

## SOYBEAN CYST NEMATODE SOIL SAMPLE METHODOLOGY AND TEST RESULTS MEMO

Date: Wednesday, June 14, 2017  
 Project: Big Stone South to Ellendale (BSSE) 345kV Transmission Line  
 Subject: **UPDATED APRIL 2017: SCN Memo #3: BSSE SCN Soil Sample Methodology and Test Results**

### APRIL 2017 UPDATE

Soybean Cyst Nematode (SCN) Soil Sample Methodology and Test Results Memo #3, originally dated June 30, 2015 and unanimously accepted by the South Dakota Public Utilities Commission on September 1, 2015, has been updated with final SCN test results, which was completed for all qualifying parcels in April 2017, for the Big Stone South to Ellendale Project (Project). These final test results conclude SCN testing for the Project.

Note that this update is tiered from the June 30, 2015 Memo #3, therefore please reference the June 30 memo for the Background Information and SCN Sampling Methodology. The Project intends to do no further testing, this is the final update.

### TEST RESULTS

The number of samples fluctuated, due to access road changes, alignment shifts, parcel boundary modifications, identification of land being pastured and not cultivated, and data cleaned-up as the testing progressed. Initially, 719 samples were identified to be collected and tested for SCN, however a total of 689 samples were collected at the conclusion of sampling in 2017 (Table 1). Samples that remained uncollected in 2014, 2015 and 2016 were primarily due to access permissions and weather at the date of sampling (Table 1).

Table 1: Sample Pattern Collection Counts

	Number	Percent
<b>Samples (2014)</b>	<b>528</b>	<b>76.6</b>
<i>Pre-sampling Soil Sample Patterns</i>	719	
<i>Soil Sample Patterns ID'd for testing</i>	(+)5	
<i>Soil Sample Patterns Removed</i>	(-)29	
Soil Samples Uncollected	167	25.0
<b>Samples (2015)</b>	<b>114</b>	<b>16.6</b>
<i>Pre-sampling Soil Sample Patterns Remaining</i>	223	
<i>Soil Sample Patterns ID'd for testing</i>	(+)27	



	Number	Percent
Soil Sample Patterns Removed	(-)57	
Soil Samples Uncollected	79	9.3
<b>Samples (2016)</b>	<b>31</b>	<b>4.5</b>
Pre-sampling Soil Sample Patterns Remaining	79	
Soil Sample Patterns ID'd for testing	(+)0	
Soil Sample Patterns Removed	(-)3	
Soil Samples Uncollected	45	9.3
<b>Samples (2017)</b>	<b>16</b>	<b>2.3</b>
Pre-sampling Soil Sample Patterns Remaining	45	
Soil Sample Patterns ID'd for testing	(+)0	
Soil Sample Patterns Removed	(-)29	
Soil Samples Uncollected	0	
<b>TOTAL SAMPLES TAKEN</b>	<b>689</b>	<b>100.0</b>

SDSU provided test results (egg count) as they are an indicator of the level of infestation and are used in determining management strategy. The lower egg counts indicate impacts from an infection that is more manageable by the producer. Although each land parcel is unique, an egg count of 1-2,000 eggs/100 cm<sup>3</sup> is considered a low infection, 2,001 – 12,000 is considered a medium infection, and egg counts over 12,000 eggs/100 cm<sup>3</sup> are considered highly infected (Byamukama & Tande, 2013).

In 2014, 528 sample patterns were collected and brought to SDSU for testing (Table 2). A total of 22.3 percent of the samples tested positive for SCN (Table 2).

Table 2: SCN Testing Results (2014)

2014	Number	Percent	
<b>Total Samples (2014)</b>	<b>528</b>	<b>100.0</b>	
<b>Total Positive for SCN</b>	<b>118</b>	<b>22.3</b>	
No. Eggs per 100 cc of soil		Percent of 2014 Positive Samples	Percent of All Samples (2014-2017)
<b>Total</b>	<b>117</b>	<b>100.0</b>	<b>17.1</b>
1-50 Eggs	61	52.1	8.9
51-2,000 Eggs	55	47.0	8.1
2,001-3,000 Eggs	1	0.9	0.1
3,001+ Eggs	0	0.0	0.0

In 2015, 114 samples were collected and brought to SDSU for testing (Table 3). A total of 28.1 percent of the samples tested positive for SCN (Table 3).

Table 3: SCN Testing Results (2015)

2015		Number	Percent	
Total Samples (2015)		114	100.0	
Total Positive for SCN		32	28.1	
No. Eggs per 100 cc of soil			Percent of 2015 Positive Samples	Percent of All Samples (2014-2017)
Total		32	100.0	4.6
1-50 Eggs		5	15.6	0.7
51-2,000 Eggs		25	78.1	3.6
2,001-3,000 Eggs		1	3.1	0.1
3,001+ Eggs		1	3.1	0.1

In 2016, 31 samples were collected and brought to SDSU for testing (Table 4). A total of 0 percent of the samples tested positive for SCN (Table 4).

Table 4: SCN Testing Results (2016)

2016		Number	Percent	
Total Samples (2016)		31	100.0	
Total Positive for SCN		0	0.0	
No. Eggs per 100 cc of soil			Percent of 2016 Positive Samples	Percent of All Samples (2014-2017)
Total		0	0.0	0.0
1-50 Eggs		0	0.0	0.0
51-2,000 Eggs		0	0.0	0.0
2,001-3,000 Eggs		0	0.0	0.0
3,001+ Eggs		0	0.0	0.0

In 2017, 16 samples were successfully collected and brought to SDSU for testing (Table 5). A total of 12.5 percent of the samples tested positive for SCN (Table 5).

Table 5: SCN Testing Results (2017)

2017		Number	Percent	
Total Samples (2017)		16	100.0	
Total Positive for SCN		2	12.5	
No. Eggs per 100 cc of soil			Percent of 2017 Positive Samples	Percent of All Samples (2014-2017)
Total		2	100.0	0.3
1-50 Eggs		0	0.0	0.0
51-2,000 Eggs		2	100.0	0.3

2017	Number	Percent	
2,001-3,000 Eggs	0	0.0	0.0
3,001+ Eggs	0	0.0	0.0

A total of 689 samples were collected and brought to SDSU for testing between 2014 and 2017 (Table 6). The cumulative number of samples that tested positive for SCN was 22.1 percent (Table 6).

Table 6: SCN Testing Results (2014-2017)

2014 – 2017 Totals	Number	Percent	
Total Samples (All)	689	100.0	
Total Positive for SCN	152	22.1	
No. Eggs per 100 cc of soil		Percent of Positive Samples	Percent of All Samples (2014-2017)
Total	152	100.0	22.1
1-50 Eggs	66	43.4	9.6
51-2,000 Eggs	83	54.6	12.0
2,001-3,000 Eggs	2	1.3	0.3
3,001+ Eggs	1	0.7	0.1

The Project chose to treat all infected fields equally, but it is important to note that 43.4 percent of the SCN positive fields tested in the lowest infection range detectable, with the highest SCN egg count being 3,950 eggs/100 cm<sup>3</sup>. SCN test results conducted by the Project may not be a complete reflection of a field’s SCN infection because samples were only collected in the 500-foot sampling area. SCN is known to affect some areas more than others in a cultivated field including areas of higher pH, low spots, spots prone to flooding, and field entrances (Byamukama & Tande, 2013). Because construction and maintenance of the Project is not expected to impact an entire field crossed by the Project, and after consultation with SDSU, the Project determined not to test outside of the sample area. SCN may in fact be present on other areas of the landowner’s parcel, even if the test is negative. The Project intends to do no further testing. Landowners are encouraged to continue to test their land for SCN including outside of the Project’s Sample Area to better understand and develop their own SCN management plans.