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CHEMISTRY AND CHEMICAL ENGINEERING DIVISION
DEPARTMENT OF ANALYTICAL AND ENVIRONMENTAL CHEMISTRY

June 27, 2016

Los Alamos National Laboratory
TA-3 SM-271 Drop Point 02U
Los Alamos, New Mexico 87545

Attn: Victor Garde

Subject:		
	Case:	Zeolite
	SwRI Project Number:	21592.01.00X
	SDG:	598447
	SwRI Task Order Number:	160605-2
	SwRI Sample Receipt Number:	57710
	Samples Received:	05.31.2016
	Analysis:	Solid Sodium Nitrate Solutions

Dear Mr. Garde,

Please find the enclosed results for the eighteen overall samples received on the above referenced date. Should you have any questions, please feel free to contact me at 210-522-3242, or at radonna.spies@swri.org.

Sincerely,

FOR Radonna Spies
Group Leader – R&D

APPROVED:

Michael J. Dammann
Director

RPS: jz

Cc: Anya Gonzales, Los Alamos National Laboratory

Encl

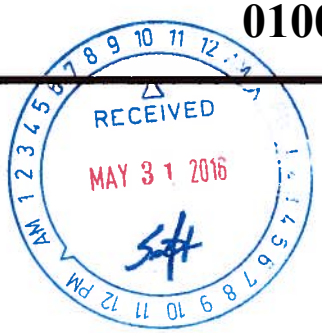
SOUTHWEST RESEARCH INSTITUTE
CLIENT: Los Alamos National Laboratory
SwRI PROJECT#: 21592.01.00X
SwRI TASK ORDER: 160605-2
SwRI SRR: 57710
SDG: 598447
VTSR: 05.31.2016

Chain-of-Custody
&
Sample Receipt Paperwork

Total Page Count: 010001
Fraction: Sodium Nitrate Solutions Pages: 010134

010002

Douglas, Steven M.



From: Moken, James A.
Sent: Tuesday, May 31, 2016 9:27 AM
To: Douglas, Steven M.
Subject: Sample ID's

Steven,

Can I get you to make sample ID's and SDG's for the following samples. Table 1 will need to be on one SDG and Table 2 will be on a separate SDG since we will be adding samples to it later this month. If you have any questions let me know. Thanks.

Table 1

Requested Analysis					
Sample ID	**SW-846 Test Method 1030**	**SW-846 Test Method 1050**	**DOT O.1 Test**	**DOT O.2 Test**	**Test Method 9095B (Paint Filter)**
Sod Nit A				X	
Sod Nit Sol – Zeo 1			X		X
Sod Nit Sol – Zeo 2			X		X
Sod Nit B				X	
Sod Nit B – Zeo 1			X		X
Sod Nit B – Zeo 2			X		X
Sod Nit A pH – Zeo 1			X		X
Sod Nit A pH – Zeo 2			X		X
Sod Nit A Blend 1	X	X	X		X
Sod Nit A Blend 2	X	X	X		X
Sod Nit A Blend 3	X	X	X		X
Sod Nit A Blend 4	X	X	X		X
Sod Nit B Blend 1	X	X	X		X
Sod Nit B Blend 2	X	X	X		X
Sod Nit B Blend 3	X	X	X		X
Sod Nit B Blend 4	X	X	X		X
Sod Nit A pH Blend 1	X	X	X		X
Sod Nit A pH Blend 2	X	X	X		X
Sod Nit A pH Blend 3	X	X	X		X
Sod Nit A pH Blend 4	X	X	X		X

Table 2

Wypall Blend ID (Wypall mix: zeolite)	Wypall Mixture (ml)	Zeolite (ml)

Client: Los Alamos National Laboratory
SRR # 57710
Project # 21592.01.00X
Case: Zeolite
VTSR: 05/31/2016
Sample(s) Received: Intact
Temperature: N/A °C/ SN #: N/A

WB1(1:3)	1233	3700
WB2(1:4)	925	3700
WB3(1:5)	740	3700

Jamie

Southwest Research Institute

Laboratory Task Order

010004

TO #: 160605-2 Revision: 2

SDG: 598447

SRR #'s: 57710

Client(s): Los Alamos National Laboratory

Project(s): 21592.01.00X
Manager(s): SPIES, RADONNA
To Client: 06/19/16

Instructions

Documents Related to this task order: 200812[COC for SRR 57710], 200814[SRR Paperwork for SRR 57710]

Deliverables --> Hard Copy: -YES- EDD: no PDF: no

Test: COMB_1050
Section: WETCHEM

Holding: 180 days from CED

SW846 1050 Test A & C Spontaneous Combustion

Cnt: 12

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
598447		1	Solid	Sod Nit A Blend 1	NO DATA	NO DATA
598448		1	Solid	Sod Nit A Blend 2	NO DATA	NO DATA
598449		1	Solid	Sod Nit A Blend 3	NO DATA	NO DATA
598450		1	Solid	Sod Nit A Blend 4	NO DATA	NO DATA
598453		1	Solid	Sod Nit A pH Blend - 1	NO DATA	NO DATA
598454		1	Solid	Sod Nit A pH Blend - 2	NO DATA	NO DATA
598455		1	Solid	Sod Nit A pH Blend - 3	NO DATA	NO DATA
598456		1	Solid	Sod Nit A pH Blend - 4	NO DATA	NO DATA
598460		1	Solid	Sod Nit B Blend 1	NO DATA	NO DATA
598461		1	Solid	Sod Nit B Blend 2	NO DATA	NO DATA
598462		1	Solid	Sod Nit B Blend 3	NO DATA	NO DATA
598463		1	Solid	Sod Nit B Blend 4	NO DATA	NO DATA

Test: IGNIT_1030
Section: WETCHEM

Holding: 180 days from CED

SW 846 Method 1030 Ignitability of solids

Cnt: 12

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
598447		1	Solid	Sod Nit A Blend 1	NO DATA	NO DATA
598448		1	Solid	Sod Nit A Blend 2	NO DATA	NO DATA
598449		1	Solid	Sod Nit A Blend 3	NO DATA	NO DATA
598450		1	Solid	Sod Nit A Blend 4	NO DATA	NO DATA
598453		1	Solid	Sod Nit A pH Blend - 1	NO DATA	NO DATA
598454		1	Solid	Sod Nit A pH Blend - 2	NO DATA	NO DATA
598455		1	Solid	Sod Nit A pH Blend - 3	NO DATA	NO DATA
598456		1	Solid	Sod Nit A pH Blend - 4	NO DATA	NO DATA
598460		1	Solid	Sod Nit B Blend 1	NO DATA	NO DATA
598461		1	Solid	Sod Nit B Blend 2	NO DATA	NO DATA
598462		1	Solid	Sod Nit B Blend 3	NO DATA	NO DATA
598463		1	Solid	Sod Nit B Blend 4	NO DATA	NO DATA

Test: Oxidizer_UN
Section: WETCHEM

Holding: 180 days from CED

United Nations (UN) "Recommendations on the Transport of Dangerous Goods", Section 34, Classification Procedures, Test Methods and Criteria Relating to Oxidizing Substances of Division 5.1.

Cnt: 18

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
598447		1	Solid	Sod Nit A Blend 1	NO DATA	NO DATA
598448		1	Solid	Sod Nit A Blend 2	NO DATA	NO DATA
598449		1	Solid	Sod Nit A Blend 3	NO DATA	NO DATA
598450		1	Solid	Sod Nit A Blend 4	NO DATA	NO DATA

Southwest Research Institute

Laboratory Task Order

010005

TO #: 160605-2 Revision: 2

Project(s): 21592.01.00X
Manager(s): SPIES, RADONNA
To Client: 06/19/16

SDG: 598447

SRR #'s: 57710
Client(s): Los Alamos National Laboratory

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
598451		1	Solid	Sod Nit A pH - Zeo 1	NO DATA	NO DATA
598452		1	Solid	Sod Nit A pH - Zeo 2	NO DATA	NO DATA
598453		1	Solid	Sod Nit A pH Blend - 1	NO DATA	NO DATA
598454		1	Solid	Sod Nit A pH Blend - 2	NO DATA	NO DATA
598455		1	Solid	Sod Nit A pH Blend - 3	NO DATA	NO DATA
598456		1	Solid	Sod Nit A pH Blend - 4	NO DATA	NO DATA
598458		1	Solid	Sod Nit B - Zeo 1	NO DATA	NO DATA
598459		1	Solid	Sod Nit B - Zeo 2	NO DATA	NO DATA
598460		1	Solid	Sod Nit B Blend 1	NO DATA	NO DATA
598461		1	Solid	Sod Nit B Blend 2	NO DATA	NO DATA
598462		1	Solid	Sod Nit B Blend 3	NO DATA	NO DATA
598463		1	Solid	Sod Nit B Blend 4	NO DATA	NO DATA
598464		1	Solid	Sod Nit Sol - Zeo 1	NO DATA	NO DATA
598465		1	Solid	Sod Nit Sol - Zeo 2	NO DATA	NO DATA

Test: PAINT_9095
Section: WETCHEM

Holding: 180 days from CED

SW846 9095 Paint Filter Liquids Test

Cnt: 18

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
598447		1	Solid	Sod Nit A Blend 1	NO DATA	NO DATA
598448		1	Solid	Sod Nit A Blend 2	NO DATA	NO DATA
598449		1	Solid	Sod Nit A Blend 3	NO DATA	NO DATA
598450		1	Solid	Sod Nit A Blend 4	NO DATA	NO DATA
598451		1	Solid	Sod Nit A pH - Zeo 1	NO DATA	NO DATA
598452		1	Solid	Sod Nit A pH - Zeo 2	NO DATA	NO DATA
598453		1	Solid	Sod Nit A pH Blend - 1	NO DATA	NO DATA
598454		1	Solid	Sod Nit A pH Blend - 2	NO DATA	NO DATA
598455		1	Solid	Sod Nit A pH Blend - 3	NO DATA	NO DATA
598456		1	Solid	Sod Nit A pH Blend - 4	NO DATA	NO DATA
598458		1	Solid	Sod Nit B - Zeo 1	NO DATA	NO DATA
598459		1	Solid	Sod Nit B - Zeo 2	NO DATA	NO DATA
598460		1	Solid	Sod Nit B Blend 1	NO DATA	NO DATA
598461		1	Solid	Sod Nit B Blend 2	NO DATA	NO DATA
598462		1	Solid	Sod Nit B Blend 3	NO DATA	NO DATA
598463		1	Solid	Sod Nit B Blend 4	NO DATA	NO DATA
598464		1	Solid	Sod Nit Sol - Zeo 1	NO DATA	NO DATA
598465		1	Solid	Sod Nit Sol - Zeo 2	NO DATA	NO DATA

Sample Receipt

Southwest Research Institute

Sample Receipt Number: 57710

VTSR: 05/31/16 Time: 10:00:00

Project: 21S92.01.00X
Case #: Zeolite
Client: Los Alamos National Laboratory

Manager: SPIES, RADONNA
Logged in by: SDOUGLAS
Creation Date: 05/31/16

Notes

Email was received to create an SRR for the following.

Parameters: Requirements located on the applicable Task Order.

See chain of custody as part of the LIMS system for more information.

System ID	Customer ID	CED	Matrix	Containers	Special Reqs.
598446	Sod Nit A		Liquid	1	
598447	Sod Nit A Blend 1		Solid	1	
598448	Sod Nit A Blend 2		Solid	1	
598449	Sod Nit A Blend 3		Solid	1	
598450	Sod Nit A Blend 4		Solid	1	
598451	Sod Nit A pH - Zeo 1		Solid	1	
598452	Sod Nit A pH - Zeo 2		Solid	1	
598453	Sod Nit A pH Blend - 1		Solid	1	
598454	Sod Nit A pH Blend - 2		Solid	1	
598455	Sod Nit A pH Blend - 3		Solid	1	
598456	Sod Nit A pH Blend - 4		Solid	1	
598457	Sod Nit B		Liquid	1	
598458	Sod Nit B - Zeo 1		Solid	1	
598459	Sod Nit B - Zeo 2		Solid	1	
598460	Sod Nit B Blend 1		Solid	1	
598461	Sod Nit B Blend 2		Solid	1	
598462	Sod Nit B Blend 3		Solid	1	
598463	Sod Nit B Blend 4		Solid	1	
598464	Sod Nit Sol - Zeo 1		Solid	1	
598465	Sod Nit Sol - Zeo 2		Solid	1	

Containers: 20 **Samples: 20**

These documents are associated with this receipt: 200812[COC for SRR 57710], 200814[SRR Paperwork for SRR 57710]

Thermometer: N/A
Temperature: N/A

Page Printed: 06/27/2016 14:29
ver: (7/18/2014)

57710 Los Alamos National Laborato

Southwest Research Institute

Traffic Report

010007

Sample Custodian Signature: _____

1. Custody Seal — Not Present or Damaged
2. Chain of Custody — Present
3. Sample Tags — Not Present
   Sample Tag Numbers — Not on COC
4. SMO Forms — Not Present

Client: Los Alamos National Laboratory

Project: 21592.01.00X

Case: Zeolite / SDG: _____

Sample Receipt: 57710

Airbill: Email

Custody Seal #(s): N/A

Date Received	Time Received	COC Record	SMO Sample #	Corresponding		Traffic Rpt, Tags, COC Agree	Sample Condition
				Sample Tag #	SwRI #		
05/31/16	10:00:00	Email	Sod Nit A	N/A	598446	YES	Intact
05/31/16	10:00:00	Email	Sod Nit A Blend 1	N/A	598447	YES	Intact
05/31/16	10:00:00	Email	Sod Nit A Blend 2	N/A	598448	YES	Intact
05/31/16	10:00:00	Email	Sod Nit A Blend 3	N/A	598449	YES	Intact
05/31/16	10:00:00	Email	Sod Nit A Blend 4	N/A	598450	YES	Intact
05/31/16	10:00:00	Email	Sod Nit A pH - Zeo 1	N/A	598451	YES	Intact
05/31/16	10:00:00	Email	Sod Nit A pH - Zeo 2	N/A	598452	YES	Intact
05/31/16	10:00:00	Email	Sod Nit A pH Blend - 1	N/A	598453	YES	Intact
05/31/16	10:00:00	Email	Sod Nit A pH Blend - 2	N/A	598454	YES	Intact
05/31/16	10:00:00	Email	Sod Nit A pH Blend - 3	N/A	598455	YES	Intact
05/31/16	10:00:00	Email	Sod Nit A pH Blend - 4	N/A	598456	YES	Intact
05/31/16	10:00:00	Email	Sod Nit B	N/A	598457	YES	Intact
05/31/16	10:00:00	Email	Sod Nit B - Zeo 1	N/A	598458	YES	Intact
05/31/16	10:00:00	Email	Sod Nit B - Zeo 2	N/A	598459	YES	Intact
05/31/16	10:00:00	Email	Sod Nit B Blend 1	N/A	598460	YES	Intact
05/31/16	10:00:00	Email	Sod Nit B Blend 2	N/A	598461	YES	Intact
05/31/16	10:00:00	Email	Sod Nit B Blend 3	N/A	598462	YES	Intact
05/31/16	10:00:00	Email	Sod Nit B Blend 4	N/A	598463	YES	Intact
05/31/16	10:00:00	Email	Sod Nit Sol - Zeo 1	N/A	598464	YES	Intact
05/31/16	10:00:00	Email	Sod Nit Sol - Zeo 2	N/A	598465	YES	Intact

SAMPLE LOG-IN SHEET **010008**

Lab Name: Southwest Research Institute	Page 1 of 1
Received By (Print Name): STEVEN DOUGLAS	Log-in Date: 05/31/2016
Received By (Signature): SD	
Case Number: Zeolite	Sample Delivery Group No.: NA
	SAS Number: NA

Remarks: 21592.01.00X

1.	Custody Seal(s)	Present/Absent* Intact/Broken
2.	Custody Seal Nos.	N/A
3.	Chain-of Custody Records	Present/Absent*
4.	Traffic Reports or Packing Lists	Present/Absent
5.	Airbill	Airbill/Sticker Present/Absent*
6.	Airbill No.	Email
7.	Sample Tags	Present/Absent
	Sample Tag Numbers	Listed/Not listed on Chain of Custody
8.	Sample Condition	Intact/Broken*/ Leaking
9.	Cooler Temperature	N/AC
10.	Does Information on custody records, traffic reports, and sample tags agree?	Yes/No*
11.	Date Received at Lab	05/31/2016
12.	Time Received	10:00:00

Sample Transfer	
Fraction: INORG	Fraction
Area #: J. MOKE	Area #
By: STEVEN DOUGLAS	By
On: 05/31/2016	On

EPA Sample #	Corresponding Sample Tag #	Corresponding Assigned Lab #	Remarks: Condition of Sample Shipment, etc
Sod Nit A	N/A	598446	Intact
Sod Nit A Blend 1	N/A	598447	Intact
Sod Nit A Blend 2	N/A	598448	Intact
Sod Nit A Blend 3	N/A	598449	Intact
Sod Nit A Blend 4	N/A	598450	Intact
Sod Nit A pH - Zeo 1	N/A	598451	Intact
Sod Nit A pH - Zeo 2	N/A	598452	Intact
Sod Nit A pH Blend - 1	N/A	598453	Intact
Sod Nit A pH Blend - 2	N/A	598454	Intact
Sod Nit A pH Blend - 3	N/A	598455	Intact
Sod Nit A pH Blend - 4	N/A	598456	Intact
Sod Nit B	N/A	598457	Intact
Sod Nit B - Zeo 1	N/A	598458	Intact
Sod Nit B - Zeo 2	N/A	598459	Intact
Sod Nit B Blend 1	N/A	598460	Intact
Sod Nit B Blend 2	N/A	598461	Intact
Sod Nit B Blend 3	N/A	598462	Intact
Sod Nit B Blend 4	N/A	598463	Intact
Sod Nit Sol - Zeo 1	N/A	598464	Intact
Sod Nit Sol - Zeo 2	N/A	598465	Intact

* Contact SMO and attach record of resolution

Reviewed By:	Logbook No.: Sample Receipt (57710)
Date: 6.1.16	Logbook Page No.: 9472 SOC 1 of 2

010009

SOUTHWEST RESEARCH INSTITUTE
CLIENT: Los Alamos National Laboratory
SwRI PROJECT#: 21592.01.00X
SwRI TASK ORDER: 160605-2
SwRI SRR: 57710
SDG: 598447
VTSR: 05.31.2016

Case Narrative

Client: Los Alamos National Laboratory **010010**
SwRI Project Number: 21592.01.00X
SwRI Task Order Number(s): 160605-2

WETCHEM ANALYSIS

Initial sample preparation

This report encompasses the preparation and analysis of the solid Sodium Nitrate solution blends presented in Table 1 which contains the sample ID's and the methods requested on each of the blends. Three different sodium nitrate solutions were prepared in accordance with the scope of work provided by Los Alamos. The three solutions include; 1 molar nitric acid (Sod Nit A) and 1 molar sodium hydroxide (Sod Nit B) solutions saturated with sodium nitrate, and a 1 molar nitric acid solution that was first saturated with sodium nitrate and then pH adjusted between 4-9 with Spilfyter® Kolorsafe® liquid acid neutralizer (Sod Nit A pH).

To make the blends, each solution was mixed with Swheat in the designated ratios and then allowed to set for 24 hours. After the 24 hours water was added if required and then zeolite was added in the designated ratios. Once the zeolite was added the samples were allowed to set for an additional 24 hours prior to submittal for analysis (Image 1).

Table 1. Surrogate creation and analysis table

Surrogate ID	Times made	Methods			
		1030	1050	UN Ox solid (DOT 0.1)	Paint filter
Sod Nit A – Zeo 1	2	*	*	1	1
Sod Nit A – Zeo 2	1	*	*	1	1
Sod Nit B – Zeo 1	2	*	*	1	1
Sod Nit B - Zeo 2	1	*	*	1	1
Sod Nit A pH – Zeo 1	1	*	*	1	1
Sod Nit A pH – Zeo 2	1	*	*	1	1
Sod Nit A Blend 1	1	1	1	1	1
Sod Nit A Blend 2	1	1	1	1	1
Sod Nit A Blend 3	1	1	1	1	1
Sod Nit A Blend 4	1	1	1	1	1
Sod Nit B Blend 1	1	1	1	1	1
Sod Nit B Blend 2	1	1	1	1	1
Sod Nit B Blend 3	1	1	1	1	1
Sod Nit B Blend 4	1	1	1	1	1
Sod Nit A pH Blend 1	1	1	1	1	1
Sod Nit A pH Blend 2	1	1	1	1	1
Sod Nit A pH Blend 3	1	1	1	1	1
Sod Nit A pH Blend 4	1	1	1	1	1

*Testing not required for these methods.

(Note: Sod Nit A and Sod Nit B – UN Ox Liquid (DOT 0.2) testing will be submitted separately.)

SW-846 9095B: Paint Filter

For this method 100g of each blend was placed into a Gerson 260um paint filter (PN010714R, Lot# B5140428JF8) that was suspended over a 250 mL beaker for 5 minutes to collect any free liquids. During this 5-min period if any of the sample material drips into the cylinder, the material is deemed to contain free liquids for purposes of 40 CFR 264.314 and 265.314. Initially, Sod Nit A – Zeo 1 and Sod Nit B – Zeo 1 were made at the requested 2:1 Zeolite to waste ratio. When these two samples were analyzed they both began dripping liquid after about 3 minutes in the paint filter (Image 2). When this information was presented to the Los Alamos, they decided to raise the ratio from 2:1 to 4:1. Under the laboratory conditions all other sodium nitrate blends tested for paint filter were not deemed to contain free liquids.

SW-846 1030: Ignitability of Solids

An ignition source is applied to one end of the test material to determine whether combustion will propagate along 200 mm of the strip within 2 minutes. If the material combustion propogates, the burning time was measured over a distance of 100 mm and the rate of burning would be determined. The surrogate material was formed into an unbroken powder train, 250 mm in length atop a ceramic tile with marks at the 80 and 180 mm in from the end of the train. The ceramic tile was placed about 8 inches in a hood with the sash lowered to give airflow of about 0.7 m/sec. One end of the train was exposed to the end of an acetylene torch with a temperature greater than 1000°C. The torch was held there for 2 minutes and if the sample began to burn down the train the time taken to get from the 80 to 180 mm mark was measure to determine the burn rate.

All of the sodium nitrate samples followed the same series of events during the analysis. The surrogate sample would go from a moistened, green color to a dry white, faint green color as the heat dried the sample; the samples would then proceed to char (Image 3). The only notable difference was all the Sod Nit A Blends 1 through 4, Sod Nit A pH Blend 1, and Sod Nit B Blend 3 had a cracking sound to them most likely from the nitrate salts being heated. Since none of the blends burned into the 100mm zone, all are considered non-flammable under the test conditions and criteria outlined in Method 1030.

Fine Excelsior (natural hardwood shavings) were used as a positive control each day testing was performed.

SW-846 1050: Spontaneous combustion and self heating

The surrogates for this analysis were first sprinkled several times onto a ceramic tile to observe if they smoked or flamed and could be considered pyrophoric solids by test Method A. Since none of the samples exhibited these characteristics, they were tested by Method C. In this test, a 100-mm sample cube is exposed to a test temperature of 140°C ± 2°C for a minimum of 24 hours to determine whether it undergoes spontaneous ignition or a rise in sample temperature to over 200C within the 24 hours. If the results of the preliminary test are positive, a second test using a 25-mm sample cube is conducted to further classify the waste as specified in Table 2.

Table 2. Method 1050 Waste Classification

Results of Self-Heating Test	DOT Packing Group
Negative for the 100-mm cube test	Not a Self-Heating Waste
Positive for the 100-mm , but negative for the 25-mm cube test	III
Positive for both the 100-mm and 25-mm cube tests or positive for the 25-mm test, if tested alone	II

The filled cube was placed into an oven with two thermocouples measuring the oven temp and up to four thermocouples inserted into each sample to measure its temperature during the analysis. Lids were placed onto the top of the test cubes and tungsten weights were placed on top of those sample believed to have event in order to keep the thermocouples and lids from coming off the sample. Also up to two thermocouples were placed in a tray below the sample in case any sample pushed out of the cube and onto the tray. Once the thermocouples were in place, the oven was ramped to 140°C ± 2°C and held for 24-48 hours depending on when the sample reached a stable temperature. Although the method states testing to be conducted for 24 hours, many of the samples did not reach 140°C ± 2°C during the initial 24 hour period, therefore the testing was extended to a minimum of 12 hours after the sample had reached a stable temperature. Temperatures of the oven and sample were collected every 10 seconds and plotted to determine if the sample temperature exceeded 200°C during the time of testing. At the conclusion of the test, the oven was turned off and allowed to cool before removing the sample. The oven and sample temperature graphs are located in Attachment A.

Two sodium nitrate samples were analyzed simultaneously, using the 100mm cube, since past samples having similar combinations of waste and zeolite did not self heat. These blends were allowed to run for at least 38 hours before ending the analysis due to their moisture content. Although the method states testing to be conducted for 24 hours, many of the samples not reaching 140°C ± 2°C during the initial 24 hour period, therefore the testing was extended to a minimum of 12 hours after the sample had reached a stable temperature. After the analysis the cubes were removed and all had a dried zeolite appearance to them and most of them came readily out of the cube. Sod Nit A pH Blend 1 formed hardened chunks of zeolite but no odd coloring or event took place (Image 4). Since none of these blends exceeded 200°C during the analysis all of them are classified as "Not a Self-Heating Waste" as defined by Method 1050.

DOT UN Oxidation testing

The sodium nitrate solid blends were tested in accordance with the United Nations (UN) "Recommendations on the Transport of Dangerous Goods", Section 34, *Classification Procedures, Test Methods and Criteria Relating to Oxidizing Substances of Division 5.1*. The UN procedure assesses the relative hazard of oxidizing substances so that an appropriate classification for transport can be made. Tests are conducted on the samples mixed with dry fibrous cellulose in mixing ratios of 1:1 and 4:1, by mass, of sample to cellulose. The burning characteristics of the mixtures are compared with the standard 3:7 mixture, by mass, of potassium bromated to cellulose. If the burning time is less than the standard mixture, the burning times should be compared with those from packing group I or II or category I or II oxidizer, reference standards 3:2 and 2:3, by mass, of potassium bromated to cellulose, respectively. See Table 3 for classification. Table 4 presents the results for the reference standards. Tables 5 and 6 lists the comments the analyst noted for each of the two sample-to- cellulose ratio burns.

All sodium nitrate solid blends were classified as "Not Division 5.1".

Table 3. Oxidizer Classifications

The test criteria for determining oxidizing properties of the substance are:	UN Classification
Any substance which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time less than the mean burning time of a 3:2 mixture, by mass, of potassium bromate and cellulose.	Packing group I
Any substance which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time equal to or less than the mean burning time of a 2:3 mixture (by mass) of potassium bromate and cellulose; and which does not meet the criteria for packing group I	Packing group II
Any substance which, in the 4:1 or 1:1 sample-to-cellulose ration (by mass) tested, exhibits a mean burning time equal to or less than the mean burning time of a 3:7 mixture (by mass) of potassium bromate and cellulose; and which does not meet the criteria for packing group I and II.	Packing group III
Any substance which, in both the 4:1 and 1:1 sample-to-cellulose ration(by mass) tested, does not ignite and burn, or exhibit mean burning times greater than that of a 3:7 mixture (by mass) of potassium bromate and cellulose.	Not Division 5.1

Table 4. Potassium Bromate and Cellulose Reference Mixtures

Mean Burn Time, sec 3:7 $KBrO_3$:Cellulose Ratio	Mean Burn Time, sec 2:3 $KBrO_3$:Cellulose Ratio	Mean Burn Time, sec 3:2 $KBrO_3$:Cellulose Ratio
135.32	52.44	19.54

Table 5. Comments for Sample to Cellulose ratio of 4:1

Sample ID	Comment 4:1
Sod Nit A – Zeo 1	Spontaneous flames at wire leads, charring, smoke
Sod Nit A – Zeo 2	Charring around wire leads, smoke, no flame
Sod Nit B – Zeo 1	Charring at wire leads, smoke.
Sod Nit B - Zeo 2	Charring around wire leads & smoking
Sod Nit A pH – Zeo 1	Charring around wire, smoke, no flames
Sod Nit A pH – Zeo 2	Charring around wire, smoke, no flames
Sod Nit A Blend 1	Charring around wire, smoke, no flames
Sod Nit A Blend 2	Charring at wire leads, slight smoke, no flames
Sod Nit A Blend 3	Charring around wire, smoke
Sod Nit A Blend 4	Charring around wire, smoke, no flames
Sod Nit B Blend 1	Charring around wire, smoke, no flames
Sod Nit B Blend 2	Charring around wire, smoke, no flames
Sod Nit B Blend 3	Charring at wire leads, smoke & random flames at wire leads
Sod Nit B Blend 4	Charring around wire leads & smoke, no flames
Sod Nit A pH Blend 1	Charring around wire leads, spontaneous flame at front wire lead. Smoke
Sod Nit A pH Blend 2	Charring around wire and smoke
Sod Nit A pH Blend 3	Charring around wire, smoke, no flames
Sod Nit A pH Blend 4	Charring around wire leads, smoke, no flames

Table 6 Comments for Sample to Cellulose ratio of 1:1

Sample ID	Comment 1:1
Sod Nit A – Zeo 1	low flames at wire leads, charring and smoke.
Sod Nit A – Zeo 2	low flames at the wire leads, charring and smoke
Sod Nit B – Zeo 1	flames at wire leads, smoke + charring. One rep had slight propagation of the flame.
Sod Nit B - Zeo 2	charring at wire leads and smoking
Sod Nit A pH – Zeo 1	small flames at wire leads, charring and smoke
Sod Nit A pH – Zeo 2	small flames at wire leads, smoke and charring
Sod Nit A Blend 1	small flames at wire leads, smoke + charring
Sod Nit A Blend 2	small flames at wire leads, smoke
Sod Nit A Blend 3	small flames at wire leades, charring and smoke. Flame propagated slightly on one rep.
Sod Nit A Blend 4	low flames ta wire leads, charring and smoke. Flames propagated slightly around the sides of the mound.
Sod Nit B Blend 1	small flames at wire leads, smoke and charring
Sod Nit B Blend 2	small flames at wire leads, charring and smoke
Sod Nit B Blend 3	low flames at wire leads, charring & smoke
Sod Nit B Blend 4	small flame at wire leads, smoke & charring.
Sod Nit A pH Blend 1	flames at wire leads + slight propagation, charring and smoke
Sod Nit A pH Blend 2	small flames at wire leads, charring & smoke
Sod Nit A pH Blend 3	small flames at wire leads, charring and smoke
Sod Nit A pH Blend 4	low flames at wire leads, charring and smoke

Image 1: Appearance of the sodium nitrate solution blends setting for 24 hours after the addition of the zeolite.

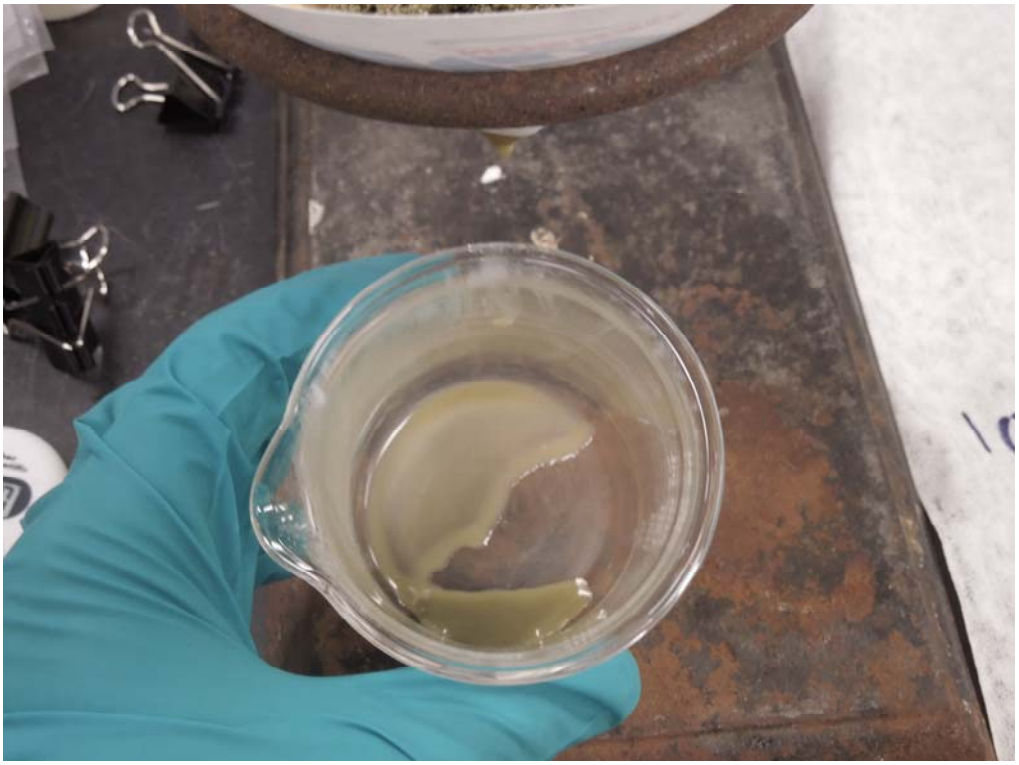


Image 2: Showing the liquid draining out of the paint filter after 5 minutes from Sod Nit A – Zeo 1 at a 2:1 zeolite to waste ratio.

Image 3: Appearance of the Sodium nitrate blends after flame application for 2 minutes during 1030 analysis.

Image 4: Solid chunk formed during 1050 analysis from Sod Nit A pH 1.

"I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on diskette has been authorized by the laboratory manager or his/her designee, as verified by the following signature. This report shall not be reproduced except in full without the written approval of SwRI."

RSpies

Group Leader **Date** **06/24/16**

SOUTHWEST RESEARCH INSTITUTE
CLIENT: Los Alamos National Laboratory
SwRI PROJECT#: 21592.01.00X
SwRI TASK ORDER: 160605-2
SwRI SRR: 57710
SDG: 598447
VTSR: 05.31.2016

Attachment A

Method 1050 Graphs

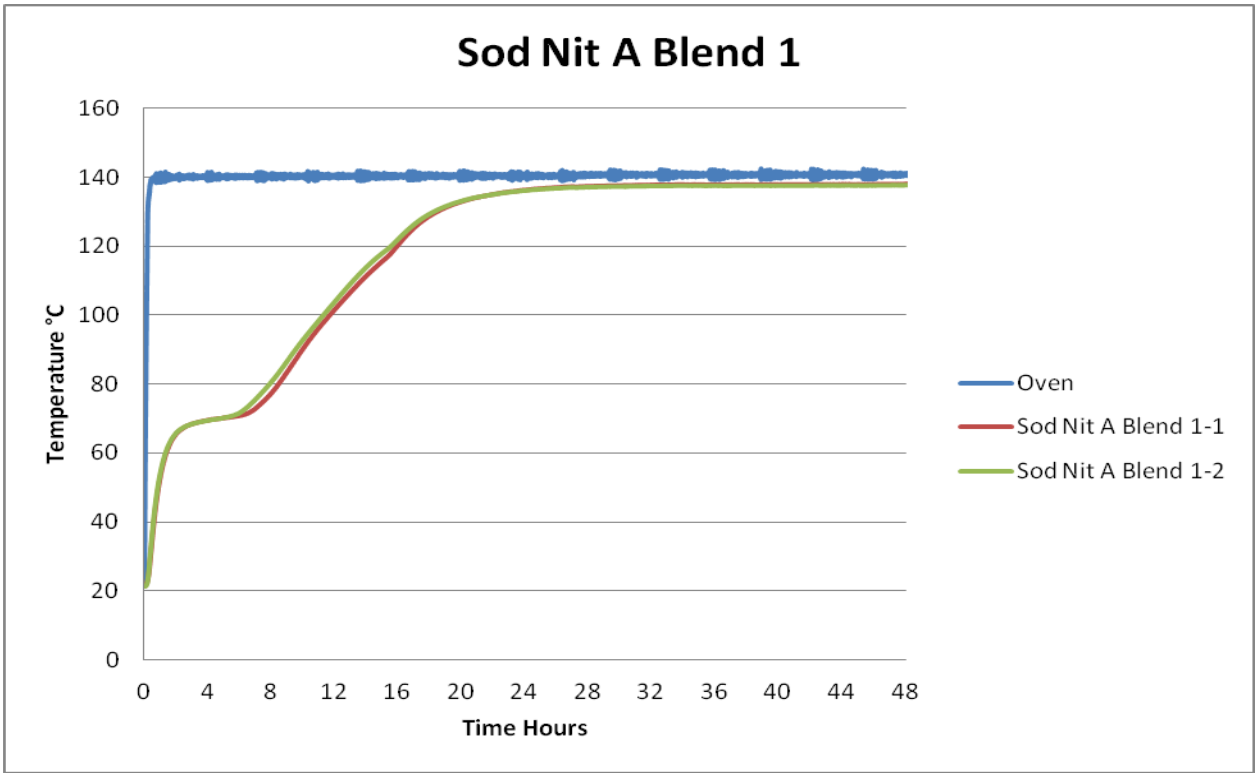


Figure 1. Method 1050 – Sod Nit A Blend 1 (100mm cube) full run.

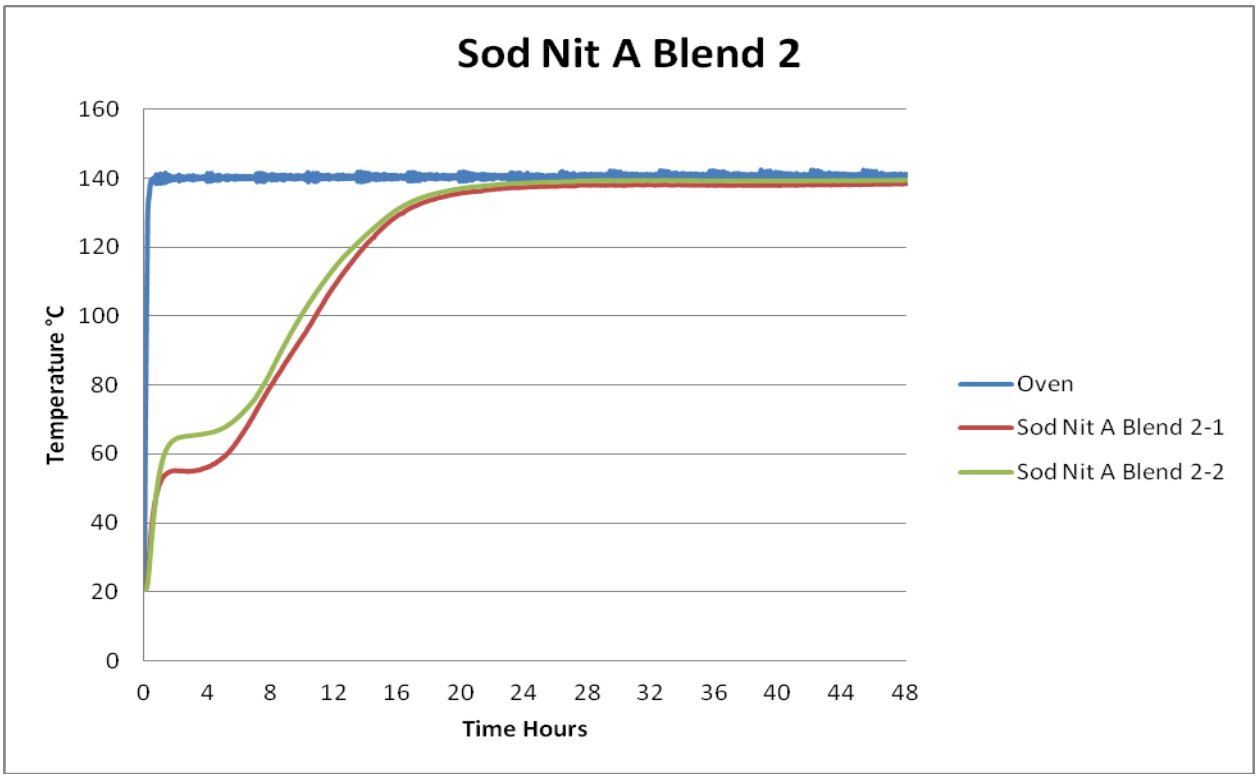


Figure 2. Method 1050 – Sod Nit A Blend 2 (100mm cube) full run.

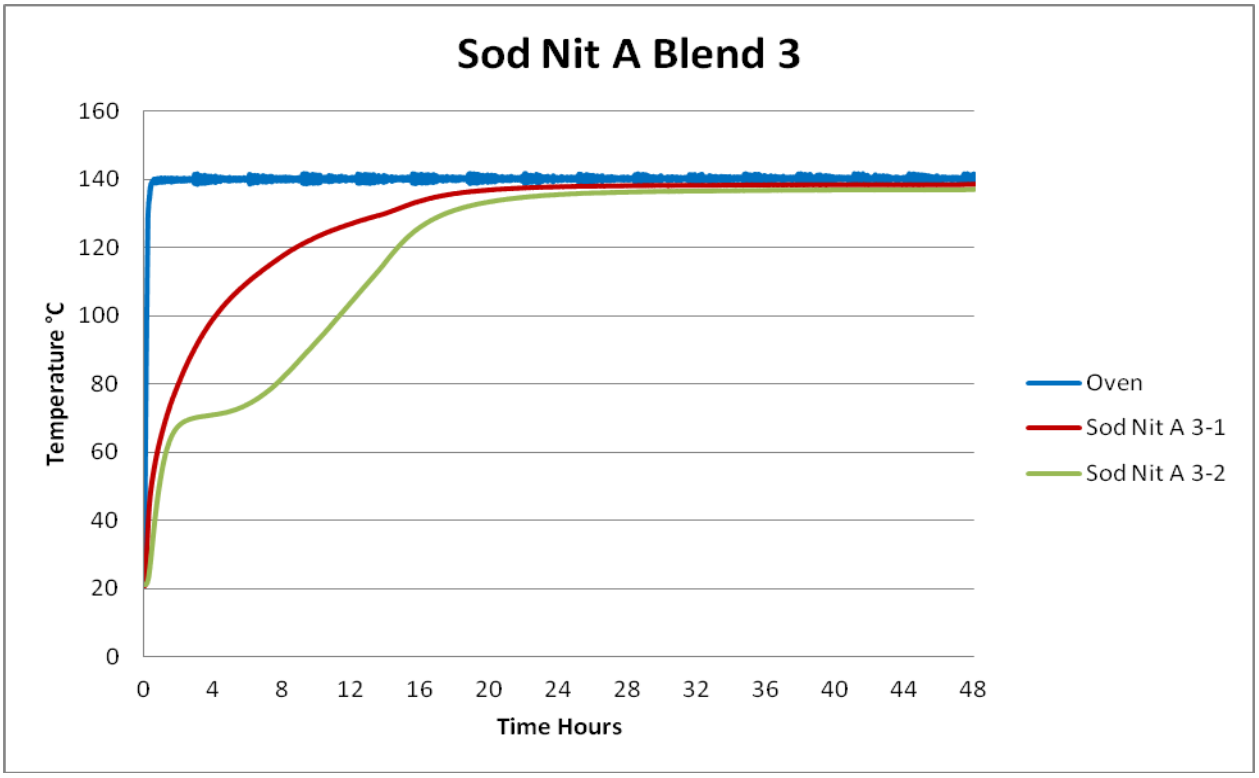


Figure 3. Method 1050 – Sod Nit A Blend 3 (100mm cube) full run.

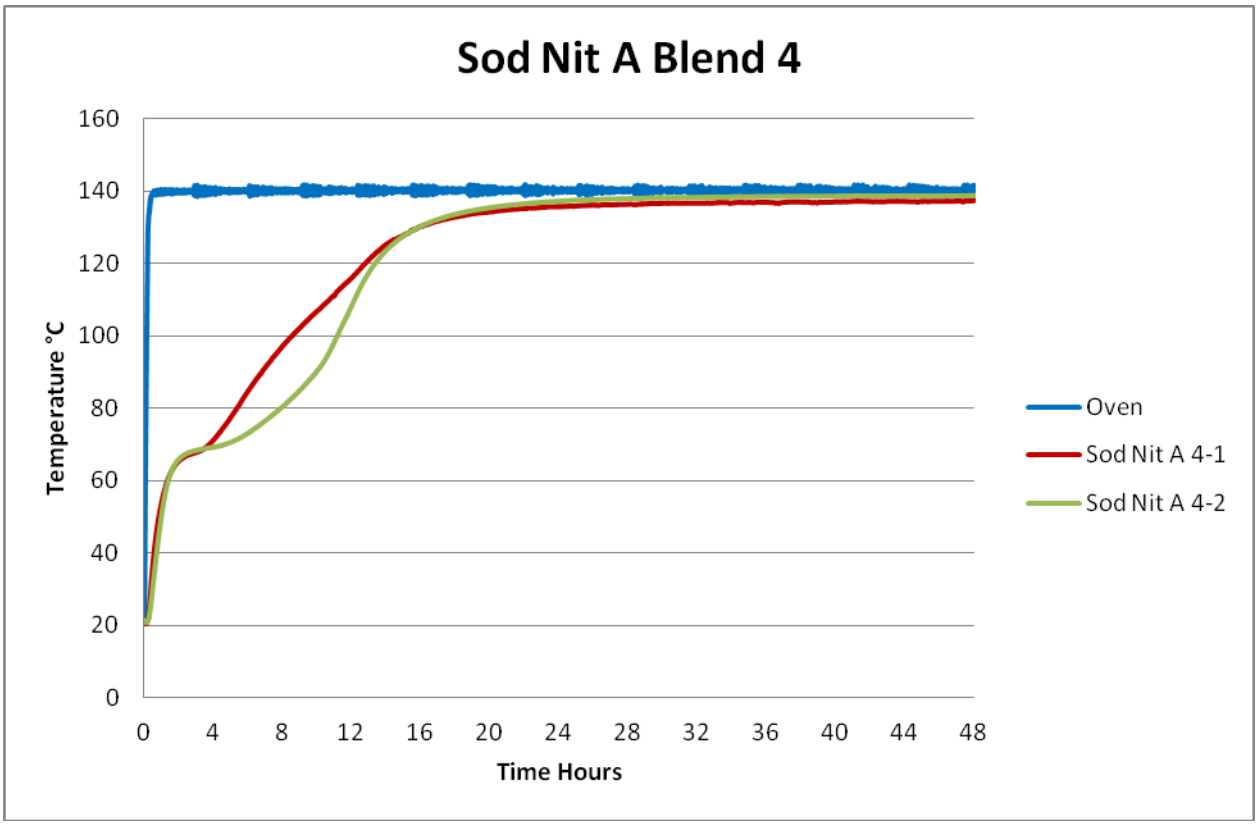


Figure 4. Method 1050 – Sod Nit A Blend 4 (100mm cube) full run.

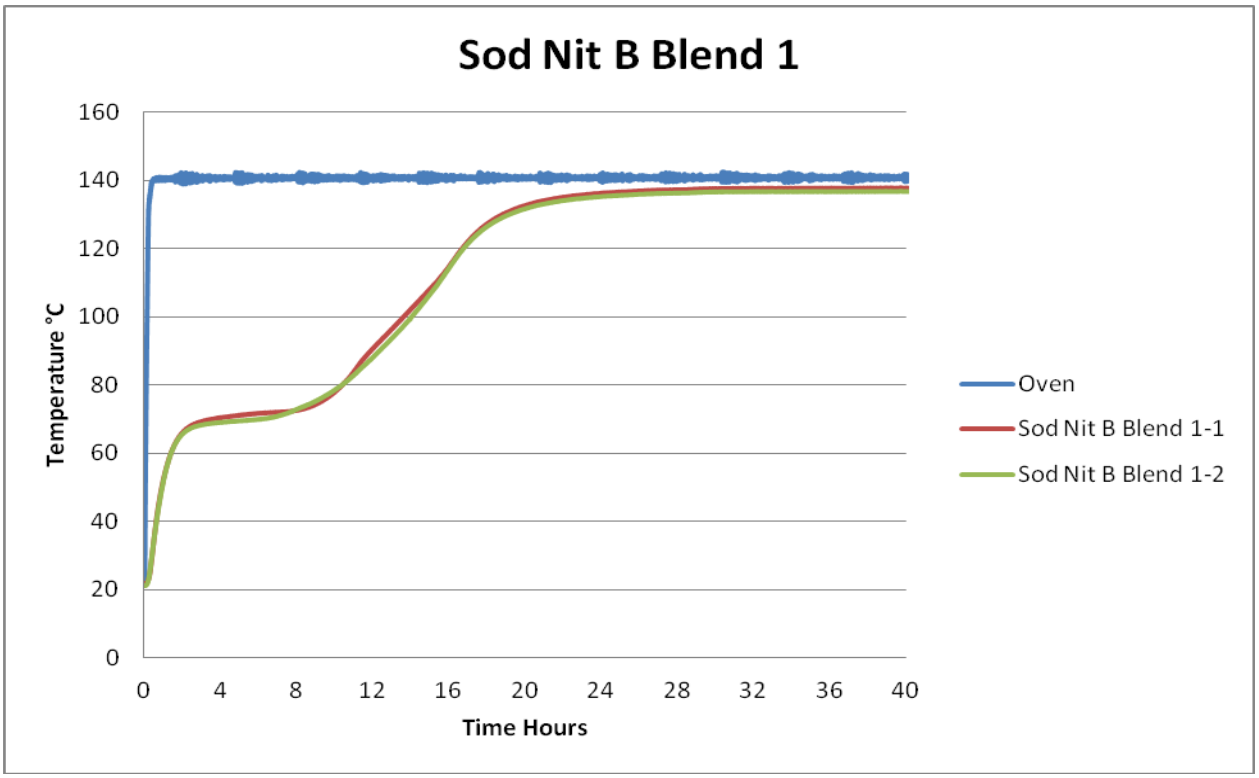


Figure 5. Method 1050 – Sod Nit B Blend 1 (100mm cube) full run.

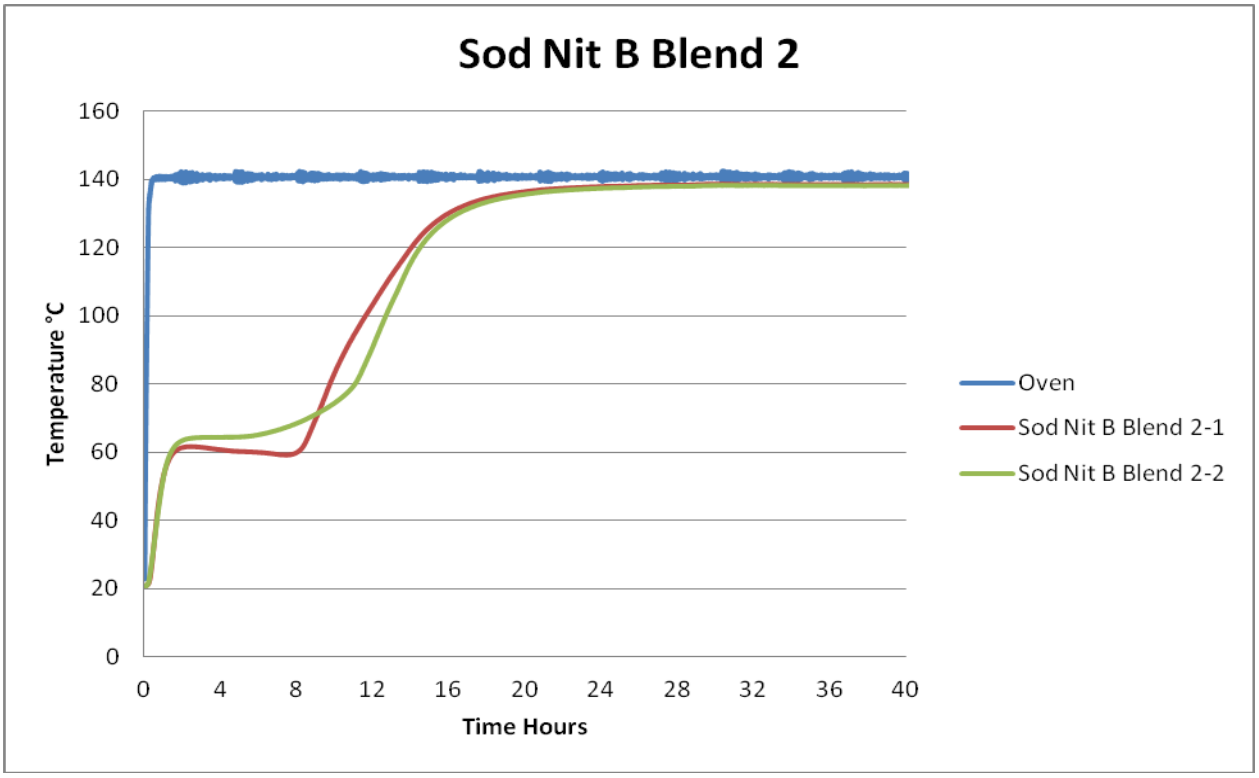


Figure 6. Method 1050 – Sod Nit B Blend 2 (100mm cube) full run.

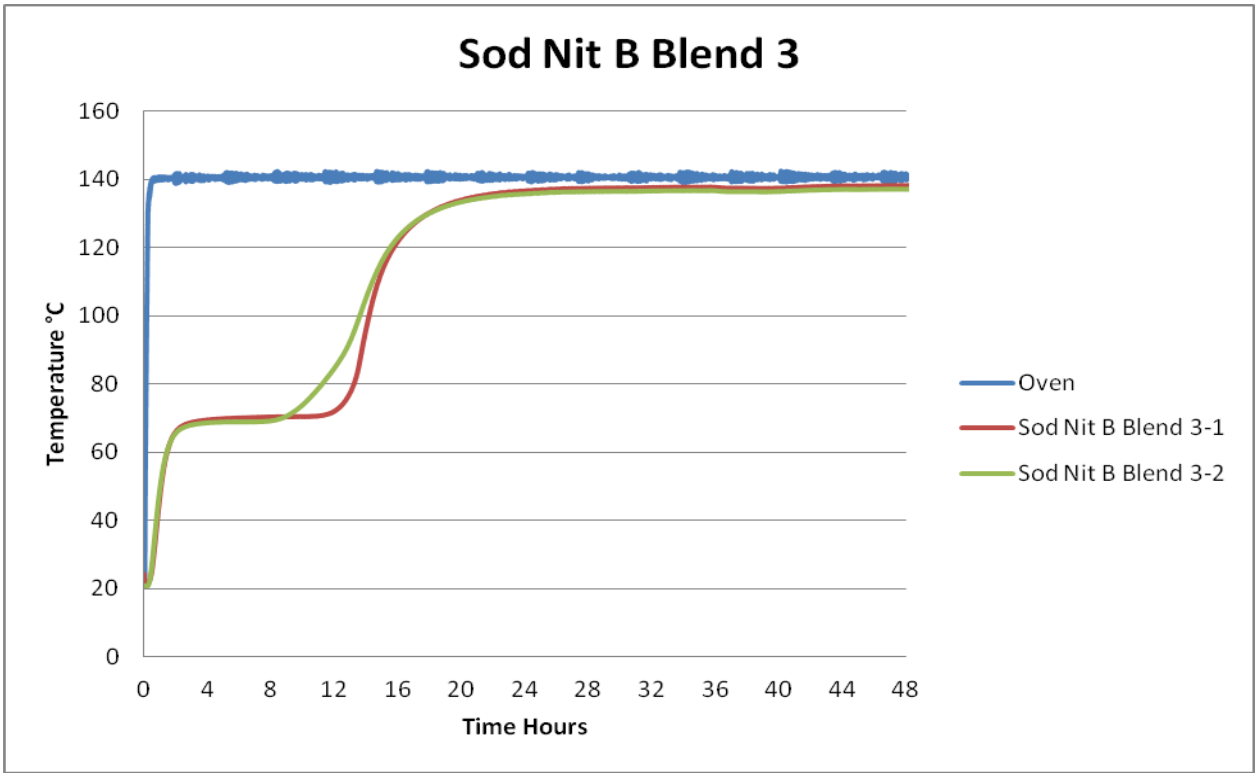


Figure 7. Method 1050 – Sod Nit B Blend 3 (100mm cube) full run

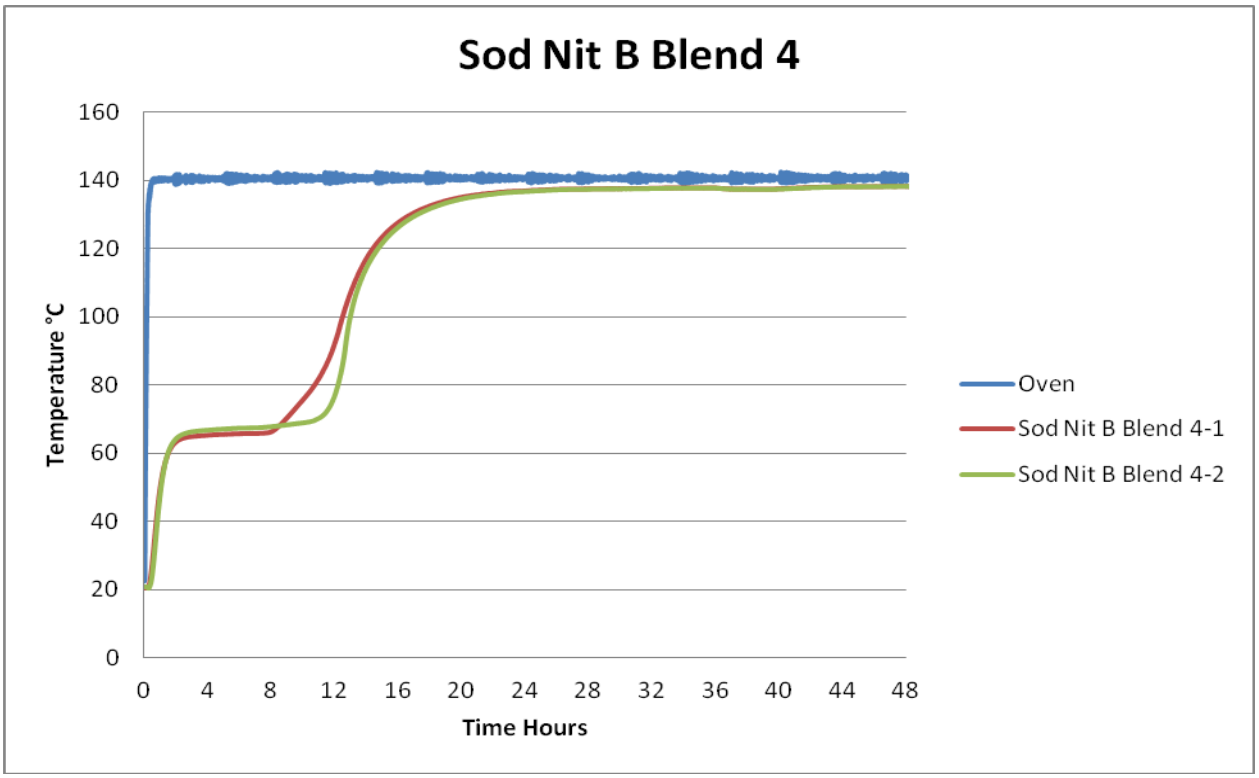


Figure 8. Method 1050 – Sod Nit B Blend 4 (100mm cube) full run.

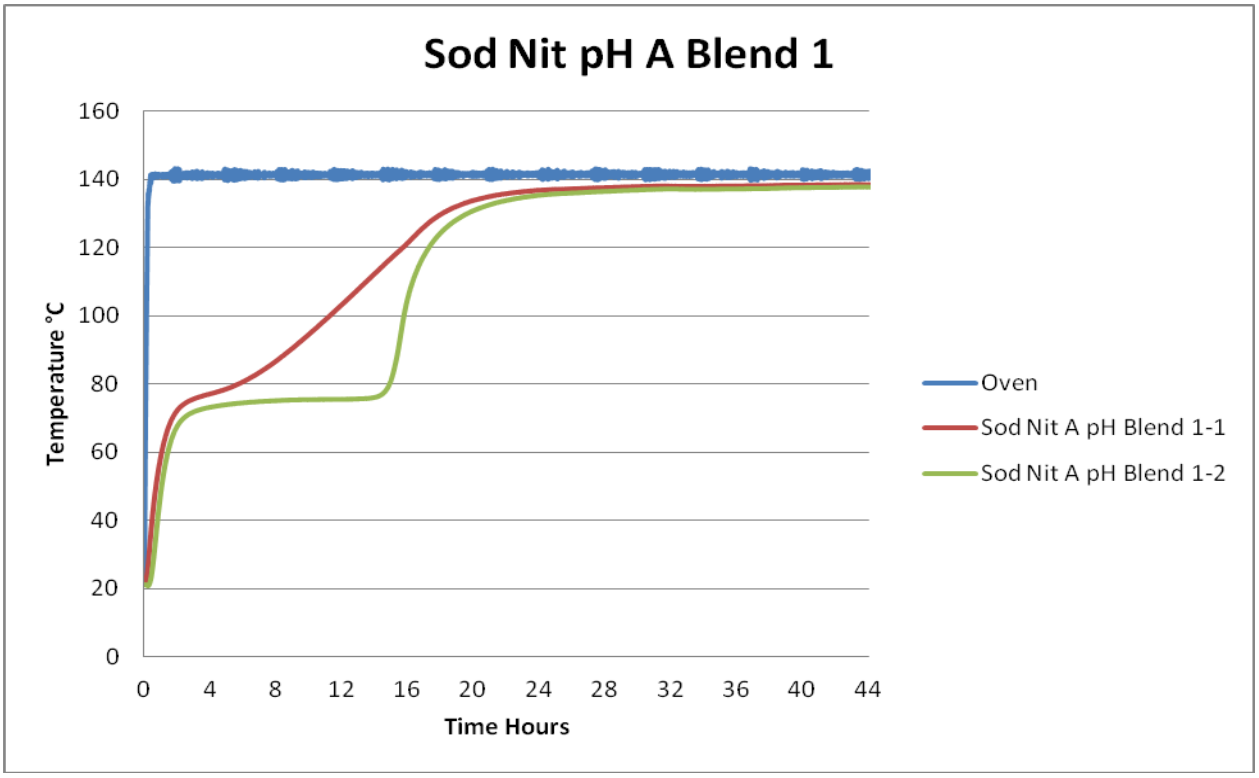


Figure 9. Method 1050 – Sod Nit pH A Blend 1 (100mm cube) full run.

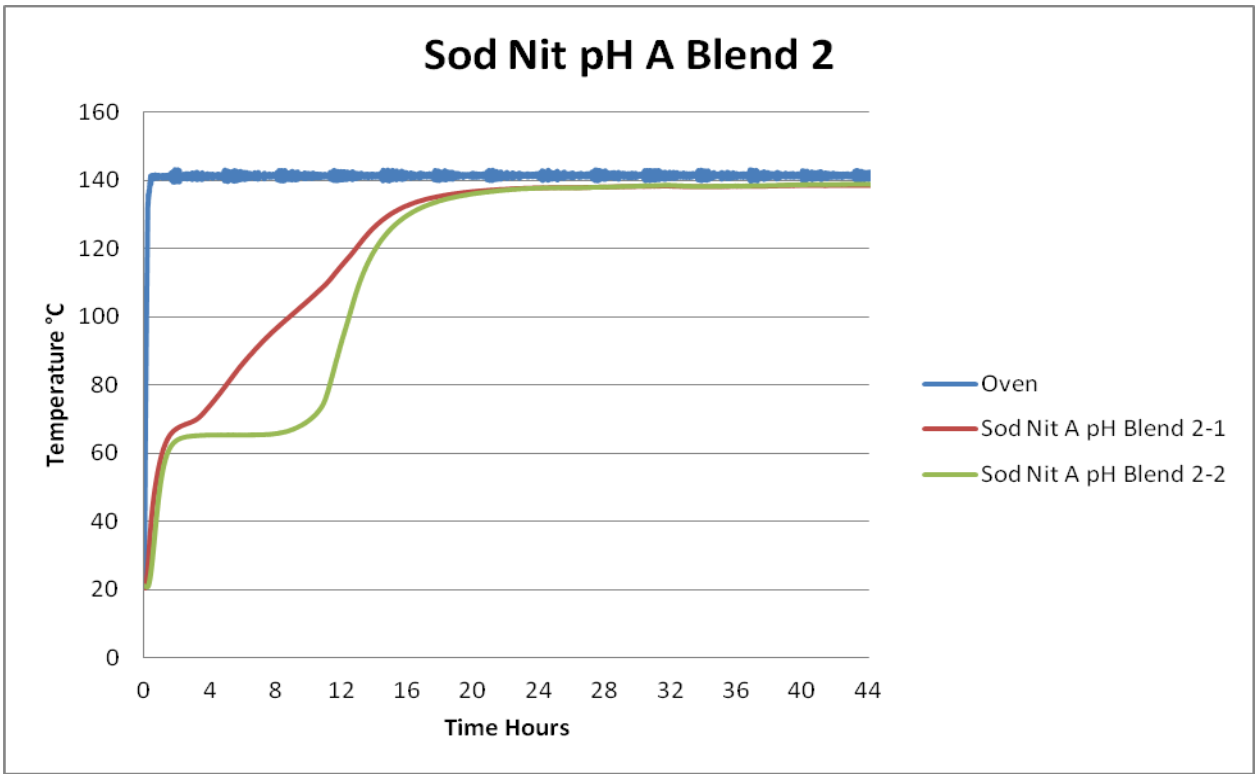


Figure 10. Method 1050 – Sod Nit pH A Blend 2 (100mm cube) full run

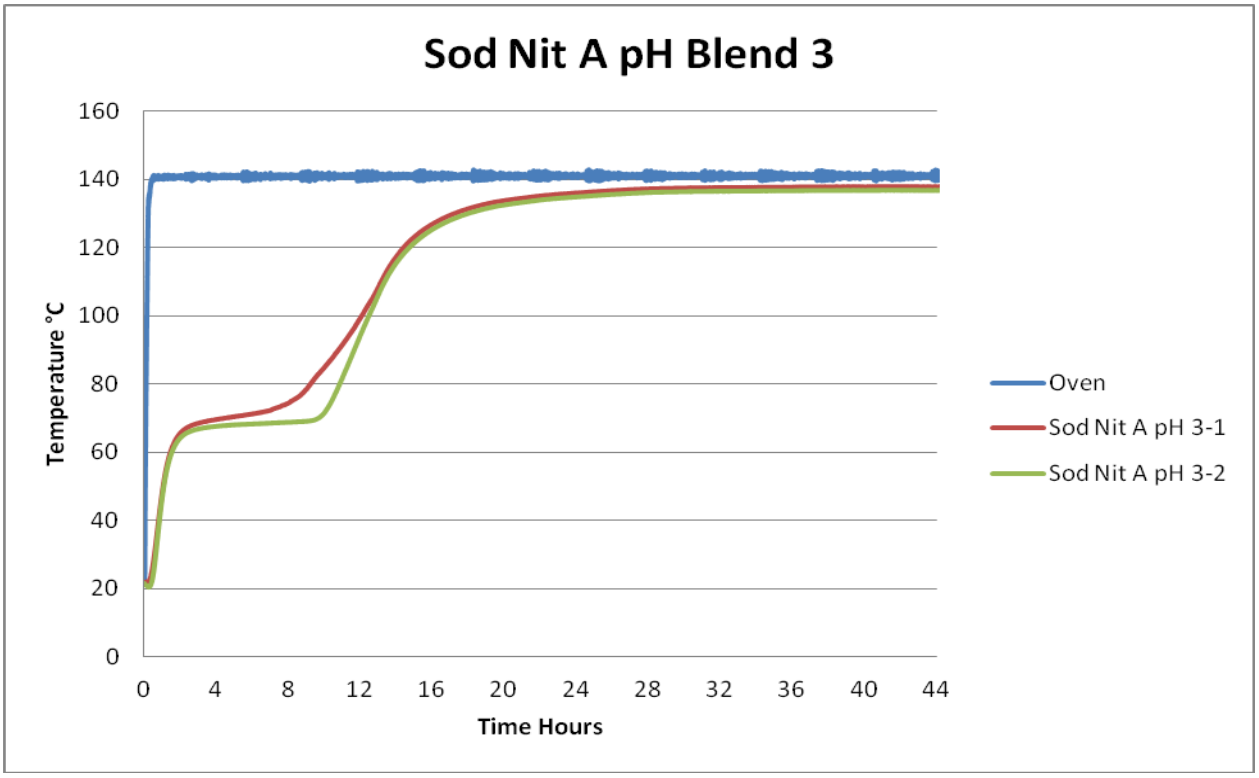


Figure 11. Method 1050 – Sod Nit pH A Blend 3 (100 mm cube) full run.

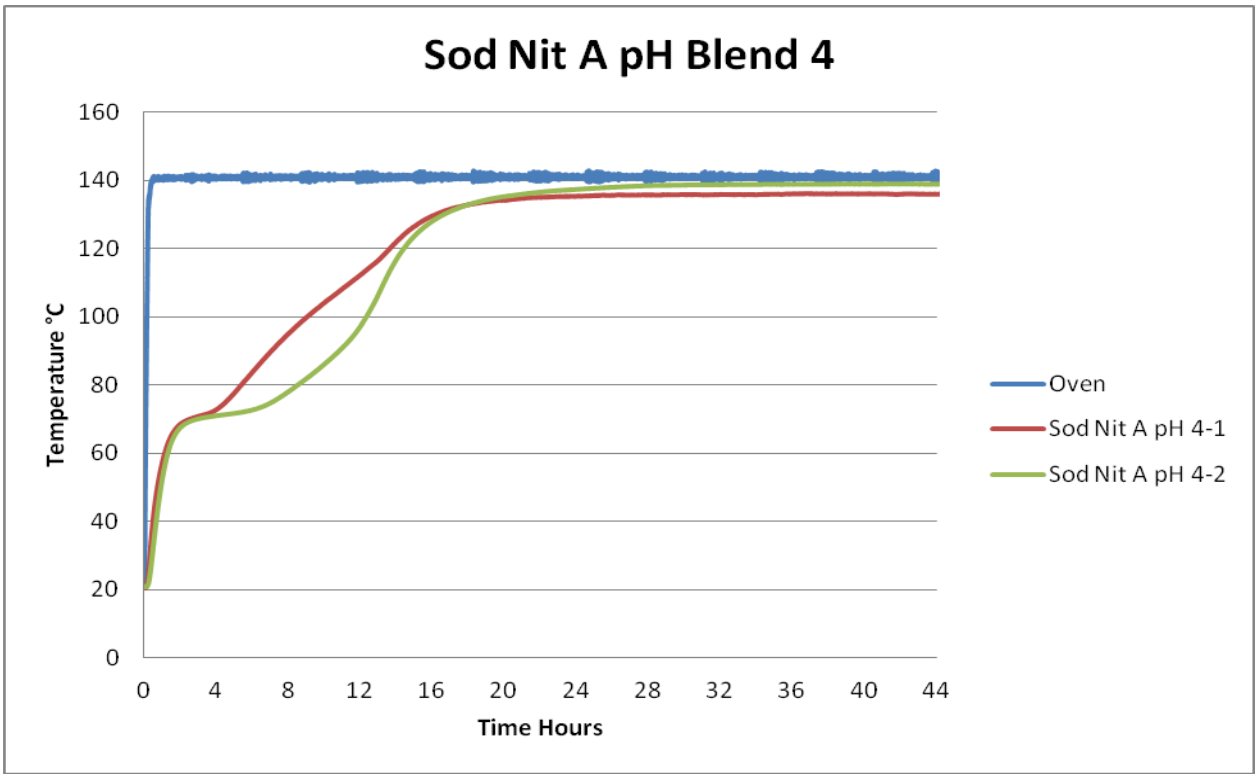


Figure 12. Method 1050 – Sod Nit pH A Blend 4 (25 mm cube) full run.

010025

SOUTHWEST RESEARCH INSTITUTE
CLIENT: Los Alamos National Laboratory
SwRI PROJECT#: 21592.01.00X
SwRI TASK ORDER: 160605-2
SwRI SRR: 57710
SDG: 598447
VTSR: 05.31.2016

Wetchem Analyses

Sample Results

SOUTHWEST RESEARCH INSTITUTE

SW 846 Method 1030

SAMPLE DATA SHEET

Lab Name: Southwest Research Institute

Client: Los Alamos National Laboratory

Lab Code: SwRI

Project No.: 21592.01.00X

Matrix: Solid

Date Made: 5/13/16

SRR #: 57710

Task Order #: 160605-2

Sample ID	SwRI System ID	Method 1030 *Ignitability of Solids Results*	Date Analyzed
Sod Nit A Blend 1	598447	Nonflammable	06/12/16
Sod Nit A Blend 1 Dup	598447	Nonflammable	06/12/16
Sod Nit A Blend 2	598448	Nonflammable	06/12/16
Sod Nit A Blend 3	598449	Nonflammable	06/12/16
Sod Nit A Blend 4	598450	Nonflammable	06/12/16
Sod Nit A pH Blend -1	598453	Nonflammable	06/12/16
Sod Nit A pH Blend -2	598454	Nonflammable	06/12/16
Sod Nit A pH Blend -3	598455	Nonflammable	06/12/16
Sod Nit A pH Blend -4	598456	Nonflammable	06/12/16
Sod Nit B Blend 1	598460	Nonflammable	06/12/16
Sod Nit B Blend 2	598461	Nonflammable	06/12/16
Sod Nit B Blend 3	598462	Nonflammable	06/12/16
Sod Nit B Blend 4	598463	Nonflammable	06/12/16

* Note: The Ignitability designation is based on the criteria and conditions of the test

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SOUTHWEST RESEARCH INSTITUTE

SW 846 Method 1050

SAMPLE DATA SHEET

Lab Name: Southwest Research Institute

Client: Los Alamos National Laboratory

Lab Code: SwRI

Project No.: 21592.01.00X

Matrix: Solid

Date Made: 5/13/16

SRR #: 57710

Task Order #: 160605-2

Sample ID	SwRI System ID	SW 846 Method 1050 *Test Method to Determine Substances Likey to Spontaneously Combust* (Method C) Results	Date Analyzed
Sod Nit A Blend 1	598447	Not a self-heating waste	06/08/16
Sod Nit A Blend 2	598448	Not a self-heating waste	06/08/16
Sod Nit A Blend 3	598449	Not a self-heating waste	06/05/16
Sod Nit A Blend 4	598450	Not a self-heating waste	06/05/16
Sod Nit A pH Blend -1	598453	Not a self-heating waste	05/31/16
Sod Nit A pH Blend -2	598454	Not a self-heating waste	05/31/16
Sod Nit A pH Blend -3	598455	Not a self-heating waste	06/03/16
Sod Nit A pH Blend -4	598456	Not a self-heating waste	06/03/16
Sod Nit B Blend 1	598460	Not a self-heating waste	05/29/16
Sod Nit B Blend 2	598461	Not a self-heating waste	05/29/16
Sod Nit B Blend 3	598462	Not a self-heating waste	05/27/16
Sod Nit B Blend 4	598463	Not a self-heating waste	05/27/16

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SOUTHWEST RESEARCH INSTITUTE

SW846 9095 Paint Filter Liquids Test

SAMPLE DATA SHEET

Lab Name: Southwest Research Institute

Client: Los Alamos National Laboratory

Lab Code: SwRI

Project No.: 21592.01.00X

Matrix: Solid

Date Made: 5/13/16

SRR #: 57710

Task Order #: 160605-2

Sample ID	SwRI System ID	Method 9095 *Paint Filter Results*	Date Analyzed
Sod Nit A Blend 1	598447	No free liquids	06/12/16
Sod Nit A Blend 1 Dup	598447	No free liquids	06/12/16
Sod Nit A Blend 2	598448	No free liquids	06/12/16
Sod Nit A Blend 3	598449	No free liquids	06/12/16
Sod Nit A Blend 4	598450	No free liquids	06/12/16
Sod Nit A ph - Zeo 1	598451	No free liquids	06/15/16
Sod Nit A ph - Zeo 2	598452	No free liquids	06/15/16
Sod Nit A pH Blend -1	598453	No free liquids	06/12/16
Sod Nit A pH Blend -2	598454	No free liquids	06/12/16
Sod Nit A pH Blend -3	598455	No free liquids	06/12/16
Sod Nit A pH Blend -4	598456	No free liquids	06/12/16
Sod Nit B - Zeo 1	598458	No free liquids	06/15/16
Sod Nit B - Zeo 2	598459	No free liquids	06/15/16
Sod Nit B Blend 1	598460	No free liquids	06/12/16
Sod Nit B Blend 2	598461	No free liquids	06/15/16
Sod Nit B Blend 3	598462	No free liquids	06/15/16
Sod Nit B Blend 4	598463	No free liquids	06/15/16
Sod Nit A Sol - Zeo 1	598464	No free liquids	06/15/16
Sod Nit A Sol - Zeo 2	598465	No free liquids	06/15/16

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SOUTHWEST RESEARCH INSTITUTE

UN OXIDIZER TEST

SAMPLE DATA SHEET

Lab Name: Southwest Research Institute

Client: Los Alamos National Laboratory

Lab Code: SwRI

Project No.: 21592.01.00X

Matrix: Solid

Date Made: 5/13/16

SRR #: 57710

Task Order #: 160605-2

Potassium Bromate and Cellulose Reference Mixtures

Mean Burn Time, sec 3:7 $KBrO_3$:Cellulose Ratio	Mean Burn Time, sec 2:3 $KBrO_3$:Cellulose Ratio	Mean Burn Time, sec 3:2 $KBrO_3$:Cellulose Ratio
135.32	52.44	19.45

Test Substance

Sample ID	SwRI System ID	Mean Burn Time, sec 4:1 Sample:Cellulose Ratio	Mean Burn Time, sec 1:1 Sample:Cellulose Ratio	Classification	Date Analyzed
Sod Nit A Blend 1	598447	>180	>180	Not Division 5.1	06/09/16
Sod Nit A Blend 2	598448	no reaction	>180	Not Division 5.1	06/09/16
Sod Nit A Blend 3	598449	no reaction	>180	Not Division 5.1	06/06/16
Sod Nit A Blend 4	598450	no reaction	no reaction	Not Division 5.1	06/06/16
Sod Nit A ph - Zeo 1	598451	no reaction	>180	Not Division 5.1	06/15/16
Sod Nit A ph - Zeo 2	598452	no reaction	> 180	Not Division 5.1	06/20/16
Sod Nit A pH Blend -1	598453	no reaction	>180	Not Division 5.1	06/02/16
Sod Nit A pH Blend -2	598454	no reaction	>180	Not Division 5.1	06/01/16
Sod Nit A pH Blend -3	598455	no reaction	>180	Not Division 5.1	06/07/16
Sod Nit A pH Blend -4	598456	no reaction	>180	Not Division 5.1	06/09/16
Sod Nit B - Zeo 1	598458	no reaction	>180	Not Division 5.1	06/15/16
Sod Nit B - Zeo 2	598459	no reaction	>180	Not Division 5.1	06/15/16
Sod Nit B Blend 1	598460	>180	>180	Not Division 5.1	06/01/16
Sod Nit B Blend 2	598461	no reaction	>180	Not Division 5.1	06/02/16
Sod Nit B Blend 3	598462	>180	>180	Not Division 5.1	06/07/16
Sod Nit B Blend 4	598463	no reaction	>180	Not Division 5.1	06/07/16
Sod Nit A Sol - Zeo 1	598464	no reaction	>180	Not Division 5.1	06/15/16
Sod Nit A Sol - Zeo 2	598465	no reaction	>180	Not Division 5.1	06/09/16

The test criteria for determining oxidizing properties of the substance are:	Classification
Any substance which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time less than the mean burning time of a 3:2 mixture, by mass, of potassium bromate and cellulose.	Packing group I
Any substance which, in the 4:1 or 1:1 sample-to-cellulose ratio (by mass) tested, exhibits a mean burning time equal to or less than the mean burning time of a 2:3 mixture (by mass) of potassium bromate and cellulose; and which does not meet the criteria for packing group I	Packing group II
Any substance which, in the 4:1 or 1:1 sample-to-cellulose ration (by mass) tested, exhibits a mean burning time equal to or less than the mean burning time of a 3:7 mixture (by mass) of potassium bromate and cellulose; and which does not meet the criteria for packing groups I and II.	Packing group III
Any substance which, in both the 4:1 and 1:1 sample-to-cellulose ration(by mass) tested, does not ignite and burn, or exhibit mean burning times greater than that of a 3:7 mixture (by mass) of potassium bromate and cellulose.	Not Division 5.1

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SOUTHWEST RESEARCH INSTITUTE

UN OXIDIZER TEST

LABORATORY CONTROL SAMPLE DATA SHEET

Lab Name: Southwest Research Institute

Client: Los Alamos National Laboratory

Lab Code: SwRI

Project No.: 21592.01.00X

Matrix: Solid

Date Made: 5/13/16

SRR #: 57710

Task Order #: 160605-2

Acceptance Criteria for Daily Laboratory Control Samples

Mean Burn Time, sec 3:7 $KBrO_3$:Cellulose Ratio	Mean Burn Time, sec 2:3 $KBrO_3$:Cellulose Ratio	Mean Burn Time, sec 3:2 $KBrO_3$:Cellulose Ratio
108-162 sec	42-63 sec	15-23 sec

Sample ID	Mean Burn Time, sec 3:7 $KBrO_3$:Cellulose Ratio	Mean Burn Time, sec 2:3 $KBrO_3$:Cellulose Ratio	Mean Burn Time, sec 3:2 $KBrO_3$:Cellulose Ratio	Data Analyzed
LCS	127.10	55.28	18.94	06/01/16
LCS	127.03	48.35	18.56	06/02/16
LCS	132.09	55.56	19.90	06/06/16
LCS	135.25	55.75	21.25	06/07/16
LCS	136.91	56.52	20.65	06/09/16
LCS	123.90	49.19	19.63	06/15/16
LCS	122.50	58.41	17.69	06/20/16

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010031

SOUTHWEST RESEARCH INSTITUTE
CLIENT: Los Alamos National Laboratory
SwRI PROJECT#: 21592.01.00X
SwRI TASK ORDER: 160605-2
SwRI SRR: 57710
SDG: 598447
VTSR: 05.31.2016

UN Oxidizer Test

Raw Data

010032

Southwest Research Institute

Method: UN_Oxidizer
Project #: 21592.01.0026
Client: Los Alamos (LANL)
TO# 160605-2 ; 160605-1

Reference Substance

$KBrO_3$:Cellulose	Wt $KBrO_3$, g	Wt Cellulose, g
3:7	9	21
2:3	12	18
3:2	18	12

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
3:7	1	9.0190	21.0143	135.53	
3:7	2	9.0181	21.0485	134.46	
3:7	3	9.0300	21.0156	132.35	
3:7	4	9.0481	21.0075	138.56	
3:7	5	9.0349	21.0035	135.69	
3:7	**Avg**			135.32	
Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
2:3	1	12.0035	18.0057	55.66	
2:3	2	12.0134	18.0086	52.05	
2:3	3	12.0146	18.0108	52.79	
2:3	4	12.0106	18.0083	51.37	
2:3	5	12.0056	18.0110	50.35	
2:3	**Avg**			52.44	
Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
3:2	1	18.0148	12.0069	19.15	
3:2	2	18.0104	12.0079	18.09	
3:2	3	18.0084	12.0153	18.93	
3:2	4	18.0147	12.0094	20.25	
3:2	5	18.0207	12.0032	20.81	
3:2	**Avg**			19.45	

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 5/31/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 5/31/16
Potassium Bromate: Inorg# 69450-69453 Dried: 65°C for >12hrs.
Cellulose: Inorg# 69668-69663 Dried: 105°C for >4hrs.
Variac Setting: 150±7W RE 6/1/16 MG

010033

Southwest Research Institute

Method: UN - Oxidizer
Project #: 21592.01.0006
Client: Los Alamos (LANL)
TO# 160605-2

Reference Substance

$KBrO_3$:Cellulose	Wt $KBrO_3$, g	Wt Cellulose, g
3:7	9	21
2:3	12	18
3:2	18	12

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
3:7	1	9.0051	21.0063	127.10	
3:7	2				
3:7	3				
3:7	4				
3:7	5				
3:7	**Avg**				

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
2:3	1	12.0195	18.0180	55.28	
2:3	2				
2:3	3				
2:3	4				
2:3	5				
2:3	**Avg**				

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
3:2	1	18.0053	12.0083	18.94	
3:2	2				
3:2	3				
3:2	4				
3:2	5				
3:2	**Avg**				

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/1/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/1/16
Potassium Bromate: Inorg# 69450-69453 Dried: 65°C for >12 hrs.
Cellulose: Inorg# 69662-69663 Dried: 105°C for >4 hrs.
Variac Setting: 150 ± 7 watts ee u/ llu mG

Southwest Research Institute

010034

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 166605-2

Sample Analysis

System ID: Sod Nit B Blend #1 (Blue) 137-01-WC512
598460

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0100	6.0059	181.97 ②	charring at wire leads, smoke & random flames
4:1	2	24.0161	6.0120	182.03 ②	at wire leads
4:1	3	24.0027	6.0040	185.62 ②	↓
4:1	4	24.0084	6.0079	183.06 ②	↓
4:1	5	24.0120	6.0350	180.41 ②	↓
4:1	Avg			>180	② time stopped when power was turned off

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0065	15.0070	184.75 ①	low flames at wire leads, charring & smoke
1:1	2	15.0152	15.0126	185.44 ①	↓
1:1	3	15.0253	15.0176	188.37 ①	↓
1:1	4	15.0081	15.0094	187.90 ①	↓
1:1	5	15.0048	15.0042	182.02 ①	↓
1:1	Avg			>180	① time stopped when flames extinguished

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/1/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/1/16
Sample Dried ? YES / (NO) Dried: NA
Cellulose: Inorg# 69662-69663 Dried: >4hrs.@105C
Variac Setting: 150 ± 7 Watts RE 6/1/16 mG

Classification: Not Division 5.1

Southwest Research Institute 010035

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit A pH Blend #2 (Black) 142-02-WX512
598454

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0082	6.0126	180.16 ①	charring around wire leads, slight smoke,
4:1	2	24.0032	6.0036	180.93 ①	NO flames
4:1	3	24.0014	6.0058	180.31 ①	
4:1	4	24.0098	6.0070	180.78 ①	
4:1	5	24.0007	6.0099	180.31 ①	
4:1	Avg			>180	① time when power turned off.

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0079	15.0092	185.88 ②	Small flames at wire leads, smoke
1:1	2	15.0097	15.0019	185.22 ②	
1:1	3	15.0168	15.0138	189.84 ②	
1:1	4	15.0091	15.0056	187.34 ②	
1:1	5	15.0128	15.0130	185.22 ②	
1:1	Avg			>180	② time when flames ext

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/1/16 RE 6/1/16 MG
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/1/16
Sample Dried ? YES / (NO) Dried: NA
Cellulose: Inorg# 696661-696643 Dried: >4hrs.@105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

Southwest Research Institute

Method: UN-Oxidizer
Project #: 21592.01.006
Client: Los Alamos (LANL)
TO# 160605-2

Reference Substance

$KBrO_3$:Cellulose	Wt $KBrO_3$, g	Wt Cellulose, g
3:7	9	21
2:3	12	18
3:2	18	12

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
3:7	1	9.0048	21.0022	127.03	
3:7	2				
3:7	3				
3:7	4				
3:7	5				
3:7	**Avg**				

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
2:3	1	12.0129	18.0125	48.35	
2:3	2				
2:3	3				
2:3	4				
2:3	5				
2:3	**Avg**				

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
3:2	1	18.0169	12.0050	18.56	
3:2	2				
3:2	3				
3:2	4				
3:2	5				
3:2	**Avg**				

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/2/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/2/16
Potassium Bromate: Inorg# 69450-69453 Dried: 105°C for > 12hrs.
Cellulose: Inorg# 69668-69663 Dried: 105°C for > 4hrs.
Variac Setting: 150±7 Watts EE 6/2/16 mh

Southwest Research Institute

010037

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit B Blend #2 137-02-WCS12 (Red)
RE 160523/10 MG 4 598461

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0036	6.0119	180.81 ①	Charring around wire leads + smoke, no flames
4:1	2	24.0092	6.0065	180.35 ①	
4:1	3	24.0042	6.0189	180.44 ①	
4:1	4	24.0114	6.0069	180.31 ①	
4:1	5	24.0181	6.0053	180.34 ①	↓
4:1	Avg			7180	① time when power was turned off

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0048	15.0239	184.78 ②	Small flame at wire leads, smoke + charring
1:1	2	15.0052	15.0024	185.59 ②	
1:1	3	15.0143	15.0041	188.63 ②	
1:1	4	15.0021	15.0165	184.50 ②	
1:1	5	15.0134	15.0028	184.00 ②	
1:1	Avg			7180	② time when flame extinguished

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/1/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/2/16
Sample Dried ? YES (NO) Dried: NA
Cellulose: Inorg# 469661-469663 Dried: >4hrs.@105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

Southwest Research Institute 010038

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit A pH Blend #1 192-01-WCS12 (Green)
598453

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0134	6.0158	180.84 ①	charring around wire, smoke, no flames
4:1	2	24.0238	6.0032	180.81 ①	
4:1	3	24.0194	6.0124	180.22 ①	
4:1	4	24.0160	6.0151	180.47 ①	
4:1	5	24.0167	6.0063	180.28 ①	
4:1	Avg			>180	① time when power

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0206	15.0245	182.47 ②	small flames at wire leads, smoke + charring
1:1	2	15.0140	15.0064	181.50 ②	
1:1	3	15.0153	15.0033	183.56 ②	
1:1	4	15.0139	15.0087	184.28 ②	
1:1	5	15.0080	15.0153	181.79 ②	
1:1	Avg			>180	② time when flames extinguished

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/1/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/2/16
Sample Dried ? YES / (NO) Dried: NA
Cellulose: Inorg# 160161-160163 Dried: >4hrs. @ 105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

Southwest Research Institute

010039

Method: UN_Oxidizer
Project #: 21592.01.006
Client: Los Alamos (LANL)
TO# 160605-2

Reference Substance

$KBrO_3$:Cellulose	Wt $KBrO_3$, g	Wt Cellulose, g
3:7	9	21
2:3	12	18
3:2	18	12

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
3:7	1	9.0142	21.0122	132.09	
3:7	2				
3:7	3				
3:7	4				
3:7	5				
3:7	**Avg**				
Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
2:3	1	12.0099	18.0107	55.56	
2:3	2				
2:3	3				
2:3	4				
2:3	5				
2:3	**Avg**				
Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
3:2	1	18.0081	12.00165	19.90	
3:2	2				
3:2	3				
3:2	4				
3:2	5				
3:2	**Avg**				

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 10/10/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 10/6/16
Potassium Bromate: Inorg# 69450-69453 Dried:65°C for >12hrs.
Cellulose: Inorg# 69461-69463 Dried: 105°C for >4 hrs.
Variac Setting: 150 ± 7W

Southwest Research Institute 010040

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit A Blend #3 (133-03-WCS12) [Black]
598449

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0109	6.0101	180.32 ①	Charring at wire leads, smoke
4:1	2	24.0179	6.0068	180.98 ①	
4:1	3	24.0186	6.0139	180.34 ①	
4:1	4	24.0084	6.0082	180.100 ①	
4:1	5	24.0075	6.0054	180.41 ①	↓
4:1	Avg			7/80	① time when power was turned off

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0185	15.0124	185.06 ②	flames at wire leads, smoke + charring
1:1	2	15.0155	15.0136	227.06 ②	same as rep #1 but flames propagated
1:1	3	15.0164	15.0171	229.09 ②	↓
1:1	4	15.0134	15.0091	188.22 ②	flames at wire leads, smoke + charring
1:1	5	15.0108	15.0103	188.66 ②	↓
1:1	Avg			7/80	② time when flame extinguished

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/6/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/6/16
Sample Dried ? YES / (NO) Dried: NA
Cellulose: Inorg# 69661-69663 Dried: >4hrs.@105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

Southwest Research Institute 010041

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit A Blend #4 (133-04-WCS12) [Blue]
598450

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0140	6.0136	180.41 ①	charring around wire leads, smoke
4:1	2	24.0171	6.0163	180.28 ①	
4:1	3	24.0047	6.0054	180.28 ①	
4:1	4	24.0067	6.0044	180.87 ①	
4:1	5	24.0069	6.0072	180.40 ①	↓
4:1	Avg			7180	① time when power was turned off

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0084	15.0067	187.47 ②	
1:1	2	15.0179	15.0138	188.31 ②	
1:1	3	15.0189	15.0208	193.25 ②	
1:1	4	15.0083	15.0094	201.04 ②	
1:1	5	15.0129	15.0105	188.81 ②	
1:1	Avg			7180	② time when flames extinguished

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/6/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/6/16
Sample Dried ? YES / (NO) Dried: NA
Cellulose: Inorg# 69661-69663 Dried: >4hrs. @105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

Southwest Research Institute

010042

Method: IAN - Oxidizer
Project #: 21592.01.0006
Client: Los Alamos (LANL)
TO# 160605-2

Reference Substance

$KBrO_3$:Cellulose	Wt $KBrO_3$, g	Wt Cellulose, g
3:7	9	21
2:3	12	18
3:2	18	12

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
3:7	1	9.0110	21.0107	135.25	
3:7	2				
3:7	3				
3:7	4				
3:7	5				
3:7	**Avg**				

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
2:3	1	12.0020	18.0077	55.75	
2:3	2				
2:3	3				
2:3	4				
2:3	5				
2:3	**Avg**				

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
3:2	1	18.0081	12.0027	21.25	
3:2	2				
3:2	3				
3:2	4				
3:2	5				
3:2	**Avg**				

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/7/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/7/16
Potassium Bromate: Inorg# 69450 - 69453 Dried: >12hrs. @ 65°C
Cellulose: Inorg# 69661 - 69663 Dried: >4hrs. @ 105°C
Variac Setting: 150 ± 7 Watts

Southwest Research Institute 010043

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit B Blend #3 (137-023-WCS12) [Red]
5984662 RE 6/6/16 MG

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0071	6.0043	180.28 ①	charring around wire, spontanious flame at front wire lead, smoke
4:1	2	24.0074	6.0083	180.88 ①	
4:1	3	24.0106	6.0118	180.29 ①	
4:1	4	24.0098	6.0056	180.41 ①	
4:1	5	24.0162	6.0088	180.31 ①	
4:1	Avg			>180	① time when power turned off

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0148	15.0139	208.41 ②	flames at wire leads + propigated a little bit, charring + smoke
1:1	2	15.0064	15.0114	197.50 ①	
1:1	3	15.0074	15.0080	186.60 ②	
1:1	4	15.0168	15.0162	204.00 ①	
1:1	5	15.0097	15.0092	207.65 ②	
1:1	Avg			>180	② time when flames extinguished; power turned off at 180 sec.

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/6/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/7/16
Sample Dried ? YES (NO) Dried: N/A
Cellulose: Inorg# 696161-696163 Dried: >4hrs.@105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

Southwest Research Institute 010044

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit B Blend #4 (137-04-WCS12) [Green]
598463

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0060	6.0170	180.38 ①	charring around wire + smoke
4:1	2	24.0047	6.0072	180.29 ①	
4:1	3	24.0025	6.0070	180.35 ①	
4:1	4	24.0078	6.0103	180.22 ①	
4:1	5	24.00198	6.0127	180.25 ①	
4:1	Avg			>180	① time when power was turned off.

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0139	15.0176	180.97 ②	small flames at wire leads, charring + smoke
1:1	2	15.0130	15.0087	185.12 ②	
1:1	3	15.0048	15.0064	184.84 ②	
1:1	4	15.0006	15.0026	187.94 ②	
1:1	5	15.0042	15.0142	184.53 ②	
1:1	Avg			>180	② time flame extinguished, power turned off at 180 sec

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/6/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/7/16
Sample Dried ? YES / (NO) Dried: NA
Cellulose: Inorg# 149661-49663 Dried: >4hrs.@105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

Southwest Research Institute

010045

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit A pH Blend #3 (142-03-WCS12) [Blue]
598455

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0082	6.0152	180.28 ①	Charring around wire + smoke
4:1	2	24.0099	6.0162	180.34 ①	↓
4:1	3	24.0034	6.0085	180.31 ①	
4:1	4	24.0141	6.0104	180.163 ①	
4:1	5	24.0092	6.0084	180.37 ①	↓
4:1	Avg			>180	①time when power was turned off

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0183	15.0078	181.28 ②	small flames at wire leads, charring +
1:1	2	15.0097	15.0032	185.47 ②	smoke
1:1	3	15.0025	15.0078	208.69 ②	flame propagated a little bit + Above disc
1:1	4	15.0098	15.0098	182.71 ②	small flame at wire leads, charring + smoke
1:1	5	15.0089	15.0112	182.71 ②	↓
1:1	Avg			>180	②time when flame extinguished; power turned off at 180 sec.

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/7/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/7/16
Sample Dried ? YES / (NO) Dried: NA
Cellulose: Inorg# 69641 - 69663 Dried: >4hrs. @ 105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

010046

Southwest Research Institute

Method: UN - Oxidizer
Project #: 21592.01.0006
Client: Los Alamos (LANL)
TO# 160605-2

Reference Substance

$KBrO_3$:Cellulose	Wt $KBrO_3$, g	Wt Cellulose, g
3:7	9	21
2:3	12	18
3:2	18	12

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
3:7	1	9.0696	21.0070	136.91	
3:7	2				
3:7	3				
3:7	4				
3:7	5				
3:7	**Avg**				

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
2:3	1	12.0060	18.0018	50.52	
2:3	2				
2:3	3				
2:3	4				
2:3	5				
2:3	**Avg**				

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
3:2	1	18.0040	12.0058	20.65	
3:2	2				
3:2	3				
3:2	4				
3:2	5				
3:2	**Avg**				

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/9/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/9/16
Potassium Bromate: Inorg# 69450-59453 Dried: >12hrs. @ 65°C
Cellulose: Inorg# 69461-69663 Dried: >4hrs. @ 105°C
Variac Setting: 150±7 Watts

Southwest Research Institute

010047

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit A pH Blend #4 (142-04-WC512) [Black]
598456

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0045	6.0109	180.35 ①	charring around wire, smoke, + no flames
4:1	2	24.0160	6.0045	180.44 ①	
4:1	3	24.0099	6.0099	180.47 ①	
4:1	4	24.0095	6.0108	180.31 ①	
4:1	5	24.0049	6.0068	180.37 ①	
4:1	Avg			>180	① time power turned off, no reaction

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0064	15.0056	196.31 ②	low flames at wire leads, charring + smoke
1:1	2	15.0124	15.0108	191.68 ②	↓
1:1	3	15.0112	15.0067	212.41 ②	↓
1:1	4	15.0165	15.0104	7240 ③	low flames propagated around side of mound
1:1	5	15.0130	15.0080	196.62 ②	low flames at wire leads, charring + smoke
1:1	Avg			>180	② time when flame extinguished, power turned off at 180 sec

③ flame continued after 4 min/240 sec.

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/8/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/9/16
Sample Dried ? YES (NO) Dried: NA
Cellulose: Inorg# 96661-96663 Dried: >4hrs. @ 105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

Southwest Research Institute

010048

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit A Blend #1 (133-01-WCS12) [Green]
598447

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0167	6.0037	180.56 ①	spontaneous flames at wire leads, charring + smoke
4:1	2	24.0174	6.0139	180.81 ①	
4:1	3	24.0051	6.0026	180.16 ①	
4:1	4	24.0184	6.0145	180.59 ①	
4:1	5	24.0104	6.0077	180.50 ①	
4:1	Avg			>180	① time when power was turned off

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0026	15.0059	184.25 ②	low flames at wire leads, charring + smoke
1:1	2	15.0029	15.0056	199.91 ②	
1:1	3	15.0023	15.0046	183.12 ②	
1:1	4	15.0135	15.0058	183.41 ②	
1:1	5	15.0065	15.0126	186.54 ②	
1:1	Avg			>180	② time when flames extinguished

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/8/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/9/16
Sample Dried ? YES (NO) Dried: NA
Cellulose: Inorg# 169161 - 169163 Dried: >4hrs. @105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

Southwest Research Institute

010049

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit A Blend #2 (133-02-WCS12) [Blue]
598448

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0156	6.0092	180.28 ①	charring around wire leads, smoke, NO flames
4:1	2	24.0052	6.0087	180.81 ①	
4:1	3	24.0129	6.0075	180.18 ①	
4:1	4	24.0114	6.0065	180.32 ①	
4:1	5	24.0045	6.0061	180.41 ①	
4:1	Avg			>180	① time when power was turned off

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0187	15.0033	190.13 ②	low flames at wire leads, charring + smoke
1:1	2	15.0065	15.0058	185.37 ②	
1:1	3	15.0093	15.0101	188.28 ②	
1:1	4	15.0018	15.0079	215.13 ②	
1:1	5	15.0119	15.0179	185.96 ②	
1:1	Avg			>180	② time when flames extinguished

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/8/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/9/16
Sample Dried ? YES / (NO) Dried: NA
Cellulose: Inorg# 169661-169663 Dried: >4hrs. @105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

Southwest Research Institute 010050

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit A Zco 2 (126-02-WCS12) [Red]
598465

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0138	6.0220	180.34 ①	charring around wire leads, smoke, no flames
4:1	2	24.0083	6.0040	180.28 ①	
4:1	3	24.0192	6.0159	180.41 ①	
4:1	4	24.0011	6.0089	180.43 ①	
4:1	5	24.0194	6.0188	180.34 ①	
4:1	Avg			>180	① time when power turned off

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0197	15.0127	181.31 ②	low flames at wire leads, charring + smoke
1:1	2	15.0105	15.0122	181.01 ②	
1:1	3	15.0024	15.0067	182.03 ②	
1:1	4	15.0010	15.0056	181.91 ②	
1:1	5	15.0072	15.0053	181.59 ②	
1:1	Avg			>180	② Time when flames extinguished, power turned off at 180 sec.

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/8/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/9/16
Sample Dried ? YES / (NO) Dried: NA
Cellulose: Inorg# 69661-69663 Dried: >4hrs. @105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

010051

Southwest Research Institute

Method: HN- Oxidizer
Project #: 21592.01.006
Client: Los Alamos (LANL)
TO# 160005-2

Reference Substance

$KBrO_3$:Cellulose	Wt $KBrO_3$, g	Wt Cellulose, g
3:7	9	21
2:3	12	18
3:2	18	12

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
3:7	1	9.0152	21.0033	123.90	
3:7	2				
3:7	3				
3:7	4				
3:7	5				
3:7	**Avg**				

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
2:3	1	12.0154	18.0024	49.19	
2:3	2				
2:3	3				
2:3	4				
2:3	5				
2:3	**Avg**				

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
3:2	1	18.0046	12.0035	19.63	
3:2	2				
3:2	3				
3:2	4				
3:2	5				
3:2	**Avg**				

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/15/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/15/16
Potassium Bromate: Inorg# 69450 - 69453 Dried: 7 12hrs. @ 65°C
Cellulose: Inorg# 69661 - 69663 Dried: 7 4hrs. @ 105°C
Variac Setting: 150 ± 7 W

Southwest Research Institute

010052

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit B-2e02 (128-02-WCS12) [Blue]
598459

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0091	6.0093	180.28 ①	charring around wire, smoke, no flame
4:1	2	24.0069	6.0024	180.38 ①	↓
4:1	3	24.0155	6.0099	180.75 ①	
4:1	4	24.0099	6.0146	180.31 ①	
4:1	5	24.0064	6.0130	180.34 ①	↓
4:1	Avg			7180	①time power turned off; no reaction

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0043	15.0127	183.09 ②	small flames at wire leads, charring + smoke
1:1	2	15.0129	15.0108	181.91 ②	↓
1:1	3	15.0028	15.0076	183.03 ②	
1:1	4	15.0086	15.0109	181.60 ②	
1:1	5	15.0044	15.0026	183.06 ②	↓
1:1	Avg			7180	②time when flames extinguished - Power turned off at 180sec.

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/13/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/15/16
Sample Dried ? YES / (NO) Dried: NA
Cellulose: Inorg# 69661-69663 Dried: >4hrs. @105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

Southwest Research Institute

010053

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit A pH Zeo 1 (150-04-WCS12) [Red]
598451

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0098	6.0059	180.31 ①	charring around wire, smoke, no flames
4:1	2	24.0144	6.0107	180.85 ①	
4:1	3	24.0067	6.0016	180.34 ①	
4:1	4	24.0119	6.0114	180.25 ①	
4:1	5	24.0120	6.0081	180.49 ①	WD 6/15/16 MA
4:1	Avg			>180	①time when power ~~timer~~ was turned off. No reaction

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0089	15.0087	180.34 ②	Small flames at wire leads, charring + smoke
1:1	2	15.0041	15.0069	182.16 ②	
1:1	3	15.0144	15.0092	182.56 ②	
1:1	4	15.0036	15.0077	182.44 ②	
1:1	5	15.0063	15.0066	182.97 ②	
1:1	Avg			>180	②time when flames extinguished. Power turned off at 180 sec

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/13/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/15/16
Sample Dried ? YES (NO) Dried: NA
Cellulose: Inorg# 69661-69663 Dried: >4hrs.@105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

Southwest Research Institute

010054

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit A-Zeol (150-01-WCS12) [Black]
598464

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0125	6.0058	180.75 ①	charring around wire, smoke, no flames
4:1	2	24.0139	6.0132	180.38 ①	
4:1	3	24.0128	6.0004	180.33 ①	
4:1	4	24.0051	6.0112	180.28 ①	
4:1	5	24.0029	6.0135	180.31 ①	
4:1	Avg			>180	①time when power was turned off. NO reaction

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0035	15.0148	183.75 ②	small flames at wire leads, smoke + charring
1:1	2	15.0032	15.0114	182.13 ②	
1:1	3	15.0040	15.0097	182.72 ②	
1:1	4	15.0081	15.0101	182.47 ②	
1:1	5	15.0109	15.0108	182.53 ②	
1:1	Avg			>180	②Time when flames extinguished - Power turned off at 180sec.

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/13/16
Tested Samples: Monica Gabaldon Timer ID: D22921 Date: 6/15/16
Sample Dried ? YES / (NO) Dried: NA
Cellulose: Inorg# 69661-691663 Dried: >4hrs.@105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

Southwest Research Institute

010055

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit B-Zeol (150-02-WCS12) [Green]
598458

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0009	6.0042	180.41 ①	charring around wire, smoke, no flames
4:1	2	24.0042	6.0153	180.32 ①	
4:1	3	24.0036	6.0076	180.38 ①	
4:1	4	24.0156	6.0137	180.31 ①	
4:1	5	24.0037	6.0164	180.31 ①	↓
4:1	Avg			>180	① time power turned off.

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0042	15.0183	181.35 ②	small flames at wire leads, smoke + charring
1:1	2	15.0115	15.0149	181.81 ②	
1:1	3	15.0048	15.0108	181.68 ②	
1:1	4	15.0039	15.0083	181.72 ②	
1:1	5	15.0091	15.0066	181.75 ②	↓
1:1	Avg			>180	② time flames extinguished. Power turned off at 180sec.

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/13/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/15/16
Sample Dried ? YES (NO) Dried: NA
Cellulose: Inorg# 696161-696163 Dried: >4hrs. @105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

010056

Southwest Research Institute

Method: LLN - Oxidizer
Project #: 21592.01.0006
Client: Los Alamos (LANL)
TO# 160605-1, 160505-2
6 RE 6/20/16 MG

Reference Substance

$KBrO_3$:Cellulose	Wt $KBrO_3$, g	Wt Cellulose, g
3:7	9	21
2:3	12	18
3:2	18	12

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
3:7	1	9.0291	21.0211	124.50	
3:7	2				
3:7	3				
3:7	4				
3:7	5				
3:7	**Avg**				

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
2:3	1	12.0117	18.0044	58.41	
2:3	2				
2:3	3				
2:3	4				
2:3	5				
2:3	**Avg**				

Ratio	Rep	Actual KBrO3 Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
3:2	1	18.0039	12.0049	17.109	
3:2	2				
3:2	3				
3:2	4				
3:2	5				
3:2	**Avg**				

Weighted Samples: Monica Grabaldon Balance#: 88 Date: 6/20/16
Tested Samples: Monica Grabaldon Timer ID: 022921 Date: 6/20/16
Potassium Bromate: Inorg# 69450 - 69453 Dried: 7 1/2 hrs. @ 65°C
Cellulose: Inorg# 69461 - 69663 Dried: > 4 hrs. @ 105°C
Variac Setting: 150 ± 7 W

Southwest Research Institute

010057

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-2

Sample Analysis

System ID: Sod Nit A pH 2e02 (150-05-wcs12) [Blue]
598452

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0090	6.0162	180.62 ①	charring around wire, smoke, NO flames
4:1	2	24.0018	6.0040	180.37 ①	
4:1	3	24.0075	6.0067	180.38 ①	
4:1	4	24.0139	6.0076	180.56 ①	
4:1	5	24.0046	6.0064	180.28 ①	↓
4:1	Avg			7180	①Time power turned off. NO reaction

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0074	15.0070	181.34 ②	Small flames at wire leads, smoke + charring
1:1	2	15.0080	15.0128	183.50 ②	
1:1	3	15.0067	15.0053	181.91 ②	
1:1	4	15.0171	15.0057	182.50 ②	
1:1	5	15.0032	15.0154	181.85 ②	↓
1:1	Avg			7180	②Time flames extinguished. Power turned off at 180 sec

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/16/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/20/16
Sample Dried ? YES / (NO) . oz w/cellulose mix Dried: NA
Cellulose: Inorg# 691961 - 691663 Dried: >4hrs.@105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

Southwest Research Institute

010058

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160665-1

Sample Analysis

System ID: 598466 WB1 (1:3) [red]

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0127	6.0152	180.35 ①	charring around wire, smoke, no flames
4:1	2	24.0086	6.0151	180.31 ①	
4:1	3	24.0148	6.0086	180.66 ①	
4:1	4	24.0100	6.0067	180.28 ①	
4:1	5	24.0010	6.0049	180.44 ①	
4:1	Avg			>180	①Time power turned off. No reaction

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0049	15.0070	181.31 ②	small flames at wire leads, smoke & charring
1:1	2	15.0250	15.0113	183.19 ②	
1:1	3	15.0150	15.0041	192.94 ②	
1:1	4	15.0238	15.0103	182.75 ②	
1:1	5	15.0063	15.0090	183.38 ②	
1:1	Avg			>180	②Time when flames extinguished. Power turned off at 180 sec.

Weighted Samples: Monica Gabaldon Balance#: 135 Date: 6/17/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/20/16
Sample Dried ? YES / (NO) Dried: NA
Cellulose: Inorg# 696681 - 696683 Dried: >4hrs.@105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

Southwest Research Institute

010059

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160105-1

Sample Analysis

System ID: 598467 WB2(1:4) [Black]

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0217	6.0090	180.28 ①	Charring around wire, smoke & charring, NO flames
4:1	2	24.0015	6.0055	180.53 ①	
4:1	3	24.0095	6.0136	180.57 ①	
4:1	4	24.0195	6.0132	180.63 ①	
4:1	5	24.0159	6.0092	180.34 ①	
4:1	Avg			>180	① Time power was turned off. No reaction

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0273	15.0108	183.28 ②	Small flames at wire leads, smoke & charring
1:1	2	15.0140	15.0154	183.85 ②	
1:1	3	15.0255	15.0210	184.28 ②	
1:1	4	15.0246	15.0198	185.04 ②	
1:1	5	15.0085	15.0098	184.84 ②	
1:1	Avg			>180	② time when flame extinguished. Power turned off at 180 sec.

Weighted Samples: Monica Gabaldon Balance#: 88 Date: 6/20/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/20/16
Sample Dried ? YES (NO) Dried: N/A
Cellulose: Inorg# 691621-696463 Dried: >4hrs.@105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

010060

Southwest Research Institute

Method: UN Oxidizer
Project #: 21592.01.006
Client: Los Alamos
TO# 160605-1

Sample Analysis

System ID: 598408 WB3 (1:5) [Green]

Sample:Cellulose	Wt Sample, g	Wt Cellulose, g
4:1	24	6
1:1	15	15

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
4:1	1	24.0160	6.0092	180.31 ①	charring around wire, smoke, no flames
4:1	2	24.0047	6.0097	180.39 ①	
4:1	3	24.0118	6.0056	180.28 ①	
4:1	4	24.0136	6.0116	180.41 ①	
4:1	5	24.0109	6.0065	180.75 ①	
4:1	Avg			>180	① time when power turned off. No reaction

Ratio	Rep	Actual Sample Wt, g	Actual Cellulose Wt, g	Burning Time, sec	Comment
1:1	1	15.0173	15.0103	184.22 ②	charring + smoke, sparking + smoldering
1:1	2	15.0059	15.0151	184.75 ②	after power was turned off
1:1	3	15.0233	15.0242	185.87 ②	
1:1	4	15.0047	15.0063	183.22 ②	
1:1	5	15.0072	15.0086	185.12 ②	
1:1	Avg			>180	② Time sparking/smoldering stopped. Power turned off at 180sec.

Weighted Samples: Monica Gabaldon Balance#: 88 Date: 6/20/16
Tested Samples: Monica Gabaldon Timer ID: 022921 Date: 6/20/16
Sample Dried ? YES (NO) Dried: NA
Cellulose: Inorg# 691661-691663 Dried: >4hrs.@105C
Variac Setting: 150 ± 7 Watts

Classification: Not Division 5.1

010061

SOUTHWEST RESEARCH INSTITUTE
CLIENT: Los Alamos National Laboratory
SwRI PROJECT#: 21592.01.00X
SwRI TASK ORDER: 160605-2
SwRI SRR: 57710
SDG: 598447
VTSR: 05.31.2016

Method 1050
Logbook Pages

010062

Southwest Research Institute®
Logbook: Miscellaneous

Book I.D. #__15-0406-048_

Analysis / Method: 1050 Project# 21592.01.006

TAP# (if applicable):

Client: Los Alamos TO# 160605-2

Balance #

LCS Info: TV:

Notes: Sod Nit B Blend #4, #3 poured out easily
start 5/27/16 16:13 pm TE Sam 6/7/16
~~6/15/16 4:44 pm~~
Stop 5/29/16 18:09 pm TE Sam 6/7/16
~~6/17/16 11:44 AM~~

Sample ID					
Sod Nit B Blend #3					
One thermocouple was closer to the edge and did not have the water lost slow ramp that thermocouple 2 had. Sample @ temp and stable around 28 to 32 hours. Sample was removed from the oven and appeared loose and dry. Since no excess temperature was noted the sample is not self heating					
Sod nit B Blend #4					
Both thermocouples saw a slow rise in temperature due to the moisture of the sample. They came to temperature around 28-32 hours into testing. Sample was removed after analysis and appeared loose and dry. Since no event was noticed and temperature did not exceed 200°C it is considered to be not self heating.					
Calculation:					

Analyst Signature: Date: 5/27/16

Reviewed by: M. Gradalski Date: 5/31/16

Logbook #/ Page #___017___ 0046_____

Southwest Research Institute®
Logbook: Miscellaneous

010063

Book I.D. #__15-0406-048_

Analysis / Method: 1050 Project# 21592.01.006

TAP# (if applicable): _____

Client: Los Alamos TO# 160605-2

Balance # _____

LCS Info: _____ TV: _____

Notes: Sod Nit B Blend #1, #2

Start 5/29/16 19:27

Stop 5/31/16 12:24

Sample ID					
Sod Nit B blend #1					
Both thermocouples had a slow rise in temperature due to moisture in the sample. Came to a stable temperature around 28 hrs. Once removed after analysis the sample was both cool and dry, since sample did not exceed 200°C and no visual event occured the sample is considered to be not self heating.					
Sod Nit B Blend #2					
Similar observations as blend #1 sample is considered to be not self heating.					
Calculation:					

Analyst Signature: _____ Date: 5/29/16

Reviewed by: _____ Date: 5/31/16

Logbook #/ Page #___017___ 0047_____

010064

Southwest Research Institute®
Logbook: Miscellaneous

Book I.D. #__15-0406-048_

Analysis / Method: 1050 Project# 21592.01.006

TAP# (if applicable):

Client: Los Alamos TO# 160605-2

Balance #

LCS Info: TV:

Notes: ~~sodNIT~~ A pH #1 and #2

#1 hardened mass extracted

Start: 5/31/16 19:13

Stop 6/2/16 16:44

Sample ID					
sod NIT A pH #1					
Sample thermocouples took some time to get to temperature due to the moisture in the sample. The sample came to temperature in 28-32 hours. Upon removal of the sample it was noticed that it formed a hardened mass in the cube that was chipped out. Since sample did not exceed 200°C it is not self heating.					
sod NIT A pH #2					
Similer to #1 except upon removal from oven sample was loose and dry. Since sample did not exceed 200°C it is not self heating.					
Calculation:					

Analyst Signature: Date: 5/31/16

Reviewed by: M. Crabtree Date: 5/31/16

Logbook #/ Page #___017___ 0048_____

Southwest Research Institute®
Logbook: Miscellaneous

010065

Book I.D. #__15-0406-048_

Analysis / Method: 1050 Project# 21592.01.006

TAP# (if applicable): _____

Client: Los Alamos TO# 1606005-2

Balance # _____

LCS Info: _____ TV: _____

Notes: Sed Nist A pH 3 & 4

Start 6/3/16 7:11 am

Stop 6/5/16 7:21 am

Sample ID					
Sed Nist A pH 3					
Sample took some time to come to temperature due to the moisture in the sample. Sample came to temp in about 28 hours. Upon removing of the sample after analysis it was noted to be loose & dry. Since sample did not exceed 200°C it is not considered to be a of heating.					
Sed Nist A pH 4					
Same as sample #3.					
DAM 6/3/16					
Calculation:					

Analyst Signature: _____ Date: 6/3/16

Reviewed by: M. Galaloa Date: 6/24/16

Logbook #/ Page #___017___ 0051_____

FRM-292 (Rev 4/Mar 10)

Southwest Research Institute®
Logbook: Miscellaneous

010066

Book I.D. #__15-0406-048_

Analysis / Method: 1050 Project# 21592.01.006

TAP# (if applicable): _____

Client: Los Alamos TO# 160605-2

Balance # _____

LCS Info: _____ TV: _____

Notes: Sod Nit A Blend 3 & 4
#3 some darkened areas of filter both loose
start: 6/15/16 9:41
Stop: 6/17/16 11:41

Sample ID					

Sod Nit A Blend 3

Sample took some time to come to temperature due to the moisture in the sample. Sample reach temperature around 28 hours. After removal of sample once analysis was completed, the sample was loose and dry. Since sample did not exceed 200°C it is considered to be not self heating.

Sod Nit A Blend 4

Same observations and results as #3

SAM 06/15/16

Calculation:

Analyst Signature: _____ Date: 6/15/16

Reviewed by: M. Gabaldon Date: 6/24/16

Logbook #/ Page #___017___ 0052_____

FRM-292 (Rev 4/Mar 10)

Southwest Research Institute®
Logbook: Miscellaneous

010067

Book I.D. #__15-0406-048_

Analysis / Method: 1050 Project# 21592101.006

TAP# (if applicable): _____ _____

Client: Los Alamos TO# 160605-2

Balance # _____

LCS Info: _____ TV: _____

Notes: SOC Nit A 1 & 2

start: 6/8/16 9:57

Stop: 6/10/16 11:33

Sample ID					
Soc Nit A	Blend #1				
Sample took some time to get to temperature due to moisture in the sample. Sample came to temperature in about 24 hours. After sample was removed once analysis was completed it was found to be loose and dry. Since sample did not exceed 200°C it is considered to be not self heating.					
Soc Nit A	Blend #2				
Same observations as #1.					

JAM 6/10/16

Calculation:

Analyst Signature: _____ Date: 6/8/16

Reviewed by: _____ Date: 6/24/16

Logbook #/ Page #___017___ 0053_____

010068

SOUTHWEST RESEARCH INSTITUTE
CLIENT: Los Alamos National Laboratory
SwRI PROJECT#: 21592.01.00X
SwRI TASK ORDER: 160605-2
SwRI SRR: 57710
SDG: 598447
VTSR: 05.31.2016

Method 1030
Logbook Pages

Southwest Research Institute®
Logbook: Miscellaneous

Book I.D. #__15-0406-048_

Analysis / Method: 1030

Project# 21592.01.006

TAP# (if applicable):

Client: LANL

TO# 16(?)605-2 / 1606605-1

Balance # excelsior wood balance #34

LCS Info: #61753

TV: positive

Notes: burn rate greater than 2.2mm/sec is positive

Sample ID	burn time across 100mm	burn rate mm/sec			
LCS	10.94 sec	9.14			
598447	did not burn	—	whitened at flame application region, some crackling heard but no flame		
598447D	did not burn	—	or burning. only smoke.		
598448	did not burn	—	charring and whitening of zeolite, some crackling but no burning took place.		
598449	did not burn	—	charring and whitening of zeolite, some crackling of sample.		
598450	did not burn	—	charring and drying of zeolite		
598453	did not burn	—	charring and drying of zeolite, cracking		
598454	did not burn	—	charring and whitening at burn area no flame present.		
598455	did not burn	—	charring and drying of zeolite		
598456	did not burn	—	charring and drying of zeolite		
598460	did not burn	—	charring and drying of zeolite		
598461	did not burn	—	charring and drying of zeolite		
598462	did not burn	—	charring and drying of zeolite, some crackling		
598463	did not burn	—	charring and drying of zeolite		
LCS II	8.35 sec	11.98	dried zeolite blackened wypall areas		wrong LCS?
598466	did not burn	—	dried zeolite, blackened wypall areas		
598466D	did not burn	—	dried zeolite, blackened wypall areas		
598467	did not burn	—	dried zeolite, blackened wypall areas		
598468	did not burn	8.90	charred and dried zeolite blackened areas with wypall		

Calculation:
LCS III 11.24 sec

Analyst Signature: [signature] Date: 6/12/16 / 6/15/16

Reviewed by: J.M. Grabaldo Date: 6/24/16

Logbook #/ Page #____017___ 0054_______

010070

SOUTHWEST RESEARCH INSTITUTE
CLIENT: Los Alamos National Laboratory
SwRI PROJECT#: 21592.01.00X
SwRI TASK ORDER: 160605-2
SwRI SRR: 57710
SDG: 598447
VTSR: 05.31.2016

Method 9095
Paint Filter
Logbook Pages

010071

Southwest Research Institute®
Logbook: Miscellaneous

Book I.D. #__15-0406-048_

Analysis / Method: paint filter 9095 Project# 21592.01.006

TAP# (if applicable): _____

Client: LANL TO# K6W05-2

Balance # 34

LCS Info: water TV: fail

Notes: _____

Sample ID	sample wgt	Pass / fail			
LCS	100.0124g	fail			
Sod Ni-Zeo 1 2:1 A	100.2174	fail	Did not drip immediately but began to drip and then run after 2:30min passed		
Sod Ni-Zeo 1 2:1 Dup A	109.3418	fail			
Sod Ni-Zeo B 2:1	104.2716	fail			

5/16/16

SAM

Calculation:

Analyst Signature: _____ Date: 5/15/16

Reviewed by: M. Gabaldon Date: 5/31/16

Logbook #/ Page #___017___ 0040_____

FRM-292 (Rev 4/Mar 10)

Southwest Research Institute®
Logbook: Miscellaneous

010072

Book I.D. #__15-0406-048_

Analysis / Method: Paint Filter 9095 Project# 21592.01.006

TAP# (if applicable): _____

Client: LANL TO# 160605-2
160605-1

Balance # 34

LCS Info: water TV: fail

Notes: _____

Sample ID	sample weight (g)	pass / fail			
LCS	101.2271	fail			
598447	100.6282	pass	Soil	Nit A Blend 1	
598447D	102.8179	pass			
598448	104.2198	pass	Soil	Nit A Blend 2	
598449	103.7724	pass			
598450	106.3029	pass			
598453	101.0121	pass			
598454	100.9715	pass	Soil	Nit A pH Blend 2	
598455	101.0279	pass			
598456	103.2149	pass			
598460	104.5137	pass			
598461	101.4509	pass	Sample ID	Sample wt (g)	pass / fail
598462	101.0100	Pass			
598463	101.2436	Pass	LCS III KEC 14116 (RD)	100.5403	Fail
598451	104.3260	Pass	598466	104.1483	Pass
598452	100.9383	Pass	598466D	103.4290	Pass
598458	100.5220	pass	598467	115.8450	Pass
598459	100.9887	Pass	598468	109.6482	Pass
598464	100.2055	Pass	LCS IV	100.1001	Fail
Calculation: 598465	100.7298	Pass			
LCS II	100.9985	Fail			

Analyst Signature: _____ Date: 6/12/16 / 6/15/16

Reviewed by: _____ Date: 6/24/16

Logbook #/ Page #___017___ 0055_____

010073

SOUTHWEST RESEARCH INSTITUTE
CLIENT: Los Alamos National Laboratory
SwRI PROJECT#: 21592.01.00X
SwRI TASK ORDER: 160605-2
SwRI SRR: 57710
SDG: 598447
VTSR: 05.31.2016

Preparation
Logbook Pages

Work continued from Page

SWRI

124-01-WCS12 1M NaOH

40.01441 TGAM 5/12/16 g NaOH (# 62694) to FV 1L with DI H_2O
balance #135 exp 5/12/17

124-02-WCS12 1M HNO_3 WO 5AM 5/17/16

63.3mL HNO_3 (# 67843) to FV 1L with DI H_2O
SOCC-R exp 5/12/17

124-03-WCS12 saturated HNO_3

1L 124-02-WCS12 + 1000.27g sodium nitrate (# 69610)
balance # 135

124-04-WCS12 saturated 1M NaOH

1L 124-01-WCS12 + 1000.29g sodium nitrate (# 69610)

5 AM 5/17/16

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Work continued to Page

SIGNATURE [signature] DATE 5/12/16

DISCLOSED TO AND UNDERSTOOD BY M. Bradley DATE WITNESS DATE 5/13/16

Work continued from Page

SWRI

Sod Nit A-200 126-01-WCS12 (2:1)

600mL (124-03-WCS12) to 1200mL zealite (mud cracking ruins when setting)

126-02-WCS12 Sod Nit A-200 2 (3:1) Wet zealite set for 24hr

600mL (124-03-WCS12) to 1800mL zealite

126-03-WCS12 WB8

743.801	g	Aluminum nitrate (#65579) +	
2957.067	g	calcium nitrate (#65736) + (#63614) + (65735) + (#69600)	
36.405	g	chromium nitrate (#63857) +	A
1129.441	g	iron nitrate (#65821) + (63604)	
8298.857	g	magnesium nitrate (#65737) + 69602	
1839.762	g	sodium nitrate (#69610, 69611) +	
653.127	g	lead nitrate (#66142, 65951) +	
oxalic acid	671.146	g (#69684) +	
potassium carbonate	350.133	g (#65514, 69460) +	B
water	1000.148	g	

balance #89

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Work continued to Page

SIGNATURE [signature] DATE 5/13/16

DISCLOSED TO AND UNDERSTOOD BY M. Gabaldon DATE WITNESS DATE 5/25/14

Work continued from Page

SWRI

128-01-WCS12 Nit B 200-1

600mL (124-04-WCS12) to 1200mL zeolite

let sit for 24hr prior to analysis 5/15/16 10:10

128-02-WCS12 Nit B 200-2

600mL (124-04-WCS12) to 1800mL zeolite

128-03-WCS12 LLNS solution

8322.851 g aluminum nitrate nonahydrate (# 69597-69592, 69593-69571, 69591-69586)+
840.695 g calcium nitrate (# 69606, 69607)+
61.562 g chromium nitrate (# 66141, 63857)+
595.084 g Iron(III) nitrate (# 63601, 65582)+
40008.600 g magnesium nitrate (# 69603, 69609) +
~~Sodium~~ TBJ Am 5/16/16 ~~nitrite~~ Sodium Nitrite
493.5682 g Sodium nitrate (# 69611)+
596.525 g lead nitrate (# 65951, 69629, 69623)+
2373.849 g oxalic acid (# 69684)+
2.340 g nickle nitrate (# 65593)+

63.727 g nitric acid (# 67843)
6500.17 g DI H_2O

balance #89

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Work continued to Page

SIGNATURE [signature] DATE 5/15/16

DISCLOSED TO AND UNDERSTOOD BY M. Gabaldon DATE WITNESS DATE 5/25/16

Work continued from Page

SWRI

131-01-WCS12 - UVT5 (1:3)

500mL UVT5 solution (# 128-03-WCS12) + 1500mL solvent
tray #3 test sit for 48 hours start: 5/16/16 15:00

131-02-WCS12 1M HNO_3

63.3mL HNO_3 (# 67843) to FV 1L with DI H_2O
5000-2 exp 5/16/17

131-03-WCS13 Saturated 1M HNO_3

1L 1M HNO_3 (# 131-02-WCS12) to unsaturated salts from (124-03-WCS12)
then added 600.217g sodium nitrate (#6960)
balance #135

SAM 5/17/16

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Work continued to Page

SIGNATURE James Mohr DATE 5/16/16

DISCLOSED TO AND UNDERSTOOD BY M. Gabaldon DATE WITNESS DATE 5/25/16

SWRI

Work continued from Page

133-01-WCS12 Soil Nit A Blend 1 tray #11

400mL saturate 1M NHO_3 (# 131-03-WCS12) + 400mL solvent let sit for 24 Hours. 800mL of this to 400mL DI H_2O and mix for 2min take 975 mL of this to 1950 mL zeolite

133-02-WCS12 Soil Nit A Blend 2 tray #3

200mL saturate 1M HNO_3 (# 131-03-WCS12) + 600mL solvent let sit for 24 hours. 800mL of this to 400mL DI H_2O and mix for 2min. 750 mL of this to 1500mL zeolite

13

133-03-WCS12 Soil Nit A Blend 3 tray # 12

400mL saturate 1M HNO_3 (131-03-WCS12) + 400mL solvent let sit for 24 hours 6800 mL (Tasm 5/20/16) of this and mix for 2min with 3400 mL (Tasm 5/20/16) DI H_2O.
Take 750mL of this to 2250mL zeolite

133-04-WCS12 Soil Nit A Blend #4 # 15

200mL saturated 1M HNO_3 (# 131-03-WCS12) + 600mL solvent let sit for 24 hours. 700 mL of this to 350mL DI H_2O mix for 2 min.
Take 700 mL of this to 2100mL zeolite

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Work continued to Page

SIGNATURE [signature] DATE 5/19/16

DISCLOSED TO AND UNDERSTOOD BY [signature] DATE WITNESS DATE 5/25/16

Work continued from Page

SWRI

135-01-WCS12 1M NaOH

40.0814 g NaOH (#62693) to FV. 1L with DI H_2O
balance #135 exp 5/23/17

135-02-WCS12 1M HNO_3

63.3mL HNO_3 (#69790) to FV. 1L with DI H_2O
exp 52317

135-03-WCS12 saturated HNO_3

1L 1M HNO_3 (135-01-WCS12) to undissolved salts from (131-03-WCS12) then added 683.21 g $NaNO_3$ (#69610).
balance #135

135-04-WCS12 saturated NaOH

1L 1M NaOH (~~124-01~~ 135-02-WCS12) to undissolved salts from (124-04-WCS12) TESAMS 5/23/16
then added 721.82g $NaNO_3$ (#69610, 70359)
balance #135

JAM 5/24/16

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Work continued to Page

SIGNATURE		DATE
		5/23/16
DISCLOSED TO AND UNDERSTOOD BY	DATE	WITNESS
M. Graboski		DATE 5/25/16

Work continued from Page

SWRI

137-01-WCS12 Sod Nit B Blend #1 tray #11

400mL saturate 1M NaOH (#135-04-WCS12) + 400mL sweat mix and let sit for 24 hr.
600mL of this was added to 300mL DI H_2O mixed and then 700mL was added to 1400mL zeolite.

137-02-WCS12 Sod Nit B Blend #2 tray #8

200mL saturate 1M NaOH (135-04-WCS12) + 600mL sweat mix and let sit for 24 hours
800mL of this was added to 400mL water mixed and then 750mL was added to 1500 mL zeolite

137-03-WCS12 Sod Nit B Blend #3 tray #12

400mL saturated 1M NaOH (135-04-WCS12) to 400mL sweat mix and let sit for 24 hr.
600mL of this was added to 300mL DI H_2O mixed and then 700mL was added to 2100 mL zeolite.

137-04-WCS12 Sod Nit B Blend #4 tray # 15

200mL saturated 1M NaOH (135-04-WCS12) to 600mL sweat mix and let sit for 24 hours.
780 TRIAM 5/16/16 mL of this was added to 350mL of DI H_2O, and mixed and then 700mL added to 2100mL zeolite.

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Work continued to Page

SIGNATURE [signature] DATE 5/24/16

DISCLOSED TO AND UNDERSTOOD BY [signature] DATE WITNESS DATE 5/25/16

Work continued from Page

SWRI

141-01-WCS12 calcium hypochlorite

2.5104 g calcium hypochlorite (# 263041) to FV. 50mL with DI H_2O
balance #135 exp 5/26/17

141-02-WCS12 0.25N NaOH

10.0572 g NaOH (# 62643) to FV. 1L with DI H_2O
balance #135 exp 5/26/17

141-03-WCS12 neutralize 1M HNO_3 saturated with $NaNO_3$ 2x

500mL saturated 1M HNO_3 with $NaNO_3$ (# 135-02-WCS12) added 125 mL of spiltger to pH ~7.

JAM 6/16/16

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Work continued to Page

SIGNATURE			DATE
	James Mer		5/26/16
DISCLOSED TO AND UNDERSTOOD BY	DATE	WITNESS	DATE
M. Grabaldon			6/10/16

Work continued from Page

142-01-WCS12 Sod Nit A pH Blend #1

400mL of neutralized HNO_3 (#141-03-WCS12) to 400mL swheat and let sit for 24 hours.
600mL of this added to 300mL of water and mixed for 2 min.
700mL of the solution was then added to 1400mL zeolite.

142-02-WCS12 Sod Nit A pH Blend #2

200mL of neutralized HNO_3 (#141-03-WCS12) to 600 mL swheat and let sit for 24 hr.
800mL of this added to 400mL water and mixed for two minutes before using 750mL to 1500mL zeolite.

142-03-WCS12 Sod Nit ~~B~~ A (TES/AM 5/17/16) pH Blend #3

400mL of neutralized HNO_3 (#141-03-WCS12) to 400mL swheat and let sit for 24 hr.
600mL of this was added to 300mL water and mixed for two minutes before using 700mL of the mixture in 2100mL zeolite

142-04-WCS12 Sod Nit ~~B~~ A (TES/AM 5/17/16) pH Blend #4

200mL of neutralized HNO_3 (#141-03-WCS12) to 600mL swheat and let sit for 24 hours.
700mL of this to 350mL water and mix for 2 minutes, take 700mL of this to 2100mL zeolite.

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Work continued to Page

SIGNATURE [signature] DATE 5/25/16

DISCLOSED TO AND UNDERSTOOD BY [signature] DATE WITNESS DATE 6/10/16

150 TITLE LANL

PROJECT NO. 21592.01.06 **010083**

BOOK NO. 15-0406-052

Work continued from Page

SWRI

150-01-WCS12 Sod Nit A zeo 1 (4:1) smallest tray

100mL saturated HNO_3 (# 135-03-WCS12) + 400mL zeolite

150-02-WCS12 Sod Nit B zeo 1 (4:1) tray #14

100mL saturate NaOH (#135-04-WCS12) + 400mL zeolite

150-03-WCS12 neutralize saturate HNO_3

300mL saturated HNO_3 (# 135-03-WCS12) + mL spillfor (# 65913)

150-04-WCS12 Sod Nit A pH zeo 1 4:1 tray #10

100mL neutralized saturated HNO_3 (# 150-03-WCS12) + 400mL zeolite

150-05-WCS12 Sod Nit A pH zeo 2 3:1 tray #15

200mL neutralized saturated HNO_3 (# 150-03-WCS12) + 600mL zeolite

150-06-WCS12 TISAB

Combined 131-01-WCS12 + 118-02-WCS12

exp 6/30/16

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Work continued to Page

SIGNATURE		DATE 6/16/16
DISCLOSED TO AND UNDERSTOOD BY M. Goodwin	DATE	WITNESS DATE 6/23/16

SOUTHWEST RESEARCH INSTITUTE
CLIENT: Los Alamos National Laboratory
SwRI PROJECT#: 21592.01.00X
SwRI TASK ORDER: 160605-2
SwRI SRR: 57710
SDG: 598447
VTSR: 05.31.2016

Certificates of Calibration

010085

Southwest Research Institute
Calibration Certificate

ACCREDITED
Calibration Laboratory
Certificate # 3759.01

Cost Center:	01 CHEMISTRY & CHEMICAL ENGINEERING	Certificate Number:	36974
Asset Number:	022396	Calibrated:	8/19/2015
Description:	THERMOCOUPLE, TYPE K	Calibration Due:	8/19/2016
Manufacturer:	DIGI-SENSE	Data Type:	AS LEFT
Model Number:	93631-11	Temp./RH:	73.6°F / 58 %
Serial Number:	22396	Work Order #	403133757
Calibration Procedure:	TEMPERATURE PROBES		

This certificate documents traceability to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or other national metrology institute. The laboratory quality system is compliant to ISO/IEC 17025 2005, ANSI/NCSL Z540-1-1994 and relevant requirements of ISO 9001-2008. This certificate shall not be reproduced, except in full, without written approval of Southwest Research Institute Calibration Laboratory and shall not be used to claim product endorsement by SwRI® or any agency of the U.S. Government.

Results of this calibration relate only to the instrument described above at the time of calibration and does not imply any long term stability. Date due for recalibration is determined by the customer and does not imply the instrument will remain within limits, as any number of factors may cause an out of tolerance condition before this date.

Data type shall be interpreted as follows: Found-left - data recorded and no adjustment or repair was performed. As-left - data recorded after adjustment or repair was performed. As-found data are reviewed and the customer notified when the as-found results are other than pass and/or greater than 70 percent of the test limit. Pass? or Fail? Indicate the measured value, plus or minus the expanded uncertainty, overlap the test limit and it is not possible to state Pass or Fail with a 95% confidence level. No statement of compliance with manufacturer or other specification is made or implied by this certificate. The customer has sole responsibility for determination of in/out-of-tolerance or compliance/noncompliance for the intended use of the instrument.

Measurement uncertainties are calculated in accordance with the methods described in the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM) as an expanded uncertainty with a coverage factor of k = 2 to approximately a 95% level of confidence. See Remarks or attached Measurement Report with the same Work Order number for data.

Remarks:
CAL -80 °C TO 1000 °C. See Measurement Report for values and limits applied.

Standards Used To Calibrate Equipment

Asset	Manufacturer	Model	Description	Cal. Due Date
009137	HART SCIENTIFIC	1575	SUPER THERMOMETER	1/13/2016
010281	HART SCIENTIFIC	5628	SPRT	2/19/2016
010814	HART SCIENTIFIC	1529	TEMPERATURE METER	11/21/2015
013617	HART SCIENTIFIC	5650	THERMOCOUPLE PROBE TYPE S	5/8/2016
013908	HART SCIENTIFIC	5628	SPRT	2/18/2016
015240	HART SCIENTIFIC	2566	THERMOCOUPLE SCANNER, 12-(	11/20/2015

Approved By

Calibrated By: MAR
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403133757	Mfr.	Digi-Sense	Technician:	Mark Romero
Asset No.	022396	Model	93631-11	Type Data:	As-found
Serial No.	22396	Type.	Thermocouple, Type K	Cal Date:	18-Aug-15
Remarks:					

Function/Range	Test Point	TI Reading	Difference	+/- Limit	+/- Uncertainty	Result	% Limit
Temperature	°C	°C	°C	°C	°C		
	-79.6	-76.1	3.5	2.2	0.5	Fail	159%
	99.7	99.3	-0.4	2.2	0.5	Pass	20%
	398.4	401.4	3.0	3.0	1.3	Fail?	100%
	699.3	702.6	3.3	5.2	1.3	Pass	63%
	1002.6	1002.4	-0.2	7.5	1.3	Pass	3%

END OF REPORT

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403133757	Mfr.	Digi-Sense	Technician:	Mark Romero
Asset No.	022396	Model	93631-11	Type Data:	As-left
Serial No.	22396	Type.	Thermocouple, Type K	Cal Date:	19-Aug-15

Remarks: limits set to ±5% of reading for test point at -80 ℃ and 400 ℃ and above, per customer. Rem ainder of test points calibrated to standard Type K limits.

Function/Range	Test Point	TI Reading	Difference	+/- Limit	+/- Uncertainty	Result	% Limit
Temperature	°C	°C	°C	°C	°C		
	-79.6	-76.1	3.5	4.0	0.5	Pass	88%
	-44.4	-42.8	1.6	2.2	0.5	Pass	73%
	-0.1	0.3	0.4	2.2	0.5	Pass	18%
	99.7	99.3	-0.4	2.2	0.5	Pass	20%
	398.4	401.4	3.0	20.0	1.3	Pass	15%
	699.3	702.6	3.3	35.0	1.3	Pass	9%
	1002.6	1002.4	-0.2	50.0	1.3	Pass	0%

END OF REPORT

010088

Southwest Research Institute
Calibration Certificate

ACCREDITED
Calibration Laboratory
Certificate # 3759.01

Cost Center:	01 CHEMISTRY & CHEMICAL ENGINEERING	Certificate Number:	47205
Asset Number:	022923	Calibrated:	2/22/2016
Description:	THERMOCOUPLE TYPE K	Calibration Due:	2/22/2017
Manufacturer:	DIGI-SENSE	Data Type:	AS LEFT
Model Number:	08516-96	Temp./RH:	74.7°F / 38 %
Serial Number:	22923	Work Order #	403137431
Calibration Procedure:	TEMPERATURE PROBES		

This certificate documents traceability to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or other national metrology institute. The laboratory quality system is compliant to ISO/IEC 17025 2005, ANSI/NCSL Z540-1-1994 and relevant requirements of ISO 9001-2008. This certificate shall not be reproduced, except in full, without written approval of Southwest Research Institute Calibration Laboratory and shall not be used to claim product endorsement by SwRI® or any agency of the U.S. Government.

Results of this calibration relate only to the instrument described above at the time of calibration and does not imply any long term stability. Date due for recalibration is determined by the customer and does not imply the instrument will remain within limits, as any number of factors may cause an out of tolerance condition before this date.

Data type shall be interpreted as follows: Found-left - data recorded and no adjustment or repair was performed. As-left - data recorded after adjustment or repair was performed. As-found data are reviewed and the customer notified when the as-found results are other than pass and/or greater than 70 percent of the test limit. Pass? or Fail? indicate the measured value, plus or minus the expanded uncertainty, overlap the test limit and it is not possible to state Pass or Fail with a 95% confidence level. No statement of compliance with manufacturer or other specification is made or implied by this certificate. The customer has sole responsibility for determination of in/out-of-tolerance or compliance/noncompliance for the intended use of the instrument.

Measurement uncertainties are calculated in accordance with the methods described in the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM) as an expanded uncertainty with a coverage factor of k = 2 to approximately a 95% level of confidence. See Remarks or attached Measurement Report with the same Work Order number for data.

Remarks:
CAL -45 °C TO 1100 °C. Limits at -45 °C ±3 °C, rest of range meets normal type K specifications.

Standards Used To Calibrate Equipment

Asset	Manufacturer	Model	Description	Cal. Due Date
009414	HART SCIENTIFIC	1502A	TEMPERATURE METER W/PROBI	6/22/2016
010814	HART SCIENTIFIC	1529	TEMPERATURE METER	11/3/2016
013617	HART SCIENTIFIC	5650	THERMOCOUPLE PROBE TYPE S	5/8/2016
015240	HART SCIENTIFIC	2566	THERMOCOUPLE SCANNER, 12-(	11/3/2016
015895	HART SCIENTIFIC	5618B	RTD	6/22/2016

Approved By

Calibrated By: MAR
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403137431	Mfr:	Digi-Sense	Technician:	Mark Romero
Asset No.:	022923	Model:	08516-96	Type Data:	As-found
Serial No.:	22923	Type:	Thermocouple Type K	Cal Date:	18-Feb-16
Remarks:					

Function/Range	Test Point	TI Reading	Difference	± Limit	± Uncertainty	Result	% Limit
Temperature	°C	°C	°C	°C	°C		
	-79.1	-76.3	2.8	2.2	0.5	Fail	127%
	0.2	0.0	-0.2	2.2	0.5	Pass	9%
	396.7	396.0	-0.7	3.0	1.3	Pass	24%
	698.9	698.0	-0.9	5.2	1.3	Pass	17%
	1101.6	1094.9	-6.7	8.3	1.3	Pass	81%

END OF REPORT

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403137431	Mfr:	Digi-Sense	Technician:	Mark Romero
Asset No.:	022923	Model:	08516-96	Type Data:	As-left
Serial No.:	22923	Type:	Thermocouple Type K	Cal Date:	22-Feb-16

Remarks: customer requested limits for test point -45 ℃ be ±3 ℃. A reading exceeded 70% of limits. Customer to determine if readings meet their requirements.

Function/Range	Test Point	TI Reading	Difference	± Limit	± Uncertainty	Result	% Limit
Temperature	°C	°C	°C	°C	°C		
	-44.9	-43.0	1.9	3.0	0.5	Pass	63%
	0.2	0.0	-0.2	2.2	0.5	Pass	9%
	396.7	396.5	-0.2	3.0	1.3	Pass	7%
	698.9	698.0	-0.9	5.2	1.3	Pass	17%
	1101.6	1094.9	-6.7	8.3	1.3	Pass	81%

END OF REPORT

010091

Southwest Research Institute
Calibration Certificate

ACCREDITED
Calibration Laboratory
Certificate # 3759.01

Cost Center:	01 CHEMISTRY & CHEMICAL ENGINEERING	Certificate Number:	53401
Asset Number:	023174	Calibrated:	5/25/2016
Description:	THERMOCOUPLE TYPE K	Calibration Due:	5/25/2017
Manufacturer:	DIGI-SENSE	Data Type:	FOUND / LEFT
Model Number:	08516-96	Temp./RH:	75.4°F / 57 %
Serial Number:	23174	Work Order #	403139870
Calibration Procedure:	TEMPERATURE PROBES		

This certificate documents traceability to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or other national metrology institute. The laboratory quality system is compliant to ISO/IEC 17025 2005, ANSI/NCSL Z540-1-1994 and relevant requirements of ISO 9001-2008. This certificate shall not be reproduced, except in full, without written approval of Southwest Research Institute Calibration Laboratory and shall not be used to claim product endorsement by SwRI® or any agency of the U.S. Government.

Results of this calibration relate only to the instrument described above at the time of calibration and does not imply any long term stability. Date due for recalibration is determined by the customer and does not imply the instrument will remain within limits, as any number of factors may cause an out of tolerance condition before this date.

Data type shall be interpreted as follows: Found-left - data recorded and no adjustment or repair was performed. As-left - data recorded after adjustment or repair was performed. As-found data are reviewed and the customer notified when the as-found results are other than pass and/or greater than 70 percent of the test limit. Pass? or Fail? indicate the measured value, plus or minus the expanded uncertainty, overlap the test limit and it is not possible to state Pass or Fail with a 95% confidence level. No statement of compliance with manufacturer or other specification is made or implied by this certificate. The customer has sole responsibility for determination of in/out-of-tolerance or compliance/noncompliance for the intended use of the instrument.

Measurement uncertainties are calculated in accordance with the methods described in the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM) as an expanded uncertainty with a coverage factor of k = 2 to approximately a 95% level of confidence. See Remarks or attached Measurement Report with the same Work Order number for data.

Remarks:
CAL -45 °C TO 200 °C.

Standards Used To Calibrate Equipment

Asset	Manufacturer	Model	Description	Cal. Due Date
009137	HART SCIENTIFIC	1575	SUPER THERMOMETER	12/9/2016
010281	HART SCIENTIFIC	5628	SPRT	4/29/2017
013908	HART SCIENTIFIC	5628	SPRT	2/24/2017
015240	HART SCIENTIFIC	2566	THERMOCOUPLE SCANNER, 12-(	11/3/2016

Authorized Signatory

Calibrated By: MAR
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403139870	Mfr:	Digi-Sense	Technician:	Mark Romero
Asset No.:	023174	Model:	08516-96	Type Data:	Found-left
Serial No.:	23174	Type:	Thermocouple Type K	Cal Date:	25-May-16

Remarks: a reading exceeded 70% of limits. No adjustment possible. Customer to determine if reading meets their requirements.

Function/Range	Test Point	TI Reading	Difference	± Limit	± Uncertainty	Result	% Limit
Temperature	°C	°C	°C	°C	°C		
	-44.9	-43.0	1.9	2.2	0.5	Pass	86%
	0.0	0.3	0.3	2.2	0.5	Pass	14%
	99.7	99.4	-0.3	2.2	0.5	Pass	14%
	200.5	200.8	0.3	2.2	0.5	Pass	14%

END OF REPORT

010093

Southwest Research Institute
Calibration Certificate

ACCREDITED
Calibration Laboratory
Certificate # 3759.01

Cost Center:	01 CHEMISTRY & CHEMICAL ENGINEERING	Certificate Number:	38118
Asset Number:	022473	Calibrated:	9/9/2015
Description:	THERMOCOUPLE PROBE TYPE K	Calibration Due:	9/9/2016
Manufacturer:	DIGI-SENSE	Data Type:	FOUND / LEFT
Model Number:	08516-96	Temp./RH:	74.3°F / 56 %
Serial Number:	22473	Work Order #	403134196
Calibration Procedure:	TEMPERATURE PROBES		

This certificate documents traceability to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or other national metrology institute. The laboratory quality system is compliant to ISO/IEC 17025 2005, ANSI/NCSL Z540-1-1994 and relevant requirements of ISO 9001-2008. This certificate shall not be reproduced, except in full, without written approval of Southwest Research Institute Calibration Laboratory and shall not be used to claim product endorsement by SwRI® or any agency of the U.S. Government.

Results of this calibration relate only to the instrument described above at the time of calibration and does not imply any long term stability. Date due for recalibration is determined by the customer and does not imply the instrument will remain within limits, as any number of factors may cause an out of tolerance condition before this date.

Data type shall be interpreted as follows: Found-left - data recorded and no adjustment or repair was performed. As-left - data recorded after adjustment or repair was performed. As-found data are reviewed and the customer notified when the as-found results are other than pass and/or greater than 70 percent of the test limit. Pass? or Fail? indicate the measured value, plus or minus the expanded uncertainty, overlap the test limit and it is not possible to state Pass or Fail with a 95% confidence level. No statement of compliance with manufacturer or other specification is made or implied by this certificate. The customer has sole responsibility for determination of in/out-of-tolerance or compliance/noncompliance for the intended use of the instrument.

Measurement uncertainties are calculated in accordance with the methods described in the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM) as an expanded uncertainty with a coverage factor of k = 2 to approximately a 95% level of confidence. See Remarks or attached Measurement Report with the same Work Order number for data.

Remarks:
CAL -40 °C TO 1000 °C

Standards Used To Calibrate Equipment

Asset	Manufacturer	Model	Description	Cal. Due Date
009137	HART SCIENTIFIC	1575	SUPER THERMOMETER	1/13/2016
010281	HART SCIENTIFIC	5628	SPRT	2/19/2016
010814	HART SCIENTIFIC	1529	TEMPERATURE METER	11/21/2015
013617	HART SCIENTIFIC	5650	THERMOCOUPLE PROBE TYPE S	5/8/2016
013908	HART SCIENTIFIC	5628	SPRT	2/18/2016

Approved By

Calibrated By: MAR
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403134196	Mfr.	Digi-Sense	Technician:	Mark Romero
Asset No.	022473	Model	08516-96	Type Data:	Found-left
Serial No.	22473	Type.	Thermocouple Probe, Type K	Cal Date:	9-Sep-15

Remarks: a reading exceeded 70% of limits. No adjustment possible. Customer to determine if readings meet their requirements.

Function/Range	Test Point	TI Reading	Difference	+/- Limit	+/- Uncertainty	Result	% Limit
Temperature	°C	°C	°C	°C	°C		
	-39.8	-38.2	1.6	2.2	0.5	Pass	72%
	99.7	99.2	-0.5	2.2	0.5	Pass	24%
	498.0	498.7	0.8	3.7	1.3	Pass	20%
	750.3	750.9	0.6	5.6	1.3	Pass	11%
	1002.9	1001.5	-1.4	7.5	1.3	Pass	19%

END OF REPORT

010095

Southwest Research Institute
Calibration Certificate

ACCREDITED
Calibration Laboratory
Certificate # 3759.01

Cost Center:	01 CHEMISTRY & CHEMICAL ENGINEERING	Certificate Number:	47207
Asset Number:	022925	Calibrated:	2/22/2016
Description:	THERMOCOUPLE TYPE K	Calibration Due:	2/22/2017
Manufacturer:	DIGI-SENSE	Data Type:	AS LEFT
Model Number:	08516-96	Temp./RH:	74.7°F / 38 %
Serial Number:	22925	Work Order #	403137433
Calibration Procedure:	TEMPERATURE PROBES		

This certificate documents traceability to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or other national metrology institute. The laboratory quality system is compliant to ISO/IEC 17025 2005, ANSI/NCSL Z540-1-1994 and relevant requirements of ISO 9001-2008. This certificate shall not be reproduced, except in full, without written approval of Southwest Research Institute Calibration Laboratory and shall not be used to claim product endorsement by SwRI® or any agency of the U.S. Government.

Results of this calibration relate only to the instrument described above at the time of calibration and does not imply any long term stability. Date due for recalibration is determined by the customer and does not imply the instrument will remain within limits, as any number of factors may cause an out of tolerance condition before this date.

Data type shall be interpreted as follows: Found-left - data recorded and no adjustment or repair was performed. As-left - data recorded after adjustment or repair was performed. As-found data are reviewed and the customer notified when the as-found results are other than pass and/or greater than 70 percent of the test limit. Pass? or Fail? indicate the measured value, plus or minus the expanded uncertainty, overlap the test limit and it is not possible to state Pass or Fail with a 95% confidence level. No statement of compliance with manufacturer or other specification is made or implied by this certificate. The customer has sole responsibility for determination of in/out-of-tolerance or compliance/noncompliance for the intended use of the instrument.

Measurement uncertainties are calculated in accordance with the methods described in the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM) as an expanded uncertainty with a coverage factor of k = 2 to approximately a 95% level of confidence. See Remarks or attached Measurement Report with the same Work Order number for data.

Remarks:
CAL -45 °C TO 1100 °C. Limits at -45 °C ±3 °C, rest of range meets normal type K specifications.

Standards Used To Calibrate Equipment

Asset	Manufacturer	Model	Description	Cal. Due Date
009414	HART SCIENTIFIC	1502A	TEMPERATURE METER W/PROBI	6/22/2016
010814	HART SCIENTIFIC	1529	TEMPERATURE METER	11/3/2016
013617	HART SCIENTIFIC	5650	THERMOCOUPLE PROBE TYPE S	5/8/2016
015240	HART SCIENTIFIC	2566	THERMOCOUPLE SCANNER, 12-(	11/3/2016
015895	HART SCIENTIFIC	5618B	RTD	6/22/2016

Approved By

Calibrated By: MAR
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403137433	Mfr:	Digi-Sense	Technician:	Mark Romero
Asset No.:	022925	Model:	08516-96	Type Data:	As-found
Serial No.:	22925	Type:	Thermocouple Type K	Cal Date:	18-Feb-16
Remarks:					

Function/Range	Test Point	TI Reading	Difference	± Limit	± Uncertainty	Result	% Limit
Temperature	°C	°C	°C	°C	°C		
	-79.1	-75.9	3.2	2.2	0.5	Fail	145%
	0.2	0.2	0.0	2.2	0.5	Pass	0%
	396.7	396.4	-0.3	3.0	1.3	Pass	10%
	698.9	698.5	-0.4	5.2	1.3	Pass	8%
	1101.6	1095.9	-5.7	8.3	1.3	Pass	69%

END OF REPORT

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403137433	Mfr:	Digi-Sense	Technician:	Mark Romero
Asset No.:	022925	Model:	08516-96	Type Data:	As-left
Serial No.:	22925	Type:	Thermocouple Type K	Cal Date:	22-Feb-16

Remarks: customer requested limits for test point -45 ℃ be ±3 ℃. A reading exceeded 70% of limits. Customer to determine if readings meet their requirements.

Function/Range	Test Point	TI Reading	Difference	± Limit	± Uncertainty	Result	% Limit
Temperature	°C	°C	°C	°C	°C		
	-44.9	-42.5	2.4	3.0	0.5	Pass	80%
	0.2	0.2	0.0	2.2	0.5	Pass	0%
	396.7	396.4	-0.3	3.0	1.3	Pass	10%
	698.9	698.5	-0.4	5.2	1.3	Pass	8%
	1101.6	1095.9	-5.7	8.3	1.3	Pass	69%

END OF REPORT

010098

Southwest Research Institute
Calibration Certificate

ACCREDITED
Calibration Laboratory
Certificate # 3759.01

Cost Center:	01 CHEMISTRY & CHEMICAL ENGINEERING	Certificate Number:	38121
Asset Number:	022476	Calibrated:	9/9/2015
Description:	THERMOCOUPLE PROBE TYPE K	Calibration Due:	9/9/2016
Manufacturer:	DIGI-SENSE	Data Type:	FOUND / LEFT
Model Number:	08516-96	Temp./RH:	74.3°F / 56 %
Serial Number:	22476	Work Order #	403134199
Calibration Procedure:	TEMPERATURE PROBES		

This certificate documents traceability to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or other national metrology institute. The laboratory quality system is compliant to ISO/IEC 17025 2005, ANSI/NCSL Z540-1-1994 and relevant requirements of ISO 9001-2008. This certificate shall not be reproduced, except in full, without written approval of Southwest Research Institute Calibration Laboratory and shall not be used to claim product endorsement by SwRI® or any agency of the U.S. Government.

Results of this calibration relate only to the instrument described above at the time of calibration and does not imply any long term stability. Date due for recalibration is determined by the customer and does not imply the instrument will remain within limits, as any number of factors may cause an out of tolerance condition before this date.

Data type shall be interpreted as follows: Found-left - data recorded and no adjustment or repair was performed. As-left - data recorded after adjustment or repair was performed. As-found data are reviewed and the customer notified when the as-found results are other than pass and/or greater than 70 percent of the test limit. Pass? or Fail? indicate the measured value, plus or minus the expanded uncertainty, overlap the test limit and it is not possible to state Pass or Fail with a 95% confidence level. No statement of compliance with manufacturer or other specification is made or implied by this certificate. The customer has sole responsibility for determination of in/out-of-tolerance or compliance/noncompliance for the intended use of the instrument.

Measurement uncertainties are calculated in accordance with the methods described in the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM) as an expanded uncertainty with a coverage factor of k = 2 to approximately a 95% level of confidence. See Remarks or attached Measurement Report with the same Work Order number for data.

Remarks:
CAL -40 °C TO 1000 °C

Standards Used To Calibrate Equipment

Asset	Manufacturer	Model	Description	Cal. Due Date
009137	HART SCIENTIFIC	1575	SUPER THERMOMETER	1/13/2016
010281	HART SCIENTIFIC	5628	SPRT	2/19/2016
010814	HART SCIENTIFIC	1529	TEMPERATURE METER	11/21/2015
013617	HART SCIENTIFIC	5650	THERMOCOUPLE PROBE TYPE S	5/8/2016
013908	HART SCIENTIFIC	5628	SPRT	2/18/2016
015240	HART SCIENTIFIC	2566	THERMOCOUPLE SCANNER, 12-(	11/20/2015

Approved By

Calibrated By: MAR
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403134199	Mfr.	Digi-Sense	Technician:	Mark Romero
Asset No.	022476	Model	08516-96	Type Data:	Found-left
Serial No.	22476	Type.	Thermocouple Probe, Type K	Cal Date:	9-Sep-15
Remarks: a reading exceeded 70% of limits. No adjustment possible. Customer to determine if readings meet their requirements.					

Function/Range	Test Point	TI Reading	Difference	+/- Limit	+/- Uncertainty	Result	% Limit
Temperature	°C	°C	°C	°C	°C		
	-39.8	-37.9	1.9	2.2	0.5	Pass	86%
	99.7	99.0	-0.7	2.2	0.5	Pass	33%
	498.0	497.7	-0.3	3.7	1.3	Pass	7%
	750.3	749.6	-0.7	5.6	1.3	Pass	12%
	1002.9	999.9	-3.0	7.5	1.3	Pass	40%

END OF REPORT

010100

Southwest Research Institute
Calibration Certificate

ACCREDITED
Calibration Laboratory
Certificate # 3759.01

Cost Center:	01 CHEMISTRY & CHEMICAL ENGINEERING	Certificate Number:	38184
Asset Number:	022488	Calibrated:	9/10/2015
Description:	THERMOCOUPLE PROBE TYPE K	Calibration Due:	9/10/2016
Manufacturer:	DIGI-SENSE	Data Type:	FOUND / LEFT
Model Number:	08516-96	Temp./RH:	73.2°F / 62 %
Serial Number:	22488	Work Order #	403134274
Calibration Procedure:	TEMPERATURE PROBES		

This certificate documents traceability to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or other national metrology institute. The laboratory quality system is compliant to ISO/IEC 17025 2005, ANSI/NCSL Z540-1-1994 and relevant requirements of ISO 9001-2008. This certificate shall not be reproduced, except in full, without written approval of Southwest Research Institute Calibration Laboratory and shall not be used to claim product endorsement by SwRI® or any agency of the U.S. Government.

Results of this calibration relate only to the instrument described above at the time of calibration and does not imply any long term stability. Date due for recalibration is determined by the customer and does not imply the instrument will remain within limits, as any number of factors may cause an out of tolerance condition before this date.

Data type shall be interpreted as follows: Found-left - data recorded and no adjustment or repair was performed. As-left - data recorded after adjustment or repair was performed. As-found data are reviewed and the customer notified when the as-found results are other than pass and/or greater than 70 percent of the test limit. Pass? or Fail? indicate the measured value, plus or minus the expanded uncertainty, overlap the test limit and it is not possible to state Pass or Fail with a 95% confidence level. No statement of compliance with manufacturer or other specification is made or implied by this certificate. The customer has sole responsibility for determination of in/out-of-tolerance or compliance/noncompliance for the intended use of the instrument.

Measurement uncertainties are calculated in accordance with the methods described in the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM) as an expanded uncertainty with a coverage factor of k = 2 to approximately a 95% level of confidence. See Remarks or attached Measurement Report with the same Work Order number for data.

Remarks:
CAL -40 °C TO 1000 °C

Standards Used To Calibrate Equipment

Asset	Manufacturer	Model	Description	Cal. Due Date
009137	HART SCIENTIFIC	1575	SUPER THERMOMETER	1/13/2016
010281	HART SCIENTIFIC	5628	SPRT	2/19/2016
010814	HART SCIENTIFIC	1529	TEMPERATURE METER	11/21/2015
013617	HART SCIENTIFIC	5650	THERMOCOUPLE PROBE TYPE S	5/8/2016
013908	HART SCIENTIFIC	5628	SPRT	2/18/2016
015240	HART SCIENTIFIC	2566	THERMOCOUPLE SCANNER, 12-(	11/20/2015

Approved By

Calibrated By: MAR
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403134274	Mfr.	Digi-Sense	Technician:	Mark Romero
Asset No.	022488	Model	08516-96	Type Data:	Found-left
Serial No.	22488	Type.	Thermocouple Probe, Type K	Cal Date:	10-Sep-15
Remarks: a reading exceeded 70% of limits. No adjustment possible. Customer to determine if readings meet their requirements.					

Function/Range	Test Point	TI Reading	Difference	+/- Limit	+/- Uncertainty	Result	% Limit
Temperature	°C	°C	°C	°C	°C		
	-39.8	-37.9	1.9	2.2	0.5	Pass	86%
	99.7	99.2	-0.5	2.2	0.5	Pass	24%
	498.0	498.3	0.4	3.7	1.3	Pass	9%
	750.3	749.9	-0.4	5.6	1.3	Pass	7%
	1002.9	1000.5	-2.4	7.5	1.3	Pass	32%

END OF REPORT

010102

Southwest Research Institute
Calibration Certificate

ACCREDITED
Calibration Laboratory
Certificate # 3759.01

Cost Center:	01 CHEMISTRY & CHEMICAL ENGINEERING	Certificate Number:	39984
Asset Number:	020014	Calibrated:	10/7/2015
Description:	BALANCE	Calibration Due:	10/7/2016
Manufacturer:	METTLER	Data Type:	FOUND / LEFT
Model Number:	XS205DU	Temp./RH:	72 °F / 49 %
Serial Number:	B338797310	Work Order #	403134943
Calibration Procedure:	BALANCES & SCALES		

This certificate documents traceability to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or other national metrology institute. The laboratory quality system is compliant to ISO/IEC 17025 2005, ANSI/NCSL Z540-1-1994 and relevant requirements of ISO 9001-2008. This certificate shall not be reproduced, except in full, without written approval of Southwest Research Institute Calibration Laboratory and shall not be used to claim product endorsement by SwRI® or any agency of the U.S. Government.

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Data type shall be interpreted as follows: Found-left - data recorded and no adjustment or repair was performed. As-left - data recorded after adjustment or repair was performed. As-found data are reviewed and the customer notified when the as-found results are other than pass and/or greater than 70 percent of the test limit. Pass? or Fail? indicate the measured value, plus or minus the expanded uncertainty, overlap the test limit and it is not possible to state Pass or Fail with a 95% confidence level. No statement of compliance with manufacturer or other specification is made or implied by this certificate. The customer has sole responsibility for determination of in/out-of-tolerance or compliance/noncompliance for the intended use of the instrument.

Measurement uncertainties are calculated in accordance with the methods described in the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM) as an expanded uncertainty with a coverage factor of k = 2 to approximately a 95% level of confidence. See Remarks or attached Measurement Report with the same Work Order number for data.

Remarks:

Standards Used To Calibrate Equipment

Asset	Manufacturer	Model	Description	Cal. Due Date
001704	TROEMNER	1 G	WEIGHT CLASS 1	12/10/2015
001705	TROEMNER	2 G	WEIGHT CLASS 1	7/2/2016
001706	RICE LAKE	2 G	WEIGHT CLASS 1	7/8/2016
001707	TROEMNER	5 G	WEIGHT CLASS 1	7/29/2016
001708	RICE LAKE	10 G	WEIGHT CLASS 1	7/2/2016
001709	TROEMNER	20 G	WEIGHT CLASS 1	8/5/2016
001710	TROEMNER	20 G	WEIGHT CLASS 1	8/5/2016

Approved By

Calibrated By: RRV
Metrology Technician

Southwest Research Institute
Calibration Certificate

ACCREDITED
Calibration Laboratory
Certificate # 3759.01

001711	TROEMNER	50 G	WEIGHT CLASS 1	7/2/2016
001712	TROEMNER	100 G	WEIGHT CLASS 1	7/29/2016
001713	RICE LAKE	200 G	WEIGHT CLASS 1	9/30/2016

Approved By

Calibrated By: RRV
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403134943	Mfr:	Mettler	Technician:	RRV
Asset No.:	020014	Model:	XS205DU	Type Data:	Found-left
Serial No.:	B338797310	Type:	Balance	Cal Date:	7-Oct-15
Remarks:					

Function/Range	Applied	TI Reading	Difference	± Limit	Result	% Limit
Corner Load	grams	grams	grams	grams		
Reference	100					
Left Front		100.0002	0.0002	0.0006	Pass	33%
Left Rear		100.0003	0.0003		Pass	50%
Right Rear		100.0001	0.0001		Pass	17%
Right Front		100.0002	0.0002		Pass	33%
Repeatability						
< 81 g Range						
1	80	80.00001				
2		80.00002				
3		80.00001				
4		80.00002				
5		80.00001				
6		80.00002				
7		80.00002				
8		80.00002				
9		80.00002				
10		80.00002				
Std Deviation		0.000005		0.00008	Pass	6%
< 220 g Range						
1	200	200.0001				
2		200.0000				
3		200.0002				
4		200.0001				
5		200.0002				
6		200.0001				
7		200.0002				
8		200.0002				
9		200.0002				
10		200.0002				
Std Deviation		0.00007		0.00020	Pass	35%

Function/Range	Applied	TI Reading	Difference	± Limit	± Uncertainty	Result	% Limit
Direct Weighing	grams	grams	milligrams	milligrams	milligrams		
< 81 g Range	0.00000	0.00000	0.00	0.40	0.06	Pass	0%
	8.00001	8.00002	0.01			Pass	3%
	15.99996	15.99995	-0.01			Pass	3%
	24.00005	24.00010	0.05			Pass	13%
	32.00000	32.00006	0.06			Pass	15%
	40.00002	40.00007	0.05			Pass	13%
	48.00003	48.00006	0.03			Pass	8%

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403134943	Mfr:	Mettler	Technician:	RRV
Asset No.:	020014	Model:	XS205DU	Type Data:	Found-left
Serial No.:	B338797310	Type:	Balance	Cal Date:	7-Oct-15

Function/Range	Applied	TI Reading	Difference	± Limit	± Uncertainty	Result	% Limit
Direct Weighing (Cont)	grams	grams	milligrams	milligrams	milligrams		
< 81 g Range	55.99998	56.00006	0.08	0.40	0.06	Pass	20%
	63.99999	64.00014	0.15			Pass	38%
	72.00002	72.00018	0.16			Pass	40%
	79.99998	80.00009	0.11			Pass	28%
Direct Weighing	0.0000	0.0000	0.0	0.4	0.18	Pass	0%
< 220 g Range	20.0000	20.0001	0.1			Pass	25%
	40.0000	40.0000	0.0			Pass	0%
	60.0000	60.0001	0.1			Pass	25%
	80.0000	80.0001	0.1			Pass	25%
	100.0001	100.0000	-0.1			Pass	25%
	120.0001	120.0001	0.0			Pass	0%
	140.0001	140.0002	0.1			Pass	25%
	160.0001	160.0002	0.1			Pass	25%
	180.0001	180.0002	0.1			Pass	25%
	199.9999	200.0002	0.3			Pass	75%

END OF REPORT

010106

Southwest Research Institute
Calibration Certificate

ACCREDITED
Calibration Laboratory
Certificate # 3759.01

Cost Center:	01 CHEMISTRY & CHEMICAL ENGINEERING	Certificate Number:	39315
Asset Number:	014981	Calibrated:	9/25/2015
Description:	BALANCE	Calibration Due:	9/25/2016
Manufacturer:	METTLER	Data Type:	FOUND / LEFT
Model Number:	XS205DU	Temp./RH:	73 °F / 48 %
Serial Number:	1129242107	Work Order #	403134657
Calibration Procedure:	BALANCES & SCALES		

This certificate documents traceability to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or other national metrology institute. The laboratory quality system is compliant to ISO/IEC 17025 2005, ANSI/NCSL Z540-1-1994 and relevant requirements of ISO 9001-2008. This certificate shall not be reproduced, except in full, without written approval of Southwest Research Institute Calibration Laboratory and shall not be used to claim product endorsement by SwRI® or any agency of the U.S. Government.

Results of this calibration relate only to the instrument described above at the time of calibration and does not imply any long term stability. Date due for recalibration is determined by the customer and does not imply the instrument will remain within limits, as any number of factors may cause an out of tolerance condition before this date.

Data type shall be interpreted as follows: Found-left - data recorded and no adjustment or repair was performed. As-left - data recorded after adjustment or repair was performed. As-found data are reviewed and the customer notified when the as-found results are other than pass and/or greater than 70 percent of the test limit. Pass? or Fail? indicate the measured value, plus or minus the expanded uncertainty, overlap the test limit and it is not possible to state Pass or Fail with a 95% confidence level. No statement of compliance with manufacturer or other specification is made or implied by this certificate. The customer has sole responsibility for determination of in/out-of-tolerance or compliance/noncompliance for the intended use of the instrument.

Measurement uncertainties are calculated in accordance with the methods described in the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM) as an expanded uncertainty with a coverage factor of k = 2 to approximately a 95% level of confidence. See Remarks or attached Measurement Report with the same Work Order number for data.

Remarks:

Standards Used To Calibrate Equipment

Asset	Manufacturer	Model	Description	Cal. Due Date
001704	TROEMNER	1 G	WEIGHT CLASS 1	12/10/2015
001705	TROEMNER	2 G	WEIGHT CLASS 1	7/2/2016
001706	RICE LAKE	2 G	WEIGHT CLASS 1	7/8/2016
001707	TROEMNER	5 G	WEIGHT CLASS 1	7/29/2016
001708	RICE LAKE	10 G	WEIGHT CLASS 1	7/2/2016
001709	TROEMNER	20 G	WEIGHT CLASS 1	8/5/2016
001710	TROEMNER	20 G	WEIGHT CLASS 1	8/5/2016

Approved By

Calibrated By: RRV
Metrology Technician

Southwest Research Institute
Calibration Certificate

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Calibration Laboratory
Certificate # 3759.01

001711	TROEMNER	50 G	WEIGHT CLASS 1	7/2/2016
001712	TROEMNER	100 G	WEIGHT CLASS 1	7/29/2016
001713	RICE LAKE	200 G	WEIGHT CLASS 1	10/1/2015

Approved By

Calibrated By: RRV
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403134657	Mfr:	Mettler	Technician:	RRV
Asset No.:	014981	Model:	XS205DU	Type Data:	Found-left
Serial No.:	1129242107	Type:	Balance	Cal Date:	25-Sep-15
Remarks:					

Function/Range	Applied	TI Reading	Difference	± Limit	Result	% Limit
Corner Load	grams	grams	grams	grams		
Reference	100					
Left Front		99.9998	-0.0002	0.0006	Pass	33%
Left Rear		100.0000	0.0000		Pass	0%
Right Rear		100.0001	0.0001		Pass	17%
Right Front		100.0000	0.0000		Pass	0%
Repeatability						
< 81 g Range						
1	80	79.99998				
2		79.99998				
3		79.99999				
4		79.99998				
5		79.99997				
6		80.00001				
7		79.99999				
8		79.99998				
9		79.99999				
10		80.00000				
Std Deviation		0.000012		0.00008	Pass	15%
< 220 g Range						
1	200	200.0000				
2		199.9999				
3		199.9999				
4		199.9998				
5		199.9997				
6		200.0000				
7		199.9999				
8		199.9998				
9		199.9999				
10		199.9999				
Std Deviation		0.00009		0.00020	Pass	45%

Function/Range	Applied	TI Reading	Difference	± Limit	± Uncertainty	Result	% Limit
Direct Weighing	grams	grams	milligrams	milligrams	milligrams		
< 81 g Range	0.00000	0.00000	0.00	0.40	0.07	Pass	0%
	8.00001	8.00000	-0.01			Pass	3%
	15.99996	15.99999	0.03			Pass	8%
	24.00005	24.00000	-0.05			Pass	13%
	32.00000	31.99999	-0.01			Pass	3%
	40.00002	40.00005	0.03			Pass	8%
	48.00003	48.00006	0.03			Pass	8%

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403134657	Mfr:	Mettler	Technician:	RRV
Asset No.:	014981	Model:	XS205DU	Type Data:	Found-left
Serial No.:	1129242107	Type:	Balance	Cal Date:	25-Sep-15

Function/Range	Applied	TI Reading	Difference	± Limit	± Uncertainty	Result	% Limit
Direct Weighing (Cont)	grams	grams	milligrams	milligrams	milligrams		
< 81 g Range	55.99998	56.00000	0.02	0.40	0.07	Pass	5%
	63.99999	64.00005	0.06			Pass	15%
	72.00002	72.00004	0.02			Pass	5%
	79.99998	80.00003	0.05			Pass	13%
Direct Weighing	0.0000	0.0000	0.0	0.4	0.22	Pass	0%
< 220 g Range	20.0000	19.9999	-0.1			Pass	25%
	40.0000	39.9999	-0.1			Pass	25%
	60.0000	59.9998	-0.2			Pass	50%
	80.0000	79.9998	-0.2			Pass	50%
	100.0001	99.9999	-0.2			Pass	50%
	120.0001	120.0001	0.0			Pass	0%
	140.0001	140.0000	-0.1			Pass	25%
	160.0001	160.0000	-0.1			Pass	25%
	180.0001	180.0000	-0.1			Pass	25%
	199.9999	200.0001	0.2			Pass	50%

END OF REPORT

010110

Southwest Research Institute
Calibration Certificate

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Calibration Laboratory
Certificate # 3759.01

Cost Center:	01 CHEMISTRY & CHEMICAL ENGINEERING	Certificate Number:	46011
Asset Number:	018344	Calibrated:	2/1/2016
Description:	OVEN	Calibration Due:	2/1/2017
Manufacturer:	THERMO SCIENTIFIC	Data Type:	FOUND / LEFT
Model Number:	HERATHERM OMS60	Temp./RH:	70 °F / 42 %
Serial Number:	41241291	Work Order #	403137157
Calibration Procedure:	OVENS, CHAMBERS, INCUBA		

This certificate documents traceability to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or other national metrology institute. The laboratory quality system is compliant to ISO/IEC 17025 2005, ANSI/NCSL Z540-1-1994 and relevant requirements of ISO 9001-2008. This certificate shall not be reproduced, except in full, without written approval of Southwest Research Institute Calibration Laboratory and shall not be used to claim product endorsement by SwRI® or any agency of the U.S. Government.

Results of this calibration relate only to the instrument described above at the time of calibration and does not imply any long term stability. Date due for recalibration is determined by the customer and does not imply the instrument will remain within limits, as any number of factors may cause an out of tolerance condition before this date.

Data type shall be interpreted as follows: Found-left - data recorded and no adjustment or repair was performed. As-left - data recorded after adjustment or repair was performed. As-found data are reviewed and the customer notified when the as-found results are other than pass and/or greater than 70 percent of the test limit. Pass? or Fail? indicate the measured value, plus or minus the expanded uncertainty, overlap the test limit and it is not possible to state Pass or Fail with a 95% confidence level. No statement of compliance with manufacturer or other specification is made or implied by this certificate. The customer has sole responsibility for determination of in/out-of-tolerance or compliance/noncompliance for the intended use of the instrument.

Measurement uncertainties are calculated in accordance with the methods described in the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM) as an expanded uncertainty with a coverage factor of k = 2 to approximately a 95% level of confidence. See Remarks or attached Measurement Report with the same Work Order number for data.

Remarks:

Standards Used To Calibrate Equipment

Asset	Manufacturer	Model	Description	Cal. Due Date
015454	HART SCIENTIFIC	5627A	THERMOMETER PRT	2/18/2016
018495	FLUKE	1523	TEMPERATURE METER	2/18/2016

Approved By

Calibrated By: RRV
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403137157	Mfr:	Thermo Scientific	Technician:	RRV
Asset No:	018344	Model:	Heratherm OMS60	Type Data:	Found-left
Serial No:	41241291	Type:	Oven Chamber	Cal Date:	1-Feb-16

Remarks: Calibration limits per customer request. Chamber exceeds 70% of limit at the 200 °C test point. Customer to determine if the result found meets their requirements. Temperature uniformity not calibrated

Function/Range	Test Point	TI Reading	Difference	± Limit	± Uncertainty	Result	% Limit
Temperature	°C	°C	°C	°C	°C		
50 °C	50.4	50.0	-0.4	2.0	0.18	Pass	20%
100 °C	101.0	100.0	-1.0			Pass	50%
150 °C	152.1	150.0	-2.1	3.0		Pass	70%
200 °C	203.2	200.0	-3.2	4.0		Pass	80%

END OF REPORT

010112

Southwest Research Institute
Calibration Certificate

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Calibration Laboratory
Certificate # 3759.01

Cost Center:	01 CHEMISTRY & CHEMICAL ENGINEERING	Certificate Number:	33589
Asset Number:	005420	Calibrated:	6/24/2015
Description:	BALANCE	Calibration Due:	6/24/2016
Manufacturer:	METTLER	Data Type:	FOUND / LEFT
Model Number:	AG245	Temp./RH:	72 °F / 52 %
Serial Number:	1116031935	Work Order #	403132562
Calibration Procedure:	BALANCES & SCALES		

This certificate documents traceability to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or other national metrology institute. The laboratory quality system is compliant to ISO/IEC 17025 2005, ANSI/NCSL Z540-1-1994 and relevant requirements of ISO 9001-2008. This certificate shall not be reproduced, except in full, without written approval of Southwest Research Institute Calibration Laboratory and shall not be used to claim product endorsement by SwRI® or any agency of the U.S. Government.

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Data type shall be interpreted as follows: Found-left - data recorded and no adjustment or repair was performed. As-left - data recorded after adjustment or repair was performed. As-found data are reviewed and the customer notified when the as-found results are other than pass and/or greater than 70 percent of the test limit. Pass? or Fail? indicate the measured value, plus or minus the expanded uncertainty, overlap the test limit and it is not possible to state Pass or Fail with a 95% confidence level. No statement of compliance with manufacturer or other specification is made or implied by this certificate. The customer has sole responsibility for determination of in/out-of-tolerance or compliance/noncompliance for the intended use of the instrument.

Measurement uncertainties are calculated in accordance with the methods described in the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM) as an expanded uncertainty with a coverage factor of k = 2 to approximately a 95% level of confidence. See Remarks or attached Measurement Report with the same Work Order number for data.

Remarks:

Standards Used To Calibrate Equipment

Asset	Manufacturer	Model	Description	Cal. Due Date
001704	TROEMNER	1 G	WEIGHT CLASS 1	12/10/2015
001705	TROEMNER	2 G	WEIGHT CLASS 1	7/1/2015
001706	RICE LAKE	2 G	WEIGHT CLASS 1	7/9/2015
001707	TROEMNER	5 G	WEIGHT CLASS 1	7/21/2015
001708	RICE LAKE	10 G	WEIGHT CLASS 1	7/1/2015
001709	TROEMNER	20 G	WEIGHT CLASS 1	8/6/2015
001710	TROEMNER	20 G	WEIGHT CLASS 1	8/6/2015

Approved By

Calibrated By: RRV
Metrology Technician

Southwest Research Institute

Calibration Certificate

ACCREDITED
Calibration Laboratory
Certificate # 3759.01

001711	TROEMNER	50 G	WEIGHT CLASS 1	7/1/2015
001712	TROEMNER	100 G	WEIGHT CLASS 1	7/29/2015
001713	RICE LAKE	200 G	WEIGHT CLASS 1	10/1/2015

Approved By

Calibrated By: RRV
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403132562	Mfr:	Mettler	Technician:	RRV
Asset No:	005420	Model:	AG245	Type Data:	Found-left
Serial No:	1116031935	Type:	Balance	Cal Date:	24-Jun-15

Remarks: The balance has resulted in a <Pass?> at multiple test points. An external calibration was performed but it did not improve the results. Customer to determine if the results found meet their requirements

Function/Range	Applied	TI Reading	Difference	± Limit	Result	% Limit
Corner Load	grams	grams	grams	grams		
Reference	100					
Front		99.9997	-0.0003	0.0006	Pass	50%
Rear		99.9999	-0.0001		Pass	17%
Left		100.0004	0.0004		Pass	67%
Right		100.0002	0.0002		Pass	33%
Repeatability						
< 41 g Range						
1	20	20.00000				
2		20.00001				
3		20.00000				
4		19.99999				
5		20.00000				
6		20.00000				
7		19.99999				
8		19.99999				
9		20.00000				
10		20.00001				
Std Deviation		0.000007		0.000040	Pass	18%
Repeatability						
< 205 g Range						
1	100	100.0000				
2		100.0000				
3		100.0001				
4		99.9999				
5		99.9999				
6		100.0000				
7		100.0000				
8		100.0000				
9		99.9999				
10		99.9999				
Std Deviation		0.00007		0.00020	Pass	35%

Function/Range	Applied	TI Reading	Difference	± Limit	± Uncertainty	Result	% Limit
Direct Weighing	grams	grams	grams	grams	grams		
< 41 g Range	0.00000	0.00000	0.00000	0.00006	0.000057	Pass	0%
	4.00003	4.00000	-0.00003			Pass	50%
	8.00001	7.99999	-0.00002			Pass	33%
	12.00000	11.99999	-0.00001			Pass	17%
	15.99998	15.99998	0.00000			Pass	0%

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	403132562	Mfr:	Mettler	Technician:	RRV
Asset No:	005420	Model:	AG245	Type Data:	Found-left
Serial No:	1116031935	Type:	Balance	Cal Date:	24-Jun-15

Function/Range	Applied	TI Reading	Difference	± Limit	± Uncertainty	Result	% Limit
Direct Weighing	grams	grams	grams	grams	grams		
< 41 g Range *(Cont)*	20.00002	19.99999	-0.00003			Pass	50%
	24.00005	24.00002	-0.00003	0.00006	0.000057	Pass	50%
	28.00003	27.99998	-0.00005			Pass?	83%
	32.00002	31.99998	-0.00004			Pass?	67%
	36.00000	35.99997	-0.00003			Pass	50%
	40.00002	40.00000	-0.00002			Pass	33%
< 205 g Range	0.0000	0.0000	0.0000	0.0004	0.00020	Pass	0%
	20.0000	19.9999	-0.0001			Pass	25%
	40.0000	40.0000	0.0000			Pass	0%
	59.9999	60.0000	0.0001			Pass	25%
	80.0000	79.9999	-0.0001			Pass	25%
	100.0001	100.0000	-0.0001			Pass	25%
	120.0001	120.0001	0.0000			Pass	0%
	140.0001	140.0001	0.0000			Pass	0%
	160.0000	159.9998	-0.0002			Pass	50%
	180.0001	179.9998	-0.0003			Pass	75%
	199.9999	199.9998	-0.0001			Pass	25%

END OF REPORT

010116

SOUTHWEST RESEARCH INSTITUTE
CLIENT: Los Alamos National Laboratory
SwRI PROJECT#: 21592.01.00X
SwRI TASK ORDER: 160605-2
SwRI SRR: 57710
SDG: 598447
VTSR: 05.31.2016

Certificates of Analysis for Chemicals

Fisher Scientific

1 Reagent Lane
Fair Lawn, NJ 07410
201.796.7100 tel
201.796.1329 fax

Certificate of Analysis

Fisher Scientific's Quality System has been found to conform to Quality Management System Standard ISO9001:2008 standard by DNV Certificate number CERT-08052-2006-AQ-HOU-ANAB

This is to certify that units of the above mentioned lot number were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Certain products (USP/FCC/NF/EP/BP/JP grades) are sold for use in food, drug, or medical device manufacturing. Fisher does not claim regulatory coverage under 21 CFR nor maintain DMF's with the FDA. The following are the actual analytical results obtained:

Catalog Number	**A509**	**Mfg. Date**	11/4/2015
Lot Number	**1115100**	**Sample Id**	N/A
Product Description	Nitric Acid (TRACEMETAL GRADE)		
Country Origin	Canada		
Chemical Origin	Inorganic		

BSE/TSE Comment:	No animal products are used as starting raw material ingredients, or used in processing, including lubricants, processing aids, or any other material that might migrate to the finished product.

Result Name	Units	Specifications	Test Value
.Expiry Date	mm/dd/yyyy	2 yrs	11/04/2017
Assay (HNO3, w/w)	% by w/w	67 - 70	69
Color	APHA	<= 10	< 7
Aluminum (Al)	ppb	<= 1	< 0.5
Antimony (Sb)	ppb	<= 0.5	< 0.1
Arsenic (As)	ppb	<= 0.5	< 0.1
Barium (Ba)	ppb	<= 0.1	< 0.1
Beryllium (Be)	ppb	<= 0.1	< 0.1
Bismuth (Bi)	ppb	<= 0.1	< 0.1
Boron (B)	ppb	<= 1	< 0.5
Cadmium (Cd)	ppb	<= 0.5	< 0.1
Calcium (Ca)	ppb	<= 1	< 0.5
Cerium (Ce)	ppb	<= 0.1	< 0.1
Cesium (Cs)	ppb	<= 0.1	< 0.1
Chromium (Cr)	ppb	<= 1	< 0.5
Cobalt (Co)	ppb	<= 0.5	< 0.1
Copper (Cu)	ppb	<= 0.5	< 0.2
Dysprosium (Dy)	ppb	<= 0.1	< 0.1
Erbium (Er)	ppb	<= 0.1	< 0.1
Europium (Eu)	ppb	<= 0.1	< 0.1
Gadolinium (Gd)	ppb	<= 0.1	< 0.1
Gallium (Ga)	ppb	<= 0.1	< 0.1
Germanium (Ge)	ppb	<= 0.1	< 0.1
Gold (Au)	ppb	<= 0.1	< 0.1
Hafnium (Hf)	ppb	<= 0.1	< 0.1
Holmium (Ho)	ppb	<= 0.1	< 0.1
Indium (In)	ppb	<= 0.1	< 0.1
Iron (Fe)	ppb	<= 1	< 0.5
Lanthanum (La)	ppb	<= 0.1	< 0.1
Lead (Pb)	ppb	<= 0.1	< 0.1
Lithium (Li)	ppb	<= 0.1	< 0.1

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SwRI Chem ID: 67843

Lutetium (Lu)	ppb	<= 0.1	< 0.1
Magnesium (Mg)	ppb	<= 1	< 0.2
Manganese (Mn)	ppb	<= 0.1	< 0.1
Mercury (Hg)	ppb	<= 0.1	< 0.02
Molybdenum (Mo)	ppb	<= 0.1	< 0.1
Neodymium (Nd)	ppb	<= 0.1	< 0.1
Nickel (Ni)	ppb	<= 0.5	< 0.5
Niobium (Nb)	ppb	<= 0.1	< 0.1
Palladium (Pd)	ppb	<= 0.5	< 0.1
Platinum (Pt)	ppb	<= 0.5	< 0.1
Potassium (K)	ppb	<= 1	< 0.2
Praseodymium (Pr)	ppb	<= 0.1	< 0.1
Rhenium (Re)	ppb	<= 0.1	< 0.1
Rhodium (Rh)	ppb	<= 0.5	< 0.1
Rubidium (Rb)	ppb	<= 0.1	< 0.1
Ruthenium (Ru)	ppb	<= 0.5	< 0.1
Samarium (Sm)	ppb	<= 0.1	< 0.1
Scandium (Sc)	ppb	<= 0.1	< 0.1
Selenium (Se)	ppb	<= 1	< 0.1
Silver (Ag)	ppb	<= 0.1	< 0.1
Sodium (Na)	ppb	<= 1	< 0.3
Strontium (Sr)	ppb	<= 0.1	< 0.1
Tantalum (Ta)	ppb	Information Only	< 0.1
Tellurium (Te)	ppb	<= 0.1	< 0.1
Terbium (Tb)	ppb	<= 0.1	< 0.1
Thallium (Tl)	ppb	<= 0.1	< 0.1
Thorium (Th)	ppb	<= 0.1	< 0.1
Thulium (Tm)	ppb	<= 0.1	< 0.1
Tin (Sn)	ppb	<= 0.5	< 0.1
Titanium (Ti)	ppb	<= 0.5	< 0.1
Tungsten (W)	ppb	<= 0.1	< 0.1
Uranium (U)	ppb	<= 0.1	< 0.1
Vanadium (V)	ppb	<= 0.5	< 0.1
Ytterbium (Yb)	ppb	<= 0.1	< 0.1
Yttrium (Y)	ppb	<= 0.1	< 0.1
Zinc (Zn)	ppb	<= 0.5	< 0.2
Zirconium (Zr)	ppb	<= 0.1	< 0.1
Chloride (Cl-)	ppm	<= 0.2	< 0.2
Total Phosphorus (P)	ppm	<= 0.01	< 0.01
Total Sulfur (S)	ppm	<= 0.3	< 0.3

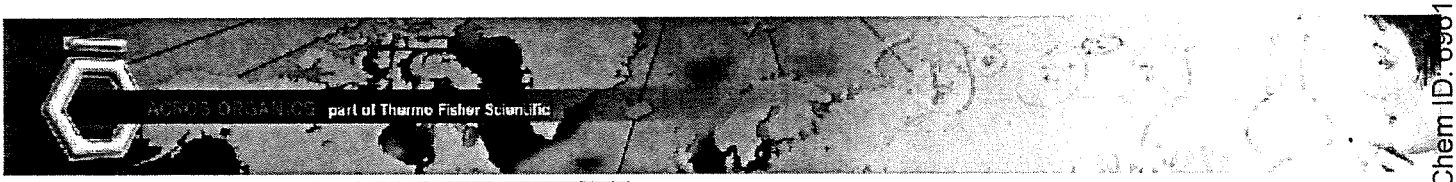
CERTIFIED BY

Edgar E Hess — Lab Manager Fair Lawn

Joel Boland — Lab Manager BPF

Note: The data listed is valid for all package sizes of this lot of product, expressed as an extension of the catalog number listed above. If there are any questions with this certificate, please call Chemical Services at 1.800.227.6701.

SwRI Chem ID: 67843
SwRI Chem ID: 67843
SwRI Chem ID: 67843



ACROS ORGANICS

Version	0
Molecular weight	84.99
Molecular formula	N Na O3
CAS No	7631-99-4
Linear formula	NaNO3
Flash point (°C)	

Certificate of Analysis

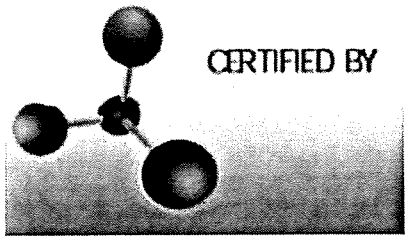
This is to certify that units of the below mentioned lot number were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Acros Organics expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Unless otherwise stated, these products are not intended for dialysis, parenteral or injectable use without further processing. The following are the actual analytical results obtained:

Catalog Number	42434	**Quality Test / Release Date**	2 November 2015
Lot Number	A0365903	**Suggested Retest Date**	November 2020
Description	Sodium nitrate,99+%,ACS reagent		
Country of Origin	INDIA		
Declaration of Origin	synthetic		

Origin Comment	

Result Name	Specifications	Test Value
Appearance (Color)	White	White
Appearance (Form)	Crystals	Crystals
Titration after Ion exchange	>=99.0 %	100.2 %
Heavy metals (as Pb)	=<5 ppm	=<5 ppm
Insoluble matter	=<0.005 %	0.004 %
pH	5.5 to 8.3 (5% soln. at 25°C)	6.1 (5% soln. at 25°C)
Chloride (Cl)	=<10 ppm	7 ppm
Iodate (IO3)	=<5 ppm	ppm (none detected)
Phosphate (PO4)	=<5 ppm	=<5 ppm
Iron (Fe)	=<3 ppm	=<3 ppm
Sulfate (SO4)	=<30 ppm	10 ppm
Calcium (Ca)	=<50 ppm	1.4 ppm
Magnesium (Mg)	=<20 ppm	8 ppm
Nitrite (NO2)	=<10 ppm	ppm (none detected)

SwRI Chem ID: 69610
SwRI Chem ID: 69610
SwRI Chem ID: 69610



CERTIFIED BY

L. Van den Broek, QA Manager Issued: 25 April 2016

Acros Organics
ENA23, zone 1, nr 1350, Janssen Pharmaceuticalaan 3a, B-2440 Geel, Belgium
Tel +32 14/57.52.11 - Fax +32 14/59.34.34 Internet: http://www.acros.com
1 Reagent Lane, Fair Lawn, NJ 07410,USA Fax 201-796-1329

SwRI Chem ID: 69610
SwRI Chem ID: 69610
SwRI Chem ID: 69610

SwRI Chem ID: 62694

SIGMA-ALDRICH®

sigma-aldrich.com

3050 Spruce Street, Saint Louis, MO 63103, USA
Website: www.sigmaaldrich.com
Email USA: techserv@sial.com
Outside USA: eurtechserv@sial.com

Certificate of Analysis

Product Name:
Sodium hydroxide - ACS reagent, ≥97.0%, pellets

Product Number:	**221465**
Batch Number:	**MKBV3988V**
Brand:	SIAL
CAS Number:	1310-73-2
MDL Number:	MFCD00003548
Formula:	HNaO
Formula Weight:	40.00 g/mol
Quality Release Date:	22 APR 2015
Recommended Retest Date:	APR 2017

NaOH

Test	Specification	Result
Appearance (Color)	White	White
Appearance (Form)	Pellets	Pellets
X-Ray Diffraction	Conforms to Structure	Conforms
Titration by HCL	≥ 97.0 %	99.0 %
Impurity % Na2CO3 by HCl Titration	≤ 1.0 %	0.3 %
Sulfate (SO4)	≤ 0.003 %	0.003 %
Chloride Content	≤ 0.005 %	0.005 %
Nitrogen Compounds (as N)	≤ 0.001 %	0.001 %
Phosphate (PO4)	≤ 0.001 %	0.001 %
Heavy Metals (as Ag)	≤ 0.002 %	0.002 %
Iron (Fe)	≤ 0.001 %	0.001 %
Nickel (Ni)	≤ 0.001 %	0.001 %
Mercury (Hg)	≤ 0.1 ppm	0.1 ppm
Calcium (Ca)	≤ 0.005 %	0.005 %
Magnesium (Mg)	≤ 0.002 %	0.002 %
Potassium (K)	≤ 0.02 %	0.02 %
Meets ACS Requirements 10th Edition	Current ACS Specification	Conforms

SwRI Chem ID: 62694

SwRI Chem ID: 62694

Sigma-Aldrich warrants, that at the time of the quality release or subsequent retest date this product conformed to the information contained in this publication. The current Specification sheet may be available at Sigma-Aldrich.com. For further inquiries, please contact Technical Service. Purchaser must determine the suitability of the product for its particular use. See reverse side of invoice or packing slip for additional terms and conditions of sale.

SwRI Chem ID: 62694

SIGMA-ALDRICH®

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3050 Spruce Street, Saint Louis, MO 63103, USA
Website: www.sigmaaldrich.com
Email USA: techserv@sial.com
Outside USA: eurtechserv@sial.com

Certificate of Analysis

Product Number: 221465
Batch Number: MKBV3988V

Test	Specification	Result
Recommended Retest Period 2 Years	----------	----------

ali ataei

Ali Ataei, Manager
Quality Control
Milwaukee, WI US

SwRI Chem ID: 62694

SwRI Chem ID: 62694

Sigma-Aldrich warrants, that at the time of the quality release or subsequent retest date this product conformed to the information contained in this publication. The current Specification sheet may be available at Sigma-Aldrich.com. For further inquiries, please contact Technical Service. Purchaser must determine the suitability of the product for its particular use. See reverse side of invoice or packing slip for additional terms and conditions of sale.

SwRI Chem ID: 62693

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3050 Spruce Street, Saint Louis, MO 63103, USA
Website: www.sigmaaldrich.com
Email USA: techserv@sial.com
Outside USA: eurtechserv@sial.com

Certificate of Analysis

Product Name:
Sodium hydroxide – ACS reagent, ≥97.0%, pellets

Product Number:	**221465**
Batch Number:	**MKBV3988V**
Brand:	SIAL
CAS Number:	1310-73-2
MDL Number:	MFCD00003548
Formula:	HNaO
Formula Weight:	40.00 g/mol
Quality Release Date:	22 APR 2015
Recommended Retest Date:	APR 2017

NaOH

Test	Specification	Result
Appearance (Color)	White	White
Appearance (Form)	Pellets	Pellets
X-Ray Diffraction	Conforms to Structure	Conforms
Titration by HCL	≥ 97.0 %	99.0 %
Impurity	≤ 1.0 %	0.3 %
% Na2CO3 by HCl Titration		
Sulfate (SO4)	≤ 0.003 %	0.003 %
Chloride Content	≤ 0.005 %	0.005 %
Nitrogen Compounds	≤ 0.001 %	0.001 %
(as N)		
Phosphate (PO4)	≤ 0.001 %	0.001 %
Heavy Metals	≤ 0.002 %	0.002 %
(as Ag)		
Iron (Fe)	≤ 0.001 %	0.001 %
Nickel (Ni)	≤ 0.001 %	0.001 %
Mercury (Hg)	≤ 0.1 ppm	0.1 ppm
Calcium (Ca)	≤ 0.005 %	0.005 %
Magnesium (Mg)	≤ 0.002 %	0.002 %
Potassium (K)	≤ 0.02 %	0.02 %
Meets ACS Requirements	Current ACS Specification	Conforms
10th Edition		

SwRI Chem ID: 62693

SwRI Chem ID: 62693

Sigma-Aldrich warrants, that at the time of the quality release or subsequent retest date this product conformed to the information contained in this publication. The current Specification sheet may be available at Sigma-Aldrich.com. For further inquiries, please contact Technical Service. Purchaser must determine the suitability of the product for its particular use. See reverse side of invoice or packing slip for additional terms and conditions of sale.

SwRI Chem ID: 62693

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3050 Spruce Street, Saint Louis, MO 63103, USA
Website: www.sigmaaldrich.com
Email USA: techserv@sial.com
Outside USA: eurtechserv@sial.com

Certificate of Analysis

Product Number: 221465
Batch Number: MKBV3988V

Test	Specification	Result
Recommended Retest Period 2 Years	----------	----------

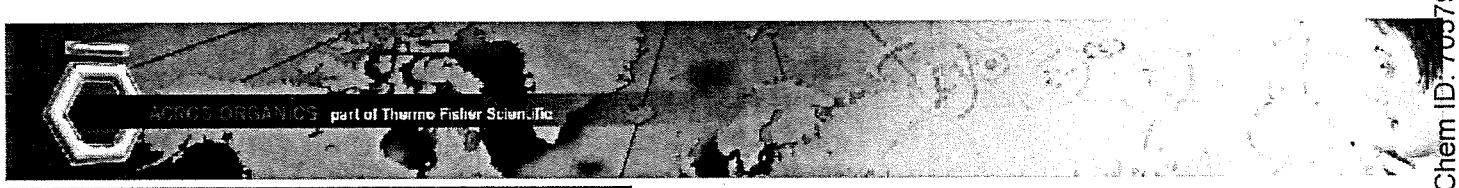
ali ataei

Ali Ataei, Manager
Quality Control
Milwaukee, WI US

SwRI Chem ID: 62693

SwRI Chem ID: 62693

Sigma-Aldrich warrants, that at the time of the quality release or subsequent retest date this product conformed to the information contained in this publication. The current Specification sheet may be available at Sigma-Aldrich.com. For further inquiries, please contact Technical Service. Purchaser must determine the suitability of the product for its particular use. See reverse side of invoice or packing slip for additional terms and conditions of sale.



ACROS ORGANICS

Version	0
Molecular weight	84.99
Molecular formula	N Na O3
CAS No	7631-99-4
Linear formula	NaNO3
Flash point (°C)	

Certificate of Analysis

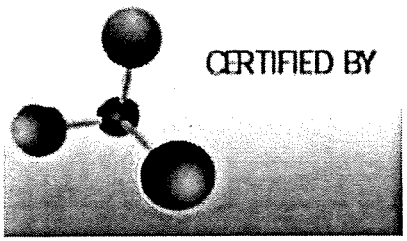
This is to certify that units of the below mentioned lot number were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Acros Organics expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantabllity and fitness for a particular purpose. Unless otherwise stated, these products are not intended for dialysis, parenteral or injectable use without further processing. The following are the actual analytical results obtained:

Catalog Number	42434	**Quality Test / Release Date**	23 December 2015
Lot Number	A0367952	**Suggested Retest Date**	December 2020
Description	Sodium nitrate,99+%,ACS reagent		
Country of Origin	INDIA		
Declaration of Origin	synthetic		

Origin Comment	

Result Name	Specifications	Test Value
Appearance (Color)	White	White
Appearance (Form)	Crystals	Crystals
Titration after Ion exchange	>=99.0 %	100.2 %
Heavy metals (as Pb)	=<5 ppm	=<5 ppm
Insoluble matter	=<0.005 %	0.004 %
pH	5.5 to 8.3 (5 % at 25°C)	5.7 (5 % at 25°C)
Chloride (Cl)	=<10 ppm	7 ppm
Iodate (IO3)	=<5 ppm	ppm (none detected)
Phosphate (PO4)	=<5 ppm	=<5 ppm
Iron (Fe)	=<3 ppm	=<3 ppm
Sulfate (SO4)	=<30 ppm	10 ppm
Calcium (Ca)	=<50 ppm	1.4 ppm
Magnesium (Mg)	=<20 ppm	8 ppm
Nitrite (NO2)	=<10 ppm	ppm (none detected)

SwRI Chem ID: 70579
SwRI Chem ID: 70579
SwRI Chem ID: 70579



CERTIFIED BY

L. Van den Broek, QA Manager Issued: 20 May 2016

Acros Organics
ENA23, zone 1, nr 1350, Janssen Pharmaceutlcalaan 3a, B-2440 Geel, Belgium
Tel +32 14/57.52.11 - Fax +32 14/59.34.34 Internet: http://www.acros.com
1 Reagent Lane, Fair Lawn, NJ 07410,USA Fax 201-796-1329

SwRI Chem ID: 70579

SwRI Chem ID: 70579

SwRI Chem ID: 70579

010127

SOUTHWEST RESEARCH INSTITUTE
CLIENT: Los Alamos National Laboratory
SwRI PROJECT#: 21592.01.00X
SwRI TASK ORDER: 160605-2
SwRI SRR: 57710
SDG: 598447
VTSR: 05.31.2016

Balance and DI Water Verification Logs

Southwest Research Institute®
Division 01, Building 70
Inorganic's Balance Verification Log

010128

Book I.D.: 15-0406-042

Balance Number	Asset Number	Manufacturer	Model Number	Location	Number of Places	Maximum Weight
88	014981	Mettler Toledo	XS205	Lab 47	4th 5th	220 g 81 g

Date	Operator	Std Wt. 200 g AN # 011988 Tolerance: 199.9800-200.0200 g Recorded Wt. (mg)	Std Wt. 2 g AN # 020641 Tolerance: 1.99980-2.00020 g Recorded Wt. (mg)	Std Wt. 0.02 g AN # 012685 Tolerance: 0.01995-0.02005 g Recorded Wt. (mg)
5/4/16	JCU	200.0001	1.99999	0.01999
5-5-16	JK	200.0000	② 2.00016	0.02001
5-6-16	JK	199.9996	② 2.00002	0.02001
5-8-16	JK	199.9999	② 2.00002	0.02004
5-9-16	KE	199.9999	① 1.99997	0.02001
5-10-16	JK	199.9998	① 2.00008	0.02003
5-11-16	JK	199.9997	② 2.00002	0.02000
5-12-16	KE	199.9998	1.99999	0.02002
5-13-16	KE	199.9999	1.99999	0.01998
5-14-16	DM	199.9998	1.99996	0.02000
5-15-16	KE	199.9997	1.99991	0.01999
5-16-16	KE	199.9998	1.99998	0.01998
5-17-16	KE	199.9998	1.99996	0.01999
5-18-16	KE	199.9997	1.99998	0.02000
5-19-16	KE	199.9998	1.99991	0.02002
5-20-16	JK	199.9999	2.00002	0.02003
5-21-16	JK	199.9998	1.99999	0.02004
5-22-16	JK	199.9998	2.00004	0.02004
5-23-16	JK	200.0003	1.99999	0.02001
5/24/16	JCU	199.9998 KE 5/25/16	2.00000	0.02003
5/25/16	KE	199.99999	1.99999	0.20000
5/26/16	JCU	200.0001	1.99997	0.02001

Comments: ① KE 5-9-16 (TE) K USED 2g WEIGHT SN 1022033133 ID 011999
② 020641 is back. 5-11-16 KE

Southwest Research Institute®
Division 01, Building 70
Inorganic's Balance Verification Log

010129

Book I.D.: 15-0406-042

Balance Number	Asset Number	Manufacturer	Model Number	Location	Number of Places	Maximum Weight
88	014981	Mettler Toledo	XS205	Lab 47	4th 5th	220 g 81 g

Date	Operator	Std Wt. 200 g AN # 011988 Tolerance: 199.9800-200.0200 g Recorded Wt. (mg)	Std Wt. 2 g AN # 020641 Tolerance: 1.99980-2.00020 g Recorded Wt. (mg)	Std Wt. 0.02 g AN # 012685 Tolerance: 0.01995-0.02005 g Recorded Wt. (mg)
5/27/16	SAM	199.9999	1.99999	0.02001
~~5-28~~		~~JK 5-27-16~~		
5-29-16	JK	200.0020	2.00002 KE 5/31/16	① 0.02003
5/31/16	L-P	200.0001	1.99997 5/31/16	TE ① 0.02004
6-1-16	JK	199.9998	2.00001	① 0.02003
6-2-16	JK	199.9995	2.00000	① 0.01999
6-3-16	KE	199.9997	1.99998	② 0.02002
6-4-16	JK	200.0000	2.00002	② 0.02000
6-5-16	JK	200.0001	2.00003	② 0.02000
6-6-16	JK	199.9999	1.99998	② 0.01999
6/7/16	JGH	200.0000	1.99999	0.02002
6-8-16	JK	199.9996	1.99996	② 0.01999
6-9-16	JK	199.9998	2.00006	② 0.02002
6-10-16	KE	199.9998	1.99999	② 0.02001
6-13-16 KE 6/14/16	KE	199.9998	2.00002	② 0.01998
6-14-16	KE	199.9998	2.00001	② 0.01999
6-15-16	JK	199.9995	2.00001	② 0.01997
6-16-16	JK	199.9996	1.99999	② 0.02001
6-17-16	JK	199.9995	2.00001	② 0.02000
6-20-16	KE	199.9997	2.00000	② 0.02001
6-21-16	KE	200.0000	1.99997 ②	~~0.02002~~ KE 6/21/16 0.02002
6-22-16	KE	200.0004	1.99999	② 0.01997

⑤ 5/31/16 TE

Comments: ⚠ : USED WT. I.D. 013790 (20mg) JK
② wt. is back # 12685.

Southwest Research Institute®
Division 01, Building 70
Inorganic's Balance Verification Log

010130

Book I.D.: 15-0406-055

Balance Number	Asset Number	Manufacturer	Serial Number	Location	Number of Places	Maximum Weight
135	020014	Mettler Toledo	B338797310	Lab 47	4th 5th	220 g 81 g

Date	Operator	Std Wt. 200 g AN # 011988 Tolerance: 199.9800-200.0200 g Recorded Wt. (mg)	Std Wt. 2 g AN # 020641 Tolerance: 1.99980-2.00020 g Recorded Wt. (mg)	Std Wt. 0.02 g AN # 012685 Tolerance: 0.01995-0.02005 g Recorded Wt. (mg)
5/14/16	JT	199.9998	1.99997	0.01998
5/16/16	VF	199.9999	1.99997	0.01997
5/17/16	JAM	199.9994	1.99997	0.02002
5/18/16	MG	200.0002	1.99999	0.02001
5/19/16	MG	199.9998	2.00001	0.01999
5/20/16	JAM	200.0000	2.00001	0.02000
5/22/16	JCM	199.9993	1.99999	0.02000
5/23/16	MG	200.0000	1.99999	0.01999
5/24/16	JAM	199.9994	2.00000	0.02001
5/25/16	JAM	199.9996	2.00001	0.01999
5/26/16	JAM	200.0000	1.99999	0.02002
5/27/16	JAM	199.9996	2.00002	0.01999
5/28/16	JAM	199.9998	2.00000	① 0.02003
5/29/16	JAM	199.9996	1.99999	① 0.01999
5/31/16	JCM	199.9996	1.99999	① 0.01999
6/1/16	JAM	199.9995	1.99994	① 0.01999
6/2/16	JCM	200.0000	2.00005	0.01999
6/3/16	JAM	199.9998	1.99999	0.02000
6/6/16	MG	199.9999	1.99996	0.01999
6/7/16	JAM	199.9998	1.99999	0.01998
6/8/16	JCM	199.9993	1.99997	0.01997
6/9/16	JCM	199.9991	1.99996	0.01999

Comments: ① wgt out for calibration use ID# 013790 20mg wgt

Southwest Research Institute®
Division 01, Building 70
Inorganic's Balance Verification Log

010131

Book I.D.: 15-0406-055

Balance Number	Asset Number	Manufacturer	Serial Number	Location	Number of Places	Maximum Weight
135	020014	Mettler Toledo	B338797310	Lab 47	4th 5th	220 g 81 g

Date	Operator	Std Wt. 200 g AN # 011988 Tolerance: 199.9800-200.0200 g Recorded Wt. (mg)	Std Wt. 2 g AN # 020641 Tolerance: 1.99980-2.00020 g Recorded Wt. (mg)	Std Wt. 0.02 g AN # 012685 Tolerance: 0.01995-0.02005 g Recorded Wt. (mg)
6/10/16	JCM	199.9998	2.00003	0.01995
6/13/16	SAM	199.9996	1.99996	0.02001
6/14/16	SAM	199.9998	1.99999	0.02003
6/15/16	SAM	199.9996	1.99997	0.01999
6/16/16	[illegible]	199.9998	2.00013	0.02002
6-17-16	KE	199.9998	2.00000	0.02001
6-19-16	SAM	199.9997	1.99998	0.02000
6-20-16	KE	199.9994	2.00005	0.01998
6/21/16	SAM	199.9997	1.99998	0.01997
6-22-16	KE	199.9997	1.99996	0.01996
6-23-16	KE	199.9996	1.99995	0.01998
6-24-16	KE	199.9996	1.99996	0.01997

Comments:

Southwest Research Institute®
Division 01, Building 70
Inorganic's Balance Verification Log

010132

Book ID #: 16-0406-010

Balance Number	Asset Number	Manufacturer	Model Number	Location	Number of Places	Maximum Weight
34	005260	Mettler	AG 245	Lab 26	4th 5th	210 g 41 g

Date	Operator	Asset# 015142 Std Wt. 200 g Tolerance: 199.9800-200.02000 g Recorded Wt. (g)	Asset# 015144 Std Wt. 2 g Tolerance: 1.99980-2.00020 g Recorded Wt. (g)	Asset# 015143 Std Wt. 0.02 g Tolerance: 0.01995-0.02005 g Recorded Wt. (g)
3/8/16	MG	199.9963	1.99997	0.01995
3/15/16	JCM	199.9988	1.999991	0.01999
4/21/16	MG	200.0003	1.99997	0.01998
4/25/16	SAM	199.9999	1.999993	0.02001
4/26/16	SAM	199.9994	1.999995	0.01998
4/27/16	SAM	199.9996	1.99996	0.01998
5/11/16	SAM	200.0022	1.99984	0.02001
6/9/16	JCM	200.0046	1.99999	0.01997
6/12/16	SAM	200.0037	2.00007	0.02002
6/15/16	SAM	200.0044	2.00006	0.02001
12/23/16	MG	200.0054	2.00006	0.01999

Comments:

D.I. WATER SYSTEM NOTEBOOK 010133
SOUTHWEST RESEARCH INSTITUTE
BUILDING 70

Contact Envoqua Water Technologies (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

HIGH PURITY SYSTEM (HP)

DATE / TIME	INITIALS	RESISTIVITY MONITOR (M OHMS)	RESISTIVITY MONITOR QC LT.	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
5/9/16 1735	DRmz	17.93	✓	✓	✓	n/a	✓
5/10/16 1801	DRmz	17.94	✓	✓	✓	n/a	✓
5/13/16 1810	DRmz	17.94	✓	✓	✓	n/a	✓
5/16/16 1715	DRmz	17.93	✓	✓	✓	n/a	✓
5/17/16 1930	DRmz	17.94	✓	✓	✓	n/a	✓
5/18/16 1801	DRmz	17.94	✓	✓	✓	n/a	✓
5/19/16 1805	DRmz	17.94	✓	✓	✓	n/a	✓
5/20/16 1650	DRmz	17.94	✓	✓	✓	n/a	✓
5/23/16 1807	DRmz	17.93	✓	✓	✓	n/a	✓
5/24/16 1811	DRmz	17.93	✓	✓	✓	n/a	✓
5/25/16 1747	DRmz	17.93	✓	✓	✓	n/a	✓
5/26/16 1800	DRmz	17.93	✓	✓	✓	n/a	✓
5/27/16 1547	DRmz	17.93	✓	✓	✓	n/a	✓
5/31/16 1657	DRmz	17.94	✓	✓	✓	n/a	✓
6/1/16 1801	DRmz	17.93	✓	X	✓	n/a	X-change needed ??
6/2/16 1710	DRmz	17.93	✓	X	✓	n/a	tank xchange needed

Legend: Check = Green (OK); X = Red (call for service)

LOW PURITY SYSTEM (LP)

DATE / TIME	INITIALS	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
5/9/16 1736	DRmz	✓	✓ 18.0	37407.4	✓
5/10/16 1802	DRmz	✓	✓ 18.0	37408.1	✓
5/13/16 1812	DRmz	✓	✓ 18.0	37411.8	✓
5/16/16 1716	DRmz	✓	✓ 18.0	37426.5	✓
5/17/16 1931	DRmz	✓	✓ 18.0	37427.6	✓
5/18/16 1803	DRmz	✓	✓ 18.0	37435.3	✓
5/19/16 1806	DRmz	✓	✓ 18.0	37446.7	✓
5/20/16 1451	DRmz	✓	✓ 18.0	37448.4	✓
5/23/16 1808	DRmz	✓	✓ 18.0	37462.1	✓
5/24/16 1812	DRmz	✓	✓ 18.0	37463.5	✓
5/25/16 1748	DRmz	✓	✓ 18.0	37464.6	✓
5/26/16 1821	DRmz	✓	✓ 18.0	37471.5	✓
5/27/16 1548	DRmz	✓	✓ 18.0	37473.0	✓
5/31/16 1657	DRmz	✓	✓ 18.0	37473.9	✓
6/1/16 1802	DRmz	✓	✓ 18.0	37476.7	✓
6/2/16 1711	DRmz	✓	✓ 18.0	37480.1	✓

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D.I. WATER SYSTEM NOTEBOOK
SOUTHWEST RESEARCH INSTITUTE
BUILDING 70

010134

Contact Envoqua Water Technologies (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

HIGH PURITY SYSTEM (HP)

DATE / TIME	INITIALS	RESISTIVITY MONITOR (M OHMS)	RESISTIVITY MONITOR QC LT.	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
6/3/16 1757	DRmz	17.94	✓	X	✓	n/a	TAIL PLATED
6/6/16 1806	DRmz	17.94	✓	X	✓	n/a	pending
6/7/16 1700	DRmz	17.93	✓	X	✓	n/a	pending
6/8/16 1702	DRmz	17.93	✓	X	✓	n/a	still pending
6/9/16 1728	DRmz	17.93	✓	X	✓	n/a	pending
6/10/16 1630	DRmz	17.93	✓	X	✓	n/a	PENDING EXCHANGE
6/13/16 1655	DRmz	17.93	—	✓	✓	n/a	MIXED BED TANK V-1 HANGS. ALL OK
6/14/16 1815	DRmz	17.93	✓	✓	—	n/a	✓
6/15/16 1817	DRmz	17.93	✓	✓	—	n/a	✓
6/16/16 1750	DRmz	17.93	✓	✓	✓	n/a	✓
6/17/16 1950	DRmz	17.93	—	—	✓	n/a	✓
6/20/16 1755	DRmz	17.94	✓	✓	—	n/a	✓
6/21/16 1735	DRmz	17.92	✓	✓	—	n/a	✓
6/22/16 1800	DRmz	17.93	✓	✓	—	n/a	✓
6/23/16 1751	DRmz	17.92	✓	—	—	n/a	✓

Legend: Check = Green (OK); X = Red (call for service)

LOW PURITY SYSTEM (LP)

DATE / TIME	INITIALS	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
6/3/16 1758	DRmz	✓	✓ 18.0	37482.2	—
6/6/16 1857	DRmz	✓	— 18.0	37484.3	—
6/7/16 1701	DRmz	✓	— 18.0	37489.2	✓
6/8/16 1703	DRmz	✓	— 18.0	37491.8	✓
6/9/16 1729	DRmz	✓	✓ 18.0	37492.6	✓
6/10/16 1631	DRmz	✓	✓ 18.0	37499.3	✓
6/13/16 1656	DRmz	✓	✓ 18.0	37501.4	✓
6/14/16 1816	DRmz	✓	✓ 18.0	37520.5	✓
6/15/16 1818	DRmz	✓	✓ 18.0	37521.3	✓
6/16/16 1751	DRmz	✓	✓ 18.0	37522.6	—
6/17/16 1951	DRmz	✓	✓ 18.0	37527.3	✓
6/20/16 1757	DRmz	✓	✓ 18.0	37530.8	—
6/21/16 1736	DRmz	✓	✓ 18.0	37538.4	✓
6/22/16 1801	DRmz	✓	✓ 18.0	37540.1	✓
6/23/16 1752	DRmz	✓	✓ 18.0	37541.4	✓

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