25%	45.36	15.12			3.0
Total Pipe Sections in Test Section:		3	Averages:	0.375	31.250	27.250		Sum Of Factors:		1.00	Weight Of Factors: (=100%)			0.92	0.08
Total Volume Test Section (Gal):		1838.32	Total Volume Test Section (CF):		245.76	Total Length Test Section: (Ft)			48.0	Total Length AG / BG / Inside: (ft)				44.0	4.0

Use Factoring For Volume Change & Pressure / Temperature Calculations — Total Number Factors: 2

Hydrostatic Pipeline Pressure Test Report 2014
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Pipeline Pressure Test Report (Continued)

IV. TEST PRESSURE INFORMATION

Test Pressure:(psi): 162.375 | % SMYS: 19.33% | MAWP: (psi) 108.25 | Stated MAOP:(psi) 108.25 | Max System Design Pressure: (100% SMYS x WJF x DF)(Pipe Only - Does Not Include Fittings & Components) 484

How MAWP Determined: *(Customer Provided / Pipeline Questionnaire / SPCC Plan / Calculated / Pump Deadhead / PRV Settings / Other):* Max head from a full tank calculated by (.433)(SG)(Height) = 250' high x 1 (SG of water) x .433 = 108.25 x 1.5 = 162.375

Does pipeline have a elevation difference of 100' or greater? ☐ Yes ☑ No

(If yes then attach profile drawing of the pipeline indicating locations of pressure sensors IAW 49 CFR 195 if applicable)

HP Elevation: (Ft)	9.5	Min Pressure @ High Point:	162.375	% SMYS:	19.33%
LP Elevation: (Ft)		Max Pressure @ Low Point:	166	% SMYS:	19.82%
Difference: (Ft)	9.5	Pressure at TE Elevation:	162	% SMYS:	19.33%
Test Equipment (TE) Elevation: (Ft)	9.24	*See Test Pressure Calculation Sheet*			

Flange Class: 150 lb

150 lb Class Flanges Max Test Pressure = 425 psi (MAOP: 275 psi) / 300 lb Class Flange Max Test Pressure = 1100 psi (MAOP: 720 psi)

Is Test Pneumatic or Hydro-Pneumatic? (Yes or No): No | Joints / Welds Soaped? (Yes or No): N/A

If Yes Use The Following Information if Test is Performed With Nitrogen:

Estimated Volume of Nitrogen Needed From 0 psi to Test Pressure: (If Line Empty)(CF): N/A | Equivalent Bottles: N/A

+ 1 ATM) / 1 ATM = Volume CF of Nitrogen Needed (Note: 1 ATM = 14.7 psi) | Note: 1 Bottle = 300 CF

Estimated Pipe Fill at Start of Pressurization: (%)(Existing product): N/A

Estimated Volume of Nitrogen Needed: (At Estimated Line Fill): N/A | Equivalent Bottles: N/A

Pressure Relief Valves: ☐ Yes ☑ No

ID	Size	Set Pressure	Location	Serial Number	Manufacturer

V. TEST SUMMARY

Weather (Test Start): Test Section Inside - Weather Not A Factor | Weather (Test End): N/A | Weather Comments: None

Note: Only Use Volume Calculations & Temperature Evaluation for Underground Hydrostatic or Hydraulic Testing (Not Applicable 100% AG Pipe for Pneumatic or Hydro-Pneumatic Testing).

Does Test Section Have UG Pipe? (Yes or No): Yes

Test Volume Calculation Summary: (See Attachment B)

Volume Calculated to Fill Pipeline: (DV / DP)(Gal)(If Empty): 1838.32 | Actual Volume to Fill Pipeline: (Gallon): 1836.03 | Difference: -2.29 | Difference: (%): -0.12%

Volume Calculated to Reach Test Pressure from 0 PSI: (Pipeline must be full)(From Pre-Test Calculation Page): 1.6972 Gal | Difference: 17.7128 Gal | Pressurization DV/DP Diff (%) Volume: 91.26%

Actual Volume Required to Reach Test Pressure: (From Pre-Test Calculation Page): 19.41 Gal | Equivalent % Pipe Fill (At Pressurization >100% = Pipe Full)(<100% = Pipe has Trapped Vapor): 8.74%

Test Volume Correction Calculation Summary: (See Attachment B)

AVG Calculated DV / DP for Test Section: (Gal / psi): 0.0104524

dV/dP: Change in volume with respect to pressure.

dP/dV (=1/dV/dP) (From Pre-Test Calcs)(psi/gal) = 95.67 PSI / Gal

dP/dV: Change in pressure with respect to volume.

dV/dT (From Pre-Test Calcs - Sum of all pipe sections)(gal/°F) = 0.203 Gal / °F

dV/dT: Change in volume with respect to temperature

dP/dT: =(dP/dV)x(dV/dT)(psi/°F) 19.44 PSI / °F

Change in pressure with respect to temperature

Equivalent Pressure Loss From Drained Amount: (Calculated DP / DV)

1 | Gallons = 95.67 PSI | Total Gal Drained = PSI

Equivalent Pressure Loss From Drained Amount: (Field DP / DV)

N/A | Gallons = 41.67 PSI | Total Gal Drained = PSI

Pressure & Temperature Evaluation (From Attachment E)

	dP / dT		FChg T		Chg P	
Chg P expected = *(°C converted to °F)*	19.44	(psi / °F) x		°F =		Change of Pressure Expected ▲P

Pressure increases (Chg P > 0): If Chg P observed > Chg P expected test is successful.

Pressure decreases (Chg P < 0): If Abs (Chg P observed) < Abs (Chg P expected) test is successful.

Test Successful: (Pass / Fail): Fail | Expected ▲ P: (Calculated Chg P) | Observed ▲ P: (From Log Sheet) -0.1000

Total pressure differential (TPD) from Attachment A (Log Sheet) →

Note: The sign (+/-) of the observed pressure change should be consistent with the sign of the temperature change (FChg T).

Calculating Fluid Volume Gain / Loss (From Attachment F)

dV =Total Pipeline Volume*K_1* dT+ dV/dP*dP	dV		Net Volume Removed (Accountable Loss(-) / Gain(+) - From Log Sheet)		Unaccountable Loss	Actual Gain(+) / Loss(-)
Volume. Loss/8hrs	0.00	+		=	0.00	
Volume. Loss/hour	0.00	+		=	0.00	

Added or Subtracted During Test

CSFM Loss Allowable Gal./hour 1.03 Gal./8hours 8.22 | Test Conclusion IAW CSFM / hr: Pass | Test Conclusion IAW CSFM / 8 hrs: Pass

Test Acceptable: ☑ Yes ☐ No

(IAW Applicable Test Criteria & Regulation)

Test Readings Recap:

Start Test	Time:	845	Start Pressure:	163.5	Average AG/IN Temp Start:	79.34	Average BG Temp Start:	79.34
End Test	Time:	930	End Pressure:	163.4	Average AG/IN Temp End:	79.34	Average BG Temp End:	79.34
			Difference:	-0.1	Difference:		Difference:	

Any Leaks or Weeps Detected During Pressurization or Test Period: ☑ Yes ☐ No

Remarks & Leak Corrections (Include Repairs Made Prior To Test): No visual leaks were identified on the test section after the 32" flange gasket inside of the tank was properly sealed. There was at least three periods of pressurization to allow for the gasket to be changed / replaced.

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Pipeline Pressure Test Report (Continued)

VI: ATTACHMENTS TO THIS REPORT: (All May Not Be Included or Required)

- [x] Attachment A / Test Pressure Calculations
- [x] Attachment B / Pre-Test Calculations & Pressurization Log
- [x] Attachment C / Pressure / Volume Plot
- [x] Attachment D / Pressure & Temp Log
- [x] Attachment E / Pressure & Temperature Evaluation
- [x] Attachment F / Volume Change Calculations
- [ ] Attachment G / Test Procedure & Valve Line-Up Sheet
- [ ] Attachment H / Loading Arm Information
- [ ] Attachment I / Photograph Page(s)
- [x] Pressure Graph
- [x] Temperature Graph
- [ ] Pipeline Elevation Drawing
- [x] Pipeline Test Section Drawing
- [ ] Test Equipment Drawing
- [ ] Disposal Manifest

VII: GENERAL TEST REMARKS: (List General Pipeline Condition / Recommendations from Visual Inspection)

Test considered inconclusive IAW applicable jurisdictional regulation, applied industry standards, and the intent of the test.

This is not a precision leak detection test and should not be considered as such. This hydrotest is considered a point-in-time, pressure decay, strength / stress / leak test against installed test blinds to determine if there are possible leaks at the stated MAOP / MAWP.

Test results are based on criteria established by (In Part) API-RP-1110; 5th Edition, California State Fire Marshall Office (CSFM), as well as, calculated acceptable thermal pressure loss / gain, no visual leaks identified in exposed piping during the test period, good engineering practice, and accepted industry practice. The pass/fail criteria may or may not be the required regulation however the criteria used is the accepted industry practice and is greater than or equal to the requirements in the jurisdictional regulation.

Initial pressurization attempted on 6/23/14 and the flange gasket inside of the tank began leaking at 60 psi when the pressurization pump was started. Attempts at tightening flange was unsuccessful. Remove flange and remove defective gasket. Install a rubber full faced gasket in conjunction with a new Garlok full faced gasket. Repressurize and this gasket combination began to leak at 75 psi. Remove flange for the second time and install two Garlok gaskets with high pressure / temperature silicone sealant between the flange face and gaskets and between the gaskets themselves. The flange face is coated and uneven making proper sealing difficult. This combination leaked as well from a triangular notch that was cut out of the flange on the tank side of the pipe. The final configuration of a 1/4" thick neoprene gasket proved successful at sealing the flange for the test.

Interior of the pipe section was reported to be affected by corrosion pitting by the customer prior to our arrival and filling. This did not affect the test procedure and is added to this report only as additional information.

The pipeline never truly stabilized during the official test period, however the last 45 minutes of the following day (After the dataloggers were removed and the data recovered) appeared to achieve stabilization.

We highly recommend a pneumatic test to confirm the existence of trapped air in the test section.

This was a theroretical test using data from the last 45 minutes of the dstalogger data. The results are the same with a volume loss passing result and a temperature evaluation resulting in a faiulure however the results are much closer: +/- .1 psi loss.

No data was changed from the "A" test other than the data entered in the log sheet to manipulate the calculations.

VIII: TEST EQUIPMENT INFORMATION:

(See drawing of testing apparatus if required and Calibration Certificates)

All calibrations are performed third-party and are traceable to NIST.

Equipment Description:	PPSI Unit Number:	Manufacturer:	Serial Number:	Calibration Date:	Calibrated By:
Pipe Pressure Datalogger	Unit 1	MadgeTech	N84154	4/11/2014	Madgetech
4 Channel Temperature Datalogger (Thermocouple)	Unit 1	MadgeTech	N82430	8/21/2013	Madgetech
2 Channel Temperature Datalogger (Thermocouple)	Aux Unit 1	MadgeTech	N84147	8/20/2013	Madgetech
Digital Flowmeter / Totalizer (1/2")	Unit 3	GPI Industries	3206877	6/16/2014	Angels Instruments
Digital Flowmeter / Totalizer (1")	Unit 4	GPI Industries	3710745	6/16/2014	Angels Instruments
0-5000 psi Digital Deadweight Accurate Test Gauge	Unit 1	Crystal	870422	5/5/2014	Angels Instruments

IX: SIGNATURES

Tested By:	Dennis Cobb	Report Prepared By:	Dennis Cobb	Reviewed & Approved:	Dennis Cobb	Customer Witness:	James Hagen
Title:	Vice President	Title:	Vice President	Title	Vice President	Title:	Project Manager
Signed:		Signed:		Signed:		Company:	Willbros Government Services
						Signed: (If Required)	
Date:	6/27/2014	Date:	6/27/2014	Date:	6/27/2014	Date:	6/27/2014

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PIPELINE PETROLEUM SERVICES, INC.

Piping Test Pressure Calculations (Attachment A)

Note: Green cells that are blank indicate a value of 0 (Zero).
Note: Fill in blue cells with required information / Green cells are calculated values.

Test ID Number:	14-332-01B	Test Section:	Tank 5 Fuel Piping - 32"
Dwg Code Color:	None	Customer:	Willbros Government Services
Date:	6/27/2014	Location:	Red Hill Fuel Farm
			Oahu, HI

TEST CALCULATIONS INPUT

NPS		32.000	in.	NPS=	Nominal Pipe Size (Diameter Inches)
D	=	31.250	in.	D =	Outside Diameter of pipe (in)(Avg of all sections x % total length)
t	=	0.375	in.	t =	Pipe wall Thickness (in)(Avg of all sections x % total length)
W_{JF}	=	0.8		W_{JF} =	Weld Joint Factor (From Report Page 1)(Range (.6 - 1.0) per ASME B 31.4 Table 402.4.3)
D_F	=	0.72		D_F =	Design Factor (From Report Page 1)(.72 for Haz Liquid Pipelines per ASME B31.4)
SMYS	=	35,000	psi	SMYS =	Specified Minimum Yield Strength (From Report Page 1)
P_{WP}	=	108.25	psi	P_{WP} =	Maximum Working Pressure (psi)
G	=	1		G =	Product (Test Medium) Specific Gravity
LE	=		feet	LE =	Lowest elevation
HE	=	9.5	feet	HE =	Highest elevation
TE	=	9.24	feet	TE =	Test equipment elevation
▲E	=	9.5	feet	▲E =	Elevation Difference (If pipeline has an elevation difference >100' attach pipeline profile dwg)

Describe How Elevations Determined: (Line of sight estimation, known data, current survey, information source, ect.)

Foot of hydrostatic head was calculated at 9.5' based on 4 psi static head pressure x .433 psi / ft (=9.24') + 6" at bottom of pipe not recorded by the gauge due to location of the gauge itself relative to the center of the pipe.

TEST PRESSURE CALCULATIONS RESULTS

Nominal Test Pressure: (PSI) 162.375

162.4	psi	Min. Pressure at High Point
166.5	psi	Max. Pressure at Low Point
162.5	psi	Pressure at Test Equipment Point
19.3%		Test Pressure as % SMYS
840.0	psi	100% SMYS
483.8	psi	Design Pressure (Calculated - Pipe Only)

Calculate Max Low Point Pressure:

(Factor .433 psi / ft for water or Total Ft x .433 (Specific Gravity: 1.0) or correct factor for other test medium):

Test Medium: Water

(Use Formula: p=.433(h)(SG) where p: Pressure / h: Head in Ft / SG: Specific Gravity Test Medium)

h: (Ft) 9.5

SG: 1

TEST RESULTS

P_{MAX}	=	163.5	psi	P_{MAX} =	Maximum test gauge pressure
P_{MIN}	=	163.5	psi	P_{MIN} =	Minimum test gauge pressure
Difference	=		psi		

Remarks & Assumptions: We have to assume that the weld joint factor for this pipe is .08 for steel, however no data was available. We also have to assume that the design factor of .72 from ASME is the same because the pipeline is in combustible liquid service.

Test pressure determined by max head from a full tank calculated by (.433)(SG)(Height) = 250' high x 1 (SG of water) x .433 = 108.25 x 1.5 = 162.375

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Pre-Test Calculations & Pressurization Log (Attachment B)

Note: Green cells that are blank indicate a value of 0 (Zero).

Note: Fill in blue cells with required information / Green cells are calculated values.

Test ID Number:	14-332-01B	**Dwg Code Color:**	None
Customer:	Willbros Government Services	**Date:**	6/27/2014
System Under Evaluation:	Tank 5 Fuel Piping - 32"	**Location:**	Red Hill Fuel Farm

Use this form to establish the pre-test DV/DP, line fill volume, and test pressure volume, as well as plot the actual DV/DP and fill volumes.

Calculated DV / DP Data

DV / DP (Change in Volume / Change in Pressure): DV / DP is defined as the change in volume for an associated change in pressure of a known volume under pressure. Two DV/DP calculations are used in these guidelines, a theoretical and a field value. A theoretical DV/DP will give the expected volume change for an associated change in pressure for the specified volume under test assuming that the volume under pressure is free of entrained gas. The field value of DV/DP is the actual volume change for an associated change in pressure for the specified volume under test. If air exists within the line under pressure, this value will be different than the theoretical value.

The theoretical DV/DP for aboveground (unrestrained) pipe is calculated through the following equation:

$$\frac{DV}{DP} = V * \left[\left(\frac{D}{E * t}\right)\left(\frac{5}{4} - \nu\right) + C\right]$$

The theoretical DV/DP for buried (restrained) pipe is calculated through the following equation:

$$\frac{DV}{DP} = V * \left[\left(\frac{D}{E * t}\right)(1 - \nu^2) + C\right]$$

where,

V = volume of the segment for the individual pipe diameter, D (gallons),
D = outside diameter of pipe (in),
E = elastic modulus of steel pipe (psi),
t = wall thickness of pipe (in),
ν = poisson's ratio of steel pipe,
C = compressibility of test media ($in^3/in^3/psi$).

NOTE: For a test segment with multiple diameters, sum the individual DV/DP's of each pipe diameter to obtain a total DV/DP for the entire test section.

Restrained Pipe (Underground) (Volume = 0.0408 x d² x L)		Unrestrained Pipe (Aboveground & Inside) (Volume = 0.0408 x d² x L)	
From Formula at Left (CSFM)		From Formula at Left (CSFM)	
V=	1753.12	V=	85.20
D=	31.25	D=	31.25
E=	2.95E+07	E=	2.95E+07
t=	0.375	t=	0.375
ν=	0.3	ν=	0.3
c=	3.11E-06	c=	3.11E-06
DV/DP=	0.009958816	DV/DP=	0.000493618
Weight of Restrained Pipe	0.92	Weight of Unrestrained Pipe	0.08 (Values from Report Page 1)
AVG DV / DP for Test Section: (Gal)			0.0104524 (Use Avg DV/DP in Fill Chart - Page 3)

dV/dP: Change in volume with respect to pressure.

Use the Following Information for DV / DP Calculations - Values From Properties Charts Below

Test Medium:		Water	
B= Coef of Expansion:	1.23E-04	C=Compressibility of Test Media:	3.11E-06
Pipe Material #1:		Carbon Steel	
E = Elastic Modulus of Pipe #1 (PSI):			2.95E+07
ν = Poisson's Ratio of Pipe #1:			0.3
α = Linear Coefficient of Expansion: Pipe #1:			6.10E-06
Pipe Material #2:		N/A	
E = Elastic Modulus of Pipe #1 (PSI):			
ν = Poisson's Ratio of Pipe #1:			
α = Linear Coefficient of Expansion: Pipe #2:			
Number of Different Pipe Materials:			1
E Avg For Pipe Materials:			2.95E+07
ν Avg For Pipe Materials:			0.3
α Avg For Pipe Materials:			6.10E-06

Property Chart for Pipe Material

Pipe Material	Elastic Modulus: E	Coefficient of Expansion: a	Linear Coefficient of Expansion: α	Poisson's Ratio: ν
Carbon Steel	2.95E+07	6.50E-06	6.10E-06	.27-.30
Stainless Steel	2.8E+07	9.60E-06		.30-.31
FRP	2.3E+06	1.16E-05	1.16E-05	0.33
Aluminum	1.00E+07			0.33

Property Chart for Test Medium

Test Medium	Compressibility: C = (1/β)	Bulk Modulus: (β)	Coefficient of Expansion: B	SG @ 60°F
JP-5 / JP-8	5.85E-06	1.71E+05	4.98E-04	0.81
Diesel	5.21E-06	1.92E+05	4.59E-04	0.85
Gasoline	5.29E-06	1.89E+05	4.57E-04	0.84
Water	3.11E-06	3.22E+05	1.23E-04	1.00

Test Sections

Pipe Section (Identification)	Pipe Material	Nominal Pipe Ø (in)	Outside Ø (in)	Wall Thickness (in)	AVG Wall Thickness Exposed (AG)	AVG Wall Thickness Buried (BG)	AVG Wall Thickness Inside (IN)	dV/dT: Unrestrained (AG & IN) Pipe: Vx(B-3a) Restrained (Buried) Pipe: Vx(B-2a) (Total Last Cell)	Configuration (Buried-BG / Exposed-AG / Inside-IN)	Length (Ft)	Volume (Gallons)	Volume per Foot Pipe ID	Length AG (% Total Length)(Ft)	Length BG (% Total Length)(Ft)	Length Inside (% Total Length)(Ft)	Volume AG (% Total Length)(Ft)	Volume BG (% Total Length)(Ft)	Volume Inside (% Total Length)(Ft)
Non Exposed	CS / S10	32	32	0.375		0.375		0.194	Buried	44	1753.12	39.84		44			1753.12	
Nozzle Inside Tank	CS / S10	32	32	0.375			0.375	0.004	Inside	1	39.84	39.84			1			39.84
Nozzle Outside Tank	CS / S10	20	20	0.375			0.375	0.005	Inside	3	45.36	15.12			3			45.36
Total # AG Pipe Sections:						0.375	0.375	0.203	Total Length:	48	1838.32	Totals:		44	4		1753.12	85.20

Total # BG Pipe Sections:	1	AVG Wall AG & IN:	0.375	Note: AG & IN pipe is calculated as unrestrained.	
Total # IN Pipe Sections:	2	AVG Wall Buried:	0.375	Note: Buried (UG) pipe is calculated as restrained.	
Total # Pipe Sections:	3	Number Exposed Factors:	1		

Total Exposed Pipe Length: (AG & IN)	4	(Ft)	Total Exposed Volume: (AG & IN)	85.20	(Gal)
Total Non-Exposed Pipe Length: (UG)	44	(Ft)	Total Non-Exposed Volume: (UG)	1753.12	(Gal)

dP/dV (=1/dV/dP) (dV/dP calculated above)(psi/gal) =	95.67	**dP/dT: =(dP/dV)x(dV/dT)**(psi/°F)	19.44
dP/dV: Change in pressure with respect to volume.		Change in pressure with respect to temperature	
dV/dT (From above table - Sum of all pipe sections)(gal/°F) =	0.203		
dV/dT: Change in volume with respect to temperature			
Total Volume to Fill Test Section (If Line Empty)(Gal):			1838.32
Test Pressure (From Report Page 1)(PSI):			162.375
Total Volume to Reach Test Pressure From 0 psi (Use DV / DP Chart Below)(Gal):			1.69721

Hydrostatic Pipeline Pressure Test Report 2014
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Pre-Test Calculations & Pressurization Log (Attachment B)(Page 2)

Field DV / DP Data

Field DV /DP: Before the test section is under full test pressure, a field value of DV / DP should be obtained. This value of DV/DP can be compared with the theoretical value of DV/DP calculated under section 3.5 (completed during pre-test calculations). A field value of DV/DP that is smaller than the theoretical DV/DP indicates an incorrect pressure reading, incorrect DV/DP calculation, or incorrect measurement of the volume under test. A field value of DV/DP that is greater than the theoretical DV/DP indicates the presence of entrapped air or other gas in the pipe section.

Obtaining Field DV / DP: During initial pressurization, the test section should be pressurized to approximately 50 psi and allowed to stabilize. Take an accurate pressure reading. Then bleed approximately 10 psi and allow the test section to stabilize. Take another accurate pressure reading. Carefully, measure the volume of the fluid that was bled and convert this to gallons if necessary. Take the volume bled and divide this number by the difference in the pressure readings. This is the field value of DV/DP.

Beginning Pressure: (psi)	152.2	**Volume Bled** (Gallons):	0.24		
Ending Pressure: (psi)	152.2	Equivalent Gallon / Unit Pressure (psi):	4.17	Gallon	
Difference: (psi)	10	Field Equivalent dP/dV (=1/dV/dP):	41.67	psi / Gal	
		Calculated dP/dV (=1/dV/dP):	95.67	psi / Gal	
		Percentage Difference:	0.44%		

Field DV / DP:	0.024	**Field DV/DP Acceptable (Must be Greater Than or Equal To Calculated):**	Yes
Calculated DV / DP:	0.0104524		% Diff = (Difference/subtrahend)*Difference
Difference:	0.0135476	**Air Entrapment Percentage:**	0.18%

(Air entrapment percentage should be kept below 2% of total line volume if possible to increase the accuracy of the test. (API-RP-1110)(Pipe may be full or partially full at the beginning of pressurization. Bleed trapped vapor if possible or re-pack the line. Percentages over 100% = Line is packed or calculation error as described above.

Equivalent Pressure Loss From Drained Amount: (Calculated DP / DV)				Equivalent Pressure Loss From Drained Amount: (Field DP / DV)			
1	Gallons =	95.67	PSI	1	Gallons =	41.67	PSI
	Total Gal Drained =		PSI		Total Gal Drained =		PSI

PRESSURIZATION DATA

Final Pressurization Log

DATE (mm/dd/yy)	TIME (24 hr) hr - min	Dead Weight Reading (psig)	Change in Pressure (psig)	Volume Metered (gal)	Volume Increment (gal)	Filling Totalizer Reading (gal)	Remarks
06/27/14	1838	48.7		17.88	17.88	17.88	Initial fill from main.
	1857	71.6	22.9	0.12	18.00	18.00	Pressurize with pump
	1912	165.0	93.4	1.50	19.50	19.50	
	1956	162.2	-2.8		19.50		
	1957	152.2	-10.0	-0.24	19.26		DV/DP check
	1958	168.1	15.9	0.15	19.41		
	2000	168.0	-0.1		19.41		Start Test
					19.41		
Start Test (Time & Press) (From Test Log)	845	163.5		19.41	Final Volume Injected		

Is Pipeline Full?	☐ Yes ☑ No
Volume To Fill or Pack Pipeline: (Gal)	1836.03
Volume Fill Comments:	See notes below for initial pressure.
Pressurize From	48.7 psi

Source of Initial Pressure:
Fill line with existing water main in the lower access tunnel. The maximum pressure from the water main is 48 psi. Allow water main to pressurize line after air was bled inside of tank.

General Pressurization Comments: (List any reasons for repressurization)(List injection media temp if different from the pipe temp at time of pressurization)
The listed values for pressurization are from the period of the evening of 6/26/14 even though initial filling took place on 6/23/14. There were several depressurizations and re-pressurizations due to the leaking gasket inside of the tank.

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Theoretical DV/DP (Test Pressure Fill Chart)(0-453 psi)

Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)
		51	0.53307417	101	1.0558959	151	1.578317627	201	2.100939357	252	2.634013523	302	3.159636254	352	3.679256984	403	4.21233116
1	0.010452435	51	0.53307417	101	1.0558959	151	1.578317627	202	2.111391792	252	2.634013523	302	3.159636254	353	3.689709419	404	4.222783584
2	0.020904869	52	0.5435266	102	1.06614833	152	1.588770061	203	2.121844227	253	2.644465957	303	3.170087688	354	3.700161853	405	4.233236019
3	0.031357304	53	0.55397903	103	1.07669077	153	1.599222496	204	2.132296661	254	2.654918392	304	3.177540123	355	3.710614288	406	4.243688453
4	0.041809738	54	0.56443147	104	1.0870532	154	1.609674931	205	2.142749096	255	2.665370827	305	3.187992557	356	3.721066723	407	4.254140888
5	0.052262173	55	0.5748839	105	1.09750563	155	1.620127365	206	2.153201531	256	2.675823261	306	3.198444992	357	3.731519157	408	4.264593323
6	0.062714608	56	0.58533634	106	1.10795807	156	1.6305798	207	2.163653965	257	2.686275696	307	3.208897427	358	3.741971592	409	4.275045757
7	0.073167042	57	0.59578877	107	1.1184105	157	1.641032234	208	2.1741064	258	2.69672813	308	3.219349861	359	3.752424027	410	4.285498192
8	0.083619477	58	0.60624121	108	1.12886294	158	1.651484669	209	2.184558834	259	2.707180565	309	3.229802296	360	3.762876461	411	4.295950626
9	0.094071912	59	0.61669364	109	1.13931537	159	1.661937104	210	2.195011269	260	2.717633	310	3.24025473	361	3.773328896	412	4.306403061
10	0.104524346	60	0.62714608	110	1.14976781	160	1.672389538	211	2.205463704	261	2.728085434	311	3.250707165	362	3.78378133	413	4.316855496
11	0.114976781	61	0.63759851	111	1.16022024	161	1.682841973	212	2.215916138	262	2.738537869	312	3.2611596	363	3.794233765	414	4.32730793
12	0.125429215	62	0.64805095	112	1.17067268	162	1.693294408	213	2.226368573	263	2.748990304	313	3.271612034	364	3.8046862	415	4.337760365
13	0.13588165	63	0.65850338	113	1.18112511	163	1.703746842	214	2.236821007	264	2.759442738	314	3.282064469	365	3.815138634	416	4.3482128
14	0.146334085	64	0.66895582	114	1.19157755	164	1.714199277	215	2.247273442	265	2.769895173	315	3.292516904	366	3.825591069	417	4.358665234
15	0.156786519	65	0.67940825	115	1.20202998	165	1.724651711	216	2.257725877	266	2.780347607	316	3.302969338	367	3.836043503	418	4.369117669
16	0.167238954	66	0.68986068	116	1.21246242	166	1.735104146	217	2.268178311	267	2.790800042	317	3.313421773	368	3.846495938	419	4.379570103
17	0.177691388	67	0.70031312	117	1.22293485	167	1.745556581	218	2.278630746	268	2.801252477	318	3.323874207	369	3.856948373	420	4.390022538
18	0.188143823	68	0.71076555	118	1.23338728	168	1.756009015	219	2.289083181	269	2.811704911	319	3.334326642	370	3.867400807	421	4.400474973
19	0.198596258	69	0.72121799	119	1.24383972	169	1.76646145	220	2.299535615	270	2.822157346	320	3.344779077	371	3.877853242	422	4.410927407
20	0.209048692	70	0.73167042	120	1.25429215	170	1.776913884	221	2.30998805	271	2.83260978	321	3.355231511	372	3.888305677	423	4.421379842
21	0.219501127	71	0.74212286	121	1.26474459	171	1.787366319	222	2.320440484	272	2.843062215	322	3.365683946	373	3.898758111	424	4.431832276
22	0.229953562	72	0.75257529	122	1.27519702	172	1.797818754	223	2.330892919	273	2.85351465	323	3.37613638	374	3.909210546	425	4.442284711
23	0.240405996	73	0.76302773	123	1.28564946	173	1.808271188	224	2.341345354	274	2.863967084	324	3.386588815	375	3.91906298	426	4.452737146
24	0.250858431	74	0.77348016	124	1.29610189	174	1.818723623	225	2.351797788	275	2.874419519	325	3.39704125	376	3.930115415	427	4.46318958
25	0.261310865	75	0.7839326	125	1.30655433	175	1.829176058	226	2.362250223	276	2.884871954	326	3.407493684	377	3.94056785	428	4.473642015
26	0.2717633	76	0.79438503	126	1.31700676	176	1.839628492	227	2.372702657	277	2.895324388	327	3.417946119	378	3.951020284	429	4.48409445
27	0.282215735	77	0.80483747	127	1.3274592	177	1.850080927	228	2.383155092	278	2.905776823	328	3.428398554	379	3.961472719	430	4.494546884
28	0.292668169	78	0.8152899	128	1.33791163	178	1.860533361	229	2.393607527	279	2.916229257	329	3.438850988	380	3.971925153	431	4.504999319
29	0.303120604	79	0.82574233	129	1.34836407	179	1.870985796	230	2.404059961	280	2.926681692	330	3.449303423	381	3.982377588	432	4.515451753
30	0.313573038	80	0.83619477	130	1.3588165	180	1.881438231	231	2.414512396	281	2.937134127	331	3.459755857	382	3.992830023	433	4.525904188
31	0.324025473	81	0.8466472	131	1.36926893	181	1.891890665	232	2.424964831	282	2.947586561	332	3.470208292	383	4.003282457	434	4.536356623
32	0.334477908	82	0.85709964	132	1.37972137	182	1.9023431	233	2.435417265	283	2.958038996	333	3.480660727	384	4.013734892	435	4.546809057
33	0.344930342	83	0.86755207	133	1.3901738	183	1.912795534	234	2.4458697	284	2.96849143	334	3.491113161	385	4.024187327	436	4.557261492
34	0.355382777	84	0.87800451	134	1.40062624	184	1.923247969	235	2.456322134	285	2.978943865	335	3.501565596	386	4.034639761	437	4.567713926
35	0.365835212	85	0.88845694	135	1.41107867	185	1.933700404	236	2.466774569	286	2.9893963	336	3.51201803	387	4.045092196	438	4.578166361
36	0.376287646	86	0.89890938	136	1.42153111	186	1.944152838	237	2.477227004	287	2.999848734	337	3.522470465	388	4.05554463	439	4.588618796
37	0.386740081	87	0.90936181	137	1.43198354	187	1.954605273	238	2.487679438	288	3.010301169	338	3.5329229	389	4.065997065	440	4.59907123
38	0.397192515	88	0.91981425	138	1.44243598	188	1.965057707	239	2.498131873	289	3.020753604	339	3.543375334	390	4.0764495	441	4.609523665
39	0.40764495	89	0.93026668	139	1.45288841	189	1.975510142	240	2.508584307	290	3.031206038	340	3.553827769	391	4.086901934	442	4.6199761
40	0.418097386	90	0.94071912	140	1.46334085	190	1.985962577	241	2.519036742	291	3.041658473	341	3.564280203	392	4.097354369	443	4.630428534
41	0.428549819	91	0.95117155	141	1.47379328	191	1.996415011	242	2.529489177	292	3.052110907	342	3.574732638	393	4.107806803	444	4.640880969
42	0.439002254	92	0.96162398	142	1.48424572	192	2.006867446	243	2.539941611	293	3.062563342	343	3.585185073	394	4.118259238	445	4.651333403
43	0.449454688	93	0.97207642	143	1.49469815	193	2.017319881	244	2.550394046	294	3.073015777	344	3.595637507	395	4.128711673	446	4.661785838
44	0.459907123	94	0.98252885	144	1.50515058	194	2.027772315	245	2.560846481	295	3.083468211	345	3.606089942	396	4.139164107	447	4.672238273
45	0.470359558	95	0.99298129	145	1.51560302	195	2.03822475	246	2.571298915	296	3.093920646	346	3.616542377	397	4.149616542	448	4.682690707
46	0.480811992	96	1.00343372	146	1.52605545	196	2.048677184	247	2.58175135	297	3.10437308	347	3.626994811	398	4.160068977	449	4.693143142
47	0.491264427	97	1.01388616	147	1.53650789	197	2.059129619	248	2.592203784	298	3.114825515	348	3.637447246	399	4.170521411	450	4.703595576
48	0.501716861	98	1.02433859	148	1.54696032	198	2.069582054	249	2.602656219	299	3.12527795	349	3.64789968	400	4.180973846	451	4.714048011
49	0.512169296	99	1.03479103	149	1.55741276	199	2.080034488	250	2.613108654	300	3.135730384	350	3.658352115	401	4.19142628	452	4.724500446
50	0.522621731	100	1.04524346	150	1.56786519	200	2.090486923	251	2.623561088	301	3.146182819	351	3.66880455	402	4.201878715	453	4.73495288

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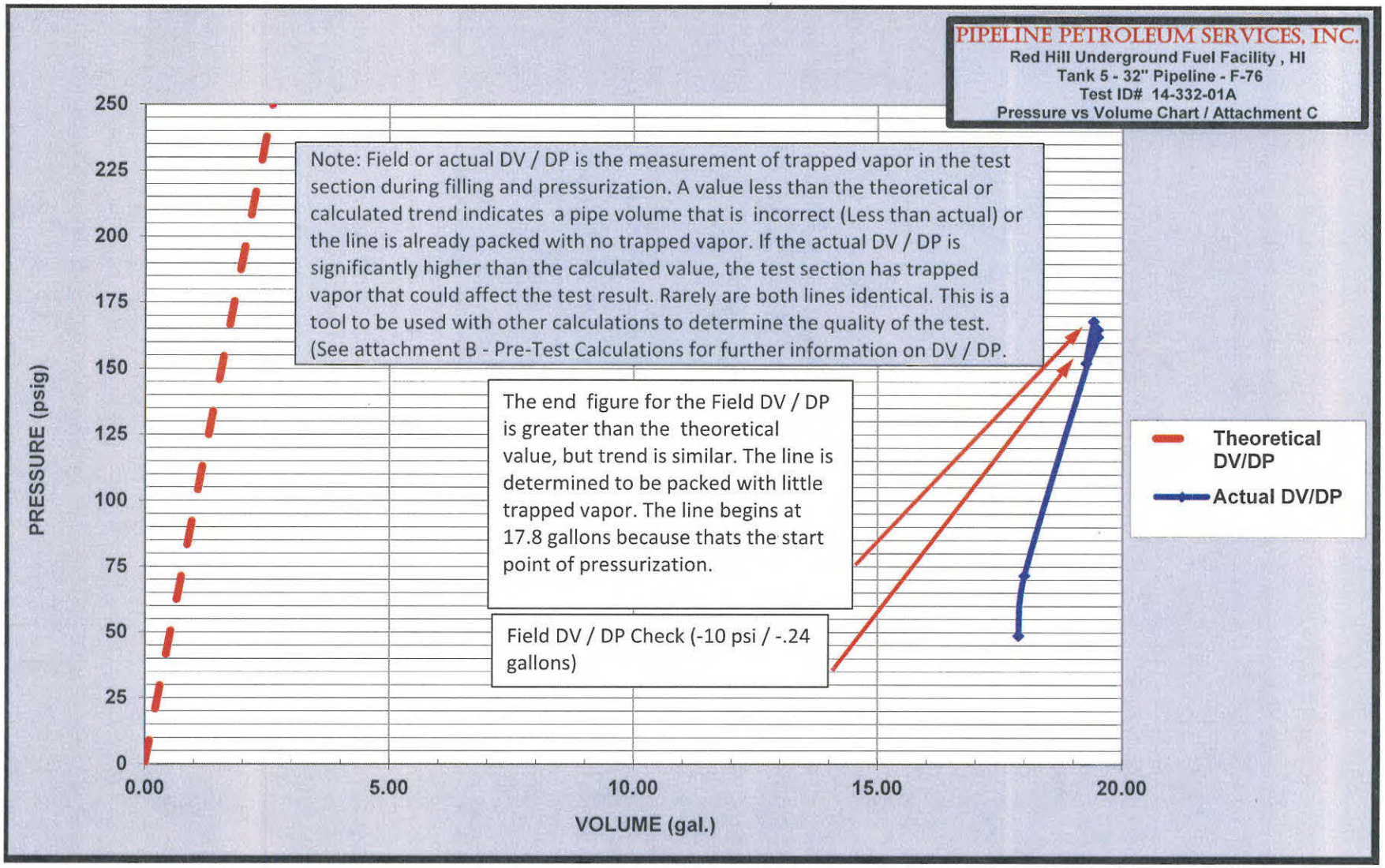
PIPELINE PETROLEUM SERVICES, INC.
Red Hill Underground Fuel Facility , HI
Tank 5 - 32" Pipeline - F-76
Test ID# 14-332-01A
Pressure vs Volume Chart / Attachment C
Note: Field or actual DV / DP is the measurement of trapped vapor in the test section during filling and pressurization. A value less than the theoretical or calculated trend indicates a pipe volume that is incorrect (Less than actual) or the line is already packed with no trapped vapor. If the actual DV / DP is significantly higher than the calculated value, the test section has trapped vapor that could affect the test result. Rarely are both lines identical. This is a tool to be used with other calculations to determine the quality of the test. (See attachment B - Pre-Test Calculations for further information on DV / DP.
The end figure for the Field DV / DP is greater than the theoretical value, but trend is similar. The line is determined to be packed with little trapped vapor. The line begins at 17.8 gallons because thats the start point of pressurization.
Field DV / DP Check (-10 psi / -.24 gallons)
Theoretical DV/DP
Actual DV/DP
PRESSURE (psig)
250
225
200
175
150
125
100
75
50
25
0
0.00
5.00
10.00
15.00
20.00
VOLUME (gal.)

PIPELINE PETROLEUM SERVICES, INC.

Pipeline Pressure & Temperature Log (Attachment D)

Date: 6/27/2014
Test ID No: 14-332-01B
Dwg Color Code: N/A

Note: Enter readings every 15 minutes for first hour of test (Entries 1-5) and every 30 minutes for each hour there after.

Customer: Willbros Government Services
Location: Red Hill Fuel Farm
System: Tank 5 Fuel Piping - 32"

Pressure Location & Unit #:		Location 1 & Unit #:	Location 2 & Unit #:	Location 3 & Unit #:	Location 4 & Unit #:
		Lower Yard Tunnel (Tank 5)			

Number AG/IN Sensors: 1
Number BG Sensors: 1
Initial Pressurization From: 48.7 PSI

Entry ID Number	Time	Deadweight Pressure (psi)	Chart / Gauge Pressure (psig)	Aboveground / Exposed Pipe Temp (F) Location 1	Belowground / Non-Exposed Pipe Temp (F) Location 1	Aboveground / Exposed Pipe Temp (F) Location 2	Belowground / Non-Exposed Pipe Temp (F) Location 2	Aboveground / Exposed Pipe Temp (F) Location 3	Belowground / Non-Exposed Pipe Temp (F) Location 3	Aboveground / Exposed Pipe Temp (F) Location 4	Belowground / Non-Exposed Pipe Temp (F) Location 4	Inside Pipe Temp (F)	Ambient Temp (F)	Volume Added (Gal)	Volume Drained (Gal)	Percent Cloud Cover (0-100%)	Remarks (Weather Conditions)
1	845	163.5	*	79.34	79.34								79.73				Start Test Time: 845
2																	No weather effects - all piping is not exposed to the elements.
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11	930	163.4		79.34	79.34								79.77				
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
	Final	163.4		79.34	79.34								79.77				End Test Time: 930
		PSI Diff		Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Total Added	Total Drained		
	Net Change	-0.1											0.04				

Note: Average Temperatures are used in the calculations for the press / temp eval sheet and volume change calculations.

Average AG/IN Temp Start:	79.34	Average AG/IN Temp End:	79.34	Average Temperature for Test AG/IN:	79.34
Average BG Temp Start:	79.34	Average BG Temp End:	79.34	Average Temperature for Test BG:	79.34

Net Volume Loss(+) / Gain (-):

Equivalent Pressure Loss From Drained Amount: (Field DP / DV)(Hydrotest Only)

1	Gallons =	41.67	PSI
	Total Gal Drained =		PSI

PSI Diff + PSI / Gal Equivalent from Drained Product (Calculated) = Total Pressure Differential (TPD)

TPD = -0.10 (Use on Evaluation Sheet - Attachment E)(Hydrotest Only)

Remarks: (Explanation of Any Pressure Discontinuities)

* See attached recorder chart. Average AG Temperature includes both Inside and Aboveground / Exposed Temperatures. (If needed)

Used the same temperatures for AG & BG pipe from the dataloggers in the tunnel and inside of the tank because there was no practical way to actually measure the temperature of the piping as it was encased in concrete. Due to the non-exposed nature of all of the piping we feel the temperatures should be very close to each other given the amount of stabilization time allowed.

Left pressure on the line from 1200 AM to 0930 Am the next morning and the pressure was at 162.3 psi with a pipe temperature of 79.9.

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PIPELINE PETROLEUM SERVICES, INC.

Hydrostatic Test Pressure and Temperature Evaluation Form (Attachment E)

Test ID Number:	14-332-01B	**Dwg Color Code:**	None	**Date:**	6/27/14
Customer:	Willbros Government Services	**Location:**	Red Hill Fuel Farm		
System Under Evaluation:	Tank 5 Fuel Piping - 32"				

Test Data:

Test Medium: (Water, Diesel, Gasoline, JP-5, JP-8, Kerosene, Other):	Water	IN: Inside Pipe Temp
Pipeline Total Length: ("L"): (All Test Sections)	48	AG: Aboveground Pipe Temp
Pipe Outside Diameter: ("*D*"): (Average From All Test Sections)	31.250	BG: Below Ground Pipe Temp
Pipe Wall Thickness: ("*t*"): (Average From All Test Sections)	0.375	TL: Total Length
D/t Ratio: (Pipe Ø / "t"): (Average From All Test Sections)	83.33	▲P: Pressure Change
Pipeline Total Volume: (From Report Page 1)	1838.32	▲T: Temperature Change
		All temp in degrees Fahrenheit unless noted
		All pressure in lb/in² (psi) unless noted

Beginning Test Pressure: ("*Pb*"):	163.5	**Ending Test Pressure: ("*Pe*"):**	163.4
Observed Pressure Change (Attachment A): (*Change P observed = Pe - Pb*):		-0.1	**▲P (PSI)**
Beginning Test Temperature AG: ("*Tb AG*"):	79.34	**Ending Test Temp AG: ("*Te AG*"):**	79.34
Length AG:		**Percent Total Length: (Length AG / Total Length): % TL AG:**	
Beginning Test Temperature BG: ("*Tb BG*"):	79.34	**Ending Test Temp BG: ("*Te BG*"):**	79.34
Length BG:	44	**Percent Total Length: (Length BG / Total Length): % TL BG:**	92%
Beginning Test Temperature Inside: ("*Tb IN*"):		**Ending Test Temp IN: ("*Te IN*"):**	
Length IN:	4	**Percent Total Length: (Length IN / Total Length): % TL *IN*:**	8%
▲T-AG: (Chg T=Te -Tb)		**x %TL AG:**	**= Adjusted Average AG ▲T:**
▲T-BG: (Chg T=Te -Tb)		**x %TL BG:** 92%	**= Adjusted Average BG ▲T:**
▲T-IN: (Chg T=Te -Tb)		**x %TL IN:** 8%	**= Adjusted Average IN ▲T:**
(Final (FChg T) = Adjusted Avg AG ▲ T + Adjusted Avg BG ▲ T + Adjusted Avg IN ▲ T / 3)			**FChg T:** **▲T (° F)**

Average Temp (T avg)	(Tb AG + Tb BG + Tb IN) / 3 =	75.66	**Tb**	Note: IN & AG are averaged together based on weighting factors.
	(Te AG + Te BG + Te IN) / 3 =	75.66	**Te**	
Average Fluid / Pipe Temperature (*T avg = (Te + Tb) / 2*):			**T avg:**	75.66 (For Test Duration)

Using T avg and D/t, find dP / dT from temperature compensation charts (exhibit 100,101,102, 103, 104, or 105) or calculate for the appropriate test medium:

dP / dT = 19.44 psi / ° F From Pre-Test Calculations - Attachment B

Formula for dP / dT Chart Development or Calculation used in Attachment B:

$$dP = \frac{[B-2a]/[Dx(1-v^2)/Et+C]}{T}$$

Formula and Results Validated by UFC 3-460-03 Section 9-3.5 / Pressure Relief Valves and CA State Hydrostatic Testing Worksheet. (Different Formula Variation)

dP=psig change per degree C or F
B=Coefficient of expansion of test medium
D=Pipe OD in inches
E=Modulus of elasticity for pipe material
v=Poisson's ratio, 0.3 for steel pipe
C=Compressibility factor for water (Or other test med), cu in/cu in/psig
a=Coefficient of expansion for steel,
t=Pipe wall thickness, in
T=Temperature, degrees C or F (20°C)(Or Tavg for test duration above)
Note: Modulus of Elasticity = Young's Modulus = Elastic Modulus

Test Medium:	Water	B=	1.23E-04	Bulk Modulus (β):	321,543
		C= (1/β)	3.11E-06	(Reciprocal of the Bulk Modulus (β) in lb/in²)	
Pipe Material #1:	Carbon Steel	E=	2.95E+07	a =	6.50E-06
Pipe Material #2:	N/A	E=		a =	
Pipe Material #3:	N/A	E=		a =	

List all Pipe Material & Test Medium Assumptions Made for Test Calculations: The type and grade of pipe material was assumed because no hard data was available from the original construction of the facility.

Test Variables for Calculations (Pipe Material Physical Properties from (*in part*) Appendix C, ASME B 31.3)

Pipe Material	E	a (in/in/per°F)	α (Linear)	Test Medium	C = (1/β)	Bulk Modulus (β):	B (° F)	SG @ 60°F
Carbon Steel	2.95E+07	6.50E-06	6.10E-06	JP-5 / JP-8 / Jet-A / Kerosene	5.18E-06	1.93E+05	4.98E-04	0.81
Stainless Steel	2.8E+07	9.60E-06		Diesel - LSD / ULSD / Dyed	5.21E-06	1.92E+05	4.59E-04	0.85
FRP	2.3E+06	1.16E-05		Gasoline	5.29E-06	1.89E+05	4.57E-04	0.84
Aluminum	1.00E+07			Water	3.11E-06	3.22E+05	1.23E-04	1.00
Other				Other				

Calculate the expected pressure change: *Chg P expected = dP / dT x FChg T*

Figure corrected for various diameters of pipe within test section.

Chg P expected =	*dP / dT*		*FChg T*		*Chg P*	
(°C converted to °F)	19.44	(psi / °F) x		°F =		psi - Expected ▲P

Pressure increases (Chg P > 0): If Chg P observed > Chg P expected test is successful.
Pressure decreases (Chg P < 0): If Abs (Chg P observed) < Abs (Chg P expected) test is successful.

Test Successful: (Pass / Fail): Fail **Expected ▲ P:** (Calculated Chg P)

Total pressure differential (TPD) from Attachment A (Log Sheet) → **Observed ▲ P:** (From Log Sheet) -0.1000

Note: The sign (+/-) of the observed pressure change should be consistent with the sign of the temperature change (FChg T).

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Hydrostatic Test Volume Change Calculations (Attachment F) Page 1 of 2

Test ID Number:	14-332-01B	Dwg Code Color:	None
Customer:	Willbros Government Services	Date:	6/27/2014
System Under Evaluation:	Tank 5 Fuel Piping - 32"	Location:	Red Hill Fuel Farm

Volume Change Calculations for Pipeline Hydrostatic Test (Calculated Volume/Pressure Slope Method)

Standard Formula: ▲V / V = Kp▲P + Kt▲T

Where: Kp = [(D/t)(5/4 -μ) / E] + 1/β = (1.9D / 2Et) + 1/β

And: Kt = 3a - g

▲P = Liquid Pressure Change
▲T = Liquid Temperature Change
▲V = Liquid Volume Added to Inside of Pipe
(Negative if Flows Out)
V= Nominal Pipeline Volume ($\pi D^2 L/4$)
D= Inside Pipe Diameter

L= Pipe Length
t = Pipe Wall Thickness
μ = Poisson's Ratio = 0.3
E = Young's Modulus = 30x10^6 psi
β = Liquid Bulk Modulus, a function of Press & Temp
g = Liquid Volumetric Expansion Coefficient, a Function of Press & Temp
a = Linear Coefficient of Thermal Expansion
Note: Modulus of Elasticity = Young's Modulus = Elastic Modulus

Test Medium:	Water				Pipe Material:	Carbon Steel
API Gravity: (141.5/SG)-131.5	Specific Gravity: SG 141.5/(131.5+Degrees API)	ρ (SG x 1000)	(Liquid Coefficient of Expansion) B & g =	Compressibility: C = (1/β)	(Young's Modulus) E=	Linear Coefficient of Expansion: a=
10.00	0.9990	999.012	1.23E-04	3.11E-06	2.95E+07	6.50E-06

Pipe Data			Test Date	6/27/2014	API Gravity	10.00
Pipe Segment	Ø Outside (In)	Ø Inside (In)	Wall (In)	Length (Ft)	Volume (Gal)	Configuration
Non Exposed	32	31.250	0.375	44	1753.12	Buried
Nozzle Inside Tank	32	31.250	0.375	1	39.84	Inside
Nozzle Outside Tank	20	19.250	0.375	3	45.36	Inside
			Totals	48	1838.32	

Weighting for Pipeline Segment	% Total Length	Configuration	Buried	Exposed	Inside
Non Exposed	0.95	Buried	0.95		
Nozzle Inside Tank	0.02	Inside			0.02
Nozzle Outside Tank	0.02	Inside			0.02
Sum of Factors	1.00		Weight Factors	0.95	0.05

The above factors are used for weighting segment temperatures.

Corrected Temperatures

Initial Test Temperatures

Buried	Exposed	Inside	Initial Corrected T1	DT1	
79.34	79.34		75.66	15.6559661	AVG. T
					75.66

Final Test Temperatures

Buried	Exposed	Inside	Final Corrected T2	DT2
79.34	79.34		75.66	15.6559661

Corrected Temperature Difference

NOTE: PIPE TYPE

	E	a
Carbon Steel	2.95E+07	6.50E-06
Stainless Steel	2.8E+07	9.60E-06
FRP	2.3E+06	1.16E-05
Aluminum	1.00E+07	

Test Pressure Difference

Initial Pressure P1	Final Pressure P2	dPressure
163.5	163.4	-0.1

Calculate (Kp)=(1.9D/2Et)+1β weighted value	Kp (1/P)		Compressability Factor (1/BETA) or (1β)	
Calculating C_{PL}	C_{PL} 1	C_{PL} 2	F_P 1	F_P 2
C_{PL} = 1/(1-F_P*P) or Kp (1/P)=	1.0005942	1.0005939	3.632E-06	3.632E-06

Calculate (Kt)-(3a-g) a=constant					
Calculating C_{TL}	C_{TL} 1	C_{TL} 2	Coefficient Of Linear Expansion	Temperature Correction Factor (c)	Test Duration
C_{TL} = Exp(-α_{60}*DT*(1+0.8*α_{60}*(DT+δ_{60}))) or Kt(1/F)=	0.9948106	0.9948106	a	α_{60}	Hours
			6.50E-06	3.31E-04	4.00

Calculating Fluid Volume Gain / Loss

dV =V2-V1=V0/(C_{PL}2*C_{TL}2)-V0/(C_{PL}1*C_{TL}1))	dV=Total Pipeline Volume*(Kp*dP+Kt*dT) ▲V / V = Total Pipeline Volume Kp▲P + Kt▲T		Net Volume Removed (Accountable Loss(-) / Gain(+) - From Log Sheet)		Unaccountable Gain	Actual Gain(+) / Loss(-)
Volume. Gain/8hrs	0.00	+		=	0.00	
Volume. Gain/hour	0.00	+		=	0.00	
			Added or Subtracted During Test			

CSFM Loss Allowable			
Gal./hour	1.03	Gal./8hours	8.22

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Hydrostatic Test Volume Change Calculations (Attachment C) Page 2 of 2

Test ID Number:	14-332-01B	Code Color:	None
Customer:	Willbros Government Services	Date:	6/27/2014
System Under Evaluation:	Tank 5 Fuel Piping - 32"	Location:	Red Hill Fuel Farm

Volume Change Calculations for Jet Fuel Pipeline (measured volume/pressure slope method)

Pipe Data			Test Date	6/27/2014	API Gravity	10
Pipe Segment	Ø Outside (In)	Ø Inside (In)	Wall (In)	Length (Ft)	Volume (Gal)	Configuration
Non Exposed	32	31.250	0.375	44	1753.12	Buried
Nozzle Inside Tank	32	31.250	0.375	1	39.84	Inside
Nozzle Outside Tank	20	19.250	0.375	3	45.36	Inside
			Totals	48	1838.32	

Weighting for segment	% Total Length	Configuration	Buried	Exposed	Inside
Non Exposed	0.95	Buried	0.95		
Nozzle Inside Tank	0.02	Inside			0.02
Nozzle Outside Tank	0.02	Inside			0.02
Sum of Factors	1.00		Weight Factors	0.95	0.05

The above factors are used for weighting segment temperatures.

Corrected Temperatures

Initial Test Temperatures

Buried	Exposed	Inside	Initial Corrected	DT1	
79.34	79.34		75.66	15.6559661	AVG. T
					75.66

Final Test Temperatures

Buried	Exposed	Inside	Final Corrected	DT2
79.34	79.34		75.66	15.6559661

Corrected Temperature Difference

Test Pressure Difference

Initial Pressure	Final Pressure	dPressure	AVG. Pressure
163.5	163.4	-0.1	163.45
			Use Reference from Test Data

dV/dP Slope Calculations (Values are From Test Data)

Initial Pressure	Final Pressure	Initial Vol.	Final Vol.	dV/dP
48.7	163.5	17.88	19.41	0.013327526

Calculating K_T	K_T	Coefficient Of Linear Expansion	Temperature Correction Factor	Test Duration
$K_T = 3a\text{-}\alpha_{60}$	-0.0003115	a	α_{60}	Hours
		6.50E-06	3.31E-04	4.00

Calculating Fluid Volume Gain / Loss

dV =Total Pipeline Volume*K_T* dT+dV/dP*dP	dV		Net Volume Removed (Accountable Loss(-) / Gain(+) - From Log Sheet)		Unaccountable Loss	Actual Gain(+) / Loss(-)
Volume. Loss/8hrs	*0.00*	+		=	0.00	
Volume. Loss/hour	*0.00*	+		=	0.00	
			Added or Subtracted During Test			

CSFM Loss Allowable				Test Conclusion IAW CSFM / hr	Pass
Gal./hour	1.03	Gal./8hours	8.22	Test Conclusion IAW CSFM / 8 hrs	Pass

Note: Use this pass/fail criteria to assist in determining a successful test with the temperature evaluation.

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PIPELINE PETROLEUM SERVICES, INC.
1324 Cavalier Blvd / PO BOX 6808
Chesapeake, VA 23323
Phone: (757) 544-0831

Pipeline Pressure Test Report - Test Summary

Form Revision Number: 6
Form Revision Date: 4-Jan-14

Note: Green cells that are blank indicate a value of 0 (Zero).
Note: Fill in blue cells with required information / Green cells are calculated values.

I. GENERAL TEST INFORMATION

Test ID No:	14-332-02	Job No:	14-332	Type of Test:	Hydrostatic Pressure Decay (Hydrostatic x 150% MAWP, Hydraulic x 125% or 150% MAWP) (Hydro-Pneumatic x 110% or 150% MAWP, Pneumatic x 110% MAWP) (Pressure Decay, Strength Test, Leak Test, Spike Test, Ect.)
Minimum Test Duration: (Hrs)	4				
Date:	6/25/2014	Customer:	Willbros Government Services	Dwg Color Code:	None
Contract Number:	N/A	System:	Tank 5 Fuel Piping - 18"	Location:	Red Hill Fuel Farm, Naval Station Pearl Harbor Oahu, HI
Test Medium:	Water				
Test Medium Source:	Water Line in Lower Access Tunnel	Tank #:	5	AST / UST:	UST
Test Medium Additives:	None	Specific Gravity: 141.5/(131.5 + Degrees API)	1	Product:	Water
API Gravity:(141.5/SG)-131.5	10.00	Flash Point:	N/A		
Included Pipe Sections or Laterals: (Test Section)	18" - JP-8 service lateral to Tank 5 from the 12" flange at the wall of the Lower Access Tunnel to the 18" flange inside of the tank where the diverter was connected. (Diverter removed for the test)	Test Connection: (Location / Size / Type)	Ported test blind on the 12" flange located in the lower yard tunnel. Temp probe also placed inside of tank.		
Time Zone:	Hawaii	Country:	USA	Purpose of Test: (Annual Or Five-Year Requalification, New Commissioning, Post Repair, Other)	Possible Suspected Leak
Test Criteria: (Jurisdictional Regulation)	CSFM / UFC 3-460-03	Skillets Installed:	☐ Yes ☑ No		
(49 CFR 195.300, 49 CFR 192, 33 CFR 156.170, 33 CFR 154, 9-VAC-25-91, UFC 3-460-03, CCR: CA Code Regulations, State Code, Customer Policy, Project Specifications, Other)		Location(s): (List valve / tank number / ect.)		Size:	
Test Procedure:	API RP-1110 / CSFM Guidelines / Willbros Test Procedure, Revision 9: June 5, 2014	Valves and diffusers removed and test blinds installed.			
(API RP 1110, API-570, ASME B.31.1, ASME B31.3, ASME B31.4, ASME B B31.8, NFPA 329, CSFM, 49 CFR 195)					
Test Medium Disposal:	☐ Yes ☑ No	Disposal Company:	N/A		
Disposal Type & Amount (Gals):	N/A				

II. PIPE DESIGN DATA

System Design Data Code: (ASME B 31.1 (Power Piping) / B 31.3 (Process Piping) / B 31.4 (Liquid Fuels Transportation) / B 31.8 (Gas Transmission) / Other)	UNK - Assume ASME B31.3				
Pipe Specification: (ASTM A53 (CS-Welded & Seamless) / A135 (ERW Pipe) / A312 (SS-Welded & Seamless) / API 5L (Welded & Seamless for Fuel Piping) / Other)	UNK - Assume API 5L ERW				
Pipe Grade: (Pipe Grade A & B / Strength X42 - X60)	UNK	SMYS: (psi)	35,000	Pipe Information Source:	No pipe information was readily available from the facility.
Year Installed:	Circa 1943				

Known Repairs / Modifications:	Date:	Known Repairs / Modifications:	Date:
None known.			

W_{JF} (Weld Joint Factor)	0.8	(Range (.6 - 1.0) per ASME B 31.4 Table 402.4.3) / Source:	Assumption
D_F (Design Factor):	0.72	(.72 for Haz Liquid Pipelines per ASME B31.4 or State Other Criteria):	N/A

III. TEST SECTIONS (If Loading Arm Present in Test Section Include Total Length & Volume from attachment I)

Pipe Section (Identification)	MP To (Location)	MP From (Location)	Nominal Pipe Ø (In)	Wall Thickness (In)	Outside Ø (In)	Inside Ø (In)	Pipe Material	Configuration (Buried-BG / Exposed-AG / Inside IN)	Length (Ft)	Section as % Total Pipe Length	Volume (Gallons)	Volume per Foot Pipe ID (Gal)	Length AG (%)(Ft)	Length BG (%)(Ft)	Length Inside (%)(Ft)
Non Exposed			18	0.375	18.000	17.25	CS / STD	Buried	58.0	89.23%	704.15	12.14		58.0	
Nozzle Inside Tank			18	0.375	18.000	17.25	CS / STD	Inside	3.0	4.62%	36.42	12.14			3.0
Nozzle Outside Tank			12	0.375	12.750	12	CS / STD	Inside	4.0	6.15%	23.50	5.88			4.0
Total Pipe Sections in Test Section:		3	Averages:	0.375	17.677	15.500		Sum Of Factors:		1.00	Weight Of Factors: (=100%)			0.89	0.11
Total Volume Test Section (Gal):		764.07	Total Volume Test Section (CF):		102.15	Total Length Test Section: (Ft)			65.0		Total Length AG / BG / Inside: (ft)			58.0	7.0
													Total Number Factors:		2

Use Factoring For Volume Change & Pressure / Temperature Calculations

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Pipeline Pressure Test Report (Continued)

IV. TEST PRESSURE INFORMATION

Test Pressure:(psi): 162.375 | % SMYS: 10.93% | MAWP: (psi) 108.25 | Stated MAOP:(psi) 108.25 | Max System Design Pressure: (100% SMYS x WJF x DF)(Pipe Only - Does Not Include Fittings & Components) 855

How MAWP Determined: *(Customer Provided / Pipeline Questionnaire / SPCC Plan / Calculated / Pump Deadhead / PRV Settings / Other):* Max head from a full tank calculated by (.433)(SG)(Height) = 250' high x 1 (SG of water) x .433 = 108.25 x 1.5 = 162.375

Does pipeline have a elevation difference of 100' or greater? ☐ Yes ☑ No

(If yes then attach profile drawing of the pipeline indicating locations of pressure sensors IAW 49 CFR 195 if applicable)

HP Elevation: (Ft)	9.5	Min Pressure @ High Point:	162.375	% SMYS:	10.93%
LP Elevation: (Ft)		Max Pressure @ Low Point:	166	% SMYS:	11.21%
Difference: (Ft)	9.5	Pressure at TE Elevation:	162	% SMYS:	10.93%
Test Equipment (TE) Elevation: (Ft)	9.24	*See Test Pressure Calculation Sheet*			

Flange Class: 150 lb

150 lb Class Flanges Max Test Pressure = 425 psi (MAOP: 275 psi) / 300 lb Class Flange Max Test Pressure = 1100 psi (MAOP: 720 psi)

Is Test Pneumatic or Hydro-Pneumatic? (Yes or No): No | Joints / Welds Soaped? (Yes or No): N/A

If Yes Use The Following Information if Test is Performed With Nitrogen:

Estimated Volume of Nitrogen Needed From 0 psi to Test Pressure: (If Line Empty)(CF): N/A | Equivalent Bottles: N/A

+ 1 ATM) / 1 ATM = Volume CF of Nitrogen Needed (Note: 1 ATM = 14.7 psi) | Note: 1 Bottle = 300 CF

Estimated Pipe Fill at Start of Pressurization: (%)(Existing product): N/A

Estimated Volume of Nitrogen Needed: (At Estimated Line Fill): N/A | Equivalent Bottles: N/A

Pressure Relief Valves: ☐ Yes ☑ No

ID	Size	Set Pressure	Location	Serial Number	Manufacturer

V. TEST SUMMARY

Weather (Test Start): Test Section Inside - Weather Not A Factor | Weather (Test End): N/A | Weather Comments: None

Note: Only Use Volume Calculations & Temperature Evaluation for Underground Hydrostatic or Hydraulic Testing (Not Applicable 100% AG Pipe for Pneumatic or Hydro-Pneumatic Testing).

Does Test Section Have UG Pipe? (Yes or No): Yes

Test Volume Calculation Summary: (See Attachment B)

Volume Calculated to Fill Pipeline: (DV / DP)(Gal)(If Empty): 764.07 | Actual Volume to Fill Pipeline: (Gallon): 764.07 | Difference: | Difference: (%)

Volume Calculated to Reach Test Pressure from 0 PSI: (Pipeline must be full)(From Pre-Test Calculation Page): 0.6669 Gal | Difference: 1.9531 Gal | Pressurization DV/DP Diff (%) Volume: 77.51%

Actual Volume Required to Reach Test Pressure: (From Pre-Test Calculation Page): 2.52 Gal | Equivalent % Pipe Fill (At Pressurization >100% = Pipe Full)(<100% = Pipe has Trapped Vapor): 22.49%

Test Volume Correction Calculation Summary: (See Attachment B)

AVG Calculated DV / DP for Test Section: (Gal / psi): 0.0034911

dV/dP: Change in volume with respect to pressure.

dP/dV (=1/dV/dP) (From Pre-Test Calcs)(psi/gal) = 286.44 PSI / Gal

dP/dV: Change in pressure with respect to volume.

dP/dT: =(dP/dV)x(dV/dT)(psi/°F) 24.15 PSI / °F

Change in pressure with respect to temperature

dV/dT (From Pre-Test Calcs - Sum of all pipe sections)(gal/°F) = 0.084 Gal / °F

dV/dT: Change in volume with respect to temperature

Equivalent Pressure Loss From Drained Amount: (Calculated DP / DV)

1	Gallons =	286.44	PSI
	Total Gal Drained =		PSI

Equivalent Pressure Loss From Drained Amount: (Field DP / DV)

N/A	Gallons =	111.11	PSI
	Total Gal Drained =		PSI

Pressure & Temperature Evaluation (From Attachment E)

	dP / dT		FChg T		Chg P	
Chg P expected =	24.15	(psi / °F) x	-0.07	°F =	-1.73	Change of Pressure Expected ▲P
(°C converted to °F)						

Pressure increases (Chg P > 0): If Chg P observed > Chg P expected test is successful.

Pressure decreases (Chg P < 0): If Abs (Chg P observed) < Abs (Chg P expected) test is successful.

Test Successful: (Pass / Fail): Fail | Expected ▲ P: (Calculated Chg P) -1.7302

Total pressure differential (TPD) from Attachment A (Log Sheet) → | Observed ▲ P: (From Log Sheet) -3.2000

Note: The sign (+/-) of the observed pressure change should be consistent with the sign of the temperature change (FChg T).

Calculating Fluid Volume Gain / Loss (From Attachment F)

dV =Total Pipeline Volume*K_1* dT+ dV/dP*dP	dV		Net Volume Removed (Accountable Loss(-) / Gain(+) - From Log Sheet)		Unaccountable Loss	Actual Gain(+) / Loss(-)
Volume. Loss/8hrs	-0.01	+		=	-0.01	
Volume. Loss/hour	0.00	+		=	0.00	

Added or Subtracted During Test

CSFM Loss Allowable | Test Conclusion IAW CSFM / hr: Pass

GaL/hour 1.02 | GaL/8hours 8.17 | Test Conclusion IAW CSFM / 8 hrs: Pass

Test Acceptable: ☑ Yes ☐ No

(IAW Applicable Test Criteria & Regulation)

Test Readings Recap:

Start Test	Time:	2237	Start Pressure:	165.2	Average AG/IN Temp Start:	79.84	Average BG Temp Start:	79.84
End Test	Time:	0137	End Pressure:	162	Average AG/IN Temp End:	79.75	Average BG Temp End:	79.75
			Difference:	-3.2	Difference:	-0.09	Difference:	-0.09

Any Leaks or Weeps Detected During Pressurization or Test Period: ☐ Yes ☑ No

Remarks & Leak Corrections (Include Repairs Made Prior To Test): No visual leaks were identified on the test section after the 18" flange gasket inside of the tank was properly sealed. There were two separate periods of pressurization to allow for the gasket to be changed / replaced.

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Pipeline Pressure Test Report (Continued)

VI: ATTACHMENTS TO THIS REPORT: (All May Not Be Included or Required)

- [x] Attachment A / Test Pressure Calculations
- [x] Attachment B / Pre-Test Calculations & Pressurization Log
- [x] Attachment C / Pressure / Volume Plot
- [x] Attachment D / Pressure & Temp Log
- [x] Attachment E / Pressure & Temperature Evaluation
- [x] Attachment F / Volume Change Calculations
- [ ] Attachment G / Test Procedure & Valve Line-Up Sheet
- [ ] Attachment H / Loading Arm Information
- [ ] Attachment I / Photograph Page(s)
- [x] Pressure Graph
- [x] Temperature Graph
- [ ] Pipeline Elevation Drawing
- [ ] Pipeline Test Section Drawing
- [ ] Test Equipment Drawing
- [ ] Disposal Manifest

VII: GENERAL TEST REMARKS: (List General Pipeline Condition / Recommendations from Visual Inspection)

Test considered inconclusive IAW applicable jurisdictional regulation, applied industry standards, and the intent of the test.

This is not a precision leak detection test and should not be considered as such. This hydrotest is considered a point-in-time, pressure decay, strength / stress / leak test against installed test blinds to determine if there are possible leaks at the stated MAOP / MAWP.

Test results are based on criteria established by (In Part) API-RP-1110, California State Fire Marshall Office (CSFM), as well as, calculated thermal pressure loss / gain, calculated volume loss / gain, no visual leaks identified in exposed piping during the test period, good engineering practice, and accepted industry practice. The pass/fail criteria may or may not be the required regulation however the criteria used is the accepted industry practice and is greater than or equal to the requirements in the jurisdictional regulation.

Initial pressurization attempted on the morning of 6/25/14 and the flange gasket inside of the tank began leaking at 162 psi when the stabilization was started. Attempts at tightening flange was unsuccessful. Remove flange and remove defective gasket. Install a new garlok gasket.

Re-pressurize to test pressure and flange was tight.

The line pressure never truly stabilized at any time throughout the project.

Evidence of the amount of trapped air in the line is the calculated volume to reach test pressure was approximately .57 gallons and it required over 2.5 gallons to reach test pressure.

We highly recommend a pneumatic test to confirm the existence of trapped air in the test section.

VIII: TEST EQUIPMENT INFORMATION:

(See drawing of testing apparatus if required and Calibration Certificates)

All calibrations are performed third-party and are traceable to NIST.

Equipment Description:	PPSI Unit Number:	Manufacturer:	Serial Number:	Calibration Date:	Calibrated By:
Pipe Pressure Datalogger	Unit 1	MadgeTech	N84154	4/11/2014	Madgetech
4 Channel Temperature Datalogger (Thermocouple)	Unit 1	MadgeTech	N82430	8/21/2013	Madgetech
2 Channel Temperature Datalogger (Thermocouple)	Aux Unit 1	MadgeTech	N84147	8/20/2013	Madgetech
Digital Flowmeter / Totalizer (1/2")	Unit 3	GPI Industries	3206877	6/16/2014	Angels Instruments
Digital Flowmeter / Totalizer (1")	Unit 4	GPI Industries	3710745	6/16/2014	Angels Instruments
0-5000 psi Digital Deadweight Accurate Test Gauge	Unit 1	Crystal	870422	5/5/2014	Angels Instruments

IX: SIGNATURES

Tested By:	Dennis Cobb	Report Prepared By:	Dennis Cobb	Reviewed & Approved:	Dennis Cobb	Customer Witness:	James Hagen
Title:	Vice President	Title:	Vice President	Title	Vice President	Title:	Project Manager
Signed:		Signed:		Signed:		Company:	Willbros Government Services
						Signed: (If Required)	
Date:	6/25/2014	Date:	6/25/2014	Date:	6/25/2014	Date:	6/25/2014

Hydrostatic Pipeline Pressure Test Report 2014
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PIPELINE PETROLEUM SERVICES, INC.

Piping Test Pressure Calculations (Attachment A)

Note: Green cells that are blank indicate a value of 0 (Zero).
Note: Fill in blue cells with required information / Green cells are calculated values.

Test ID Number:	14-332-02	Test Section:	Tank 5 Fuel Piping - 18"
Dwg Code Color:	None	Customer:	Willbros Government Services
Date:	6/25/2014	Location:	Red Hill Fuel Farm, Naval Station Pearl Harbor
			Oahu, HI

TEST CALCULATIONS INPUT

NPS		18.000	in.	NPS=	Nominal Pipe Size (Diameter Inches)
D	=	17.677	in.	D =	Outside Diameter of pipe (in)(Avg of all sections x % total length)
t	=	0.375	in.	t =	Pipe wall Thickness (in)(Avg of all sections x % total length)
W_{JF}	=	0.8		W_{JF} =	Weld Joint Factor (From Report Page 1)(Range (.6 - 1.0) per ASME B 31.4 Table 402.4.3)
D_F	=	0.72		D_F =	Design Factor (From Report Page 1)(.72 for Haz Liquid Pipelines per ASME B31.4)
SMYS	=	35,000	psi	SMYS =	Specified Minimum Yield Strength (From Report Page 1)
P_{WP}	=	108.25	psi	P_{WP} =	Maximum Working Pressure (psi)
G	=	1		G =	Product (Test Medium) Specific Gravity
LE	=		feet	LE =	Lowest elevation
HE	=	9.5	feet	HE =	Highest elevation
TE	=	9.24	feet	TE =	Test equipment elevation
▲E	=	9.5	feet	▲E =	Elevation Difference (If pipeline has an elevation difference >100' attach pipeline profile dwg)

Describe How Elevations Determined: (Line of sight estimation, known data, current survey, information source, ect.)

Foot of hydrostatic head was calculated at 9.5' based on 4 psi static head pressure x .433 psi / ft (=9.24') + 6" at bottom of pipe not recorded by the gauge due to location of the gauge itself relative to the center of the pipe.

TEST PRESSURE CALCULATIONS RESULTS

Nominal Test Pressure: (PSI) 162.375

162.4	psi	Min. Pressure at High Point
166.5	psi	Max. Pressure at Low Point
162.5	psi	Pressure at Test Equipment Point
10.9%		Test Pressure as % SMYS
1485.0	psi	100% SMYS
855.4	psi	Design Pressure (Calculated - Pipe Only)

Calculate Max Low Point Pressure:

(Factor .433 psi / ft for water or Total Ft x .433 (Specific Gravity: 1.0) or correct factor for other test medium):

Test Medium: Water

(Use Formula: p=.433(h)(SG) where p: Pressure / h: Head in Ft / SG: Specific Gravity Test Medium)

h: (Ft) 9.5

SG: 1

TEST RESULTS

P_{MAX}	=	165.2	psi	P_{MAX} =	Maximum test gauge pressure
P_{MIN}	=	165.2	psi	P_{MIN} =	Minimum test gauge pressure
Difference	=		psi		

Remarks & Assumptions: We have to assume that the weld joint factor for this pipe is .08 for steel, however no data was available. We also have to assume that the design factor of .72 from ASME is the same because the line is in combustible liquid service.

Test pressure determined by max head from a full tank calculated by (.433)(SG)(Height) = 250' high x 1 (SG of water) x .433 = 108.25 x 1.5 = 162.375

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Pre-Test Calculations & Pressurization Log (Attachment B)

Note: Green cells that are blank indicate a value of 0 (Zero).

Note: Fill in blue cells with required information / Green cells are calculated values.

Test ID Number:	14-332-02	Dwg Code Color:	None
Customer:	Willbros Government Services	Date:	6/25/2014
System Under Evaluation:	Tank 5 Fuel Piping - 18"	Location:	Red Hill Fuel Farm, Naval Station Pearl Harbor

Use this form to establish the pre-test DV/DP, line fill volume, and test pressure volume, as well as plot the actual DV/DP and fill volumes.

Calculated DV / DP Data

DV / DP (Change in Volume / Change in Pressure): DV / DP is defined as the change in volume for an associated change in pressure of a known volume under pressure. Two DV/DP calculations are used in these guidelines, a theoretical and a field value. A theoretical DV/DP will give the expected volume change for an associated change in pressure for the specified volume under test assuming that the volume under pressure is free of entrained gas. The field value of DV/DP is the actual volume change for an associated change in pressure for the specified volume under test. If air exists within the line under pressure, this value will be different than the theoretical value.

The theoretical DV/DP for aboveground (unrestrained) pipe is calculated through the following equation:

$$\frac{DV}{DP} = V * \left[\left(\frac{D}{E * t}\right)\left(\frac{5}{4} - \nu\right) + C\right]$$

The theoretical DV/DP for buried (restrained) pipe is calculated through the following equation:

$$\frac{DV}{DP} = V * \left[\left(\frac{D}{E * t}\right)(1 - \nu^2) + C\right]$$

where,

V = volume of the segment for the individual pipe diameter, D (gallons),
D = outside diameter of pipe (in),
E = elastic modulus of steel pipe (psi),
t = wall thickness of pipe (in),
ν = poisson's ratio of steel pipe,
C = compressibility of test media ($in^3/in^3/psi$).

NOTE: For a test segment with multiple diameters, sum the individual DV/DP's of each pipe diameter to obtain a total DV/DP for the entire test section.

Restrained Pipe (Underground) (Volume = 0.0408 x d² x L)

From Formula at Left (CSFM)

V=	704.15
D=	17.67692308
E=	2.95E+07
t=	0.375
ν=	0.3
c=	3.11E-06
DV/DP=	0.003213813

Weight of Restrained Pipe: 0.89

Unrestrained Pipe (Aboveground & Inside) (Volume = 0.0408 x d² x L)

From Formula at Left (CSFM)

V=	59.92
D=	17.67692308
E=	2.95E+07
t=	0.375
ν=	0.3
c=	3.11E-06
DV/DP=	0.000277322

Weight of Unrestrained Pipe: 0.11 (Values from Report Page 1)

AVG DV / DP for Test Section: (Gal) 0.0034911 (Use Avg DV/DP in Fill Chart - Page 3)

dV/dP: Change in volume with respect to pressure.

Use the Following Information for DV / DP Calculations - Values From Properties Charts Below

Test Medium:		Water	
B= Coef of Expansion:	1.23E-04	C=Compressibility of Test Media:	3.11E-06
Pipe Material #1:		Carbon Steel	
E = Elastic Modulus of Pipe #1 (PSI):			2.95E+07
ν = Poisson's Ratio of Pipe #1:			0.3
α = Linear Coefficient of Expansion: Pipe #1:			6.10E-06
Pipe Material #2:		N/A	
E = Elastic Modulus of Pipe #1 (PSI):			
ν = Poisson's Ratio of Pipe #1:			
α = Linear Coefficient of Expansion: Pipe #2:			
Number of Different Pipe Materials:			1
E Avg For Pipe Materials:			2.95E+07
ν Avg For Pipe Materials:			0.3
α Avg For Pipe Materials:			6.10E-06

Property Chart for Pipe Material

Pipe Material	Elastic Modulus: E	Coefficient of Expansion: α	Linear Coefficient of Expansion: α	Poisson's Ratio: ν
Carbon Steel	2.95E+07	6.50E-06	6.10E-06	.27-.30
Stainless Steel	2.8E+07	9.60E-06		.30-.31
FRP	2.3E+06	1.16E-05	1.16E-05	0.33
Aluminum	1.00E+07			0.33

Property Chart for Test Medium

Test Medium	Compressibility: C = (1/β)	Bulk Modulus: (β)	Coefficient of Expansion: B	SG @ 60°F
JP-5 / JP-8	5.85E-06	1.71E+05	4.98E-04	0.81
Diesel	5.21E-06	1.92E+05	4.59E-04	0.85
Gasoline	5.29E-06	1.89E+05	4.57E-04	0.84
Water	3.11E-06	3.22E+05	1.23E-04	1.00

Test Sections

Pipe Section (Identification)	Pipe Material	Nominal Pipe Ø (In)	Outside Ø (In)	Wall Thickness (In)	AVG Wall Thickness Exposed (AG)	AVG Wall Thickness Buried (BG)	AVG Wall Thickness Inside (IN)	dV/dT: Unrestrained (AG & IN) Pipe: Vx(B-3α) Restrained (Buried) Pipe: Vx(B-2α) (Total Last Cell)	Configuration [Buried-BG / Exposed-AG / Inside-IN]	Length (Ft)	Volume (Gallons)	Volume per Foot Pipe ID	Length AG (% Total Length)(Ft)	Length BG (% Total Length)(Ft)	Length Inside (% Total Length)(Ft)	Volume AG (% Total Length)(Ft)	Volume BG (% Total Length)(Ft)	Volume Inside (% Total Length)(Ft)
Non Exposed	CS / STD	18	18	0.375		0.375		0.078	Buried	58	704.15	12.14		58			704.15	
Nozzle Inside Tank	CS / STD	18	18	0.375			0.375	0.004	Inside	3	36.42	12.14			3			36.42
Nozzle Outside Tank	CS / STD	12	12.75	0.375			0.375	0.002	Inside	4	23.50	5.88			4			23.50
						0.375	0.375	0.084	Total Length:	65	764.07	Totals:		58	7		704.15	59.92

Total # AG Pipe Sections:					
Total # BG Pipe Sections:	1	AVG Wall AG & IN:	0.375	Note: AG & IN pipe is calculated as unrestrained.	
Total # IN Pipe Sections:	2	AVG Wall Buried:	0.375	Note: Buried (UG) pipe is calculated as restrained.	
Total # Pipe Sections:	3	Number Exposed Factors:	1		

Total Exposed Pipe Length: (AG & IN)	7	(Ft)	Total Exposed Volume: (AG & IN)	59.92	(Gal)
Total Non-Exposed Pipe Length: (UG)	58	(Ft)	Total Non-Exposed Volume: (UG)	704.15	(Gal)

dP/dV (=1/dV/dP) (dV/dP calculated above)(psi/gal) =	286.44	dP/dT: =(dP/dV)x(dV/dT)(psi/°F)	24.15
dP/dV: Change in pressure with respect to volume.		Change in pressure with respect to temperature	
dV/dT (From above table - Sum of all pipe sections)(gal/°F) =	0.084		
dV/dT: Change in volume with respect to temperature			
Total Volume to Fill Test Section (If Line Empty)(Gal):		764.07	
Test Pressure (From Report Page 1)(PSI):		162.375	
Total Volume to Reach Test Pressure From 0 psi (Use DV / DP Chart Below)(Gal):		0.56687	

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Pre-Test Calculations & Pressurization Log (Attachment B)(Page 2)

Field DV / DP Data

Field DV /DP: Before the test section is under full test pressure, a field value of DV / DP should be obtained. This value of DV/DP can be compared with the theoretical value of DV/DP calculated under section 3.5 (completed during pre-test calculations). A field value of DV/DP that is smaller than the theoretical DV/DP indicates an incorrect pressure reading, incorrect DV/DP calculation, or incorrect measurement of the volume under test. A field value of DV/DP that is greater than the theoretical DV/DP indicates the presence of entrapped air or other gas in the pipe section.

Obtaining Field DV / DP: During initial pressurization, the test section should be pressurized to approximately 50 psi and allowed to stabilize. Take an accurate pressure reading. Then bleed approximately 10 psi and allow the test section to stabilize. Take another accurate pressure reading. Carefully, measure the volume of the fluid that was bled and convert this to gallons if necessary. Take the volume bled and divide this number by the difference in the pressure readings. This is the field value of DV/DP.

Beginning Pressure: (psi)	102.2	**Volume Bled** (Gallons):	0.09		**Field DV / DP:**	0.009	Field DV/DP Acceptable (Must be Greater Than or Equal To Calculated): Yes
Ending Pressure: (psi)	92.2	Equivalent Gallon / Unit Pressure (psi):	11.11	Gallon	**Calculated DV / DP:**	0.0034911	% Diff =(Difference/subtrahend)*Difference
Difference: (psi)	10	Field Equivalent dP/dV (=1/dV/dP):	111.11	psi / Gal	**Difference:**	0.0055089	**Air Entrapment Percentage:** 0.09%
		Calculated dP/dV (=1/dV/dP):	286.44	psi / Gal			
		Percentage Difference:	0.39%				

(Air entrapment percentage should be kept below 2% of total line volume if possible to increase the accuracy of the test. (API-RP-1110)(Pipe may be full or partially full at the beginning of pressurization. Bleed trapped vapor if possible or re-pack the line. Percentages over 100% = Line is packed or calculation error as described above.

Equivalent Pressure Loss From Drained Amount: (Calculated DP / DV)				Equivalent Pressure Loss From Drained Amount: (Field DP / DV)			
1	Gallons =	286.44	PSI	1	Gallons =	111.11	PSI
	Total Gal Drained =		PSI		Total Gal Drained =		PSI

PRESSURIZATION DATA

Final Pressurization Log

DATE (mm/dd/yy)	TIME (24 hr) hr - min	Dead Weight Reading (psig)	Change in Pressure (psig)	Volume Metered (gal)	Volume Increment (gal)	Filling Totalizer Reading (gal)	Remarks
06/25/14	0700						
		47.0	47.0	1.65	1.65	1.65	Fill from water main
	0742	102.2	55.2	0.65	2.30	2.30	Begin using pressure pump
		92.2	-10.0	-0.09	2.21		DV / DP Check
	0747	163.0	70.8	0.31	2.52	2.67	
Start Test (Time & Press) (From Test Log)	2237	165.2		2.52	Final Volume Injected		

Is Pipeline Full? ☐ Yes ☑ No

Volume To Fill or Pack Pipeline: (Gal) 761.69

Volume Fill Comments: None

Pressurize From psi

Source of Initial Pressure:
Line was full but slack at beginning of pressurization.
Fill line with existing water main in the lower access tunnel. The maximum pressure from the water main is 48 psi. Allow water main to pressurize line after air was bled inside of tank.

General Pressurization Comments: (List any reasons for repressurization)(List injection media temp if different from the pipe temp at time of pressurization)
The listed values for pressurization are from the period of the morning of 6/25/14 even though initial filling took place on 6/24/14. There was one depressurizations and re-pressurization due to the leaking gasket inside of the tank.

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Theoretical DV/DP (Test Pressure Fill Chart)(0-453 psi)

Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)	Pressure (PSI)	Volume (Gallons)
		51	0.17804788	101	0.35260463	151	0.527161371	201	0.701718117	252	0.879765997	302	1.054322742	352	1.228879488	403	1.40992737
1	0.003491135	51	0.17804788	101	0.35260463	151	0.527161371	202	0.705209252	252	0.879765997	302	1.054322742	353	1.232370623	404	1.4104185
2	0.00698227	52	0.18153902	102	0.35609576	152	0.530652506	203	0.708700386	253	0.883257132	303	1.057813877	354	1.235861758	405	1.41390964
3	0.010473405	53	0.18503015	103	0.3595869	153	0.534143641	204	0.712191521	254	0.886748267	304	1.061305012	355	1.239352893	406	1.41740077
4	0.01396454	54	0.18852129	104	0.36307803	154	0.537634776	205	0.715682656	255	0.890239402	305	1.064796147	356	1.242844028	407	1.42089191
5	0.017455675	55	0.19201242	105	0.36656917	155	0.541125911	206	0.719173791	256	0.893730537	306	1.068287282	357	1.246335162	408	1.42438304
6	0.020946809	56	0.19550355	106	0.3700603	156	0.544617046	207	0.722664926	257	0.897221672	307	1.071778417	358	1.249826297	409	1.42787418
7	0.024437944	57	0.19899469	107	0.37355144	157	0.548108181	208	0.726156061	258	0.900712806	308	1.075269552	359	1.253317432	410	1.43136531
8	0.027929079	58	0.20248582	108	0.37704257	158	0.551599316	209	0.729647196	259	0.904203941	309	1.078760687	360	1.256808567	411	1.43485645
9	0.031420214	59	0.20597696	109	0.38053371	159	0.555090451	210	0.733138331	260	0.907695076	310	1.082251822	361	1.260299702	412	1.43834758
10	0.034911349	60	0.20946809	110	0.38402484	160	0.558581585	211	0.736629466	261	0.911186211	311	1.085742957	362	1.263790837	413	1.44183872
11	0.038402484	61	0.21295923	111	0.38751597	161	0.56207272	212	0.740120601	262	0.914677346	312	1.089234092	363	1.267281972	414	1.44532985
12	0.041893619	62	0.21645036	112	0.39100711	162	0.565563855	213	0.743611736	263	0.918168481	313	1.092725226	364	1.270773107	415	1.44882099
13	0.045384754	63	0.2199415	113	0.39449824	163	0.56905499	214	0.74710267	264	0.921659616	314	1.096216361	365	1.274264242	416	1.45231212
14	0.048875889	64	0.22343263	114	0.39798938	164	0.572546125	215	0.750594005	265	0.925150751	315	1.099707496	366	1.277755377	417	1.45580326
15	0.052367024	65	0.22692377	115	0.40148051	165	0.57603726	216	0.75408514	266	0.928641886	316	1.103198631	367	1.281246512	418	1.45829439
16	0.055858159	66	0.2304149	116	0.40497165	166	0.579528395	217	0.757576275	267	0.932133021	317	1.106689766	368	1.284737646	419	1.46278553
17	0.059349293	67	0.23390604	117	0.40846278	167	0.58301953	218	0.76106741	268	0.935624156	318	1.110180901	369	1.288228781	420	1.46627666
18	0.062840428	68	0.23739717	118	0.41195392	168	0.586510665	219	0.764558545	269	0.93911529	319	1.113672036	370	1.291719916	421	1.4697678
19	0.066331563	69	0.24088831	119	0.41544505	169	0.5900018	220	0.76804968	270	0.942606425	320	1.117163171	371	1.295211051	422	1.47325893
20	0.069822698	70	0.24437944	120	0.41893619	170	0.593492935	221	0.771540815	271	0.94609756	321	1.120654306	372	1.298702186	423	1.47675007
21	0.073313833	71	0.24787058	121	0.42242732	171	0.596984069	222	0.775031195	272	0.949588695	322	1.124145441	373	1.302193321	424	1.4802412
22	0.076804968	72	0.25136171	122	0.42591846	172	0.600475204	223	0.778523085	273	0.95307983	323	1.127636576	374	1.305684456	425	1.48373234
23	0.080296103	73	0.25485285	123	0.42940959	173	0.603966339	224	0.78201422	274	0.956570965	324	1.13112771	375	1.309175591	426	1.48722347
24	0.083787238	74	0.25834398	124	0.43290073	174	0.607457474	225	0.785505354	275	0.9600621	325	1.134618845	376	1.312666726	427	1.49071461
25	0.087278373	75	0.26183512	125	0.43639186	175	0.610948609	226	0.788996489	276	0.963553235	326	1.13810998	377	1.316157861	428	1.49420574
26	0.090769508	76	0.26532625	126	0.439883	176	0.614439744	227	0.792487624	277	0.96704437	327	1.141601115	378	1.319648996	429	1.49769688
27	0.094260643	77	0.26881739	127	0.44337413	177	0.617930879	228	0.795978759	278	0.970535505	328	1.14509225	379	1.32314013	430	1.50118801
28	0.097751777	78	0.27230852	128	0.44686527	178	0.621422014	229	0.799469894	279	0.97402664	329	1.148583385	380	1.326631265	431	1.50467915
29	0.101242912	79	0.27579966	129	0.4503564	179	0.624913149	230	0.802961029	280	0.977517774	330	1.15207452	381	1.3301224	432	1.50817028
30	0.104734047	80	0.27929079	130	0.45384754	180	0.628404284	231	0.806452164	281	0.981008909	331	1.155565655	382	1.333613535	433	1.51166142
31	0.108225182	81	0.28278193	131	0.45733867	181	0.631895418	232	0.809943299	282	0.984500044	332	1.15905679	383	1.33710467	434	1.51515255
32	0.111716317	82	0.28627306	132	0.46082981	182	0.635386553	233	0.813434434	283	0.987991179	333	1.162547925	384	1.340595805	435	1.51864369
33	0.115207452	83	0.2897642	133	0.46432094	183	0.638877688	234	0.816925569	284	0.991482314	334	1.16603906	385	1.34408694	436	1.52213482
34	0.118698587	84	0.29325533	134	0.46781208	184	0.642368823	235	0.820416704	285	0.994973449	335	1.169530194	386	1.347578075	437	1.52562596
35	0.122189722	85	0.29674647	135	0.47130321	185	0.645859958	236	0.823907838	286	0.998464584	336	1.173021329	387	1.35106921	438	1.52911709
36	0.125680857	86	0.3002376	136	0.47479435	186	0.649351093	237	0.827398973	287	1.001955719	337	1.176512464	388	1.354560345	439	1.53260822
37	0.129171992	87	0.30372874	137	0.47828548	187	0.652842228	238	0.830890108	288	1.005446854	338	1.180003599	389	1.35805148	440	1.53609936
38	0.132663127	88	0.30721987	138	0.48177662	188	0.656333363	239	0.834381243	289	1.008937989	339	1.183494734	390	1.361542614	441	1.53959049
39	0.136154261	89	0.31071101	139	0.48526775	189	0.659824498	240	0.837872378	290	1.012429124	340	1.186985869	391	1.365033749	442	1.54308163
40	0.139645396	90	0.31420214	140	0.48875889	190	0.663315633	241	0.841363513	291	1.015920258	341	1.190477004	392	1.368524884	443	1.54657276
41	0.143136531	91	0.31769328	141	0.49225002	191	0.666806768	242	0.844854648	292	1.019411393	342	1.193968139	393	1.372016019	444	1.5500639
42	0.146627666	92	0.32118441	142	0.49574116	192	0.670297902	243	0.848345783	293	1.022902528	343	1.197459274	394	1.375507154	445	1.55355503
43	0.150118801	93	0.32467555	143	0.49923229	193	0.673789037	244	0.851836918	294	1.026393663	344	1.200950409	395	1.378998289	446	1.55704617
44	0.153609936	94	0.32816668	144	0.50272343	194	0.677280172	245	0.855328053	295	1.029884798	345	1.204441544	396	1.382489424	447	1.5605373
45	0.157101071	95	0.33165782	145	0.50621456	195	0.680771307	246	0.858819188	296	1.033375933	346	1.207932678	397	1.385980559	448	1.56402844
46	0.160592206	96	0.33514895	146	0.5097057	196	0.684262442	247	0.862310322	297	1.036867068	347	1.211423813	398	1.389471694	449	1.56751957
47	0.164083341	97	0.33864009	147	0.51319683	197	0.687753577	248	0.865801457	298	1.040358203	348	1.214914948	399	1.392962829	450	1.57101071
48	0.167574476	98	0.34213122	148	0.51668797	198	0.691244712	249	0.869292592	299	1.043849338	349	1.218406083	400	1.396453964	451	1.57450184
49	0.171065611	99	0.34562236	149	0.5201791	199	0.694735847	250	0.872783727	300	1.047340473	350	1.221897218	401	1.399945098	452	1.57799298
50	0.174556745	100	0.34911349	150	0.52367024	200	0.698226982	251	0.876274862	301	1.050831608	351	1.225388353	402	1.403436233	453	1.58148411

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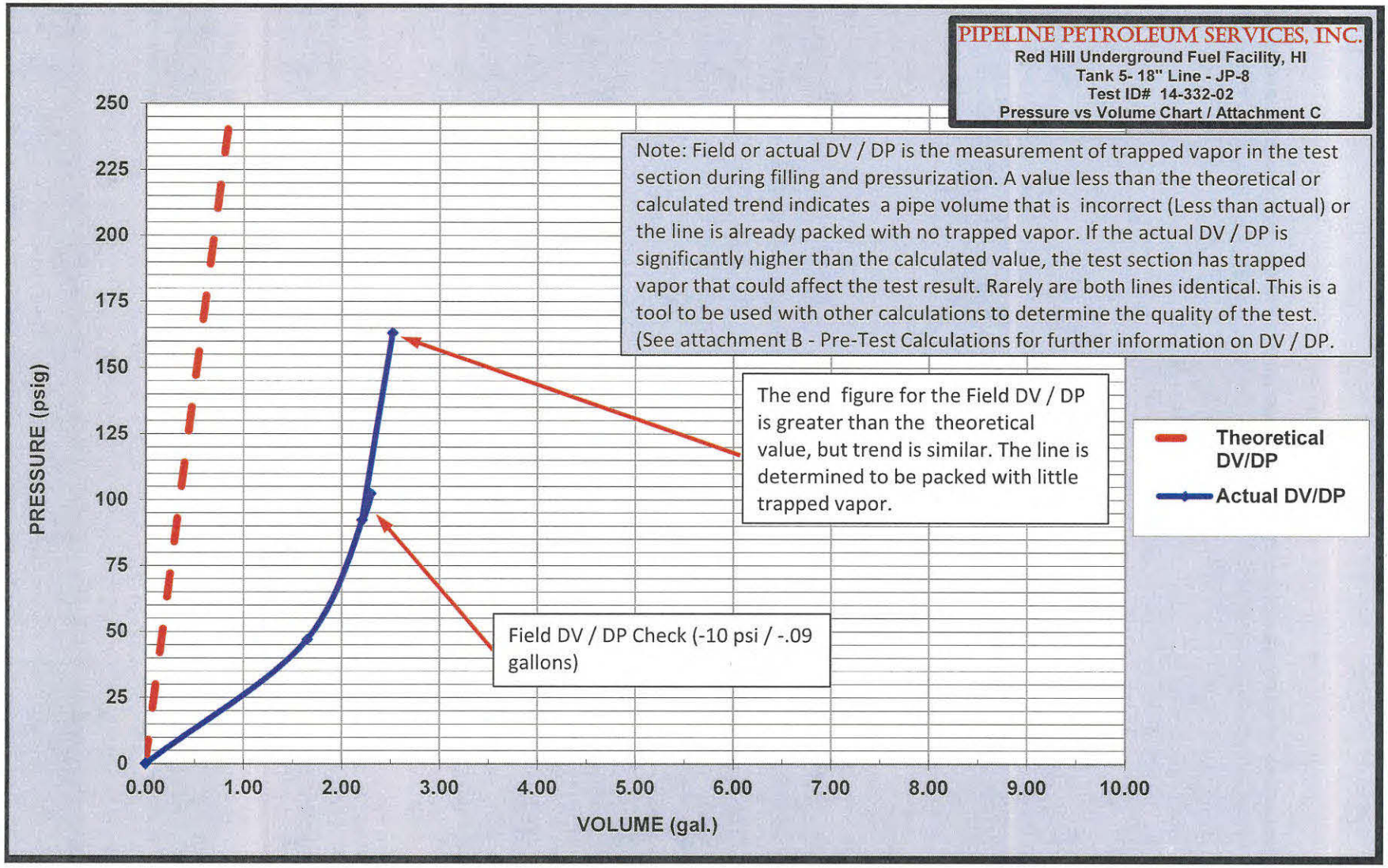
PIPELINE PETROLEUM SERVICES, INC.
Red Hill Underground Fuel Facility, HI
Tank 5- 18" Line - JP-8
Test ID# 14-332-02
Pressure vs Volume Chart / Attachment C
Note: Field or actual DV / DP is the measurement of trapped vapor in the test section during filling and pressurization. A value less than the theoretical or calculated trend indicates a pipe volume that is incorrect (Less than actual) or the line is already packed with no trapped vapor. If the actual DV / DP is significantly higher than the calculated value, the test section has trapped vapor that could affect the test result. Rarely are both lines identical. This is a tool to be used with other calculations to determine the quality of the test. (See attachment B - Pre-Test Calculations for further information on DV / DP.
The end figure for the Field DV / DP is greater than the theoretical value, but trend is similar. The line is determined to be packed with little trapped vapor.
Field DV / DP Check (-10 psi / -.09 gallons)
Theoretical DV/DP
Actual DV/DP
PRESSURE (psig)
250
225
200
175
150
125
100
75
50
25
0
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
VOLUME (gal.)

PIPELINE PETROLEUM SERVICES, INC.

Pipeline Pressure & Temperature Log (Attachment D)

Date: 6/25/2014
Test ID No: 14-332-02
Dwg Color Code: N/A

Note: Enter readings every 15 minutes for first hour of test (Entries 1-5) and every 30 minutes for each hour there after.

Customer: Willbros Government Services
Location: Red Hill Fuel Farm, Naval Station Pearl Harbor
System: Tank 5 Fuel Piping - 18"

Pressure Location & Unit #:	Location 1 & Unit #:	Location 2 & Unit #:	Location 3 & Unit #:	Location 4 & Unit #:
Lower Yard Tunnel (Tank 5)	Lower Yard Tunnel (Tank 5)			

Number AG/IN Sensors: 1
Number BG Sensors: 1
Initial Pressurization From: PSI

Entry ID Number	Time	Deadweight Pressure (psi)	Chart / Gauge Pressure (psig)	Aboveground / Exposed Pipe Temp (F) Location 1	Belowground / Non-Exposed Pipe Temp (F) Location 1	Aboveground / Exposed Pipe Temp (F) Location 2	Belowground / Non-Exposed Pipe Temp (F) Location 2	Aboveground / Exposed Pipe Temp (F) Location 3	Belowground / Non-Exposed Pipe Temp (F) Location 3	Aboveground / Exposed Pipe Temp (F) Location 4	Belowground / Non-Exposed Pipe Temp (F) Location 4	Inside Pipe Temp (F)	Ambient Temp (F)	Volume Added (Gal)	Volume Drained (Gal)	Percent Cloud Cover (0-100%)	Remarks (Weather Conditions)	
1	2237	165.2	*	79.84	79.84								79.81				Start Test	Time: 2237
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11	0137	162.0		79.75	79.75								79.68					
12																		
13																		
14																		
15																		
16																		
17																		
18																		
19																		
	Final	162.0		79.75	79.75								79.68				End Test	Time: 0137
		PSI Diff		Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Temp Diff	Total Added	Total Drained			
	Net Change	-3.2		-0.09	-0.09								-0.13					

Note: Average Temperatures are used in the calculations for the press / temp eval sheet and volume change calculations.

Average AG/IN Temp Start:	79.84	Average AG/IN Temp End:	79.75	Average Temperature for Test AG/IN:	79.80	Net Volume Loss(+) / Gain (-):	
Average BG Temp Start:	79.84	Average BG Temp End:	79.75	Average Temperature for Test BG:	79.80		

Equivalent Pressure Loss From Drained Amount: (Field DP / DV)(Hydrotest Only)

1	Gallons =	111.11	PSI
	Total Gal Drained =		PSI

PSI Diff + PSI / Gal Equivalent from Drained Product (Calculated) = Total Pressure Differential (TPD)

TPD = -3.20 (Use on Evaluation Sheet - Attachment E)(Hydrotest Only)

Remarks: (Explanation of Any Pressure Discontinuities)

* See attached recorder chart. Average AG Temperature includes both Inside and Aboveground / Exposed Temperatures. (If needed)

Used the same temperatures for AG & BG pipe from the dataloggers in the tunnel and inside of the tank because there was no practical way to actually measure the temperature of the piping as it was encased in concrete. Due to the non-exposed nature of all of the piping we feel the temperatures should be very close to each other given the amount of stabilization time allowed.

Left pressure on the line from 1600 on June 25 (Pressure: 167.65 / Pipe Temp: 80.024 + 79.466) to 0915 AM the next morning and the pressure was at 154.7 psi with a pipe temperature of 79.826 + 79.61.

Note: Line never fully stabilized.

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PIPELINE PETROLEUM SERVICES, INC.

Hydrostatic Test Pressure and Temperature Evaluation Form (Attachment E)

Test ID Number:	14-332-02	**Dwg Color Code:**	None	**Date:**	6/25/14
Customer:	Willbros Government Services	**Location:**	Red Hill Fuel Farm, Naval Station Pearl Harbor		
System Under Evaluation:	Tank 5 Fuel Piping - 18"				

Test Data:

Test Medium: (Water, Diesel, Gasoline, JP-5, JP-8, Kerosene, Other):	Water	IN: Inside Pipe Temp
Pipeline Total Length: ("L"): (All Test Sections)	65	AG: Aboveground Pipe Temp
Pipe Outside Diameter: ("*D*"): (Average From All Test Sections)	17.677	BG: Below Ground Pipe Temp
Pipe Wall Thickness: ("*t*"): (Average From All Test Sections)	0.375	TL: Total Length
D/t Ratio: (Pipe Ø / "t"): (Average From All Test Sections)	47.14	▲P: Pressure Change
Pipeline Total Volume: (From Report Page 1)	764.07	▲T: Temperature Change
		All temp in degrees Fahrenheit unless noted
		All pressure in lb/in² (psi) unless noted

Beginning Test Pressure: ("*Pb*"):	165.2	**Ending Test Pressure: ("*Pe*"):**	162
Observed Pressure Change (Attachment A): (*Change P observed = Pe - Pb*):		-3.2	**▲P (PSI)**
Beginning Test Temperature AG: ("*Tb AG*"):	79.84	**Ending Test Temp AG: ("*Te AG*"):**	79.75
Length AG:		**Percent Total Length: (Length AG / Total Length): % TL AG:**	
Beginning Test Temperature BG: ("*Tb BG*"):	79.84	**Ending Test Temp BG: ("*Te BG*"):**	79.75
Length BG: 58		**Percent Total Length: (Length BG / Total Length): % TL BG:**	89%
Beginning Test Temperature Inside: ("*Tb IN*"):		**Ending Test Temp IN: ("*Te IN*"):**	
Length IN: 7		**Percent Total Length: (Length IN / Total Length): % TL *IN*:**	11%

▲T-AG: (Chg T=Te -Tb)	-0.09	**x %TL AG:**		**= Adjusted Average AG ▲T:**	
▲T-BG: (Chg T=Te -Tb)	-0.09	**x %TL BG:**	89%	**= Adjusted Average BG ▲T:**	-0.08
▲T-IN: (Chg T=Te -Tb)		**x %TL IN:**	11%	**= Adjusted Average IN ▲T:**	

(Final (FChg T) = Adjusted Avg AG ▲T + Adjusted Avg BG ▲T + Adjusted Avg IN ▲T / 3) **FChg T:** -0.07 **▲T (° F)**

Average Temp (T avg)	(Tb AG + Tb BG + Tb IN) / 3 =	73.58	**Tb**	Note: IN & AG are averaged together based on weighting factors.
	(Te AG + Te BG + Te IN) / 3 =	73.50	**Te**	
Average Fluid / Pipe Temperature (*T avg = (Te + Tb) / 2*):			**T avg:**	73.54 (For Test Duration)

Using T avg and D/t, find dP / dT from temperature compensation charts (exhibit 100,101,102, 103, 104, or 105) or calculate for the appropriate test medium:

dP / dT = **24.15** psi / ° F From Pre-Test Calculations - Attachment B

Formula for dP / dT Chart Development or Calculation used in Attachment B:

$$dP = \frac{[B-2a]/[Dx(1-v^2)/Et+C]}{T}$$

Formula and Results Validated by UFC 3-460-03 Section 9-3.5 / Pressure Relief Valves and CA State Hydrostatic Testing Worksheet. (Different Formula Variation)

dP=psig change per degree C or F
B=Coefficient of expansion of test medium
D=Pipe OD in inches
E=Modulus of elasticity for pipe material
v=Poisson's ratio, 0.3 for steel pipe
C=Compressibility factor for water (Or other test med), cu in/cu in/psig
a=Coefficient of expansion for steel,
t=Pipe wall thickness, in
T=Temperature, degrees C or F (20°C)(Or Tavg for test duration above)
Note: Modulus of Elasticity = Young's Modulus = Elastic Modulus

Test Medium:	Water	B=	1.23E-04	Bulk Modulus (β):	321,543
		C= (1/β)	3.11E-06	(Reciprocal of the Bulk Modulus (β) in lb/in²)	
Pipe Material #1:	Carbon Steel	E=	2.95E+07	a =	6.50E-06
Pipe Material #2:	N/A	E=		a =	
Pipe Material #3:	N/A	E=		a =	

List all Pipe Material & Test Medium Assumptions Made for Test Calculations:

Test Variables for Calculations (Pipe Material Physical Properties from (*in part*) Appendix C, ASME B 31.3)

Pipe Material	E	a (in/in/per°F)	α (Linear)	Test Medium	C = (1/β)	Bulk Modulus (β):	B (° F)	SG @ 60°F
Carbon Steel	2.95E+07	6.50E-06	6.10E-06	JP-5 / JP-8 / Jet-A / Kerosene	5.18E-06	1.93E+05	4.98E-04	0.81
Stainless Steel	2.8E+07	9.60E-06		Diesel - LSD / ULSD / Dyed	5.21E-06	1.92E+05	4.59E-04	0.85
FRP	2.3E+06	1.16E-05		Gasoline	5.29E-06	1.89E+05	4.57E-04	0.84
Aluminum	1.00E+07			Water	3.11E-06	3.22E+05	1.23E-04	1.00
Other				Other				

Calculate the expected pressure change: *Chg P expected = dP / dT x FChg T*

Figure corrected for various diameters of pipe within test section.

Chg P expected =	*dP / dT*		*FChg T*		*Chg P*	
(°C converted to °F)	24.15	(psi / °F) x	-0.07	°F =	-1.73	psi - Expected ▲P

Pressure increases (Chg P > 0): If Chg P observed > Chg P expected test is successful.
Pressure decreases (Chg P < 0): If Abs (Chg P observed) < Abs (Chg P expected) test is successful.

Test Successful: (Pass / Fail):	Fail	**Expected ▲ P:** (Calculated Chg P)	-1.7302
Total pressure differential (TPD) from Attachment A (Log Sheet) →		**Observed ▲ P:** (From Log Sheet)	-3.2000

Note: The sign (+/-) of the observed pressure change should be consistent with the sign of the temperature change (FChg T).

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Hydrostatic Test Volume Change Calculations (Attachment F) Page 1 of 2

Test ID Number:	14-332-02	Dwg Code Color:	None
Customer:	Willbros Government Services	Date:	6/25/2014
System Under Evaluation:	Tank 5 Fuel Piping - 18"	Location:	Red Hill Fuel Farm, Naval Station Pearl Harbor

Volume Change Calculations for Pipeline Hydrostatic Test (Calculated Volume/Pressure Slope Method)

Standard Formula: ▲V / V = Kp▲P + Kt▲T

▲P = Liquid Pressure Change
▲T = Liquid Temperature Change
▲V = Liquid Volume Added to Inside of Pipe
(Negative if Flows Out)
V= Nominal Pipeline Volume ($\pi D^2 L/4$)
D= Inside Pipe Diameter

Where: $Kp = [(D/t)(5/4 - \mu) / E] + 1/\beta = (1.9D / 2Et) + 1/\beta$
And: $Kt = 3a - g$
L= Pipe Length
t = Pipe Wall Thickness
μ = Poisson's Ratio = 0.3
E = Young's Modulus = 30x10^6 psi
β = Liquid Bulk Modulus, a function of Press & Temp
g = Liquid Volumetric Expansion Coefficient, a Function of Press & Temp
a = Linear Coefficient of Thermal Expansion
Note: Modulus of Elasticity = Young's Modulus = Elastic Modulus

Test Medium:	Water				Pipe Material:	Carbon Steel
API Gravity: (141.5/SG)-131.5	Specific Gravity: SG 141.5/(131.5+Degrees API)	ρ (SG x 1000)	(Liquid Coefficient of Expansion) B & g =	Compressibility: C = (1/β)	(Young's Modulus) E=	Linear Coefficient of Expansion; a=
10.00	0.9990	999.012	1.23E-04	3.11E-06	2.95E+07	6.50E-06

Pipe Data			Test Date	6/25/2014	API Gravity	10.00
Pipe Segment	Ø Outside (In)	Ø Inside (In)	Wall (In)	Length (Ft)	Volume (Gal)	Configuration
Non Exposed	18	17.250	0.375	58	704.15	Buried
Nozzle Inside Tank	18	17.250	0.375	3	36.42	Inside
Nozzle Outside Tank	12.75	12.000	0.375	4	23.50	Inside
			Totals	65	764.07	

Weighting for Pipeline Segment	% Total Length	Configuration	Buried	Exposed	Inside
Non Exposed	0.92	Buried	0.92		
Nozzle Inside Tank	0.05	Inside			0.05
Nozzle Outside Tank	0.03	Inside			0.03
Sum of Factors	1.00		Weight Factors	0.92	0.08

The above factors are used for weighting segment temperatures.

Corrected Temperatures

Initial Test Temperatures

Buried	Exposed	Inside	Initial Corrected T1	DT1	
79.84	79.844		73.58	13.5716816	AVG. T
					73.54

Final Test Temperatures

Buried	Exposed	Inside	Final Corrected T2	DT2
79.75	79.754		73.50	13.4887398

Corrected Temperature Difference -0.08

NOTE: PIPE TYPE

	E	a
Carbon Steel	2.95E+07	6.50E-06
Stainless Steel	2.8E+07	9.60E-06
FRP	2.3E+06	1.16E-05
Aluminum	1.00E+07	

Test Pressure Difference

Initial Pressure P1	Final Pressure P2	dPressure
165.2	162	-3.2

Calculate (Kp)=(1.9D/2Et)+1/β weighted value	Kp (1/P)		Compressibility Factor (1/BETA) or (1/β)	
Calculating C_{PL}	C_{PL} 1	C_{PL} 2	F_P 1	F_P 2
$C_{PL} = 1/(1-F_P*P)$ or Kp (1/P)=	1.0005973	1.0005856	3.614E-06	3.613E-06

Calculate (Kt)=(3a-g)a=constant					
Calculating C_{TL}	C_{TL} 1	C_{TL} 2	Coefficient Of Linear Expansion	Temperature Correction Factor (c)	Test Duration
$C_{TL} = Exp(-\alpha_{60}*DT*(1+0.8*\alpha_{60}*(DT+\delta_{60})))$ or Kt(1/F)=	0.9955024	0.9955299	a	α_{60}	Hours
			6.50E-06	3.31E-04	4.00

Calculating Fluid Volume Gain / Loss

dV =V2-V1=V0/(C_{PL}2*C_{TL}2)-V0/(C_{PL}1*C_{TL}1))	dV=Total Pipeline Volume*(Kp*dP+Kt*dT) ▲V / V = Total Pipeline Volume Kp▲P + Kt▲T		Net Volume Removed (Accountable Loss(-) / Gain(+) - From Log Sheet)		Unaccountable Loss	Actual Gain(+) / Loss(-)
Volume. Loss/8hrs	-0.01	+		=	-0.01	
Volume. Loss/hour	0.00	+		=	0.00	
			Added or Subtracted During Test			

CSFM Loss Allowable			
Gal./hour	1.02	Gal./8hours	8.17

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Hydrostatic Test Volume Change Calculations (Attachment C) Page 2 of 2

Test ID Number:	14-332-02	Code Color:	None
Customer:	Willbros Government Services	Date:	6/25/2014
System Under Evaluation:	Tank 5 Fuel Piping - 18"	Location:	Red Hill Fuel Farm, Naval Station Pearl Harbor

Volume Change Calculations for Jet Fuel Pipeline (measured volume/pressure slope method)

Pipe Data			Test Date	6/25/2014	API Gravity	10
Pipe Segment	Ø Outside (In)	Ø Inside (In)	Wall (In)	Length (Ft)	Volume (Gal)	Configuration
Non Exposed	18	17.250	0.375	58	704.15	Buried
Nozzle Inside Tank	18	17.250	0.375	3	36.42	Inside
Nozzle Outside Tank	12.75	12.000	0.375	4	23.50	Inside
			Totals	65	764.07	

Weighting for segment	% Total Length	Configuration	Buried	Exposed	Inside
Non Exposed	0.92	Buried	0.92		
Nozzle Inside Tank	0.05	Inside			0.05
Nozzle Outside Tank	0.03	Inside			0.03
Sum of Factors	1.00		Weight Factors 0.92		0.08

The above factors are used for weighting segment temperatures.

Corrected Temperatures

Initial Test Temperatures

Buried	Exposed	Inside	Initial Corrected	DT1	
79.84	79.844		73.58	13.5716816	AVG. T
Final Test Temperatures					73.54
Buried	Exposed	Inside	Final Corrected	DT2	
79.75	79.754		73.50	13.4867398	

Corrected Temperature Difference	*-0.08*

Test Pressure Difference

Initial Pressure	Final Pressure	dPressure	AVG. Pressure
165.2	162	-3.2	163.6
			Use Reference from Test Data

dV/dP Slope Calculations (Values are From Test Data)

Initial Pressure	Final Pressure	Initial Vol.	Final Vol.	dV/dP
	165.2		2.52	0.015254237

Calculating K_T	K_T	Coefficient Of Linear Expansion	Temperature Correction Factor	Test Duration
$K_T = 3a\text{-}\alpha_{60}$	-0.0003115	a	α_{60}	Hours
		6.50E-06	3.31E-04	4.00

Calculating Fluid Volume Gain / Loss

dV =Total Pipeline Volume*K_T* dT+dV/dP*dP	dV		Net Volume Removed (Accountable Loss(-) / Gain(+) - From Log Sheet)		Unaccountable Loss	Actual Gain(+) / Loss(-)
Volume. Loss/8hrs	*-0.01*	+		=	-0.01	
Volume. Loss/hour	*0.00*	+		=	0.00	
			Added or Subtracted During Test			

CSFM Loss Allowable				Test Conclusion IAW CSFM / hr	Pass
Gal./hour	1.02	Gal./8hours	8.17	Test Conclusion IAW CSFM / 8 hrs	Pass

Note: Use this pass/fail criteria to assist in determining a successful test with the temperature evaluation.

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APPENDIX D –

RAW TEST DATA FROM DATALOGGER – 32" F-76 LINE
RAW TEST DATA FROM DATALOGGER – 18" JP-8 LINE

Tank 5: 32" Line Test Data

Note: Pressure and temperature readings are listed approximatley every minute.
Note: Lines highlighted in yellow are the official test period from 8 PM to 12 midnight. Readings highlighted in beige are where the pressure appeared to stabilize during a 41 minute period.

Device Name: Pr2000
Device Description: Pressure Recorder with LCD Display
Serial Number: N86436
Device ID: Press Unit 2

Location: Lower Access Tunnel

Reading Number	Date and Time (HST)	Channel 1 Absolute Pressure (PSIA)	Gauge Pressure (PSIG)(A-14.7)
Column1	Column2	Column3	Column4
1	2014-06-26 11:30:02	20.7	6
2	2014-06-26 11:31:02	18.95	4.25
3	2014-06-26 11:32:02	18.6	3.9
4	2014-06-26 11:33:02	18.6	3.9
5	2014-06-26 11:34:02	18.6	3.9
6	2014-06-26 11:35:02	18.6	3.9
7	2014-06-26 11:36:02	18.6	3.9
8	2014-06-26 11:37:02	18.6	3.9
9	2014-06-26 11:38:02	21.2	6.5
10	2014-06-26 11:39:02	32.75	18.05
11	2014-06-26 11:40:02	49.55	34.85
12	2014-06-26 11:41:02	60.2	45.5
13	2014-06-26 11:42:02	62.75	48.05
14	2014-06-26 11:43:02	63.25	48.55
15	2014-06-26 11:44:02	63.45	48.75
16	2014-06-26 11:45:02	63.5	48.8
17	2014-06-26 11:46:02	63.4	48.7
18	2014-06-26 11:47:02	63.35	48.65
19	2014-06-26 11:48:02	70.5	55.8
20	2014-06-26 11:49:02	82.85	68.15
21	2014-06-26 11:50:02	89.9	75.2
22	2014-06-26 11:51:02	84	69.3
23	2014-06-26 11:52:02	78.2	63.5
24	2014-06-26 11:53:02	13.05	-1.65
25	2014-06-26 11:54:02	13.1	-1.6
26	2014-06-26 11:55:02	13.15	-1.55
27	2014-06-26 11:56:02	13.2	-1.5
28	2014-06-26 11:57:02	13.2	-1.5
29	2014-06-26 11:58:02	13.2	-1.5
30	2014-06-26 11:59:02	13.2	-1.5
31	2014-06-26 12:00:02	13.2	-1.5
32	2014-06-26 12:01:02	13.2	-1.5
33	2014-06-26 12:02:02	13.2	-1.5
34	2014-06-26 12:03:02	13.25	-1.45
35	2014-06-26 12:04:02	13.25	-1.45
36	2014-06-26 12:05:02	13.25	-1.45
37	2014-06-26 12:06:02	13.25	-1.45
38	2014-06-26 12:07:02	13.25	-1.45
39	2014-06-26 12:08:02	13.25	-1.45
40	2014-06-26 12:09:02	13.3	-1.4
41	2014-06-26 12:10:02	13.25	-1.45
42	2014-06-26 12:11:02	13.3	-1.4
43	2014-06-26 12:12:02	13.3	-1.4
44	2014-06-26 12:13:02	13.3	-1.4
45	2014-06-26 12:14:02	13.25	-1.45
46	2014-06-26 12:15:02	13.3	-1.4
47	2014-06-26 12:16:02	13.3	-1.4
48	2014-06-26 12:17:02	13.3	-1.4
49	2014-06-26 12:18:02	13.3	-1.4
50	2014-06-26 12:19:02	13.3	-1.4
51	2014-06-26 12:20:02	13.3	-1.4
52	2014-06-26 12:21:02	13.3	-1.4
53	2014-06-26 12:22:02	13.3	-1.4
54	2014-06-26 12:23:02	13.3	-1.4
55	2014-06-26 12:24:02	13.35	-1.35
56	2014-06-26 12:25:02	13.3	-1.4
57	2014-06-26 12:26:02	13.35	-1.35
58	2014-06-26 12:27:02	13.35	-1.35
59	2014-06-26 12:28:02	13.3	-1.4
60	2014-06-26 12:29:02	13.35	-1.35
61	2014-06-26 12:30:02	13.35	-1.35
62	2014-06-26 12:31:02	13.35	-1.35
63	2014-06-26 12:32:02	13.35	-1.35
64	2014-06-26 12:33:02	13.35	-1.35
65	2014-06-26 12:34:02	13.35	-1.35
66	2014-06-26 12:35:02	13.35	-1.35
67	2014-06-26 12:36:02	14.4	-0.3
68	2014-06-26 12:37:02	19.7	5
69	2014-06-26 12:38:02	30.05	15.35
70	2014-06-26 12:39:02	47.2	32.5
71	2014-06-26 12:40:02	59.45	44.75
72	2014-06-26 12:41:02	62.25	47.55
73	2014-06-26 12:42:02	66.85	52.15
74	2014-06-26 12:43:02	79.45	64.75
75	2014-06-26 12:44:02	90.3	75.6
76	2014-06-26 12:45:02	88.8	74.1
77	2014-06-26 12:46:02	87.55	72.85
78	2014-06-26 12:47:02	86.55	71.85
79	2014-06-26 12:48:02	85.7	71
80	2014-06-26 12:49:02	85.05	70.35
81	2014-06-26 12:50:02	84.45	69.75
82	2014-06-26 12:51:02	84	69.3
83	2014-06-26 12:52:02	83.55	68.85

Device Name: TCTemp2000
Device Description: Thermocouple Temperature Recorder
Serial Number: N84147
Device ID: Aux Temp 3

Location: Inside Tank 5 on Flange

Reading Number	Date and Time (HST)	Channel 1 Ambient Temperature (°F)	Channel 2 Thermocouple 1 (°F)
Column5	Column6	Column7	Column8
1	2014-06-26 11:30:23	81.158	2498
2	2014-06-26 11:31:23	81.158	2498
3	2014-06-26 11:32:23	81.158	2498
4	2014-06-26 11:33:23	81.158	2498
5	2014-06-26 11:34:23	81.032	2498
6	2014-06-26 11:35:23	81.032	2498
7	2014-06-26 11:36:23	81.032	2498
8	2014-06-26 11:37:23	81.032	2498
9	2014-06-26 11:38:23	81.032	79.502
10	2014-06-26 11:39:23	81.032	79.538
11	2014-06-26 11:40:23	81.032	79.844
12	2014-06-26 11:41:23	81.032	79.898
13	2014-06-26 11:42:23	81.032	79.988
14	2014-06-26 11:43:23	80.924	79.916
15	2014-06-26 11:44:23	80.924	79.97
16	2014-06-26 11:45:23	80.816	79.934
17	2014-06-26 11:46:23	80.708	79.97
18	2014-06-26 11:47:23	80.708	79.916
19	2014-06-26 11:48:23	80.6	79.898
20	2014-06-26 11:49:23	80.6	79.898
21	2014-06-26 11:50:23	80.474	79.862
22	2014-06-26 11:51:23	80.474	79.556
23	2014-06-26 11:52:23	80.366	79.394
24	2014-06-26 11:53:23	80.474	79.376
25	2014-06-26 11:54:23	80.366	79.322
26	2014-06-26 11:55:23	80.258	79.25
27	2014-06-26 11:56:23	80.258	79.286
28	2014-06-26 11:57:23	80.258	79.214
29	2014-06-26 11:58:23	80.258	79.34
30	2014-06-26 11:59:23	80.258	79.124
31	2014-06-26 12:00:23	80.132	78.998
32	2014-06-26 12:01:23	80.132	79.124
33	2014-06-26 12:02:23	80.132	79.826
34	2014-06-26 12:03:23	80.024	79.718
35	2014-06-26 12:04:23	80.024	79.718
36	2014-06-26 12:05:23	80.024	79.718
37	2014-06-26 12:06:23	80.024	79.142
38	2014-06-26 12:07:23	80.024	79.322
39	2014-06-26 12:08:23	80.024	79.232
40	2014-06-26 12:09:23	80.024	79.106
41	2014-06-26 12:10:23	79.916	78.944
42	2014-06-26 12:11:23	80.024	79.106
43	2014-06-26 12:12:23	80.024	79.052
44	2014-06-26 12:13:23	80.024	79.142
45	2014-06-26 12:14:23	79.916	78.998
46	2014-06-26 12:15:23	79.916	79.034
47	2014-06-26 12:16:23	79.916	78.998
48	2014-06-26 12:17:23	79.916	79.034
49	2014-06-26 12:18:23	79.916	79.034
50	2014-06-26 12:19:23	79.808	78.926
51	2014-06-26 12:20:23	79.916	78.998
52	2014-06-26 12:21:23	79.916	79.034
53	2014-06-26 12:22:23	79.916	2498
54	2014-06-26 12:23:23	79.916	2498
55	2014-06-26 12:24:23	79.916	2498
56	2014-06-26 12:25:23	79.808	2498
57	2014-06-26 12:26:23	79.916	2498
58	2014-06-26 12:27:23	79.808	2498
59	2014-06-26 12:28:23	79.808	2498
60	2014-06-26 12:29:23	79.808	2498
61	2014-06-26 12:30:23	79.808	2498
62	2014-06-26 12:31:23	79.808	2498
63	2014-06-26 12:32:23	79.808	2498
64	2014-06-26 12:33:23	79.808	2498
65	2014-06-26 12:34:23	79.808	2498
66	2014-06-26 12:35:23	79.808	2498
67	2014-06-26 12:36:23	79.808	2498
68	2014-06-26 12:37:23	79.808	2498
69	2014-06-26 12:38:23	79.808	2498
70	2014-06-26 12:39:23	79.808	2498
71	2014-06-26 12:40:23	79.808	2498
72	2014-06-26 12:41:23	79.808	2498
73	2014-06-26 12:42:23	79.808	2498
74	2014-06-26 12:43:23	79.808	2498
75	2014-06-26 12:44:23	79.808	2498
76	2014-06-26 12:45:23	79.808	2498
77	2014-06-26 12:46:23	79.808	2498
78	2014-06-26 12:47:23	79.808	2498
79	2014-06-26 12:48:23	79.808	2498
80	2014-06-26 12:49:23	79.7	2498
81	2014-06-26 12:50:23	79.7	2498
82	2014-06-26 12:51:23	79.7	2498
83	2014-06-26 12:52:23	79.808	2498

Device Name: QuadTemp
Device Description: 4 Channel Thermocouple Temperature Recorder
Serial Number: N86275
Device ID: Temp Unit 2

Location: Lower Access Tunnel

Reading Number	Date and Time (HST)	Channel 2 Thermocouple 1 (Ambient) (°F)	Channel 4 Thermocouple 2 (AG Pipe) (°F)
Column9	Column10	Column11	Column12
1	2014-06-26 11:30:52	79.826	80.744
2	2014-06-26 11:31:52	79.862	80.744
3	2014-06-26 11:32:52	79.862	80.744
4	2014-06-26 11:33:52	79.934	80.726
5	2014-06-26 11:34:52	79.934	80.636
6	2014-06-26 11:35:52	79.934	80.654
7	2014-06-26 11:36:52	79.934	80.546
8	2014-06-26 11:37:52	79.898	80.636
9	2014-06-26 11:38:52	79.916	80.582
10	2014-06-26 11:39:52	79.952	80.582
11	2014-06-26 11:40:52	79.97	80.582
12	2014-06-26 11:41:52	79.916	80.582
13	2014-06-26 11:42:52	79.898	80.51
14	2014-06-26 11:43:52	79.952	80.528
15	2014-06-26 11:44:52	79.916	80.6
16	2014-06-26 11:45:52	79.898	80.564
17	2014-06-26 11:46:52	79.898	80.582
18	2014-06-26 11:47:52	79.898	80.564
19	2014-06-26 11:48:52	79.844	80.474
20	2014-06-26 11:49:52	79.862	80.474
21	2014-06-26 11:50:52	79.898	80.51
22	2014-06-26 11:51:52	79.934	80.474
23	2014-06-26 11:52:52	80.006	80.474
24	2014-06-26 11:53:52	79.88	80.474
25	2014-06-26 11:54:52	79.988	80.42
26	2014-06-26 11:55:52	79.916	80.42
27	2014-06-26 11:56:52	79.988	80.42
28	2014-06-26 11:57:52	79.862	80.438
29	2014-06-26 11:58:52	79.898	80.438
30	2014-06-26 11:59:52	79.862	80.402
31	2014-06-26 12:00:52	79.88	80.402
32	2014-06-26 12:01:52	79.826	80.366
33	2014-06-26 12:02:52	79.826	80.366
34	2014-06-26 12:03:52	79.808	80.366
35	2014-06-26 12:04:52	79.808	80.366
36	2014-06-26 12:05:52	79.862	80.312
37	2014-06-26 12:06:52	79.826	80.384
38	2014-06-26 12:07:52	79.826	80.312
39	2014-06-26 12:08:52	79.736	80.312
40	2014-06-26 12:09:52	79.79	80.348
41	2014-06-26 12:10:52	79.844	80.294
42	2014-06-26 12:11:52	79.826	80.24
43	2014-06-26 12:12:52	79.79	80.312
44	2014-06-26 12:13:52	79.79	80.276
45	2014-06-26 12:14:52	79.79	80.24
46	2014-06-26 12:15:52	79.79	80.276
47	2014-06-26 12:16:52	79.826	80.186
48	2014-06-26 12:17:52	79.826	80.24
49	2014-06-26 12:18:52	79.754	80.132
50	2014-06-26 12:19:52	79.736	80.186
51	2014-06-26 12:20:52	79.772	80.168
52	2014-06-26 12:21:52	79.826	80.132
53	2014-06-26 12:22:52	79.754	80.15
54	2014-06-26 12:23:52	79.772	80.132
55	2014-06-26 12:24:52	79.754	80.186
56	2014-06-26 12:25:52	79.754	80.132
57	2014-06-26 12:26:52	79.808	80.078
58	2014-06-26 12:27:52	79.772	80.078
59	2014-06-26 12:28:52	79.754	80.132
60	2014-06-26 12:29:52	79.754	80.06
61	2014-06-26 12:30:52	79.754	80.078
62	2014-06-26 12:31:52	79.754	80.114
63	2014-06-26 12:32:52	79.754	80.096
64	2014-06-26 12:33:52	79.718	80.114
65	2014-06-26 12:34:52	79.7	80.114
66	2014-06-26 12:35:52	79.682	80.114
67	2014-06-26 12:36:52	79.736	80.096
68	2014-06-26 12:37:52	79.754	80.096
69	2014-06-26 12:38:52	79.736	80.15
70	2014-06-26 12:39:52	79.7	80.042
71	2014-06-26 12:40:52	79.736	80.096
72	2014-06-26 12:41:52	79.754	80.15
73	2014-06-26 12:42:52	79.772	80.096
74	2014-06-26 12:43:52	79.808	80.042
75	2014-06-26 12:44:52	79.736	80.096
76	2014-06-26 12:45:52	79.736	80.06
77	2014-06-26 12:46:52	79.736	80.096
78	2014-06-26 12:47:52	79.718	80.06
79	2014-06-26 12:48:52	79.736	80.006
80	2014-06-26 12:49:52	79.736	80.114
81	2014-06-26 12:50:52	79.736	80.06
82	2014-06-26 12:51:52	79.7	80.024
83	2014-06-26 12:52:52	79.7	80.06

84	2014-06-26 12:53:02	83.2	68.5	84	2014-06-26 12:53:23	79.7	2498	84	2014-06-26 12:53:52	79.772	80.06
85	2014-06-26 12:54:02	82.85	68.15	85	2014-06-26 12:54:23	79.7	2498	85	2014-06-26 12:54:52	79.736	79.97
86	2014-06-26 12:55:02	82.55	67.85	86	2014-06-26 12:55:23	79.808	2498	86	2014-06-26 12:55:52	79.772	80.024
87	2014-06-26 12:56:02	82.25	67.55	87	2014-06-26 12:56:23	79.808	2498	87	2014-06-26 12:56:52	79.826	80.06
88	2014-06-26 12:57:02	82.05	67.35	88	2014-06-26 12:57:23	79.7	2498	88	2014-06-26 12:57:52	79.772	80.024
89	2014-06-26 12:58:02	81.8	67.1	89	2014-06-26 12:58:23	79.808	2498	89	2014-06-26 12:58:52	79.79	80.078
90	2014-06-26 12:59:02	81.55	66.85	90	2014-06-26 12:59:23	79.7	2498	90	2014-06-26 12:59:52	79.79	80.006
91	2014-06-26 13:00:02	81.4	66.7	91	2014-06-26 13:00:23	79.808	2498	91	2014-06-26 13:00:52	79.772	80.006
92	2014-06-26 13:01:02	81.2	66.5	92	2014-06-26 13:01:23	79.7	2498	92	2014-06-26 13:01:52	79.79	80.024
93	2014-06-26 13:02:02	81	66.3	93	2014-06-26 13:02:23	79.808	2498	93	2014-06-26 13:02:52	79.772	79.97
94	2014-06-26 13:03:02	80.85	66.15	94	2014-06-26 13:03:23	79.7	2498	94	2014-06-26 13:03:52	79.79	79.97
95	2014-06-26 13:04:02	80.7	66	95	2014-06-26 13:04:23	79.7	2498	95	2014-06-26 13:04:52	79.772	80.006
96	2014-06-26 13:05:02	80.55	65.85	96	2014-06-26 13:05:23	79.7	2498	96	2014-06-26 13:05:52	79.772	79.97
97	2014-06-26 13:06:02	80.4	65.7	97	2014-06-26 13:06:23	79.7	2498	97	2014-06-26 13:06:52	79.772	80.024
98	2014-06-26 13:07:02	80.25	65.55	98	2014-06-26 13:07:23	79.808	2498	98	2014-06-26 13:07:52	79.736	80.024
99	2014-06-26 13:08:02	80.15	65.45	99	2014-06-26 13:08:23	79.7	2498	99	2014-06-26 13:08:52	79.772	80.042
100	2014-06-26 13:09:02	80.05	65.35	100	2014-06-26 13:09:23	79.7	2498	100	2014-06-26 13:09:52	79.772	80.042
101	2014-06-26 13:10:02	79.95	65.25	101	2014-06-26 13:10:23	79.7	2498	101	2014-06-26 13:10:52	79.736	80.006
102	2014-06-26 13:11:02	79.85	65.15	102	2014-06-26 13:11:23	79.808	2498	102	2014-06-26 13:11:52	79.736	79.952
103	2014-06-26 13:12:02	79.7	65	103	2014-06-26 13:12:23	79.7	2498	103	2014-06-26 13:12:52	79.736	80.06
104	2014-06-26 13:13:02	79.65	64.95	104	2014-06-26 13:13:23	79.808	76.568	104	2014-06-26 13:13:52	79.754	79.988
105	2014-06-26 13:14:02	79.6	64.9	105	2014-06-26 13:14:23	79.7	78.872	105	2014-06-26 13:14:52	79.772	79.934
106	2014-06-26 13:15:02	79.6	64.9	106	2014-06-26 13:15:23	79.7	78.782	106	2014-06-26 13:15:52	79.754	79.934
107	2014-06-26 13:16:02	79.55	64.85	107	2014-06-26 13:16:23	79.7	78.116	107	2014-06-26 13:16:52	79.736	79.898
108	2014-06-26 13:17:02	79.5	64.8	108	2014-06-26 13:17:23	79.7	78.386	108	2014-06-26 13:17:52	79.754	79.934
109	2014-06-26 13:18:02	79.45	64.75	109	2014-06-26 13:18:23	79.808	78.53	109	2014-06-26 13:18:52	79.754	79.934
110	2014-06-26 13:19:02	79.4	64.7	110	2014-06-26 13:19:23	79.808	78.674	110	2014-06-26 13:19:52	79.718	79.988
111	2014-06-26 13:20:02	79.4	64.7	111	2014-06-26 13:20:23	79.808	78.674	111	2014-06-26 13:20:52	79.772	79.862
112	2014-06-26 13:21:02	89.6	74.9	112	2014-06-26 13:21:23	79.7	78.332	112	2014-06-26 13:21:52	79.772	79.772
113	2014-06-26 13:22:02	94.2	79.5	113	2014-06-26 13:22:23	79.7	79.124	113	2014-06-26 13:22:52	79.718	79.826
114	2014-06-26 13:23:02	102.85	88.15	114	2014-06-26 13:23:23	79.7	79.124	114	2014-06-26 13:23:52	79.754	79.826
115	2014-06-26 13:24:02	100.15	85.45	115	2014-06-26 13:24:23	79.808	79.412	115	2014-06-26 13:24:52	79.754	79.826
116	2014-06-26 13:25:02	98.3	83.6	116	2014-06-26 13:25:23	79.808	79.412	116	2014-06-26 13:25:52	79.736	79.826
117	2014-06-26 13:26:02	96.95	82.25	117	2014-06-26 13:26:23	79.808	79.592	117	2014-06-26 13:26:52	79.754	79.826
118	2014-06-26 13:27:02	95.9	81.2	118	2014-06-26 13:27:23	79.808	79.628	118	2014-06-26 13:27:52	79.718	79.772
119	2014-06-26 13:28:02	95	80.3	119	2014-06-26 13:28:23	79.808	79.718	119	2014-06-26 13:28:52	79.718	79.808
120	2014-06-26 13:29:02	95.5	80.8	120	2014-06-26 13:29:23	79.916	79.79	120	2014-06-26 13:29:52	79.718	79.808
121	2014-06-26 13:30:02	94.75	80.05	121	2014-06-26 13:30:23	79.808	79.754	121	2014-06-26 13:30:52	79.826	79.772
122	2014-06-26 13:31:02	94.1	79.4	122	2014-06-26 13:31:23	79.916	76.532	122	2014-06-26 13:31:52	79.862	79.808
123	2014-06-26 13:32:02	93.5	78.8	123	2014-06-26 13:32:23	79.916	76.586	123	2014-06-26 13:32:52	79.844	79.808
124	2014-06-26 13:33:02	92.9	78.2	124	2014-06-26 13:33:23	79.916	76.622	124	2014-06-26 13:33:52	79.808	79.862
125	2014-06-26 13:34:02	92.35	77.65	125	2014-06-26 13:34:23	79.916	76.676	125	2014-06-26 13:34:52	79.772	79.754
126	2014-06-26 13:35:02	91.85	77.15	126	2014-06-26 13:35:23	79.916	76.712	126	2014-06-26 13:35:52	79.808	79.862
127	2014-06-26 13:36:02	91.4	76.7	127	2014-06-26 13:36:23	79.916	76.712	127	2014-06-26 13:36:52	79.718	79.808
128	2014-06-26 13:37:02	90.95	76.25	128	2014-06-26 13:37:23	79.808	76.604	128	2014-06-26 13:37:52	79.772	79.808
129	2014-06-26 13:38:02	90.5	75.8	129	2014-06-26 13:38:23	79.916	76.784	129	2014-06-26 13:38:52	79.772	79.826
130	2014-06-26 13:39:02	90.15	75.45	130	2014-06-26 13:39:23	79.916	76.802	130	2014-06-26 13:39:52	79.772	79.826
131	2014-06-26 13:40:02	89.75	75.05	131	2014-06-26 13:40:23	79.808	76.73	131	2014-06-26 13:40:52	79.754	79.826
132	2014-06-26 13:41:02	89.4	74.7	132	2014-06-26 13:41:23	79.808	76.73	132	2014-06-26 13:41:52	79.808	79.772
133	2014-06-26 13:42:02	89.05	74.35	133	2014-06-26 13:42:23	79.808	76.73	133	2014-06-26 13:42:52	79.808	79.754
134	2014-06-26 13:43:02	88.75	74.05	134	2014-06-26 13:43:23	79.808	76.784	134	2014-06-26 13:43:52	79.808	79.826
135	2014-06-26 13:44:02	88.45	73.75	135	2014-06-26 13:44:23	79.808	76.82	135	2014-06-26 13:44:52	79.718	79.826
136	2014-06-26 13:45:02	88.15	73.45	136	2014-06-26 13:45:23	79.808	76.874	136	2014-06-26 13:45:52	79.754	79.826
137	2014-06-26 13:46:02	87.9	73.2	137	2014-06-26 13:46:23	79.808	76.91	137	2014-06-26 13:46:52	79.772	79.862
138	2014-06-26 13:47:02	87.65	72.95	138	2014-06-26 13:47:23	79.808	76.964	138	2014-06-26 13:47:52	79.754	79.772
139	2014-06-26 13:48:02	87.4	72.7	139	2014-06-26 13:48:23	79.808	76.964	139	2014-06-26 13:48:52	79.736	79.826
140	2014-06-26 13:49:02	87.15	72.45	140	2014-06-26 13:49:23	79.808	77	140	2014-06-26 13:49:52	79.7	79.772
141	2014-06-26 13:50:02	86.9	72.2	141	2014-06-26 13:50:23	79.808	77.036	141	2014-06-26 13:50:52	79.79	79.808
142	2014-06-26 13:51:02	86.7	72	142	2014-06-26 13:51:23	79.808	77.126	142	2014-06-26 13:51:52	79.79	79.754
143	2014-06-26 13:52:02	86.5	71.8	143	2014-06-26 13:52:23	79.808	77.18	143	2014-06-26 13:52:52	79.754	79.808
144	2014-06-26 13:53:02	86.3	71.6	144	2014-06-26 13:53:23	79.808	77.216	144	2014-06-26 13:53:52	79.772	79.808
145	2014-06-26 13:54:02	86.1	71.4	145	2014-06-26 13:54:23	79.808	77.27	145	2014-06-26 13:54:52	79.7	79.826
146	2014-06-26 13:55:02	85.95	71.25	146	2014-06-26 13:55:23	79.7	77.198	146	2014-06-26 13:55:52	79.718	79.808
147	2014-06-26 13:56:02	85.7	71	147	2014-06-26 13:56:23	79.7	77.288	147	2014-06-26 13:56:52	79.808	79.772
148	2014-06-26 13:57:02	85.6	70.9	148	2014-06-26 13:57:23	79.7	77.288	148	2014-06-26 13:57:52	79.682	79.772
149	2014-06-26 13:58:02	85.4	70.7	149	2014-06-26 13:58:23	79.808	77.486	149	2014-06-26 13:58:52	79.754	79.808
150	2014-06-26 13:59:02	85.25	70.55	150	2014-06-26 13:59:23	79.7	77.468	150	2014-06-26 13:59:52	79.754	79.772
151	2014-06-26 14:00:02	85.1	70.4	151	2014-06-26 14:00:23	79.808	77.702	151	2014-06-26 14:00:52	79.7	79.808
152	2014-06-26 14:01:02	84.95	70.25	152	2014-06-26 14:01:23	79.7	77.594	152	2014-06-26 14:01:52	79.736	79.808
153	2014-06-26 14:02:02	84.85	70.15	153	2014-06-26 14:02:23	79.7	77.684	153	2014-06-26 14:02:52	79.736	79.808
154	2014-06-26 14:03:02	84.65	69.95	154	2014-06-26 14:03:23	79.7	77.81	154	2014-06-26 14:03:52	79.772	79.808
155	2014-06-26 14:04:02	84.55	69.85	155	2014-06-26 14:04:23	79.7	77.81	155	2014-06-26 14:04:52	79.718	79.808
156	2014-06-26 14:05:02	84.45	69.75	156	2014-06-26 14:05:23	79.7	77.936	156	2014-06-26 14:05:52	79.736	79.772
157	2014-06-26 14:06:02	84.3	69.6	157	2014-06-26 14:06:23	79.7	77.99	157	2014-06-26 14:06:52	79.754	79.718
158	2014-06-26 14:07:02	84.2	69.5	158	2014-06-26 14:07:23	79.7	78.026	158	2014-06-26 14:07:52	79.772	79.772
159	2014-06-26 14:08:02	84.05	69.35	159	2014-06-26 14:08:23	79.7	78.08	159	2014-06-26 14:08:52	79.772	79.772
160	2014-06-26 14:09:02	83.95	69.25	160	2014-06-26 14:09:23	79.7	78.116	160	2014-06-26 14:09:52	79.754	79.772
161	2014-06-26 14:10:02	83.85	69.15	161	2014-06-26 14:10:23	79.7	78.206	161	2014-06-26 14:10:52	79.79	79.754
162	2014-06-26 14:11:02	83.75	69.05	162	2014-06-26 14:11:23	79.7	78.206	162	2014-06-26 14:11:52	79.736	79.718
163	2014-06-26 14:12:02	83.65	68.95	163	2014-06-26 14:12:23	79.7	78.26	163	2014-06-26 14:12:52	79.736	79.718
164	2014-06-26 14:13:02	83.55	68.85	164	2014-06-26 14:13:23	79.7	78.26	164	2014-06-26 14:13:52	79.772	79.754
165	2014-06-26 14:14:02	83.45	68.75	165	2014-06-26 14:14:23	79.7	78.332	165	2014-06-26 14:14:52	79.682	79.718
166	2014-06-26 14:15:02	83.35	68.65	166	2014-06-26 14:15:23	79.7	78.332	166	2014-06-26 14:15:52	79.7	79.7
167	2014-06-26 14:16:02	83.25	68.55	167	2014-06-26 14:16:23	79.7	78.332	167	2014-06-26 14:16:52	79.754	79.808
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169	2014-06-26 14:18:02	83.15	68.45	169	2014-06-26 14:18:23	79.7	78.422	169	2014-06-26 14:18:52	79.736	79.772
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171	2014-06-26 14:20:02	82.95	68.25	171	2014-06-26 14:20:23	79.7	78.476	171	2014-06-26 14:20:52	79.772	79.808
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173	2014-06-26 14:22:02	82.8	68.1	173	2014-06-26 14:22:23	79.7	78.476	173	2014-06-26 14:22:52	79.736	79.808
174	2014-06-26 14:23:02	82.75	68.05	174	2014-06-26 14:23:23	79.7	78.476	174	2014-06-26 14:23:52	79.736	79.718
175	2014-06-26 14:24:02	66.65	51.95	175	2014-06-26 14:24:23	79.7	78.512	175	2014-06-26 14:24:52	79.754	79.718
176	2014-06-26 14:25:02	15.8	1.1	176	2014-06-26 14:25:23	79.7	78.512	176	2014-06-26 14:25:52	79.772	79.808
177	2014-06-26 14:26:02	15.6	0.9	177	2014-06-26 14:26:23	79.7	78.566	177	2014-06-26 14:26:52	79.772	79.718
178	2014-06-26 14:27:02	11.95	-2.75	178	2014-06-26 14:27:23	79.7	78.476	178	2014-06-26 14:27:52	79.736	79.772

179	2014-06-26 14:28:02	12.3	-2.4
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181	2014-06-26 14:30:02	12.35	-2.35
182	2014-06-26 14:31:02	12.35	-2.35
183	2014-06-26 14:32:02	12.65	-2.05
184	2014-06-26 14:33:02	17.35	2.65
185	2014-06-26 14:34:02	18.25	3.55
186	2014-06-26 14:35:02	18.35	3.65
187	2014-06-26 14:36:02	18.35	3.65
188	2014-06-26 14:37:02	18.35	3.65
189	2014-06-26 14:38:02	18.4	3.7
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193	2014-06-26 14:42:02	18.35	3.65
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197	2014-06-26 14:46:02	18.35	3.65
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199	2014-06-26 14:48:02	18.35	3.65
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217	2014-06-26 15:06:02	18.35	3.65
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232	2014-06-26 15:21:02	17.75	3.05
233	2014-06-26 15:22:02	17.65	2.95
234	2014-06-26 15:23:02	18.2	3.5
235	2014-06-26 15:24:02	18.2	3.5
236	2014-06-26 15:25:02	18.2	3.5
237	2014-06-26 15:26:02	18.2	3.5
238	2014-06-26 15:27:02	18.2	3.5
239	2014-06-26 15:28:02	18.2	3.5
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248	2014-06-26 15:37:02	18.2	3.5
249	2014-06-26 15:38:02	18.2	3.5
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253	2014-06-26 15:42:02	18.2	3.5
254	2014-06-26 15:43:02	18.2	3.5
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272	2014-06-26 16:01:02	18.2	3.5
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182	2014-06-26 14:31:23	79.7	78.476
183	2014-06-26 14:32:23	79.7	78.476
184	2014-06-26 14:33:23	79.7	78.512
185	2014-06-26 14:34:23	79.7	78.512
186	2014-06-26 14:35:23	79.7	78.566
187	2014-06-26 14:36:23	79.7	78.566
188	2014-06-26 14:37:23	79.7	78.566
189	2014-06-26 14:38:23	79.7	76.332
190	2014-06-26 14:39:23	79.7	78.476
191	2014-06-26 14:40:23	79.7	80.438
192	2014-06-26 14:41:23	79.7	80.348
193	2014-06-26 14:42:23	79.7	80.348
194	2014-06-26 14:43:23	79.7	80.402
195	2014-06-26 14:44:23	79.7	80.402
196	2014-06-26 14:45:23	79.7	80.438
197	2014-06-26 14:46:23	79.7	80.438
198	2014-06-26 14:47:23	79.7	80.438
199	2014-06-26 14:48:23	79.808	80.6
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213	2014-06-26 15:02:23	79.808	80.384
214	2014-06-26 15:03:23	79.808	80.384
215	2014-06-26 15:04:23	79.808	80.33
216	2014-06-26 15:05:23	79.808	80.33
217	2014-06-26 15:06:23	79.808	80.294
218	2014-06-26 15:07:23	79.808	80.33
219	2014-06-26 15:08:23	79.7	80.186
220	2014-06-26 15:09:23	79.808	80.294
221	2014-06-26 15:10:23	79.808	80.294
222	2014-06-26 15:11:23	79.7	80.186
223	2014-06-26 15:12:23	79.7	80.132
224	2014-06-26 15:13:23	79.808	80.24
225	2014-06-26 15:14:23	79.808	80.204
226	2014-06-26 15:15:23	79.7	80.096
227	2014-06-26 15:16:23	79.808	80.15
228	2014-06-26 15:17:23	79.7	80.006
229	2014-06-26 15:18:23	79.7	80.006
230	2014-06-26 15:19:23	79.7	80.006
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233	2014-06-26 15:22:23	79.7	79.79
234	2014-06-26 15:23:23	79.7	79.79
235	2014-06-26 15:24:23	79.808	79.898
236	2014-06-26 15:25:23	79.7	79.736
237	2014-06-26 15:26:23	79.808	79.844
238	2014-06-26 15:27:23	79.7	79.79
239	2014-06-26 15:28:23	79.7	79.826
240	2014-06-26 15:29:23	79.7	79.826
241	2014-06-26 15:30:23	79.7	79.826
242	2014-06-26 15:31:23	79.574	79.7
243	2014-06-26 15:32:23	79.574	79.754
244	2014-06-26 15:33:23	79.574	79.754
245	2014-06-26 15:34:23	79.574	79.79
246	2014-06-26 15:35:23	79.574	79.826
247	2014-06-26 15:36:23	79.574	79.826
248	2014-06-26 15:37:23	79.574	79.826
249	2014-06-26 15:38:23	79.466	79.718
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251	2014-06-26 15:40:23	79.466	79.682
252	2014-06-26 15:41:23	79.466	79.682
253	2014-06-26 15:42:23	79.466	79.682
254	2014-06-26 15:43:23	79.466	79.682
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256	2014-06-26 15:45:23	79.466	79.646
257	2014-06-26 15:46:23	79.466	79.592
258	2014-06-26 15:47:23	79.466	79.592
259	2014-06-26 15:48:23	79.466	79.556
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261	2014-06-26 15:50:23	79.466	79.592
262	2014-06-26 15:51:23	79.466	79.592
263	2014-06-26 15:52:23	79.466	79.556
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267	2014-06-26 15:56:23	79.466	79.556
268	2014-06-26 15:57:23	79.466	79.556
269	2014-06-26 15:58:23	79.466	79.502
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271	2014-06-26 16:00:23	79.574	79.61
272	2014-06-26 16:01:23	79.466	79.502
273	2014-06-26 16:02:23	79.574	79.61

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182	2014-06-26 14:31:52	79.808	79.7
183	2014-06-26 14:32:52	79.772	79.772
184	2014-06-26 14:33:52	79.754	79.862
185	2014-06-26 14:34:52	79.808	79.772
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187	2014-06-26 14:36:52	79.7	79.772
188	2014-06-26 14:37:52	79.754	79.718
189	2014-06-26 14:38:52	79.718	79.808
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191	2014-06-26 14:40:52	79.7	79.808
192	2014-06-26 14:41:52	79.718	79.718
193	2014-06-26 14:42:52	79.7	79.754
194	2014-06-26 14:43:52	79.7	79.844
195	2014-06-26 14:44:52	79.754	79.844
196	2014-06-26 14:45:52	79.754	79.88
197	2014-06-26 14:46:52	79.754	79.79
198	2014-06-26 14:47:52	79.682	79.88
199	2014-06-26 14:48:52	79.718	79.826
200	2014-06-26 14:49:52	79.7	79.808
201	2014-06-26 14:50:52	79.718	79.844
202	2014-06-26 14:51:52	79.736	79.79
203	2014-06-26 14:52:52	79.718	79.844
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206	2014-06-26 14:55:52	79.754	79.844
207	2014-06-26 14:56:52	79.754	79.826
208	2014-06-26 14:57:52	79.736	79.826
209	2014-06-26 14:58:52	79.628	79.808
210	2014-06-26 14:59:52	79.7	79.844
211	2014-06-26 15:00:52	79.754	79.844
212	2014-06-26 15:01:52	79.736	79.79
213	2014-06-26 15:02:52	79.736	79.826
214	2014-06-26 15:03:52	79.736	79.826
215	2014-06-26 15:04:52	79.736	79.826
216	2014-06-26 15:05:52	79.754	79.79
217	2014-06-26 15:06:52	79.772	79.79
218	2014-06-26 15:07:52	79.826	79.808
219	2014-06-26 15:08:52	79.79	79.808
220	2014-06-26 15:09:52	79.79	79.844
221	2014-06-26 15:10:52	79.862	79.808
222	2014-06-26 15:11:52	79.826	79.754
223	2014-06-26 15:12:52	79.862	79.754
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226	2014-06-26 15:15:52	79.862	79.808
227	2014-06-26 15:16:52	79.79	79.754
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229	2014-06-26 15:18:52	79.862	79.754
230	2014-06-26 15:19:52	79.808	79.736
231	2014-06-26 15:20:52	79.79	79.79
232	2014-06-26 15:21:52	79.826	79.772
233	2014-06-26 15:22:52	79.862	79.808
234	2014-06-26 15:23:52	79.862	79.772
235	2014-06-26 15:24:52	79.826	79.772
236	2014-06-26 15:25:52	79.898	79.754
237	2014-06-26 15:26:52	79.88	79.826
238	2014-06-26 15:27:52	79.826	79.754
239	2014-06-26 15:28:52	79.898	79.826
240	2014-06-26 15:29:52	79.934	79.808
241	2014-06-26 15:30:52	79.844	79.754
242	2014-06-26 15:31:52	79.862	79.754
243	2014-06-26 15:32:52	79.844	79.772
244	2014-06-26 15:33:52	79.79	79.808
245	2014-06-26 15:34:52	79.772	79.808
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247	2014-06-26 15:36:52	79.754	79.808
248	2014-06-26 15:37:52	79.754	79.808
249	2014-06-26 15:38:52	79.754	79.844
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251	2014-06-26 15:40:52	79.754	79.844
252	2014-06-26 15:41:52	79.7	79.844
253	2014-06-26 15:42:52	79.682	79.844
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261	2014-06-26 15:50:52	79.772	79.79
262	2014-06-26 15:51:52	79.736	79.79
263	2014-06-26 15:52:52	79.736	79.79
264	2014-06-26 15:53:52	79.736	79.844
265	2014-06-26 15:54:52	79.736	79.808
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268	2014-06-26 15:57:52	79.79	79.844
269	2014-06-26 15:58:52	79.754	79.79
270	2014-06-26 15:59:52	79.7	79.826
271	2014-06-26 16:00:52	79.79	79.79
272	2014-06-26 16:01:52	79.736	79.844
273	2014-06-26 16:02:52	79.7	79.844

274	2014-06-26 16:03:02	18.25	3.55	274	2014-06-26 16:03:23	79.466	79.502	274	2014-06-26 16:03:52	79.754	79.808
275	2014-06-26 16:04:02	18.2	3.5	275	2014-06-26 16:04:23	79.466	79.556	275	2014-06-26 16:04:52	79.736	79.826
276	2014-06-26 16:05:02	18.25	3.55	276	2014-06-26 16:05:23	79.466	79.502	276	2014-06-26 16:05:52	79.736	79.826
277	2014-06-26 16:06:02	18.25	3.55	277	2014-06-26 16:06:23	79.466	79.502	277	2014-06-26 16:06:52	79.754	79.808
278	2014-06-26 16:07:02	18.25	3.55	278	2014-06-26 16:07:23	79.574	79.61	278	2014-06-26 16:07:52	79.754	79.844
279	2014-06-26 16:08:02	18.25	3.55	279	2014-06-26 16:08:23	79.466	79.502	279	2014-06-26 16:08:52	79.7	79.79
280	2014-06-26 16:09:02	18.25	3.55	280	2014-06-26 16:09:23	79.466	79.502	280	2014-06-26 16:09:52	79.682	79.844
281	2014-06-26 16:10:02	18.2	3.5	281	2014-06-26 16:10:23	79.466	79.502	281	2014-06-26 16:10:52	79.646	79.79
282	2014-06-26 16:11:02	18.2	3.5	282	2014-06-26 16:11:23	79.574	79.61	282	2014-06-26 16:11:52	79.7	79.808
283	2014-06-26 16:12:02	18.2	3.5	283	2014-06-26 16:12:23	79.466	79.556	283	2014-06-26 16:12:52	79.7	79.844
284	2014-06-26 16:13:02	18.2	3.5	284	2014-06-26 16:13:23	79.466	79.502	284	2014-06-26 16:13:52	79.754	79.844
285	2014-06-26 16:14:02	18.2	3.5	285	2014-06-26 16:14:23	79.466	79.502	285	2014-06-26 16:14:52	79.736	79.79
286	2014-06-26 16:15:02	18.25	3.55	286	2014-06-26 16:15:23	79.466	79.502	286	2014-06-26 16:15:52	79.754	79.808
287	2014-06-26 16:16:02	18.25	3.55	287	2014-06-26 16:16:23	79.574	79.61	287	2014-06-26 16:16:52	79.7	79.826
288	2014-06-26 16:17:02	18.2	3.5	288	2014-06-26 16:17:23	79.574	79.61	288	2014-06-26 16:17:52	79.7	79.826
289	2014-06-26 16:18:02	18.25	3.55	289	2014-06-26 16:18:23	79.466	79.502	289	2014-06-26 16:18:52	79.7	79.808
290	2014-06-26 16:19:02	18.2	3.5	290	2014-06-26 16:19:23	79.466	79.466	290	2014-06-26 16:19:52	79.736	79.844
291	2014-06-26 16:20:02	18.2	3.5	291	2014-06-26 16:20:23	79.466	79.466	291	2014-06-26 16:20:52	79.682	79.79
292	2014-06-26 16:21:02	18.2	3.5	292	2014-06-26 16:21:23	79.466	79.502	292	2014-06-26 16:21:52	79.646	79.826
293	2014-06-26 16:22:02	18.2	3.5	293	2014-06-26 16:22:23	79.466	79.466	293	2014-06-26 16:22:52	79.736	79.79
294	2014-06-26 16:23:02	18.25	3.55	294	2014-06-26 16:23:23	79.574	79.574	294	2014-06-26 16:23:52	79.7	79.826
295	2014-06-26 16:24:02	18.2	3.5	295	2014-06-26 16:24:23	79.574	79.574	295	2014-06-26 16:24:52	79.736	79.772
296	2014-06-26 16:25:02	18.2	3.5	296	2014-06-26 16:25:23	79.466	79.466	296	2014-06-26 16:25:52	79.682	79.79
297	2014-06-26 16:26:02	18.2	3.5	297	2014-06-26 16:26:23	79.466	79.466	297	2014-06-26 16:26:52	79.736	79.808
298	2014-06-26 16:27:02	18.2	3.5	298	2014-06-26 16:27:23	79.574	79.574	298	2014-06-26 16:27:52	79.736	79.79
299	2014-06-26 16:28:02	18.2	3.5	299	2014-06-26 16:28:23	79.574	79.61	299	2014-06-26 16:28:52	79.7	79.844
300	2014-06-26 16:29:02	18.25	3.55	300	2014-06-26 16:29:23	79.466	79.466	300	2014-06-26 16:29:52	79.7	79.844
301	2014-06-26 16:30:02	18.2	3.5	301	2014-06-26 16:30:23	79.466	79.466	301	2014-06-26 16:30:52	79.772	79.772
302	2014-06-26 16:31:02	18.2	3.5	302	2014-06-26 16:31:23	79.574	79.52	302	2014-06-26 16:31:52	79.736	79.808
303	2014-06-26 16:32:02	18.25	3.55	303	2014-06-26 16:32:23	79.466	79.376	303	2014-06-26 16:32:52	79.7	79.772
304	2014-06-26 16:33:02	18.2	3.5	304	2014-06-26 16:33:23	79.574	79.52	304	2014-06-26 16:33:52	79.682	79.772
305	2014-06-26 16:34:02	18.2	3.5	305	2014-06-26 16:34:23	79.574	79.484	305	2014-06-26 16:34:52	79.7	79.826
306	2014-06-26 16:35:02	18.2	3.5	306	2014-06-26 16:35:23	79.466	79.376	306	2014-06-26 16:35:52	79.7	79.772
307	2014-06-26 16:36:02	18.2	3.5	307	2014-06-26 16:36:23	79.574	79.484	307	2014-06-26 16:36:52	79.718	79.79
308	2014-06-26 16:37:02	18.2	3.5	308	2014-06-26 16:37:23	79.574	79.484	308	2014-06-26 16:37:52	79.736	79.79
309	2014-06-26 16:38:02	18.2	3.5	309	2014-06-26 16:38:23	79.574	79.484	309	2014-06-26 16:38:52	79.79	79.808
310	2014-06-26 16:39:02	18.2	3.5	310	2014-06-26 16:39:23	79.574	79.484	310	2014-06-26 16:39:52	79.79	79.736
311	2014-06-26 16:40:02	18.25	3.55	311	2014-06-26 16:40:23	79.574	79.484	311	2014-06-26 16:40:52	79.79	79.754
312	2014-06-26 16:41:02	18.2	3.5	312	2014-06-26 16:41:23	79.574	79.484	312	2014-06-26 16:41:52	79.718	79.808
313	2014-06-26 16:42:02	18.25	3.55	313	2014-06-26 16:42:23	79.574	79.484	313	2014-06-26 16:42:52	79.7	79.772
314	2014-06-26 16:43:02	18.2	3.5	314	2014-06-26 16:43:23	79.574	79.52	314	2014-06-26 16:43:52	79.772	79.736
315	2014-06-26 16:44:02	18.2	3.5	315	2014-06-26 16:44:23	79.574	79.484	315	2014-06-26 16:44:52	79.736	79.79
316	2014-06-26 16:45:02	18.2	3.5	316	2014-06-26 16:45:23	79.574	79.484	316	2014-06-26 16:45:52	79.79	79.736
317	2014-06-26 16:46:02	18.25	3.55	317	2014-06-26 16:46:23	79.574	79.484	317	2014-06-26 16:46:52	79.772	79.79
318	2014-06-26 16:47:02	18.2	3.5	318	2014-06-26 16:47:23	79.574	79.484	318	2014-06-26 16:47:52	79.79	79.772
319	2014-06-26 16:48:02	18.2	3.5	319	2014-06-26 16:48:23	79.574	79.448	319	2014-06-26 16:48:52	79.736	79.754
320	2014-06-26 16:49:02	18.25	3.55	320	2014-06-26 16:49:23	79.574	79.484	320	2014-06-26 16:49:52	79.736	79.7
321	2014-06-26 16:50:02	18.25	3.55	321	2014-06-26 16:50:23	79.574	79.484	321	2014-06-26 16:50:52	79.79	79.772
322	2014-06-26 16:51:02	18.25	3.55	322	2014-06-26 16:51:23	79.574	79.484	322	2014-06-26 16:51:52	79.826	79.754
323	2014-06-26 16:52:02	18.2	3.5	323	2014-06-26 16:52:23	79.574	79.448	323	2014-06-26 16:52:52	79.862	79.79
324	2014-06-26 16:53:02	18.2	3.5	324	2014-06-26 16:53:23	79.574	79.448	324	2014-06-26 16:53:52	79.79	79.754
325	2014-06-26 16:54:02	18.2	3.5	325	2014-06-26 16:54:23	79.574	79.484	325	2014-06-26 16:54:52	79.88	79.772
326	2014-06-26 16:55:02	18.2	3.5	326	2014-06-26 16:55:23	79.574	79.484	326	2014-06-26 16:55:52	79.862	79.754
327	2014-06-26 16:56:02	18.2	3.5	327	2014-06-26 16:56:23	79.574	79.448	327	2014-06-26 16:56:52	79.79	79.754
328	2014-06-26 16:57:02	18.2	3.5	328	2014-06-26 16:57:23	79.574	79.484	328	2014-06-26 16:57:52	79.826	79.754
329	2014-06-26 16:58:02	18.2	3.5	329	2014-06-26 16:58:23	79.574	79.484	329	2014-06-26 16:58:52	79.826	79.772
330	2014-06-26 16:59:02	18.25	3.55	330	2014-06-26 16:59:23	79.466	79.376	330	2014-06-26 16:59:52	79.862	79.7
331	2014-06-26 17:00:02	18.25	3.55	331	2014-06-26 17:00:23	79.466	79.376	331	2014-06-26 17:00:52	79.844	79.754
332	2014-06-26 17:01:02	18.25	3.55	332	2014-06-26 17:01:23	79.466	79.376	332	2014-06-26 17:01:52	79.862	79.754
333	2014-06-26 17:02:02	18.25	3.55	333	2014-06-26 17:02:23	79.466	79.376	333	2014-06-26 17:02:52	79.826	79.844
334	2014-06-26 17:03:02	18.2	3.5	334	2014-06-26 17:03:23	79.466	79.376	334	2014-06-26 17:03:52	79.79	79.79
335	2014-06-26 17:04:02	18.2	3.5	335	2014-06-26 17:04:23	79.466	79.412	335	2014-06-26 17:04:52	79.826	79.772
336	2014-06-26 17:05:02	18.2	3.5	336	2014-06-26 17:05:23	79.466	79.376	336	2014-06-26 17:05:52	79.79	79.754
337	2014-06-26 17:06:02	18.25	3.55	337	2014-06-26 17:06:23	79.466	79.376	337	2014-06-26 17:06:52	79.826	79.79
338	2014-06-26 17:07:02	18.25	3.55	338	2014-06-26 17:07:23	79.466	79.376	338	2014-06-26 17:07:52	79.826	79.79
339	2014-06-26 17:08:02	18.2	3.5	339	2014-06-26 17:08:23	79.466	79.376	339	2014-06-26 17:08:52	79.79	79.808
340	2014-06-26 17:09:02	18.25	3.55	340	2014-06-26 17:09:23	79.466	79.412	340	2014-06-26 17:09:52	79.862	79.772
341	2014-06-26 17:10:02	18.2	3.5	341	2014-06-26 17:10:23	79.574	79.484	341	2014-06-26 17:10:52	79.844	79.754
342	2014-06-26 17:11:02	18.25	3.55	342	2014-06-26 17:11:23	79.466	79.376	342	2014-06-26 17:11:52	79.79	79.772
343	2014-06-26 17:12:02	18.3	3.6	343	2014-06-26 17:12:23	79.574	79.484	343	2014-06-26 17:12:52	79.736	79.808
344	2014-06-26 17:13:02	18.25	3.55	344	2014-06-26 17:13:23	79.466	79.376	344	2014-06-26 17:13:52	79.844	79.808
345	2014-06-26 17:14:02	18.25	3.55	345	2014-06-26 17:14:23	79.574	79.484	345	2014-06-26 17:14:52	79.736	79.754
346	2014-06-26 17:15:02	18.25	3.55	346	2014-06-26 17:15:23	79.574	79.484	346	2014-06-26 17:15:52	79.79	79.808
347	2014-06-26 17:16:02	18.25	3.55	347	2014-06-26 17:16:23	79.466	79.34	347	2014-06-26 17:16:52	79.844	79.754
348	2014-06-26 17:17:02	18.25	3.55	348	2014-06-26 17:17:23	79.574	79.448	348	2014-06-26 17:17:52	79.736	79.754
349	2014-06-26 17:18:02	18.25	3.55	349	2014-06-26 17:18:23	79.574	79.448	349	2014-06-26 17:18:52	79.79	79.772
350	2014-06-26 17:19:02	18.25	3.55	350	2014-06-26 17:19:23	79.574	79.394	350	2014-06-26 17:19:52	79.772	79.808
351	2014-06-26 17:20:02	18.3	3.6	351	2014-06-26 17:20:23	79.574	79.448	351	2014-06-26 17:20:52	79.7	79.79
352	2014-06-26 17:21:02	18.25	3.55	352	2014-06-26 17:21:23	79.574	79.448	352	2014-06-26 17:21:52	79.736	79.79
353	2014-06-26 17:22:02	18.25	3.55	353	2014-06-26 17:22:23	79.574	79.394	353	2014-06-26 17:22:52	79.7	79.79
354	2014-06-26 17:23:02	18.25	3.55	354	2014-06-26 17:23:23	79.574	79.394	354	2014-06-26 17:23:52	79.772	79.79
355	2014-06-26 17:24:02	18.3	3.6	355	2014-06-26 17:24:23	79.574	79.394	355	2014-06-26 17:24:52	79.772	79.808
356	2014-06-26 17:25:02	18.3	3.6	356	2014-06-26 17:25:23	79.7	79.484	356	2014-06-26 17:25:52	79.736	79.808
357	2014-06-26 17:26:02	18.25	3.55	357	2014-06-26 17:26:23	79.7	79.52	357	2014-06-26 17:26:52	79.772	79.844
358	2014-06-26 17:27:02	18.25	3.55	358	2014-06-26 17:27:23	79.574	79.394	358	2014-06-26 17:27:52	79.7	79.79
359	2014-06-26 17:28:02	18.3	3.6	359	2014-06-26 17:28:23	79.7	79.484	359	2014-06-26 17:28:52	79.736	79.808
360	2014-06-26 17:29:02	18.25	3.55	360	2014-06-26 17:29:23	79.574	79.394	360	2014-06-26 17:29:52	79.772	79.79
361	2014-06-26 17:30:02	18.25	3.55	361	2014-06-26 17:30:23	79.7	79.484	361	2014-06-26 17:30:52	79.754	79.808
362	2014-06-26 17:31:02	18.25	3.55	362	2014-06-26 17:31:23	79.7	79.52	362	2014-06-26 17:31:52	79.736	79.826
363	2014-06-26 17:32:02	18.25	3.55	363	2014-06-26 17:32:23	79.7	79.52	363	2014-06-26 17:32:52	79.772	79.79
364	2014-06-26 17:33:02	18.3	3.6	364	2014-06-26 17:33:23	79.7	79.52	364	2014-06-26 17:33:52	79.736	79.844
365	2014-06-26 17:34:02	18.25	3.55	365	2014-06-26 17:34:23	79.7	79.484	365	2014-06-26 17:34:52	79.736	79.808
366	2014-06-26 17:35:02	18.25	3.55	366	2014-06-26 17:35:23	79.7	79.52	366	2014-06-26 17:35:52	79.772	79.808
367	2014-06-26 17:36:02	18.25	3.55	367	2014-06-26 17:36:23	79.7	79.52	367	2014-06-26 17:36:52	79.772	79.808
368	2014-06-26 17:37:02	18.25	3.55	368	2014-06-26 17:37:23	79.7	79.52	368	2014-06-26 17:37:52	79.772	79.844

369	2014-06-26 17:38:02	18.25	3.55	369	2014-06-26 17:38:23	79.7	79.52	369	2014-06-26 17:38:52	79.754	79.808
370	2014-06-26 17:39:02	18.25	3.55	370	2014-06-26 17:39:23	79.7	79.484	370	2014-06-26 17:39:52	79.736	79.808
371	2014-06-26 17:40:02	18.3	3.6	371	2014-06-26 17:40:23	79.7	79.484	371	2014-06-26 17:40:52	79.682	79.772
372	2014-06-26 17:41:02	18.25	3.55	372	2014-06-26 17:41:23	79.7	79.484	372	2014-06-26 17:41:52	79.808	79.772
373	2014-06-26 17:42:02	18.25	3.55	373	2014-06-26 17:42:23	79.7	79.43	373	2014-06-26 17:42:52	79.7	79.844
374	2014-06-26 17:43:02	18.25	3.55	374	2014-06-26 17:43:23	79.7	79.484	374	2014-06-26 17:43:52	79.772	79.79
375	2014-06-26 17:44:02	18.25	3.55	375	2014-06-26 17:44:23	79.808	79.592	375	2014-06-26 17:44:52	79.808	79.808
376	2014-06-26 17:45:02	18.25	3.55	376	2014-06-26 17:45:23	79.7	79.484	376	2014-06-26 17:45:52	79.79	79.808
377	2014-06-26 17:46:02	18.25	3.55	377	2014-06-26 17:46:23	79.7	79.484	377	2014-06-26 17:46:52	79.826	79.754
378	2014-06-26 17:47:02	18.25	3.55	378	2014-06-26 17:47:23	79.7	79.484	378	2014-06-26 17:47:52	79.826	79.808
379	2014-06-26 17:48:02	18.25	3.55	379	2014-06-26 17:48:23	79.7	79.484	379	2014-06-26 17:48:52	79.826	79.79
380	2014-06-26 17:49:02	18.25	3.55	380	2014-06-26 17:49:23	79.7	79.484	380	2014-06-26 17:49:52	79.844	79.79
381	2014-06-26 17:50:02	18.25	3.55	381	2014-06-26 17:50:23	79.7	79.52	381	2014-06-26 17:50:52	79.862	79.79
382	2014-06-26 17:51:02	18.25	3.55	382	2014-06-26 17:51:23	79.7	79.484	382	2014-06-26 17:51:52	79.79	79.826
383	2014-06-26 17:52:02	18.25	3.55	383	2014-06-26 17:52:23	79.7	79.52	383	2014-06-26 17:52:52	79.826	79.772
384	2014-06-26 17:53:02	18.25	3.55	384	2014-06-26 17:53:23	79.7	79.484	384	2014-06-26 17:53:52	79.898	79.772
385	2014-06-26 17:54:02	18.25	3.55	385	2014-06-26 17:54:23	79.7	79.484	385	2014-06-26 17:54:52	79.826	79.754
386	2014-06-26 17:55:02	18.25	3.55	386	2014-06-26 17:55:23	79.7	79.52	386	2014-06-26 17:55:52	79.862	79.808
387	2014-06-26 17:56:02	18.3	3.6	387	2014-06-26 17:56:23	79.7	79.52	387	2014-06-26 17:56:52	79.862	79.826
388	2014-06-26 17:57:02	18.25	3.55	388	2014-06-26 17:57:23	79.7	79.52	388	2014-06-26 17:57:52	79.826	79.772
389	2014-06-26 17:58:02	18.25	3.55	389	2014-06-26 17:58:23	79.7	79.484	389	2014-06-26 17:58:52	79.898	79.808
390	2014-06-26 17:59:02	18.3	3.6	390	2014-06-26 17:59:23	79.808	79.592	390	2014-06-26 17:59:52	79.826	79.7
391	2014-06-26 18:00:02	18.25	3.55	391	2014-06-26 18:00:23	79.7	79.43	391	2014-06-26 18:00:52	79.88	79.772
392	2014-06-26 18:01:02	18.3	3.6	392	2014-06-26 18:01:23	79.808	79.592	392	2014-06-26 18:01:52	79.862	79.772
393	2014-06-26 18:02:02	18.3	3.6	393	2014-06-26 18:02:23	79.808	79.538	393	2014-06-26 18:02:52	79.826	79.844
394	2014-06-26 18:03:02	18.3	3.6	394	2014-06-26 18:03:23	79.808	79.412	394	2014-06-26 18:03:52	79.862	79.772
395	2014-06-26 18:04:02	18.25	3.55	395	2014-06-26 18:04:23	79.808	79.412	395	2014-06-26 18:04:52	79.898	79.808
396	2014-06-26 18:05:02	18.3	3.6	396	2014-06-26 18:05:23	79.916	79.52	396	2014-06-26 18:05:52	79.826	79.718
397	2014-06-26 18:06:02	18.3	3.6	397	2014-06-26 18:06:23	79.916	79.556	397	2014-06-26 18:06:52	79.916	79.808
398	2014-06-26 18:07:02	18.3	3.6	398	2014-06-26 18:07:23	79.916	79.556	398	2014-06-26 18:07:52	79.88	79.808
399	2014-06-26 18:08:02	18.35	3.65	399	2014-06-26 18:08:23	79.808	79.502	399	2014-06-26 18:08:52	79.898	79.772
400	2014-06-26 18:09:02	18.35	3.65	400	2014-06-26 18:09:23	79.808	79.538	400	2014-06-26 18:09:52	79.88	79.826
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405	2014-06-26 18:14:02	20.95	6.25	405	2014-06-26 18:14:23	79.808	79.538	405	2014-06-26 18:14:52	79.844	79.826
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407	2014-06-26 18:16:02	43.3	28.6	407	2014-06-26 18:16:23	79.808	79.844	407	2014-06-26 18:16:52	79.862	79.862
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413	2014-06-26 18:22:02	14.35	-0.35	413	2014-06-26 18:22:23	82.274	2498	413	2014-06-26 18:22:52	79.898	79.862
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426	2014-06-26 18:35:02	61.9	47.2	426	2014-06-26 18:35:23	81.266	73.238	426	2014-06-26 18:35:52	80.024	79.88
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429	2014-06-26 18:38:02	64.6	49.9	429	2014-06-26 18:38:23	80.924	72.806	429	2014-06-26 18:38:52	79.97	79.952
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437	2014-06-26 18:46:02	81.3	66.6	437	2014-06-26 18:46:23	80.474	72.482	437	2014-06-26 18:46:52	80.042	80.006
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549	2014-06-26 20:38:23	80.258	77.36
550	2014-06-26 20:39:23	80.258	77.414
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553	2014-06-26 20:42:23	80.258	77.54
554	2014-06-26 20:43:23	80.366	77.648
555	2014-06-26 20:44:23	80.258	77.576
556	2014-06-26 20:45:23	80.366	77.612
557	2014-06-26 20:46:23	80.474	77.666
558	2014-06-26 20:47:23	80.474	77.666

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465	2014-06-26 19:14:52	80.078	80.15
466	2014-06-26 19:15:52	80.078	80.15
467	2014-06-26 19:16:52	80.078	80.132
468	2014-06-26 19:17:52	80.042	80.186
469	2014-06-26 19:18:52	79.934	80.132
470	2014-06-26 19:19:52	79.952	80.132
471	2014-06-26 19:20:52	79.916	80.15
472	2014-06-26 19:21:52	79.916	80.096
473	2014-06-26 19:22:52	79.952	80.078
474	2014-06-26 19:23:52	79.97	80.078
475	2014-06-26 19:24:52	79.916	80.132
476	2014-06-26 19:25:52	80.006	80.096
477	2014-06-26 19:26:52	79.952	80.132
478	2014-06-26 19:27:52	79.916	80.096
479	2014-06-26 19:28:52	79.916	80.132
480	2014-06-26 19:29:52	79.898	80.132
481	2014-06-26 19:30:52	79.898	80.078
482	2014-06-26 19:31:52	79.88	80.132
483	2014-06-26 19:32:52	79.88	80.024
484	2014-06-26 19:33:52	79.934	80.132
485	2014-06-26 19:34:52	79.88	80.132
486	2014-06-26 19:35:52	79.988	80.042
487	2014-06-26 19:36:52	79.934	80.042
488	2014-06-26 19:37:52	80.006	80.042
489	2014-06-26 19:38:52	80.024	80.042
490	2014-06-26 19:39:52	80.024	80.042
491	2014-06-26 19:40:52	80.078	80.006
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493	2014-06-26 19:42:52	80.024	80.006
494	2014-06-26 19:43:52	80.006	80.078
495	2014-06-26 19:44:52	79.862	80.06
496	2014-06-26 19:45:52	79.916	80.024
497	2014-06-26 19:46:52	79.934	80.078
498	2014-06-26 19:47:52	79.88	80.06
499	2014-06-26 19:48:52	79.916	80.024
500	2014-06-26 19:49:52	79.952	79.97
501	2014-06-26 19:50:52	79.916	79.97
502	2014-06-26 19:51:52	79.916	80.006
503	2014-06-26 19:52:52	79.88	80.024
504	2014-06-26 19:53:52	79.952	80.006
505	2014-06-26 19:54:52	79.952	79.952
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507	2014-06-26 19:56:52	79.88	79.97
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513	2014-06-26 20:02:52	79.952	80.006
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525	2014-06-26 20:14:52	79.862	80.006
526	2014-06-26 20:15:52	79.772	80.006
527	2014-06-26 20:16:52	79.808	79.97
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534	2014-06-26 20:23:52	79.772	79.97
535	2014-06-26 20:24:52	79.754	79.916
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544	2014-06-26 20:33:52	79.79	79.916
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552	2014-06-26 20:41:52	79.754	79.88
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556	2014-06-26 20:45:52	79.754	79.88
557	2014-06-26 20:46:52	79.79	79.88
558	2014-06-26 20:47:52	79.79	79.934

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561	2014-06-26 20:50:02	182.3	167.6	561	2014-06-26 20:50:23	80.474	77.72	561	2014-06-26 20:50:52	79.844	79.898
562	2014-06-26 20:51:02	182.25	167.55	562	2014-06-26 20:51:23	80.474	77.72	562	2014-06-26 20:51:52	79.79	79.826
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564	2014-06-26 20:53:02	182.25	167.55	564	2014-06-26 20:53:23	80.474	77.756	564	2014-06-26 20:53:52	79.772	79.934
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566	2014-06-26 20:55:02	182.2	167.5	566	2014-06-26 20:55:23	80.474	77.792	566	2014-06-26 20:55:52	79.79	79.826
567	2014-06-26 20:56:02	182.2	167.5	567	2014-06-26 20:56:23	80.474	77.792	567	2014-06-26 20:56:52	79.772	79.844
568	2014-06-26 20:57:02	182.2	167.5	568	2014-06-26 20:57:23	80.474	77.792	568	2014-06-26 20:57:52	79.682	79.898
569	2014-06-26 20:58:02	182.15	167.45	569	2014-06-26 20:58:23	80.6	77.972	569	2014-06-26 20:58:52	79.79	79.808
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573	2014-06-26 21:02:02	182.1	167.4	573	2014-06-26 21:02:23	80.474	77.882	573	2014-06-26 21:02:52	79.826	79.898
574	2014-06-26 21:03:02	182.1	167.4	574	2014-06-26 21:03:23	80.474	77.936	574	2014-06-26 21:03:52	79.88	79.88
575	2014-06-26 21:04:02	182.1	167.4	575	2014-06-26 21:04:23	80.474	77.882	575	2014-06-26 21:04:52	79.772	79.826
576	2014-06-26 21:05:02	182.05	167.35	576	2014-06-26 21:05:23	80.474	77.882	576	2014-06-26 21:05:52	79.826	79.898
577	2014-06-26 21:06:02	182.05	167.35	577	2014-06-26 21:06:23	80.474	77.972	577	2014-06-26 21:06:52	79.808	79.826
578	2014-06-26 21:07:02	182.05	167.35	578	2014-06-26 21:07:23	80.366	77.864	578	2014-06-26 21:07:52	79.772	79.934
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584	2014-06-26 21:13:02	182	167.3	584	2014-06-26 21:13:23	80.474	78.062	584	2014-06-26 21:13:52	79.808	79.88
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586	2014-06-26 21:15:02	181.95	167.25	586	2014-06-26 21:15:23	80.366	78.008	586	2014-06-26 21:15:52	79.808	79.772
587	2014-06-26 21:16:02	181.95	167.25	587	2014-06-26 21:16:23	80.474	78.116	587	2014-06-26 21:16:52	79.772	79.808
588	2014-06-26 21:17:02	181.95	167.25	588	2014-06-26 21:17:23	80.474	78.116	588	2014-06-26 21:17:52	79.808	79.808
589	2014-06-26 21:18:02	181.95	167.25	589	2014-06-26 21:18:23	80.366	78.008	589	2014-06-26 21:18:52	79.754	79.808
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592	2014-06-26 21:21:02	181.9	167.2	592	2014-06-26 21:21:23	80.474	78.152	592	2014-06-26 21:21:52	79.736	79.826
593	2014-06-26 21:22:02	181.85	167.15	593	2014-06-26 21:22:23	80.474	78.152	593	2014-06-26 21:22:52	79.754	79.862
594	2014-06-26 21:23:02	181.85	167.15	594	2014-06-26 21:23:23	80.474	78.152	594	2014-06-26 21:23:52	79.718	79.862
595	2014-06-26 21:24:02	181.85	167.15	595	2014-06-26 21:24:23	80.474	78.188	595	2014-06-26 21:24:52	79.736	79.862
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598	2014-06-26 21:27:02	181.8	167.1	598	2014-06-26 21:27:23	80.474	78.152	598	2014-06-26 21:27:52	79.772	79.808
599	2014-06-26 21:28:02	181.8	167.1	599	2014-06-26 21:28:23	80.6	78.278	599	2014-06-26 21:28:52	79.718	79.808
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602	2014-06-26 21:31:02	181.8	167.1	602	2014-06-26 21:31:23	80.6	78.278	602	2014-06-26 21:31:52	79.718	79.862
603	2014-06-26 21:32:02	181.75	167.05	603	2014-06-26 21:32:23	80.6	78.278	603	2014-06-26 21:32:52	79.718	79.862
604	2014-06-26 21:33:02	181.75	167.05	604	2014-06-26 21:33:23	80.6	78.278	604	2014-06-26 21:33:52	79.808	79.808
605	2014-06-26 21:34:02	181.75	167.05	605	2014-06-26 21:34:23	80.6	78.242	605	2014-06-26 21:34:52	79.754	79.772
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607	2014-06-26 21:36:02	181.7	167	607	2014-06-26 21:36:23	80.6	78.242	607	2014-06-26 21:36:52	79.826	79.772
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609	2014-06-26 21:38:02	181.7	167	609	2014-06-26 21:38:23	80.6	78.278	609	2014-06-26 21:38:52	79.772	79.862
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611	2014-06-26 21:40:02	181.7	167	611	2014-06-26 21:40:23	80.6	78.314	611	2014-06-26 21:40:52	79.718	79.808
612	2014-06-26 21:41:02	181.65	166.95	612	2014-06-26 21:41:23	80.6	78.314	612	2014-06-26 21:41:52	79.862	79.772
613	2014-06-26 21:42:02	181.65	166.95	613	2014-06-26 21:42:23	80.6	78.314	613	2014-06-26 21:42:52	79.844	79.772
614	2014-06-26 21:43:02	181.65	166.95	614	2014-06-26 21:43:23	80.6	78.368	614	2014-06-26 21:43:52	79.772	79.754
615	2014-06-26 21:44:02	181.65	166.95	615	2014-06-26 21:44:23	80.6	78.314	615	2014-06-26 21:44:52	79.772	79.826
616	2014-06-26 21:45:02	181.65	166.95	616	2014-06-26 21:45:23	80.6	78.368	616	2014-06-26 21:45:52	79.772	79.826
617	2014-06-26 21:46:02	181.65	166.95	617	2014-06-26 21:46:23	80.6	78.368	617	2014-06-26 21:46:52	79.754	79.862
618	2014-06-26 21:47:02	181.6	166.9	618	2014-06-26 21:47:23	80.6	78.314	618	2014-06-26 21:47:52	79.772	79.862
619	2014-06-26 21:48:02	181.6	166.9	619	2014-06-26 21:48:23	80.6	78.368	619	2014-06-26 21:48:52	79.808	79.772
620	2014-06-26 21:49:02	181.6	166.9	620	2014-06-26 21:49:23	80.6	78.368	620	2014-06-26 21:49:52	79.772	79.772
621	2014-06-26 21:50:02	181.55	166.85	621	2014-06-26 21:50:23	80.6	78.368	621	2014-06-26 21:50:52	79.718	79.772
622	2014-06-26 21:51:02	181.55	166.85	622	2014-06-26 21:51:23	80.474	78.242	622	2014-06-26 21:51:52	79.808	79.808
623	2014-06-26 21:52:02	181.55	166.85	623	2014-06-26 21:52:23	80.474	78.242	623	2014-06-26 21:52:52	79.754	79.808
624	2014-06-26 21:53:02	181.55	166.85	624	2014-06-26 21:53:23	80.6	78.368	624	2014-06-26 21:53:52	79.754	79.754
625	2014-06-26 21:54:02	181.55	166.85	625	2014-06-26 21:54:23	80.6	78.368	625	2014-06-26 21:54:52	79.718	79.826
626	2014-06-26 21:55:02	181.5	166.8	626	2014-06-26 21:55:23	80.6	78.368	626	2014-06-26 21:55:52	79.808	79.808
627	2014-06-26 21:56:02	181.55	166.85	627	2014-06-26 21:56:23	80.6	78.368	627	2014-06-26 21:56:52	79.718	79.808
628	2014-06-26 21:57:02	181.5	166.8	628	2014-06-26 21:57:23	80.474	78.242	628	2014-06-26 21:57:52	79.772	79.808
629	2014-06-26 21:58:02	181.5	166.8	629	2014-06-26 21:58:23	80.6	78.368	629	2014-06-26 21:58:52	79.772	79.808
630	2014-06-26 21:59:02	181.5	166.8	630	2014-06-26 21:59:23	80.6	78.674	630	2014-06-26 21:59:52	79.754	79.826
631	2014-06-26 22:00:02	181.5	166.8	631	2014-06-26 22:00:23	80.6	78.368	631	2014-06-26 22:00:52	79.718	79.772
632	2014-06-26 22:01:02	181.45	166.75	632	2014-06-26 22:01:23	80.6	78.368	632	2014-06-26 22:01:52	79.754	79.754
633	2014-06-26 22:02:02	181.45	166.75	633	2014-06-26 22:02:23	80.6	78.368	633	2014-06-26 22:02:52	79.772	79.826
634	2014-06-26 22:03:02	181.45	166.75	634	2014-06-26 22:03:23	80.6	78.368	634	2014-06-26 22:03:52	79.772	79.826
635	2014-06-26 22:04:02	181.45	166.75	635	2014-06-26 22:04:23	80.6	78.368	635	2014-06-26 22:04:52	79.844	79.772
636	2014-06-26 22:05:02	181.45	166.75	636	2014-06-26 22:05:23	80.708	78.476	636	2014-06-26 22:05:52	79.808	79.826
637	2014-06-26 22:06:02	181.45	166.75	637	2014-06-26 22:06:23	80.6	78.314	637	2014-06-26 22:06:52	79.754	79.772
638	2014-06-26 22:07:02	181.4	166.7	638	2014-06-26 22:07:23	80.708	78.476	638	2014-06-26 22:07:52	79.808	79.772
639	2014-06-26 22:08:02	181.4	166.7	639	2014-06-26 22:08:23	80.708	78.386	639	2014-06-26 22:08:52	79.772	79.754
640	2014-06-26 22:09:02	181.4	166.7	640	2014-06-26 22:09:23	80.708	78.422	640	2014-06-26 22:09:52	79.862	79.772
641	2014-06-26 22:10:02	181.4	166.7	641	2014-06-26 22:10:23	80.708	78.386	641	2014-06-26 22:10:52	79.754	79.754
642	2014-06-26 22:11:02	181.4	166.7	642	2014-06-26 22:11:23	80.816	78.494	642	2014-06-26 22:11:52	79.826	79.808
643	2014-06-26 22:12:02	181.4	166.7	643	2014-06-26 22:12:23	80.708	78.386	643	2014-06-26 22:12:52	79.754	79.754
644	2014-06-26 22:13:02	181.4	166.7	644	2014-06-26 22:13:23	80.708	78.476	644	2014-06-26 22:13:52	79.808	79.754
645	2014-06-26 22:14:02	181.4	166.7	645	2014-06-26 22:14:23	80.708	78.512	645	2014-06-26 22:14:52	79.718	79.808
646	2014-06-26 22:15:02	181.35	166.65	646	2014-06-26 22:15:23	80.708	78.566	646	2014-06-26 22:15:52	79.7	79.754
647	2014-06-26 22:16:02	181.35	166.65	647	2014-06-26 22:16:23	80.708	78.656	647	2014-06-26 22:16:52	79.7	79.754
648	2014-06-26 22:17:02	181.35	166.65	648	2014-06-26 22:17:23	80.708	78.656	648	2014-06-26 22:17:52	79.718	79.754
649	2014-06-26 22:18:02	181.35	166.65	649	2014-06-26 22:18:23	80.6	78.584	649	2014-06-26 22:18:52	79.772	79.754
650	2014-06-26 22:19:02	181.35	166.65	650	2014-06-26 22:19:23	80.6	78.62	650	2014-06-26 22:19:52	79.7	79.754
651	2014-06-26 22:20:02	181.35	166.65	651	2014-06-26 22:20:23	80.6	78.62	651	2014-06-26 22:20:52	79.754	79.808
652	2014-06-26 22:21:02	181.35	166.65	652	2014-06-26 22:21:23	80.6	78.674	652	2014-06-26 22:21:52	79.772	79.826
653	2014-06-26 22:22:02	181.3	166.6	653	2014-06-26 22:22:23	80.474	78.584	653	2014-06-26 22:22:52	79.7	79.808

654	2014-06-26 22:23:02	181.3	166.6	654	2014-06-26 22:23:23	80.474	78.584	654	2014-06-26 22:23:52	79.7	79.826
655	2014-06-26 22:24:02	181.3	166.6	655	2014-06-26 22:24:23	80.474	78.638	655	2014-06-26 22:24:52	79.736	79.772
656	2014-06-26 22:25:02	181.3	166.6	656	2014-06-26 22:25:23	80.474	78.674	656	2014-06-26 22:25:52	79.754	79.754
657	2014-06-26 22:26:02	181.25	166.55	657	2014-06-26 22:26:23	80.474	78.728	657	2014-06-26 22:26:52	79.7	79.808
658	2014-06-26 22:27:02	181.25	166.55	658	2014-06-26 22:27:23	80.474	78.728	658	2014-06-26 22:27:52	79.7	79.808
659	2014-06-26 22:28:02	181.25	166.55	659	2014-06-26 22:28:23	80.474	78.764	659	2014-06-26 22:28:52	79.754	79.772
660	2014-06-26 22:29:02	181.25	166.55	660	2014-06-26 22:29:23	80.474	78.764	660	2014-06-26 22:29:52	79.79	79.808
661	2014-06-26 22:30:02	181.2	166.5	661	2014-06-26 22:30:23	80.474	78.728	661	2014-06-26 22:30:52	79.79	79.772
662	2014-06-26 22:31:02	181.25	166.55	662	2014-06-26 22:31:23	80.474	78.728	662	2014-06-26 22:31:52	79.79	79.88
663	2014-06-26 22:32:02	181.2	166.5	663	2014-06-26 22:32:23	80.474	78.764	663	2014-06-26 22:32:52	79.718	79.808
664	2014-06-26 22:33:02	181.2	166.5	664	2014-06-26 22:33:23	80.474	78.764	664	2014-06-26 22:33:52	79.808	79.862
665	2014-06-26 22:34:02	181.2	166.5	665	2014-06-26 22:34:23	80.474	78.764	665	2014-06-26 22:34:52	79.772	79.772
666	2014-06-26 22:35:02	181.2	166.5	666	2014-06-26 22:35:23	80.474	78.764	666	2014-06-26 22:35:52	79.772	79.808
667	2014-06-26 22:36:02	181.2	166.5	667	2014-06-26 22:36:23	80.474	78.764	667	2014-06-26 22:36:52	79.754	79.808
668	2014-06-26 22:37:02	181.2	166.5	668	2014-06-26 22:37:23	80.474	78.818	668	2014-06-26 22:37:52	79.772	79.826
669	2014-06-26 22:38:02	181.2	166.5	669	2014-06-26 22:38:23	80.474	78.818	669	2014-06-26 22:38:52	79.7	79.772
670	2014-06-26 22:39:02	181.15	166.45	670	2014-06-26 22:39:23	80.474	78.818	670	2014-06-26 22:39:52	79.808	79.808
671	2014-06-26 22:40:02	181.15	166.45	671	2014-06-26 22:40:23	80.474	78.818	671	2014-06-26 22:40:52	79.718	79.826
672	2014-06-26 22:41:02	181.15	166.45	672	2014-06-26 22:41:23	80.474	78.854	672	2014-06-26 22:41:52	79.718	79.772
673	2014-06-26 22:42:02	181.15	166.45	673	2014-06-26 22:42:23	80.474	78.818	673	2014-06-26 22:42:52	79.754	79.826
674	2014-06-26 22:43:02	181.15	166.45	674	2014-06-26 22:43:23	80.474	78.818	674	2014-06-26 22:43:52	79.754	79.808
675	2014-06-26 22:44:02	181.15	166.45	675	2014-06-26 22:44:23	80.474	78.854	675	2014-06-26 22:44:52	79.718	79.826
676	2014-06-26 22:45:02	181.1	166.4	676	2014-06-26 22:45:23	80.474	78.818	676	2014-06-26 22:45:52	79.718	79.754
677	2014-06-26 22:46:02	181.1	166.4	677	2014-06-26 22:46:23	80.474	78.854	677	2014-06-26 22:46:52	79.754	79.772
678	2014-06-26 22:47:02	181.1	166.4	678	2014-06-26 22:47:23	80.6	78.98	678	2014-06-26 22:47:52	79.754	79.754
679	2014-06-26 22:48:02	181.1	166.4	679	2014-06-26 22:48:23	80.474	78.854	679	2014-06-26 22:48:52	79.754	79.772
680	2014-06-26 22:49:02	181.1	166.4	680	2014-06-26 22:49:23	80.474	78.854	680	2014-06-26 22:49:52	79.7	79.754
681	2014-06-26 22:50:02	181.1	166.4	681	2014-06-26 22:50:23	80.474	78.818	681	2014-06-26 22:50:52	79.772	79.826
682	2014-06-26 22:51:02	181.1	166.4	682	2014-06-26 22:51:23	80.474	78.854	682	2014-06-26 22:51:52	79.718	79.754
683	2014-06-26 22:52:02	181.05	166.35	683	2014-06-26 22:52:23	80.474	78.854	683	2014-06-26 22:52:52	79.7	79.772
684	2014-06-26 22:53:02	181.05	166.35	684	2014-06-26 22:53:23	80.474	78.854	684	2014-06-26 22:53:52	79.754	79.772
685	2014-06-26 22:54:02	181.05	166.35	685	2014-06-26 22:54:23	80.474	78.854	685	2014-06-26 22:54:52	79.808	79.772
686	2014-06-26 22:55:02	181.05	166.35	686	2014-06-26 22:55:23	80.474	78.854	686	2014-06-26 22:55:52	79.772	79.808
687	2014-06-26 22:56:02	181.05	166.35	687	2014-06-26 22:56:23	80.6	78.98	687	2014-06-26 22:56:52	79.7	79.808
688	2014-06-26 22:57:02	181	166.3	688	2014-06-26 22:57:23	80.6	78.944	688	2014-06-26 22:57:52	79.718	79.772
689	2014-06-26 22:58:02	181	166.3	689	2014-06-26 22:58:23	80.6	78.944	689	2014-06-26 22:58:52	79.754	79.772
690	2014-06-26 22:59:02	181	166.3	690	2014-06-26 22:59:23	80.6	78.98	690	2014-06-26 22:59:52	79.754	79.754
691	2014-06-26 23:00:02	181	166.3	691	2014-06-26 23:00:23	80.6	78.944	691	2014-06-26 23:00:52	79.754	79.808
692	2014-06-26 23:01:02	181	166.3	692	2014-06-26 23:01:23	80.6	78.944	692	2014-06-26 23:01:52	79.754	79.772
693	2014-06-26 23:02:02	181	166.3	693	2014-06-26 23:02:23	80.6	78.944	693	2014-06-26 23:02:52	79.754	79.718
694	2014-06-26 23:03:02	181	166.3	694	2014-06-26 23:03:23	80.6	78.944	694	2014-06-26 23:03:52	79.808	79.826
695	2014-06-26 23:04:02	180.95	166.25	695	2014-06-26 23:04:23	80.6	78.98	695	2014-06-26 23:04:52	79.844	79.754
696	2014-06-26 23:05:02	180.95	166.25	696	2014-06-26 23:05:23	80.6	78.944	696	2014-06-26 23:05:52	79.844	79.826
697	2014-06-26 23:06:02	180.95	166.25	697	2014-06-26 23:06:23	80.6	78.98	697	2014-06-26 23:06:52	79.772	79.772
698	2014-06-26 23:07:02	180.95	166.25	698	2014-06-26 23:07:23	80.6	79.016	698	2014-06-26 23:07:52	79.772	79.754
699	2014-06-26 23:08:02	180.95	166.25	699	2014-06-26 23:08:23	80.6	79.016	699	2014-06-26 23:08:52	79.772	79.754
700	2014-06-26 23:09:02	180.95	166.25	700	2014-06-26 23:09:23	80.6	79.07	700	2014-06-26 23:09:52	79.772	79.808
701	2014-06-26 23:10:02	180.9	166.2	701	2014-06-26 23:10:23	80.474	78.944	701	2014-06-26 23:10:52	79.844	79.826
702	2014-06-26 23:11:02	180.9	166.2	702	2014-06-26 23:11:23	80.474	78.944	702	2014-06-26 23:11:52	79.898	79.862
703	2014-06-26 23:12:02	180.9	166.2	703	2014-06-26 23:12:23	80.474	78.98	703	2014-06-26 23:12:52	79.898	79.718
704	2014-06-26 23:13:02	180.9	166.2	704	2014-06-26 23:13:23	80.474	78.98	704	2014-06-26 23:13:52	79.808	79.772
705	2014-06-26 23:14:02	180.9	166.2	705	2014-06-26 23:14:23	80.474	79.034	705	2014-06-26 23:14:52	79.844	79.772
706	2014-06-26 23:15:02	180.9	166.2	706	2014-06-26 23:15:23	80.474	79.07	706	2014-06-26 23:15:52	79.772	79.808
707	2014-06-26 23:16:02	180.85	166.15	707	2014-06-26 23:16:23	80.474	79.034	707	2014-06-26 23:16:52	79.808	79.808
708	2014-06-26 23:17:02	180.85	166.15	708	2014-06-26 23:17:23	80.366	78.962	708	2014-06-26 23:17:52	79.79	79.772
709	2014-06-26 23:18:02	180.85	166.15	709	2014-06-26 23:18:23	80.366	78.962	709	2014-06-26 23:18:52	79.808	79.754
710	2014-06-26 23:19:02	180.85	166.15	710	2014-06-26 23:19:23	80.474	79.124	710	2014-06-26 23:19:52	79.772	79.808
711	2014-06-26 23:20:02	180.85	166.15	711	2014-06-26 23:20:23	80.366	79.016	711	2014-06-26 23:20:52	79.79	79.808
712	2014-06-26 23:21:02	180.85	166.15	712	2014-06-26 23:21:23	80.366	78.962	712	2014-06-26 23:21:52	79.772	79.808
713	2014-06-26 23:22:02	180.85	166.15	713	2014-06-26 23:22:23	80.366	78.962	713	2014-06-26 23:22:52	79.862	79.772
714	2014-06-26 23:23:02	180.85	166.15	714	2014-06-26 23:23:23	80.366	78.962	714	2014-06-26 23:23:52	79.844	79.808
715	2014-06-26 23:24:02	180.8	166.1	715	2014-06-26 23:24:23	80.368	78.962	715	2014-06-26 23:24:52	79.862	79.772
716	2014-06-26 23:25:02	180.8	166.1	716	2014-06-26 23:25:23	80.474	79.07	716	2014-06-26 23:25:52	79.808	79.808
717	2014-06-26 23:26:02	180.8	166.1	717	2014-06-26 23:26:23	80.474	79.07	717	2014-06-26 23:26:52	79.79	79.754
718	2014-06-26 23:27:02	180.8	166.1	718	2014-06-26 23:27:23	80.474	79.07	718	2014-06-26 23:27:52	79.844	79.808
719	2014-06-26 23:28:02	180.8	166.1	719	2014-06-26 23:28:23	80.474	79.07	719	2014-06-26 23:28:52	79.808	79.808
720	2014-06-26 23:29:02	180.8	166.1	720	2014-06-26 23:29:23	80.366	79.016	720	2014-06-26 23:29:52	79.772	79.772
721	2014-06-26 23:30:02	180.8	166.1	721	2014-06-26 23:30:23	80.366	78.962	721	2014-06-26 23:30:52	79.916	79.772
722	2014-06-26 23:31:02	180.8	166.1	722	2014-06-26 23:31:23	80.366	78.962	722	2014-06-26 23:31:52	79.898	79.826
723	2014-06-26 23:32:02	180.8	166.1	723	2014-06-26 23:32:23	80.474	79.07	723	2014-06-26 23:32:52	79.898	79.862
724	2014-06-26 23:33:02	180.8	166.1	724	2014-06-26 23:33:23	80.474	79.034	724	2014-06-26 23:33:52	79.952	79.88
725	2014-06-26 23:34:02	180.8	166.1	725	2014-06-26 23:34:23	80.474	79.07	725	2014-06-26 23:34:52	79.862	79.808
726	2014-06-26 23:35:02	180.75	166.05	726	2014-06-26 23:35:23	80.474	79.034	726	2014-06-26 23:35:52	79.952	79.826
727	2014-06-26 23:36:02	180.75	166.05	727	2014-06-26 23:36:23	80.474	79.034	727	2014-06-26 23:36:52	79.862	79.862
728	2014-06-26 23:37:02	180.75	166.05	728	2014-06-26 23:37:23	80.6	79.16	728	2014-06-26 23:37:52	79.898	79.862
729	2014-06-26 23:38:02	180.75	166.05	729	2014-06-26 23:38:23	80.474	79.034	729	2014-06-26 23:38:52	79.952	79.862
730	2014-06-26 23:39:02	180.75	166.05	730	2014-06-26 23:39:23	80.474	79.07	730	2014-06-26 23:39:52	79.862	79.844
731	2014-06-26 23:40:02	180.75	166.05	731	2014-06-26 23:40:23	80.474	79.07	731	2014-06-26 23:40:52	79.898	79.808
732	2014-06-26 23:41:02	180.7	166	732	2014-06-26 23:41:23	80.474	79.07	732	2014-06-26 23:41:52	79.988	79.826
733	2014-06-26 23:42:02	180.75	166.05	733	2014-06-26 23:42:23	80.474	79.034	733	2014-06-26 23:42:52	79.934	79.808
734	2014-06-26 23:43:02	180.75	166.05	734	2014-06-26 23:43:23	80.474	79.07	734	2014-06-26 23:43:52	79.844	79.808
735	2014-06-26 23:44:02	180.7	166	735	2014-06-26 23:44:23	80.474	79.07	735	2014-06-26 23:44:52	79.916	79.808
736	2014-06-26 23:45:02	180.7	166	736	2014-06-26 23:45:23	80.474	79.07	736	2014-06-26 23:45:52	79.862	79.772
737	2014-06-26 23:46:02	180.7	166	737	2014-06-26 23:46:23	80.474	79.07	737	2014-06-26 23:46:52	79.97	79.808
738	2014-06-26 23:47:02	180.7	166	738	2014-06-26 23:47:23	80.474	79.07	738	2014-06-26 23:47:52	79.952	79.754
739	2014-06-26 23:48:02	180.7	166	739	2014-06-26 23:48:23	80.474	79.07	739	2014-06-26 23:48:52	79.934	79.862
740	2014-06-26 23:49:02	180.7	166	740	2014-06-26 23:49:23	80.474	79.034	740	2014-06-26 23:49:52	79.898	79.826
741	2014-06-26 23:50:02	180.65	165.95	741	2014-06-26 23:50:23	80.474	79.034	741	2014-06-26 23:50:52	79.844	79.826
742	2014-06-26 23:51:02	180.65	165.95	742	2014-06-26 23:51:23	80.474	79.034	742	2014-06-26 23:51:52	79.898	79.862
743	2014-06-26 23:52:02	180.65	165.95	743	2014-06-26 23:52:23	80.474	78.98	743	2014-06-26 23:52:52	79.898	79.826
744	2014-06-26 23:53:02	180.65	165.95	744	2014-06-26 23:53:23	80.474	78.98	744	2014-06-26 23:53:52	79.898	79.826
745	2014-06-26 23:54:02	180.65	165.95	745	2014-06-26 23:54:23	80.6	79.106	745	2014-06-26 23:54:52	79.808	79.826
746	2014-06-26 23:55:02	180.65	165.95	746	2014-06-26 23:55:23	80.474	78.944	746	2014-06-26 23:55:52	79.808	79.88
747	2014-06-26 23:56:02	180.6	165.9	747	2014-06-26 23:56:23	80.474	78.944	747	2014-06-26 23:56:52	79.826	79.826
748	2014-06-26 23:57:02	180.6	165.9	748	2014-06-26 23:57:23	80.6	79.106	748	2014-06-26 23:57:52	79.826	79.808

749	2014-06-26 23:58:02	180.6	165.9	749	2014-06-26 23:58:23	80.6	79.07	749	2014-06-26 23:58:52	79.844	79.808
750	2014-06-26 23:59:02	180.6	165.9	750	2014-06-26 23:59:23	80.6	79.07	750	2014-06-26 23:59:52	79.844	79.808
751	2014-06-27 00:00:02	180.6	165.9	751	2014-06-27 00:00:23	80.6	79.07	751	2014-06-27 00:00:52	79.844	79.772
752	2014-06-27 00:01:02	180.6	165.9	752	2014-06-27 00:01:23	80.6	78.98	752	2014-06-27 00:01:52	79.826	79.862
753	2014-06-27 00:02:02	180.6	165.9	753	2014-06-27 00:02:23	80.708	79.052	753	2014-06-27 00:02:52	79.808	79.934
754	2014-06-27 00:03:02	180.6	165.9	754	2014-06-27 00:03:23	80.708	78.962	754	2014-06-27 00:03:52	79.862	79.898
755	2014-06-27 00:04:02	180.55	165.85	755	2014-06-27 00:04:23	80.708	78.908	755	2014-06-27 00:04:52	79.916	79.844
756	2014-06-27 00:05:02	180.55	165.85	756	2014-06-27 00:05:23	80.708	78.908	756	2014-06-27 00:05:52	79.862	79.934
757	2014-06-27 00:06:02	180.55	165.85	757	2014-06-27 00:06:23	80.708	78.872	757	2014-06-27 00:06:52	79.916	79.97
758	2014-06-27 00:07:02	180.55	165.85	758	2014-06-27 00:07:23	80.816	78.926	758	2014-06-27 00:07:52	79.88	79.844
759	2014-06-27 00:08:02	180.55	165.85	759	2014-06-27 00:08:23	80.816	78.926	759	2014-06-27 00:08:52	79.88	79.88
760	2014-06-27 00:09:02	180.55	165.85	760	2014-06-27 00:09:23	80.816	78.89	760	2014-06-27 00:09:52	79.88	79.844
761	2014-06-27 00:10:02	180.55	165.85	761	2014-06-27 00:10:23	80.816	78.89	761	2014-06-27 00:10:52	79.898	79.934
762	2014-06-27 00:11:02	180.55	165.85	762	2014-06-27 00:11:23	80.924	78.998	762	2014-06-27 00:11:52	79.916	79.898
763	2014-06-27 00:12:02	180.5	165.8	763	2014-06-27 00:12:23	80.924	79.034	763	2014-06-27 00:12:52	79.934	79.88
764	2014-06-27 00:13:02	180.5	165.8	764	2014-06-27 00:13:23	80.816	78.926	764	2014-06-27 00:13:52	79.916	79.898
765	2014-06-27 00:14:02	180.5	165.8	765	2014-06-27 00:14:23	80.816	79.016	765	2014-06-27 00:14:52	79.934	79.898
766	2014-06-27 00:15:02	180.5	165.8	766	2014-06-27 00:15:23	80.816	79.016	766	2014-06-27 00:15:52	79.898	79.88
767	2014-06-27 00:16:02	180.5	165.8	767	2014-06-27 00:16:23	80.816	79.016	767	2014-06-27 00:16:52	79.88	79.88
768	2014-06-27 00:17:02	180.5	165.8	768	2014-06-27 00:17:23	80.816	79.07	768	2014-06-27 00:17:52	79.808	79.88
769	2014-06-27 00:18:02	180.45	165.75	769	2014-06-27 00:18:23	80.816	79.106	769	2014-06-27 00:18:52	79.808	79.898
770	2014-06-27 00:19:02	180.5	165.8	770	2014-06-27 00:19:23	80.816	79.106	770	2014-06-27 00:19:52	79.808	79.88
771	2014-06-27 00:20:02	180.45	165.75	771	2014-06-27 00:20:23	80.816	79.106	771	2014-06-27 00:20:52	79.826	79.844
772	2014-06-27 00:21:02	180.45	165.75	772	2014-06-27 00:21:23	80.816	79.106	772	2014-06-27 00:21:52	79.808	79.88
773	2014-06-27 00:22:02	180.45	165.75	773	2014-06-27 00:22:23	80.708	79.052	773	2014-06-27 00:22:52	79.826	79.934
774	2014-06-27 00:23:02	180.45	165.75	774	2014-06-27 00:23:23	80.708	79.052	774	2014-06-27 00:23:52	79.772	79.844
775	2014-06-27 00:24:02	180.45	165.75	775	2014-06-27 00:24:23	80.708	79.088	775	2014-06-27 00:24:52	79.772	79.844
776	2014-06-27 00:25:02	180.4	165.7	776	2014-06-27 00:25:23	80.708	79.088	776	2014-06-27 00:25:52	79.772	79.844
777	2014-06-27 00:26:02	180.45	165.75	777	2014-06-27 00:26:23	80.708	79.088	777	2014-06-27 00:26:52	79.736	79.88
778	2014-06-27 00:27:02	180.4	165.7	778	2014-06-27 00:27:23	80.708	79.124	778	2014-06-27 00:27:52	79.772	79.826
779	2014-06-27 00:28:02	180.4	165.7	779	2014-06-27 00:28:23	80.708	79.124	779	2014-06-27 00:28:52	79.79	79.808
780	2014-06-27 00:29:02	180.4	165.7	780	2014-06-27 00:29:23	80.708	79.178	780	2014-06-27 00:29:52	79.736	79.808
781	2014-06-27 00:30:02	180.4	165.7	781	2014-06-27 00:30:23	80.6	79.07	781	2014-06-27 00:30:52	79.772	79.88
782	2014-06-27 00:31:02	180.4	165.7	782	2014-06-27 00:31:23	80.6	79.106	782	2014-06-27 00:31:52	79.772	79.844
783	2014-06-27 00:32:02	180.4	165.7	783	2014-06-27 00:32:23	80.6	79.106	783	2014-06-27 00:32:52	79.682	79.844
784	2014-06-27 00:33:02	180.4	165.7	784	2014-06-27 00:33:23	80.6	79.106	784	2014-06-27 00:33:52	79.682	79.826
785	2014-06-27 00:34:02	180.35	165.65	785	2014-06-27 00:34:23	80.6	79.16	785	2014-06-27 00:34:52	79.682	79.88
786	2014-06-27 00:35:02	180.4	165.7	786	2014-06-27 00:35:23	80.6	79.16	786	2014-06-27 00:35:52	79.664	79.808
787	2014-06-27 00:36:02	180.35	165.65	787	2014-06-27 00:36:23	80.6	79.16	787	2014-06-27 00:36:52	79.736	79.826
788	2014-06-27 00:37:02	180.35	165.65	788	2014-06-27 00:37:23	80.6	79.16	788	2014-06-27 00:37:52	79.736	79.808
789	2014-06-27 00:38:02	180.35	165.65	789	2014-06-27 00:38:23	80.474	79.07	789	2014-06-27 00:38:52	79.718	79.862
790	2014-06-27 00:39:02	180.35	165.65	790	2014-06-27 00:39:23	80.474	79.124	790	2014-06-27 00:39:52	79.682	79.808
791	2014-06-27 00:40:02	180.35	165.65	791	2014-06-27 00:40:23	80.474	79.124	791	2014-06-27 00:40:52	79.772	79.844
792	2014-06-27 00:41:02	180.35	165.65	792	2014-06-27 00:41:23	80.474	79.124	792	2014-06-27 00:41:52	79.718	79.826
793	2014-06-27 00:42:02	180.35	165.65	793	2014-06-27 00:42:23	80.474	79.16	793	2014-06-27 00:42:52	79.718	79.862
794	2014-06-27 00:43:02	180.35	165.65	794	2014-06-27 00:43:23	80.474	79.16	794	2014-06-27 00:43:52	79.736	79.826
795	2014-06-27 00:44:02	180.3	165.6	795	2014-06-27 00:44:23	80.474	79.196	795	2014-06-27 00:44:52	79.718	79.772
796	2014-06-27 00:45:02	180.3	165.6	796	2014-06-27 00:45:23	80.474	79.16	796	2014-06-27 00:45:52	79.736	79.826
797	2014-06-27 00:46:02	180.3	165.6	797	2014-06-27 00:46:23	80.474	79.196	797	2014-06-27 00:46:52	79.682	79.772
798	2014-06-27 00:47:02	180.3	165.6	798	2014-06-27 00:47:23	80.474	79.196	798	2014-06-27 00:47:52	79.736	79.826
799	2014-06-27 00:48:02	180.3	165.6	799	2014-06-27 00:48:23	80.474	79.196	799	2014-06-27 00:48:52	79.736	79.862
800	2014-06-27 00:49:02	180.3	165.6	800	2014-06-27 00:49:23	80.474	79.25	800	2014-06-27 00:49:52	79.718	79.772
801	2014-06-27 00:50:02	180.3	165.6	801	2014-06-27 00:50:23	80.366	79.088	801	2014-06-27 00:50:52	79.736	79.772
802	2014-06-27 00:51:02	180.25	165.55	802	2014-06-27 00:51:23	80.366	79.142	802	2014-06-27 00:51:52	79.754	79.772
803	2014-06-27 00:52:02	180.25	165.55	803	2014-06-27 00:52:23	80.474	79.25	803	2014-06-27 00:52:52	79.718	79.772
804	2014-06-27 00:53:02	180.25	165.55	804	2014-06-27 00:53:23	80.366	79.178	804	2014-06-27 00:53:52	79.682	79.826
805	2014-06-27 00:54:02	180.25	165.55	805	2014-06-27 00:54:23	80.366	79.142	805	2014-06-27 00:54:52	79.682	79.772
806	2014-06-27 00:55:02	180.25	165.55	806	2014-06-27 00:55:23	80.366	79.178	806	2014-06-27 00:55:52	79.736	79.772
807	2014-06-27 00:56:02	180.25	165.55	807	2014-06-27 00:56:23	80.366	79.178	807	2014-06-27 00:56:52	79.682	79.826
808	2014-06-27 00:57:02	180.25	165.55	808	2014-06-27 00:57:23	80.366	79.178	808	2014-06-27 00:57:52	79.736	79.808
809	2014-06-27 00:58:02	180.2	165.5	809	2014-06-27 00:58:23	80.366	79.178	809	2014-06-27 00:58:52	79.718	79.826
810	2014-06-27 00:59:02	180.2	165.5	810	2014-06-27 00:59:23	80.366	79.178	810	2014-06-27 00:59:52	79.682	79.808
811	2014-06-27 01:00:02	180.25	165.55	811	2014-06-27 01:00:23	80.366	79.232	811	2014-06-27 01:00:52	79.682	79.808
812	2014-06-27 01:01:02	180.2	165.5	812	2014-06-27 01:01:23	80.366	79.232	812	2014-06-27 01:01:52	79.718	79.808
813	2014-06-27 01:02:02	180.2	165.5	813	2014-06-27 01:02:23	80.366	79.232	813	2014-06-27 01:02:52	79.808	79.772
814	2014-06-27 01:03:02	180.2	165.5	814	2014-06-27 01:03:23	80.258	79.124	814	2014-06-27 01:03:52	79.754	79.772
815	2014-06-27 01:04:02	180.2	165.5	815	2014-06-27 01:04:23	80.366	79.268	815	2014-06-27 01:04:52	79.772	79.754
816	2014-06-27 01:05:02	180.2	165.5	816	2014-06-27 01:05:23	80.366	79.268	816	2014-06-27 01:05:52	79.772	79.772
817	2014-06-27 01:06:02	180.2	165.5	817	2014-06-27 01:06:23	80.366	79.268	817	2014-06-27 01:06:52	79.754	79.808
818	2014-06-27 01:07:02	180.2	165.5	818	2014-06-27 01:07:23	80.258	79.16	818	2014-06-27 01:07:52	79.718	79.754
819	2014-06-27 01:08:02	180.2	165.5	819	2014-06-27 01:08:23	80.258	79.16	819	2014-06-27 01:08:52	79.718	79.862
820	2014-06-27 01:09:02	180.2	165.5	820	2014-06-27 01:09:23	80.366	79.268	820	2014-06-27 01:09:52	79.718	79.754
821	2014-06-27 01:10:02	180.2	165.5	821	2014-06-27 01:10:23	80.258	79.214	821	2014-06-27 01:10:52	79.772	79.772
822	2014-06-27 01:11:02	180.15	165.45	822	2014-06-27 01:11:23	80.258	79.214	822	2014-06-27 01:11:52	79.7	79.754
823	2014-06-27 01:12:02	180.15	165.45	823	2014-06-27 01:12:23	80.258	79.214	823	2014-06-27 01:12:52	79.718	79.718
824	2014-06-27 01:13:02	180.15	165.45	824	2014-06-27 01:13:23	80.258	79.25	824	2014-06-27 01:13:52	79.718	79.754
825	2014-06-27 01:14:02	180.15	165.45	825	2014-06-27 01:14:23	80.258	79.25	825	2014-06-27 01:14:52	79.718	79.718
826	2014-06-27 01:15:02	180.15	165.45	826	2014-06-27 01:15:23	80.258	79.214	826	2014-06-27 01:15:52	79.664	79.754
827	2014-06-27 01:16:02	180.15	165.45	827	2014-06-27 01:16:23	80.258	79.25	827	2014-06-27 01:16:52	79.718	79.718
828	2014-06-27 01:17:02	180.15	165.45	828	2014-06-27 01:17:23	80.258	79.25	828	2014-06-27 01:17:52	79.754	79.754
829	2014-06-27 01:18:02	180.15	165.45	829	2014-06-27 01:18:23	80.258	79.25	829	2014-06-27 01:18:52	79.754	79.772
830	2014-06-27 01:19:02	180.15	165.45	830	2014-06-27 01:19:23	80.258	79.25	830	2014-06-27 01:19:52	79.718	79.718
831	2014-06-27 01:20:02	180.1	165.4	831	2014-06-27 01:20:23	80.258	79.286	831	2014-06-27 01:20:52	79.7	79.808
832	2014-06-27 01:21:02	180.1	165.4	832	2014-06-27 01:21:23	80.132	79.16	832	2014-06-27 01:21:52	79.646	79.718
833	2014-06-27 01:22:02	180.1	165.4	833	2014-06-27 01:22:23	80.132	79.16	833	2014-06-27 01:22:52	79.7	79.808
834	2014-06-27 01:23:02	180.1	165.4	834	2014-06-27 01:23:23	80.132	79.16	834	2014-06-27 01:23:52	79.7	79.7
835	2014-06-27 01:24:02	180.1	165.4	835	2014-06-27 01:24:23	80.132	79.16	835	2014-06-27 01:24:52	79.7	79.772
836	2014-06-27 01:25:02	180.1	165.4	836	2014-06-27 01:25:23	80.132	79.16	836	2014-06-27 01:25:52	79.718	79.772
837	2014-06-27 01:26:02	180.1	165.4	837	2014-06-27 01:26:23	80.258	79.286	837	2014-06-27 01:26:52	79.754	79.772
838	2014-06-27 01:27:02	180.1	165.4	838	2014-06-27 01:27:23	80.132	79.16	838	2014-06-27 01:27:52	79.682	79.808
839	2014-06-27 01:28:02	180.05	165.35	839	2014-06-27 01:28:23	80.132	79.214	839	2014-06-27 01:28:52	79.646	79.718
840	2014-06-27 01:29:02	180.05	165.35	840	2014-06-27 01:29:23	80.132	79.214	840	2014-06-27 01:29:52	79.664	79.808
841	2014-06-27 01:30:02	180.05	165.35	841	2014-06-27 01:30:23	80.132	79.214	841	2014-06-27 01:30:52	79.664	79.754
842	2014-06-27 01:31:02	180.05	165.35	842	2014-06-27 01:31:23	80.132	79.214	842	2014-06-27 01:31:52	79.7	79.718
843	2014-06-27 01:32:02	180.05	165.35	843	2014-06-27 01:32:23	80.132	79.214	843	2014-06-27 01:32:52	79.7	79.772

844	2014-06-27 01:33:02	180.05	165.35	844	2014-06-27 01:33:23	80.132	79.214	844	2014-06-27 01:33:52	79.7	79.718
845	2014-06-27 01:34:02	180.05	165.35	845	2014-06-27 01:34:23	80.132	79.25	845	2014-06-27 01:34:52	79.736	79.718
846	2014-06-27 01:35:02	180.05	165.35	846	2014-06-27 01:35:23	80.132	79.25	846	2014-06-27 01:35:52	79.682	79.736
847	2014-06-27 01:36:02	180.05	165.35	847	2014-06-27 01:36:23	80.132	79.214	847	2014-06-27 01:36:52	79.664	79.754
848	2014-06-27 01:37:02	180	165.3	848	2014-06-27 01:37:23	80.132	79.25	848	2014-06-27 01:37:52	79.7	79.754
849	2014-06-27 01:38:02	180	165.3	849	2014-06-27 01:38:23	80.132	79.25	849	2014-06-27 01:38:52	79.682	79.718
850	2014-06-27 01:39:02	180	165.3	850	2014-06-27 01:39:23	80.132	79.25	850	2014-06-27 01:39:52	79.718	79.772
851	2014-06-27 01:40:02	180	165.3	851	2014-06-27 01:40:23	80.132	79.25	851	2014-06-27 01:40:52	79.682	79.718
852	2014-06-27 01:41:02	180	165.3	852	2014-06-27 01:41:23	80.132	79.25	852	2014-06-27 01:41:52	79.7	79.754
853	2014-06-27 01:42:02	180	165.3	853	2014-06-27 01:42:23	80.132	79.25	853	2014-06-27 01:42:52	79.682	79.772
854	2014-06-27 01:43:02	180	165.3	854	2014-06-27 01:43:23	80.132	79.25	854	2014-06-27 01:43:52	79.682	79.754
855	2014-06-27 01:44:02	180	165.3	855	2014-06-27 01:44:23	80.132	79.304	855	2014-06-27 01:44:52	79.718	79.718
856	2014-06-27 01:45:02	180	165.3	856	2014-06-27 01:45:23	80.132	79.304	856	2014-06-27 01:45:52	79.7	79.718
857	2014-06-27 01:46:02	179.95	165.25	857	2014-06-27 01:46:23	80.132	79.25	857	2014-06-27 01:46:52	79.664	79.7
858	2014-06-27 01:47:02	179.95	165.25	858	2014-06-27 01:47:23	80.132	79.304	858	2014-06-27 01:47:52	79.682	79.718
859	2014-06-27 01:48:02	179.95	165.25	859	2014-06-27 01:48:23	80.024	79.196	859	2014-06-27 01:48:52	79.646	79.754
860	2014-06-27 01:49:02	179.95	165.25	860	2014-06-27 01:49:23	80.132	79.304	860	2014-06-27 01:49:52	79.682	79.754
861	2014-06-27 01:50:02	179.95	165.25	861	2014-06-27 01:50:23	80.024	79.196	861	2014-06-27 01:50:52	79.718	79.718
862	2014-06-27 01:51:02	179.95	165.25	862	2014-06-27 01:51:23	80.132	79.304	862	2014-06-27 01:51:52	79.7	79.754
863	2014-06-27 01:52:02	179.9	165.2	863	2014-06-27 01:52:23	80.024	79.232	863	2014-06-27 01:52:52	79.61	79.772
864	2014-06-27 01:53:02	179.95	165.25	864	2014-06-27 01:53:23	80.132	79.34	864	2014-06-27 01:53:52	79.646	79.754
865	2014-06-27 01:54:02	179.95	165.25	865	2014-06-27 01:54:23	80.024	79.196	865	2014-06-27 01:54:52	79.646	79.7
866	2014-06-27 01:55:02	179.9	165.2	866	2014-06-27 01:55:23	80.024	79.232	866	2014-06-27 01:55:52	79.646	79.754
867	2014-06-27 01:56:02	179.9	165.2	867	2014-06-27 01:56:23	80.024	79.232	867	2014-06-27 01:56:52	79.646	79.7
868	2014-06-27 01:57:02	179.9	165.2	868	2014-06-27 01:57:23	80.132	79.34	868	2014-06-27 01:57:52	79.682	79.7
869	2014-06-27 01:58:02	179.9	165.2	869	2014-06-27 01:58:23	80.024	79.232	869	2014-06-27 01:58:52	79.718	79.682
870	2014-06-27 01:59:02	179.9	165.2	870	2014-06-27 01:59:23	80.024	79.232	870	2014-06-27 01:59:52	79.682	79.7
871	2014-06-27 02:00:02	179.9	165.2	871	2014-06-27 02:00:23	80.024	79.232	871	2014-06-27 02:00:52	79.646	79.718
872	2014-06-27 02:01:02	179.9	165.2	872	2014-06-27 02:01:23	80.024	79.232	872	2014-06-27 02:01:52	79.754	79.772
873	2014-06-27 02:02:02	179.9	165.2	873	2014-06-27 02:02:23	80.024	79.232	873	2014-06-27 02:02:52	79.7	79.7
874	2014-06-27 02:03:02	179.85	165.15	874	2014-06-27 02:03:23	80.024	79.232	874	2014-06-27 02:03:52	79.736	79.718
875	2014-06-27 02:04:02	179.85	165.15	875	2014-06-27 02:04:23	80.024	79.232	875	2014-06-27 02:04:52	79.7	79.718
876	2014-06-27 02:05:02	179.9	165.2	876	2014-06-27 02:05:23	80.024	79.286	876	2014-06-27 02:05:52	79.754	79.7
877	2014-06-27 02:06:02	179.85	165.15	877	2014-06-27 02:06:23	80.024	79.232	877	2014-06-27 02:06:52	79.682	79.772
878	2014-06-27 02:07:02	179.85	165.15	878	2014-06-27 02:07:23	80.024	79.286	878	2014-06-27 02:07:52	79.7	79.772
879	2014-06-27 02:08:02	179.85	165.15	879	2014-06-27 02:08:23	80.024	79.232	879	2014-06-27 02:08:52	79.736	79.718
880	2014-06-27 02:09:02	179.85	165.15	880	2014-06-27 02:09:23	80.024	79.232	880	2014-06-27 02:09:52	79.736	79.772
881	2014-06-27 02:10:02	179.85	165.15	881	2014-06-27 02:10:23	80.024	79.286	881	2014-06-27 02:10:52	79.7	79.808
882	2014-06-27 02:11:02	179.85	165.15	882	2014-06-27 02:11:23	80.024	79.286	882	2014-06-27 02:11:52	79.718	79.808
883	2014-06-27 02:12:02	179.85	165.15	883	2014-06-27 02:12:23	80.024	79.286	883	2014-06-27 02:12:52	79.736	79.718
884	2014-06-27 02:13:02	179.85	165.15	884	2014-06-27 02:13:23	80.024	79.286	884	2014-06-27 02:13:52	79.7	79.7
885	2014-06-27 02:14:02	179.8	165.1	885	2014-06-27 02:14:23	80.024	79.286	885	2014-06-27 02:14:52	79.736	79.754
886	2014-06-27 02:15:02	179.8	165.1	886	2014-06-27 02:15:23	80.024	79.232	886	2014-06-27 02:15:52	79.736	79.7
887	2014-06-27 02:16:02	179.8	165.1	887	2014-06-27 02:16:23	80.024	79.286	887	2014-06-27 02:16:52	79.682	79.772
888	2014-06-27 02:17:02	179.8	165.1	888	2014-06-27 02:17:23	80.024	79.322	888	2014-06-27 02:17:52	79.682	79.808
889	2014-06-27 02:18:02	179.8	165.1	889	2014-06-27 02:18:23	80.024	79.286	889	2014-06-27 02:18:52	79.7	79.754
890	2014-06-27 02:19:02	179.8	165.1	890	2014-06-27 02:19:23	80.024	79.286	890	2014-06-27 02:19:52	79.682	79.754
891	2014-06-27 02:20:02	179.8	165.1	891	2014-06-27 02:20:23	80.024	79.286	891	2014-06-27 02:20:52	79.682	79.754
892	2014-06-27 02:21:02	179.8	165.1	892	2014-06-27 02:21:23	80.024	79.322	892	2014-06-27 02:21:52	79.736	79.7
893	2014-06-27 02:22:02	179.8	165.1	893	2014-06-27 02:22:23	80.024	79.322	893	2014-06-27 02:22:52	79.682	79.808
894	2014-06-27 02:23:02	179.8	165.1	894	2014-06-27 02:23:23	80.024	79.322	894	2014-06-27 02:23:52	79.7	79.754
895	2014-06-27 02:24:02	179.75	165.05	895	2014-06-27 02:24:23	80.024	79.322	895	2014-06-27 02:24:52	79.682	79.718
896	2014-06-27 02:25:02	179.75	165.05	896	2014-06-27 02:25:23	80.024	79.286	896	2014-06-27 02:25:52	79.682	79.7
897	2014-06-27 02:26:02	179.75	165.05	897	2014-06-27 02:26:23	79.916	79.214	897	2014-06-27 02:26:52	79.682	79.7
898	2014-06-27 02:27:02	179.75	165.05	898	2014-06-27 02:27:23	80.024	79.322	898	2014-06-27 02:27:52	79.7	79.718
899	2014-06-27 02:28:02	179.75	165.05	899	2014-06-27 02:28:23	80.024	79.322	899	2014-06-27 02:28:52	79.646	79.754
900	2014-06-27 02:29:02	179.75	165.05	900	2014-06-27 02:29:23	80.024	79.322	900	2014-06-27 02:29:52	79.646	79.772
901	2014-06-27 02:30:02	179.75	165.05	901	2014-06-27 02:30:23	79.916	79.214	901	2014-06-27 02:30:52	79.736	79.754
902	2014-06-27 02:31:02	179.75	165.05	902	2014-06-27 02:31:23	80.024	79.322	902	2014-06-27 02:31:52	79.61	79.7
903	2014-06-27 02:32:02	179.75	165.05	903	2014-06-27 02:32:23	79.916	79.25	903	2014-06-27 02:32:52	79.646	79.754
904	2014-06-27 02:33:02	179.7	165	904	2014-06-27 02:33:23	79.916	79.214	904	2014-06-27 02:33:52	79.646	79.718
905	2014-06-27 02:34:02	179.7	165	905	2014-06-27 02:34:23	79.916	79.214	905	2014-06-27 02:34:52	79.7	79.808
906	2014-06-27 02:35:02	179.7	165	906	2014-06-27 02:35:23	80.024	79.322	906	2014-06-27 02:35:52	79.61	79.754
907	2014-06-27 02:36:02	179.7	165	907	2014-06-27 02:36:23	79.916	79.25	907	2014-06-27 02:36:52	79.664	79.7
908	2014-06-27 02:37:02	179.7	165	908	2014-06-27 02:37:23	79.916	79.25	908	2014-06-27 02:37:52	79.646	79.754
909	2014-06-27 02:38:02	179.7	165	909	2014-06-27 02:38:23	80.024	79.322	909	2014-06-27 02:38:52	79.664	79.7
910	2014-06-27 02:39:02	179.7	165	910	2014-06-27 02:39:23	79.916	79.214	910	2014-06-27 02:39:52	79.646	79.826
911	2014-06-27 02:40:02	179.7	165	911	2014-06-27 02:40:23	79.916	79.25	911	2014-06-27 02:40:52	79.61	79.754
912	2014-06-27 02:41:02	179.65	164.95	912	2014-06-27 02:41:23	79.916	79.25	912	2014-06-27 02:41:52	79.646	79.754
913	2014-06-27 02:42:02	179.65	164.95	913	2014-06-27 02:42:23	79.916	79.25	913	2014-06-27 02:42:52	79.646	79.7
914	2014-06-27 02:43:02	179.7	165	914	2014-06-27 02:43:23	79.916	79.25	914	2014-06-27 02:43:52	79.646	79.754
915	2014-06-27 02:44:02	179.65	164.95	915	2014-06-27 02:44:23	79.916	79.25	915	2014-06-27 02:44:52	79.61	79.682
916	2014-06-27 02:45:02	179.65	164.95	916	2014-06-27 02:45:23	80.024	79.358	916	2014-06-27 02:45:52	79.646	79.772
917	2014-06-27 02:46:02	179.65	164.95	917	2014-06-27 02:46:23	79.916	79.25	917	2014-06-27 02:46:52	79.7	79.772
918	2014-06-27 02:47:02	179.65	164.95	918	2014-06-27 02:47:23	79.916	79.25	918	2014-06-27 02:47:52	79.682	79.7
919	2014-06-27 02:48:02	179.65	164.95	919	2014-06-27 02:48:23	79.916	79.25	919	2014-06-27 02:48:52	79.682	79.7
920	2014-06-27 02:49:02	179.65	164.95	920	2014-06-27 02:49:23	79.916	79.304	920	2014-06-27 02:49:52	79.682	79.754
921	2014-06-27 02:50:02	179.65	164.95	921	2014-06-27 02:50:23	79.916	79.25	921	2014-06-27 02:50:52	79.682	79.754
922	2014-06-27 02:51:02	179.65	164.95	922	2014-06-27 02:51:23	79.916	79.25	922	2014-06-27 02:51:52	79.7	79.682
923	2014-06-27 02:52:02	179.65	164.95	923	2014-06-27 02:52:23	79.916	79.25	923	2014-06-27 02:52:52	79.61	79.736
924	2014-06-27 02:53:02	179.65	164.95	924	2014-06-27 02:53:23	79.916	79.25	924	2014-06-27 02:53:52	79.682	79.718
925	2014-06-27 02:54:02	179.65	164.95	925	2014-06-27 02:54:23	79.916	79.25	925	2014-06-27 02:54:52	79.682	79.754
926	2014-06-27 02:55:02	179.65	164.95	926	2014-06-27 02:55:23	79.916	79.25	926	2014-06-27 02:55:52	79.682	79.7
927	2014-06-27 02:56:02	179.6	164.9	927	2014-06-27 02:56:23	79.916	79.25	927	2014-06-27 02:56:52	79.592	79.754
928	2014-06-27 02:57:02	179.6	164.9	928	2014-06-27 02:57:23	79.916	79.304	928	2014-06-27 02:57:52	79.682	79.736
929	2014-06-27 02:58:02	179.6	164.9	929	2014-06-27 02:58:23	79.916	79.25	929	2014-06-27 02:58:52	79.646	79.718
930	2014-06-27 02:59:02	179.6	164.9	930	2014-06-27 02:59:23	80.024	79.358	930	2014-06-27 02:59:52	79.61	79.718
931	2014-06-27 03:00:02	179.6	164.9	931	2014-06-27 03:00:23	79.916	79.25	931	2014-06-27 03:00:52	79.754	79.682
932	2014-06-27 03:01:02	179.6	164.9	932	2014-06-27 03:01:23	79.916	79.304	932	2014-06-27 03:01:52	79.646	79.754
933	2014-06-27 03:02:02	179.6	164.9	933	2014-06-27 03:02:23	79.916	79.304	933	2014-06-27 03:02:52	79.682	79.682
934	2014-06-27 03:03:02	179.6	164.9	934	2014-06-27 03:03:23	79.916	79.25	934	2014-06-27 03:03:52	79.646	79.754
935	2014-06-27 03:04:02	179.6	164.9	935	2014-06-27 03:04:23	79.916	79.25	935	2014-06-27 03:04:52	79.646	79.7
936	2014-06-27 03:05:02	179.55	164.85	936	2014-06-27 03:05:23	79.916	79.304	936	2014-06-27 03:05:52	79.646	79.772
937	2014-06-27 03:06:02	179.55	164.85	937	2014-06-27 03:06:23	79.916	79.25	937	2014-06-27 03:06:52	79.682	79.682
938	2014-06-27 03:07:02	179.55	164.85	938	2014-06-27 03:07:23	79.916	79.304	938	2014-06-27 03:07:52	79.7	79.646

939	2014-06-27 03:08:02	179.55	164.85	939	2014-06-27 03:08:23	79.916	79.304	939	2014-06-27 03:08:52	79.646	79.682
940	2014-06-27 03:09:02	179.55	164.85	940	2014-06-27 03:09:23	79.916	79.304	940	2014-06-27 03:09:52	79.646	79.736
941	2014-06-27 03:10:02	179.55	164.85	941	2014-06-27 03:10:23	79.916	79.304	941	2014-06-27 03:10:52	79.682	79.7
942	2014-06-27 03:11:02	179.55	164.85	942	2014-06-27 03:11:23	79.916	79.304	942	2014-06-27 03:11:52	79.628	79.754
943	2014-06-27 03:12:02	179.55	164.85	943	2014-06-27 03:12:23	79.916	79.304	943	2014-06-27 03:12:52	79.646	79.7
944	2014-06-27 03:13:02	179.55	164.85	944	2014-06-27 03:13:23	79.916	79.34	944	2014-06-27 03:13:52	79.682	79.646
945	2014-06-27 03:14:02	179.5	164.8	945	2014-06-27 03:14:23	79.916	79.304	945	2014-06-27 03:14:52	79.646	79.754
946	2014-06-27 03:15:02	179.55	164.85	946	2014-06-27 03:15:23	79.916	79.304	946	2014-06-27 03:15:52	79.646	79.682
947	2014-06-27 03:16:02	179.55	164.85	947	2014-06-27 03:16:23	79.916	79.304	947	2014-06-27 03:16:52	79.61	79.682
948	2014-06-27 03:17:02	179.5	164.8	948	2014-06-27 03:17:23	79.916	79.304	948	2014-06-27 03:17:52	79.61	79.7
949	2014-06-27 03:18:02	179.5	164.8	949	2014-06-27 03:18:23	79.916	79.304	949	2014-06-27 03:18:52	79.592	79.7
950	2014-06-27 03:19:02	179.5	164.8	950	2014-06-27 03:19:23	79.916	79.304	950	2014-06-27 03:19:52	79.592	79.736
951	2014-06-27 03:20:02	179.5	164.8	951	2014-06-27 03:20:23	79.916	79.304	951	2014-06-27 03:20:52	79.592	79.7
952	2014-06-27 03:21:02	179.5	164.8	952	2014-06-27 03:21:23	79.916	79.304	952	2014-06-27 03:21:52	79.628	79.682
953	2014-06-27 03:22:02	179.5	164.8	953	2014-06-27 03:22:23	79.916	79.304	953	2014-06-27 03:22:52	79.646	79.682
954	2014-06-27 03:23:02	179.5	164.8	954	2014-06-27 03:23:23	79.916	79.304	954	2014-06-27 03:23:52	79.646	79.7
955	2014-06-27 03:24:02	179.5	164.8	955	2014-06-27 03:24:23	79.916	79.34	955	2014-06-27 03:24:52	79.646	79.736
956	2014-06-27 03:25:02	179.5	164.8	956	2014-06-27 03:25:23	79.916	79.304	956	2014-06-27 03:25:52	79.502	79.7
957	2014-06-27 03:26:02	179.5	164.8	957	2014-06-27 03:26:23	79.916	79.304	957	2014-06-27 03:26:52	79.646	79.736
958	2014-06-27 03:27:02	179.45	164.75	958	2014-06-27 03:27:23	79.916	79.304	958	2014-06-27 03:27:52	79.7	79.736
959	2014-06-27 03:28:02	179.45	164.75	959	2014-06-27 03:28:23	79.916	79.304	959	2014-06-27 03:28:52	79.592	79.646
960	2014-06-27 03:29:02	179.45	164.75	960	2014-06-27 03:29:23	79.916	79.34	960	2014-06-27 03:29:52	79.61	79.736
961	2014-06-27 03:30:02	179.45	164.75	961	2014-06-27 03:30:23	79.916	79.34	961	2014-06-27 03:30:52	79.61	79.754
962	2014-06-27 03:31:02	179.45	164.75	962	2014-06-27 03:31:23	79.916	79.34	962	2014-06-27 03:31:52	79.646	79.682
963	2014-06-27 03:32:02	179.45	164.75	963	2014-06-27 03:32:23	79.916	79.34	963	2014-06-27 03:32:52	79.556	79.682
964	2014-06-27 03:33:02	179.45	164.75	964	2014-06-27 03:33:23	79.916	79.304	964	2014-06-27 03:33:52	79.646	79.682
965	2014-06-27 03:34:02	179.45	164.75	965	2014-06-27 03:34:23	79.808	79.196	965	2014-06-27 03:34:52	79.628	79.682
966	2014-06-27 03:35:02	179.45	164.75	966	2014-06-27 03:35:23	79.916	79.34	966	2014-06-27 03:35:52	79.628	79.736
967	2014-06-27 03:36:02	179.4	164.7	967	2014-06-27 03:36:23	79.916	79.304	967	2014-06-27 03:36:52	79.646	79.646
968	2014-06-27 03:37:02	179.4	164.7	968	2014-06-27 03:37:23	79.916	79.34	968	2014-06-27 03:37:52	79.628	79.682
969	2014-06-27 03:38:02	179.4	164.7	969	2014-06-27 03:38:23	79.916	79.34	969	2014-06-27 03:38:52	79.646	79.736
970	2014-06-27 03:39:02	179.4	164.7	970	2014-06-27 03:39:23	79.916	79.34	970	2014-06-27 03:39:52	79.646	79.646
971	2014-06-27 03:40:02	179.4	164.7	971	2014-06-27 03:40:23	79.916	79.34	971	2014-06-27 03:40:52	79.646	79.7
972	2014-06-27 03:41:02	179.4	164.7	972	2014-06-27 03:41:23	79.916	79.304	972	2014-06-27 03:41:52	79.646	79.754
973	2014-06-27 03:42:02	179.4	164.7	973	2014-06-27 03:42:23	79.916	79.34	973	2014-06-27 03:42:52	79.646	79.7
974	2014-06-27 03:43:02	179.4	164.7	974	2014-06-27 03:43:23	79.916	79.34	974	2014-06-27 03:43:52	79.628	79.682
975	2014-06-27 03:44:02	179.4	164.7	975	2014-06-27 03:44:23	79.916	79.34	975	2014-06-27 03:44:52	79.628	79.646
976	2014-06-27 03:45:02	179.4	164.7	976	2014-06-27 03:45:23	79.808	79.232	976	2014-06-27 03:45:52	79.556	79.646
977	2014-06-27 03:46:02	179.4	164.7	977	2014-06-27 03:46:23	79.808	79.232	977	2014-06-27 03:46:52	79.628	79.736
978	2014-06-27 03:47:02	179.4	164.7	978	2014-06-27 03:47:23	79.916	79.34	978	2014-06-27 03:47:52	79.7	79.7
979	2014-06-27 03:48:02	179.35	164.65	979	2014-06-27 03:48:23	79.916	79.34	979	2014-06-27 03:48:52	79.628	79.682
980	2014-06-27 03:49:02	179.35	164.65	980	2014-06-27 03:49:23	79.916	79.34	980	2014-06-27 03:49:52	79.646	79.646
981	2014-06-27 03:50:02	179.35	164.65	981	2014-06-27 03:50:23	79.808	79.232	981	2014-06-27 03:50:52	79.628	79.682
982	2014-06-27 03:51:02	179.35	164.65	982	2014-06-27 03:51:23	79.916	79.394	982	2014-06-27 03:51:52	79.646	79.7
983	2014-06-27 03:52:02	179.35	164.65	983	2014-06-27 03:52:23	79.916	79.304	983	2014-06-27 03:52:52	79.646	79.646
984	2014-06-27 03:53:02	179.35	164.65	984	2014-06-27 03:53:23	79.808	79.286	984	2014-06-27 03:53:52	79.646	79.736
985	2014-06-27 03:54:02	179.35	164.65	985	2014-06-27 03:54:23	79.916	79.394	985	2014-06-27 03:54:52	79.628	79.628
986	2014-06-27 03:55:02	179.35	164.65	986	2014-06-27 03:55:23	79.916	79.394	986	2014-06-27 03:55:52	79.646	79.646
987	2014-06-27 03:56:02	179.35	164.65	987	2014-06-27 03:56:23	79.916	79.34	987	2014-06-27 03:56:52	79.628	79.7
988	2014-06-27 03:57:02	179.35	164.65	988	2014-06-27 03:57:23	79.916	79.34	988	2014-06-27 03:57:52	79.646	79.7
989	2014-06-27 03:58:02	179.35	164.65	989	2014-06-27 03:58:23	79.808	79.286	989	2014-06-27 03:58:52	79.592	79.646
990	2014-06-27 03:59:02	179.35	164.65	990	2014-06-27 03:59:23	79.808	79.232	990	2014-06-27 03:59:52	79.682	79.646
991	2014-06-27 04:00:02	179.3	164.6	991	2014-06-27 04:00:23	79.916	79.34	991	2014-06-27 04:00:52	79.646	79.7
992	2014-06-27 04:01:02	179.3	164.6	992	2014-06-27 04:01:23	79.916	79.34	992	2014-06-27 04:01:52	79.61	79.682
993	2014-06-27 04:02:02	179.3	164.6	993	2014-06-27 04:02:23	79.808	79.232	993	2014-06-27 04:02:52	79.592	79.7
994	2014-06-27 04:03:02	179.3	164.6	994	2014-06-27 04:03:23	79.808	79.286	994	2014-06-27 04:03:52	79.628	79.682
995	2014-06-27 04:04:02	179.3	164.6	995	2014-06-27 04:04:23	79.916	79.34	995	2014-06-27 04:04:52	79.628	79.628
996	2014-06-27 04:05:02	179.3	164.6	996	2014-06-27 04:05:23	79.808	79.232	996	2014-06-27 04:05:52	79.646	79.7
997	2014-06-27 04:06:02	179.3	164.6	997	2014-06-27 04:06:23	79.808	79.232	997	2014-06-27 04:06:52	79.61	79.736
998	2014-06-27 04:07:02	179.3	164.6	998	2014-06-27 04:07:23	79.808	79.232	998	2014-06-27 04:07:52	79.682	79.682
999	2014-06-27 04:08:02	179.3	164.6	999	2014-06-27 04:08:23	79.916	79.34	999	2014-06-27 04:08:52	79.628	79.646
1000	2014-06-27 04:09:02	179.3	164.6	1000	2014-06-27 04:09:23	79.808	79.286	1000	2014-06-27 04:09:52	79.592	79.646
1001	2014-06-27 04:10:02	179.25	164.55	1001	2014-06-27 04:10:23	79.808	79.232	1001	2014-06-27 04:10:52	79.628	79.736
1002	2014-06-27 04:11:02	179.25	164.55	1002	2014-06-27 04:11:23	79.808	79.286	1002	2014-06-27 04:11:52	79.646	79.646
1003	2014-06-27 04:12:02	179.25	164.55	1003	2014-06-27 04:12:23	79.916	79.394	1003	2014-06-27 04:12:52	79.7	79.628
1004	2014-06-27 04:13:02	179.25	164.55	1004	2014-06-27 04:13:23	79.916	79.34	1004	2014-06-27 04:13:52	79.628	79.646
1005	2014-06-27 04:14:02	179.25	164.55	1005	2014-06-27 04:14:23	79.808	79.286	1005	2014-06-27 04:14:52	79.682	79.646
1006	2014-06-27 04:15:02	179.25	164.55	1006	2014-06-27 04:15:23	79.808	79.286	1006	2014-06-27 04:15:52	79.628	79.7
1007	2014-06-27 04:16:02	179.25	164.55	1007	2014-06-27 04:16:23	79.808	79.232	1007	2014-06-27 04:16:52	79.592	79.7
1008	2014-06-27 04:17:02	179.25	164.55	1008	2014-06-27 04:17:23	79.808	79.286	1008	2014-06-27 04:17:52	79.592	79.736
1009	2014-06-27 04:18:02	179.25	164.55	1009	2014-06-27 04:18:23	79.916	79.34	1009	2014-06-27 04:18:52	79.628	79.7
1010	2014-06-27 04:19:02	179.25	164.55	1010	2014-06-27 04:19:23	79.808	79.232	1010	2014-06-27 04:19:52	79.682	79.7
1011	2014-06-27 04:20:02	179.2	164.5	1011	2014-06-27 04:20:23	79.808	79.232	1011	2014-06-27 04:20:52	79.592	79.736
1012	2014-06-27 04:21:02	179.25	164.55	1012	2014-06-27 04:21:23	79.808	79.286	1012	2014-06-27 04:21:52	79.592	79.682
1013	2014-06-27 04:22:02	179.2	164.5	1013	2014-06-27 04:22:23	79.808	79.286	1013	2014-06-27 04:22:52	79.646	79.682
1014	2014-06-27 04:23:02	179.2	164.5	1014	2014-06-27 04:23:23	79.808	79.286	1014	2014-06-27 04:23:52	79.628	79.646
1015	2014-06-27 04:24:02	179.2	164.5	1015	2014-06-27 04:24:23	79.808	79.232	1015	2014-06-27 04:24:52	79.592	79.682
1016	2014-06-27 04:25:02	179.2	164.5	1016	2014-06-27 04:25:23	79.808	79.286	1016	2014-06-27 04:25:52	79.7	79.7
1017	2014-06-27 04:26:02	179.2	164.5	1017	2014-06-27 04:26:23	79.808	79.286	1017	2014-06-27 04:26:52	79.574	79.646
1018	2014-06-27 04:27:02	179.2	164.5	1018	2014-06-27 04:27:23	79.808	79.286	1018	2014-06-27 04:27:52	79.646	79.682
1019	2014-06-27 04:28:02	179.2	164.5	1019	2014-06-27 04:28:23	79.808	79.286	1019	2014-06-27 04:28:52	79.628	79.646
1020	2014-06-27 04:29:02	179.2	164.5	1020	2014-06-27 04:29:23	79.916	79.394	1020	2014-06-27 04:29:52	79.646	79.7
1021	2014-06-27 04:30:02	179.2	164.5	1021	2014-06-27 04:30:23	79.808	79.286	1021	2014-06-27 04:30:52	79.628	79.682
1022	2014-06-27 04:31:02	179.2	164.5	1022	2014-06-27 04:31:23	79.808	79.286	1022	2014-06-27 04:31:52	79.628	79.628
1023	2014-06-27 04:32:02	179.15	164.45	1023	2014-06-27 04:32:23	79.808	79.286	1023	2014-06-27 04:32:52	79.628	79.7
1024	2014-06-27 04:33:02	179.15	164.45	1024	2014-06-27 04:33:23	79.808	79.232	1024	2014-06-27 04:33:52	79.592	79.628
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1030	2014-06-27 04:39:02	179.15	164.45	1030	2014-06-27 04:39:23	79.808	79.286	1030	2014-06-27 04:39:52	79.682	79.646
1031	2014-06-27 04:40:02	179.15	164.45	1031	2014-06-27 04:40:23	79.808	79.322	1031	2014-06-27 04:40:52	79.592	79.628
1032	2014-06-27 04:41:02	179.15	164.45	1032	2014-06-27 04:41:23	79.808	79.322	1032	2014-06-27 04:41:52	79.646	79.646
1033	2014-06-27 04:42:02	179.15	164.45	1033	2014-06-27 04:42:23	79.808	79.322	1033	2014-06-27 04:42:52	79.592	79.646

1034	2014-06-27 04:43:02	179.1	164.4	1034	2014-06-27 04:43:23	79.808	79.286	1034	2014-06-27 04:43:52	79.682	79.646
1035	2014-06-27 04:44:02	179.1	164.4	1035	2014-06-27 04:44:23	79.808	79.286	1035	2014-06-27 04:44:52	79.682	79.592
1036	2014-06-27 04:45:02	179.1	164.4	1036	2014-06-27 04:45:23	79.808	79.286	1036	2014-06-27 04:45:52	79.628	79.646
1037	2014-06-27 04:46:02	179.1	164.4	1037	2014-06-27 04:46:23	79.808	79.286	1037	2014-06-27 04:46:52	79.646	79.7
1038	2014-06-27 04:47:02	179.1	164.4	1038	2014-06-27 04:47:23	79.808	79.286	1038	2014-06-27 04:47:52	79.592	79.646
1039	2014-06-27 04:48:02	179.1	164.4	1039	2014-06-27 04:48:23	79.808	79.286	1039	2014-06-27 04:48:52	79.682	79.736
1040	2014-06-27 04:49:02	179.1	164.4	1040	2014-06-27 04:49:23	79.808	79.286	1040	2014-06-27 04:49:52	79.592	79.682
1041	2014-06-27 04:50:02	179.1	164.4	1041	2014-06-27 04:50:23	79.808	79.286	1041	2014-06-27 04:50:52	79.646	79.646
1042	2014-06-27 04:51:02	179.1	164.4	1042	2014-06-27 04:51:23	79.808	79.322	1042	2014-06-27 04:51:52	79.646	79.682
1043	2014-06-27 04:52:02	179.1	164.4	1043	2014-06-27 04:52:23	79.808	79.286	1043	2014-06-27 04:52:52	79.682	79.7
1044	2014-06-27 04:53:02	179.1	164.4	1044	2014-06-27 04:53:23	79.808	79.286	1044	2014-06-27 04:53:52	79.646	79.682
1045	2014-06-27 04:54:02	179.05	164.35	1045	2014-06-27 04:54:23	79.808	79.286	1045	2014-06-27 04:54:52	79.646	79.682
1046	2014-06-27 04:55:02	179.05	164.35	1046	2014-06-27 04:55:23	79.808	79.286	1046	2014-06-27 04:55:52	79.592	79.646
1047	2014-06-27 04:56:02	179.05	164.35	1047	2014-06-27 04:56:23	79.808	79.286	1047	2014-06-27 04:56:52	79.646	79.7
1048	2014-06-27 04:57:02	179.05	164.35	1048	2014-06-27 04:57:23	79.808	79.286	1048	2014-06-27 04:57:52	79.646	79.628
1049	2014-06-27 04:58:02	179.05	164.35	1049	2014-06-27 04:58:23	79.808	79.286	1049	2014-06-27 04:58:52	79.682	79.7
1050	2014-06-27 04:59:02	179.05	164.35	1050	2014-06-27 04:59:23	79.808	79.322	1050	2014-06-27 04:59:52	79.628	79.7
1051	2014-06-27 05:00:02	179.05	164.35	1051	2014-06-27 05:00:23	79.808	79.322	1051	2014-06-27 05:00:52	79.682	79.754
1052	2014-06-27 05:01:02	179.05	164.35	1052	2014-06-27 05:01:23	79.808	79.322	1052	2014-06-27 05:01:52	79.682	79.7
1053	2014-06-27 05:02:02	179.05	164.35	1053	2014-06-27 05:02:23	79.808	79.322	1053	2014-06-27 05:02:52	79.646	79.628
1054	2014-06-27 05:03:02	179.05	164.35	1054	2014-06-27 05:03:23	79.808	79.286	1054	2014-06-27 05:03:52	79.628	79.7
1055	2014-06-27 05:04:02	179.05	164.35	1055	2014-06-27 05:04:23	79.808	79.286	1055	2014-06-27 05:04:52	79.682	79.736
1056	2014-06-27 05:05:02	179.05	164.35	1056	2014-06-27 05:05:23	79.808	79.322	1056	2014-06-27 05:05:52	79.628	79.7
1057	2014-06-27 05:06:02	179.05	164.35	1057	2014-06-27 05:06:23	79.808	79.286	1057	2014-06-27 05:06:52	79.628	79.7
1058	2014-06-27 05:07:02	179.05	164.35	1058	2014-06-27 05:07:23	79.808	79.322	1058	2014-06-27 05:07:52	79.592	79.646
1059	2014-06-27 05:08:02	179.05	164.35	1059	2014-06-27 05:08:23	79.808	79.322	1059	2014-06-27 05:08:52	79.574	79.646
1060	2014-06-27 05:09:02	179.05	164.35	1060	2014-06-27 05:09:23	79.808	79.286	1060	2014-06-27 05:09:52	79.592	79.682
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1062	2014-06-27 05:11:02	179	164.3	1062	2014-06-27 05:11:23	79.808	79.322	1062	2014-06-27 05:11:52	79.7	79.628
1063	2014-06-27 05:12:02	179	164.3	1063	2014-06-27 05:12:23	79.808	79.322	1063	2014-06-27 05:12:52	79.628	79.7
1064	2014-06-27 05:13:02	179	164.3	1064	2014-06-27 05:13:23	79.808	79.322	1064	2014-06-27 05:13:52	79.646	79.682
1065	2014-06-27 05:14:02	179	164.3	1065	2014-06-27 05:14:23	79.808	79.322	1065	2014-06-27 05:14:52	79.574	79.628
1066	2014-06-27 05:15:02	179	164.3	1066	2014-06-27 05:15:23	79.808	79.322	1066	2014-06-27 05:15:52	79.628	79.682
1067	2014-06-27 05:16:02	179	164.3	1067	2014-06-27 05:16:23	79.808	79.322	1067	2014-06-27 05:16:52	79.574	79.7
1068	2014-06-27 05:17:02	179	164.3	1068	2014-06-27 05:17:23	79.808	79.322	1068	2014-06-27 05:17:52	79.628	79.7
1069	2014-06-27 05:18:02	179	164.3	1069	2014-06-27 05:18:23	79.808	79.322	1069	2014-06-27 05:18:52	79.628	79.7
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1071	2014-06-27 05:20:02	179	164.3	1071	2014-06-27 05:20:23	79.808	79.286	1071	2014-06-27 05:20:52	79.628	79.646
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1073	2014-06-27 05:22:02	179	164.3	1073	2014-06-27 05:22:23	79.808	79.322	1073	2014-06-27 05:22:52	79.628	79.7
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1075	2014-06-27 05:24:02	179	164.3	1075	2014-06-27 05:24:23	79.808	79.322	1075	2014-06-27 05:24:52	79.574	79.7
1076	2014-06-27 05:25:02	178.95	164.25	1076	2014-06-27 05:25:23	79.808	79.322	1076	2014-06-27 05:25:52	79.592	79.592
1077	2014-06-27 05:26:02	178.95	164.25	1077	2014-06-27 05:26:23	79.808	79.286	1077	2014-06-27 05:26:52	79.592	79.646
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1079	2014-06-27 05:28:02	178.95	164.25	1079	2014-06-27 05:28:23	79.808	79.322	1079	2014-06-27 05:28:52	79.592	79.646
1080	2014-06-27 05:29:02	178.95	164.25	1080	2014-06-27 05:29:23	79.808	79.322	1080	2014-06-27 05:29:52	79.574	79.682
1081	2014-06-27 05:30:02	178.95	164.25	1081	2014-06-27 05:30:23	79.808	79.322	1081	2014-06-27 05:30:52	79.646	79.646
1082	2014-06-27 05:31:02	178.95	164.25	1082	2014-06-27 05:31:23	79.808	79.322	1082	2014-06-27 05:31:52	79.646	79.646
1083	2014-06-27 05:32:02	178.95	164.25	1083	2014-06-27 05:32:23	79.808	79.286	1083	2014-06-27 05:32:52	79.628	79.682
1084	2014-06-27 05:33:02	178.95	164.25	1084	2014-06-27 05:33:23	79.808	79.322	1084	2014-06-27 05:33:52	79.592	79.736
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1086	2014-06-27 05:35:02	178.95	164.25	1086	2014-06-27 05:35:23	79.808	79.322	1086	2014-06-27 05:35:52	79.556	79.682
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1089	2014-06-27 05:38:02	178.9	164.2	1089	2014-06-27 05:38:23	79.808	79.376	1089	2014-06-27 05:38:52	79.592	79.628
1090	2014-06-27 05:39:02	178.9	164.2	1090	2014-06-27 05:39:23	79.808	79.322	1090	2014-06-27 05:39:52	79.592	79.646
1091	2014-06-27 05:40:02	178.9	164.2	1091	2014-06-27 05:40:23	79.808	79.322	1091	2014-06-27 05:40:52	79.628	79.628
1092	2014-06-27 05:41:02	178.9	164.2	1092	2014-06-27 05:41:23	79.808	79.322	1092	2014-06-27 05:41:52	79.628	79.682
1093	2014-06-27 05:42:02	178.9	164.2	1093	2014-06-27 05:42:23	79.808	79.376	1093	2014-06-27 05:42:52	79.628	79.682
1094	2014-06-27 05:43:02	178.9	164.2	1094	2014-06-27 05:43:23	79.808	79.322	1094	2014-06-27 05:43:52	79.574	79.646
1095	2014-06-27 05:44:02	178.85	164.15	1095	2014-06-27 05:44:23	79.808	79.376	1095	2014-06-27 05:44:52	79.646	79.682
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1100	2014-06-27 05:49:02	178.85	164.15	1100	2014-06-27 05:49:23	79.808	79.322	1100	2014-06-27 05:49:52	79.646	79.7
1101	2014-06-27 05:50:02	178.85	164.15	1101	2014-06-27 05:50:23	79.808	79.376	1101	2014-06-27 05:50:52	79.592	79.646
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1103	2014-06-27 05:52:02	178.85	164.15	1103	2014-06-27 05:52:23	79.808	79.376	1103	2014-06-27 05:52:52	79.628	79.682
1104	2014-06-27 05:53:02	178.85	164.15	1104	2014-06-27 05:53:23	79.808	79.376	1104	2014-06-27 05:53:52	79.592	79.646
1105	2014-06-27 05:54:02	178.85	164.15	1105	2014-06-27 05:54:23	79.808	79.376	1105	2014-06-27 05:54:52	79.592	79.646
1106	2014-06-27 05:55:02	178.85	164.15	1106	2014-06-27 05:55:23	79.808	79.376	1106	2014-06-27 05:55:52	79.538	79.646
1107	2014-06-27 05:56:02	178.85	164.15	1107	2014-06-27 05:56:23	79.808	79.376	1107	2014-06-27 05:56:52	79.628	79.736
1108	2014-06-27 05:57:02	178.85	164.15	1108	2014-06-27 05:57:23	79.808	79.322	1108	2014-06-27 05:57:52	79.592	79.7
1109	2014-06-27 05:58:02	178.85	164.15	1109	2014-06-27 05:58:23	79.808	79.322	1109	2014-06-27 05:58:52	79.556	79.7
1110	2014-06-27 05:59:02	178.85	164.15	1110	2014-06-27 05:59:23	79.808	79.376	1110	2014-06-27 05:59:52	79.628	79.646
1111	2014-06-27 06:00:02	178.8	164.1	1111	2014-06-27 06:00:23	79.808	79.376	1111	2014-06-27 06:00:52	79.592	79.736
1112	2014-06-27 06:01:02	178.85	164.15	1112	2014-06-27 06:01:23	79.808	79.376	1112	2014-06-27 06:01:52	79.646	79.682
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1114	2014-06-27 06:03:02	178.8	164.1	1114	2014-06-27 06:03:23	79.808	79.322	1114	2014-06-27 06:03:52	79.592	79.646
1115	2014-06-27 06:04:02	178.8	164.1	1115	2014-06-27 06:04:23	79.808	79.376	1115	2014-06-27 06:04:52	79.592	79.628
1116	2014-06-27 06:05:02	178.8	164.1	1116	2014-06-27 06:05:23	79.808	79.322	1116	2014-06-27 06:05:52	79.592	79.628
1117	2014-06-27 06:06:02	178.8	164.1	1117	2014-06-27 06:06:23	79.808	79.322	1117	2014-06-27 06:06:52	79.556	79.682
1118	2014-06-27 06:07:02	178.8	164.1	1118	2014-06-27 06:07:23	79.808	79.376	1118	2014-06-27 06:07:52	79.646	79.682
1119	2014-06-27 06:08:02	178.75	164.05	1119	2014-06-27 06:08:23	79.808	79.322	1119	2014-06-27 06:08:52	79.628	79.646
1120	2014-06-27 06:09:02	178.8	164.1	1120	2014-06-27 06:09:23	79.808	79.376	1120	2014-06-27 06:09:52	79.628	79.7
1121	2014-06-27 06:10:02	178.8	164.1	1121	2014-06-27 06:10:23	79.7	79.268	1121	2014-06-27 06:10:52	79.592	79.7
1122	2014-06-27 06:11:02	178.8	164.1	1122	2014-06-27 06:11:23	79.808	79.376	1122	2014-06-27 06:11:52	79.592	79.646
1123	2014-06-27 06:12:02	178.8	164.1	1123	2014-06-27 06:12:23	79.808	79.322	1123	2014-06-27 06:12:52	79.628	79.646
1124	2014-06-27 06:13:02	178.75	164.05	1124	2014-06-27 06:13:23	79.808	79.376	1124	2014-06-27 06:13:52	79.592	79.628
1125	2014-06-27 06:14:02	178.75	164.05	1125	2014-06-27 06:14:23	79.7	79.268	1125	2014-06-27 06:14:52	79.628	79.7
1126	2014-06-27 06:15:02	178.75	164.05	1126	2014-06-27 06:15:23	79.808	79.376	1126	2014-06-27 06:15:52	79.556	79.682
1127	2014-06-27 06:16:02	178.75	164.05	1127	2014-06-27 06:16:23	79.808	79.376	1127	2014-06-27 06:16:52	79.592	79.646
1128	2014-06-27 06:17:02	178.75	164.05	1128	2014-06-27 06:17:23	79.808	79.376	1128	2014-06-27 06:17:52	79.646	79.7

1129	2014-06-27 06:18:02	178.75	164.05	1129	2014-06-27 06:18:23	79.808	79.376	1129	2014-06-27 06:18:52	79.592	79.682
1130	2014-06-27 06:19:02	178.75	164.05	1130	2014-06-27 06:19:23	79.808	79.376	1130	2014-06-27 06:19:52	79.592	79.7
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1132	2014-06-27 06:21:02	178.75	164.05	1132	2014-06-27 06:21:23	79.7	79.268	1132	2014-06-27 06:21:52	79.592	79.646
1133	2014-06-27 06:22:02	178.75	164.05	1133	2014-06-27 06:22:23	79.808	79.412	1133	2014-06-27 06:22:52	79.592	79.628
1134	2014-06-27 06:23:02	178.75	164.05	1134	2014-06-27 06:23:23	79.808	79.412	1134	2014-06-27 06:23:52	79.628	79.682
1135	2014-06-27 06:24:02	178.7	164	1135	2014-06-27 06:24:23	79.808	79.376	1135	2014-06-27 06:24:52	79.556	79.682
1136	2014-06-27 06:25:02	178.7	164	1136	2014-06-27 06:25:23	79.808	79.376	1136	2014-06-27 06:25:52	79.574	79.628
1137	2014-06-27 06:26:02	178.7	164	1137	2014-06-27 06:26:23	79.7	79.268	1137	2014-06-27 06:26:52	79.687	79.628
1138	2014-06-27 06:27:02	178.75	164.05	1138	2014-06-27 06:27:23	79.7	79.268	1138	2014-06-27 06:27:52	79.646	79.628
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1140	2014-06-27 06:29:02	178.7	164	1140	2014-06-27 06:29:23	79.808	79.376	1140	2014-06-27 06:29:52	79.628	79.646
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1143	2014-06-27 06:32:02	178.7	164	1143	2014-06-27 06:32:23	79.808	79.376	1143	2014-06-27 06:32:52	79.682	79.682
1144	2014-06-27 06:33:02	178.65	163.95	1144	2014-06-27 06:33:23	79.808	79.376	1144	2014-06-27 06:33:52	79.628	79.646
1145	2014-06-27 06:34:02	178.7	164	1145	2014-06-27 06:34:23	79.808	79.412	1145	2014-06-27 06:34:52	79.628	79.682
1146	2014-06-27 06:35:02	178.7	164	1146	2014-06-27 06:35:23	79.808	79.376	1146	2014-06-27 06:35:52	79.592	79.7
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1157	2014-06-27 06:46:02	178.65	163.95	1157	2014-06-27 06:46:23	79.808	79.376	1157	2014-06-27 06:46:52	79.592	79.628
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1168	2014-06-27 06:57:02	178.6	163.9	1168	2014-06-27 06:57:23	79.808	79.412	1168	2014-06-27 06:57:52	79.628	79.646
1169	2014-06-27 06:58:02	178.6	163.9	1169	2014-06-27 06:58:23	79.7	79.268	1169	2014-06-27 06:58:52	79.628	79.7
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1173	2014-06-27 07:02:02	178.6	163.9	1173	2014-06-27 07:02:23	79.808	79.412	1173	2014-06-27 07:02:52	79.592	79.7
1174	2014-06-27 07:03:02	178.55	163.85	1174	2014-06-27 07:03:23	79.808	79.376	1174	2014-06-27 07:03:52	79.628	79.646
1175	2014-06-27 07:04:02	178.6	163.9	1175	2014-06-27 07:04:23	79.7	79.268	1175	2014-06-27 07:04:52	79.592	79.7
1176	2014-06-27 07:05:02	178.55	163.85	1176	2014-06-27 07:05:23	79.7	79.268	1176	2014-06-27 07:05:52	79.628	79.646
1177	2014-06-27 07:06:02	178.6	163.9	1177	2014-06-27 07:06:23	79.808	79.412	1177	2014-06-27 07:06:52	79.628	79.682
1178	2014-06-27 07:07:02	178.55	163.85	1178	2014-06-27 07:07:23	79.808	79.412	1178	2014-06-27 07:07:52	79.628	79.646
1179	2014-06-27 07:08:02	178.55	163.85	1179	2014-06-27 07:08:23	79.808	79.412	1179	2014-06-27 07:08:52	79.574	79.682
1180	2014-06-27 07:09:02	178.55	163.85	1180	2014-06-27 07:09:23	79.7	79.268	1180	2014-06-27 07:09:52	79.628	79.736
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1182	2014-06-27 07:11:02	178.55	163.85	1182	2014-06-27 07:11:23	79.7	79.268	1182	2014-06-27 07:11:52	79.592	79.646
1183	2014-06-27 07:12:02	178.55	163.85	1183	2014-06-27 07:12:23	79.7	79.304	1183	2014-06-27 07:12:52	79.592	79.628
1184	2014-06-27 07:13:02	178.55	163.85	1184	2014-06-27 07:13:23	79.808	79.412	1184	2014-06-27 07:13:52	79.592	79.682
1185	2014-06-27 07:14:02	178.55	163.85	1185	2014-06-27 07:14:23	79.808	79.412	1185	2014-06-27 07:14:52	79.556	79.628
1186	2014-06-27 07:15:02	178.55	163.85	1186	2014-06-27 07:15:23	79.808	79.412	1186	2014-06-27 07:15:52	79.628	79.628
1187	2014-06-27 07:16:02	178.5	163.8	1187	2014-06-27 07:16:23	79.808	79.448	1187	2014-06-27 07:16:52	79.592	79.682
1188	2014-06-27 07:17:02	178.5	163.8	1188	2014-06-27 07:17:23	79.808	79.412	1188	2014-06-27 07:17:52	79.646	79.7
1189	2014-06-27 07:18:02	178.5	163.8	1189	2014-06-27 07:18:23	79.808	79.412	1189	2014-06-27 07:18:52	79.556	79.646
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1191	2014-06-27 07:20:02	178.5	163.8	1191	2014-06-27 07:20:23	79.808	79.376	1191	2014-06-27 07:20:52	79.628	79.628
1192	2014-06-27 07:21:02	178.5	163.8	1192	2014-06-27 07:21:23	79.7	79.304	1192	2014-06-27 07:21:52	79.646	79.646
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1195	2014-06-27 07:24:02	178.5	163.8	1195	2014-06-27 07:24:23	79.808	79.412	1195	2014-06-27 07:24:52	79.646	79.646
1196	2014-06-27 07:25:02	178.5	163.8	1196	2014-06-27 07:25:23	79.808	79.412	1196	2014-06-27 07:25:52	79.646	79.628
1197	2014-06-27 07:26:02	178.5	163.8	1197	2014-06-27 07:26:23	79.808	79.376	1197	2014-06-27 07:26:52	79.592	79.628
1198	2014-06-27 07:27:02	178.5	163.8	1198	2014-06-27 07:27:23	79.7	79.304	1198	2014-06-27 07:27:52	79.7	79.646
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1200	2014-06-27 07:29:02	178.5	163.8	1200	2014-06-27 07:29:23	79.7	79.304	1200	2014-06-27 07:29:52	79.682	79.646
1201	2014-06-27 07:30:02	178.5	163.8	1201	2014-06-27 07:30:23	79.808	79.412	1201	2014-06-27 07:30:52	79.682	79.736
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1203	2014-06-27 07:32:02	178.45	163.75	1203	2014-06-27 07:32:23	79.7	79.304	1203	2014-06-27 07:32:52	79.736	79.646
1204	2014-06-27 07:33:02	178.45	163.75	1204	2014-06-27 07:33:23	79.808	79.412	1204	2014-06-27 07:33:52	79.682	79.682
1205	2014-06-27 07:34:02	178.5	163.8	1205	2014-06-27 07:34:23	79.7	79.304	1205	2014-06-27 07:34:52	79.592	79.646
1206	2014-06-27 07:35:02	178.45	163.75	1206	2014-06-27 07:35:23	79.7	79.304	1206	2014-06-27 07:35:52	79.682	79.7
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1212	2014-06-27 07:41:02	178.45	163.75	1212	2014-06-27 07:41:23	79.7	79.268	1212	2014-06-27 07:41:52	79.646	79.646
1213	2014-06-27 07:42:02	178.45	163.75	1213	2014-06-27 07:42:23	79.7	79.304	1213	2014-06-27 07:42:52	79.7	79.682
1214	2014-06-27 07:43:02	178.45	163.75	1214	2014-06-27 07:43:23	79.7	79.304	1214	2014-06-27 07:43:52	79.682	79.7
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1218	2014-06-27 07:47:02	178.45	163.75	1218	2014-06-27 07:47:23	79.808	79.412	1218	2014-06-27 07:47:52	79.646	79.736
1219	2014-06-27 07:48:02	178.45	163.75	1219	2014-06-27 07:48:23	79.7	79.304	1219	2014-06-27 07:48:52	79.646	79.736
1220	2014-06-27 07:49:02	178.45	163.75	1220	2014-06-27 07:49:23	79.808	79.412	1220	2014-06-27 07:49:52	79.628	79.646
1221	2014-06-27 07:50:02	178.45	163.75	1221	2014-06-27 07:50:23	79.7	79.304	1221	2014-06-27 07:50:52	79.592	79.682
1222	2014-06-27 07:51:02	178.45	163.75	1222	2014-06-27 07:51:23	79.7	79.304	1222	2014-06-27 07:51:52	79.628	79.682
1223	2014-06-27 07:52:02	178.4	163.7	1223	2014-06-27 07:52:23	79.808	79.448	1223	2014-06-27 07:52:52	79.646	79.646

1224	2014-06-27 07:53:02	178.4	163.7	1224	2014-06-27 07:53:23	79.808	79.412	1224	2014-06-27 07:53:52	79.736	79.682
1225	2014-06-27 07:54:02	178.4	163.7	1225	2014-06-27 07:54:23	79.7	79.304	1225	2014-06-27 07:54:52	79.682	79.7
1226	2014-06-27 07:55:02	178.4	163.7	1226	2014-06-27 07:55:23	79.808	79.412	1226	2014-06-27 07:55:52	79.687	79.646
1227	2014-06-27 07:56:02	178.4	163.7	1227	2014-06-27 07:56:23	79.7	79.304	1227	2014-06-27 07:56:52	79.7	79.7
1228	2014-06-27 07:57:02	178.4	163.7	1228	2014-06-27 07:57:23	79.808	79.448	1228	2014-06-27 07:57:52	79.7	79.7
1229	2014-06-27 07:58:02	178.4	163.7	1229	2014-06-27 07:58:23	79.808	79.412	1229	2014-06-27 07:58:52	79.718	79.682
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1231	2014-06-27 08:00:02	178.4	163.7	1231	2014-06-27 08:00:23	79.808	79.412	1231	2014-06-27 08:00:52	79.682	79.682
1232	2014-06-27 08:01:02	178.4	163.7	1232	2014-06-27 08:01:23	79.7	79.304	1232	2014-06-27 08:01:52	79.718	79.7
1233	2014-06-27 08:02:02	178.35	163.65	1233	2014-06-27 08:02:23	79.808	79.448	1233	2014-06-27 08:02:52	79.736	79.736
1234	2014-06-27 08:03:02	178.4	163.7	1234	2014-06-27 08:03:23	79.7	79.304	1234	2014-06-27 08:03:52	79.736	79.646
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1238	2014-06-27 08:07:02	178.35	163.65	1238	2014-06-27 08:07:23	79.7	79.34	1238	2014-06-27 08:07:52	79.682	79.682
1239	2014-06-27 08:08:02	178.35	163.65	1239	2014-06-27 08:08:23	79.7	79.304	1239	2014-06-27 08:08:52	79.736	79.736
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1241	2014-06-27 08:10:02	178.35	163.65	1241	2014-06-27 08:10:23	79.7	79.304	1241	2014-06-27 08:10:52	79.682	79.682
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1243	2014-06-27 08:12:02	178.35	163.65	1243	2014-06-27 08:12:23	79.808	79.412	1243	2014-06-27 08:12:52	79.682	79.682
1244	2014-06-27 08:13:02	178.35	163.65	1244	2014-06-27 08:13:23	79.808	79.448	1244	2014-06-27 08:13:52	79.574	79.772
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1246	2014-06-27 08:15:02	178.35	163.65	1246	2014-06-27 08:15:23	79.7	79.304	1246	2014-06-27 08:15:52	79.682	79.646
1247	2014-06-27 08:16:02	178.35	163.65	1247	2014-06-27 08:16:23	79.7	79.304	1247	2014-06-27 08:16:52	79.736	79.7
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1255	2014-06-27 08:24:02	178.3	163.6	1255	2014-06-27 08:24:23	79.7	79.34	1255	2014-06-27 08:24:52	79.7	79.682
1256	2014-06-27 08:25:02	178.3	163.6	1256	2014-06-27 08:25:23	79.808	79.448	1256	2014-06-27 08:25:52	79.736	79.682
1257	2014-06-27 08:26:02	178.3	163.6	1257	2014-06-27 08:26:23	79.808	79.412	1257	2014-06-27 08:26:52	79.772	79.736
1258	2014-06-27 08:27:02	178.3	163.6	1258	2014-06-27 08:27:23	79.7	79.304	1258	2014-06-27 08:27:52	79.772	79.736
1259	2014-06-27 08:28:02	178.3	163.6	1259	2014-06-27 08:28:23	79.808	79.448	1259	2014-06-27 08:28:52	79.7	79.682
1260	2014-06-27 08:29:02	178.3	163.6	1260	2014-06-27 08:29:23	79.7	79.304	1260	2014-06-27 08:29:52	79.682	79.754
1261	2014-06-27 08:30:02	178.3	163.6	1261	2014-06-27 08:30:23	79.7	79.34	1261	2014-06-27 08:30:52	79.7	79.754
1262	2014-06-27 08:31:02	178.25	163.55	1262	2014-06-27 08:31:23	79.7	79.304	1262	2014-06-27 08:31:52	79.628	79.7
1263	2014-06-27 08:32:02	178.3	163.6	1263	2014-06-27 08:32:23	79.808	79.448	1263	2014-06-27 08:32:52	79.687	79.7
1264	2014-06-27 08:33:02	178.3	163.6	1264	2014-06-27 08:33:23	79.7	79.304	1264	2014-06-27 08:33:52	79.628	79.7
1265	2014-06-27 08:34:02	178.3	163.6	1265	2014-06-27 08:34:23	79.7	79.34	1265	2014-06-27 08:34:52	79.736	79.7
1266	2014-06-27 08:35:02	178.3	163.6	1266	2014-06-27 08:35:23	79.7	79.34	1266	2014-06-27 08:35:52	79.736	79.7
1267	2014-06-27 08:36:02	178.25	163.55	1267	2014-06-27 08:36:23	79.7	79.34	1267	2014-06-27 08:36:52	79.7	79.754
1268	2014-06-27 08:37:02	178.25	163.55	1268	2014-06-27 08:37:23	79.7	79.34	1268	2014-06-27 08:37:52	79.682	79.754
1269	2014-06-27 08:38:02	178.25	163.55	1269	2014-06-27 08:38:23	79.808	79.412	1269	2014-06-27 08:38:52	79.628	79.736
1270	2014-06-27 08:39:02	178.25	163.55	1270	2014-06-27 08:39:23	79.7	79.34	1270	2014-06-27 08:39:52	79.7	79.772
1271	2014-06-27 08:40:02	178.25	163.55	1271	2014-06-27 08:40:23	79.7	79.304	1271	2014-06-27 08:40:52	79.736	79.772
1272	2014-06-27 08:41:02	178.25	163.55	1272	2014-06-27 08:41:23	79.808	79.448	1272	2014-06-27 08:41:52	79.736	79.754
1273	2014-06-27 08:42:02	178.25	163.55	1273	2014-06-27 08:42:23	79.7	79.34	1273	2014-06-27 08:42:52	79.7	79.682
1274	2014-06-27 08:43:02	178.25	163.55	1274	2014-06-27 08:43:23	79.808	79.412	1274	2014-06-27 08:43:52	79.682	79.754
1275	2014-06-27 08:44:02	178.25	163.55	1275	2014-06-27 08:44:23	79.7	79.34	1275	2014-06-27 08:44:52	79.7	79.736
1276	2014-06-27 08:45:02	178.25	163.55	1276	2014-06-27 08:45:23	79.7	79.34	1276	2014-06-27 08:45:52	79.736	79.754
1277	2014-06-27 08:46:02	178.25	163.55	1277	2014-06-27 08:46:23	79.7	79.34	1277	2014-06-27 08:46:52	79.736	79.718
1278	2014-06-27 08:47:02	178.2	163.5	1278	2014-06-27 08:47:23	79.7	79.34	1278	2014-06-27 08:47:52	79.7	79.754
1279	2014-06-27 08:48:02	178.2	163.5	1279	2014-06-27 08:48:23	79.7	79.34	1279	2014-06-27 08:48:52	79.7	79.754
1280	2014-06-27 08:49:02	178.2	163.5	1280	2014-06-27 08:49:23	79.7	79.304	1280	2014-06-27 08:49:52	79.7	79.7
1281	2014-06-27 08:50:02	178.2	163.5	1281	2014-06-27 08:50:23	79.7	79.34	1281	2014-06-27 08:50:52	79.736	79.646
1282	2014-06-27 08:51:02	178.2	163.5	1282	2014-06-27 08:51:23	79.808	79.448	1282	2014-06-27 08:51:52	79.7	79.772
1283	2014-06-27 08:52:02	178.2	163.5	1283	2014-06-27 08:52:23	79.7	79.34	1283	2014-06-27 08:52:52	79.736	79.772
1284	2014-06-27 08:53:02	178.2	163.5	1284	2014-06-27 08:53:23	79.7	79.34	1284	2014-06-27 08:53:52	79.736	79.7
1285	2014-06-27 08:54:02	178.2	163.5	1285	2014-06-27 08:54:23	79.7	79.34	1285	2014-06-27 08:54:52	79.7	79.7
1286	2014-06-27 08:55:02	178.2	163.5	1286	2014-06-27 08:55:23	79.7	79.34	1286	2014-06-27 08:55:52	79.772	79.754
1287	2014-06-27 08:56:02	178.2	163.5	1287	2014-06-27 08:56:23	79.7	79.304	1287	2014-06-27 08:56:52	79.736	79.772
1288	2014-06-27 08:57:02	178.2	163.5	1288	2014-06-27 08:57:23	79.7	79.304	1288	2014-06-27 08:57:52	79.736	79.7
1289	2014-06-27 08:58:02	178.2	163.5	1289	2014-06-27 08:58:23	79.7	79.34	1289	2014-06-27 08:58:52	79.736	79.754
1290	2014-06-27 08:59:02	178.2	163.5	1290	2014-06-27 08:59:23	79.7	79.34	1290	2014-06-27 08:59:52	79.772	79.772
1291	2014-06-27 09:00:02	178.15	163.45	1291	2014-06-27 09:00:23	79.7	79.34	1291	2014-06-27 09:00:52	79.772	79.754
1292	2014-06-27 09:01:02	178.2	163.5	1292	2014-06-27 09:01:23	79.7	79.34	1292	2014-06-27 09:01:52	79.772	79.772
1293	2014-06-27 09:02:02	178.15	163.45	1293	2014-06-27 09:02:23	79.7	79.34	1293	2014-06-27 09:02:52	79.736	79.718
1294	2014-06-27 09:03:02	178.15	163.45	1294	2014-06-27 09:03:23	79.808	79.412	1294	2014-06-27 09:03:52	79.772	79.718
1295	2014-06-27 09:04:02	178.2	163.5	1295	2014-06-27 09:04:23	79.7	79.34	1295	2014-06-27 09:04:52	79.79	79.754
1296	2014-06-27 09:05:02	178.15	163.45	1296	2014-06-27 09:05:23	79.7	79.34	1296	2014-06-27 09:05:52	79.772	79.736
1297	2014-06-27 09:06:02	178.15	163.45	1297	2014-06-27 09:06:23	79.7	79.34	1297	2014-06-27 09:06:52	79.736	79.718
1298	2014-06-27 09:07:02	178.15	163.45	1298	2014-06-27 09:07:23	79.7	79.34	1298	2014-06-27 09:07:52	79.736	79.772
1299	2014-06-27 09:08:02	178.15	163.45	1299	2014-06-27 09:08:23	79.7	79.394	1299	2014-06-27 09:08:52	79.7	79.7
1300	2014-06-27 09:09:02	178.15	163.45	1300	2014-06-27 09:09:23	79.7	79.34	1300	2014-06-27 09:09:52	79.736	79.718
1301	2014-06-27 09:10:02	178.15	163.45	1301	2014-06-27 09:10:23	79.7	79.34	1301	2014-06-27 09:10:52	79.772	79.772
1302	2014-06-27 09:11:02	178.15	163.45	1302	2014-06-27 09:11:23	79.7	79.34	1302	2014-06-27 09:11:52	79.7	79.772
1303	2014-06-27 09:12:02	178.15	163.45	1303	2014-06-27 09:12:23	79.7	79.34	1303	2014-06-27 09:12:52	79.79	79.754
1304	2014-06-27 09:13:02	178.15	163.45	1304	2014-06-27 09:13:23	79.7	79.34	1304	2014-06-27 09:13:52	79.79	79.754
1305	2014-06-27 09:14:02	178.15	163.45	1305	2014-06-27 09:14:23	79.7	79.34	1305	2014-06-27 09:14:52	79.7	79.772
1306	2014-06-27 09:15:02	178.1	163.4	1306	2014-06-27 09:15:23	79.7	79.34	1306	2014-06-27 09:15:52	79.79	79.808
1307	2014-06-27 09:16:02	178.1	163.4	1307	2014-06-27 09:16:23	79.808	79.448	1307	2014-06-27 09:16:52	79.79	79.7
1308	2014-06-27 09:17:02	178.15	163.45	1308	2014-06-27 09:17:23	79.808	79.448	1308	2014-06-27 09:17:52	79.772	79.772
1309	2014-06-27 09:18:02	178.1	163.4	1309	2014-06-27 09:18:23	79.808	79.448	1309	2014-06-27 09:18:52	79.736	79.772
1310	2014-06-27 09:19:02	178.1	163.4	1310	2014-06-27 09:19:23	79.7	79.34	1310	2014-06-27 09:19:52	79.754	79.754
1311	2014-06-27 09:20:02	178.1	163.4	1311	2014-06-27 09:20:23	79.7	79.34	1311	2014-06-27 09:20:52	79.682	79.772
1312	2014-06-27 09:21:02	178.1	163.4	1312	2014-06-27 09:21:23	79.7	79.34	1312	2014-06-27 09:21:52	79.736	79.808
1313	2014-06-27 09:22:02	178.1	163.4	1313	2014-06-27 09:22:23	79.808	79.448	1313	2014-06-27 09:22:52	79.736	79.718
1314	2014-06-27 09:23:02	178.1	163.4	1314	2014-06-27 09:23:23	79.7	79.34	1314	2014-06-27 09:23:52	79.772	79.754
1315	2014-06-27 09:24:02	178.1	163.4	1315	2014-06-27 09:24:23	79.7	79.34	1315	2014-06-27 09:24:52	79.772	79.718
1316	2014-06-27 09:25:02	178.1	163.4	1316	2014-06-27 09:25:23	79.7	79.34	1316	2014-06-27 09:25:52	79.772	79.718
1317	2014-06-27 09:26:02	178.1	163.4	1317	2014-06-27 09:26:23	79.7	79.34	1317	2014-06-27 09:26:52	79.772	79.808
1318	2014-06-27 09:27:02	178.1	163.4	1318	2014-06-27 09:27:23	79.7	79.34	1318	2014-06-27 09:27:52	79.772	79.718

1319	2014-06-27 09:28:02	178.1	163.4
1320	2014-06-27 09:29:02	34.2	19.5
1321	2014-06-27 09:30:02	13.8	-0.9
1322	2014-06-27 09:31:02	11.65	-3.05
1323	2014-06-27 09:32:02	11.85	-2.85
1324	2014-06-27 09:33:02	12	-2.7
1325	2014-06-27 09:34:02	12.2	-2.5
1326	2014-06-27 09:35:02	12.4	-2.3
1327	2014-06-27 09:36:02	12.5	-2.2
1328	2014-06-27 09:37:02	18	3.3
1329	2014-06-27 09:38:02	14.45	-0.25
1330	2014-06-27 09:39:02	12.45	-2.25
1331	2014-06-27 09:40:02	12	-2.7
1332	2014-06-27 09:41:02	12.15	-2.55
1333	2014-06-27 09:42:02	12.25	-2.45
1334	2014-06-27 09:43:02	12.35	-2.35
1335	2014-06-27 09:44:02	12.45	-2.25
1336	2014-06-27 09:45:02	12.5	-2.2
1337	2014-06-27 09:46:02	12.6	-2.1
1338	2014-06-27 09:47:02	12.65	-2.05
1339	2014-06-27 09:48:02	12.7	-2
1340	2014-06-27 09:49:02	12.75	-1.95
1341	2014-06-27 09:50:02	12.8	-1.9
1342	2014-06-27 09:51:02	12.85	-1.85
1343	2014-06-27 09:52:02	12.9	-1.8
1344	2014-06-27 09:53:02	14.95	0.25
1345	2014-06-27 09:54:02	14.9	0.2

1319	2014-06-27 09:28:23	79.7	79.34
1320	2014-06-27 09:29:23	79.7	79.34
1321	2014-06-27 09:30:23	79.7	79.34
1322	2014-06-27 09:31:23	79.808	79.448
1323	2014-06-27 09:32:23	79.7	79.304
1324	2014-06-27 09:33:23	79.7	79.34
1325	2014-06-27 09:34:23	79.7	79.34
1326	2014-06-27 09:35:23	79.7	2498
1327	2014-06-27 09:36:23	79.7	2498
1328	2014-06-27 09:37:23	79.7	2498
1329	2014-06-27 09:38:23	79.808	2498
1330	2014-06-27 09:39:23	79.808	2498
1331	2014-06-27 09:40:23	80.024	2498
1332	2014-06-27 09:41:23	80.366	2498
1333	2014-06-27 09:42:23	80.708	2498
1334	2014-06-27 09:43:23	81.032	2498
1335	2014-06-27 09:44:23	81.266	2498
1336	2014-06-27 09:45:23	81.5	2498
1337	2014-06-27 09:46:23	81.716	2498
1338	2014-06-27 09:47:23	82.058	2498
1339	2014-06-27 09:48:23	82.274	2498
1340	2014-06-27 09:49:23	82.508	2498
1341	2014-06-27 09:50:23	82.724	2498
1342	2014-06-27 09:51:23	82.958	2498
1343	2014-06-27 09:52:23	82.832	2498
1344	2014-06-27 09:53:23	82.724	2498
1345	2014-06-27 09:54:23	82.508	2498

1319	2014-06-27 09:28:52	79.772	79.718
1320	2014-06-27 09:29:52	79.79	79.772
1321	2014-06-27 09:30:52	79.79	79.772
1322	2014-06-27 09:31:52	79.934	2498
1323	2014-06-27 09:32:52	80.06	80.006
1324	2014-06-27 09:33:52	80.096	80.06
1325			
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Tank 5: 18" Line Test Data

Note: Pressure and temperature readings are listed approximatley every minute.

Device Name: Pr2000
Device Description: Pressure Recorder with LCD Display
Serial Number: N86436
Device ID: Press Unit 2

Location: Flange in Lower Access Tunnel

Reading Number	Date and Time (HST)	Channel 1 Absolute Pressure (PSIA)	Channel 1 Gauge Pressure (PSIG)(A-14.7)
Column1	Column2	Column3	Column4
1	2014-06-25 07:22:17	18.7	2
2	2014-06-25 07:23:17	16.65	1.95
3	2014-06-25 07:24:17	16.65	1.95
4	2014-06-25 07:25:17	16.65	1.95
5	2014-06-25 07:26:17	16.65	1.95
6	2014-06-25 07:27:17	16.6	1.9
7	2014-06-25 07:28:17	16.65	1.95
8	2014-06-25 07:29:17	16.6	1.9
9	2014-06-25 07:30:17	16.6	1.9
10	2014-06-25 07:31:17	23.4	8.7
11	2014-06-25 07:32:17	63.1	48.4
12	2014-06-25 07:33:17	22.4	7.7
13	2014-06-25 07:34:17	30.45	15.75
14	2014-06-25 07:35:17	41.3	26.6
15	2014-06-25 07:36:17	53.2	38.5
16	2014-06-25 07:37:17	60.2	45.5
17	2014-06-25 07:38:17	61.85	47.15
18	2014-06-25 07:39:17	70.75	56.05
19	2014-06-25 07:40:17	117.65	102.95
20	2014-06-25 07:41:17	117.25	102.55
21	2014-06-25 07:42:17	106	91.3
22	2014-06-25 07:43:17	143.2	128.5
23	2014-06-25 07:44:17	178.35	163.65
24	2014-06-25 07:45:17	178.05	163.35
25	2014-06-25 07:46:17	177.85	163.15
26	2014-06-25 07:47:17	177.7	163
27	2014-06-25 07:48:17	177.55	162.85
28	2014-06-25 07:49:17	177.35	162.65
29	2014-06-25 07:50:17	177.25	162.55
30	2014-06-25 07:51:17	177.15	162.45
31	2014-06-25 07:52:17	177	162.3
32	2014-06-25 07:53:17	176.85	162.15
33	2014-06-25 07:54:17	176.75	162.05
34	2014-06-25 07:55:17	176.65	161.95
35	2014-06-25 07:56:17	176.55	161.85
36	2014-06-25 07:57:17	176.45	161.75
37	2014-06-25 07:58:17	174.75	160.05
38	2014-06-25 07:59:17	15.35	0.65
39	2014-06-25 08:00:17	172.65	157.95
40	2014-06-25 08:01:17	165.15	150.45
41	2014-06-25 08:02:17	159.25	144.55
42	2014-06-25 08:03:17	173.35	158.65
43	2014-06-25 08:04:17	173.3	158.6
44	2014-06-25 08:05:17	173.2	158.5
45	2014-06-25 08:06:17	173.15	158.45
46	2014-06-25 08:07:17	178.25	163.55
47	2014-06-25 08:08:17	178.2	163.5
48	2014-06-25 08:09:17	178.1	163.4
49	2014-06-25 08:10:17	178	163.3
50	2014-06-25 08:11:17	177.95	163.25
51	2014-06-25 08:12:17	177.9	163.2
52	2014-06-25 08:13:17	177.85	163.15
53	2014-06-25 08:14:17	177.75	163.05
54	2014-06-25 08:15:17	177.7	163
55	2014-06-25 08:16:17	177.65	162.95
56	2014-06-25 08:17:17	177.55	162.85
57	2014-06-25 08:18:17	177.5	162.8
58	2014-06-25 08:19:17	177.45	162.75
59	2014-06-25 08:20:17	177.35	162.65
60	2014-06-25 08:21:17	177.3	162.6
61	2014-06-25 08:22:17	177.25	162.55
62	2014-06-25 08:23:17	176.05	161.35
63	2014-06-25 08:24:17	175.65	160.95
64	2014-06-25 08:25:17	175.6	160.9
65	2014-06-25 08:26:17	176.5	161.8
66	2014-06-25 08:27:17	177	162.3
67	2014-06-25 08:28:17	65.45	50.75
68	2014-06-25 08:29:17	14.95	0.25
69	2014-06-25 08:30:17	14.95	0.25
70	2014-06-25 08:31:17	14.95	0.25
71	2014-06-25 08:32:17	14.95	0.25
72	2014-06-25 08:33:17	14.95	0.25

Device Name: QuadTemp
Device Description: 4 Channel Thermocouple Temperature Recorder
Serial Number: N86275
Device ID: Temp Unit 2

Location: Lower Access Tunnel

Reading Number	Date and Time (HST)	Channel 2 Thermocouple 1 (Ambient) (°F)	Channel 4 Thermocouple 2 (AG Pipe) (°F)
Column5	Column6	Column7	Column8
1	2014-06-25 07:22:23	81.896	83.066
2	2014-06-25 07:23:23	81.536	82.85
3	2014-06-25 07:24:53	80.87	82.616
4	2014-06-25 07:25:53	80.726	82.472
5	2014-06-25 07:26:53	80.528	82.328
6	2014-06-25 07:27:53	80.492	82.148
7	2014-06-25 07:28:53	80.348	82.058
8	2014-06-25 07:29:53	80.402	81.968
9	2014-06-25 07:30:53	80.33	81.824
10	2014-06-25 07:31:53	80.24	81.662
11	2014-06-25 07:32:53	80.168	81.572
12	2014-06-25 07:33:23	80.186	81.626
13	2014-06-25 07:34:53	80.132	81.41
14	2014-06-25 07:35:53	80.132	81.464
15	2014-06-25 07:36:53	80.078	81.338
16	2014-06-25 07:37:53	80.06	81.302
17	2014-06-25 07:38:53	80.132	81.266
18	2014-06-25 07:39:53	80.096	81.194
19	2014-06-25 07:40:53	80.078	81.176
20	2014-06-25 07:41:53	80.096	81.104
21	2014-06-25 07:42:53	80.078	81.05
22	2014-06-25 07:43:53	80.132	81.014
23	2014-06-25 07:44:53	80.15	81.014
24	2014-06-25 07:45:53	80.186	80.564
25	2014-06-25 07:46:53	80.15	80.438
26	2014-06-25 07:47:53	80.204	80.528
27	2014-06-25 07:48:53	80.15	80.51
28	2014-06-25 07:49:53	80.114	80.51
29	2014-06-25 07:50:53	80.114	80.492
30	2014-06-25 07:51:53	80.114	80.528
31	2014-06-25 07:52:53	80.096	80.492
32	2014-06-25 07:53:53	80.402	80.528
33	2014-06-25 07:54:53	80.402	80.474
34	2014-06-25 07:55:53	80.366	80.438
35	2014-06-25 07:56:53	80.294	80.42
36	2014-06-25 07:57:53	80.186	80.456
37	2014-06-25 07:58:53	80.186	80.384
38	2014-06-25 07:59:53	80.15	80.366
39	2014-06-25 08:00:53	80.06	80.402
40	2014-06-25 08:01:53	80.096	80.366
41	2014-06-25 08:02:53	80.042	80.402
42	2014-06-25 08:03:53	80.006	80.366
43	2014-06-25 08:04:53	80.024	80.366
44	2014-06-25 08:05:53	80.024	80.33
45	2014-06-25 08:06:53	80.024	80.348
46	2014-06-25 08:07:53	79.988	80.33
47	2014-06-25 08:08:53	80.024	80.294
48	2014-06-25 08:09:53	80.024	80.33
49	2014-06-25 08:10:53	80.042	80.33
50	2014-06-25 08:11:53	80.06	80.276
51	2014-06-25 08:12:53	80.024	80.276
52	2014-06-25 08:13:53	80.024	80.276
53	2014-06-25 08:14:53	80.024	80.294
54	2014-06-25 08:15:53	80.078	80.204
55	2014-06-25 08:16:53	80.096	80.294
56	2014-06-25 08:17:53	80.042	80.33
57	2014-06-25 08:18:53	80.096	80.24
58	2014-06-25 08:19:53	80.078	80.276
59	2014-06-25 08:20:53	80.078	80.24
60	2014-06-25 08:21:53	80.078	80.258
61	2014-06-25 08:22:53	80.042	80.222
62	2014-06-25 08:23:53	80.096	80.222
63	2014-06-25 08:24:53	80.042	80.204
64	2014-06-25 08:25:53	80.006	80.204
65	2014-06-25 08:26:53	80.078	80.168
66	2014-06-25 08:27:53	80.042	80.222
67	2014-06-25 08:28:53	80.078	80.222
68	2014-06-25 08:29:53	80.15	80.168
69	2014-06-25 08:30:53	80.024	80.204
70	2014-06-25 08:31:53	80.06	80.276
71	2014-06-25 08:32:53	80.006	80.204
72	2014-06-25 08:33:53	80.024	80.168

Device Name: TCTemp2000
Device Description: Thermocouple Temperature Recorder
Serial Number: N84145
Device ID: Aux Temp 1

Location: Inside Tank 5 on Flange

Reading Number	Date and Time (HST)	Channel 1 Ambient Temperature (°F)	Channel 2 Thermocouple 1 (°F)
Column9	Column10	Column11	Column12
1	2014-06-25 07:22:04	74.966	77.846
2	2014-06-25 07:23:04	75.416	78.692
3	2014-06-25 07:24:34	75.758	79.124
4	2014-06-25 07:25:34	75.974	79.34
5	2014-06-25 07:26:34	76.1	79.376
6	2014-06-25 07:27:34	76.208	79.412
7	2014-06-25 07:28:34	76.55	79.664
8	2014-06-25 07:29:34	76.658	79.628
9	2014-06-25 07:30:34	76.874	79.718
10	2014-06-25 07:31:34	77	79.754
11	2014-06-25 07:32:34	77.108	79.736
12	2014-06-25 07:33:04	77.216	79.754
13	2014-06-25 07:34:34	77.45	79.772
14	2014-06-25 07:35:34	77.45	79.682
15	2014-06-25 07:36:34	77.666	79.808
16	2014-06-25 07:37:34	77.666	79.772
17	2014-06-25 07:38:34	77.774	79.754
18	2014-06-25 07:39:34	77.9	79.826
19	2014-06-25 07:40:34	77.9	79.79
20	2014-06-25 07:41:34	78.008	79.682
21	2014-06-25 07:42:34	78.116	79.61
22	2014-06-25 07:43:34	78.35	79.628
23	2014-06-25 07:44:34	78.458	79.646
24	2014-06-25 07:45:34	78.566	79.574
25	2014-06-25 07:46:34	78.674	79.502
26	2014-06-25 07:47:34	78.908	79.61
27	2014-06-25 07:48:34	79.016	79.592
28	2014-06-25 07:49:34	79.124	79.574
29	2014-06-25 07:50:34	79.25	79.61
30	2014-06-25 07:51:34	79.25	79.52
31	2014-06-25 07:52:34	79.358	79.538
32	2014-06-25 07:53:34	79.358	79.502
33	2014-06-25 07:54:34	79.358	79.412
34	2014-06-25 07:55:34	79.466	79.43
35	2014-06-25 07:56:34	79.466	79.43
36	2014-06-25 07:57:34	79.574	79.448
37	2014-06-25 07:58:34	79.7	79.574
38	2014-06-25 07:59:34	79.7	79.538
39	2014-06-25 08:00:34	79.7	79.484
40	2014-06-25 08:01:34	79.7	79.448
41	2014-06-25 08:02:34	79.808	79.466
42	2014-06-25 08:03:34	79.808	79.466
43	2014-06-25 08:04:34	79.808	79.412
44	2014-06-25 08:05:34	79.916	79.52
45	2014-06-25 08:06:34	79.916	79.484
46	2014-06-25 08:07:34	79.916	79.484
47	2014-06-25 08:08:34	79.916	79.484
48	2014-06-25 08:09:34	79.916	79.394
49	2014-06-25 08:10:34	80.024	79.502
50	2014-06-25 08:11:34	79.916	79.304
51	2014-06-25 08:12:34	79.916	79.268
52	2014-06-25 08:13:34	80.024	79.412
53	2014-06-25 08:14:34	80.024	79.412
54	2014-06-25 08:15:34	80.024	79.376
55	2014-06-25 08:16:34	80.024	79.376
56	2014-06-25 08:17:34	80.024	79.376
57	2014-06-25 08:18:34	80.024	79.376
58	2014-06-25 08:19:34	80.15	79.448
59	2014-06-25 08:20:34	80.15	79.412
60	2014-06-25 08:21:34	80.15	79.376
61	2014-06-25 08:22:34	80.15	79.376
62	2014-06-25 08:23:34	80.258	79.34
63	2014-06-25 08:24:34	80.258	79.124
64	2014-06-25 08:25:34	80.366	79.016
65	2014-06-25 08:26:34	80.366	78.89
66	2014-06-25 08:27:34	80.366	78.89
67	2014-06-25 08:28:34	80.366	78.98
68	2014-06-25 08:29:34	80.366	78.98
69	2014-06-25 08:30:34	80.366	78.98
70	2014-06-25 08:31:34	80.474	79.088
71	2014-06-25 08:32:34	80.474	79.034
72	2014-06-25 08:33:34	80.474	78.998

73	2014-06-25 08:34:17	15	0.3	73	2014-06-25 08:34:53	80.024	80.15	73	2014-06-25 08:34:34	80.366	78.836
74	2014-06-25 08:35:17	17.65	2.95	74	2014-06-25 08:35:53	80.024	80.204	74	2014-06-25 08:35:34	80.366	78.836
75	2014-06-25 08:36:17	18.95	4.25	75	2014-06-25 08:36:53	80.042	80.222	75	2014-06-25 08:36:34	80.474	78.908
76	2014-06-25 08:37:17	18.85	4.15	76	2014-06-25 08:37:53	79.988	80.168	76	2014-06-25 08:37:34	80.366	78.8
77	2014-06-25 08:38:17	18.85	4.15	77	2014-06-25 08:38:53	79.952	80.15	77	2014-06-25 08:38:34	80.474	78.908
78	2014-06-25 08:39:17	18.8	4.1	78	2014-06-25 08:39:53	79.952	80.15	78	2014-06-25 08:39:34	80.366	78.746
79	2014-06-25 08:40:17	18.75	4.05	79	2014-06-25 08:40:53	79.934	80.168	79	2014-06-25 08:40:34	80.474	78.854
80	2014-06-25 08:41:17	18.7	4	80	2014-06-25 08:41:53	79.88	80.132	80	2014-06-25 08:41:34	80.474	78.818
81	2014-06-25 08:42:17	18.7	4	81	2014-06-25 08:42:53	79.934	80.132	81	2014-06-25 08:42:34	80.474	78.818
82	2014-06-25 08:43:17	18.65	3.95	82	2014-06-25 08:43:53	79.898	80.06	82	2014-06-25 08:43:34	80.474	78.818
83	2014-06-25 08:44:17	18.65	3.95	83	2014-06-25 08:44:53	79.862	80.132	83	2014-06-25 08:44:34	80.474	78.908
84	2014-06-25 08:45:17	18.6	3.9	84	2014-06-25 08:45:53	79.862	80.096	84	2014-06-25 08:45:34	80.474	78.944
85	2014-06-25 08:46:17	18.6	3.9	85	2014-06-25 08:46:53	79.88	80.132	85	2014-06-25 08:46:34	80.474	79.034
86	2014-06-25 08:47:17	18.6	3.9	86	2014-06-25 08:47:53	79.88	80.096	86	2014-06-25 08:47:34	80.474	79.034
87	2014-06-25 08:48:17	18.55	3.85	87	2014-06-25 08:48:53	79.952	80.186	87	2014-06-25 08:48:34	80.474	79.088
88	2014-06-25 08:49:17	18.6	3.9	88	2014-06-25 08:49:53	79.952	80.096	88	2014-06-25 08:49:34	80.6	79.16
89	2014-06-25 08:50:17	92.25	77.55	89	2014-06-25 08:50:53	79.916	80.132	89	2014-06-25 08:50:34	80.6	79.214
90	2014-06-25 08:51:17	176.05	161.35	90	2014-06-25 08:51:53	79.952	80.078	90	2014-06-25 08:51:34	80.6	79.214
91	2014-06-25 08:52:17	176	161.3	91	2014-06-25 08:52:53	79.952	80.132	91	2014-06-25 08:52:34	80.6	79.25
92	2014-06-25 08:53:17	175.9	161.2	92	2014-06-25 08:53:53	79.934	80.096	92	2014-06-25 08:53:34	80.6	79.34
93	2014-06-25 08:54:17	179.5	164.8	93	2014-06-25 08:54:53	80.006	80.096	93	2014-06-25 08:54:34	80.6	79.376
94	2014-06-25 08:55:17	179.45	164.75	94	2014-06-25 08:55:53	79.988	80.078	94	2014-06-25 08:55:34	80.6	79.376
95	2014-06-25 08:56:17	179.4	164.7	95	2014-06-25 08:56:53	80.006	80.132	95	2014-06-25 08:56:34	80.6	79.376
96	2014-06-25 08:57:17	182.4	167.7	96	2014-06-25 08:57:53	80.006	80.132	96	2014-06-25 08:57:34	80.6	79.43
97	2014-06-25 08:58:17	182.35	167.65	97	2014-06-25 08:58:53	80.042	80.078	97	2014-06-25 08:58:34	80.6	79.43
98	2014-06-25 08:59:17	182.3	167.6	98	2014-06-25 08:59:53	79.988	80.096	98	2014-06-25 08:59:34	80.6	79.466
99	2014-06-25 09:00:17	182.2	167.5	99	2014-06-25 09:00:53	80.006	80.006	99	2014-06-25 09:00:34	80.6	79.52
100	2014-06-25 09:01:17	182.2	167.5	100	2014-06-25 09:01:53	79.952	80.078	100	2014-06-25 09:01:34	80.474	79.43
101	2014-06-25 09:02:17	182.15	167.45	101	2014-06-25 09:02:53	79.952	80.042	101	2014-06-25 09:02:34	80.474	79.394
102	2014-06-25 09:03:17	182.05	167.35	102	2014-06-25 09:03:53	79.988	80.096	102	2014-06-25 09:03:34	80.6	79.556
103	2014-06-25 09:04:17	182	167.3	103	2014-06-25 09:04:53	79.988	80.042	103	2014-06-25 09:04:34	80.6	79.52
104	2014-06-25 09:05:17	181.95	167.25	104	2014-06-25 09:05:53	80.078	80.15	104	2014-06-25 09:05:34	80.6	79.466
105	2014-06-25 09:06:17	181.9	167.2	105	2014-06-25 09:06:53	80.15	80.24	105	2014-06-25 09:06:34	80.6	79.43
106	2014-06-25 09:07:17	181.85	167.15	106	2014-06-25 09:07:53	80.096	80.258	106	2014-06-25 09:07:34	80.6	79.43
107	2014-06-25 09:08:17	181.8	167.1	107	2014-06-25 09:08:53	80.204	80.258	107	2014-06-25 09:08:34	80.708	79.484
108	2014-06-25 09:09:17	181.75	167.05	108	2014-06-25 09:09:53	80.15	80.312	108	2014-06-25 09:09:34	80.708	79.412
109	2014-06-25 09:10:17	181.7	167	109	2014-06-25 09:10:53	80.168	80.258	109	2014-06-25 09:10:34	80.816	79.376
110	2014-06-25 09:11:17	181.65	166.95	110	2014-06-25 09:11:53	80.096	80.312	110	2014-06-25 09:11:34	80.816	79.34
111	2014-06-25 09:12:17	181.65	166.95	111	2014-06-25 09:12:53	80.114	80.366	111	2014-06-25 09:12:34	80.816	79.34
112	2014-06-25 09:13:17	181.55	166.85	112	2014-06-25 09:13:53	80.168	80.294	112	2014-06-25 09:13:34	80.816	79.34
113	2014-06-25 09:14:17	181.45	166.75	113	2014-06-25 09:14:53	80.078	80.366	113	2014-06-25 09:14:34	80.816	79.376
114	2014-06-25 09:15:17	181.4	166.7	114	2014-06-25 09:15:53	80.114	80.294	114	2014-06-25 09:15:34	80.816	79.376
115	2014-06-25 09:16:17	181.4	166.7	115	2014-06-25 09:16:53	79.97	80.33	115	2014-06-25 09:16:34	80.816	79.43
116	2014-06-25 09:17:17	181.4	166.7	116	2014-06-25 09:17:53	80.024	80.33	116	2014-06-25 09:17:34	80.816	79.376
117	2014-06-25 09:18:17	181.35	166.65	117	2014-06-25 09:18:53	79.97	80.276	117	2014-06-25 09:18:34	80.816	79.376
118	2014-06-25 09:19:17	181.3	166.6	118	2014-06-25 09:19:53	80.024	80.294	118	2014-06-25 09:19:34	80.816	79.376
119	2014-06-25 09:20:17	181.3	166.6	119	2014-06-25 09:20:53	80.168	80.546	119	2014-06-25 09:20:34	80.816	79.34
120	2014-06-25 09:21:17	181.25	166.55	120	2014-06-25 09:21:53	80.348	81.248	120	2014-06-25 09:21:34	80.816	79.376
121	2014-06-25 09:22:17	181.25	166.55	121	2014-06-25 09:22:53	80.492	80.708	121	2014-06-25 09:22:34	80.708	79.268
122	2014-06-25 09:23:17	181.2	166.5	122	2014-06-25 09:23:53	80.546	80.798	122	2014-06-25 09:23:34	80.816	79.376
123	2014-06-25 09:24:17	181.1	166.4	123	2014-06-25 09:24:53	80.474	80.744	123	2014-06-25 09:24:34	80.816	79.376
124	2014-06-25 09:25:17	181.05	166.35	124	2014-06-25 09:25:53	80.474	80.708	124	2014-06-25 09:25:34	80.816	79.376
125	2014-06-25 09:26:17	181	166.3	125	2014-06-25 09:26:53	80.384	80.708	125	2014-06-25 09:26:34	80.708	79.322
126	2014-06-25 09:27:17	180.95	166.25	126	2014-06-25 09:27:53	80.33	80.654	126	2014-06-25 09:27:34	80.708	79.322
127	2014-06-25 09:28:17	180.95	166.25	127	2014-06-25 09:28:53	80.33	80.636	127	2014-06-25 09:28:34	80.816	79.466
128	2014-06-25 09:29:17	180.9	166.2	128	2014-06-25 09:29:53	80.222	80.636	128	2014-06-25 09:29:34	80.708	79.358
129	2014-06-25 09:30:17	180.85	166.15	129	2014-06-25 09:30:53	80.294	80.564	129	2014-06-25 09:30:34	80.816	79.376
130	2014-06-25 09:31:17	180.85	166.15	130	2014-06-25 09:31:53	80.294	80.582	130	2014-06-25 09:31:34	80.708	79.232
131	2014-06-25 09:32:17	180.8	166.1	131	2014-06-25 09:32:53	80.222	80.6	131	2014-06-25 09:32:34	80.708	79.232
132	2014-06-25 09:33:17	180.8	166.1	132	2014-06-25 09:33:53	80.222	80.546	132	2014-06-25 09:33:34	80.816	79.376
133	2014-06-25 09:34:17	180.8	166.1	133	2014-06-25 09:34:53	80.186	80.546	133	2014-06-25 09:34:34	80.816	79.376
134	2014-06-25 09:35:17	180.75	166.05	134	2014-06-25 09:35:53	80.186	80.528	134	2014-06-25 09:35:34	80.708	79.322
135	2014-06-25 09:36:17	180.75	166.05	135	2014-06-25 09:36:53	80.15	80.546	135	2014-06-25 09:36:34	80.816	79.376
136	2014-06-25 09:37:17	180.7	166	136	2014-06-25 09:37:53	80.06	80.438	136	2014-06-25 09:37:34	80.816	79.34
137	2014-06-25 09:38:17	180.65	165.95	137	2014-06-25 09:38:53	79.988	80.474	137	2014-06-25 09:38:34	80.816	79.34
138	2014-06-25 09:39:17	180.65	165.95	138	2014-06-25 09:39:53	80.042	80.474	138	2014-06-25 09:39:34	80.708	79.322
139	2014-06-25 09:40:17	180.6	165.9	139	2014-06-25 09:40:53	79.988	80.42	139	2014-06-25 09:40:34	80.708	79.358
140	2014-06-25 09:41:17	180.55	165.85	140	2014-06-25 09:41:53	79.988	80.438	140	2014-06-25 09:41:34	80.708	79.448
141	2014-06-25 09:42:17	180.55	165.85	141	2014-06-25 09:42:53	79.988	80.402	141	2014-06-25 09:42:34	80.708	79.484
142	2014-06-25 09:43:17	180.55	165.85	142	2014-06-25 09:43:53	79.934	80.42	142	2014-06-25 09:43:34	80.6	79.466
143	2014-06-25 09:44:17	180.5	165.8	143	2014-06-25 09:44:53	79.97	80.366	143	2014-06-25 09:44:34	80.6	79.61
144	2014-06-25 09:45:17	180.45	165.75	144	2014-06-25 09:45:53	79.916	80.366	144	2014-06-25 09:45:34	80.6	79.646
145	2014-06-25 09:46:17	180.45	165.75	145	2014-06-25 09:46:53	79.934	80.33	145	2014-06-25 09:46:34	80.474	79.61
146	2014-06-25 09:47:17	180.4	165.7	146	2014-06-25 09:47:53	79.898	80.312	146	2014-06-25 09:47:34	80.474	79.646
147	2014-06-25 09:48:17	180.4	165.7	147	2014-06-25 09:48:53	79.88	80.33	147	2014-06-25 09:48:34	80.474	79.646
148	2014-06-25 09:49:17	180.35	165.65	148	2014-06-25 09:49:53	79.97	80.33	148	2014-06-25 09:49:34	80.366	79.592
149	2014-06-25 09:50:17	180.35	165.65	149	2014-06-25 09:50:53	79.88	80.33	149	2014-06-25 09:50:34	80.366	79.628
150	2014-06-25 09:51:17	180.3	165.6	150	2014-06-25 09:51:53	79.88	80.276	150	2014-06-25 09:51:34	80.366	79.682
151	2014-06-25 09:52:17	180.3	165.6	151	2014-06-25 09:52:53	79.952	80.258	151	2014-06-25 09:52:34	80.366	79.718
152	2014-06-25 09:53:17	180.25	165.55	152	2014-06-25 09:53:53	79.88	80.24	152	2014-06-25 09:53:34	80.366	79.718
153	2014-06-25 09:54:17	180.25	165.55	153	2014-06-25 09:54:53	79.898	80.276	153	2014-06-25 09:54:34	80.366	79.718
154	2014-06-25 09:55:17	180.2	165.5	154	2014-06-25 09:55:53	79.88	80.204	154	2014-06-25 09:55:34	80.258	79.646
155	2014-06-25 09:56:17	180.2	165.5	155	2014-06-25 09:56:53	79.88	80.222	155	2014-06-25 09:56:34	80.366	79.754

156	2014-06-25 09:57:17	180.2	165.5
157	2014-06-25 09:58:17	180.15	165.45
158	2014-06-25 09:59:17	180.1	165.4
159	2014-06-25 10:00:17	180.1	165.4
160	2014-06-25 10:01:17	180	165.3
161	2014-06-25 10:02:17	179.85	165.15
162	2014-06-25 10:03:17	179.75	165.05
163	2014-06-25 10:04:17	179.65	164.95
164	2014-06-25 10:05:17	179.55	164.85
165	2014-06-25 10:06:17	179.35	164.65
166	2014-06-25 10:07:17	179.2	164.5
167	2014-06-25 10:08:17	179.05	164.35
168	2014-06-25 10:09:17	178.8	164.1
169	2014-06-25 10:10:17	178.7	164
170	2014-06-25 10:11:17	178.45	163.75
171	2014-06-25 10:12:17	178.25	163.55
172	2014-06-25 10:13:17	178.1	163.4
173	2014-06-25 10:14:17	177.95	163.25
174	2014-06-25 10:15:17	177.85	163.15
175	2014-06-25 10:16:17	177.55	162.85
176	2014-06-25 10:17:17	177.35	162.65
177	2014-06-25 10:18:17	177.15	162.45
178	2014-06-25 10:19:17	176.7	162
179	2014-06-25 10:20:17	176.45	161.75
180	2014-06-25 10:21:17	176.15	161.45
181	2014-06-25 10:22:17	176	161.3
182	2014-06-25 10:23:17	176	161.3
183	2014-06-25 10:24:17	175.95	161.25
184	2014-06-25 10:25:17	175.95	161.25
185	2014-06-25 10:26:17	175.95	161.25
186	2014-06-25 10:27:17	175.9	161.2
187	2014-06-25 10:28:17	175.9	161.2
188	2014-06-25 10:29:17	175.85	161.15
189	2014-06-25 10:30:17	175.85	161.15
190	2014-06-25 10:31:17	175.8	161.1
191	2014-06-25 10:32:17	175.8	161.1
192	2014-06-25 10:33:17	175.8	161.1
193	2014-06-25 10:34:17	175.75	161.05
194	2014-06-25 10:35:17	175.75	161.05
195	2014-06-25 10:36:17	175.75	161.05
196	2014-06-25 10:37:17	75.5	60.8
197	2014-06-25 10:38:17	42.9	28.2
198	2014-06-25 10:39:17	26.35	11.65
199	2014-06-25 10:40:17	19.75	5.05
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201	2014-06-25 10:42:17	15	0.3
202	2014-06-25 10:43:17	14.55	-0.15
203	2014-06-25 10:44:17	14.6	-0.1
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205	2014-06-25 10:46:17	14.6	-0.1
206	2014-06-25 10:47:17	14.65	-0.05
207	2014-06-25 10:48:17	14.65	-0.05
208	2014-06-25 10:49:17	14.6	-0.1
209	2014-06-25 10:50:17	14.6	-0.1
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211	2014-06-25 10:52:17	14.6	-0.1
212	2014-06-25 10:53:17	14.65	-0.05
213	2014-06-25 10:54:17	18	3.3
214	2014-06-25 10:55:17	18.1	3.4
215	2014-06-25 10:56:17	18.15	3.45
216	2014-06-25 10:57:17	18.2	3.5
217	2014-06-25 10:58:17	18.25	3.55
218	2014-06-25 10:59:17	18.25	3.55
219	2014-06-25 11:00:17	18.25	3.55
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221	2014-06-25 11:02:17	18.3	3.6
222	2014-06-25 11:03:17	18.3	3.6
223	2014-06-25 11:04:17	18.3	3.6
224	2014-06-25 11:05:17	18.3	3.6
225	2014-06-25 11:06:17	18.3	3.6
226	2014-06-25 11:07:17	18.3	3.6
227	2014-06-25 11:08:17	18.35	3.65
228	2014-06-25 11:09:17	18.35	3.65
229	2014-06-25 11:10:17	18.35	3.65
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233	2014-06-25 11:14:17	18.35	3.65
234	2014-06-25 11:15:17	18.35	3.65
235	2014-06-25 11:16:17	18.35	3.65
236	2014-06-25 11:17:17	18.35	3.65
237	2014-06-25 11:18:17	18.35	3.65
238	2014-06-25 11:19:17	18.35	3.65

156	2014-06-25 09:57:53	79.916	80.168
157	2014-06-25 09:58:53	79.862	80.186
158	2014-06-25 09:59:53	79.826	80.168
159	2014-06-25 10:00:53	79.862	80.168
160	2014-06-25 10:01:53	79.844	80.168
161	2014-06-25 10:02:53	79.862	80.15
162	2014-06-25 10:03:53	79.808	80.15
163	2014-06-25 10:04:53	79.772	80.204
164	2014-06-25 10:05:53	79.844	80.132
165	2014-06-25 10:06:53	79.79	80.15
166	2014-06-25 10:07:53	79.844	80.096
167	2014-06-25 10:08:53	79.79	80.096
168	2014-06-25 10:09:53	79.79	80.096
169	2014-06-25 10:10:53	79.826	80.078
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172	2014-06-25 10:13:53	79.79	80.096
173	2014-06-25 10:14:53	79.772	80.06
174	2014-06-25 10:15:53	79.79	80.006
175	2014-06-25 10:16:53	79.79	80.042
176	2014-06-25 10:17:53	79.772	80.042
177	2014-06-25 10:18:53	79.79	80.024
178	2014-06-25 10:19:53	79.808	80.024
179	2014-06-25 10:20:53	79.916	80.006
180	2014-06-25 10:21:53	79.808	79.97
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182	2014-06-25 10:23:53	79.808	80.024
183	2014-06-25 10:24:53	79.844	80.06
184	2014-06-25 10:25:53	79.844	80.006
185	2014-06-25 10:26:53	79.754	80.024
186	2014-06-25 10:27:53	79.754	80.078
187	2014-06-25 10:28:53	79.79	80.024
188	2014-06-25 10:29:53	79.808	79.97
189	2014-06-25 10:30:53	79.79	80.024
190	2014-06-25 10:31:53	79.772	79.916
191	2014-06-25 10:32:53	79.826	79.97
192	2014-06-25 10:33:53	79.79	79.97
193	2014-06-25 10:34:53	79.844	79.952
194	2014-06-25 10:35:53	79.79	79.97
195	2014-06-25 10:36:53	79.862	80.006
196	2014-06-25 10:37:53	79.916	79.952
197	2014-06-25 10:38:53	79.808	79.952
198	2014-06-25 10:39:53	79.88	79.952
199	2014-06-25 10:40:53	79.826	79.97
200	2014-06-25 10:41:53	79.916	79.97
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202	2014-06-25 10:43:53	79.916	79.97
203	2014-06-25 10:44:53	79.844	80.024
204	2014-06-25 10:45:53	79.862	80.024
205	2014-06-25 10:46:53	79.826	79.952
206	2014-06-25 10:47:53	79.772	80.006
207	2014-06-25 10:48:53	79.844	80.006
208	2014-06-25 10:49:53	79.826	79.952
209	2014-06-25 10:50:53	79.826	79.916
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211	2014-06-25 10:52:53	79.808	79.97
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213	2014-06-25 10:54:53	79.772	79.97
214	2014-06-25 10:55:53	79.79	79.916
215	2014-06-25 10:56:53	79.754	79.862
216	2014-06-25 10:57:53	79.754	79.88
217	2014-06-25 10:58:53	79.754	79.988
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221	2014-06-25 11:02:53	79.754	79.952
222	2014-06-25 11:03:53	79.772	79.916
223	2014-06-25 11:04:53	79.754	79.844
224	2014-06-25 11:05:53	79.772	79.898
225	2014-06-25 11:06:53	79.718	79.88
226	2014-06-25 11:07:53	79.754	79.88
227	2014-06-25 11:08:53	79.754	79.88
228	2014-06-25 11:09:53	79.718	79.934
229	2014-06-25 11:10:53	79.7	79.898
230	2014-06-25 11:11:53	79.754	79.898
231	2014-06-25 11:12:53	79.736	79.844
232	2014-06-25 11:13:53	79.718	79.88
233	2014-06-25 11:14:53	79.718	79.898
234	2014-06-25 11:15:53	79.7	79.898
235	2014-06-25 11:16:53	79.718	79.88
236	2014-06-25 11:17:53	79.736	79.88
237	2014-06-25 11:18:53	79.754	79.844
238	2014-06-25 11:19:53	79.736	79.844

156	2014-06-25 09:57:34	80.258	79.646
157	2014-06-25 09:58:34	80.258	79.736
158	2014-06-25 09:59:34	80.258	79.736
159	2014-06-25 10:00:34	80.15	79.628
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161	2014-06-25 10:02:34	80.15	79.682
162	2014-06-25 10:03:34	80.15	79.718
163	2014-06-25 10:04:34	80.15	79.718
164	2014-06-25 10:05:34	80.15	79.772
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166	2014-06-25 10:07:34	80.15	79.772
167	2014-06-25 10:08:34	80.15	79.772
168	2014-06-25 10:09:34	80.15	79.772
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171	2014-06-25 10:12:34	80.15	79.808
172	2014-06-25 10:13:34	80.15	79.844
173	2014-06-25 10:14:34	80.15	79.844
174	2014-06-25 10:15:34	80.15	79.898
175	2014-06-25 10:16:34	80.15	79.934
176	2014-06-25 10:17:34	80.15	80.024
177	2014-06-25 10:18:34	80.15	80.078
178	2014-06-25 10:19:34	80.15	80.114
179	2014-06-25 10:20:34	80.024	80.024
180	2014-06-25 10:21:34	80.024	80.078
181	2014-06-25 10:22:34	80.024	80.078
182	2014-06-25 10:23:34	80.024	80.114
183	2014-06-25 10:24:34	80.024	80.168
184	2014-06-25 10:25:34	80.024	80.168
185	2014-06-25 10:26:34	80.024	80.114
186	2014-06-25 10:27:34	80.15	80.33
187	2014-06-25 10:28:34	80.15	80.33
188	2014-06-25 10:29:34	80.15	80.384
189	2014-06-25 10:30:34	80.15	80.384
190	2014-06-25 10:31:34	80.024	80.294
191	2014-06-25 10:32:34	80.024	80.294
192	2014-06-25 10:33:34	80.024	80.294
193	2014-06-25 10:34:34	80.024	80.33
194	2014-06-25 10:35:34	80.024	80.294
195	2014-06-25 10:36:34	80.024	80.33
196	2014-06-25 10:37:34	80.15	80.51
197	2014-06-25 10:38:34	80.024	80.42
198	2014-06-25 10:39:34	80.15	80.294
199	2014-06-25 10:40:34	80.15	80.204
200	2014-06-25 10:41:34	80.258	80.312
201	2014-06-25 10:42:34	80.258	80.312
202	2014-06-25 10:43:34	80.258	87.872
203	2014-06-25 10:44:34	80.366	80.294
204	2014-06-25 10:45:34	80.366	80.33
205	2014-06-25 10:46:34	80.366	80.24
206	2014-06-25 10:47:34	80.474	80.348
207	2014-06-25 10:48:34	80.474	80.312
208	2014-06-25 10:49:34	80.474	80.312
209	2014-06-25 10:50:34	80.474	80.258
210	2014-06-25 10:51:34	80.474	79.862
211	2014-06-25 10:52:34	80.366	79.988
212	2014-06-25 10:53:34	80.474	80.096
213	2014-06-25 10:54:34	80.474	80.348
214	2014-06-25 10:55:34	80.474	80.348
215	2014-06-25 10:56:34	80.474	80.402
216	2014-06-25 10:57:34	80.474	80.438
217	2014-06-25 10:58:34	80.474	80.402
218	2014-06-25 10:59:34	80.474	80.438
219	2014-06-25 11:00:34	80.474	80.438
220	2014-06-25 11:01:34	80.474	80.438
221	2014-06-25 11:02:34	80.474	80.438
222	2014-06-25 11:03:34	80.474	80.438
223	2014-06-25 11:04:34	80.474	80.474
224	2014-06-25 11:05:34	80.474	80.528
225	2014-06-25 11:06:34	80.474	80.564
226	2014-06-25 11:07:34	80.474	80.564
227	2014-06-25 11:08:34	80.474	80.618
228	2014-06-25 11:09:34	80.474	80.618
229	2014-06-25 11:10:34	80.474	80.654
230	2014-06-25 11:11:34	80.474	77.234
231	2014-06-25 11:12:34	80.474	76.226
232	2014-06-25 11:13:34	80.474	75.794
233	2014-06-25 11:14:34	80.474	75.794
234	2014-06-25 11:15:34	80.474	76.046
235	2014-06-25 11:16:34	80.366	76.424
236	2014-06-25 11:17:34	80.366	77.036
237	2014-06-25 11:18:34	80.366	77.522
238	2014-06-25 11:19:34	80.366	77.882

239	2014-06-25 11:20:17	18.35	3.65	239	2014-06-25 11:20:53	79.736	79.844	239	2014-06-25 11:20:34	80.366	78.134
240	2014-06-25 11:21:17	18.35	3.65	240	2014-06-25 11:21:53	79.718	79.844	240	2014-06-25 11:21:34	80.258	78.206
241	2014-06-25 11:22:17	18.35	3.65	241	2014-06-25 11:22:53	79.754	79.826	241	2014-06-25 11:22:34	80.258	78.422
242	2014-06-25 11:23:17	18.4	3.7	242	2014-06-25 11:23:53	79.736	79.898	242	2014-06-25 11:23:34	80.258	78.638
243	2014-06-25 11:24:17	18.4	3.7	243	2014-06-25 11:24:53	79.718	79.844	243	2014-06-25 11:24:34	80.258	78.782
244	2014-06-25 11:25:17	18.4	3.7	244	2014-06-25 11:25:53	79.718	79.844	244	2014-06-25 11:25:34	80.258	78.944
245	2014-06-25 11:26:17	18.35	3.65	245	2014-06-25 11:26:53	79.736	79.88	245	2014-06-25 11:26:34	80.258	79.124
246	2014-06-25 11:27:17	18.35	3.65	246	2014-06-25 11:27:53	79.772	79.88	246	2014-06-25 11:27:34	80.258	79.25
247	2014-06-25 11:28:17	18.4	3.7	247	2014-06-25 11:28:53	79.772	79.808	247	2014-06-25 11:28:34	80.258	79.394
248	2014-06-25 11:29:17	18.4	3.7	248	2014-06-25 11:29:53	79.736	79.808	248	2014-06-25 11:29:34	80.15	79.376
249	2014-06-25 11:30:17	18.4	3.7	249	2014-06-25 11:30:53	79.718	79.79	249	2014-06-25 11:30:34	80.15	79.448
250	2014-06-25 11:31:17	18.4	3.7	250	2014-06-25 11:31:53	79.736	79.826	250	2014-06-25 11:31:34	80.258	79.61
251	2014-06-25 11:32:17	18.4	3.7	251	2014-06-25 11:32:53	79.79	79.844	251	2014-06-25 11:32:34	80.15	79.538
252	2014-06-25 11:33:17	18.4	3.7	252	2014-06-25 11:33:53	79.79	79.88	252	2014-06-25 11:33:34	80.15	79.592
253	2014-06-25 11:34:17	18.4	3.7	253	2014-06-25 11:34:53	79.736	79.844	253	2014-06-25 11:34:34	80.15	79.628
254	2014-06-25 11:35:17	18.4	3.7	254	2014-06-25 11:35:53	79.79	79.88	254	2014-06-25 11:35:34	80.15	79.628
255	2014-06-25 11:36:17	18.4	3.7	255	2014-06-25 11:36:53	79.718	79.826	255	2014-06-25 11:36:34	80.15	79.682
256	2014-06-25 11:37:17	18.4	3.7	256	2014-06-25 11:37:53	79.808	79.826	256	2014-06-25 11:37:34	80.15	79.718
257	2014-06-25 11:38:17	18.4	3.7	257	2014-06-25 11:38:53	79.736	79.826	257	2014-06-25 11:38:34	80.15	79.772
258	2014-06-25 11:39:17	18.4	3.7	258	2014-06-25 11:39:53	79.79	79.826	258	2014-06-25 11:39:34	80.15	79.772
259	2014-06-25 11:40:17	18.4	3.7	259	2014-06-25 11:40:53	79.772	79.88	259	2014-06-25 11:40:34	80.15	79.808
260	2014-06-25 11:41:17	18.4	3.7	260	2014-06-25 11:41:53	79.808	79.88	260	2014-06-25 11:41:34	80.15	79.844
261	2014-06-25 11:42:17	18.4	3.7	261	2014-06-25 11:42:53	79.772	79.844	261	2014-06-25 11:42:34	80.024	79.718
262	2014-06-25 11:43:17	18.4	3.7	262	2014-06-25 11:43:53	79.772	79.826	262	2014-06-25 11:43:34	80.024	79.718
263	2014-06-25 11:44:17	18.4	3.7	263	2014-06-25 11:44:53	79.772	79.826	263	2014-06-25 11:44:34	80.024	79.718
264	2014-06-25 11:45:17	18.4	3.7	264	2014-06-25 11:45:53	79.736	79.826	264	2014-06-25 11:45:34	80.024	79.988
265	2014-06-25 11:46:17	18.4	3.7	265	2014-06-25 11:46:53	79.772	79.808	265	2014-06-25 11:46:34	80.024	80.024
266	2014-06-25 11:47:17	18.4	3.7	266	2014-06-25 11:47:53	79.772	79.826	266	2014-06-25 11:47:34	80.024	80.024
267	2014-06-25 11:48:17	18.4	3.7	267	2014-06-25 11:48:53	79.736	79.826	267	2014-06-25 11:48:34	80.024	80.078
268	2014-06-25 11:49:17	18.4	3.7	268	2014-06-25 11:49:53	79.718	79.808	268	2014-06-25 11:49:34	80.024	79.952
269	2014-06-25 11:50:17	18.4	3.7	269	2014-06-25 11:50:53	79.826	79.808	269	2014-06-25 11:50:34	80.024	79.898
270	2014-06-25 11:51:17	18.4	3.7	270	2014-06-25 11:51:53	79.754	79.826	270	2014-06-25 11:51:34	80.024	79.718
271	2014-06-25 11:52:17	18.4	3.7	271	2014-06-25 11:52:53	79.772	79.826	271	2014-06-25 11:52:34	80.024	79.322
272	2014-06-25 11:53:17	18.45	3.75	272	2014-06-25 11:53:53	79.772	79.826	272	2014-06-25 11:53:34	80.024	79.286
273	2014-06-25 11:54:17	18.4	3.7	273	2014-06-25 11:54:53	79.736	79.808	273	2014-06-25 11:54:34	80.024	79.016
274	2014-06-25 11:55:17	18.4	3.7	274	2014-06-25 11:55:53	79.772	79.808	274	2014-06-25 11:55:34	80.024	79.106
275	2014-06-25 11:56:17	18.45	3.75	275	2014-06-25 11:56:53	79.772	79.844	275	2014-06-25 11:56:34	80.024	79.286
276	2014-06-25 11:57:17	18.4	3.7	276	2014-06-25 11:57:53	79.736	79.826	276	2014-06-25 11:57:34	80.024	79.376
277	2014-06-25 11:58:17	18.4	3.7	277	2014-06-25 11:58:53	79.718	79.808	277	2014-06-25 11:58:34	80.024	79.466
278	2014-06-25 11:59:17	18.4	3.7	278	2014-06-25 11:59:53	79.772	79.826	278	2014-06-25 11:59:34	80.024	79.556
279	2014-06-25 12:00:17	18.4	3.7	279	2014-06-25 12:00:53	79.736	79.826	279	2014-06-25 12:00:34	80.024	79.592
280	2014-06-25 12:01:17	18.4	3.7	280	2014-06-25 12:01:53	79.808	79.826	280	2014-06-25 12:01:34	80.024	79.646
281	2014-06-25 12:02:17	18.4	3.7	281	2014-06-25 12:02:53	79.736	79.826	281	2014-06-25 12:02:34	80.024	79.682
282	2014-06-25 12:03:17	18.45	3.75	282	2014-06-25 12:03:53	79.808	79.826	282	2014-06-25 12:03:34	80.024	79.682
283	2014-06-25 12:04:17	18.4	3.7	283	2014-06-25 12:04:53	79.772	79.898	283	2014-06-25 12:04:34	80.024	79.718
284	2014-06-25 12:05:17	18.45	3.75	284	2014-06-25 12:05:53	79.772	79.808	284	2014-06-25 12:05:34	80.024	79.718
285	2014-06-25 12:06:17	18.45	3.75	285	2014-06-25 12:06:53	79.772	79.808	285	2014-06-25 12:06:34	80.024	79.718
286	2014-06-25 12:07:17	18.5	3.8	286	2014-06-25 12:07:53	79.772	79.808	286	2014-06-25 12:07:34	80.024	79.772
287	2014-06-25 12:08:17	18.5	3.8	287	2014-06-25 12:08:53	79.736	79.862	287	2014-06-25 12:08:34	80.024	79.952
288	2014-06-25 12:09:17	18.5	3.8	288	2014-06-25 12:09:53	79.808	79.808	288	2014-06-25 12:09:34	80.024	79.952
289	2014-06-25 12:10:17	18.5	3.8	289	2014-06-25 12:10:53	79.754	79.862	289	2014-06-25 12:10:34	79.916	79.844
290	2014-06-25 12:11:17	18.5	3.8	290	2014-06-25 12:11:53	79.754	79.862	290	2014-06-25 12:11:34	80.024	79.898
291	2014-06-25 12:12:17	18.5	3.8	291	2014-06-25 12:12:53	79.808	79.826	291	2014-06-25 12:12:34	80.024	79.988
292	2014-06-25 12:13:17	18.7	4	292	2014-06-25 12:13:53	79.862	79.862	292	2014-06-25 12:13:34	80.024	80.078
293	2014-06-25 12:14:17	22.6	7.9	293	2014-06-25 12:14:53	79.862	79.808	293	2014-06-25 12:14:34	79.916	79.916
294	2014-06-25 12:15:17	19.65	4.95	294	2014-06-25 12:15:53	79.862	79.88	294	2014-06-25 12:15:34	79.916	79.88
295	2014-06-25 12:16:17	18.65	3.95	295	2014-06-25 12:16:53	79.862	79.808	295	2014-06-25 12:16:34	80.024	79.898
296	2014-06-25 12:17:17	18.5	3.8	296	2014-06-25 12:17:53	79.898	79.934	296	2014-06-25 12:17:34	80.024	-134.194
297	2014-06-25 12:18:17	16.95	2.25	297	2014-06-25 12:18:53	80.024	79.916	297	2014-06-25 12:18:34	80.024	2498
298	2014-06-25 12:19:17	16.55	1.85	298	2014-06-25 12:19:53	80.024	79.952	298	2014-06-25 12:19:34	80.024	79.718
299	2014-06-25 12:20:17	20.1	5.4	299	2014-06-25 12:20:53	79.952	80.006	299	2014-06-25 12:20:34	80.15	80.078
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301	2014-06-25 12:22:17	30.55	15.85	301	2014-06-25 12:22:53	80.024	80.024	301	2014-06-25 12:22:34	80.258	80.006
302	2014-06-25 12:23:17	43.15	28.45	302	2014-06-25 12:23:53	79.988	80.006	302	2014-06-25 12:23:34	80.258	80.186
303	2014-06-25 12:24:17	57.45	42.75	303	2014-06-25 12:24:53	79.97	79.934	303	2014-06-25 12:24:34	80.258	80.258
304	2014-06-25 12:25:17	61.15	46.45	304	2014-06-25 12:25:53	79.97	79.97	304	2014-06-25 12:25:34	80.258	80.042
305	2014-06-25 12:26:17	62.05	47.35	305	2014-06-25 12:26:53	79.97	79.934	305	2014-06-25 12:26:34	80.258	80.006
306	2014-06-25 12:27:17	62.95	48.25	306	2014-06-25 12:27:53	79.934	79.934	306	2014-06-25 12:27:34	80.258	80.132
307	2014-06-25 12:28:17	63.45	48.75	307	2014-06-25 12:28:53	79.97	80.006	307	2014-06-25 12:28:34	80.258	80.222
308	2014-06-25 12:29:17	76.6	61.9	308	2014-06-25 12:29:53	79.898	80.006	308	2014-06-25 12:29:34	80.258	80.258
309	2014-06-25 12:30:17	100	85.3	309	2014-06-25 12:30:53	79.898	80.006	309	2014-06-25 12:30:34	80.258	80.348
310	2014-06-25 12:31:17	131.8	117.1	310	2014-06-25 12:31:53	79.934	79.988	310	2014-06-25 12:31:34	80.258	80.348
311	2014-06-25 12:32:17	168.4	153.7	311	2014-06-25 12:32:53	79.988	79.934	311	2014-06-25 12:32:34	80.258	80.312
312	2014-06-25 12:33:17	180.15	165.45	312	2014-06-25 12:33:53	79.952	79.97	312	2014-06-25 12:33:34	80.258	80.258
313	2014-06-25 12:34:17	180	165.3	313	2014-06-25 12:34:53	79.898	79.898	313	2014-06-25 12:34:34	80.258	80.258
314	2014-06-25 12:35:17	179.9	165.2	314	2014-06-25 12:35:53	79.898	79.934	314	2014-06-25 12:35:34	80.258	80.312
315	2014-06-25 12:36:17	179.8	165.1	315	2014-06-25 12:36:53	79.934	79.988	315	2014-06-25 12:36:34	80.15	80.15
316	2014-06-25 12:37:17	179.75	165.05	316	2014-06-25 12:37:53	79.988	79.952	316	2014-06-25 12:37:34	80.15	80.15
317	2014-06-25 12:38:17	179.65	164.95	317	2014-06-25 12:38:53	80.114	79.97	317	2014-06-25 12:38:34	80.15	80.15
318	2014-06-25 12:39:17	179.6	164.9	318	2014-06-25 12:39:53	79.952	79.97	318	2014-06-25 12:39:34	80.15	80.15
319	2014-06-25 12:40:17	179.55	164.85	319	2014-06-25 12:40:53	79.97	79.97	319	2014-06-25 12:40:34	80.258	80.222
320	2014-06-25 12:41:17	179.5	164.8	320	2014-06-25 12:41:53	79.916	79.97	320	2014-06-25 12:41:34	80.258	80.222
321	2014-06-25 12:42:17	179.45	164.75	321	2014-06-25 12:42:53	79.97	79.97	321	2014-06-25 12:42:34	80.258	80.222

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325	2014-06-25 12:46:17	180.7	166
326	2014-06-25 12:47:17	180.65	165.95
327	2014-06-25 12:48:17	180.6	165.9
328	2014-06-25 12:49:17	180.55	165.85
329	2014-06-25 12:50:17	180.55	165.85
330	2014-06-25 12:51:17	180.5	165.8
331	2014-06-25 12:52:17	180.45	165.75
332	2014-06-25 12:53:17	180.45	165.75
333	2014-06-25 12:54:17	180.4	165.7
334	2014-06-25 12:55:17	180.35	165.65
335	2014-06-25 12:56:17	180.3	165.6
336	2014-06-25 12:57:17	180.3	165.6
337	2014-06-25 12:58:17	180.25	165.55
338	2014-06-25 12:59:17	180.2	165.5
339	2014-06-25 13:00:17	180.2	165.5
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343	2014-06-25 13:04:17	180.05	165.35
344	2014-06-25 13:05:17	180.05	165.35
345	2014-06-25 13:06:17	180	165.3
346	2014-06-25 13:07:17	179.95	165.25
347	2014-06-25 13:08:17	179.9	165.2
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356	2014-06-25 13:17:17	181.4	166.7
357	2014-06-25 13:18:17	181.35	166.65
358	2014-06-25 13:19:17	181.3	166.6
359	2014-06-25 13:20:17	181.3	166.6
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361	2014-06-25 13:22:17	181.2	166.5
362	2014-06-25 13:23:17	181.2	166.5
363	2014-06-25 13:24:17	181.15	166.45
364	2014-06-25 13:25:17	182.4	167.7
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366	2014-06-25 13:27:17	182.35	167.65
367	2014-06-25 13:28:17	182.3	167.6
368	2014-06-25 13:29:17	182.3	167.6
369	2014-06-25 13:30:17	182.25	167.55
370	2014-06-25 13:31:17	182.25	167.55
371	2014-06-25 13:32:17	182.2	167.5
372	2014-06-25 13:33:17	182.2	167.5
373	2014-06-25 13:34:17	182.15	167.45
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375	2014-06-25 13:36:17	182.1	167.4
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377	2014-06-25 13:38:17	182.05	167.35
378	2014-06-25 13:39:17	182	167.3
379	2014-06-25 13:40:17	182	167.3
380	2014-06-25 13:41:17	181.95	167.25
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382	2014-06-25 13:43:17	181.95	167.25
383	2014-06-25 13:44:17	181.9	167.2
384	2014-06-25 13:45:17	181.85	167.15
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391	2014-06-25 13:52:17	181.6	166.9
392	2014-06-25 13:53:17	181.5	166.8
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402	2014-06-25 14:03:17	181.25	166.55
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404	2014-06-25 14:05:17	181.2	166.5

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370	2014-06-25 13:31:53	79.88	79.916
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383	2014-06-25 13:44:53	80.222	80.06
384	2014-06-25 13:45:53	80.186	80.024
385	2014-06-25 13:46:53	80.186	80.024
386	2014-06-25 13:47:53	80.132	80.024
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391	2014-06-25 13:52:53	80.168	79.97
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393	2014-06-25 13:54:53	80.132	80.06
394	2014-06-25 13:55:53	80.096	80.024
395	2014-06-25 13:56:53	80.042	80.06
396	2014-06-25 13:57:53	80.024	80.06
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402	2014-06-25 14:03:53	79.952	80.024
403	2014-06-25 14:04:53	79.97	80.006
404	2014-06-25 14:05:53	80.006	80.024

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326	2014-06-25 12:47:34	80.258	80.222
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331	2014-06-25 12:52:34	80.15	80.15
332	2014-06-25 12:53:34	80.15	80.114
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334	2014-06-25 12:55:34	80.258	80.222
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336	2014-06-25 12:57:34	80.15	80.114
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368	2014-06-25 13:29:34	80.024	79.952
369	2014-06-25 13:30:34	80.024	79.898
370	2014-06-25 13:31:34	79.916	79.79
371	2014-06-25 13:32:34	80.024	79.898
372	2014-06-25 13:33:34	80.024	79.862
373	2014-06-25 13:34:34	80.024	79.862
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384	2014-06-25 13:45:34	80.024	79.772
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386	2014-06-25 13:47:34	80.15	79.844
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393	2014-06-25 13:54:34	80.15	79.718
394	2014-06-25 13:55:34	80.15	79.682
395	2014-06-25 13:56:34	80.15	79.772
396	2014-06-25 13:57:34	80.15	79.718
397	2014-06-25 13:58:34	80.15	79.682
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399	2014-06-25 14:00:34	80.15	79.682
400	2014-06-25 14:01:34	80.15	79.682
401	2014-06-25 14:02:34	80.15	79.628
402	2014-06-25 14:03:34	80.15	79.628
403	2014-06-25 14:04:34	80.024	79.502
404	2014-06-25 14:05:34	80.024	79.466

405	2014-06-25 14:06:17	181.15	166.45	405	2014-06-25 14:06:53	80.006	79.952	405	2014-06-25 14:06:34	80.024	79.412
406	2014-06-25 14:07:17	181.15	166.45	406	2014-06-25 14:07:53	80.006	80.024	406	2014-06-25 14:07:34	80.15	79.538
407	2014-06-25 14:08:17	181.1	166.4	407	2014-06-25 14:08:53	80.042	79.97	407	2014-06-25 14:08:34	80.15	79.538
408	2014-06-25 14:09:17	181.1	166.4	408	2014-06-25 14:09:53	80.042	80.06	408	2014-06-25 14:09:34	80.024	79.376
409	2014-06-25 14:10:17	181.1	166.4	409	2014-06-25 14:10:53	80.006	79.97	409	2014-06-25 14:10:34	80.024	79.322
410	2014-06-25 14:11:17	181.05	166.35	410	2014-06-25 14:11:53	80.06	80.024	410	2014-06-25 14:11:34	80.024	79.25
411	2014-06-25 14:12:17	181.05	166.35	411	2014-06-25 14:12:53	80.006	80.006	411	2014-06-25 14:12:34	80.024	79.25
412	2014-06-25 14:13:17	181	166.3	412	2014-06-25 14:13:53	80.114	80.006	412	2014-06-25 14:13:34	80.024	79.25
413	2014-06-25 14:14:17	181	166.3	413	2014-06-25 14:14:53	80.15	79.97	413	2014-06-25 14:14:34	80.15	79.376
414	2014-06-25 14:15:17	180.95	166.25	414	2014-06-25 14:15:53	80.06	79.97	414	2014-06-25 14:15:34	80.024	79.196
415	2014-06-25 14:16:17	180.95	166.25	415	2014-06-25 14:16:53	80.114	80.06	415	2014-06-25 14:16:34	80.024	79.196
416	2014-06-25 14:17:17	180.95	166.25	416	2014-06-25 14:17:53	80.096	80.078	416	2014-06-25 14:17:34	80.024	79.16
417	2014-06-25 14:18:17	180.85	166.15	417	2014-06-25 14:18:53	80.168	80.006	417	2014-06-25 14:18:34	80.024	79.16
418	2014-06-25 14:19:17	180.75	166.05	418	2014-06-25 14:19:53	80.168	80.024	418	2014-06-25 14:19:34	80.024	79.106
419	2014-06-25 14:20:17	180.7	166	419	2014-06-25 14:20:53	80.15	80.006	419	2014-06-25 14:20:34	80.024	79.106
420	2014-06-25 14:21:17	180.7	166	420	2014-06-25 14:21:53	80.15	80.006	420	2014-06-25 14:21:34	80.024	79.16
421	2014-06-25 14:22:17	180.65	165.95	421	2014-06-25 14:22:53	80.132	80.024	421	2014-06-25 14:22:34	80.024	79.16
422	2014-06-25 14:23:17	180.65	165.95	422	2014-06-25 14:23:53	80.096	79.97	422	2014-06-25 14:23:34	80.024	79.196
423	2014-06-25 14:24:17	180.6	165.9	423	2014-06-25 14:24:53	80.132	80.06	423	2014-06-25 14:24:34	80.024	79.196
424	2014-06-25 14:25:17	180.6	165.9	424	2014-06-25 14:25:53	80.132	80.006	424	2014-06-25 14:25:34	80.024	79.196
425	2014-06-25 14:26:17	180.55	165.85	425	2014-06-25 14:26:53	80.132	80.006	425	2014-06-25 14:26:34	80.024	79.196
426	2014-06-25 14:27:17	180.55	165.85	426	2014-06-25 14:27:53	80.132	79.97	426	2014-06-25 14:27:34	80.024	79.196
427	2014-06-25 14:28:17	180.5	165.8	427	2014-06-25 14:28:53	80.132	79.97	427	2014-06-25 14:28:34	80.024	79.196
428	2014-06-25 14:29:17	180.5	165.8	428	2014-06-25 14:29:53	80.132	80.078	428	2014-06-25 14:29:34	80.024	79.196
429	2014-06-25 14:30:17	180.5	165.8	429	2014-06-25 14:30:53	80.15	80.024	429	2014-06-25 14:30:34	80.024	79.25
430	2014-06-25 14:31:17	180.45	165.75	430	2014-06-25 14:31:53	80.132	80.006	430	2014-06-25 14:31:34	80.024	79.25
431	2014-06-25 14:32:17	180.45	165.75	431	2014-06-25 14:32:53	80.096	80.006	431	2014-06-25 14:32:34	80.024	79.196
432	2014-06-25 14:33:17	180.4	165.7	432	2014-06-25 14:33:53	80.096	80.06	432	2014-06-25 14:33:34	80.024	79.25
433	2014-06-25 14:34:17	180.35	165.65	433	2014-06-25 14:34:53	80.096	80.024	433	2014-06-25 14:34:34	80.024	79.25
434	2014-06-25 14:35:17	180.35	165.65	434	2014-06-25 14:35:53	80.186	80.006	434	2014-06-25 14:35:34	80.024	79.25
435	2014-06-25 14:36:17	180.35	165.65	435	2014-06-25 14:36:53	80.15	80.006	435	2014-06-25 14:36:34	80.024	79.286
436	2014-06-25 14:37:17	180.3	165.6	436	2014-06-25 14:37:53	80.096	80.006	436	2014-06-25 14:37:34	80.024	79.16
437	2014-06-25 14:38:17	180.3	165.6	437	2014-06-25 14:38:53	80.15	79.97	437	2014-06-25 14:38:34	80.024	79.106
438	2014-06-25 14:39:17	180.25	165.55	438	2014-06-25 14:39:53	80.186	80.06	438	2014-06-25 14:39:34	80.024	79.106
439	2014-06-25 14:40:17	180.25	165.55	439	2014-06-25 14:40:53	80.132	80.06	439	2014-06-25 14:40:34	80.024	79.106
440	2014-06-25 14:41:17	180.2	165.5	440	2014-06-25 14:41:53	80.186	80.024	440	2014-06-25 14:41:34	80.024	79.16
441	2014-06-25 14:42:17	180.2	165.5	441	2014-06-25 14:42:53	80.15	80.06	441	2014-06-25 14:42:34	80.024	79.106
442	2014-06-25 14:43:17	180.2	165.5	442	2014-06-25 14:43:53	80.186	80.078	442	2014-06-25 14:43:34	80.024	79.106
443	2014-06-25 14:44:17	180.2	165.5	443	2014-06-25 14:44:53	80.15	79.97	443	2014-06-25 14:44:34	80.024	79.16
444	2014-06-25 14:45:17	180.15	165.45	444	2014-06-25 14:45:53	80.114	79.97	444	2014-06-25 14:45:34	80.024	79.106
445	2014-06-25 14:46:17	180.15	165.45	445	2014-06-25 14:46:53	80.258	80.024	445	2014-06-25 14:46:34	80.024	79.07
446	2014-06-25 14:47:17	180.1	165.4	446	2014-06-25 14:47:53	80.24	80.006	446	2014-06-25 14:47:34	80.024	79.07
447	2014-06-25 14:48:17	180.1	165.4	447	2014-06-25 14:48:53	80.114	80.078	447	2014-06-25 14:48:34	80.024	79.016
448	2014-06-25 14:49:17	180	165.3	448	2014-06-25 14:49:53	80.114	80.006	448	2014-06-25 14:49:34	80.024	79.016
449	2014-06-25 14:50:17	179.95	165.25	449	2014-06-25 14:50:53	80.186	80.06	449	2014-06-25 14:50:34	80.024	79.016
450	2014-06-25 14:51:17	179.95	165.25	450	2014-06-25 14:51:53	80.15	79.97	450	2014-06-25 14:51:34	80.024	79.016
451	2014-06-25 14:52:17	179.9	165.2	451	2014-06-25 14:52:53	80.15	80.024	451	2014-06-25 14:52:34	80.024	78.944
452	2014-06-25 14:53:17	179.8	165.1	452	2014-06-25 14:53:53	80.168	79.97	452	2014-06-25 14:53:34	80.024	78.98
453	2014-06-25 14:54:17	179.8	165.1	453	2014-06-25 14:54:53	80.06	80.06	453	2014-06-25 14:54:34	80.024	78.98
454	2014-06-25 14:55:17	179.75	165.05	454	2014-06-25 14:55:53	80.15	80.078	454	2014-06-25 14:55:34	80.024	78.98
455	2014-06-25 14:56:17	179.75	165.05	455	2014-06-25 14:56:53	80.114	80.078	455	2014-06-25 14:56:34	80.024	78.944
456	2014-06-25 14:57:17	179.65	164.95	456	2014-06-25 14:57:53	80.168	80.006	456	2014-06-25 14:57:34	80.024	78.944
457	2014-06-25 14:58:17	179.6	164.9	457	2014-06-25 14:58:53	80.114	80.006	457	2014-06-25 14:58:34	80.024	78.98
458	2014-06-25 14:59:17	179.65	164.95	458	2014-06-25 14:59:53	80.096	80.078	458	2014-06-25 14:59:34	80.024	78.944
459	2014-06-25 15:00:17	179.6	164.9	459	2014-06-25 15:00:53	80.06	80.078	459	2014-06-25 15:00:34	80.024	78.944
460	2014-06-25 15:01:17	179.55	164.85	460	2014-06-25 15:01:53	80.168	80.06	460	2014-06-25 15:01:34	80.024	78.944
461	2014-06-25 15:02:17	179.55	164.85	461	2014-06-25 15:02:53	80.06	80.024	461	2014-06-25 15:02:34	80.024	78.944
462	2014-06-25 15:03:17	179.5	164.8	462	2014-06-25 15:03:53	80.168	80.006	462	2014-06-25 15:03:34	80.024	78.98
463	2014-06-25 15:04:17	179.5	164.8	463	2014-06-25 15:04:53	80.15	80.024	463	2014-06-25 15:04:34	80.024	79.016
464	2014-06-25 15:05:17	179.5	164.8	464	2014-06-25 15:05:53	80.15	80.006	464	2014-06-25 15:05:34	80.024	79.016
465	2014-06-25 15:06:17	179.45	164.75	465	2014-06-25 15:06:53	80.114	80.024	465	2014-06-25 15:06:34	80.024	79.016
466	2014-06-25 15:07:17	179.45	164.75	466	2014-06-25 15:07:53	80.15	80.042	466	2014-06-25 15:07:34	80.024	79.016
467	2014-06-25 15:08:17	179.4	164.7	467	2014-06-25 15:08:53	80.24	80.024	467	2014-06-25 15:08:34	80.024	78.98
468	2014-06-25 15:09:17	179.4	164.7	468	2014-06-25 15:09:53	80.204	80.06	468	2014-06-25 15:09:34	80.024	78.98
469	2014-06-25 15:10:17	179.4	164.7	469	2014-06-25 15:10:53	80.168	80.06	469	2014-06-25 15:10:34	80.024	78.98
470	2014-06-25 15:11:17	179.35	164.65	470	2014-06-25 15:11:53	80.258	80.042	470	2014-06-25 15:11:34	80.024	79.016
471	2014-06-25 15:12:17	179.35	164.65	471	2014-06-25 15:12:53	80.186	80.006	471	2014-06-25 15:12:34	80.024	79.016
472	2014-06-25 15:13:17	179.3	164.6	472	2014-06-25 15:13:53	80.24	80.006	472	2014-06-25 15:13:34	79.916	78.908
473	2014-06-25 15:14:17	179.3	164.6	473	2014-06-25 15:14:53	80.276	80.024	473	2014-06-25 15:14:34	79.916	78.908
474	2014-06-25 15:15:17	179.25	164.55	474	2014-06-25 15:15:53	80.24	80.042	474	2014-06-25 15:15:34	80.024	79.016
475	2014-06-25 15:16:17	179.25	164.55	475	2014-06-25 15:16:53	80.312	80.024	475	2014-06-25 15:16:34	80.024	79.016
476	2014-06-25 15:17:17	179.25	164.55	476	2014-06-25 15:17:53	80.276	80.078	476	2014-06-25 15:17:34	79.916	78.908
477	2014-06-25 15:18:17	179.2	164.5	477	2014-06-25 15:18:53	80.276	80.06	477	2014-06-25 15:18:34	79.916	78.872
478	2014-06-25 15:19:17	179.2	164.5	478	2014-06-25 15:19:53	80.294	80.096	478	2014-06-25 15:19:34	79.916	78.872
479	2014-06-25 15:20:17	179.15	164.45	479	2014-06-25 15:20:53	80.222	80.024	479	2014-06-25 15:20:34	79.916	78.908
480	2014-06-25 15:21:17	179.15	164.45	480	2014-06-25 15:21:53	80.276	80.006	480	2014-06-25 15:21:34	79.916	78.908
481	2014-06-25 15:22:17	179.1	164.4	481	2014-06-25 15:22:53	80.186	80.024	481	2014-06-25 15:22:34	80.024	79.016
482	2014-06-25 15:23:17	179.1	164.4	482	2014-06-25 15:23:53	80.168	80.096	482	2014-06-25 15:23:34	79.916	78.908
483	2014-06-25 15:24:17	179.05	164.35	483	2014-06-25 15:24:53	80.186	80.006	483	2014-06-25 15:24:34	79.916	78.908
484	2014-06-25 15:25:17	179.05	164.35	484	2014-06-25 15:25:53	80.15	80.06	484	2014-06-25 15:25:34	79.916	78.908
485	2014-06-25 15:26:17	179.05	164.35	485	2014-06-25 15:26:53	80.24	80.078	485	2014-06-25 15:26:34	80.024	79.016
486	2014-06-25 15:27:17	179.05	164.35	486	2014-06-25 15:27:53	80.15	80.024	486	2014-06-25 15:27:34	79.916	78.908
487	2014-06-25 15:28:17	179	164.3	487	2014-06-25 15:28:53	80.24	80.078	487	2014-06-25 15:28:34	80.024	79.016

488	2014-06-25 15:29:17	179	164.3	488	2014-06-25 15:29:53	80.24	80.006	488	2014-06-25 15:29:34	79.916	78.908
489	2014-06-25 15:30:17	178.95	164.25	489	2014-06-25 15:30:53	80.24	80.024	489	2014-06-25 15:30:34	79.916	78.962
490	2014-06-25 15:31:17	178.95	164.25	490	2014-06-25 15:31:53	80.24	80.078	490	2014-06-25 15:31:34	80.024	79.07
491	2014-06-25 15:32:17	178.95	164.25	491	2014-06-25 15:32:53	80.186	80.078	491	2014-06-25 15:32:34	79.916	78.962
492	2014-06-25 15:33:17	178.9	164.2	492	2014-06-25 15:33:53	80.24	80.024	492	2014-06-25 15:33:34	79.916	78.962
493	2014-06-25 15:34:17	178.9	164.2	493	2014-06-25 15:34:53	80.24	80.096	493	2014-06-25 15:34:34	79.916	78.998
494	2014-06-25 15:35:17	178.85	164.15	494	2014-06-25 15:35:53	80.204	80.024	494	2014-06-25 15:35:34	79.916	78.998
495	2014-06-25 15:36:17	178.85	164.15	495	2014-06-25 15:36:53	80.186	80.078	495	2014-06-25 15:36:34	79.916	79.052
496	2014-06-25 15:37:17	178.85	164.15	496	2014-06-25 15:37:53	80.15	80.024	496	2014-06-25 15:37:34	79.916	79.052
497	2014-06-25 15:38:17	178.8	164.1	497	2014-06-25 15:38:53	80.24	80.024	497	2014-06-25 15:38:34	79.916	79.088
498	2014-06-25 15:39:17	178.8	164.1	498	2014-06-25 15:39:53	80.186	80.078	498	2014-06-25 15:39:34	79.916	79.142
499	2014-06-25 15:40:17	178.75	164.05	499	2014-06-25 15:40:53	80.24	80.006	499	2014-06-25 15:40:34	79.916	79.142
500	2014-06-25 15:41:17	178.75	164.05	500	2014-06-25 15:41:53	80.186	80.06	500	2014-06-25 15:41:34	79.916	79.178
501	2014-06-25 15:42:17	178.7	164	501	2014-06-25 15:42:53	80.24	80.024	501	2014-06-25 15:42:34	79.916	79.214
502	2014-06-25 15:43:17	178.7	164	502	2014-06-25 15:43:53	80.15	80.006	502	2014-06-25 15:43:34	79.916	79.268
503	2014-06-25 15:44:17	178.65	163.95	503	2014-06-25 15:44:53	80.186	80.024	503	2014-06-25 15:44:34	79.916	79.304
504	2014-06-25 15:45:17	178.65	163.95	504	2014-06-25 15:45:53	80.132	80.042	504	2014-06-25 15:45:34	79.916	79.268
505	2014-06-25 15:46:17	178.65	163.95	505	2014-06-25 15:46:53	80.294	80.006	505	2014-06-25 15:46:34	79.916	79.304
506	2014-06-25 15:47:17	178.6	163.9	506	2014-06-25 15:47:53	80.186	80.006	506	2014-06-25 15:47:34	79.916	79.358
507	2014-06-25 15:48:17	178.6	163.9	507	2014-06-25 15:48:53	80.24	80.024	507	2014-06-25 15:48:34	79.916	79.358
508	2014-06-25 15:49:17	178.6	163.9	508	2014-06-25 15:49:53	80.204	80.06	508	2014-06-25 15:49:34	79.916	79.358
509	2014-06-25 15:50:17	178.55	163.85	509	2014-06-25 15:50:53	80.15	79.97	509	2014-06-25 15:50:34	79.916	79.358
510	2014-06-25 15:51:17	178.55	163.85	510	2014-06-25 15:51:53	80.114	80.06	510	2014-06-25 15:51:34	80.024	79.412
511	2014-06-25 15:52:17	178.5	163.8	511	2014-06-25 15:52:53	80.132	80.06	511	2014-06-25 15:52:34	79.916	79.214
512	2014-06-25 15:53:17	178.4	163.7	512	2014-06-25 15:53:53	80.15	79.97	512	2014-06-25 15:53:34	80.024	79.376
513	2014-06-25 15:54:17	178.35	163.65	513	2014-06-25 15:54:53	80.15	80.006	513	2014-06-25 15:54:34	80.024	79.412
514	2014-06-25 15:55:17	178.3	163.6	514	2014-06-25 15:55:53	80.15	79.97	514	2014-06-25 15:55:34	80.024	79.376
515	2014-06-25 15:56:17	178.3	163.6	515	2014-06-25 15:56:53	80.15	80.024	515	2014-06-25 15:56:34	80.366	79.412
516	2014-06-25 15:57:17	178.3	163.6	516	2014-06-25 15:57:53	80.186	80.006	516	2014-06-25 15:57:34	80.816	79.466
517	2014-06-25 15:58:17	178.25	163.55	517	2014-06-25 15:58:53	80.186	80.006	517	2014-06-25 15:58:34	81.266	79.358
518	2014-06-25 15:59:17	178.25	163.55	518	2014-06-25 15:59:53	80.24	80.024	518	2014-06-25 15:59:34	81.608	79.466
519	2014-06-25 16:00:17	178.9	164.2	519	2014-06-25 16:00:53	80.186	80.024	519	2014-06-25 16:00:34	81.608	79.43
520	2014-06-25 16:01:17	182.35	167.65	520	2014-06-25 16:01:53	80.24	80.024	520	2014-06-25 16:01:34	81.608	79.466
521	2014-06-25 16:02:17	182.35	167.65	521	2014-06-25 16:02:53	80.24	79.97	521	2014-06-25 16:02:34	81.5	79.412
522	2014-06-25 16:03:17	182.3	167.6	522	2014-06-25 16:03:53	80.186	80.024	522	2014-06-25 16:03:34	81.5	79.502
523	2014-06-25 16:04:17	182.3	167.6	523	2014-06-25 16:04:53	80.186	80.024	523	2014-06-25 16:04:34	81.374	79.466
524	2014-06-25 16:05:17	182.3	167.6	524	2014-06-25 16:05:53	80.24	80.024	524	2014-06-25 16:05:34	81.266	79.43
525	2014-06-25 16:06:17	182.25	167.55	525	2014-06-25 16:06:53	80.114	80.024	525	2014-06-25 16:06:34	81.158	79.466
526	2014-06-25 16:07:17	182.25	167.55	526	2014-06-25 16:07:53	80.15	80.024	526	2014-06-25 16:07:34	81.05	79.448
527	2014-06-25 16:08:17	182.25	167.55	527	2014-06-25 16:08:53	80.06	80.078	527	2014-06-25 16:08:34	80.924	79.394
528	2014-06-25 16:09:17	182.05	167.35	528	2014-06-25 16:09:53	80.114	80.006	528	2014-06-25 16:09:34	80.924	79.484
529	2014-06-25 16:10:17	182.05	167.35	529	2014-06-25 16:10:53	80.06	80.006	529	2014-06-25 16:10:34	80.816	79.466
530	2014-06-25 16:11:17	182.05	167.35	530	2014-06-25 16:11:53	80.06	80.006	530	2014-06-25 16:11:34	80.708	79.448
531	2014-06-25 16:12:17	182	167.3	531	2014-06-25 16:12:53	79.97	80.006	531	2014-06-25 16:12:34	80.708	79.484
532	2014-06-25 16:13:17	182	167.3	532	2014-06-25 16:13:53	80.096	80.024	532	2014-06-25 16:13:34	80.708	79.574
533	2014-06-25 16:14:17	182	167.3	533	2014-06-25 16:14:53	79.952	80.042	533	2014-06-25 16:14:34	80.6	79.52
534	2014-06-25 16:15:17	181.95	167.25	534	2014-06-25 16:15:53	79.97	79.97	534	2014-06-25 16:15:34	80.6	79.61
535	2014-06-25 16:16:17	181.95	167.25	535	2014-06-25 16:16:53	80.024	80.006	535	2014-06-25 16:16:34	80.474	79.484
536	2014-06-25 16:17:17	181.9	167.2	536	2014-06-25 16:17:53	79.952	79.97	536	2014-06-25 16:17:34	80.474	79.52
537	2014-06-25 16:18:17	181.9	167.2	537	2014-06-25 16:18:53	80.006	79.952	537	2014-06-25 16:18:34	80.474	79.556
538	2014-06-25 16:19:17	181.9	167.2	538	2014-06-25 16:19:53	80.024	79.97	538	2014-06-25 16:19:34	80.474	79.61
539	2014-06-25 16:20:17	181.85	167.15	539	2014-06-25 16:20:53	79.952	80.024	539	2014-06-25 16:20:34	80.366	79.502
540	2014-06-25 16:21:17	181.85	167.15	540	2014-06-25 16:21:53	80.006	80.006	540	2014-06-25 16:21:34	80.366	79.502
541	2014-06-25 16:22:17	181.8	167.1	541	2014-06-25 16:22:53	79.97	80.006	541	2014-06-25 16:22:34	80.366	79.538
542	2014-06-25 16:23:17	181.8	167.1	542	2014-06-25 16:23:53	79.97	80.006	542	2014-06-25 16:23:34	80.366	79.538
543	2014-06-25 16:24:17	181.75	167.05	543	2014-06-25 16:24:53	79.952	80.06	543	2014-06-25 16:24:34	80.366	79.592
544	2014-06-25 16:25:17	181.75	167.05	544	2014-06-25 16:25:53	80.006	80.024	544	2014-06-25 16:25:34	80.258	79.43
545	2014-06-25 16:26:17	181.7	167	545	2014-06-25 16:26:53	79.952	80.006	545	2014-06-25 16:26:34	80.258	79.52
546	2014-06-25 16:27:17	181.7	167	546	2014-06-25 16:27:53	80.006	79.97	546	2014-06-25 16:27:34	80.258	79.484
547	2014-06-25 16:28:17	181.65	166.95	547	2014-06-25 16:28:53	79.952	79.97	547	2014-06-25 16:28:34	80.258	79.484
548	2014-06-25 16:29:17	181.65	166.95	548	2014-06-25 16:29:53	79.916	79.97	548	2014-06-25 16:29:34	80.258	79.52
549	2014-06-25 16:30:17	181.65	166.95	549	2014-06-25 16:30:53	79.952	80.024	549	2014-06-25 16:30:34	80.258	79.52
550	2014-06-25 16:31:17	181.6	166.9	550	2014-06-25 16:31:53	79.916	79.97	550	2014-06-25 16:31:34	80.258	79.52
551	2014-06-25 16:32:17	181.6	166.9	551	2014-06-25 16:32:53	79.916	80.024	551	2014-06-25 16:32:34	80.258	79.52
552	2014-06-25 16:33:17	181.55	166.85	552	2014-06-25 16:33:53	79.916	80.024	552	2014-06-25 16:33:34	80.258	79.52
553	2014-06-25 16:34:17	181.55	166.85	553	2014-06-25 16:34:53	79.898	79.952	553	2014-06-25 16:34:34	80.258	79.484
554	2014-06-25 16:35:17	181.55	166.85	554	2014-06-25 16:35:53	79.916	79.952	554	2014-06-25 16:35:34	80.258	79.52
555	2014-06-25 16:36:17	181.5	166.8	555	2014-06-25 16:36:53	79.88	79.898	555	2014-06-25 16:36:34	80.258	79.484
556	2014-06-25 16:37:17	181.5	166.8	556	2014-06-25 16:37:53	79.898	80.006	556	2014-06-25 16:37:34	80.258	79.484
557	2014-06-25 16:38:17	181.45	166.75	557	2014-06-25 16:38:53	79.916	79.952	557	2014-06-25 16:38:34	80.258	79.484
558	2014-06-25 16:39:17	181.45	166.75	558	2014-06-25 16:39:53	79.88	79.952	558	2014-06-25 16:39:34	80.258	79.484
559	2014-06-25 16:40:17	181.45	166.75	559	2014-06-25 16:40:53	79.88	79.952	559	2014-06-25 16:40:34	80.258	79.484
560	2014-06-25 16:41:17	181.4	166.7	560	2014-06-25 16:41:53	79.88	80.006	560	2014-06-25 16:41:34	80.258	79.484
561	2014-06-25 16:42:17	181.4	166.7	561	2014-06-25 16:42:53	79.862	79.952	561	2014-06-25 16:42:34	80.258	79.43
562	2014-06-25 16:43:17	181.4	166.7	562	2014-06-25 16:43:53	79.862	79.916	562	2014-06-25 16:43:34	80.258	79.484
563	2014-06-25 16:44:17	181.4	166.7	563	2014-06-25 16:44:53	79.88	79.97	563	2014-06-25 16:44:34	80.258	79.484
564	2014-06-25 16:45:17	181.35	166.65	564	2014-06-25 16:45:53	79.898	79.952	564	2014-06-25 16:45:34	80.15	79.376
565	2014-06-25 16:46:17	181.3	166.6	565	2014-06-25 16:46:53	79.916	79.916	565	2014-06-25 16:46:34	80.258	79.484
566	2014-06-25 16:47:17	181.3	166.6	566	2014-06-25 16:47:53	79.952	79.952	566	2014-06-25 16:47:34	80.258	79.52
567	2014-06-25 16:48:17	181.3	166.6	567	2014-06-25 16:48:53	79.88	79.952	567	2014-06-25 16:48:34	80.258	79.484
568	2014-06-25 16:49:17	181.25	166.55	568	2014-06-25 16:49:53	79.934	79.952	568	2014-06-25 16:49:34	80.15	79.412
569	2014-06-25 16:50:17	181.25	166.55	569	2014-06-25 16:50:53	79.898	79.952	569	2014-06-25 16:50:34	80.15	79.412
570	2014-06-25 16:51:17	181.2	166.5	570	2014-06-25 16:51:53	79.988	79.916	570	2014-06-25 16:51:34	80.15	79.412

571	2014-06-25 16:52:17	181.2	166.5	571	2014-06-25 16:52:53	79.952	79.952	571	2014-06-25 16:52:34	80.15	79.412
572	2014-06-25 16:53:17	181.2	166.5	572	2014-06-25 16:53:53	80.042	79.952	572	2014-06-25 16:53:34	80.15	79.412
573	2014-06-25 16:54:17	181.2	166.5	573	2014-06-25 16:54:53	80.006	79.952	573	2014-06-25 16:54:34	80.15	79.376
574	2014-06-25 16:55:17	181.15	166.45	574	2014-06-25 16:55:53	80.006	79.916	574	2014-06-25 16:55:34	80.258	79.52
575	2014-06-25 16:56:17	181.15	166.45	575	2014-06-25 16:56:53	79.988	79.952	575	2014-06-25 16:56:34	80.15	79.376
576	2014-06-25 16:57:17	181.1	166.4	576	2014-06-25 16:57:53	79.97	79.97	576	2014-06-25 16:57:34	80.15	79.412
577	2014-06-25 16:58:17	181.1	166.4	577	2014-06-25 16:58:53	79.97	79.898	577	2014-06-25 16:58:34	80.15	79.412
578	2014-06-25 16:59:17	181.05	166.35	578	2014-06-25 16:59:53	79.988	79.952	578	2014-06-25 16:59:34	80.15	79.412
579	2014-06-25 17:00:17	181.05	166.35	579	2014-06-25 17:00:53	80.006	79.916	579	2014-06-25 17:00:34	80.15	79.376
580	2014-06-25 17:01:17	181.05	166.35	580	2014-06-25 17:01:53	79.97	79.916	580	2014-06-25 17:01:34	80.15	79.376
581	2014-06-25 17:02:17	181	166.3	581	2014-06-25 17:02:53	79.988	80.006	581	2014-06-25 17:02:34	80.258	79.484
582	2014-06-25 17:03:17	181	166.3	582	2014-06-25 17:03:53	79.952	79.952	582	2014-06-25 17:03:34	80.15	79.376
583	2014-06-25 17:04:17	180.95	166.25	583	2014-06-25 17:04:53	80.096	79.97	583	2014-06-25 17:04:34	80.15	79.376
584	2014-06-25 17:05:17	180.95	166.25	584	2014-06-25 17:05:53	80.006	80.006	584	2014-06-25 17:05:34	80.15	79.376
585	2014-06-25 17:06:17	180.9	166.2	585	2014-06-25 17:06:53	80.006	80.006	585	2014-06-25 17:06:34	80.258	79.484
586	2014-06-25 17:07:17	180.85	166.15	586	2014-06-25 17:07:53	79.97	79.97	586	2014-06-25 17:07:34	80.258	79.52
587	2014-06-25 17:08:17	180.8	166.1	587	2014-06-25 17:08:53	79.97	80.006	587	2014-06-25 17:08:34	80.15	79.412
588	2014-06-25 17:09:17	180.8	166.1	588	2014-06-25 17:09:53	80.006	79.97	588	2014-06-25 17:09:34	80.258	79.484
589	2014-06-25 17:10:17	180.75	166.05	589	2014-06-25 17:10:53	79.97	80.006	589	2014-06-25 17:10:34	80.15	79.412
590	2014-06-25 17:11:17	180.75	166.05	590	2014-06-25 17:11:53	80.006	80.006	590	2014-06-25 17:11:34	80.15	79.376
591	2014-06-25 17:12:17	180.7	166	591	2014-06-25 17:12:53	79.97	80.006	591	2014-06-25 17:12:34	80.15	79.322
592	2014-06-25 17:13:17	180.7	166	592	2014-06-25 17:13:53	80.006	79.952	592	2014-06-25 17:13:34	80.258	79.34
593	2014-06-25 17:14:17	180.7	166	593	2014-06-25 17:14:53	79.916	79.952	593	2014-06-25 17:14:34	80.258	79.304
594	2014-06-25 17:15:17	180.65	165.95	594	2014-06-25 17:15:53	79.898	80.006	594	2014-06-25 17:15:34	80.258	79.214
595	2014-06-25 17:16:17	180.65	165.95	595	2014-06-25 17:16:53	79.898	80.006	595	2014-06-25 17:16:34	80.258	79.25
596	2014-06-25 17:17:17	180.6	165.9	596	2014-06-25 17:17:53	79.88	79.916	596	2014-06-25 17:17:34	80.258	79.34
597	2014-06-25 17:18:17	180.6	165.9	597	2014-06-25 17:18:53	79.898	79.916	597	2014-06-25 17:18:34	80.258	79.394
598	2014-06-25 17:19:17	180.6	165.9	598	2014-06-25 17:19:53	79.898	79.916	598	2014-06-25 17:19:34	80.258	79.43
599	2014-06-25 17:20:17	180.55	165.85	599	2014-06-25 17:20:53	80.042	79.916	599	2014-06-25 17:20:34	80.15	79.376
600	2014-06-25 17:21:17	180.55	165.85	600	2014-06-25 17:21:53	80.06	79.916	600	2014-06-25 17:21:34	80.15	79.412
601	2014-06-25 17:22:17	180.5	165.8	601	2014-06-25 17:22:53	80.186	80.006	601	2014-06-25 17:22:34	80.15	79.412
602	2014-06-25 17:23:17	180.5	165.8	602	2014-06-25 17:23:53	80.186	79.916	602	2014-06-25 17:23:34	80.15	79.502
603	2014-06-25 17:24:17	180.45	165.75	603	2014-06-25 17:24:53	80.186	80.024	603	2014-06-25 17:24:34	80.15	79.502
604	2014-06-25 17:25:17	180.45	165.75	604	2014-06-25 17:25:53	80.168	80.024	604	2014-06-25 17:25:34	80.024	79.376
605	2014-06-25 17:26:17	180.4	165.7	605	2014-06-25 17:26:53	80.168	79.97	605	2014-06-25 17:26:34	80.15	79.538
606	2014-06-25 17:27:17	180.4	165.7	606	2014-06-25 17:27:53	80.24	79.97	606	2014-06-25 17:27:34	80.15	79.538
607	2014-06-25 17:28:17	180.4	165.7	607	2014-06-25 17:28:53	80.366	80.006	607	2014-06-25 17:28:34	80.024	79.412
608	2014-06-25 17:29:17	180.35	165.65	608	2014-06-25 17:29:53	80.348	80.078	608	2014-06-25 17:29:34	80.024	79.412
609	2014-06-25 17:30:17	180.3	165.6	609	2014-06-25 17:30:53	80.366	80.132	609	2014-06-25 17:30:34	80.024	79.466
610	2014-06-25 17:31:17	180.2	165.5	610	2014-06-25 17:31:53	80.312	80.078	610	2014-06-25 17:31:34	80.024	79.502
611	2014-06-25 17:32:17	180.2	165.5	611	2014-06-25 17:32:53	80.294	80.06	611	2014-06-25 17:32:34	80.024	79.502
612	2014-06-25 17:33:17	180.15	165.45	612	2014-06-25 17:33:53	80.186	80.096	612	2014-06-25 17:33:34	80.024	79.502
613	2014-06-25 17:34:17	180.15	165.45	613	2014-06-25 17:34:53	80.258	80.078	613	2014-06-25 17:34:34	80.15	79.538
614	2014-06-25 17:35:17	180.15	165.45	614	2014-06-25 17:35:53	80.258	80.132	614	2014-06-25 17:35:34	80.258	79.61
615	2014-06-25 17:36:17	180.1	165.4	615	2014-06-25 17:36:53	80.24	80.096	615	2014-06-25 17:36:34	80.258	79.574
616	2014-06-25 17:37:17	180.1	165.4	616	2014-06-25 17:37:53	80.33	80.06	616	2014-06-25 17:37:34	80.258	79.61
617	2014-06-25 17:38:17	180.1	165.4	617	2014-06-25 17:38:53	80.276	80.096	617	2014-06-25 17:38:34	80.258	79.61
618	2014-06-25 17:39:17	180.05	165.35	618	2014-06-25 17:39:53	80.258	80.096	618	2014-06-25 17:39:34	80.15	79.538
619	2014-06-25 17:40:17	180.05	165.35	619	2014-06-25 17:40:53	80.258	80.132	619	2014-06-25 17:40:34	80.15	79.538
620	2014-06-25 17:41:17	180	165.3	620	2014-06-25 17:41:53	80.186	80.042	620	2014-06-25 17:41:34	80.15	79.592
621	2014-06-25 17:42:17	180	165.3	621	2014-06-25 17:42:53	80.168	80.078	621	2014-06-25 17:42:34	80.15	79.592
622	2014-06-25 17:43:17	179.95	165.25	622	2014-06-25 17:43:53	80.168	80.078	622	2014-06-25 17:43:34	80.15	79.628
623	2014-06-25 17:44:17	179.9	165.2	623	2014-06-25 17:44:53	80.06	80.096	623	2014-06-25 17:44:34	80.15	79.682
624	2014-06-25 17:45:17	179.85	165.15	624	2014-06-25 17:45:53	80.024	80.042	624	2014-06-25 17:45:34	80.15	79.682
625	2014-06-25 17:46:17	179.85	165.15	625	2014-06-25 17:46:53	80.024	80.024	625	2014-06-25 17:46:34	80.15	79.628
626	2014-06-25 17:47:17	179.8	165.1	626	2014-06-25 17:47:53	79.97	80.096	626	2014-06-25 17:47:34	80.024	79.502
627	2014-06-25 17:48:17	179.8	165.1	627	2014-06-25 17:48:53	80.006	80.06	627	2014-06-25 17:48:34	80.024	79.592
628	2014-06-25 17:49:17	179.75	165.05	628	2014-06-25 17:49:53	79.97	80.078	628	2014-06-25 17:49:34	80.024	79.592
629	2014-06-25 17:50:17	179.75	165.05	629	2014-06-25 17:50:53	79.934	80.024	629	2014-06-25 17:50:34	80.024	79.646
630	2014-06-25 17:51:17	179.75	165.05	630	2014-06-25 17:51:53	79.88	80.024	630	2014-06-25 17:51:34	80.024	79.682
631	2014-06-25 17:52:17	179.7	165	631	2014-06-25 17:52:53	79.934	80.024	631	2014-06-25 17:52:34	80.024	79.718
632	2014-06-25 17:53:17	179.7	165	632	2014-06-25 17:53:53	79.934	80.078	632	2014-06-25 17:53:34	80.024	79.682
633	2014-06-25 17:54:17	179.7	165	633	2014-06-25 17:54:53	79.988	80.006	633	2014-06-25 17:54:34	80.024	79.682
634	2014-06-25 17:55:17	179.65	164.95	634	2014-06-25 17:55:53	79.88	80.006	634	2014-06-25 17:55:34	80.024	79.718
635	2014-06-25 17:56:17	179.65	164.95	635	2014-06-25 17:56:53	79.97	80.006	635	2014-06-25 17:56:34	80.024	79.718
636	2014-06-25 17:57:17	179.65	164.95	636	2014-06-25 17:57:53	79.862	80.006	636	2014-06-25 17:57:34	80.024	79.718
637	2014-06-25 17:58:17	179.6	164.9	637	2014-06-25 17:58:53	79.862	79.97	637	2014-06-25 17:58:34	79.916	79.664
638	2014-06-25 17:59:17	179.6	164.9	638	2014-06-25 17:59:53	79.826	79.916	638	2014-06-25 17:59:34	80.024	79.718
639	2014-06-25 18:00:17	179.6	164.9	639	2014-06-25 18:00:53	80.096	80.006	639	2014-06-25 18:00:34	79.916	79.664
640	2014-06-25 18:01:17	179.55	164.85	640	2014-06-25 18:01:53	79.97	80.078	640	2014-06-25 18:01:34	79.916	79.664
641	2014-06-25 18:02:17	179.55	164.85	641	2014-06-25 18:02:53	79.952	80.006	641	2014-06-25 18:02:34	79.916	79.664
642	2014-06-25 18:03:17	179.5	164.8	642	2014-06-25 18:03:53	79.934	80.078	642	2014-06-25 18:03:34	79.916	79.664
643	2014-06-25 18:04:17	179.5	164.8	643	2014-06-25 18:04:53	79.916	80.06	643	2014-06-25 18:04:34	79.916	79.664
644	2014-06-25 18:05:17	179.45	164.75	644	2014-06-25 18:05:53	79.88	80.06	644	2014-06-25 18:05:34	79.916	79.664
645	2014-06-25 18:06:17	179.45	164.75	645	2014-06-25 18:06:53	79.934	80.06	645	2014-06-25 18:06:34	79.916	79.7
646	2014-06-25 18:07:17	179.45	164.75	646	2014-06-25 18:07:53	79.97	80.006	646	2014-06-25 18:07:34	79.916	79.664
647	2014-06-25 18:08:17	179.4	164.7	647	2014-06-25 18:08:53	79.97	80.06	647	2014-06-25 18:08:34	79.916	79.664
648	2014-06-25 18:09:17	179.4	164.7	648	2014-06-25 18:09:53	79.88	80.024	648	2014-06-25 18:09:34	79.916	79.7
649	2014-06-25 18:10:17	179.4	164.7	649	2014-06-25 18:10:53	79.844	80.006	649	2014-06-25 18:10:34	79.916	79.754
650	2014-06-25 18:11:17	179.35	164.65	650	2014-06-25 18:11:53	79.862	80.06	650	2014-06-25 18:11:34	79.916	79.7
651	2014-06-25 18:12:17	179.35	164.65	651	2014-06-25 18:12:53	79.844	79.916	651	2014-06-25 18:12:34	79.916	79.664
652	2014-06-25 18:13:17	179.35	164.65	652	2014-06-25 18:13:53	79.862	79.97	652	2014-06-25 18:13:34	79.916	79.61
653	2014-06-25 18:14:17	179.3	164.6	653	2014-06-25 18:14:53	79.826	79.97	653	2014-06-25 18:14:34	79.916	79.664

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776	2014-06-25 20:17:17	182.7	168	776	2014-06-25 20:17:53	79.88	79.952	776	2014-06-25 20:17:34	80.024	79.718
777	2014-06-25 20:18:17	182.7	168	777	2014-06-25 20:18:53	79.88	79.952	777	2014-06-25 20:18:34	80.024	79.772
778	2014-06-25 20:19:17	182.65	167.95	778	2014-06-25 20:19:53	79.808	79.97	778	2014-06-25 20:19:34	80.024	79.772
779	2014-06-25 20:20:17	182.65	167.95	779	2014-06-25 20:20:53	79.808	79.898	779	2014-06-25 20:20:34	80.024	79.808
780	2014-06-25 20:21:17	182.65	167.95	780	2014-06-25 20:21:53	79.808	79.934	780	2014-06-25 20:21:34	80.024	79.772
781	2014-06-25 20:22:17	182.6	167.9	781	2014-06-25 20:22:53	79.844	79.952	781	2014-06-25 20:22:34	80.024	79.772
782	2014-06-25 20:23:17	182.6	167.9	782	2014-06-25 20:23:53	79.862	79.88	782	2014-06-25 20:23:34	80.024	79.772
783	2014-06-25 20:24:17	182.6	167.9	783	2014-06-25 20:24:53	79.808	79.88	783	2014-06-25 20:24:34	80.024	79.772
784	2014-06-25 20:25:17	182.6	167.9	784	2014-06-25 20:25:53	79.826	79.952	784	2014-06-25 20:25:34	80.024	79.772
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786	2014-06-25 20:27:17	182.55	167.85	786	2014-06-25 20:27:53	79.808	79.88	786	2014-06-25 20:27:34	80.024	79.808
787	2014-06-25 20:28:17	182.5	167.8	787	2014-06-25 20:28:53	79.826	79.88	787	2014-06-25 20:28:34	80.024	79.772
788	2014-06-25 20:29:17	182.5	167.8	788	2014-06-25 20:29:53	79.826	79.898	788	2014-06-25 20:29:34	80.024	79.718
789	2014-06-25 20:30:17	182.45	167.75	789	2014-06-25 20:30:53	79.79	79.898	789	2014-06-25 20:30:34	80.024	79.718
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791	2014-06-25 20:32:17	182.45	167.75	791	2014-06-25 20:32:53	79.826	79.844	791	2014-06-25 20:32:34	80.024	79.772
792	2014-06-25 20:33:17	182.4	167.7	792	2014-06-25 20:33:53	79.88	79.844	792	2014-06-25 20:33:34	79.916	79.664
793	2014-06-25 20:34:17	182.4	167.7	793	2014-06-25 20:34:53	79.826	79.952	793	2014-06-25 20:34:34	80.024	79.808
794	2014-06-25 20:35:17	182.35	167.65	794	2014-06-25 20:35:53	79.88	79.844	794	2014-06-25 20:35:34	79.916	79.7
795	2014-06-25 20:36:17	182.35	167.65	795	2014-06-25 20:36:53	79.898	79.844	795	2014-06-25 20:36:34	79.916	79.7
796	2014-06-25 20:37:17	182.3	167.6	796	2014-06-25 20:37:53	79.898	79.898	796	2014-06-25 20:37:34	79.916	79.664
797	2014-06-25 20:38:17	182.3	167.6	797	2014-06-25 20:38:53	79.898	79.844	797	2014-06-25 20:38:34	79.916	79.664
798	2014-06-25 20:39:17	182.25	167.55	798	2014-06-25 20:39:53	79.862	79.844	798	2014-06-25 20:39:34	79.916	79.664
799	2014-06-25 20:40:17	182.25	167.55	799	2014-06-25 20:40:53	79.826	79.826	799	2014-06-25 20:40:34	79.916	79.61
800	2014-06-25 20:41:17	182.25	167.55	800	2014-06-25 20:41:53	79.844	79.88	800	2014-06-25 20:41:34	79.916	79.664
801	2014-06-25 20:42:17	182.2	167.5	801	2014-06-25 20:42:53	79.898	79.844	801	2014-06-25 20:42:34	79.916	79.61
802	2014-06-25 20:43:17	182.2	167.5	802	2014-06-25 20:43:53	79.898	79.844	802	2014-06-25 20:43:34	79.916	79.664
803	2014-06-25 20:44:17	182.15	167.45	803	2014-06-25 20:44:53	79.898	79.898	803	2014-06-25 20:44:34	79.916	79.61
804	2014-06-25 20:45:17	182.15	167.45	804	2014-06-25 20:45:53	79.88	79.844	804	2014-06-25 20:45:34	79.916	79.574
805	2014-06-25 20:46:17	182.15	167.45	805	2014-06-25 20:46:53	79.88	79.844	805	2014-06-25 20:46:34	79.916	79.664
806	2014-06-25 20:47:17	182.1	167.4	806	2014-06-25 20:47:53	79.898	79.898	806	2014-06-25 20:47:34	79.916	79.664
807	2014-06-25 20:48:17	182.1	167.4	807	2014-06-25 20:48:53	79.844	79.898	807	2014-06-25 20:48:34	79.916	79.61
808	2014-06-25 20:49:17	182.05	167.35	808	2014-06-25 20:49:53	79.934	79.862	808	2014-06-25 20:49:34	79.916	79.61
809	2014-06-25 20:50:17	182.05	167.35	809	2014-06-25 20:50:53	79.88	79.844	809	2014-06-25 20:50:34	79.916	79.61
810	2014-06-25 20:51:17	182	167.3	810	2014-06-25 20:51:53	79.862	79.88	810	2014-06-25 20:51:34	79.916	79.664
811	2014-06-25 20:52:17	182	167.3	811	2014-06-25 20:52:53	79.898	79.88	811	2014-06-25 20:52:34	79.916	79.7
812	2014-06-25 20:53:17	182	167.3	812	2014-06-25 20:53:53	79.88	79.844	812	2014-06-25 20:53:34	79.916	79.7
813	2014-06-25 20:54:17	182	167.3	813	2014-06-25 20:54:53	79.844	79.826	813	2014-06-25 20:54:34	79.916	79.7
814	2014-06-25 20:55:17	181.95	167.25	814	2014-06-25 20:55:53	79.88	79.88	814	2014-06-25 20:55:34	79.916	79.7
815	2014-06-25 20:56:17	181.95	167.25	815	2014-06-25 20:56:53	79.844	79.88	815	2014-06-25 20:56:34	79.916	79.754
816	2014-06-25 20:57:17	181.95	167.25	816	2014-06-25 20:57:53	79.898	79.826	816	2014-06-25 20:57:34	79.916	79.7
817	2014-06-25 20:58:17	181.9	167.2	817	2014-06-25 20:58:53	79.952	79.844	817	2014-06-25 20:58:34	79.808	79.592
818	2014-06-25 20:59:17	181.85	167.15	818	2014-06-25 20:59:53	79.898	79.898	818	2014-06-25 20:59:34	79.916	79.7
819	2014-06-25 21:00:17	181.85	167.15	819	2014-06-25 21:00:53	79.934	79.898	819	2014-06-25 21:00:34	79.916	79.7

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821	2014-06-25 21:02:17	181.8	167.1	821	2014-06-25 21:02:53	79.934	79.934	821	2014-06-25 21:02:34	79.916	79.7
822	2014-06-25 21:03:17	181.8	167.1	822	2014-06-25 21:03:53	79.916	79.88	822	2014-06-25 21:03:34	79.808	79.592
823	2014-06-25 21:04:17	181.75	167.05	823	2014-06-25 21:04:53	79.898	79.898	823	2014-06-25 21:04:34	79.808	79.646
824	2014-06-25 21:05:17	181.75	167.05	824	2014-06-25 21:05:53	79.88	79.844	824	2014-06-25 21:05:34	79.808	79.646
825	2014-06-25 21:06:17	181.75	167.05	825	2014-06-25 21:06:53	79.862	79.844	825	2014-06-25 21:06:34	79.916	79.754
826	2014-06-25 21:07:17	181.7	167	826	2014-06-25 21:07:53	79.862	79.898	826	2014-06-25 21:07:34	79.916	79.7
827	2014-06-25 21:08:17	181.7	167	827	2014-06-25 21:08:53	79.862	79.844	827	2014-06-25 21:08:34	79.916	79.754
828	2014-06-25 21:09:17	181.65	166.95	828	2014-06-25 21:09:53	79.88	79.898	828	2014-06-25 21:09:34	79.808	79.646
829	2014-06-25 21:10:17	181.65	166.95	829	2014-06-25 21:10:53	79.898	79.898	829	2014-06-25 21:10:34	79.916	79.79
830	2014-06-25 21:11:17	181.65	166.95	830	2014-06-25 21:11:53	79.88	79.844	830	2014-06-25 21:11:34	79.808	79.646
831	2014-06-25 21:12:17	181.6	166.9	831	2014-06-25 21:12:53	79.88	79.88	831	2014-06-25 21:12:34	79.808	79.646
832	2014-06-25 21:13:17	181.6	166.9	832	2014-06-25 21:13:53	79.826	79.88	832	2014-06-25 21:13:34	79.808	79.646
833	2014-06-25 21:14:17	181.55	166.85	833	2014-06-25 21:14:53	79.844	79.952	833	2014-06-25 21:14:34	79.808	79.646
834	2014-06-25 21:15:17	181.55	166.85	834	2014-06-25 21:15:53	79.934	79.88	834	2014-06-25 21:15:34	79.808	79.592
835	2014-06-25 21:16:17	181.5	166.8	835	2014-06-25 21:16:53	79.88	79.898	835	2014-06-25 21:16:34	79.808	79.646
836	2014-06-25 21:17:17	181.5	166.8	836	2014-06-25 21:17:53	79.898	79.844	836	2014-06-25 21:17:34	79.808	79.646
837	2014-06-25 21:18:17	181.5	166.8	837	2014-06-25 21:18:53	79.934	79.898	837	2014-06-25 21:18:34	79.808	79.646
838	2014-06-25 21:19:17	181.45	166.75	838	2014-06-25 21:19:53	79.88	79.898	838	2014-06-25 21:19:34	79.916	79.754
839	2014-06-25 21:20:17	181.45	166.75	839	2014-06-25 21:20:53	79.826	79.844	839	2014-06-25 21:20:34	79.808	79.592
840	2014-06-25 21:21:17	181.4	166.7	840	2014-06-25 21:21:53	79.844	79.898	840	2014-06-25 21:21:34	79.808	79.592
841	2014-06-25 21:22:17	181.4	166.7	841	2014-06-25 21:22:53	79.826	79.898	841	2014-06-25 21:22:34	79.808	79.592
842	2014-06-25 21:23:17	181.4	166.7	842	2014-06-25 21:23:53	79.826	79.844	842	2014-06-25 21:23:34	79.808	79.592
843	2014-06-25 21:24:17	181.35	166.65	843	2014-06-25 21:24:53	79.826	79.826	843	2014-06-25 21:24:34	79.808	79.556
844	2014-06-25 21:25:17	181.35	166.65	844	2014-06-25 21:25:53	79.826	79.844	844	2014-06-25 21:25:34	79.808	79.502
845	2014-06-25 21:26:17	181.35	166.65	845	2014-06-25 21:26:53	79.934	79.844	845	2014-06-25 21:26:34	79.808	79.466
846	2014-06-25 21:27:17	181.3	166.6	846	2014-06-25 21:27:53	79.844	79.844	846	2014-06-25 21:27:34	79.808	79.466
847	2014-06-25 21:28:17	181.3	166.6	847	2014-06-25 21:28:53	79.808	79.844	847	2014-06-25 21:28:34	79.808	79.466
848	2014-06-25 21:29:17	181.3	166.6	848	2014-06-25 21:29:53	79.844	79.826	848	2014-06-25 21:29:34	79.808	79.502
849	2014-06-25 21:30:17	181.25	166.55	849	2014-06-25 21:30:53	79.826	79.898	849	2014-06-25 21:30:34	79.808	79.502
850	2014-06-25 21:31:17	181.25	166.55	850	2014-06-25 21:31:53	79.826	79.898	850	2014-06-25 21:31:34	79.808	79.466
851	2014-06-25 21:32:17	181.25	166.55	851	2014-06-25 21:32:53	79.826	79.88	851	2014-06-25 21:32:34	79.808	79.502
852	2014-06-25 21:33:17	181.2	166.5	852	2014-06-25 21:33:53	79.79	79.844	852	2014-06-25 21:33:34	79.808	79.502
853	2014-06-25 21:34:17	181.2	166.5	853	2014-06-25 21:34:53	79.826	79.898	853	2014-06-25 21:34:34	79.808	79.502
854	2014-06-25 21:35:17	181.15	166.45	854	2014-06-25 21:35:53	79.826	79.88	854	2014-06-25 21:35:34	79.808	79.502
855	2014-06-25 21:36:17	181.15	166.45	855	2014-06-25 21:36:53	79.826	79.934	855	2014-06-25 21:36:34	79.808	79.466
856	2014-06-25 21:37:17	181.15	166.45	856	2014-06-25 21:37:53	79.79	79.88	856	2014-06-25 21:37:34	79.808	79.466
857	2014-06-25 21:38:17	181.1	166.4	857	2014-06-25 21:38:53	79.826	79.898	857	2014-06-25 21:38:34	79.808	79.376
858	2014-06-25 21:39:17	181.1	166.4	858	2014-06-25 21:39:53	79.826	79.844	858	2014-06-25 21:39:34	79.808	79.466
859	2014-06-25 21:40:17	181.05	166.35	859	2014-06-25 21:40:53	79.826	79.934	859	2014-06-25 21:40:34	79.808	79.466
860	2014-06-25 21:41:17	181.05	166.35	860	2014-06-25 21:41:53	79.79	79.898	860	2014-06-25 21:41:34	79.808	79.376
861	2014-06-25 21:42:17	181	166.3	861	2014-06-25 21:42:53	79.826	79.88	861	2014-06-25 21:42:34	79.808	79.34
862	2014-06-25 21:43:17	181	166.3	862	2014-06-25 21:43:53	79.808	79.844	862	2014-06-25 21:43:34	79.808	79.286
863	2014-06-25 21:44:17	180.95	166.25	863	2014-06-25 21:44:53	79.826	79.88	863	2014-06-25 21:44:34	79.808	79.286
864	2014-06-25 21:45:17	180.95	166.25	864	2014-06-25 21:45:53	79.88	79.844	864	2014-06-25 21:45:34	79.808	79.286
865	2014-06-25 21:46:17	180.95	166.25	865	2014-06-25 21:46:53	79.826	79.826	865	2014-06-25 21:46:34	79.808	79.34
866	2014-06-25 21:47:17	180.9	166.2	866	2014-06-25 21:47:53	79.826	79.898	866	2014-06-25 21:47:34	79.808	79.286
867	2014-06-25 21:48:17	180.9	166.2	867	2014-06-25 21:48:53	79.772	79.826	867	2014-06-25 21:48:34	79.808	79.34
868	2014-06-25 21:49:17	180.9	166.2	868	2014-06-25 21:49:53	79.808	79.844	868	2014-06-25 21:49:34	79.808	79.34
869	2014-06-25 21:50:17	180.85	166.15	869	2014-06-25 21:50:53	79.808	79.844	869	2014-06-25 21:50:34	79.808	79.25
870	2014-06-25 21:51:17	180.85	166.15	870	2014-06-25 21:51:53	79.808	79.826	870	2014-06-25 21:51:34	79.808	79.25
871	2014-06-25 21:52:17	180.8	166.1	871	2014-06-25 21:52:53	79.826	79.826	871	2014-06-25 21:52:34	79.808	79.25
872	2014-06-25 21:53:17	180.8	166.1	872	2014-06-25 21:53:53	79.808	79.826	872	2014-06-25 21:53:34	79.808	79.286
873	2014-06-25 21:54:17	180.8	166.1	873	2014-06-25 21:54:53	79.808	79.88	873	2014-06-25 21:54:34	79.808	79.286
874	2014-06-25 21:55:17	180.8	166.1	874	2014-06-25 21:55:53	79.808	79.808	874	2014-06-25 21:55:34	79.808	79.286
875	2014-06-25 21:56:17	180.75	166.05	875	2014-06-25 21:56:53	79.808	79.844	875	2014-06-25 21:56:34	79.808	79.34
876	2014-06-25 21:57:17	180.75	166.05	876	2014-06-25 21:57:53	79.88	79.808	876	2014-06-25 21:57:34	79.808	79.34
877	2014-06-25 21:58:17	180.7	166	877	2014-06-25 21:58:53	79.808	79.898	877	2014-06-25 21:58:34	79.7	79.142
878	2014-06-25 21:59:17	180.7	166	878	2014-06-25 21:59:53	79.88	79.826	878	2014-06-25 21:59:34	79.808	79.286
879	2014-06-25 22:00:17	180.65	165.95	879	2014-06-25 22:00:53	79.79	79.898	879	2014-06-25 22:00:34	79.808	79.34
880	2014-06-25 22:01:17	180.65	165.95	880	2014-06-25 22:01:53	79.79	79.826	880	2014-06-25 22:01:34	79.808	79.34
881	2014-06-25 22:02:17	180.65	165.95	881	2014-06-25 22:02:53	79.754	79.772	881	2014-06-25 22:02:34	79.808	79.34
882	2014-06-25 22:03:17	180.6	165.9	882	2014-06-25 22:03:53	79.808	79.898	882	2014-06-25 22:03:34	79.7	79.142
883	2014-06-25 22:04:17	180.6	165.9	883	2014-06-25 22:04:53	79.772	79.826	883	2014-06-25 22:04:34	79.808	79.286
884	2014-06-25 22:05:17	180.6	165.9	884	2014-06-25 22:05:53	79.808	79.826	884	2014-06-25 22:05:34	79.808	79.34
885	2014-06-25 22:06:17	180.55	165.85	885	2014-06-25 22:06:53	79.772	79.862	885	2014-06-25 22:06:34	79.808	79.34
886	2014-06-25 22:07:17	180.55	165.85	886	2014-06-25 22:07:53	79.826	79.844	886	2014-06-25 22:07:34	79.808	79.34
887	2014-06-25 22:08:17	180.5	165.8	887	2014-06-25 22:08:53	79.826	79.88	887	2014-06-25 22:08:34	79.808	79.376
888	2014-06-25 22:09:17	180.5	165.8	888	2014-06-25 22:09:53	79.88	79.862	888	2014-06-25 22:09:34	79.808	79.376
889	2014-06-25 22:10:17	180.5	165.8	889	2014-06-25 22:10:53	79.808	79.808	889	2014-06-25 22:10:34	79.808	79.376
890	2014-06-25 22:11:17	180.45	165.75	890	2014-06-25 22:11:53	79.826	79.844	890	2014-06-25 22:11:34	79.808	79.376
891	2014-06-25 22:12:17	180.45	165.75	891	2014-06-25 22:12:53	79.826	79.844	891	2014-06-25 22:12:34	79.808	79.34
892	2014-06-25 22:13:17	180.4	165.7	892	2014-06-25 22:13:53	79.808	79.844	892	2014-06-25 22:13:34	79.808	79.34
893	2014-06-25 22:14:17	180.4	165.7	893	2014-06-25 22:14:53	79.808	79.826	893	2014-06-25 22:14:34	79.808	79.34
894	2014-06-25 22:15:17	180.35	165.65	894	2014-06-25 22:15:53	79.772	79.844	894	2014-06-25 22:15:34	79.808	79.34
895	2014-06-25 22:16:17	180.35	165.65	895	2014-06-25 22:16:53	79.79	79.844	895	2014-06-25 22:16:34	79.808	79.34
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897	2014-06-25 22:18:17	180.3	165.6	897	2014-06-25 22:18:53	79.772	79.898	897	2014-06-25 22:18:34	79.808	79.34
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911	2014-06-25 22:32:34	79.808	79.376
912	2014-06-25 22:33:34	79.7	79.304
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974	2014-06-25 23:35:34	79.808	79.466
975	2014-06-25 23:36:34	79.7	79.358
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988	2014-06-25 23:49:17	178.6	163.9	988	2014-06-25 23:49:53	79.754	79.808	988	2014-06-25 23:49:34	79.7	79.358
989	2014-06-25 23:50:17	178.6	163.9	989	2014-06-25 23:50:53	79.754	79.808	989	2014-06-25 23:50:34	79.7	79.394
990	2014-06-25 23:51:17	178.6	163.9	990	2014-06-25 23:51:53	79.808	79.826	990	2014-06-25 23:51:34	79.7	79.394
991	2014-06-25 23:52:17	178.55	163.85	991	2014-06-25 23:52:53	79.772	79.862	991	2014-06-25 23:52:34	79.7	79.394
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993	2014-06-25 23:54:17	178.55	163.85	993	2014-06-25 23:54:53	79.7	79.826	993	2014-06-25 23:54:34	79.7	79.394
994	2014-06-25 23:55:17	178.5	163.8	994	2014-06-25 23:55:53	79.772	79.808	994	2014-06-25 23:55:34	79.7	79.394
995	2014-06-25 23:56:17	178.5	163.8	995	2014-06-25 23:56:53	79.754	79.826	995	2014-06-25 23:56:34	79.7	79.394
996	2014-06-25 23:57:17	178.45	163.75	996	2014-06-25 23:57:53	79.754	79.772	996	2014-06-25 23:57:34	79.7	79.394
997	2014-06-25 23:58:17	178.45	163.75	997	2014-06-25 23:58:53	79.772	79.754	997	2014-06-25 23:58:34	79.7	79.394
998	2014-06-25 23:59:17	178.45	163.75	998	2014-06-25 23:59:53	79.772	79.862	998	2014-06-25 23:59:34	79.7	79.358
999	2014-06-26 00:00:17	178.45	163.75	999	2014-06-26 00:00:53	79.754	79.754	999	2014-06-26 00:00:34	79.7	79.358
1000	2014-06-26 00:01:17	178.4	163.7	1000	2014-06-26 00:01:53	79.808	79.826	1000	2014-06-26 00:01:34	79.7	79.394
1001	2014-06-26 00:02:17	178.4	163.7	1001	2014-06-26 00:02:53	79.754	79.826	1001	2014-06-26 00:02:34	79.7	79.394
1002	2014-06-26 00:03:17	178.4	163.7	1002	2014-06-26 00:03:53	79.772	79.754	1002	2014-06-26 00:03:34	79.7	79.358
1003	2014-06-26 00:04:17	178.35	163.65	1003	2014-06-26 00:04:53	79.718	79.826	1003	2014-06-26 00:04:34	79.7	79.394
1004	2014-06-26 00:05:17	178.35	163.65	1004	2014-06-26 00:05:53	79.808	79.898	1004	2014-06-26 00:05:34	79.7	79.394
1005	2014-06-26 00:06:17	178.3	163.6	1005	2014-06-26 00:06:53	79.808	79.772	1005	2014-06-26 00:06:34	79.7	79.394
1006	2014-06-26 00:07:17	178.3	163.6	1006	2014-06-26 00:07:53	79.88	79.826	1006	2014-06-26 00:07:34	79.7	79.394
1007	2014-06-26 00:08:17	178.3	163.6	1007	2014-06-26 00:08:53	79.754	79.772	1007	2014-06-26 00:08:34	79.7	79.394
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1012	2014-06-26 00:13:17	178.2	163.5	1012	2014-06-26 00:13:53	79.772	79.808	1012	2014-06-26 00:13:34	79.7	79.394
1013	2014-06-26 00:14:17	178.2	163.5	1013	2014-06-26 00:14:53	79.772	79.862	1013	2014-06-26 00:14:34	79.7	79.394
1014	2014-06-26 00:15:17	178.15	163.45	1014	2014-06-26 00:15:53	79.754	79.862	1014	2014-06-26 00:15:34	79.7	79.394
1015	2014-06-26 00:16:17	178.15	163.45	1015	2014-06-26 00:16:53	79.772	79.772	1015	2014-06-26 00:16:34	79.7	79.394
1016	2014-06-26 00:17:17	178.1	163.4	1016	2014-06-26 00:17:53	79.808	79.772	1016	2014-06-26 00:17:34	79.7	79.448
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1018	2014-06-26 00:19:17	178.1	163.4	1018	2014-06-26 00:19:53	79.754	79.862	1018	2014-06-26 00:19:34	79.7	79.394
1019	2014-06-26 00:20:17	178.05	163.35	1019	2014-06-26 00:20:53	79.736	79.808	1019	2014-06-26 00:20:34	79.7	79.394
1020	2014-06-26 00:21:17	178.05	163.35	1020	2014-06-26 00:21:53	79.718	79.862	1020	2014-06-26 00:21:34	79.7	79.394
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1023	2014-06-26 00:24:17	177.95	163.25	1023	2014-06-26 00:24:53	79.718	79.826	1023	2014-06-26 00:24:34	79.7	79.394
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1571	2014-06-26 09:32:34	79.7	79.61
1572	2014-06-26 09:33:34	79.7	79.61
1573	2014-06-26 09:34:34	79.7	79.61
1574	2014-06-26 09:35:34	79.7	79.61
1575	2014-06-26 09:36:34	79.7	79.61
1576	2014-06-26 09:37:34	79.7	79.61
1577	2014-06-26 09:38:34	79.7	79.61
1578	2014-06-26 09:39:34	79.7	79.61
1579	2014-06-26 09:40:34	79.7	79.61
1580	2014-06-26 09:41:34	79.7	79.61
1581	2014-06-26 09:42:34	79.7	79.574
1582	2014-06-26 09:43:34	79.7	79.61
1583	2014-06-26 09:44:34	79.808	79.718
1584	2014-06-26 09:45:34	79.7	79.61
1585	2014-06-26 09:46:34	79.7	79.61
1586	2014-06-26 09:47:34	79.7	79.61
1587	2014-06-26 09:48:34	79.7	79.574
1588	2014-06-26 09:49:34	79.7	79.574
1589	2014-06-26 09:50:34	79.7	79.61
1590	2014-06-26 09:51:34	79.7	79.574
1591	2014-06-26 09:52:34	79.7	79.61
1592	2014-06-26 09:53:34	79.808	79.682
1593	2014-06-26 09:54:34	79.7	79.61
1594	2014-06-26 09:55:34	79.7	79.61
1595	2014-06-26 09:56:34	79.7	79.61
1596	2014-06-26 09:57:34	79.7	79.61
1597	2014-06-26 09:58:34	79.7	79.61
1598	2014-06-26 09:59:34	79.7	79.61
1599	2014-06-26 10:00:34	79.7	79.664
1600	2014-06-26 10:01:34	79.7	79.61
1601	2014-06-26 10:02:34	79.7	79.61
1602	2014-06-26 10:03:34	79.7	79.61
1603	2014-06-26 10:04:34	79.7	79.61
1604	2014-06-26 10:05:34	79.7	79.61
1605	2014-06-26 10:06:34	79.7	79.61
1606	2014-06-26 10:07:34	79.7	79.61
1607	2014-06-26 10:08:34	79.7	79.61
1608	2014-06-26 10:09:34	79.7	79.61
1609	2014-06-26 10:10:34	79.7	79.664
1610	2014-06-26 10:11:34	79.7	79.664
1611	2014-06-26 10:12:34	79.7	79.61
1612	2014-06-26 10:13:34	79.7	79.664
1613	2014-06-26 10:14:34	79.7	79.61
1614	2014-06-26 10:15:34	79.7	79.664
1615	2014-06-26 10:16:34	79.7	79.664
1616	2014-06-26 10:17:34	79.7	79.61
1617	2014-06-26 10:18:34	79.7	79.61
1618	2014-06-26 10:19:34	79.7	79.664
1619	2014-06-26 10:20:34	79.7	79.61
1620	2014-06-26 10:21:34	79.7	2498
1621	2014-06-26 10:22:34	79.916	2498
1622	2014-06-26 10:23:34	80.258	2498

APPENDIX E –

INSTRUMENT CALIBRATION CERTIFICATES

MADGETECH
WE BUILD DATA LOGGERS

CERTIFICATE OF CALIBRATION

Certificate Information		Device Information	
Certificate Number:	NC-14-04-11-001	Device Name:	PR2000-500psi
Calibration Technician:	James Day	Device ID:	Unit 1 Press
Calibration Date:	2014-04-11	Serial Number:	N84154
Next Calibration Due:	2015-04-11	Model Description:	Pressure Data Logger with Display

MadgeTech, Inc. certifies that the instrument identified below has been calibrated (except where otherwise noted) using calibration standards that are traceable to the National Institute of Standards and Technology (NIST). This certificate is copyrighted and may not be reproduced, except in full, without prior written approval of MadgeTech, Inc..

PR2000-500psi - Pressure (absolute) - Serial Number: N84154

The Pressure (absolute) channel of the device under test (DUT) was calibrated in direct comparison to the reference equipment listed on the last page of this calibration certificate.

Published Device Specifications

Calibrated Accuracy: ±10.00 psi
Calibrated Accuracy Range: 5 psi to 500 psi
Resolution: 0.05 psi
Notes:

Channel 1 - Units of psi

Point	Standard Actual Test Point	DUT Uncorrected Device As Found	Device Error = Device - Standard	Device Allowable Limits = Standard ± Accuracy	DUT Corrected Device As Left	Device Error =Device - Standard
1	14.750	14.75	0.00	4.75 to 24.75	14.75	0.00
2	400.000	399.95	-0.05	390.00 to 410.00	400.00	0.00

	Initial Correction Values	Applied Correction Values
Gain:	0.9928412	0.9926453
Offset:	-3.36535 psi	-3.3610001 psi

Maintaining Calibration:

This product is manufactured from the highest quality components. The unit has been designed to remain within its specifications during normal use. However, the length of in-tolerance service can be affected by low battery voltage, age, temperature, humidity, shock, and other environmental influences. For those users with critical performance or validation requirements, MadgeTech, Inc. recommends that the unit be serviced and calibrated at regular periodic intervals.

Reference Equipment	Serial #	Certificate #	Last Calibration Date	Next Calibration Due
Mensor CPC6000	611758	96293 / 96304	2013-12-13	2014-12-13

Calibration and Service:

For information regarding this calibration or to arrange factory calibration or other service for this product, contact MadgeTech, Inc. or an authorized reseller. Products shipped directly to MadgeTech, Inc. will require a Return Merchandise Authorization (RMA) number.

Calibration Notes:

Issued By:	J. Day	Date:	2014-04-11
Approved By:	K. Strese	Date:	2014-04-11

CERTIFICATE OF CALIBRATION

MADGETECH
WE BUILD DATA LOGGERS

Certificate Information:

Certificate Number:	AR-13-08-20-003
Calibration Technician:	J Day
Calibration Date:	8/20/2013
Next Calibration Due:	8/20/2014

Device Information:

Device Name:	TCTemp2000
Device ID:	Aux Temp Unit 1
Serial Number:	N84147
Model Description:	Thermocouple Temperature Recorder
Calibration Date As Received:	7/16/2012
Condition As Received:	Used
Condition As Left:	In Tolerance

MadgeTech, Inc. certifies that the instrument identified below has been calibrated using calibration standards that are traceable to the National Institute of Standards and Technology(NIST). This certificate is copyrighted and may not be reproduced, except in full, without prior written approval of MadgeTech, Inc.

TCTemp2000 -Temperature Channel- Serial Number: N84147

The Temperature channel of the device under test (DUT) was calibrated in direct comparison to the reference equipment listed on the last page of this calibration certificate.

Published Device Specifications

Accuracy:	±0.5°C
Range:	0 to +50°C
Resolution:	0.01

Channel 1 - All data is in degrees Celsius (±°C)

Point	Standard Actual Test Point	DUT Uncorrected Device As Found	Device Error = Device-Standard	Allowable Device Limits = Standard±Accuracy	DUT Corrected Device As Left	Device Error = Device-Standard
1	25	24.76	-0.24	24.5 to 25.5	25	0

	Initial Correction Values	Applied Correction Values
Gain:	1	1
Offset:	0.12	-0.12

TCTemp2000 -T/C Channel- Serial Number: N84147

Channel 2 - All data is in Millivolts (mV)

Point	Standard Actual Test Point	DUT Uncorrected Device As Found	Device Error = Device-Standard	Allowable Device Limits = Standard±Accuracy	DUT Corrected Device As Left	Device Error = Device-Standard
1	0	-0.000064	0	N/A	0	0

	Initial Correction	Applied Correction Values
Gain:	1	1
Offset:	-0.000086	-0.00015000001

Maintaining Calibration:

This product is manufactured from the highest quality components. The unit has been designed to remain within its specifications during normal use. However, the length of in-tolerance service can be affected by low battery voltage, age, temperature, humidity, shock, and other environmental influences. For those users with critical performance or validation requirements, MadgeTech, Inc. recommends that the unit be serviced and calibrated at regular periodic intervals.

Calibration And Service:

For information regarding this calibration, or to arrange factory calibration or other service for this product, contact MadgeTech or an authorized reseller. Products shipped directly to MadgeTech, Inc. will require a Return Material Authorization (RMA) number.

MADGETECH
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CERTIFICATE OF CALIBRATION

Issued By: J. Day **Date:** 8/20/2013

Approved By: J. Heald **Date:** 8/20/2013

Reference Equipment	Serial No	Certificate No	Last Cal Date	Next Cal Due
Rotronic HygroClip IC1 Thermo-Hygrometer	43142019	2013.30047	4/30/2013	4/13/2014

Company Contact Information: MadgeTech, 6 Warner Road, Warner NH 03278

(603) 456-2011 (Tel)
(603) 456-2012 (Fax)
info@madgetech.com (E)
http://www.madgetech.com (W)

CERTIFICATE OF CALIBRATION

MADGETECH
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Certificate Information:		Device Information:	
Certificate Number:	AR-13-08-21-001	Device Name:	QuadTemp2000
Calibration Technician:	J Day	Device ID:	Temp Unit 1
Calibration Date:	8/21/2013	Serial Number:	N82430
Next Calibration Due:	8/21/2014	Model Description:	Four Channel Thermocouple Recorder
		Calibration Date As Received:	7/16/2012
		Condition As Received:	Used
		Condition As Left:	In Tolerance

MadgeTech, Inc. certifies that the instrument identified below has been calibrated using calibration standards that are traceable to the National Institute of Standards and Technology(NIST). This certificate is copyrighted and may not be reproduced, except in full, without prior written approval of MadgeTech, Inc.

QuadTemp2000 -Temperature Channel- Serial Number: N82430

The Temperature channels of the device under test (DUT) were calibrated in direct comparison to the reference equipment listed on the last page of this calibration certificate.

Published Device Specifications

Accuracy: ±0.5°C
Range: 0 to + 50°C
Resolution: 0.01

Channel 1 - All data is in degrees Celsius (±°C)

Point	Standard Actual Test Point	DUT Uncorrected Device As Found	Device Error = Device-Standard	Allowable Device Limits = Standard±Accuracy	DUT Corrected Device As Left	Device Error = Device-Standard
1	25	24.79	-0.21	24.5 to 25.5	24.99	-0.01
2	60	60.35	0.35	59.5 to 60.5	60.02	0.02

	Initial Correction Values	Applied Correction Values
Gain:	1.0008	1.0168571
Offset:	1.350008	0.73857141

Channel 3 - All data is in degrees Celsius (±°C)

Point	Standard Actual Test Point	DUT Uncorrected Device As Found	Device Error = Device-Standard	Allowable Device Limits = Standard±Accuracy	DUT Corrected Device As Left	Device Error = Device-Standard
1	25	24.71	-0.29	24.5 to 25.5	25	0
2	60	60.32	0.32	59.5 to 60.5	60.02	0.02

	Initial Correction Values	Applied Correction Values
Gain:	1.0024	1.0197144
Offset:	-2.2799759	-3.0028572

Channel 5 - All data is in degrees Celsius (±°C)

Point	Standard Actual Test Point	DUT Uncorrected Device As Found	Device Error = Device-Standard	Allowable Device Limits = Standard±Accuracy	DUT Corrected Device As Left	Device Error = Device-Standard
1	25	24.65	-0.35	24.5 to 25.5	25.01	0.01
2	60	60.27	0.27	59.5 to 60.5	59.99	-0.01

	Initial Correction Values	Applied Correction Values
Gain:	1	1.0177143
Offset:	0.81	0.017142856

Channel 7 - All data is in degrees Celsius (±°C)

Point	Standard Actual Test Point	DUT Uncorrected Device As Found	Device Error = Device-Standard	Allowable Device Limits = Standard±Accuracy	DUT Corrected Device As Left	Device Error = Device-Standard
1	25	24.52	-0.48	24.5 to 25.5	24.99	-0.01
2	60	60.15	0.15	59.5 to 60.5	60	0

	Initial Correction Values	Applied Correction Values
Gain:	0.98839998	1.006

Company Contact Information: MadgeTech, 6 Warner Road, Warner NH 03278
(603) 456-2011 (Tel)
(603) 456-2012 (Fax)
info@madgetech.com (E)
http://www.madgetech.com (W)

CERTIFICATE OF CALIBRATION

MADGETECH
WE BUILD DATA LOGGERS

Offset:	0.079884	-0.82999998

QuadTemp2000 -T/C Channel- **Serial Number: N82430**

Channel 2 - All data is in Millivolts (mV)

Point	Standard Actual Test Point	DUT Uncorrected Device As Found	Device Error = Device-Standard	Allowable Device Limits = Standard±Accuracy	DUT Corrected Device As Left	Device Error = Device-Standard
1	0	-0.000326	0	N/A	0	0

	Initial Correction	Applied Correction Values
Gain:	1	1
Offset:	-0.00050700002	-0.000833

Channel 4 - All data is in Millivolts (mV)

Point	Standard Actual Test Point	DUT Uncorrected Device As Found	Device Error = Device-Standard	Allowable Device Limits = Standard±Accuracy	DUT Corrected Device As Left	Device Error = Device-Standard
1	0	0.000212	0	N/A	0	0

	Initial Correction	Applied Correction Values
Gain:	1	1
Offset:	-0.000439	-0.000227

Channel 6 - All data is in Millivolts (mV)

Point	Standard Actual Test Point	DUT Uncorrected Device As Found	Device Error = Device-Standard	Allowable Device Limits = Standard±Accuracy	DUT Corrected Device As Left	Device Error = Device-Standard
1	0	-0.000108	0	N/A	0	0

	Initial Correction	Applied Correction Values
Gain:	1	1
Offset:	-0.00079999998	-0.00090799999

Channel 8 - All data is in Millivolts (mV)

Point	Standard Actual Test Point	DUT Uncorrected Device As Found	Device Error = Device-Standard	Allowable Device Limits = Standard±Accuracy	DUT Corrected Device As Left	Device Error = Device-Standard
1	0	-0.000165	0	N/A	0	0

	Initial Correction	Applied Correction Values
Gain:	1	1
Offset:	0.000014	-0.000151

Maintaining Calibration:

This product is manufactured from the highest quality components. The unit has been designed to remain within its specifications during normal use. However, the length of in-tolerance service can be affected by low battery voltage, age, temperature, humidity, shock, and other environmental influences. For those users with critical performance or validation requirements, MadgeTech, Inc. recommends that the unit be serviced and calibrated at regular periodic intervals.

Calibration And Service:

For information regarding this calibration, or to arrange factory calibration or other service for this product, contact MadgeTech or an authorized reseller. Products shipped directly to MadgeTech, Inc. will require a Return Material Authorization (RMA) number.

Issued By: J. Day **Date:** 8/21/2013

Approved By: J. Heald **Date:** 8/21/2013

A I Angel's Instrumentation INC. ISO 17025 ACCREDITED

CERTIFICATE OF CALIBRATION

Angel's Instrumentation Inc.
928 Canal Drive
Chesapeake, VA 23323

UNIT UNDER TEST(UUT):	10 GPM Flow Meter	TEST RESULT:	PASS
MANUFACTURER:	GPI	PERFORMED ON:	6/16/2014
MODEL NUMBER:	G2S05N09GMA	TEMPERATURE:	22.4°C
SERIAL NUMBER:	3206877	HUMIDITY:	46%
CUSTOMER ID NUMBER:	211871 UNIT 3	CAL DATE:	6/16/2014
PROCEDURE NAME:	17-20MG-38 (Rev. 8/1/2010)	NEXT CAL DUE:	6/16/2015
CALIBRATED BY:	Dante Daneri	WORKORDER#:	25137
CONTACT NAME:	Dennis Cobb	CERTIFICATE#:	211871:6856481481
CUSTOMER:	Pipeline Petroleum Service 1324 Cavalier Blvd CHESAPEAKE, VA 23323	Purchase Order#:	Verbal Dennis
		DATA TYPE:	FOUND-LEFT
		PERFORMED AT Angel's Instrumentation Inc.	

Angel's Instrumentation Inc. certifies that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure unless otherwise noted. It has been calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration complies with ISO-IEC 17025-2005, ANSI/NCSL Z540-1-1994, and/or ANSI/NCSL Z540.3-2006.

Complete records of work performed are maintained by Angel's Instrumentation and are available for inspection. All calibrations have been performed using processes that have a test uncertainty ratio of four or more times greater than the unit calibrated. Uncertainties have been estimated at 95 percent confidence level (k=2). Calibration at 4:1 TUR provides reasonable confidence that the instrument is within the manufacturer's published specifications.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the calibration organization issuing this report.

Note: Any Test Uncertainty Ratio (TUR) that is less than four to one will appear in the remarks section of this report and identified with an asterisk (*) in the readings section.

Note: Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired. The customer is responsible for assigning intervals. Angel's Instrumentation does not recommend calibration intervals.

Angel's Instrumentation is responsible for the calibration process results during the time of the calibration process, and this certificate of calibration is neither a contract nor a contractual representation.

REMARKS: Received on 6/16/2014.

Received Condition: Fair / In Tolerance

Standards Used

Asset	Description	CAL DUE DATE
300018	Flow Meter	28-May-16

Test Data

Flow Calibration

Range	Applied	As Found	As Left	Lower Limit	Upper Limit	
10 GPM	2 GPM	1.99	1.99	1.96	2.04	PASS
.	4 GPM	3.99	3.99	3.92	4.08	PASS
.	6 GPM	5.99	5.99	5.88	6.12	PASS
.	8 GPM	7.99	7.99	7.84	8.16	PASS

End of Test Data

Signed: _____
Authorized Service Technician/Manager

Signed: _____
Designated Service QA Manager

A I Angel's Instrumentation INC. ISO 17025 ACCREDITED

CERTIFICATE OF CALIBRATION

Angel's Instrumentation Inc.
928 Canal Drive
Chesapeake, VA 23323

UNIT UNDER TEST(UUT):	5-50 GPM Flow Meter	TEST RESULT:	PASS
MANUFACTURER:	GPI	PERFORMED ON:	6/16/2014
MODEL NUMBER:	G2S10N09GMA	TEMPERATURE:	22.4°C
SERIAL NUMBER:	3710745	HUMIDITY:	46%
CUSTOMER ID NUMBER:	211872 UNIT 4 - 1" ϕ	CAL DATE:	6/16/2014
PROCEDURE NAME:	17-20MG-38 (Rev. 8/1/2014)	NEXT CAL DUE:	6/16/2015
CALIBRATED BY:	Dante Daneri	WORKORDER#:	25137
CONTACT NAME:	Dennis Cobb	CERTIFICATE#:	211872:6885416667
CUSTOMER:	Pipeline Petroleum Service 1324 Cavalier Blvd CHESAPEAKE, VA 23323	Purchase Order#:	Verbal Dennis
		DATA TYPE:	FOUND-LEFT
		PERFORMED AT	Angel's Instrumentation Inc.

Angel's Instrumentation Inc. certifies that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure unless otherwise noted. It has been calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration complies with ISO-IEC 17025-2005, ANSI/NCSL Z540-1-1994, and/or ANSI/NCSL Z540.3-2006.

Complete records of work performed are maintained by Angel's Instrumentation and are available for inspection. All calibrations have been performed using processes that have a test uncertainty ratio of four or more times greater than the unit calibrated. Uncertainties have been estimated at 95 percent confidence level (k=2). Calibration at 4:1 TUR provides reasonable confidence that the instrument is within the manufacturer's published specifications.

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Note: Any Test Uncertainty Ratio (TUR) that is less than four to one will appear in the remarks section of this report and identified with an asterisk (*) in the readings section.

Note: Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired. The customer is responsible for assigning intervals. Angel's Instrumentation does not recommend calibration intervals.

Angel's Instrumentation is responsible for the calibration process results during the time of the calibration process, and this certificate of calibration is neither a contract nor a contractual representation.

REMARKS: Received on 6/16/2014.

Received Condition: Fair / In Tolerance

Standards Used

Asset	Description	CAL DUE DATE
300018	Flow Meter	28-May-16

Test Data

Flow Calibration

Range	Applied	As Found	As Left	Lower Limit	Upper Limit	
5 GPM	10 GPM	9.95	9.95	9.85	10.15	PASS
.	20 GPM	19.96	19.96	19.70	20.30	PASS
.	30 GPM	29.95	29.95	29.55	30.45	PASS
30 GPM	40 GPM	39.94	39.94	39.40	40.60	PASS

End of Test Data

Signed: *Authorized Service Technician/Manager*

Signed: *Designated Service QA Manager*

A I Angel's Instrumentation INC. ISO 17025 ACCREDITED

CERTIFICATE OF CALIBRATION

Angel's Instrumentation Inc.
928 Canal Drive
Chesapeake, VA 23323

UNIT UNDER TEST(UUT):	5000 PSI Pressure Gauge	TEST RESULT:	PASS
MANUFACTURER:	Crystal Engineering	PERFORMED ON:	5/5/2014
MODEL NUMBER:	XP2i 5000	TEMPERATURE:	20.2°C
SERIAL NUMBER:	870422	HUMIDITY:	47%
CUSTOMER ID NUMBER:	211596 UNIT 1	CAL DATE:	5/5/2014
PROCEDURE NAME:	AILCP-136 (Rev. 2)	NEXT CAL DUE:	5/5/2015
CALIBRATED BY:	Dante Daneri	WORKORDER#:	24846
CONTACT NAME:	Joe Jackson	CERTIFICATE#:	211596:6267592593
CUSTOMER:	Pipeline Petroleum Service 1324 Cavalier Blvd CHESAPEAKE, VA 23323	Purchase Order#:	CHARGE
		DATA TYPE:	FOUND-LEFT
		PERFORMED AT Angel's Instrumentation Inc.	

Angel's Instrumentation Inc. certifies that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure unless otherwise noted. It has been calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration complies with ISO-IEC 17025-2005, ANSI/NCSL Z540-1-1994, and/or ANSI/NCSL Z540.3-2006.

Complete records of work performed are maintained by Angel's Instrumentation and are available for inspection. All calibrations have been performed using processes that have a test uncertainty ratio of four or more times greater than the unit calibrated. Uncertainties have been estimated at 95 percent confidence level (k=2). Calibration at 4:1 TUR provides reasonable confidence that the instrument is within the manufacturer's published specifications.

This report may not be reproduced, except in full, unless permission for the publication of an approved abstract is obtained in writing from the calibration organization issuing this report.

Note: Any Test Uncertainty Ratio (TUR) that is less than four to one will appear in the remarks section of this report and identified with an asterisk (*) in the readings section.

Note: Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired. The customer is responsible for assigning intervals. Angel's Instrumentation does not recommend calibration intervals.

Angel's Instrumentation is responsible for the calibration process results during the time of the calibration process, and this certificate of calibration is neither a contract nor a contractual representation.

REMARKS: Received on 5/5/2014.

Received Condition: Good / In Tolerance

Standards Used

Asset	Description	CAL DUE DATE
301068	RTD Probe w/ Indicator	16-Dec-15
301069	100 Kg Mass Set	04-Oct-14
301071	500 PSI Piston	10-Sep-14

Test Data

Digital Pressure Calibration

DUT

Set Point	Applied	As Found	As Left	Lower Limit	Upper Limit	
500 PSI	499.797	500.0	500.0	498.80	500.80	Pass
1000 PSI	999.845	1000.0	1000.0	998.85	1000.85	Pass
1500 PSI	1499.893	1500.0	1500.0	1498.39	1501.39	Pass
2000 PSI	1999.937	1999.8	1999.8	1997.94	2001.94	Pass
2500 PSI	2499.983	2499.5	2499.5	2497.48	2502.48	Pass
3000 PSI	3000.027	2999.5	2999.5	2997.03	3003.03	Pass
3500 PSI	3500.063	3499.5	3499.5	3496.56	3503.56	Pass
4000 PSI	4000.098	3999.5	3999.5	3996.10	4004.10	Pass
4500 PSI	4500.128	4499.4	4499.4	4495.63	4504.63	Pass
5000 PSI	5000.162	4999.6	4999.6	4995.16	5005.16	Pass

Device Under Test Accuracy +/- .02% F.S. from 0-20% of F.S. and +/- .1% Rdg from 20-100% of F.S.

End of Test Data

Signed: _____
Authorized Service Technician/Manager

Signed: _____
Designated Service QA Manager

QUALITY ASSURANCE SURVEILLANCE PLAN

WARRANTY PHASE WORK
RE-INSPECT AND REPAIR RED HILL TANK 5
JBPHH, Pearl Harbor, HI
Contract Number N62583-09-D-0132/0003

Issued 13 Nov 2014

FOR CONSTRUCTION

Rev Number	Date	Comment
8	6 Nov 2014	Incorporated SME comments to draft matrix in Attachment 6; PAC and NFHI comments incorporated; QAI role added

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QUALITY ASSURANCE SURVEILLANCE PLAN

1 INTRODUCTION

This quality assurance surveillance plan (QASP) is pursuant to the requirements listed in the Task Order and modifications (TO) performance work statement (PWS). This QASP sets forth the procedures, guidelines, roles, and responsibilities. QASP implementation will be led by Naval Facilities Engineering and Expeditionary Warfare Center (EXWC) with support from NAVFAC Hawaii. The Government Technical team (GTT) will use this QASP to ensure the required performance standards are achieved by the contractor. The GTT consists of the PM, COR, CSE, CSET, and any technical specialist performing QA duties upon the request or on behalf of the KO or a GTT member.

1.1 Purpose

1.1.1 The purpose of the QASP is:

(a) Describe methods used to monitor performance

(b) Provide guidelines for systematic inspection and documentation of contractor activities

(c) Provide reasonable assurance that the completed work will meet or exceed the requirements of the contract

(d) Identify required documentation

(e) List roles and responsibilities for the resources to be employed.

This QASP provides guidance for evaluating whether or not the contractor is meeting the performance standards and quality levels identified in the TO requirements and the contractor's quality control plan (QCP). The primary objective of the warranty work addressed by this QASP is the reinspection, repair, and return to service of Red Hill Fuel Storage Tank 5. A secondary objective is to determine the existence and location of free product, if any, and to recover free product to the extent possible.

Aspects of the project require an enhanced level of effort which is above and beyond ordinary NAVFAC QA surveillance activity.

1.1.2 The Quality Assurance (QA) work identified in this QASP has aspects which require an increased level of effort (LOE). EXWC is responsible for the management of the project technical team for inspection, testing, and repair of fuel system facilities. The Project Manager (PM) role is defined in Section 2.3 of this QASP. ACO authority is at EXWC ACQ72. The COR has been appointed at NAVFAC Hawaii. The CSE and CSET are contract employees of NAVFAC Hawaii and act under authority from the COR. The warranty work will be subject to high visibility and will be performed as part of an ongoing warranty repair action by the Contractor.

1.1.3 This QASP defines the roles and responsibilities of members of the GTT, identifies the performance objectives, defines the methodologies used to monitor and evaluate the contractor's performance, describes QA documentation requirements, and describes the analysis of QA monitoring results.

1.2 Performance Management Approach

1.2.1 This QASP will define the performance management approach taken by the GTT to monitor and manage the contractor's warranty work performance to ensure the expected outcomes communicated in the PWS are achieved. Performance management rests on developing a capability to review and analyze information generated through QA performance assessment. The ability to make decisions based on the analysis of performance and QC data is the cornerstone of performance management; this QA analysis yields information that indicate whether or not expected outcomes for the warranty work are being achieved by the contractor.

1.2.2 The performance-based approach identified in this QASP enables the contractor to play a large role in how the warranty work is performed. The proposed QA processes are designed to monitor contractor's performance within the stated constraints and if necessary, to stop contractor's work progress if deemed unacceptable. The exceptions to QA process reviews are prescriptive reviews as required by applicable federal, state, and local laws, along with compelling business situations such as unacceptable environmental, safety and health risks. The "results" focus of this QASP provides the contractor with flexibility to continuously improve and innovate over the course of the warranty work, but all work performed by contractor must maintain the critical outcomes expected.

1.2.3 As an enhancement to the performance-based approach, the GTT will execute proactive measures to validate contractor QC program output quality and data. These enhanced measures execute an acceptance sampling plan of attributes (NDE results) at a statistically significant level. The acceptance sampling plan is a valid method by which the quality of the QC program output can be determined by inspecting a representative sample of the entire population (Juran, 1988). Additional technical specialist resources may be utilized by the GTT to execute the plan. Should the acceptance sampling results be found less than the Acceptable Quality Level, corrective action steps will be taken as described in Section 5.

1.3 Performance Management Strategy

1.3.1 The contractor is responsible for the workmanship and quality of all work performed. The contractor measures quality through the contractor's QC program. Contractor QC is work output. Therefore, QC includes all work performed, under this contract regardless of whether the work is performed by prime contractor's employees or by subcontractors. The contractor's QCP will set forth the staffing and procedures for self-inspecting the workmanship quality, timeliness, responsiveness, customer satisfaction, and other performance requirements in the PWS and warranty action. The contractor will develop and implement a performance management system with processes to assess its performance and contractor's PM will report its performance to the EXWC PM.

1.3.2 The NAVFAC Hawaii Facilities Engineering and Acquisitions Division (FEAD) Construction Surveillance Engineer (CSE) will monitor onsite performance and the EXWC PM will review performance reports furnished by the contractor to determine how the contractor is performing against communicated performance objectives. The EXWC PM will be the primary point of contact (POC) responsible for communicating corrective actions required to achieve critical outcomes and performance objectives. The contractor will be responsible for implementing corrective actions in QC processes and workmanship practices. The FEAD CSE will be the primary point of contact (POC) responsible for communicating the results of onsite QA assessments which verify contractor's QC personnel are effectively monitoring and documenting workmanship. Technical specialists such as third party QA technician(s) or government subject matter experts requested by the GTT will report to the contracting officer's representative (COR) or the onsite GTT member respectively.

2 ROLES AND RESPONSIBILITIES

2.1 The Contracting Officer

The EXWC Contracting Officer (KO), with support from the EXWC PM and the FEAD COR, is responsible for monitoring contract and warranty work compliance, including contract administration and cost control. The KO will resolve any differences between the observations documented by the GTT and the contractor. The KO has designated one FEAD COR as the government local authority for performance management of PWS and warranty action efforts. The FEAD COR has designated one FEAD CSE and one FEAD Construction Surveillance Engineering Technician (CSET) to support an increased LOE for field QA efforts.

2.2 The Contracting Officer's Representative

The FEAD COR has been designated in writing by the EXWC KO to act as his or her authorized representative to assist in administering the TO and warranty action. COR limitations are contained in the written appointment letter. The COR is responsible for technical administration of the project and ensures proper government surveillance of the contractor's performance. The COR is not empowered to make any contractual commitments or to authorize any contractual changes on behalf of the Government. Any changes that the contractor deems may affect TO price, terms, or conditions will be referred to the KO for action. The COR will have the responsibility for collecting and/or completing QA Reports used to document the inspection and evaluation of the contractor's workmanship and QC performance. CSE and CSET surveillance will occur under the inspection of services clause for the warranty action relating to the TO.

2.3 The Project Manager

The EXWC PM is responsible to EXWC for technical oversight of the fuel system inspection, testing, and repair as required to meet PWS objectives. The PM may engage technical specialists as-required to ensure objectives of this QASP are met. The PM is not empowered to make any contractual commitments or to authorize any contractual changes on behalf of the Government. Any changes that the contractor deems may affect contract price, terms, or conditions shall be referred to the KO for action. The PM, with field support from the CSE, will have the primary responsibility for (a) reviewing QA reports, (b) assessing Contractor inspection performance and results via periodic onsite surveillance, (c) assessing Contractor testing performance and results via periodic onsite surveillance, (d) and evaluating Contractor QC reports, as the basis for determining whether or not project objectives are being met. The PM is authorized to stop work in the event of a severe hazard exposure pursuant to 01 35 26.05 20. PM surveillance may occur under the inspection of services clause for any service relating to the TO. The PM will serve as the COR for a third party QA specialist utilized.

2.4 Construction Surveillance Engineer

The CSE supports the COR, PM, and KO. CSE limitations are managed by the FEAD. The CSE is responsible for (a) the field administration of safety and environmental compliance, (b) contractor's site access, (c) coordination with the NAVFAC customer's POC, and (d) field surveillance of TO and warranty work. The CSE will support the KO or PM upon request to obtain and provide more information on a particular QA matter. The CSE is not empowered to make any contractual commitments, authorize any contractual changes on behalf of the Government, or direct technical performance with regard to the warranty inspection, QC testing, or rework of repairs. Any changes that the CSE or the contractor deems may affect contract price, terms, or conditions will be referred to the KO for action. Within the noted area of responsibility, the CSE will be responsible for preparing QA Reports used to document the inspection and evaluation of contractor workmanship and QC performance. The CSE and CSET are authorized to stop work in the event of a severe safety, security, or environmental

hazard exposure. CSE surveillance will occur under the inspection of services clause for the warranty action relating to the TO.

2.5 Construction Surveillance Engineering Technician

The CSET will perform routine regular onsite surveillance of contractor activities on behalf of the KO. The CSET is responsible for observing and reporting contractor's progress in accomplishing the warranty inspection, QC testing, and rework of repairs. The CSET will assist the CSE in ensuring workmanship and QC performance objectives of the TO and warranty action are being met. The CSET will (a) review contractor's reports, testing personnel credentials, and equipment calibration certificates, and (b) attend contractor's field QC meetings. The CSET will provide exceptions or comment to the contractor's QC report in the QA Report portion as depicted in Attachment 4. The CSET will provide all findings to the CSE in daily QA reports, the format of which is in Attachment 2. The CSE is not empowered to make any contractual commitments or authorize any contractual changes on behalf of the Government. The CSET is authorized to stop work in the event of a severe safety, security, or environmental hazard exposure. Any changes that the CSET or contractor deems may affect contract price, terms, or conditions will be referred to the KO for action. QA surveillance by the CSET will occur under the inspection of services clause for the warranty action relating to the TO.

2.6 Quality Assurance Inspector

The Quality Assurance Inspector (QAI) is a third party A/E who will perform onsite surveillance of contractor activities and report to the GTT. The specific scope of the QAI activity and level of effort is described in a separate contract action task order statement of work. The QAI is responsible for observing and reporting contractor's progress in accomplishing the warranty inspection, QC testing, and rework of repairs. The QAI will assist the GTT in observing the workmanship and QC performance objectives of the TO and warranty action are being met. The QAI will review contractor's reports, testing personnel credentials, and equipment calibration certificates, review the API inspection, and witness leak testing and other ND examinations. The QAI will provide all findings in reports. The QAI is not empowered to direct contractor activity, make any contractual commitments, or authorize any contractual changes.

3 METHODOLOGIES TO MONITOR PERFORMANCE

Measures undertaken to provide an increased, overlapping, and redundant LOE of QA performance management include the following:

a) Daily frequency of routine and regular field surveillance activities will be used by the FEAD to evaluate contractor's workmanship and QC performance.
b) GTT access to regularly updated contractor QC Log.
c) Redundant scrutiny of QA and QC documentation.
d) Periodic field surveillance of inspection and testing results.
e) Non-periodic, comprehensive field surveillance of accomplished work.
f) Validation of the contractor QC Program results by execution of an acceptance sampling plan.

The warranty work to be performed is primarily rework which is critical to the viability of the customer's mission-essential Red Hill Fuel Storage Facility. The GTT will strive to assess QA requirements objectively but will verify acceptable contractor performance is actually being achieved. Pursuant to BMS 1.5.5.1.4 "Ongoing Quality Assurance Actions", specific QA surveillance activities will be conducted based on contractor's weekly QC meetings and the three-week look-ahead schedule. The primary methods of QA surveillance are both proactive and participatory.

3.1 Proactive Surveillance Techniques

The GTT will take an active role in verifying contractor inspection, testing, and repair results. The GTT will also validate the contractor QC Program results (QCP). Validation will take the form of randomly selecting completed repairs as-reported on the QC Log, and systematically verifying the result. Verification will take the form of requiring the contractor to repeat in the presence of the GTT, leak test and MT inspection which have been reported as "Passed" in the QC Log. Verification will take place by the GTT members in person from the suspended work platform. Validation will implement the acceptance sampling plan in Attachment 5.

3.1.1 Acceptance Sampling Plan – A method to provide evidence the QCP has met the performance goals required to return Tank 5 to service is to perform sampling inspection of completed repairs and make a decision prior to acceptance (Johnson, 1994) of the warranty work. The plan uses a single stage model with binomial probability distribution calculated no more than 5% chance of a Type II error (accepting an undetected defect). The model identifies the minimum number of random repairs (76) which will be acceptance tested at an AQL of 3. A failed test shall result in rework of the repair. If the number of test failures is below the AQL, the QC program output is validated. If the number of test failures is at or over the AQL, the QC program is rejected. Rejection of the QC program will trigger performance requirement corrective measures noted in Section 5.1 and Attachment 1. The acceptance sampling plan is in Attachment 5.

3.1.2 Periodic Onsite Verification – The PM will conduct periodic onsite verification of contractor's means, methods, and results of inspection and testing. Leak testing, MT inspections, and review of weldments (API_Standard_1104, 2014) from the inspection basket will take place. The results of the verification will be documented in QA reports per Attachment 2. To obtain accurate results, the planned locations and time of planned onsite surveillance activities might not be communicated to Contractor in advance. Frequency of the periodic surveillance is planned to be minimum five days per month.

3.1.3 Periodic Onsite Verification – The CSE will conduct periodic onsite verification of contractor's means, methods, and results of inspection and testing. Leak testing, MT inspections, and review of weldments (API_Standard_1104, 2014) from the inspection basket will take place. The results of the verification will be documented in QA reports per Attachment 2. To obtain accurate results, the planned locations and time of planned onsite surveillance activities might not be communicated to Contractor in advance. Frequency of the periodic surveillance is planned to be minimum two days per week.

3.2 Participatory Surveillance Techniques

The GTT will participate in contractor QC program three phases of control system activities. The intent will be to shape the progress and effectiveness of the contractor's quality control. Since the definable features of work are limited to a few, GTT participation will extend beyond Three Phase of Control meeting attendance. The primary daily GTT onsite member will be the CSET for minimum two hours.

3.2.1 Preparatory Phase – The GTT will participate in preparatory phase meetings prior to start of work of each definable feature of work. At the meeting the GTT will review the applicable specifications and references for the work. This will include welding specifications, NDE procedures, and testing protocol. The GTT will verify all materials and equipment have been brought onsite and have been tested and approved for use. An examination of the work area will take place to assure all required preliminary work has been completed. Review of the activity hazard analysis and discussion of the work procedures will also be performed.

3.2.2 Initial Phase – At the beginning of the work, the GTT will review preliminary QCP output, verify the adequacy of the QC controls, and assess workmanship. Corrective actions to address concerns shall be directed to the QCM and noted in the daily QA report.

3.2.3 Follow-Up Phase – The GTT will perform daily checks to assure continued compliance with contract requirements is taking place, including safety and control testing.

3.2.4 Daily Surveillance – The CSET will observe onsite contractor activity during various aspects of warranty work DFOW. This will include QA surveillance of contractor QC activities; review of contractor inspection activity to include operator credentials; review of contractor testing to include operator credentials; review of rework repair techniques, means, and methods; review of daily contractor reporting; preparation of a daily QA report. In an effort to obtain accurate results, the CSET observational activity will occur at intervals unknown to contractor and will not be readily predictable.

3.2.5 Daily Offsite Review – The PM will review Contractor daily QC and production reports, QC log, daily QA reports as necessary to monitor and assess contractor's workmanship and QC performance. The PM reviews will form the basis for an ongoing determination of performance with regard to workmanship and QC performance objectives. The determination shall be provided periodically to the GTT, KO, and EXWC management for use in reply to stakeholder inquiry.

3.2.6 Daily Offsite Review – The CSE will review Contractor daily QC and production reports, QC log, daily CSET reports as necessary to monitor and assess contractor's workmanship and QC performance. The CSE weekly assessments will form the basis for an ongoing determination of performance with regard to workmanship and QC performance objectives. The determination shall be provided periodically to the GTT, KO, and FEAD management for use in reply to stakeholder inquiry.

3.2.7 Non-Periodic Onsite Surveillance – The CSE will conduct non-periodic onsite surveillance of Contractor's accomplished work for each DFOW milestone to ensure successful completion of all inclusive work tasks and related activities. In an effort to ensure comprehensive results, specifics of planned onsite surveillance activities will be communicated to Contractor in advance.

3.2.8 Periodic QC Meetings – The CSE and CSET will attend contractor's weekly QC meetings. The CSE, with support from the CSET, will assess contractor's warranty work planning and onsite progress. Attention will be directed to the contractor's personnel assignments and individual performance capabilities in order to assess contractor's overall ability to accomplish proposed workmanship and QC results.

3.3 Customer Feedback

The contractor is expected to establish and maintain professional communication between its employees and Navy personnel. The primary objective of this communication is the Navy's customer satisfaction. Customer satisfaction is the most significant external indicator of the success and effectiveness of all services provided and can be measured through Navy and external stakeholders' complaints.

Performance management requires the contractor to be customer focused through initially and internally addressing customer complaints with the CSE and investigating the issues. The Navy and external stakeholders' retain the option to communicate complaints to the Navy POCs, as opposed to the contractor.

The COR will accept those customer complaints deemed valid after reviewing with contractor. The COR will investigate valid complaints to the extent necessary to resolve effectively and timely.

Customer feedback will be obtained by the CSE and CSET during weekly meetings with Navy stakeholders. Customer feedback summaries will be provided to contractor by the CSE and CSET during contractor's weekly QC meetings.

3.4 Acceptable Quality Levels

The acceptable quality levels (AQLs) are included in Attachment 1, "Performance Requirements Summary Table". The AQLs for contractor performance are structured to allow the contractor to manage how the work is performed, while providing negative incentives for performance shortfalls. For certain critical activities, e.g. those involving the submission and adherence to an Accident Prevention Plan (APP) as outlined in Specification 01 35 26.05 20 and 385-1-1, the desired performance level is established at 100 percent.

4 QUALITY ASSURANCE DOCUMENTATION

4.1 The Performance Management Feedback Loop

The performance management feedback loop begins with the communication of expected outcomes. Performance standards are expressed in the PWS and WP. Performance standards are assessed using the performance monitoring techniques provided in Attachment 1.

4.2 Quality Assurance Reports

The QA surveillance will be accomplished by the GTT and will be reported using the QA Report provided in Attachment 2 and the QA Report portion of the Contractor Quality Control Report provided in Attachment 3. The completed QA reports will document the GTT's assessment of the contractor's performance under the TO and warranty action to ensure the required workmanship and QC results are being achieved.

4.2.1 The COR and PM will retain a copy of all completed QA Reports from the CSE and CSET.

5 ANALYSIS OF QUALITY ASSURANCE ASSESSMENT

5.1 Determining Performance

5.1.1 The GTT will use the monitoring methods cited to determine whether the performance standards, service levels and AQLs have been met. If the contractor has not fully met the requirements, the contractor will be required to develop a corrective action plan to show how and when contractor's performance will be restored to the required levels.

5.1.2 Should the AQL prescribed in Acceptance Test Sampling Plan (Attachment 5) not be met, notification shall be provided to the contractor in the form of a notice of non-compliance. Should no extenuating circumstances be found by the Contracting Officer, the contractor QCM shall be determined to be incompetent, careless, or otherwise objectionable per FAR 52.236-5. The result of that determination shall be ineligibility from working on the project. The KO shall determine whether additional contractual steps as detailed in Attachment 1 are warranted.

5.2 Reporting

5.2.1 eProjects: Twice per month the PM will update the associated eProjects status notes summarizing contractor's progress. Once per month, the PM will update the eProjects status notes summarizing the overall results of the QA surveillance efforts. The summary will consider the contractor's progress reports and the quality assurance reports. This will become part of the QA documentation. This documentation process will enable the GTT to demonstrate whether or not the contractor is meeting the stated QA objectives and performance standards, including cost, technical and scheduling objectives.

5.2.2 eContracts: Once per week the CSE will update the associated eContracts record summarizing contractor progress. Once per month, the CSE will update the eContracts record summarizing the overall status of contractor's fieldwork progress.

5.2.3 Stakeholder: Updates provided to stakeholders will be coordinated within the GTT for content prior to release. Release shall only be made in accordance with the REDHILL Communications Plan Process.

5.3 Reviews and Resolution

5.3.1 The Contractor's PM, QC Manager and Project Engineer will meet in person or via teleconference with the PM, CSE and CSET on a weekly basis to discuss progress and performance. The GTT will conduct in-depth reviews with the contractor on a monthly basis, including self-assessments by the contractor. The CSE will meet with the contractor when required by the GTT or upon the Contractor's request. The agenda of the reviews will include:

5.3.1.1 Monthly performance assessment

5.3.1.2 Issue resolution and concerns

5.3.1.3 Three-week look-ahead review and project schedule progress review against the baseline, including corrective action plan review

5.3.1.4 Recommendations for lessons-learned and corrective actions

5.3.2 The GTT must coordinate and communicate with the contractor's onsite key personnel in a timely manner to resolve instances or concerns regarding marginal or unacceptable performance.

5.3.3 The PM and contractor's key personnel will jointly formulate long-term courses of action based on progress. Decisions regarding changes to metrics, thresholds, or service levels should be clearly documented in correspondences or meeting minutes. Changes to service levels, procedures, and metrics which will result in a contract modification shall be avoided.

6 Works Cited

API_Standard_1104. (2014). *Welding of Pipelines and Related Facilities.* Washington, DC: American Petroleum Institute.

Grant, E. L., & Leavenworth, R. S. (1988). *Statistical Quality Control Fifth Edition.* New York: McGraw-Hill Book Company.

Johnson, R. A. (1994). *Miller and Freund's Probability and Statistics for Engineers.* Englewood Cliffs: Prentice-Hall, Inc.

Juran, J. M. (1988). *Juran's Quality Control Handbook Fourth Edition.* New York: McGraw-Hill Book Company.

7 PLAN CONCURRENCE

Acceptance Satisfactory To the Participants – Sat-To

This QASP documents organizational coordination and quality assurance activities for the warranty phase repairs of Red Hill Tank 5, JBPHH. Component coordination is between NAVFAC Engineering and Expeditionary Warfare Center (EXWC), NAVFAC PAC, and NAVFAC Hawaii FEAD (NFHI). Concurrence is provided to ensure the QASP has been reviewed, meets organizational requirements, and is satisfactory to the participants.

<u>Concurrence</u>
EXWC PM
EXWC CIBL
NFHI COR
NFHI CIBL

Concurrence provided on separate document.

ATTACHMENT 1: PERFORMANCE REQUIREMENTS SUMMARY

Required Services (Tasks)	Performance Standards	Acceptable Quality Levels	Methods of Surveillance	Performance Corrective Measures
Submittals in accordance with Task Order requirements	99% of submittals accurately depict current status	97%	File reviews, periodic inspections, random, observations,	Contractor Performance Assessment Reports System (CPARS) Review
Administer quality control program including subcontractor management in accordance with QCP	Contractor is in compliance with QCP 97% of the time	97%	File reports, periodic inspections, random, observations,	CPARS Review Notice of Non-Compliance Letter of Concern Cure Notice
Preparation of comprehensive list of weld inspection/NDE/repair locations for QC and QA tracking	All previous repair locations	100% of locations uniquely identified	Review/editing of draft versus existing documentation and actual conditions	Notice of Non-Compliance Letter of Concern
Documentation of NDE inspection results	Objective Pass-Fail	100% of locations on comprehensive list tested and passed	1. Ongoing visual surveillance of onsite activity by QAT 2. Review Daily QC Reports 3. Un-announced validation of inspection NDE results on random locations by QAT or PM	Notice of Non-Compliance Letter of Concern\ Cure Notice
Govt: Validation of QCP	Acceptance Sampling Plan	3	1. In-basket review of leak test, MT inspection, weldments 2. Determine Pass:Fail 3. Compare results to AQL	Remove QC Manager Notice of Non-Compliance Letter of Concern\ Cure Notice

Required Services (Tasks)	Performance Standards	Acceptable Quality Levels	Methods of Surveillance	Performance Corrective Measures
Material and Workmanship Submittals	Contractor in compliance with SOW	97%	Work Plan, Daily Reports, Draft Report and Final Report Review	CPARS Review
Material and Workmanship: Repair of locations with failed NDE and/or unacceptable weld quality	Work in compliance with SOW and submittals through QC program IAW 01 45 00 05.20	100%	1. Ongoing visual surveillance of onsite activity by QAT 2. Review Daily Reports 3. Un-announced validation of repair NDE results on random locations by QAT or PM	CPARS Review Notice of Non-Compliance Letter of Concern Cure Notice
Draft Completion Report	Contractor in compliance with SOW	95%	Report Review	CPARS Review
Final Completion Report	Comments implemented as noted by reviewer	99% of agreed upon comments	Report Review	CPARS Review

ATTACHMENT 2: GOVERNMENT QA REPORT FORMAT

GOVERNMENT QUALITY ASSURANCE (QA) REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

REPORT NO

CONTRACT NO

TITLE AND LOCATION

STATUS

WORKING? ◉ YES ○ NO

IF NO, WHY NOT:

Add Del

WEATHER CONDITIONS:

Add Del

CHECK POINTS

SUPERINTENDENT ON SITE ○ YES ◉ NO

REMARKS:

Add Del

QC MANAGER ON SITE ◉ YES ○ NO

REMARKS:

Add Del

QC REPORTS CURRENT ○ YES ◉ NO

REMARKS:

Add Del

AS-BUILTS CURRENT ◉ YES ○ NO

REMARKS:

Add Del

SUBMITTALS APPROVED FOR ONGOING WORK ◉ YES ○ NO

REMARKS:

Add Del

DEFICIENCY LIST REVIEWED ○ YES ◉ NO

REMARKS:

Add Del

WORK OBSERVED/DEFICIENCIES NOTED/SAFETY ISSUES DISCUSSED/QA TESTS AND RESULTS:

Add Del

Schedule Activity No	DESCRIBE OBSERVATIONS

MEETING/CONFERENCE NOTES (INCLUDING PARTICIPANTS):

Add Del

Schedule Activity No	NOTES

INSTRUCTIONS GIVEN OR RECEIVED/CONTROVERSIES PENDING:

Add Del

Schedule Activity No	INSTRUCTIONS/CONTROVERSIES

QA REPRESENTATIVE DATE

SUPV INITIALS DATE

ATTACHMENT 3: CONTRACTOR QUALITY CONTROL REPORT FORMAT

CONTRACTOR QUALITY CONTROL REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

REPORT NO

PHASE	CONTRACT NO	CONTRACT TITLE

PREPARATORY

WAS PREPARATORY PHASE WORK PREFORMED TODAY? ◯ YES ◯ NO

IF YES, FILL OUT AND ATTACH SUPPLEMENTAL PREPARATORY PHASE CHECKLIST.

Add Del

Schedule Activity No	Definable Feature of Work (DFOW)	Index #

INITIAL

WAS INITIAL PHASE WORK PREFORMED TODAY? ◯ YES ◯ NO

IF YES, FILL OUT AND ATTACH SUPPLEMENTAL INITIAL PHASE CHECKLIST.

Add Del

Schedule Activity No	Definable Feature of Work (DFOW)	Index #

FOLLOW-UP

WORK COMPLIES WITH CONTRACT AS APPROVED DURING INITIAL PHASE? ◯ YES ◯ NO

WORK COMPLIES WITH SAFETY REQUIREMENTS AND INSPECTION COMPLIES WITH EM385-1-1? ◯ YES ◯ NO

Add Del

Schedule Activity No	Description of Work, Testing Performed & By Whom, Definable Feature of Work, Specification Section, Location and List of Personnel Present

REWORK ITEMS IDENTIFIED TODAY (NOT CORRECTED BY CLOSE OF BUSINESS) — REWORK ITEMS CORRECTED TODAY (FROM REWORK ITEMS LIST)

Add Del

Schedule Activity No	Description	Schedule Activity No	Description

REMARKS (Also Explain Any Follow-Up Phase checklist Item From Above That Was Answered "NO"; Work Deficiency, Safety Deficiency.) Manuf. Rep On-Site, etc.

Add Del

Schedule Activity No	Description

On behalf of the contractor, I certify that this report is complete and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge except as noted in this report.

AUTHORIZED QC MANAGER AT SITE — DATE

GOVERNMENT QUALITY ASSURANCE REPORT

DATE

QUALITY ASSURANCE REPRESENTATIVE'S REMARKS AND/OR EXCEPTIONS TO THE REPORT: FOR GOVERNMENT USE ONLY.

Add Del

Schedule Activity No	Description

GOVERNMENT QUALITY ASSURANCE MANAGER — DATE

ATTACHMENT 4: CONTRACTOR PRODUCTION REPORT FORMAT

CONTRACTOR PRODUCTION REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

CONTRACT NO	TITLE AND LOCATION	REPORT NO

CONTRACTOR	SUPERINTENDENT

AM WEATHER	PM WEATHER	MAX TEMP (F)	MIN TEMP (F)

WORK PERFORMED TODAY Add Del

Schedule Activity No	WORK LOCATION AND DESCRIPTION	EMPLOYER	NUMBER	TRADE	HRS

JOB SAFETY

WAS A JOB SAFETY MEETING HELD THIS DATE? (If YES attach copy of the meeting minutes)	YES	NO	TOTAL WORK HOURS ON JOB SITE THIS DATE, INCL CON'T SHEETS
WERE THERE ANY LOST TIME ACCIDENTS THIS DATE? (If YES attach copy of completed OSHA report)	YES	NO	CUMULATIVE TOTAL OF WORK HOURS FROM PREVIOUS REPORT
WAS CRANE/MANLIFT/TRENCHING/SCAFFOLD/HV ELEC/HIGH WORK/HAZMAT WORK DONE? (If YES attach statement or checklist showing inspection performed)	YES	NO	
WAS HAZARDOUS MATERIAL/WASTE RELEASED INTO THE ENVIRONMENT? (If YES attach description of incident and proposed actions.)	YES	NO	TOTAL WORK HOURS FROM START OF CONSTRUCTION

Schedule Activity No	LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED

☐ SAFETY REQUIREMENTS HAVE BEEN MET Add Del

EQUIPMENT/MATERIAL RECEIVED TODAY TO BE INCORPORATED IN JOB (INDICATE SCHEDULE ACTIVITY NUMBER) Add Del

Schedule Activity No	Submittal #	Description of Equipment/Material Received

CONSTRUCTION AND PLANT EQUIPMENT ON JOB SITE TODAY. INDICATE HOURS USED AND SCHEDULE ACTIVITY NUMBER. Add Del

Schedule Activity No	Owner	Description of Construction Equipment Used Today (Incl Make and Model)	Hours Used

Add Del

Schedule Activity No	REMARKS

REMARKS

CONTRACTOR/SUPERINTENDENT DATE

ATTACHMENT 5: ACCEPTANCE TEST SAMPLING PLAN

Acceptance Test Sampling Plan

Acceptance sampling is a valid method by which the quality of the QC program output can be obtained by inspecting a representative sample of the entire population. By examining a series of samples, information is obtained about the entire process (Juran, 1988).

Since information about the process, in this case the QC program output, is of interest, Type B sampling of attributes plan was selected. In the plan samples are chosen at random from all repairs reported as complete by the QC program. Witness testing will be performed to classify the repair as conforming or non-conforming. The number of non-conforming repairs will be compared to an acceptance number, c, identified in the plan and a decision made to accept or reject the entire lot (QC program output) if the acceptance number is exceeded.

The plan uses a single-stage model which will specify the quality level, lot tolerance percent defective (LTPD) of the QC program output at the specified risk of accepting an undetected defect, β. The model was optimized to reduce the sample size while maintaining no more than 5% risk of a Type II (β) error. The binomial was used as a good approximation of the probability distribution for an attributes sampling plan (Grant, 1988). The sampling plan and results are below.

	Variable	Definition	Value
Input	N	Population size	677
	LTPD	Lowest quality, or the highest proportion of defective results to total number of repairs, still acceptable	10%
	AQL	Acceptable quality level: Ideal percentage of defects	2%
Output	n	Sample size	76
	c	Maximum number of failures before entire QC program output is rejected	3
	β	Chance of accepting an undetected defect	4.7%

By acceptance sampling 76 repair locations reported to have passed QC program output, the GTT will have no more than a 5% chance of unknowingly accepting an undetected defect should no more than three defects be discovered. Should more than three defects be discovered, the entire QC program output is rejected.

ATTACHMENT 6: ROLES AND RESPONSIBILITIES MATRIX

	Phase		Element	QCM (Ktr)	FEAD	EXWC
Inspection	Leak Testing	Submittal Process	**Procedure -** Verify contractor provided complete NDE LTE-1 testing procedure including operator certifications as-required	A	QA	QA
		Field Visit	**Testing** - Perform leak testing on repairs per NDE-LT-1.	A	QA	QA
		Field Visit	**Quality Control Program Output -** Report specific leak testing status of each repair site in QC Log.	A	QA	QA
			Acceptance Testing - Verify QC Program output with random acceptance sampling. Verify leak testing procedure meets NDE-LT-1 and API 653 Section 12. Witness leak testing from the inspection basket.	—	V	V
	Weldments	Field Visit	**Visual inspection** - Verify weldments meet criteria of API 653 Section 12, API 1104.	A	QA	QA
			Testing - Perform MT on weldments per MT-3.	A	QA	QA
			Inspection - Perform liquid penetrant inspection per PT-1 on weldments.	A	QA	QA
			Quality Control Program Output - Report visual inspection, PT inspection, and MT testing results of each repair site in QC Log.	A	QA	QA
			Acceptance Testing - Verify QC Program output with random acceptance sampling. Witness MT inspections (MT-3 Yoke Technique, Wet Fluorescent Magnetic Particle Method), PT (PT-1 Liquid Penetrant Inspection by Visible Dye Method) and review of weldments (API Standard 1104) from the inspection basket.	—	V	V
Hold Point						

	Phase		Element	QCM(Ktr)	FEAD	EXWC
Repair	Welding	Submittal Process	**Welding Plan -** Provide appropriate WPS and PQR	A	QA	QA
		Submittal Process	**Welder Credentials** - Provide welder certifications. Verify meet requirements of API 653 Section 11 and WPS	A	QA	QA
		Field Visit	**Inspection -** Visual verification weldments meet criteria of API 653 Section 12, API 1104.	A	QA	QA
		Field Visit	**Testing** - Perform leak testing on repairs per NDE-LT-1.	A	QA	QA
		Field Visit	**Testing** - Perform MT on repairs per MT-3.	A	QA	QA
		Field Visit	**Inspection** - Perform liquid penetrant inspection per PT-1 on repairs.	A	QA	QA
		Field Visit	**Quality Control Program Output** - Report specific visual inspection and MT results of each repair site in QC Log.	A	QA	QA
		Field Visit	**Testing -** Verify QC Program output with random acceptance sampling. Witness MT inspections (MT-3 Yoke Technique, Wet Fluorescent Magnetic Particle Method), PT (PT-1 Liquid Penetrant Inspection by Visible Dye Method) and review of weldments (API Standard 1104) from the inspection basket.	—	V	V
	Coating	Submittal Process	**Coating -** Provide material submittals in accordance with 09 97 13.15 LOW VOC POLYSULFIDE INTERIOR COATING OF WELDED STEEL PETROLEUM FUEL TANKS	A	S	S
		Submittal Process	QP-5 Inspector qualifications	A	S	S
		Field Visit	**Inspection** - Verify surface preparation in accordance with 09 97 13.15 Part 3.	A	QA	QA
		Field Visit	**Testing** - Perform holiday testing	A	QA	QA
		Field Visit	**Testing** - Verify coating thickness	A	QA	QA
		Field Visit	**Quality Control Program Output** - Report specific visual inspection and MT results of each repair site in QC Log.	A	QA	QA

KEY = A - Approve, R - Review, W - Witness, RA - Receipt Acknowledge, S - Surveillance Review, V- Verification and Testing, C - Copy, QA - Quality Assurance

DEFINITIONS

Approve	(A)	Professional or quality control endorsement of the submittal or installed system meets the contract requirements
Review	(R)	To confirm accuracy of the submittal and that it meets contract requirements
Witness	(W)	Observe demonstration of system performance for acceptance
Receipt Acknowledge	(RA)	Confirm receipt of submittal with no review necessary
Surveillance Review	(S)	A quality assurance review based on risk, complexity, and workload
Performance Verification and Acceptance Testing	(V)	A demonstration of satisfactory construction and system performance
Receive Copy of Correspondence	(C)	Receive a copy of the transmittal sheet and/or correspondence letter
Quality Assurance Inspection	(QA)	Witnessing satisfactory performance without testing all devices or visual inspection of various parts of the system

END QUALITY ASSURANCE SURVEILLANCE PLAN

Section 2.0 – Suitability for Service Statement

Suitability for Service Statement
Tank 5 – Certificate of Compliance
UST Tank 5 Redhill Complex – Pearl Harbor, HI

Tank 5 integral structural and component integrity is suitable for continued service at the specified operation interval and can be placed back in normal operation.

The Tank 5 repairs identified for mandatory repairs for continued service, along with the short term ≤ 10 yr. and long term ≤ 20 yr. repairs for the desired operational interval have been successfully completed. After the repairs were completed, the repairs were re-inspected and tested. All repairs were found acceptable and approved for return to normal operation for continued service.

The next API-653 internal inspection should be conducted in twenty (20) years, or by May 2033. The bottom life calculations determined the tank bottom to have greater than twenty (20) years of remaining operation. A visual inspection of UST internal coatings should be conducted in in twenty (20) years with the internal inspection. A visual inspection of UST external surfaces should be conducted monthly by operations personnel to observe for signs of tank or component damage, accelerated deterioration or abnormalities. Any relevant observations should be promptly evaluated to determine any change in suitability.

Note: This certificate of compliance and suitability for service is based on continued normal operation in the same service conditions for Tank 5. Any intended change in service, product, operations or conditions to the tank should be re-evaluated prior to making the change to determine if it is a relevant change and if the tank will continue to be suitable for the desired service, product, operations or conditions. Any changes in service, product, operations or conditions will void this certificate of compliance and suitability for service.

API-653 Inspector:

SIGNATURE ON FILE – HAND SIGNED COPY WILL BE IN FINAL REPORT COPIES

Tim D. Anderson; API-510 Pressure Vessels / API-570 Piping / API-653 Aboveground Tanks # 494/37258
AWS-CWI / ASNT NDT LvL III MT, PT, UT, VT & RT

Professional Engineer's Review:

Tim Anderson

Digitally signed by Tim Anderson
DN: cn=Tim Anderson, o=Willbros, ou, email=timothy.anderson@willbros.com, c=US
Date: 2013.06.27 13:05:32 -05'00'

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Thomas Fulton, P.E. – Oklahoma / California P.E. Registration Number