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September 8, 2022

Mr. Ken Tutt  
Project Representative  
Nutrien Ltd.  
SRC Dry Area Plant  
15843 SE 78<sup>th</sup> Street  
White Springs, Florida 32096-2703

RE: CATHODIC PROTECTION SURVEY - REVISED  
SRC DRY AREA PLANT - 2022 RECOMMENDATIONS

Dear Mr. Tutt;

Please review the general recommendations concerning the results of the Nutrien Ltd. – SRC Dry Area Plant cathodic protection survey, performed beginning September 6, 2022. The following recommendations were cited during this inspection:

- Cathodic protection measurements indicate approximately 100% of the steel gas system piping components currently meet or exceed the minimum CP requirements. No further action is required at this time.

I trust the information to be in sufficient detail. Please contact me after reviewing this report to discuss these recommendations. A copy of this report is available online at [www.cityservices.biz](http://www.cityservices.biz). Click on Clients → Nutrien → Corrosion Surveys. To obtain or change your username and password, contact us at 229.226.6569.

Sincerely,

A handwritten signature in black ink that reads 'W. L. Hays'.

W. L. Hays  
CITY SERVICES, INC.



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# NUTRIEN LTD.

## SRC Dry Area Plant

CATHODIC PROTECTION SURVEY - REVISED  
SEPTEMBER 2022

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September 2022

Nutrien Ltd.  
SRC Dry Area Plant  
15843 SE 78<sup>th</sup> Street  
White Springs, Florida 32096-2703  
ATTN: Mr. Ken Tutt  
Project Representative

SRC Dry Area Plant  
Effectiveness of Cathodic Protection  
Survey Underground Natural Gas System

## INTRODUCTION

A cathodic protection survey was conducted for Nutrien Ltd. - SRC Dry Area Plant beginning September 5, 2022. During this survey, the SRC Dry Area Plant natural gas system was inspected for the effectiveness of cathodic protection, as applied. The cathodic protection system for Nutrien Ltd. - SRC Dry Area Plant consists essentially of Galvomag Magnesium anodes placed in various locations throughout the natural gas distribution system.

## RESULTS AND ANALYSIS

A total of Thirteen [13] [15 in 2021] cathodic protection voltage readings consisting of, Three [3] Galvomag anode / CTP readings, Two [2] [4 in 2021] gas casing pipe readings and Eight [8] gas pipeline readings were taken during this survey. As can be seen by the structure-to-soil potential measurements and the enclosed data sheet, 100% of the gas pipeline readings obtained are indicative of cathodic protection. A structure-to-soil potential of 850 millivolts [-0.850] or more negative direct current is the basis used in this report to confirm cathodic protection.

### **IR DROP CONSIDERATION**

Aging pipes and changing conditions can cause significant problems, such as an increase in applied CP levels and enlarged holidays in coating. In addition, increased environmental concerns also emphasize the need to minimize leaks as much as possible.

The effectiveness of any cathodic protection system can be determined by taking potential measurements between the structure and a reference electrode. These potential measurements have traditionally been recorded with “average reading” digital voltmeters while the protective current is flowing or applied. These potential measurements contain the error produced by the voltage drop in the soil (electrolyte resistance) and the voltage drop (current) in the structure being protected. This error is referred to as *IR* drop. Interpretation of a current applied measurement requires consideration of the significance of voltage drops in the earth and metallic paths.

An *IR* drop is a voltage across a resistance, in accordance with Ohm's law ( $V=IR$ ). Although there are several *IR* drops in a structure-to-electrolyte potential circuit, the *IR* drop of most concern is that which occurs between the reference electrode (half-cell) and the structure-to-electrolyte (pipe) boundary. This *IR* drop is due to a CP current in the resistance of the electrolyte and is an error in the measurement.

One way to reduce the *IR* drop is to bring the reference electrode close to the structure (pipe) to reduce the resistance of the electrolyte (soil). Another way to reduce the *IR* drop is to bring the current to zero by interrupting all sources of current (anodes) influencing that reference point at the same precise time.

### **SURVEY TEST INSTRUMENTATION & METHOD**

- Gas Electronics Model 601 Insulation Checker
- Fluke Model 71 Digital Multi-meter
- Tinker & Rasor 6-B Reference Electrode [CSE]
- Cu/CuSO<sub>4</sub> Reference Electrode Calibration 09/06/2022 – 3.7 Mv



## **RECOMMENDATIONS**

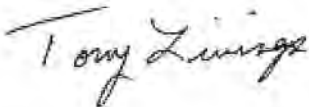
Nutrien Ltd. – SRC Dry Area Plant  
Underground Natural Gas System  
September 2022

The sacrificial galvanic anode arrangement designed to protect the coated and wrapped steel natural gas system indicates adequate current to afford cathodic protection to the steel distribution system. Structure-to-soil readings obtained from Cathodic Test Points and gas risers on the steel distribution system indicate CP readings above State and Federal minimum standards of -0.850 volts direct current. No Railroad casings could be located or identified by the Nutrien guide, thus no readings in this survey.

The coated and wrapped main gas lines show a minimum structure-to-soil potential of -1.160 vdc and a maximum structure-to-soil potential of -1.344 vdc at various Cathodic Test Points in the SRC Dry Area Plant distribution system. Continuity over the entire main line system is good to excellent. The six-inch [6"] coated and wrapped steel gas pipe from the metering station to the limestone unloading area indicates adequate cathodic protection.

At this time, the Natural Gas Distribution System for Nutrien Ltd. - SRC Dry Area Plant complex indicates cathodic protection levels above regulatory minimum levels. I trust the above information to be satisfactory and in sufficient detail, however, should you require additional information, please contact me.

Sincerely,



Anthony Livings  
C.P. Tester

## CATHODIC TEST POINTS

**CATHODIC TEST POINTS**  
 Nutrien Ltd. – SRC Dry Area Plant  
 Underground Natural Gas System  
 September 2022

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Cathodic Test Point - #1

Red Anode Connection	-1.707 Vdc
Black Gas Pipeline Connection	-1.160 Vdc
Anode / Gas Line Connections Combined	-1.193 Vdc

Cathodic Test Point - #2

Red Anode Connection	-1.201 Vdc
Black [Tape] Casing Pipeline Connection	-0.707 Vdc
Black Gas Pipeline Connection	-1.195 Vdc
Anode / Gas Line Connections Combined	-1.193 Vdc

Cathodic Test Point - #3

Red Anode Connection	-1.345 Vdc
White Casing Pipeline Connection	-0.867 Vdc
Black Gas Pipeline Connection	-1.244 Vdc
Anode / Gas Line Connections Combined	-1.305 Vdc



**STRUCTURE-TO-SOIL POTENTIALS**  
**GAS PIPE CASINGS**

**STRUCTURE-TO-SOIL POTENTIAL  
GAS PIPE CASINGS**

Nutrien Ltd. – SRC Dry Area Plant  
Underground Natural Gas System  
September 2022

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Test Location	Energized Potentials Volts
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*Railroad Casing @ CTP #3	-0.000
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*Scale House Drive Casing @ CTP #2	-0.000
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\*Casing Anode Installed

**STRUCTURE - TO - SOIL POTENTIAL DATA**

## **STRUCTURE – TO – SOIL POTENTIAL DATA**

Nutrien Ltd. – SRC Dry Area Plant  
Underground Natural Gas System  
September 2022

<u>Test Location</u>	<u>Energized Potentials Volts</u>
Metering Station [6" Steel Line Outlet]	-1.196
Limestone Loading [6" Riser Inlet]	-1.157