



OXY – STATE II-23 BATTERY

REMEDIATION PLAN

OXY will excavate the spill area as depicted on the following site diagram. Oxy will excavate the leak area to a depth of 2 feet or as practicable around the unknown (orphan) line. There is a concern around this line since no ownership has been identified and the condition of the line is unknown. Therefore, for safety reasons, conditions may alter the excavation around this line. Oxy will then place a 20 mil liner in the bottom of the excavation and backfill the entire excavation with clean top soil supplied by the Johnson's. During the course of the remediation, Oxy will have the flexibility to adjust the horizontal size of the of the leak area by utilizing the use of field screening for chlorides to guide the excavation edges. This information, if used, will be provided in the final report.

Oxy will add straw/hay to the top soil to assist in anchoring the top soil for erosion control due to winds primarily. The area will not be reseeded according to the Johnson's request. Natural seeding will be allowed.

All excavated materials will be disposed of at an NMOCD-approved disposal facility.



Groundwater Plot

Oxy State II-23 Battery

County
Lea

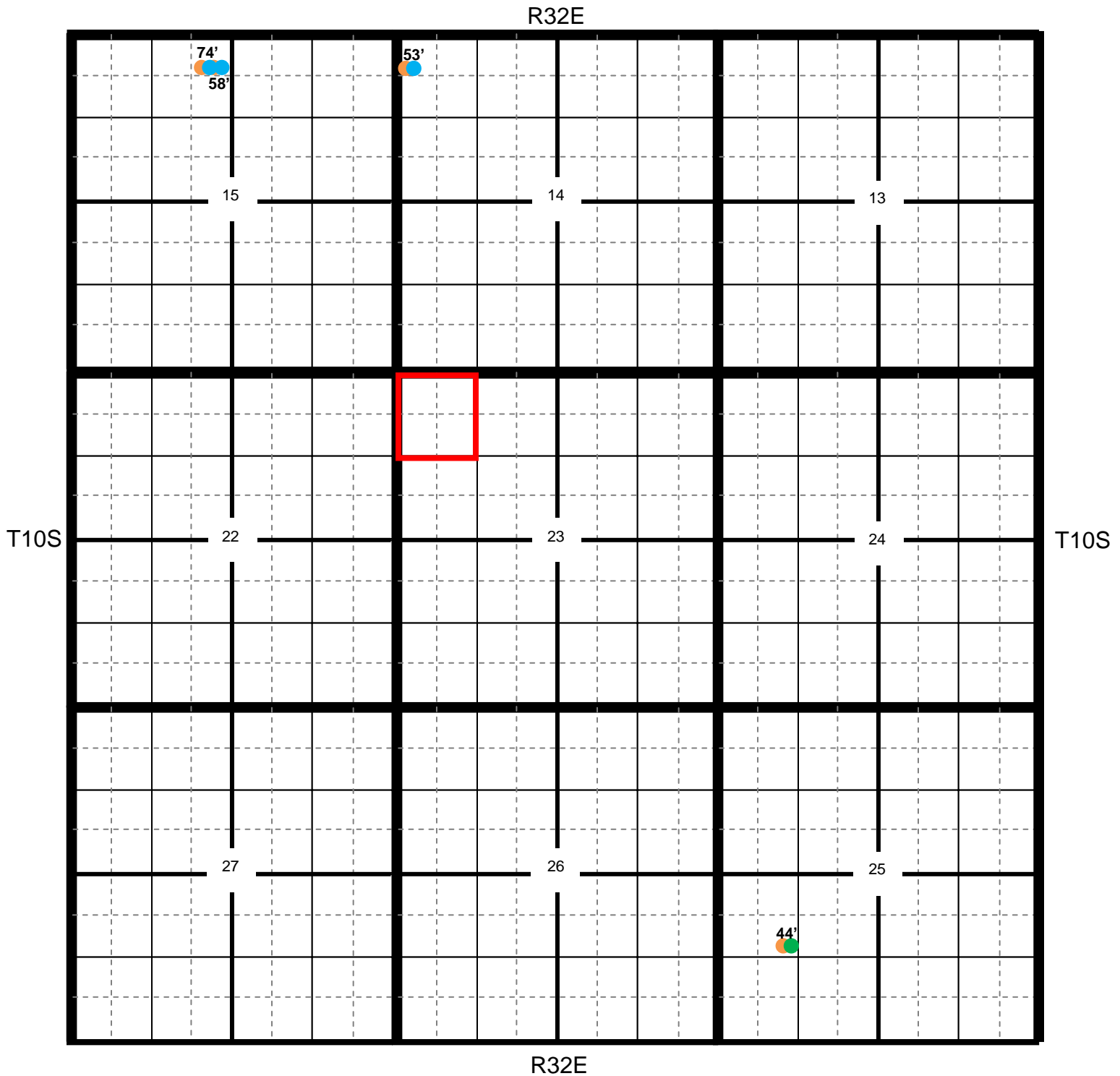
Unit Letter
D

Section
23

Township
10S

Range
32E

Trend Map <50'



Location

OCD

USGS

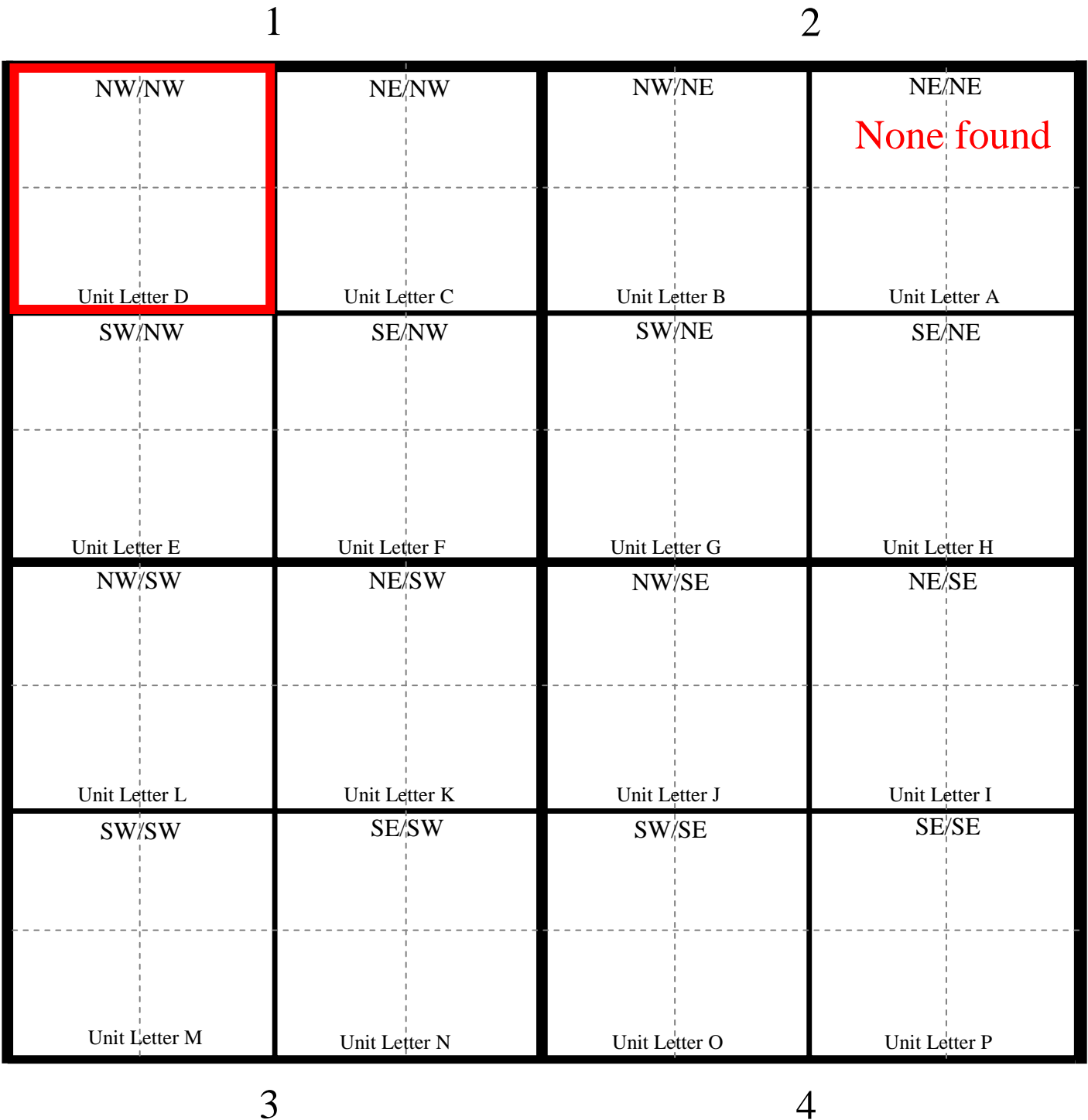
SEO

All Databases

Oxy State II-23 Battery

County	Unit Letter	Section	Township	Range
Lea	D	23	10S	32E

Trend Map <50'



Laboratory Analytical Results Summary
State II-23 Battery

		Sample	SP1 @ SURFACE	SP1 @ 1'	SP1 @ 2'	SP1 @ 3'
Analyte	Method	Date	2/5/16	2/5/16	2/5/16	2/5/16
			mg/Kg	mg/Kg	mg/Kg	mg/Kg
Benzene	BTEX 8021B		0.05	<0.050	<0.050	<0.050
Toluene	BTEX 8021B		<0.050	<0.050	<0.050	<0.050
Ethylbenzene	BTEX 8021B		<0.050	<0.050	<0.050	<0.050
Total Xylenes	BTEX 8021B		<0.150	<0.150	<0.150	<0.150
Total BTEX	BTEX 8021B		<0.300	<0.300	<0.300	<0.300
Chloride	SM4500Cl-B		86000	39600	20400	20400
GRO	TPH 8015M		<10.0	<10.0	<10.0	<10.0
DRO	TPH 8015M		<10.0	<10.0	<10.0	<10.0

		Sample	SP2 @ SURFACE	SP2 @ 1'	SP2 @ 2'	SP2 @ 3'
Analyte	Method	Date	2/5/16	2/5/16	2/5/16	2/5/16
			mg/Kg	mg/Kg	mg/Kg	mg/Kg
Benzene	BTEX 8021B		0.07	<0.050	<0.050	<0.050
Toluene	BTEX 8021B		0.07	<0.050	<0.050	<0.050
Ethylbenzene	BTEX 8021B		0.051	<0.050	<0.050	<0.050
Total Xylenes	BTEX 8021B		<0.150	<0.150	<0.150	<0.150
Total BTEX	BTEX 8021B		<0.300	<0.300	<0.300	<0.300
Chloride	SM4500Cl-B		122000	22400	21600	13500
GRO	TPH 8015M		<10.0	<10.0	<10.0	<10.0
DRO	TPH 8015M		<10.0	<10.0	<10.0	<10.0

		Sample	SP3 @ SURFACE	SP3 @ 1'	SP3 @ 2'	SP3 @ 3'
Analyte	Method	Date	2/5/16	2/5/16	2/5/16	2/5/16
			mg/Kg	mg/Kg	mg/Kg	mg/Kg
Benzene	BTEX 8021B		<0.050	0.114	<0.050	<0.050
Toluene	BTEX 8021B		<0.050	0.093	<0.050	<0.050
Ethylbenzene	BTEX 8021B		<0.050	<0.050	<0.050	<0.050
Total Xylenes	BTEX 8021B		<0.150	<0.150	<0.150	<0.150
Total BTEX	BTEX 8021B		98600	30400	12500	4400
Chloride	SM4500Cl-B		<16.0	<16.0	<16.0	<16.0
GRO	TPH 8015M		<10.0	<10.0	<10.0	<10.0
DRO	TPH 8015M		<10.0	<10.0	<10.0	<10.0

**Laboratory Analytical Results Summary
State II-23 Battery**

		Sample	SP3A @ SURFACE	SP3A @ 1'	SP3A @ 2.5'	SP3A @ 3'
Analyte	Method	Date	2/17/16	2/17/16	2/17/16	2/17/16
			mg/Kg	mg/Kg	mg/Kg	mg/Kg
Chloride	SM4500CI-B		58400	3360	112	1010

		Sample	SP5 @ SURFACE	SP5 @ 1'	SP5 @ 2'
Analyte	Method	Date	2/17/16	2/17/16	2/17/16
			mg/Kg	mg/Kg	mg/Kg
Chloride	SM4500CI-B		112	<16.0	176

		Sample	SP7 @ SURFACE	SP7 @ 1'
Analyte	Method	Date	2/17/16	2/17/16
			mg/Kg	mg/Kg
Chloride	SM4500CI-B		80	<16.0

		Sample	SP9 @ SURFACE	SP9 @ 2'
Analyte	Method	Date	2/18/16	2/18/16
			mg/Kg	mg/Kg
Chloride	SM4500CI-B		272	128

		Sample	SP11 @ SURFACE	SP11 @ 2'	SP11 @ 2.5'
Analyte	Method	Date	2/18/16	2/18/16	2/18/16
			mg/Kg	mg/Kg	mg/Kg
Chloride	SM4500CI-B		896	384	160

		Sample	SP12 @ SURFACE	SP12 @ 2'	SP12 @ 2.5'
Analyte	Method	Date	2/18/16	2/18/16	2/18/16
			mg/Kg	mg/Kg	mg/Kg
Chloride	SM4500CI-B		32000	144	160

		Sample	SP13 @ SURFACE	SP13 @ 1'	SP13 @ 2'
Analyte	Method	Date	2/18/16	2/18/16	2/18/16
			mg/Kg	mg/Kg	mg/Kg
Chloride	SM4500CI-B		80	1230	128

		Sample	SP18 @ SURFACE	SP18 @ 1'
Analyte	Method	Date	2/19/16	2/19/16
			mg/Kg	mg/Kg
Chloride	SM4500CI-B		80	48

		Sample	SP20 @ SURFACE	SP20 @ 1'
Analyte	Method	Date	2/19/16	2/19/16
			mg/Kg	mg/Kg
Chloride	SM4500CI-B		32	<16.0

		Sample	SP22 @ SURFACE	SP22 @ 1'
Analyte	Method	Date	2/19/16	2/19/16
			mg/Kg	mg/Kg
Chloride	SM4500CI-B		192	80

**Laboratory Analytical Results Summary
State II-23 Battery**

		Sample	SB1 @ 5'	SB1 @ 6'	SB1 @ 7'
Analyte	Method	Date	2/15/16	2/15/16	2/15/16
			mg/Kg	mg/Kg	mg/Kg
Chloride	SM4500Cl-B		464	144	112

		Sample	SB2 @ 5'	SB2 @ 8'	SB2 @ 11'	SB2 @ 15'	SB2 @ 18'	SB2 @ 20'	SB2 @ 25'	SB2 @ 27'	SB2 @ 28'
Analyte	Method	Date	2/15/16	2/15/16	2/15/16	2/15/16	2/15/16	2/15/16	2/15/16	2/15/16	2/15/16
			mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Chloride	SM4500Cl-B		11000	16600	17600	18400	10800	6400	912	160	32

		Sample	SB3 @ 5'	SB3 @ 8'	SB3 @ 11'	SB3 @ 15'	SB3 @ 18'	SB3 @ 20'	SB3 @ 21'
Analyte	Method	Date	2/16/16	2/16/16	2/16/16	2/16/16	2/16/16	2/16/16	2/16/16
			mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Chloride	SM4500Cl-B		22000	6260	13000	1840	256	48	192

February 08, 2016

Cliff Brunson

BBC International, Inc.

P.O. Box 805

Hobbs, NM 88241

RE: STATE II-23 BATTERY

Enclosed are the results of analyses for samples received by the laboratory on 02/05/16 17:10.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-15-7. Accreditation applies to drinking water, non-potable water and solid and chemical materials. All accredited analytes are denoted by an asterisk (*). For a complete list of accredited analytes and matrices visit the TCEQ website at www.tceq.texas.gov/field/qa/lab_accred_certif.html.

Cardinal Laboratories is accredited through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, V2, V3)

Accreditation applies to public drinking water matrices.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Celey D. Keene

Lab Director/Quality Manager

Analytical Results For:

BBC International, Inc.
Cliff Brunson
P.O. Box 805
Hobbs NM, 88241
Fax To: (575) 397-0397

Received:	02/05/2016	Sampling Date:	02/05/2016
Reported:	02/08/2016	Sampling Type:	Soil
Project Name:	STATE II-23 BATTERY	Sampling Condition:	** (See Notes)
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	TATUM, NM		

Sample ID: SP 1 @ SURFACE (H600271-01)

BTX 8021B		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	0.050	0.050	02/08/2016	ND	2.17	109	2.00	1.43	
Toluene*	<0.050	0.050	02/08/2016	ND	2.14	107	2.00	0.784	
Ethylbenzene*	<0.050	0.050	02/08/2016	ND	1.93	96.4	2.00	0.121	
Total Xylenes*	<0.150	0.150	02/08/2016	ND	5.94	99.0	6.00	0.168	
Total BTX	<0.300	0.300	02/08/2016	ND					

Surrogate: 4-Bromofluorobenzene (PID) 103 % 73.6-140

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	86000	16.0	02/08/2016	ND	416	104	400	3.77	

TPH 8015M		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	02/08/2016	ND	200	99.9	200	8.63	
DRO >C10-C28	<10.0	10.0	02/08/2016	ND	190	94.9	200	12.2	

Surrogate: 1-Chlorooctane 76.4 % 35-147

Surrogate: 1-Chlorooctadecane 83.7 % 28-171

Cardinal Laboratories

*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

BBC International, Inc.
Cliff Brunson
P.O. Box 805
Hobbs NM, 88241
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Received: 02/05/2016
Reported: 02/08/2016
Project Name: STATE II-23 BATTERY
Project Number: NONE GIVEN
Project Location: TATUM, NM

Sampling Date: 02/05/2016
Sampling Type: Soil
Sampling Condition: ** (See Notes)
Sample Received By: Jodi Henson

Sample ID: SP 1 @ 1' (H600271-02)

BTX 8021B		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	02/08/2016	ND	2.17	109	2.00	1.43	
Toluene*	<0.050	0.050	02/08/2016	ND	2.14	107	2.00	0.784	
Ethylbenzene*	<0.050	0.050	02/08/2016	ND	1.93	96.4	2.00	0.121	
Total Xylenes*	<0.150	0.150	02/08/2016	ND	5.94	99.0	6.00	0.168	
Total BTX	<0.300	0.300	02/08/2016	ND					

Surrogate: 4-Bromofluorobenzene (PID) 104 % 73.6-140

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	39600	16.0	02/08/2016	ND	416	104	400	3.77	

TPH 8015M		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	02/08/2016	ND	200	99.9	200	8.63	
DRO >C10-C28	<10.0	10.0	02/08/2016	ND	190	94.9	200	12.2	

Surrogate: 1-Chlorooctane 72.1 % 35-147

Surrogate: 1-Chlorooctadecane 77.6 % 28-171

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Analytical Results For:

 BBC International, Inc.
 Cliff Brunson
 P.O. Box 805
 Hobbs NM, 88241
 Fax To: (575) 397-0397

 Received: 02/05/2016
 Reported: 02/08/2016
 Project Name: STATE II-23 BATTERY
 Project Number: NONE GIVEN
 Project Location: TATUM, NM

 Sampling Date: 02/05/2016
 Sampling Type: Soil
 Sampling Condition: ** (See Notes)
 Sample Received By: Jodi Henson

Sample ID: SP 1 @ 2' (H600271-03)

BTEx 8021B		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	02/08/2016	ND	2.17	109	2.00	1.43	
Toluene*	<0.050	0.050	02/08/2016	ND	2.14	107	2.00	0.784	
Ethylbenzene*	<0.050	0.050	02/08/2016	ND	1.93	96.4	2.00	0.121	
Total Xylenes*	<0.150	0.150	02/08/2016	ND	5.94	99.0	6.00	0.168	
Total BTEx	<0.300	0.300	02/08/2016	ND					

Surrogate: 4-Bromofluorobenzene (PID) 103 % 73.6-140

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	20400	16.0	02/08/2016	ND	416	104	400	3.77	

TPH 8015M		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	02/08/2016	ND	200	99.9	200	8.63	
DRO >C10-C28	<10.0	10.0	02/08/2016	ND	190	94.9	200	12.2	

Surrogate: 1-Chlorooctane 83.4 % 35-147

Surrogate: 1-Chlorooctadecane 91.6 % 28-171

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* = Accredited Analyte

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Received: 02/05/2016
Reported: 02/08/2016
Project Name: STATE II-23 BATTERY
Project Number: NONE GIVEN
Project Location: TATUM, NM

Sampling Date: 02/05/2016
Sampling Type: Soil
Sampling Condition: ** (See Notes)
Sample Received By: Jodi Henson

Sample ID: SP 1 @ 3' (H600271-04)

BTX 8021B		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	02/08/2016	ND	2.17	109	2.00	1.43	
Toluene*	<0.050	0.050	02/08/2016	ND	2.14	107	2.00	0.784	
Ethylbenzene*	<0.050	0.050	02/08/2016	ND	1.93	96.4	2.00	0.121	
Total Xylenes*	<0.150	0.150	02/08/2016	ND	5.94	99.0	6.00	0.168	
Total BTX	<0.300	0.300	02/08/2016	ND					

Surrogate: 4-Bromofluorobenzene (PID) 103 % 73.6-140

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	20400	16.0	02/08/2016	ND	416	104	400	3.77	

TPH 8015M		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	02/08/2016	ND	200	99.9	200	8.63	
DRO >C10-C28	<10.0	10.0	02/08/2016	ND	190	94.9	200	12.2	

Surrogate: 1-Chlorooctane 83.8 % 35-147

Surrogate: 1-Chlorooctadecane 89.6 % 28-171

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Fax To: (575) 397-0397

Received: 02/05/2016
Reported: 02/08/2016
Project Name: STATE II-23 BATTERY
Project Number: NONE GIVEN
Project Location: TATUM, NM

Sampling Date: 02/05/2016
Sampling Type: Soil
Sampling Condition: ** (See Notes)
Sample Received By: Jodi Henson

Sample ID: SP 2 @ SURFACE (H600271-05)

BTEx 8021B		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	0.070	0.050	02/08/2016	ND	2.17	109	2.00	1.43	
Toluene*	0.070	0.050	02/08/2016	ND	2.14	107	2.00	0.784	
Ethylbenzene*	0.051	0.050	02/08/2016	ND	1.93	96.4	2.00	0.121	
Total Xylenes*	<0.150	0.150	02/08/2016	ND	5.94	99.0	6.00	0.168	
Total BTEx	<0.300	0.300	02/08/2016	ND					

Surrogate: 4-Bromofluorobenzene (PID) 105 % 73.6-140

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	122000	16.0	02/08/2016	ND	416	104	400	3.77	

TPH 8015M		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	02/08/2016	ND	200	99.9	200	8.63	
DRO >C10-C28	<10.0	10.0	02/08/2016	ND	190	94.9	200	12.2	

Surrogate: 1-Chlorooctane 83.2 % 35-147

Surrogate: 1-Chlorooctadecane 92.0 % 28-171

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

BBC International, Inc.
Cliff Brunson
P.O. Box 805
Hobbs NM, 88241
Fax To: (575) 397-0397

Received: 02/05/2016
Reported: 02/08/2016
Project Name: STATE II-23 BATTERY
Project Number: NONE GIVEN
Project Location: TATUM, NM

Sampling Date: 02/05/2016
Sampling Type: Soil
Sampling Condition: ** (See Notes)
Sample Received By: Jodi Henson

Sample ID: SP 2 @ 1' (H600271-06)

BTX 8021B		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	02/08/2016	ND	2.17	109	2.00	1.43	
Toluene*	<0.050	0.050	02/08/2016	ND	2.14	107	2.00	0.784	
Ethylbenzene*	<0.050	0.050	02/08/2016	ND	1.93	96.4	2.00	0.121	
Total Xylenes*	<0.150	0.150	02/08/2016	ND	5.94	99.0	6.00	0.168	
Total BTX	<0.300	0.300	02/08/2016	ND					

Surrogate: 4-Bromofluorobenzene (PID) 104 % 73.6-140

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	22400	16.0	02/08/2016	ND	416	104	400	3.77	

TPH 8015M		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	02/08/2016	ND	200	99.9	200	8.63	
DRO >C10-C28	<10.0	10.0	02/08/2016	ND	190	94.9	200	12.2	

Surrogate: 1-Chlorooctane 78.9 % 35-147

Surrogate: 1-Chlorooctadecane 84.7 % 28-171

Cardinal Laboratories

*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

BBC International, Inc.
Cliff Brunson
P.O. Box 805
Hobbs NM, 88241
Fax To: (575) 397-0397

Received: 02/05/2016
Reported: 02/08/2016
Project Name: STATE II-23 BATTERY
Project Number: NONE GIVEN
Project Location: TATUM, NM

Sampling Date: 02/05/2016
Sampling Type: Soil
Sampling Condition: ** (See Notes)
Sample Received By: Jodi Henson

Sample ID: SP 2 @ 2' (H600271-07)

BTX 8021B		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	02/08/2016	ND	2.17	109	2.00	1.43	
Toluene*	<0.050	0.050	02/08/2016	ND	2.14	107	2.00	0.784	
Ethylbenzene*	<0.050	0.050	02/08/2016	ND	1.93	96.4	2.00	0.121	
Total Xylenes*	<0.150	0.150	02/08/2016	ND	5.94	99.0	6.00	0.168	
Total BTX	<0.300	0.300	02/08/2016	ND					

Surrogate: 4-Bromofluorobenzene (PID) 104 % 73.6-140

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	21600	16.0	02/08/2016	ND	416	104	400	3.77	

TPH 8015M		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	02/08/2016	ND	200	99.9	200	8.63	
DRO >C10-C28	<10.0	10.0	02/08/2016	ND	190	94.9	200	12.2	

Surrogate: 1-Chlorooctane 83.5 % 35-147

Surrogate: 1-Chlorooctadecane 91.9 % 28-171

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

BBC International, Inc.
Cliff Brunson
P.O. Box 805
Hobbs NM, 88241
Fax To: (575) 397-0397

Received: 02/05/2016
Reported: 02/08/2016
Project Name: STATE II-23 BATTERY
Project Number: NONE GIVEN
Project Location: TATUM, NM

Sampling Date: 02/05/2016
Sampling Type: Soil
Sampling Condition: ** (See Notes)
Sample Received By: Jodi Henson

Sample ID: SP 2 @ 3' (H600271-08)

BTX 8021B		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	02/08/2016	ND	2.17	109	2.00	1.43	
Toluene*	<0.050	0.050	02/08/2016	ND	2.14	107	2.00	0.784	
Ethylbenzene*	<0.050	0.050	02/08/2016	ND	1.93	96.4	2.00	0.121	
Total Xylenes*	<0.150	0.150	02/08/2016	ND	5.94	99.0	6.00	0.168	
Total BTX	<0.300	0.300	02/08/2016	ND					

Surrogate: 4-Bromofluorobenzene (PID) 104 % 73.6-140

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	13500	16.0	02/08/2016	ND	416	104	400	3.77	

TPH 8015M		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	02/08/2016	ND	200	99.9	200	8.63	
DRO >C10-C28	<10.0	10.0	02/08/2016	ND	190	94.9	200	12.2	

Surrogate: 1-Chlorooctane 83.4 % 35-147

Surrogate: 1-Chlorooctadecane 89.4 % 28-171

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

BBC International, Inc.
Cliff Brunson
P.O. Box 805
Hobbs NM, 88241
Fax To: (575) 397-0397

Received: 02/05/2016
Reported: 02/08/2016
Project Name: STATE II-23 BATTERY
Project Number: NONE GIVEN
Project Location: TATUM, NM

Sampling Date: 02/05/2016
Sampling Type: Soil
Sampling Condition: ** (See Notes)
Sample Received By: Jodi Henson

Sample ID: SP 3 @ SURFACE (H600271-09)

BTX 8021B		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	02/08/2016	ND	2.17	109	2.00	1.43	
Toluene*	<0.050	0.050	02/08/2016	ND	2.14	107	2.00	0.784	
Ethylbenzene*	<0.050	0.050	02/08/2016	ND	1.93	96.4	2.00	0.121	
Total Xylenes*	<0.150	0.150	02/08/2016	ND	5.94	99.0	6.00	0.168	
Total BTX	<0.300	0.300	02/08/2016	ND					

Surrogate: 4-Bromofluorobenzene (PID) 102 % 73.6-140

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	98600	16.0	02/08/2016	ND	416	104	400	3.77	

TPH 8015M		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	02/08/2016	ND	200	99.9	200	8.63	
DRO >C10-C28	<10.0	10.0	02/08/2016	ND	190	94.9	200	12.2	

Surrogate: 1-Chlorooctane 80.3 % 35-147

Surrogate: 1-Chlorooctadecane 87.7 % 28-171

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

BBC International, Inc.
Cliff Brunson
P.O. Box 805
Hobbs NM, 88241
Fax To: (575) 397-0397

Received: 02/05/2016
Reported: 02/08/2016
Project Name: STATE II-23 BATTERY
Project Number: NONE GIVEN
Project Location: TATUM, NM

Sampling Date: 02/05/2016
Sampling Type: Soil
Sampling Condition: ** (See Notes)
Sample Received By: Jodi Henson

Sample ID: SP 3 @ 1' (H600271-10)

BTX 8021B		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	0.114	0.050	02/08/2016	ND	2.17	109	2.00	1.43	
Toluene*	0.093	0.050	02/08/2016	ND	2.14	107	2.00	0.784	
Ethylbenzene*	<0.050	0.050	02/08/2016	ND	1.93	96.4	2.00	0.121	
Total Xylenes*	<0.150	0.150	02/08/2016	ND	5.94	99.0	6.00	0.168	
Total BTX	<0.300	0.300	02/08/2016	ND					

Surrogate: 4-Bromofluorobenzene (PID) 105 % 73.6-140

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	30400	16.0	02/08/2016	ND	416	104	400	3.77	

TPH 8015M		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	02/08/2016	ND	200	99.9	200	8.63	
DRO >C10-C28	<10.0	10.0	02/08/2016	ND	190	94.9	200	12.2	

Surrogate: 1-Chlorooctane 84.2 % 35-147

Surrogate: 1-Chlorooctadecane 94.5 % 28-171

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

BBC International, Inc.
Cliff Brunson
P.O. Box 805
Hobbs NM, 88241
Fax To: (575) 397-0397

Received: 02/05/2016
Reported: 02/08/2016
Project Name: STATE II-23 BATTERY
Project Number: NONE GIVEN
Project Location: TATUM, NM

Sampling Date: 02/05/2016
Sampling Type: Soil
Sampling Condition: ** (See Notes)
Sample Received By: Jodi Henson

Sample ID: SP 3 @ 2' (H600271-11)

BTX 8021B		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	02/08/2016	ND	2.17	109	2.00	1.43	
Toluene*	<0.050	0.050	02/08/2016	ND	2.14	107	2.00	0.784	
Ethylbenzene*	<0.050	0.050	02/08/2016	ND	1.93	96.4	2.00	0.121	
Total Xylenes*	<0.150	0.150	02/08/2016	ND	5.94	99.0	6.00	0.168	
Total BTX	<0.300	0.300	02/08/2016	ND					

Surrogate: 4-Bromofluorobenzene (PID) 105 % 73.6-140

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	12500	16.0	02/08/2016	ND	416	104	400	3.77	

TPH 8015M		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	02/08/2016	ND	200	99.9	200	8.63	
DRO >C10-C28	<10.0	10.0	02/08/2016	ND	190	94.9	200	12.2	

Surrogate: 1-Chlorooctane 79.3 % 35-147

Surrogate: 1-Chlorooctadecane 85.6 % 28-171

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

BBC International, Inc.
Cliff Brunson
P.O. Box 805
Hobbs NM, 88241
Fax To: (575) 397-0397

Received: 02/05/2016
Reported: 02/08/2016
Project Name: STATE II-23 BATTERY
Project Number: NONE GIVEN
Project Location: TATUM, NM

Sampling Date: 02/05/2016
Sampling Type: Soil
Sampling Condition: ** (See Notes)
Sample Received By: Jodi Henson

Sample ID: SP 3 @ 3' (H600271-12)

BTX 8021B		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.050	0.050	02/08/2016	ND	2.17	109	2.00	1.43	
Toluene*	<0.050	0.050	02/08/2016	ND	2.14	107	2.00	0.784	
Ethylbenzene*	<0.050	0.050	02/08/2016	ND	1.93	96.4	2.00	0.121	
Total Xylenes*	<0.150	0.150	02/08/2016	ND	5.94	99.0	6.00	0.168	
Total BTX	<0.300	0.300	02/08/2016	ND					

Surrogate: 4-Bromofluorobenzene (PID) 105 % 73.6-140

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	4400	16.0	02/08/2016	ND	416	104	400	3.77	

TPH 8015M		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	02/08/2016	ND	200	99.9	200	8.63	
DRO >C10-C28	<10.0	10.0	02/08/2016	ND	190	94.9	200	12.2	

Surrogate: 1-Chlorooctane 81.5 % 35-147

Surrogate: 1-Chlorooctadecane 87.6 % 28-171

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Celey D. Keene, Lab Director/Quality Manager

Notes and Definitions

ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C Samples reported on an as received basis (wet) unless otherwise noted on report

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Celey D. Keene, Lab Director/Quality Manager



ARDINAL LABORATORIES

101 East Marland, Hobbs, NM 88240
(505) 393-2326 FAX (505) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

BILL TO

ANALYSIS REQUEST

Company Name: BBC International, Inc.

Project Manager: Cliff Brunson

Address: P.O. Box 805

City: Hobbs

Phone #: 575-397-6388

Project #:

Project Name: State II-23 Bldg

Project Location: Hobbs

Sampler Name: Jeff Daniels

FOR LAB USE ONLY

Lab I.D.

Sample I.D.

H000271

1

SP1034

(G)RAB OR (C)OMP.

CONTAINERS

GROUNDWATER

WASTEWATER

SOIL

OIL

SLUDGE

OTHER :

ACID/BASE:

ICE / COOL

OTHER :

DATE

TIME

8:50

9:37

10:00

10:45

11:00

11:00

11:44

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Relinquished By:

Date:

Time:

Received By:

Date:

Time:

Relinquished By:

Date:

Time:

Received By:

Date:

Time:

Relinquished By:

Date:

Time:

Received By:

Date:

Time:

Relinquished By:

Date:

Time:

Received By:

Date:

Time:

Relinquished By:

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Received By:

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Relinquished By:

Date:

Time:

Received By:

Date:

Time:

Relinquished By:

Date:

Time:

Received By:

Date:

Time:

Relinquished By:

Date:

Time:

Received By:

Date:

Time:

Delivered By: (Circle One)

Sampler - UPS - Bus - Other:

17.60

Sample Condition
Cool ☒ Intact ☒
Yes ☒ No ☒

CHECKED BY:
(Initials)

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476

#54



CARDINAL LABORATORIES

101 East Marland, Hobbs, NM 88240
(505) 393-2326 FAX (505) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

2/2

BILL TO

ANALYSIS REQUEST

Company Name: BBC International, Inc.

Project Manager: Cliff Brunson

Address: P.O. Box 805

City: Hobbs

Phone #: 575-397-6388

Project #:

Project Name:

Project Location:

Sampler Name:

P.O. #:

Company:

Attn:

Address:

City:

State: Zip:

Phone #:

Fax #:

FOR LAB USE ONLY

Lab I.D.

Sample I.D.

(G)RAB OR (C)OMP.

CONTAINERS

GROUNDWATER

WASTEWATER

SOIL

OIL

SLUDGE

OTHER :

ACID/BASE:

ICE / COOL

OTHER :

DATE

TIME

BTEX
TPH
Cl-

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Relinquished By:

Date: 2-5-16
Time: 5:10
Received By: Cliff Brunson

Relinquished By:

Date:

Time:

Delivered By: (Circle One)

Sampler - UPS - Bus - Other:

Sample Condition

CHECKED BY: (Initials)

Phone Result:

Fax Result:

REMARKS:

Yes No

Yes No

Yes No

Yes No

+ Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476



PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

February 24, 2016

Cliff Brunson

BBC International, Inc.

P.O. Box 805

Hobbs, NM 88241

RE: STATE II-23 BATTERY

Enclosed are the results of analyses for samples received by the laboratory on 02/22/16 14:30.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-15-7. Accreditation applies to drinking water, non-potable water and solid and chemical materials. All accredited analytes are denoted by an asterisk (*). For a complete list of accredited analytes and matrices visit the TCEQ website at www.tceq.texas.gov/field/qa/lab_accred_certif.html.

Cardinal Laboratories is accredited through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, V2, V3)

Accreditation applies to public drinking water matrices.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Celey D. Keene". The signature is written in a cursive style with a large, stylized 'C' and 'K'.

Celey D. Keene

Lab Director/Quality Manager

Analytical Results For:

BBC International, Inc.
Cliff Brunson
P.O. Box 805
Hobbs NM, 88241
Fax To: (575) 397-0397

Received: 02/22/2016
Reported: 02/24/2016
Project Name: STATE II-23 BATTERY
Project Number: NONE GIVEN
Project Location: TATUM, NM

Sampling Date: 02/17/2016
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SP 3A @ SURFACE (H600402-01)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	58400	16.0	02/23/2016	ND	416	104	400	0.00	

Sample ID: SP 3A @ 1' (H600402-02)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	3360	16.0	02/23/2016	ND	416	104	400	0.00	

Sample ID: SP 3A @ 2.5' (H600402-03)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	112	16.0	02/23/2016	ND	416	104	400	0.00	

Sample ID: SP 3A @ 3' (H600402-04)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	1010	16.0	02/23/2016	ND	416	104	400	0.00	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

 BBC International, Inc.
 Cliff Brunson
 P.O. Box 805
 Hobbs NM, 88241
 Fax To: (575) 397-0397

 Received: 02/22/2016
 Reported: 02/24/2016
 Project Name: STATE II-23 BATTERY
 Project Number: NONE GIVEN
 Project Location: TATUM, NM

 Sampling Date: 02/17/2016
 Sampling Type: Soil
 Sampling Condition: Cool & Intact
 Sample Received By: Jodi Henson

Sample ID: SP 5 @ SURFACE (H600402-05)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	112	16.0	02/23/2016	ND	416	104	400	0.00		

Sample ID: SP 5 @ 1' (H600402-06)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	<16.0	16.0	02/23/2016	ND	416	104	400	0.00		

Sample ID: SP 5 @ 2' (H600402-07)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	176	16.0	02/23/2016	ND	416	104	400	0.00		

Sample ID: SP 7 @ SURFACE (H600402-08)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	80.0	16.0	02/23/2016	ND	416	104	400	0.00	

Sample ID: SP 7 @ 1' (H600402-09)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	<16.0	16.0	02/23/2016	ND	416	104	400	0.00		

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

BBC International, Inc.
Cliff Brunson
P.O. Box 805
Hobbs NM, 88241
Fax To: (575) 397-0397

Received: 02/22/2016
Reported: 02/24/2016
Project Name: STATE II-23 BATTERY
Project Number: NONE GIVEN
Project Location: TATUM, NM

Sampling Date: 02/18/2016
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SP 9 @ SURFACE (H600402-10)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	272	16.0	02/23/2016	ND	416	104	400	0.00	

Sample ID: SP 9 @ 2' (H600402-11)

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	128	16.0	02/23/2016	ND	416	104	400	0.00	

Sample ID: SP 11 @ SURFACE (H600402-12)

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	896	16.0	02/23/2016	ND	416	104	400	0.00	

Sample ID: SP 11 @ 2' (H600402-13)

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	384	16.0	02/23/2016	ND	416	104	400	0.00	

Sample ID: SP 11 @ 2.5' (H600402-14)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	160	16.0	02/23/2016	ND	416	104	400	0.00	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

 BBC International, Inc.
 Cliff Brunson
 P.O. Box 805
 Hobbs NM, 88241
 Fax To: (575) 397-0397

 Received: 02/22/2016
 Reported: 02/24/2016
 Project Name: STATE II-23 BATTERY
 Project Number: NONE GIVEN
 Project Location: TATUM, NM

 Sampling Date: 02/18/2016
 Sampling Type: Soil
 Sampling Condition: Cool & Intact
 Sample Received By: Jodi Henson

Sample ID: SP 12 @ SURFACE (H600402-15)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	32000	16.0	02/23/2016	ND	416	104	400	0.00		

Sample ID: SP 12 @ 2' (H600402-16)

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	144	16.0	02/23/2016	ND	416	104	400	0.00	

Sample ID: SP 12 @ 2.5' (H600402-17)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	160	16.0	02/23/2016	ND	416	104	400	0.00		

Sample ID: SP 13 @ SURFACE (H600402-18)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	80.0	16.0	02/23/2016	ND	416	104	400	0.00	

Sample ID: SP 13 @ 1' (H600402-19)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	1230	16.0	02/23/2016	ND	448	112	400	3.64		

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

 BBC International, Inc.
 Cliff Brunson
 P.O. Box 805
 Hobbs NM, 88241
 Fax To: (575) 397-0397

Received:	02/22/2016	Sampling Date:	02/18/2016
Reported:	02/24/2016	Sampling Type:	Soil
Project Name:	STATE II-23 BATTERY	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	TATUM, NM		

Sample ID: SP 13 @ 2' (H600402-20)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	128	16.0	02/23/2016	ND	448	112	400	3.64		

Sample ID: SP 18 @ SURFACE (H600402-21)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	80.0	16.0	02/23/2016	ND	448	112	400	3.64	

Sample ID: SP 18 @ 1' (H600402-22)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	48.0	16.0	02/23/2016	ND	448	112	400	3.64	

Sample ID: SP 20 @ SURFACE (H600402-23)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	32.0	16.0	02/23/2016	ND	448	112	400	3.64	

Sample ID: SP 20 @ 1' (H600402-24)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	<16.0	16.0	02/23/2016	ND	448	112	400	3.64		

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

BBC International, Inc.
Cliff Brunson
P.O. Box 805
Hobbs NM, 88241
Fax To: (575) 397-0397

Received: 02/22/2016
Reported: 02/24/2016
Project Name: STATE II-23 BATTERY
Project Number: NONE GIVEN
Project Location: TATUM, NM

Sampling Date: 02/19/2016
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SP 22 @ SURFACE (H600402-25)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	192	16.0	02/23/2016	ND	448	112	400	3.64		

Sample ID: SP 22 @ 1' (H600402-26)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	80.0	16.0	02/23/2016	ND	448	112	400	3.64	

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Celey D. Keene, Lab Director/Quality Manager

Notes and Definitions

ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C Samples reported on an as received basis (wet) unless otherwise noted on report

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Celey D. Keene, Lab Director/Quality Manager



101 East Marland, Hobbs, NM 88240
(505) 393-2326 FAX (505) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Page 9 of 11

Company Name: BBC International, Inc.		P.O. #:		BILL TO		ANALYSIS REQUEST	
Project Manager: Cliff Brunson		Company:					
Address: P.O. Box 805		Attn:					
City: Hobbs		Address:					
Phone #: 575-397-6388		City:					
Fax #: 575-397-0397		State:					
Project #: 081		Zip:					
Project Name: State II - 23 Battery		Phone #:					
Project Location: Tatum Blvd		Fax #:					
Sample Name: 1st Drucker		PRESERV		SAMPLING			
FOR LAB USE ONLY		MATRIX					
Lab I.D.		Sample I.D.					
H000402		SP3+054					
1		G1					
2		G1					
3		G1					
4		G1					
5		G1					
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† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476

#54



CARDINAL LABORATORIES

101 East Marland, Hobbs, NM 88240
(505) 393-2326 FAX (505) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

3/3

BILL TO

ANALYSIS REQUEST

Company Name: BBC International, Inc.

Project Manager: Cliff Brunson

Address: P.O. Box 805

City: Hobbs

Phone #: 575-397-6388

Project #:

Project Name: State II-23 Battery

Project Location: West Creek

Sampler Name: Cliff Brunson

P.O. #:

Company:

Attn: Jimmy

Address:

City:

State:

Phone #:

Fax #:

FOR LAB USE ONLY

Lab I.D.

Sample I.D.

H000402

SP100514

(G)RAB OR (C)OMP.

CONTAINERS

GROUNDWATER

WASTEWATER

SOIL

OIL

SLUDGE

OTHER :

ACID/BASE:

ICE / COOL

OTHER :

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Relinquished By:

Cliff Brunson

Date: 10-16

Time: 3:00pm

Received By:

Cliff Brunson

Date: 10-16

Time: 3:00pm

Received By:

Cliff Brunson

Date: 10-16

Time: 3:00pm

Received By:

Cliff Brunson

Date: 10-16

Time: 3:00pm

Received By:

Cliff Brunson

Date: 10-16

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Date: 10-16

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Received By:

Cliff Brunson

Relinquished By:

Cliff Brunson

Date: 10-16

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Received By:

Cliff Brunson

Date: 10-16

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Cliff Brunson

Date: 10-16

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Cliff Brunson

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Cliff Brunson

Date: 10-16

Time: 3:00pm

Received By:

Cliff Brunson

Date: 10-16

Time: 3:00pm

Received By:

Cliff Brunson

Date: 10-16

Time: 3:00pm

Received By:

Cliff Brunson

Delivered By: (Circle One)

Sampler - UPS - Bus - Other:

Date: 10-16

Time: 3:00pm

Received By:

Cliff Brunson

Date: 10-16

Time: 3:00pm

Received By:

Cliff Brunson

Date: 10-16

Time: 3:00pm

Received By:

Cliff Brunson

Date: 10-16

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Cliff Brunson

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Received By:

Cliff Brunson

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Date: 10-16

Time: 3:00pm

Received By:

Cliff Brunson

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PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

February 23, 2016

Cliff Brunson

BBC International, Inc.

P.O. Box 805

Hobbs, NM 88241

RE: STATE II-23 BATTERY

Enclosed are the results of analyses for samples received by the laboratory on 02/17/16 16:30.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-15-7. Accreditation applies to drinking water, non-potable water and solid and chemical materials. All accredited analytes are denoted by an asterisk (*). For a complete list of accredited analytes and matrices visit the TCEQ website at www.tceq.texas.gov/field/qa/lab_accred_certif.html.

Cardinal Laboratories is accredited through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, V2, V3)

Accreditation applies to public drinking water matrices.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Celey D. Keene". The signature is written in a cursive, flowing style.

Celey D. Keene

Lab Director/Quality Manager

Analytical Results For:

BBC International, Inc.
Cliff Brunson
P.O. Box 805
Hobbs NM, 88241
Fax To: (575) 397-0397

Received: 02/17/2016
Reported: 02/23/2016
Project Name: STATE II-23 BATTERY
Project Number: NONE GIVEN
Project Location: TATUM, NM

Sampling Date: 02/15/2016
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SP 1 @ 5' (H600377-01)

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	464	16.0	02/22/2016	ND	448	112	400	11.3	

Sample ID: SP 1 @ 6' (H600377-02)

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	144	16.0	02/22/2016	ND	448	112	400	11.3	

Sample ID: SP 1 @ 7' (H600377-03)

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	112	16.0	02/22/2016	ND	448	112	400	11.3	

Sample ID: SP 2 @ 5' (H600377-04)

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	11000	16.0	02/22/2016	ND	448	112	400	11.3	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

BBC International, Inc.
Cliff Brunson
P.O. Box 805
Hobbs NM, 88241
Fax To: (575) 397-0397

Received: 02/17/2016
Reported: 02/23/2016
Project Name: STATE II-23 BATTERY
Project Number: NONE GIVEN
Project Location: TATUM, NM

Sampling Date: 02/15/2016
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SP 2 @ 8' (H600377-05)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	16600	16.0	02/22/2016	ND	448	112	400	11.3		

Sample ID: SP 2 @ 11' (H600377-06)

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	17600	16.0	02/22/2016	ND	448	112	400	11.3		

Sample ID: SP 2 @ 15' (H600377-07)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	18400	16.0	02/22/2016	ND	448	112	400	11.3	

Sample ID: SP 2 @ 18' (H600377-08)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	10800	16.0	02/22/2016	ND	448	112	400	11.3		

Sample ID: SP 2 @ 20' (H600377-09)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	6400	16.0	02/22/2016	ND	448	112	400	11.3		

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Analytical Results For:

 BBC International, Inc.
 Cliff Brunson
 P.O. Box 805
 Hobbs NM, 88241
 Fax To: (575) 397-0397

 Received: 02/17/2016
 Reported: 02/23/2016
 Project Name: STATE II-23 BATTERY
 Project Number: NONE GIVEN
 Project Location: TATUM, NM

 Sampling Date: 02/15/2016
 Sampling Type: Soil
 Sampling Condition: Cool & Intact
 Sample Received By: Jodi Henson

Sample ID: SP 2 @ 25' (H600377-10)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	912	16.0	02/22/2016	ND	448	112	400	11.3	

Sample ID: SP 2 @ 27' (H600377-11)

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	160	16.0	02/22/2016	ND	448	112	400	11.3	

Sample ID: SP 2 @ 28' (H600377-12)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	32.0	16.0	02/22/2016	ND	448	112	400	11.3	

Sample ID: SP 3 @ 5' (H600377-13)

Chloride, SM4500CI-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	22000	16.0	02/22/2016	ND	416	104	400	0.00	

Sample ID: SP 3 @ 8' (H600377-14)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	6260	16.0	02/22/2016	ND	416	104	400	0.00	

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

 BBC International, Inc.
 Cliff Brunson
 P.O. Box 805
 Hobbs NM, 88241
 Fax To: (575) 397-0397

 Received: 02/17/2016
 Reported: 02/23/2016
 Project Name: STATE II-23 BATTERY
 Project Number: NONE GIVEN
 Project Location: TATUM, NM

 Sampling Date: 02/16/2016
 Sampling Type: Soil
 Sampling Condition: Cool & Intact
 Sample Received By: Jodi Henson

Sample ID: SP 3 @ 11' (H600377-15)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	13000	16.0	02/22/2016	ND	416	104	400	0.00	

Sample ID: SP 3 @ 15' (H600377-16)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	1840	16.0	02/22/2016	ND	416	104	400	0.00	

Sample ID: SP 3 @ 18' (H600377-17)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	256	16.0	02/22/2016	ND	416	104	400	0.00	

Sample ID: SP 3 @ 20' (H600377-18)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	48.0	16.0	02/22/2016	ND	416	104	400	0.00	

Sample ID: SP 3 @ 21' (H600377-19)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	192	16.0	02/22/2016	ND	416	104	400	0.00	

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Celey D. Keene, Lab Director/Quality Manager

Notes and Definitions

ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C Samples reported on an as received basis (wet) unless otherwise noted on report

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Celey D. Keene, Lab Director/Quality Manager



CARDINAL LABORATORIES

101 East Marland, Hobbs, NM 88240
(505) 393-2326 FAX (505) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

2 of 2

Company Name: BBC International, Inc.

Project Manager: Cliff Brunson

Address: P.O. Box 805

City: Hobbs

Phone #: 575-397-6388

Project #:

Project Name: State II 23 Hwy

Project Location:

Sample Name: Jeff Onnelas

FOR LAB USE ONLY

Lab I.D.

Sample I.D.

HL0037

Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX					PRESERV.	SAMPLING	ANALYSIS REQUEST									
				GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :											
11	SB 2 @ 27'	G	1																	
12	SB 2 @ 28'	G	1																	
13	SB 3 @ 5'	G	1																	
14	SB 3 @ 8'	G	1																	
15	SB 3 @ 11'	G	1																	
16	SB 3 @ 15'	G	1																	
17	SB 3 @ 18'	G	1																	
18	SB 3 @ 20'	G	1																	
19	SB 3 @ 21'	G	1																	

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Relinquished By:

Date: 2/17/16

Time: 1:30

Received By:

Date: 2/17/16

Time: 1:30

Sample Condition

Cool ☐ Intact ☐

Yes ☐ No ☐

REMARKS:

Phone Result: ☐ Yes ☐ No ☐

Fax Result: ☐ Yes ☐ No ☐

Relinquished By: Jeff Onnelas

Date: 2/17/16

Time: 1:30

Received By: Jeff Onnelas

Date: 2/17/16

Time: 1:30

Sample Condition

Cool ☐ Intact ☐

Yes ☐ No ☐

REMARKS:

Phone Result: ☐ Yes ☐ No ☐

Fax Result: ☐ Yes ☐ No ☐

Delivered By: (Circle One)

Date: 2/17/16

Time: 1:30

Received By: Jeff Onnelas

Date: 2/17/16

Time: 1:30

Sample Condition

Cool ☐ Intact ☐

Yes ☐ No ☐

REMARKS:

Phone Result: ☐ Yes ☐ No ☐

Fax Result: ☐ Yes ☐ No ☐

Sampler - UPS - Bus - Other:

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476

#54

District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-141
Revised August 8, 2011

Submit 1 Copy to appropriate District Office in
accordance with 19.15.29 NMAC.

Release Notification and Corrective Action

OPERATOR

☒ Initial Report ☐ Final Report

Name of Company	Oxy Permian Ltd.	Contact	Casey Summers
Address	6 Desta Drive, Midland, TX 79705	Telephone No.	(575) 513-8289
Facility Name	State II-23 Battery	Facility Type	Battery

Surface Owner	State	Mineral Owner	API No.	30-25-20501
---------------	-------	---------------	---------	-------------

LOCATION OF RELEASE

Unit Letter	Section	Township	Range	Feet from the	North/South Line	Feet from the	East/West Line	County
D	23	10S	32E					Lea County, NM

Latitude N 33.43878° Longitude W 103.64761°

NATURE OF RELEASE

Type of Release	Produced water	Volume of Release	35 bbls	Volume Recovered	30 bbls
Source of Release	Stress/fatigue of 6" fiberglass water transfer SWD line	Date and Hour of Occurrence	02/02/2016	Date and Hour of Discovery	
Was Immediate Notice Given?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Required	If YES, To Whom?	Kellie Jones, Jamie Keyes- NMOCD		
By Whom?	Kathy Purvis @ BBC International, Inc.	Date and Hour	02/03/2016 @ 3:46 pm		
Was a Watercourse Reached?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If YES, Volume Impacting the Watercourse.			

If a Watercourse was Impacted, Describe Fully.*

Describe Cause of Problem and Remedial Action Taken.*

Stress/fatigue of a 6" fiberglass water transfer SWD line caused a spill of 35 bbls of produced water. A vacuum truck recovered 30 bbls of produced water and the line was repaired.

Describe Area Affected and Cleanup Action Taken.*

The affected area is approximately 150' x 40' by the right of way. Remediation will be completed in accordance with the remediation plan approved by NMOCD.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the NMOCD marked as "Final Report" does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Signature:	<u>OIL CONSERVATION DIVISION</u>		
Printed Name: Casey Summers	Approved by Environmental Specialist:		
Title: NM Environmental Advisor	Approval Date:	Expiration Date:	
E-mail Address: Casey_Summers@oxy.com	Conditions of Approval:		Attached <input type="checkbox"/>
Date: <u>2-10-16</u> Phone: (575) 513-8289			

* Attach Additional Sheets If Necessary

You are here: [Home](#) / [Characteristics](#) / Conservation Plant Characteristics for *Bouteloua curtipendula*

Characteristics

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[Conservation Plant Characteristics Data Definitions](#)
[PLANTS Characteristics species list](#)

Conservation Plant Characteristics

Bouteloua curtipendula (Michx.) Torr.
sideoats grama
BOCU

Morphology/Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Porous
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	3.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	Yes
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO ₃ Tolerance	Medium
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	Medium
Fire Tolerance	Low
Frost Free Days, Minimum	90
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	5.5
pH, Maximum	8.5
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	6
Precipitation, Maximum	25
Root Depth, Minimum (inches)	12
Salinity Tolerance	Low
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-43

Reproduction

Bloom Period	Mid Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall

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Scientific Name

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- NRCS State Plants Lists

Related Tools

- Crop Nutrient Tool
- Ecological Site Information System
- PLANTS Identification Keys
- Plant Materials Web Site
- Plant Materials Publications
- USDA Plant Hardiness Map

Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	159200
Seed Spread Rate	Slow
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	None
Suitability/Use	
Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Bouteloua curtipendula (Michx.) Torr.
sideoats grama
BOCU
Cultivar: Butte

Morphology/Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Porous
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	3.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	Yes
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO3 Tolerance	High
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	Medium

Fire Tolerance	High
Frost Free Days, Minimum	120
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	5.5
pH, Maximum	7.8
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	6
Precipitation, Maximum	25
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-33
Reproduction	
Bloom Period	Mid Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	159200
Seed Spread Rate	Slow
Seedling Vigor	High
Small Grain	No
Vegetative Spread Rate	Slow
Suitability/Use	
Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Bouteloua curtipendula (Michx.) Torr.

sideoats grama

BOCU

Cultivar: El Reno

Morphology/Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Porous
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous

Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	3.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	Yes
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO ₃ Tolerance	Medium
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	Medium
Fire Tolerance	Medium
Frost Free Days, Minimum	150
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	6.0
pH, Maximum	8.5
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	6
Precipitation, Maximum	20
Root Depth, Minimum (inches)	12
Salinity Tolerance	Low
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-28

Reproduction

Bloom Period	Mid Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	159200
Seed Spread Rate	Slow
Seedling Vigor	High
Small Grain	No
Vegetative Spread Rate	None

Suitability/Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Bouteloua curtipendula (Michx.) Torr.
sideoats grama

BOCU
Cultivar: Haskell

Morphology/Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Moderate
Foliage Porosity Winter	Porous
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	3.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	Yes
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO ₃ Tolerance	High
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	Medium
Fire Tolerance	High
Frost Free Days, Minimum	180
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	5.5
pH, Maximum	7.8
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	6
Precipitation, Maximum	25
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	7

Reproduction

Bloom Period	Mid Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	159200
Seed Spread Rate	Slow
Seedling Vigor	High
Small Grain	No

Vegetative Spread Rate	Moderate
Suitability/Use	
Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Bouteloua curtipendula (Michx.) Torr.
sideoats grama
BOCU
Cultivar: Kildeer

Morphology/Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Moderate
Foliage Porosity Winter	Porous
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	3.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	Yes
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO ₃ Tolerance	High
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	Medium
Fire Tolerance	High
Frost Free Days, Minimum	110
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	5.5
pH, Maximum	7.8
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	6
Precipitation, Maximum	25
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-43

Reproduction

Bloom Period	Mid Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Low
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	159200
Seed Spread Rate	Slow
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	Slow

Suitability/Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Bouteloua curtipendula (Michx.) Torr.
sideoats grama
BOCU
Cultivar: Niner

Morphology/Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Moderate
Foliage Porosity Winter	Porous
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	3.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	Yes
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes

Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO ₃ Tolerance	High
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	Medium
Fire Tolerance	High
Frost Free Days, Minimum	145
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	5.3
pH, Maximum	7.8
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	6
Precipitation, Maximum	25
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-13

Reproduction

Bloom Period	Mid Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	159200
Seed Spread Rate	Slow
Seedling Vigor	High
Small Grain	No
Vegetative Spread Rate	Slow

Suitability/Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Bouteloua curtipendula (Michx.) Torr.
sideoats grama
BOCU
Cultivar: Premier

Morphology/Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green

Foliage Porosity Summer	Moderate
Foliage Porosity Winter	Porous
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	3.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	Yes
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO ₃ Tolerance	High
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	Medium
Fire Tolerance	High
Frost Free Days, Minimum	160
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	5.3
pH, Maximum	7.8
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	6
Precipitation, Maximum	25
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-23

Reproduction

Bloom Period	Mid Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	159200
Seed Spread Rate	Slow
Seedling Vigor	High
Small Grain	No
Vegetative Spread Rate	Slow

Suitability/Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No

Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Bouteloua curtipendula (Michx.) Torr.
sideoats grama
BOCU
Cultivar: Trailway

Morphology/Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Moderate
Foliage Porosity Winter	Porous
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	3.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	Yes
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO ₃ Tolerance	High
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	Medium
Fire Tolerance	High
Frost Free Days, Minimum	120
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	5.3
pH, Maximum	7.9
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	6
Precipitation, Maximum	25
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-23

Reproduction

Bloom Period	Mid Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes

Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	159200
Seed Spread Rate	Slow
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	Slow
Suitability/Use	
Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Bouteloua curtipendula (Michx.) Torr.
sideoats grama
BOCU
Cultivar: Uvalde

Morphology/Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Moderate
Foliage Porosity Winter	Porous
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	3.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	Yes
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO3 Tolerance	High
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	Medium
Fire Tolerance	High
Frost Free Days, Minimum	175
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	5.5
pH, Maximum	7.9
Planting Density per Acre, Minimum	

Planting Density per Acre, Maximum	
Precipitation, Minimum	6
Precipitation, Maximum	25
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	7

Reproduction

Bloom Period	Mid Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	159200
Seed Spread Rate	Slow
Seedling Vigor	High
Small Grain	No
Vegetative Spread Rate	Slow

Suitability/Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Bouteloua curtipendula (Michx.) Torr.

sideoats grama

BOCU

Cultivar: Vaughn

Morphology/Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Moderate
Foliage Porosity Winter	Porous
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	3.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	Yes

Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO ₃ Tolerance	High
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	Medium
Fire Tolerance	High
Frost Free Days, Minimum	165
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	5.3
pH, Maximum	7.8
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	6
Precipitation, Maximum	25
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-13

Reproduction

Bloom Period	Mid Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	159200
Seed Spread Rate	Slow
Seedling Vigor	High
Small Grain	No
Vegetative Spread Rate	Slow

Suitability/Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

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Characteristics

Conservation Plant Characteristics

Bouteloua eriopoda (Torr.) Torr.
black grama
BOER4

Summary

Duration	Perennial	Federal T/E Status
Growth Habit	Graminoid	National Wetland Indicator
Native Status	L48 (N)	

Morphology/Physiology

Active Growth Period	Summer and Fall	Fruit/Seed Conspicuous	No
After Harvest Regrowth Rate	Moderate	Growth Form	Stoloniferous
Bloat	None	Growth Rate	Moderate
C:N Ratio	Medium	Height at Base Age, Maximum	
Coppice Potential	No	Height at Maturity	2.0
Fall Conspicuous	No	Known Allelopath	No
Fire Resistant	No	Leaf Retention	No
Flower Color	Yellow	Lifespan	Moderate
Flower Conspicuous	No	Low Growing Grass	No
Foliage Color	Green	Nitrogen Fixation	None
Foliage Porosity Summer	Porous	Resprout Ability	No
Foliage Porosity Winter	Porous	Shape and Orientation	Decumbent
Foliage Texture	Fine	Toxicity	None
Fruit/Seed Color	Brown		

Growth Requirements

Adapted To Coarse Textured Soils	Yes	Moisture Use	Low
Adapted To Medium Textured Soils	Yes	pH, Minimum	7.0
Adapted To Fine Textured Soils	No	pH, Maximum	8.7
Anaerobic Tolerance	None	Planting Density Per Acre, Minimum	
CaCO3 Tolerance	Medium	Planting Density Per Acre, Maximum	
Cold Stratification Required	No	Precipitation, Minimum	7
Drought Tolerance	High	Precipitation, Maximum	19
Fertility Requirement	Medium	Root Depth, Minimum	12
Fire Tolerance	High	Salinity Tolerance	Low
Frost Free Days, Minimum	155	Shade Tolerance	Intolerant

Hedge Tolerance	None	Temperature, Minimum (°F)	-23
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Reproduction

Bloom Period	Mid Spring	Propagated By Cuttings	No
Commercial Availability	Routinely Available	Propagated By Seed	Yes
Fruit/Seed Abundance	High	Propagated By Sod	No
Fruit/Seed Period Begin	Summer	Propagated By Sprigs	No
Fruit/Seed Period End	Fall	Propagated By Tubers	No
Fruit/Seed Persistence	No	Seed Per Pound	1335000
Propagated By Bare Root	No	Seed Spread Rate	Slow
Propagated By Bulbs	No	Seedling Vigor	Medium
Propagated By Container	No	Small Grain	No
Propagated By Corms	No	Vegetative Spread Rate	Moderate

Suitibility/Use

Berry/Nut/Seed Product	No	Palatable Browse Animal	High
Christmas Tree Product	No	Palatable Graze Animal	High
Fodder Product	Yes	Palatable Human	No
Fuelwood Product		Post Product	No
Lumber Product	No	Protein Potential	Medium
Naval Store Product	No	Pulpwood Product	No
Nursery Stock Product	No	Veneer Product	No

***Bouteloua eriopoda* (Torr.) Torr.**
black grama
BOER4
Cultivar: Nogal

Summary

Duration	Perennial	Federal T/E Status
Growth Habit	Graminoid	National Wetland Indicator
Native Status	L48 (N)	

Morphology/Physiology

Active Growth Period	Spring and Fall	Fruit/Seed Conspicuous	No
After Harvest Regrowth Rate	Moderate	Growth Form	Stoloniferous
Bloat	None	Growth Rate	Moderate
C:N Ratio	Medium	Height at Base Age, Maximum	
Coppice Potential	No	Height at Maturity	2.0
Fall Conspicuous	No	Known Allelopath	No
Fire Resistant	No	Leaf Retention	No
Flower Color	Yellow	Lifespan	Moderate

Flower Conspicuous	No	Low Growing Grass	No
Foliage Color	Green	Nitrogen Fixation	None
Foliage Porosity Summer	Porous	Resprout Ability	No
Foliage Porosity Winter	Porous	Shape and Orientation	Decumbent
Foliage Texture	Fine	Toxicity	None
Fruit/Seed Color	Brown		

Growth Requirements

Adapted To Coarse Textured Soils	Yes	Moisture Use	Medium
Adapted To Medium Textured Soils	Yes	pH, Minimum	7.0
Adapted To Fine Textured Soils	No	pH, Maximum	8.3
Anaerobic Tolerance	None	Planting Density Per Acre, Minimum	
CaCO3 Tolerance	Medium	Planting Density Per Acre, Maximum	
Cold Stratification Required	No	Precipitation, Minimum	7
Drought Tolerance	High	Precipitation, Maximum	18
Fertility Requirement	Medium	Root Depth, Minimum	12
Fire Tolerance	High	Salinity Tolerance	Low
Frost Free Days, Minimum	160	Shade Tolerance	Intolerant
Hedge Tolerance	None	Temperature, Minimum (°F)	-23

Reproduction

Bloom Period	Mid Spring	Propagated By Cuttings	No
Commercial Availability	Routinely Available	Propagated By Seed	Yes
Fruit/Seed Abundance	High	Propagated By Sod	No
Fruit/Seed Period Begin	Summer	Propagated By Sprigs	No
Fruit/Seed Period End	Fall	Propagated By Tubers	No
Fruit/Seed Persistence	No	Seed Per Pound	1335000
Propagated By Bare Root	No	Seed Spread Rate	Slow
Propagated By Bulbs	No	Seedling Vigor	High
Propagated By Container	No	Small Grain	No
Propagated By Corms	No	Vegetative Spread Rate	Rapid

Suitibility/Use

Berry/Nut/Seed Product	No	Palatable Browse Animal	High
Christmas Tree Product	No	Palatable Graze Animal	High
Fodder Product	Yes	Palatable Human	No
Fuelwood Product		Post Product	No
Lumber Product	No	Protein Potential	Medium
Naval Store Product	No	Pulpwood Product	No
Nursery Stock Product	No	Veneer Product	No

Bouteloua eriopoda* (Torr.) Torr.*black grama****BOER4****Cultivar: Sonora**

Summary

Duration	Perennial	Federal T/E Status
Growth Habit	Graminoid	National Wetland Indicator
Native Status	L48 (N)	

Morphology/Physiology

Active Growth Period	Summer and Fall	Fruit/Seed Conspicuous	No
After Harvest Regrowth Rate	Moderate	Growth Form	Stoloniferous
Bloat	None	Growth Rate	Moderate
C:N Ratio	Medium	Height at Base Age, Maximum	
Coppice Potential	No	Height at Maturity	2.0
Fall Conspicuous	No	Known Allelopath	No
Fire Resistant	No	Leaf Retention	No
Flower Color	Yellow	Lifespan	Moderate
Flower Conspicuous	No	Low Growing Grass	No
Foliage Color	Green	Nitrogen Fixation	None
Foliage Porosity Summer	Moderate	Resprout Ability	No
Foliage Porosity Winter	Porous	Shape and Orientation	Decumbent
Foliage Texture	Fine	Toxicity	None
Fruit/Seed Color	Brown		

Growth Requirements

Adapted To Coarse Textured Soils	Yes	Moisture Use	Medium
Adapted To Medium Textured Soils	Yes	pH, Minimum	7.0
Adapted To Fine Textured Soils	No	pH, Maximum	8.3
Anaerobic Tolerance	None	Planting Density Per Acre, Minimum	
CaCO3 Tolerance	Medium	Planting Density Per Acre, Maximum	
Cold Stratification Required	No	Precipitation, Minimum	7
Drought Tolerance	High	Precipitation, Maximum	18
Fertility Requirement	Medium	Root Depth, Minimum	12
Fire Tolerance	High	Salinity Tolerance	Low
Frost Free Days, Minimum	155	Shade Tolerance	Intolerant
Hedge Tolerance	None	Temperature, Minimum (°F)	-23

Reproduction

Bloom Period	Mid Summer	Propagated By Cuttings	No
Commercial Availability	Routinely Available	Propagated By Seed	Yes

Fruit/Seed Abundance	High	Propagated By Sod	No
Fruit/Seed Period Begin	Summer	Propagated By Sprigs	No
Fruit/Seed Period End	Fall	Propagated By Tubers	No
Fruit/Seed Persistence	No	Seed Per Pound	1335000
Propagated By Bare Root	No	Seed Spread Rate	Slow
Propagated By Bulbs	No	Seedling Vigor	Medium
Propagated By Container	No	Small Grain	No
Propagated By Corms	No	Vegetative Spread Rate	Rapid

Suitibility/Use

Berry/Nut/Seed Product	No	Palatable Browse Animal	High
Christmas Tree Product	No	Palatable Graze Animal	High
Fodder Product	Yes	Palatable Human	No
Fuelwood Product		Post Product	No
Lumber Product	No	Protein Potential	Medium
Naval Store Product	No	Pulpwood Product	No
Nursery Stock Product	No	Veneer Product	No

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