



# NACE International Calgary Section

*Raising the bar for the CP Industry. Now is the  
perfect time.*

Mario H. Salgado, MSc.



**PROVIDENCE CORROSION**

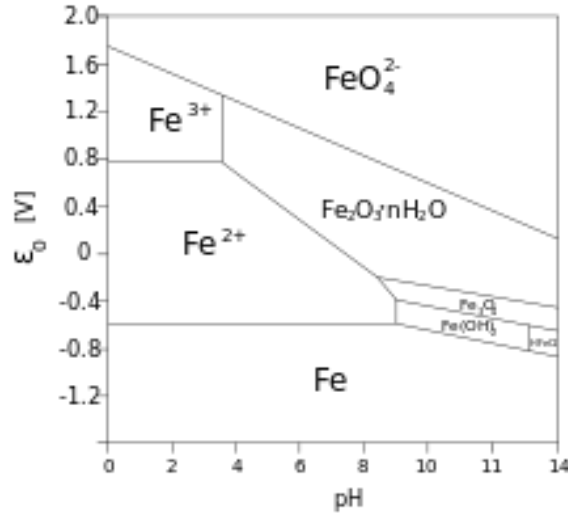
Satellite Symposium

Rocky Mountain House, AB

May 11<sup>th</sup>, 2016

# So, what is it?

Pourbaix  
Diagram



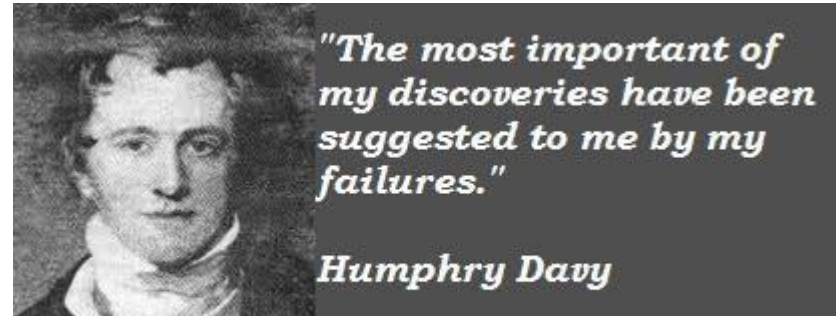
Cathodic Protection is NOT:



The first application of cathodic protection (CP) can be traced back to 1824, when Sir Humphry Davy, in a project financed by the British Navy, succeeded in protecting copper sheathing against corrosion from seawater by the use of iron anodes.



1807

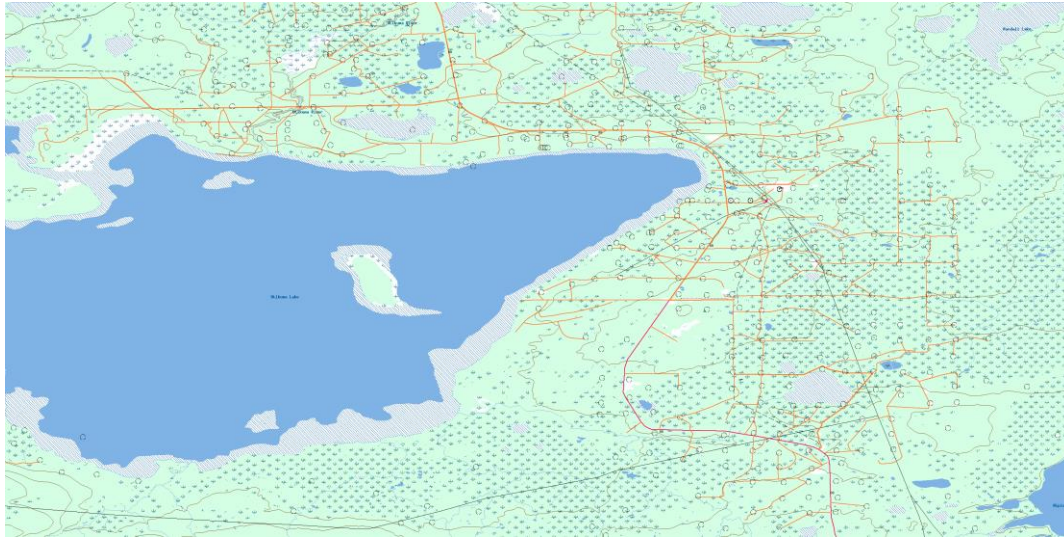


What has changed since?



# What has not changed since?

## Field Activities



# What has not changed since?

NACE SP0169-2013

6.2.1.3 A structure potential of  $-850\text{mV}$  or more negative as measured with respect to a saturated copper/copper sulfate (CSE) electrode. This potential may be either a direct measurement of the polarized potential or a current-applied potential. Interpretation of a current-applied measurement requires consideration of the significance of voltage drops in the earth and metallic paths.



$-850\text{ mV}_{\text{CSE}}$

Note: the  $-850\text{mV}_{\text{CSE}}$  is susceptible to many errors that can lead to misinterpretation and therefore wrongfully analysis, conclusions and recommendations

## Readings/Criteria

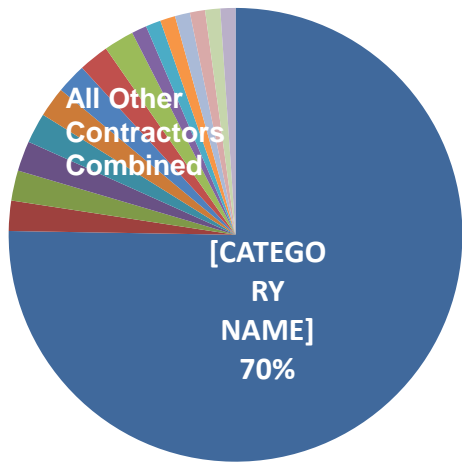
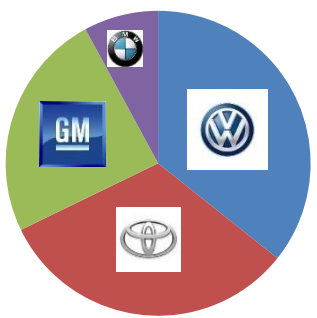
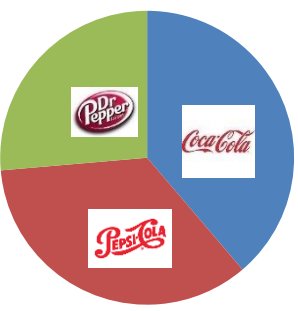
OR:

- 1) Reviewing historical performance of the CP system
- 2) Determining whether there is physical evidence of corrosion
- 3) Evaluating the physical and electrical characteristics of the pipe
- 4) Evaluation of indirect inspection data
- 5) Use of coupons
- 6) Other methods that confirm sufficient polarization has been achieved to control corrosion



# Lack of Innovation:

Is it really driven by consumer needs/survey? Or it is more driven by fair competition?



In Alberta the largest CP contractor contributes more than 70% of the total exposure hours of all contractors combined.

Source: ISN Health & Safety Performance Indicators – Publication No.1507 (2014 Data)



Has the CP industry becomes the poor cousin in the corrosion family?

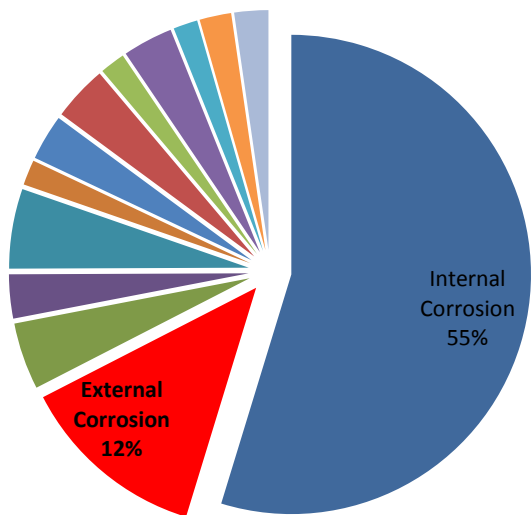
Internal Corrosion Vendor



Cathodic Protection Vendor



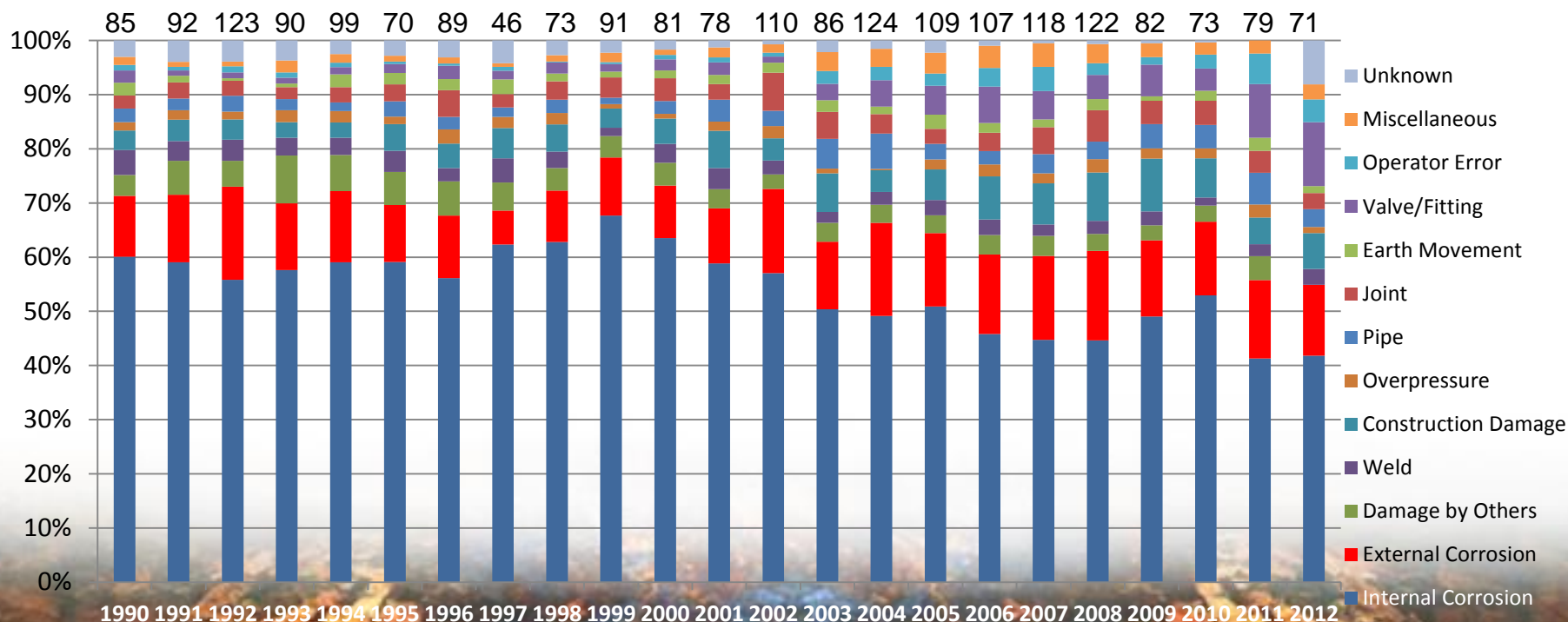
# Pipeline failures by cause (1990-2012)



External corrosion is the 2<sup>nd</sup> leading cause and is primarily due to the external pipeline coating failing from either age or excessive production temperatures

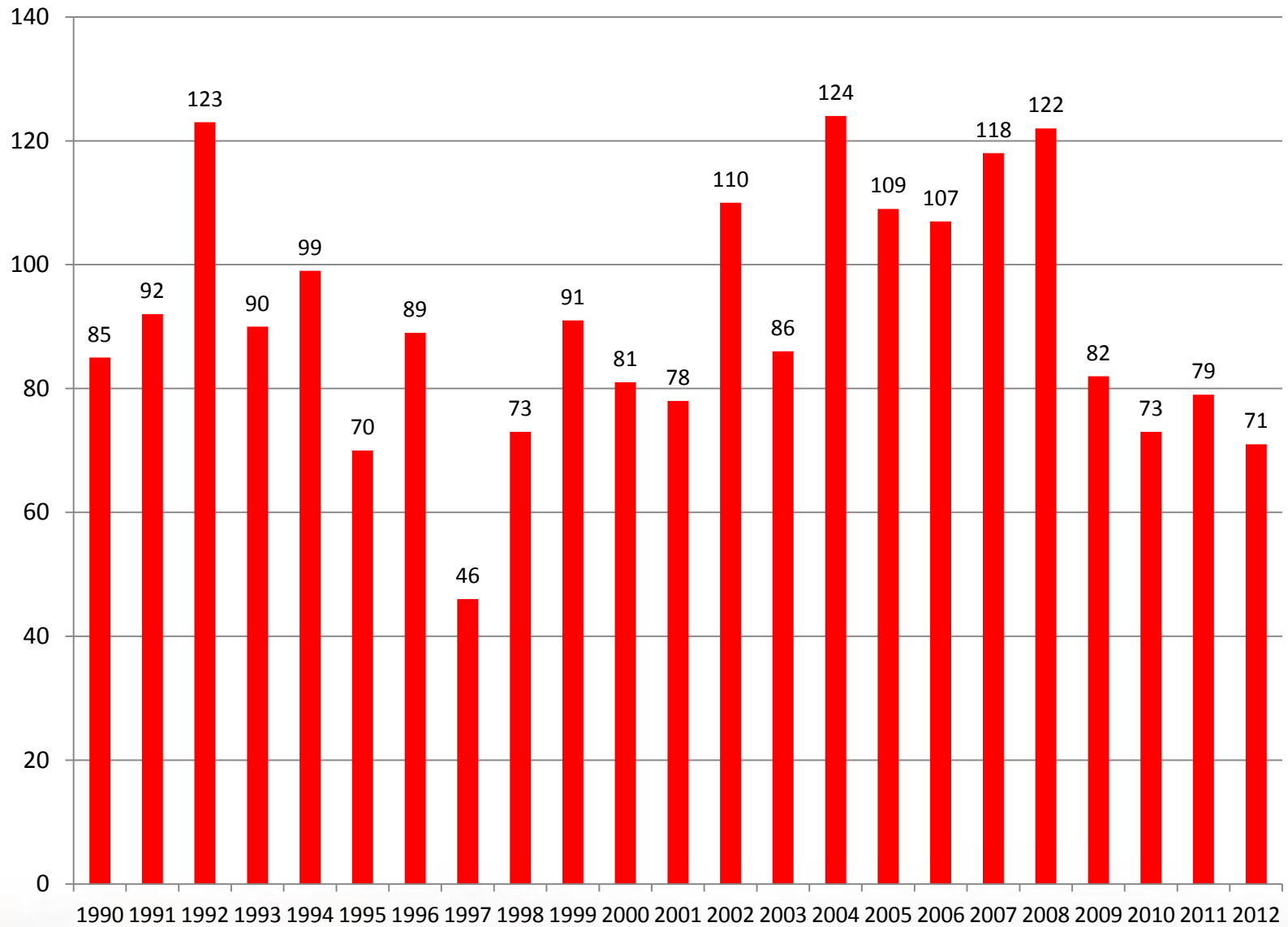
Q1) Why is that 12% almost invariable?

Q2) Is 12% too high for relatively mildly corrosive soil?





# External Corrosion Failures



Q1) Why is that 12% almost invariable?

Q2) Is 12% too high for relatively mildly corrosive soil?

A1) Technology unavailable



A2) Lack of industry knowledge



A3) More infrastructure



Then what is it?

**Try Harder.**



Could it be that we need to take better informed decisions?

Our motivation = Reduce this 12% and the cost associated with these failures

Other motivations:

- Production loss
- Regulator's actions
- Reputation

**Conclusion:** The annual cost of CP is minimal compared to the cost of 1 pipeline failure



# Cost Reduction = Easy solution = Contractors to reduce rates

Client



Contractors



Diagnosis can be compromised



## Even worse = wrongfully diagnosis



## Consequences:

- Frustration
- Resignation
- Loss of credibility



Importance of a proper inspection...



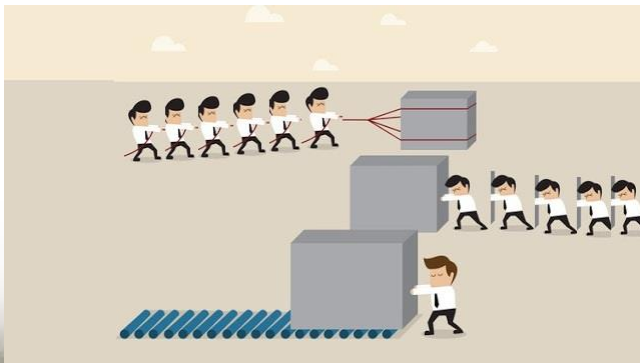
# ANNUAL – ROUTINE SURVEYS



Let's stop doing the work that should be done by the bird



Use our time and resources on more important tasks



# So, what needs to be done?

1) Collect meaningful, accurate and reliable data:

How?

- Field Training
- Appropriate equipment
- Work plan/procedure
- Reporting (credentials)

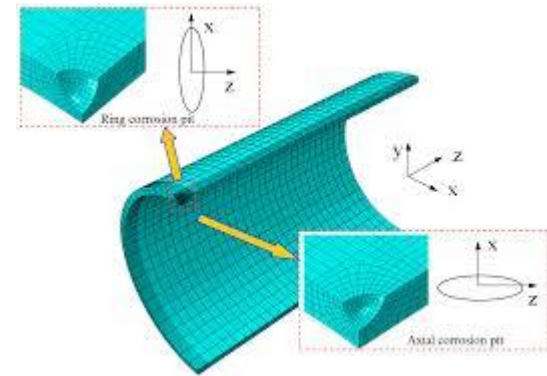


2) Remote CP surveys



# What else?

3) Take advantage of available software on the market

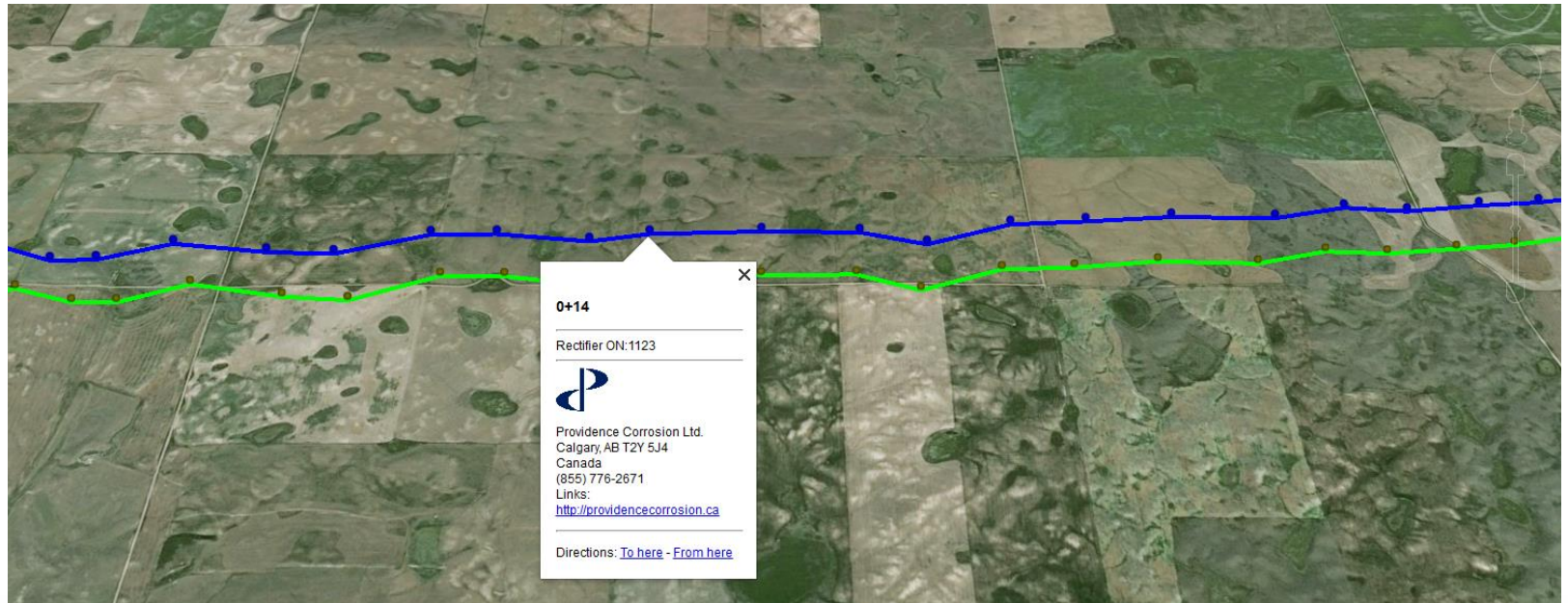


4) Increase efficiency while on-site



# What else?

## 5) GIS Mapping





# GIS Mapping Application:

The screenshot displays the ArcReader application window titled "PMF-0004-003 - ArcReader". The interface includes a menu bar (File, Edit, View, Bookmarks, Tools, Window, Help), a toolbar with navigation and editing tools, and a status bar at the bottom. The main map area shows a complex network of colored lines representing various infrastructure elements, overlaid on a grid. A prominent purple dashed boundary encloses a large portion of the map. The left-hand "Layers" panel is expanded, showing a list of map layers with checkboxes and symbols. The status bar at the bottom indicates the current coordinates as "412420.19 5572889.1 Meters" and the system time as "8:00 PM 2/1/2016".

**Layers Panel:**

- Rectifier/TEG/Sola
- SAC Anode
- Facility
- Gas Gathering Sys
- Battery Area
- Pipeline Joint Typ
- mV Shift (LineOn
- Pipeline Current (
- Pipeline Current (
- Pipeline Current (
- Pipeline - No Curr
- Sulfid Prospect.
- Transportation
- Primary Road CLASS
- Roads - Detail ROUTECA
- Access
- Paved Hig
- Gravel Hig
- Paved Roa
- Gravel Roa
- Railway
- DLS Grid
- Grid DLS Tow
- Grid DLS Secti

**Map Labels:** D0-01, D0-05, D0-12, K0-01, K0-02, K0-03, 17-5-W4, 17-4-W4, 16-5-W4, 16-4-W4.

**Status Bar:** Choose the width of the ArcReader markup you draw on the map, and choose whether the markup will be solid or transparent. To make the markup transpai 412420.19 5572889.1 Meters 8:00 PM 2/1/2016

# Finally:

## 6) Integrity Management Database





For our friends in  
Fort McMurray



PROVIDENCE CORROSION