2017 DIRT Report Version 11.0

Ontario Regional ORCGA
Common Ground Alliance

CELEBRATING 15 YEARS

DIG SAFE

Message from the President & CEO

Damage Prevention Stakeholders,

Underground infrastructure plays a central, but hidden, role in communities across Ontario. By providing reliable access to energy, communication, clean water and other necessities to homes, businesses and public institutions, this infrastructure is essential to the quality of life standards that we all enjoy.

However, underground infrastructure networks have become increasingly dense, more complex and thus, more vulnerable. Managing and protecting vital municipal and utility infrastructure must take on greater importance.

The Ontario Regional Common Ground Alliance (ORCGA) has been collecting underground damage data since 2005 to better understand the root causes that lead to these events and to develop and target public awareness plans to minimize the risk of future events. As damage events continue to increase in the professional excavator category, the ORCGA's members and committees will, through the Dig Safe program, highlight the need to Call or Click before you dig to this group. Further, the committees will explore partnerships with colleges and trade schools to design education programs around safe digging practices.

However, the ORCGA must actively encourage and seek out the collection of data from a broader cross section of industry stakeholders, particularly municipal infrastructure owners of water, sewer and streetlighting and local electricity utility distribution companies (LDCs).

By obtaining municipal and LDC data, this report will be able to provide a clear and complete understanding of the total number of annual facility damages in Ontario. Also, all ORCGA stakeholders will benefit through access to a robust DIRT database from which statistical analysis and reports can be developed to determine progress in their respective damage prevention efforts.

New for this year's report is the introduction of CIRANO data, which is an infrastructure damage societal cost formula and tool. When applied to DIRT Report data, this formula provides an estimate of the costs, both Direct and Indirect, that society bears when underground infrastructure is damaged.

Direct Costs arise from repairing the damaged facility, while Indirect Costs arise from the damage and its economic assessment of all resulting disruptions.

CIRANO data underlines the importance of damage prevention and helps:

- To justify investments toward best practices training programs for excavators;
- To aid municipalities and other stakeholders allocate resources targeted at damage prevention;
- Municipalities and other stakeholders to better assess a project's actual risks.

2017 has been a challenging year in damage prevention, where we experienced a 12% increase in damages over 2016 with only an increase of 3.3% in locate requests. There have been dramatic increases in damage events in several Geographic areas, in particular the Toronto (GTA) and London-St. Thomas areas with 30.5% (467) and 40% (66) increases respectively. Also of note is the significant number of damages where no locate was requested, where 39% or 2005 of 5149 damages had no call was made to Ontario One Call. Clearly there is much work to do to educate excavators on safe digging practices and the need to Call or Click before you dig.

The 2017 DIRT Report is the result of the dedicated volunteers on the ORCGA Reporting and Evaluation Committee, led by Co-Chairs Richard Durrer and Brandon Denton of Ontario One Call.

On behalf of the ORCGA Board of Directors, I would like to extend a sincere thank you to the Reporting and Evaluation Committee for ensuring that the 2017 DIRT Report was accessible on the ORCGA website, as well as being distributed to all members before April 1st, the start of the 2018 Dig Season.

Sincerely,

Douglas Lapp
President & CEO, ORCGA

CONTENTS

1.0 INTRODUCTION

The Ontario Regional Common Ground Alliance (ORCGA) is a non-profit organization that is working towards effectively eliminating damages to underground infrastructure through influential advocacy, meaningful education and impactful engagement and is also leading Ontario to enhance safety through the collaborative prevention of damage to underground infrastructure.

The ORCGA is a growing organization with over 500 active members and sponsors representing a wide cross section of stakeholders:

- Electrical Distribution
- Electrical Transmission
- Engineering
- Equipment & Suppliers
- Excavator
- Homebuilder
- Insurance
- Land Surveying
- Landscape/Fencing
- Locator
- Municipal & Public Works
- Oil & Gas Distribution
- One Call
- Railways
- Regulator
- Road Builders
- Safety Organization
- Telecommunications
- Transmission Pipeline

The ORCGA works to foster an environment of safety throughout Ontario for all workers and the public. This is accomplished by offering practical tools while promoting public awareness and compliance of best practices in regards to underground infrastructure and ground disturbance practices.

The ORCGA welcomes open participation and new members on its various committees. In order to submit a suggestion, or to join a meeting, please visit www.orcga.com to learn about the scope of the various committees.

General inquiries about the ORCGA can be made to:

Ontario Regional Common Ground Alliance (ORCGA)
545 North Rivermede Road, Unit 102
Concord, ON L4K 4H1
Telephone: (905) 532-9836
Toll Free: (866) 446-4493
Email: office@ORCGA.com

To learn more about the ORCGA's Dig Safe Program, visit www.digsafe.ca.

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1.1 REPORTING AND EVALUATION COMMITTEE RECOMMENDATIONS

#1 Excavation Practices Not Sufficient

Excavation Practices Not Sufficient remains a large cause of events. Excavators notified the One Call centre to have underground utilities marked, but an event still occurred due to the lack of careful excavation practices, such as:

- Other Insufficient Excavation Practices
- Failure to Use Hand Tools Where Required
- Failure to Maintain Clearance
- Failure to Maintain the Marks
- Failure to Support Exposed Facilities
- Failure to Verify Locations by Test-Hole (Pot-Holing)
- Improper Backfilling

2017 has a seen a dramatic increase in this category. Emphasis should be made to reduce events due to Excavation Practices Not Sufficient. Targeted outreach and educational information should be provided to excavators to reduce events resulting from this root cause.

#2 No Notification to One Call Centre

No Locates remains a significant issue as there has been an observed increase in the number of No Locate events in the last 3 years.
This is a major category leading to events as seen in (Figure 8) and broken out in (Figure 9). Of the 4597 events reported in 2016, 1195 or 26% were due to no notification being made to Ontario One Call.
This must be addressed as a primary focus of ORCGA education efforts within 2018 and subsequent future campaigns. Successes in this area have occurred from Dig Safe efforts but these efforts need to be reinforced and strengthened.
Particular focus should be placed on Dig Safe messaging to geographic areas which show abnormally high percentages of No Locate events (Figure 3).

#3 Data Not Collected

DIRT data contributors continue to utilize the “catch all” categories when describing their damage events.
Providing a meaningful comment in the new “Comment Required Field” would greatly enhance the ability to focus education efforts in future campaigns.
Emphasis should continue to be placed on increasing the number of stakeholders submitting into DIRT to provide a more accurate representation of all events within Ontario in each year.
Additional communication aimed towards data contributors, as well as in-field staff making the assessments of damage root causes, needs to occur so that the other specific categories of root causes are better utilized.

1.2 DATA

The Damage Information Reporting Tool (DIRT) is the result of the efforts made by the ORCGA to gather meaningful data about the occurrence of facility events. An "event" is defined by the DIRT User's Guide as "the occurrence of downtime, damages, and near misses." Gathering information about these types of events give the ORCGA the opportunity to analyze the contributing factors and recurring trends. This allows the ORCGA to identify potential educational opportunities to meet our overall goals of reducing damages and increasing safety for all stakeholders.

The annual DIRT Report provides a summary and analysis of the known events submitted during the prior year, and as additional years of data are collected, it also provides the ability to monitor trends over time. The 2017 report focuses on the data gathered throughout Ontario during the three-year period between 2015 and 2017. This data can be helpful for all stakeholders to use as a benchmark for their damage prevention performance. It identifies current issues facing the industry, region and province.

Data Analysis Disclaimer: Industry stakeholders have voluntarily submitted their underground facility event data into DIRT. The data submitted is not inclusive of all facility events that occurred during the report year as it represents only the information voluntarily submitted by industry stakeholders.

The information presented in this report is based on current information provided to the ORCGA for events that occurred, or were updated, in 2017.

When reviewing statistics published in this report, it is important to note that a major contributor is doing extensive retroactive submissions for 2015 and 2016, as well as others who are also updating events. This will cause the volume of facility events submitted by year to change in each report. It is also important to note as of January 1st, 2018, a new data standard for the DIRT Form has been implemented alongside the current. 2017 data could be submitted under the new standard, but was not required due to the 2018 variances to the old standard the root cause and the subcategory graphs may have new, as well as the old terminology. This variance will continue until the 2020 DIRT Report as the 2017 data will no longer be used.

In addition to the number of events submitted, an important factor is the completion of the associated information which allows for better overall analysis of the contributing factors. Each submitted record contains numerous data elements that are vital to understanding and interpreting the incidents reported in DIRT. It is important that stakeholders align their data collection and reporting practices with those found on the DIRT Field Form.

To gauge the overall level of completion of records submitted, the Data Quality Index (DQI) was implemented in 2009. This provides DIRT contributors a way to review the quality of the facility event records they submit.

When reviewing the statistics published in this report, it is important to note that only events with complete data were included; records with missing data were removed from the analysis.

The DIRT system compares each field within each report submitted against the fields of all other reports in DIRT, to calculate the probability that it matches an already submitted event. Based on this, there is potential that the same event may have been submitted more than once (i.e. by both the excavator and the facility owner). Repeated reporting of the same event can offer the following benefits:

- Capture of data that may be included on one submission but was omitted on another;
- Insights regarding interpretation of Root Causes based on stakeholder group.

2.0 DATA ANALYSIS

2.1 FACILITY EVENT ANALYSIS

In 2017, facility events have seen an overall increase of 12% over 2016. We will break out incidents to gain insight on where attention and efforts are to be made to reduce damages in the future.

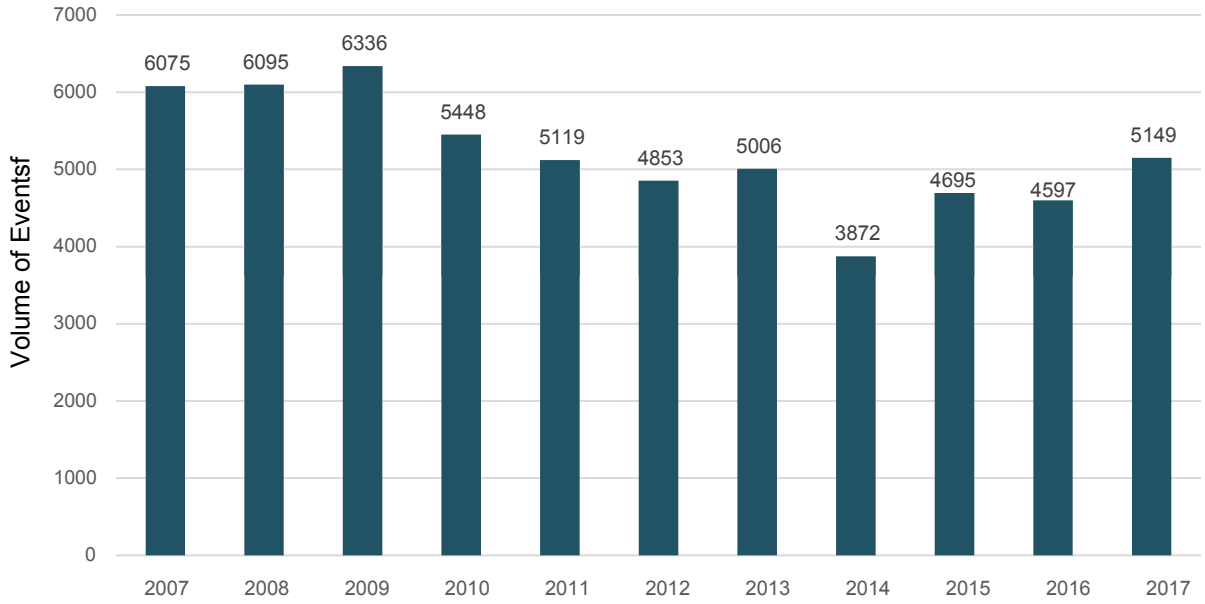


Figure 1: Facility Events Submitted by Year

2.2 FACILITY EVENTS SUBMITTED ACROSS ONTARIO

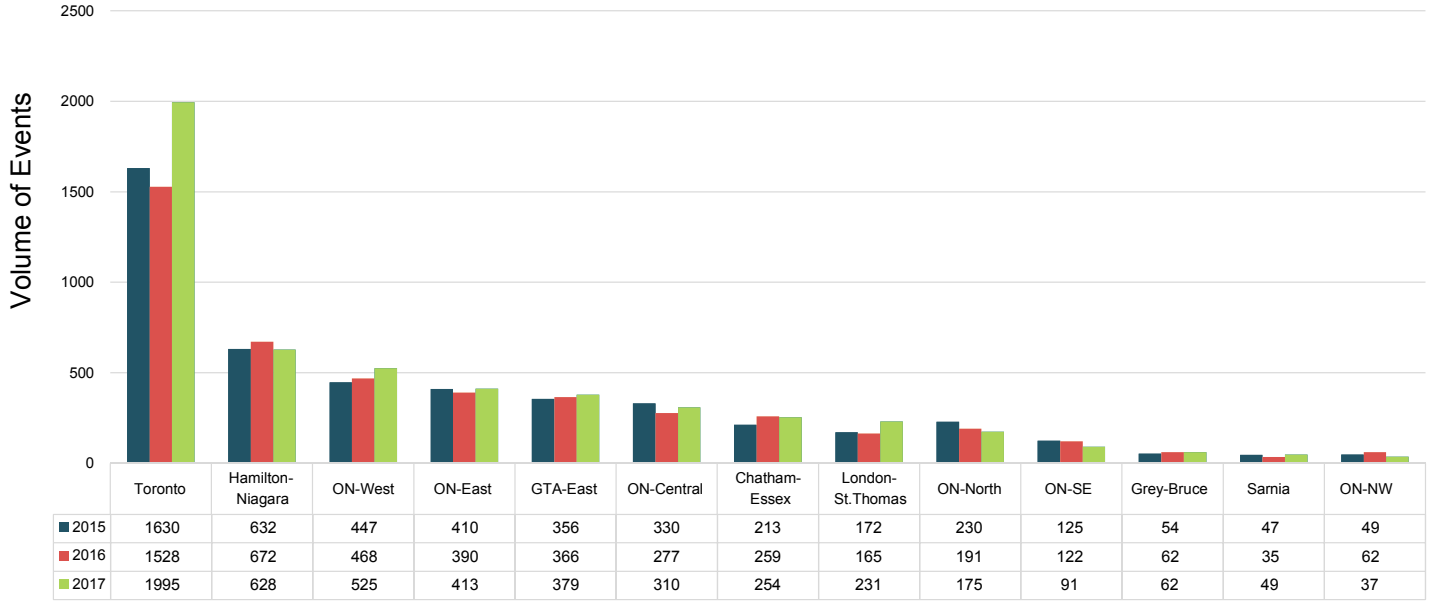
Table 1 outlines the ORCGA geographic areas and the constituent municipalities/cities.

Geographic Area	Cities
Chatham-Essex	Chatham-Kent ~ Essex
Grey-Bruce	Bruce ~ Grey
GTA-East	Durham ~ Kawartha Lakes ~ Northumberland ~ Peterborough
Hamilton-Niagara	Haldimand ~ Halton ~ Hamilton-Wentworth ~ Niagara ~ Norfolk
London-St. Thomas	Elgin ~ Middlesex
ON-Central	Dufferin ~ Simcoe
ON-East	Akwesasne ~ Lanark ~ Ottawa ~ Prescott & Russell ~ Renfrew ~ Stormant, Dundas & Glengary
ON-North	Algoma ~ Cochrane ~ Greater Sudbury ~ Haliburton ~ Manitoulin ~ Muskoka ~ Nipissing ~ Sudbury ~ Temiscamingue ~ Timiskaming
ON-Northwest	Kenora ~ Rainy River ~ Thunder Bay
ON-Southeast	Frontenac ~ Hastings ~ Leeds & Grenville ~ Lennox & Addington ~ Prince Edward
ON-West	Brant ~ Brant ~ Oxford ~ Perth ~ Waterloo ~ Wellington
Sarnia	Lambton
Toronto	Peel ~ Toronto ~ York

Table 1: Geographic Area Breakdown by Region/Municipality/City

Figure 2 illustrates the number of events for each geographic area over the past three years.

There have been minor fluctuations, however the majority of Geographic Councils are seeing an upward trend in events. Of concern is the significant jump in Toronto's incidents, a 30% increase, with only a 6% increase in locate notifications.



	Toronto	Hamilton-Niagara	ON-West	ON-East	GTA-East	ON-Central	Chatham-Essex	London-St.Thomas	ON-North	ON-SE	Grey-Bruce	Sarnia	ON-NW
2015	1630	632	447	410	356	330	213	172	230	125	54	47	49
2016	1528	672	468	390	366	277	259	165	191	122	62	35	62
2017	1995	628	525	413	379	310	254	231	175	91	62	49	37

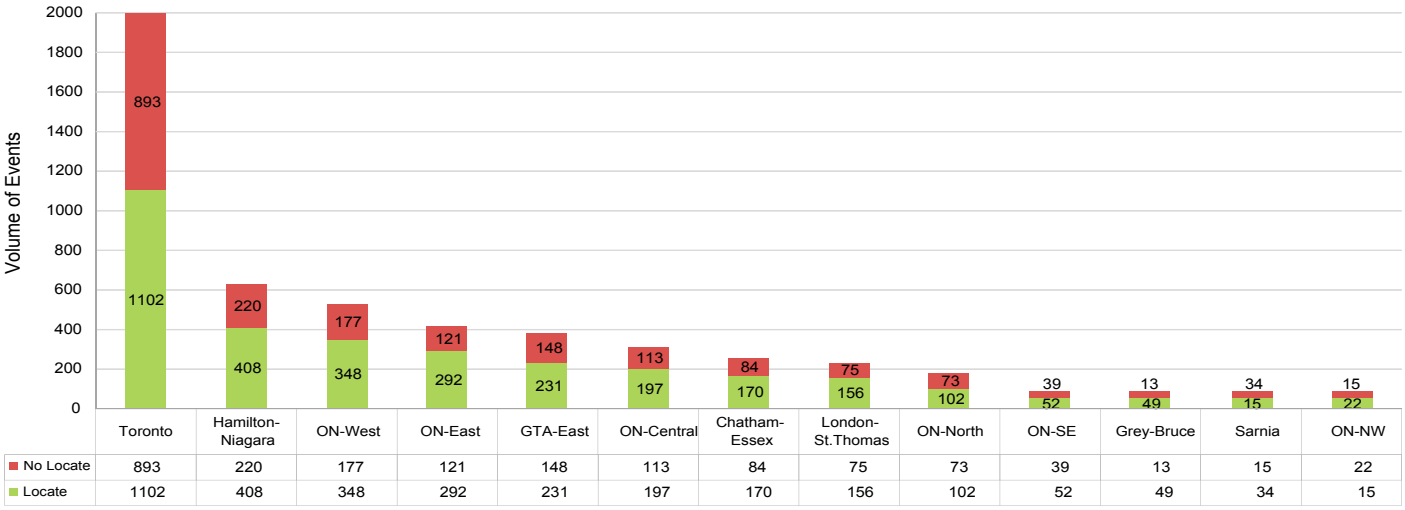
Figure 2: Volume of Events Submitted Per Geographic Area

Due to the stabilization of new members, notifications have evened out. We expect this to continue with swings up and down due to either changes in the One Call centre's notification process or the current economic trend.

Geographical Area	2015	2016	2017
Chatham-Essex	248,628	240,533	295,231
Grey-Bruce	78,246	75,670	73,940
GTA-East	453,632	426,826	432,933
Hamilton-Niagara	1,086,631	1,051,814	1,025,378
London-St.Thomas	228,603	238,602	260,871
ON-Central	268,260	270,453	260,003
ON-East	595,851	610,348	620,086
ON-North	240,041	226,611	228,432
ON-NW	80,029	74,833	74,359
ON-SE	136,928	135,373	129,913
ON-West	565,196	575,108	573,568
Sarnia	92,770	87,807	98,112
Toronto	2,459,767	2,546,712	2,705,414
Grand Total	6,534,582	6,560,690	6,778,240

Table 2: Notifications Per Geographic Council

Figure 3 illustrates a distribution by geographic area comparing the number of events in 2017 where Ontario One Call was notified for a locate request versus not being notified for a locate request.

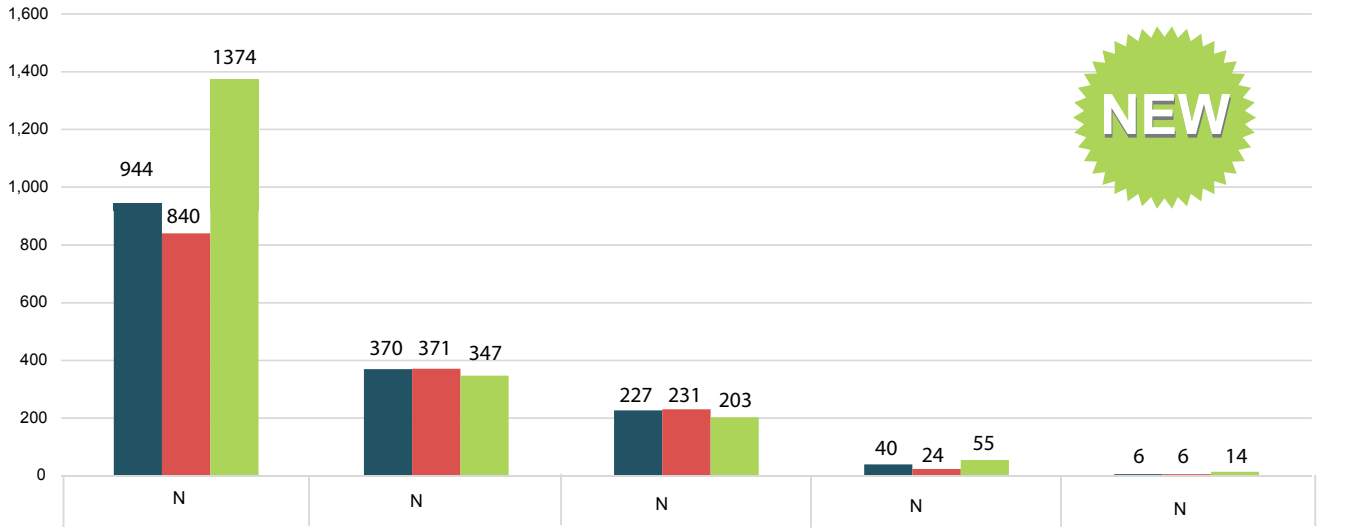


	Toronto	Hamilton-Niagara	ON-West	ON-East	GTA-East	ON-Central	Chatham-Essex	London-St.Thomas	ON-North	ON-SE	Grey-Bruce	Sarnia	ON-NW
No Locate	893	220	177	121	148	113	84	75	73	39	13	15	22
Locate	1102	408	348	292	231	197	170	156	102	52	49	34	15

Figure 3: Locate Versus No Locate Events by Geographic Area

Figure 4 provides further analysis about the categories of excavators that are not submitting locate requests.

This information provides focus on the Excavator type that requires further education in adhering to legal requirements of obtaining a locate prior to an excavation or dig.



	Contractor/Developer	Occupant/Farmer	Unknown/Other	Municipality	Utility
	N	N	N	N	N
2015	944	370	227	40	6
2016	840	371	231	24	6
2017	1,374	347	203	55	14

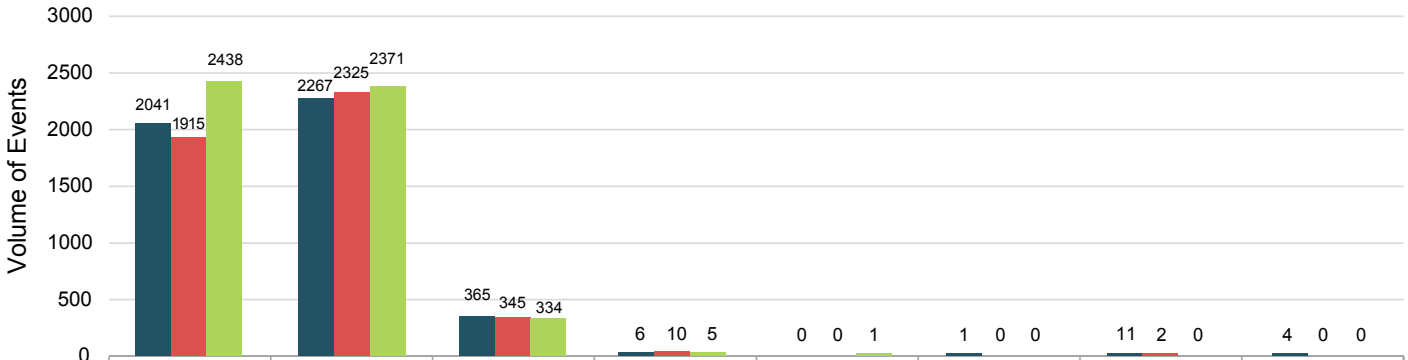
Figure 4: No Locate Damages by Excavator Type

2.3 SUBMITTED FACILITY EVENTS BY STAKEHOLDER GROUP

Figure 5 illustrates a distribution of events by stakeholder group for the past three years. Based on the figure it can be seen that Telecommunications and Natural Gas continue to submit the highest volumes of events.

This is the first time in several years that Telecommunications has surpassed Natural Gas in incident volume.

Opportunity exists for additional stakeholders to submit events which would support future trend analysis.

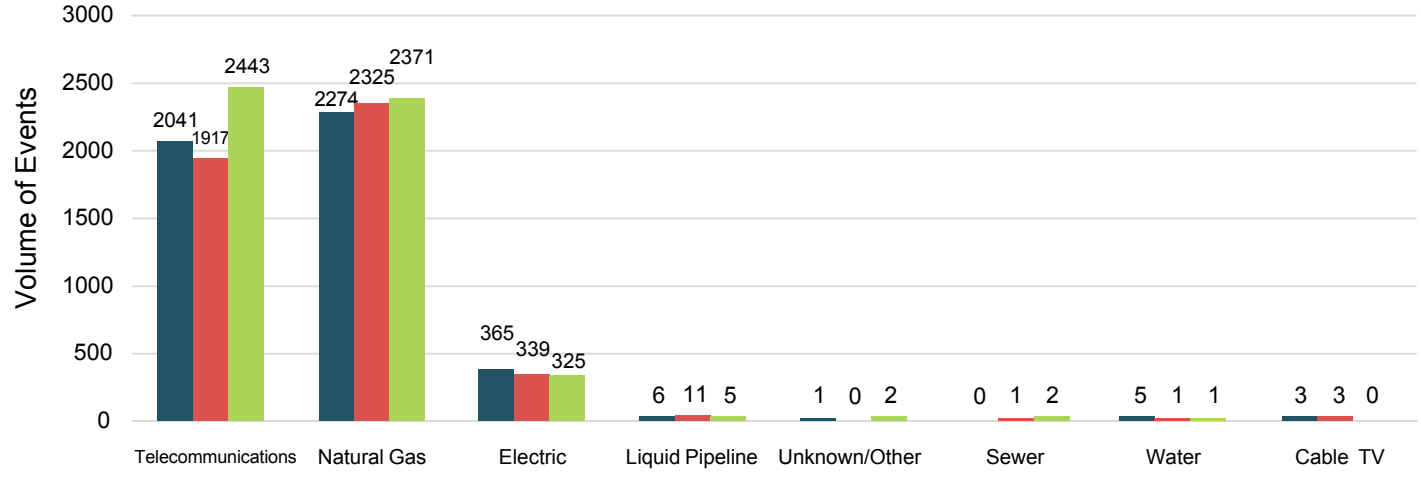


	Telecommunications	Natural Gas	Electric	Liquid Pipeline	Insurance	Private Water	Excavator	Public Works
2015	2041	2267	365	6	0	1	11	4
2016	1915	2325	345	10	0	0	2	0
2017	2438	2371	334	5	1	0	0	0

Figure 5: Facility Events Submitted by Stakeholder Group

2.4 SUBMITTED FACILITY EVENTS BY TYPE OF FACILITY OPERATION AFFECTED

Figure 6 illustrates that Telecommunications and Natural Gas can be seen as the primary facilities affected by events reported in DIRT. This aligns with the fact that Telecommunications and Natural Gas stakeholders continue to submit the majority of events.



	Telecommunications	Natural Gas	Electric	Liquid Pipeline	Unknown/Other	Sewer	Water	Cable TV
2015	2041	2274	365	6	1	0	5	3
2016	1917	2325	339	11	0	1	1	3
2017	2443	2371	325	5	2	2	1	0

Figure 6: Submitted Facility Events by Type of Facility Affected

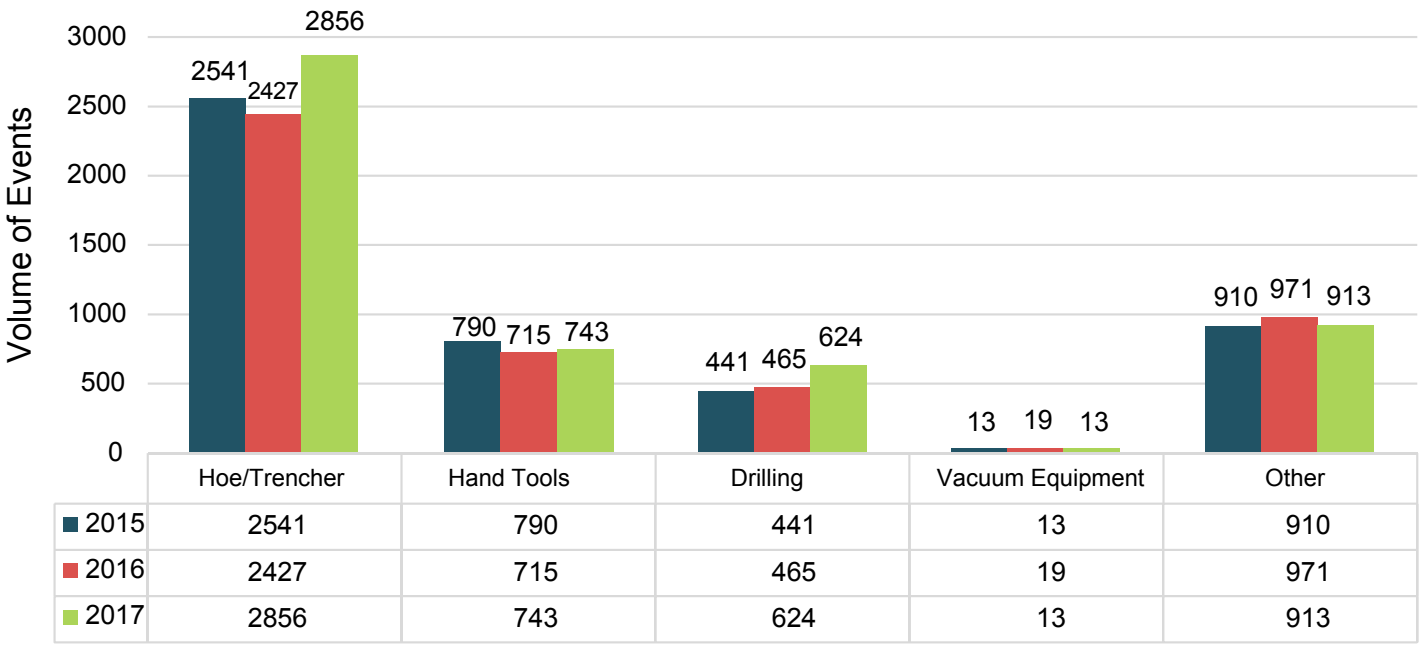
2.5 VOLUME OF EVENTS BY EXCAVATION EQUIPMENT GROUP

Table 3 outlines the types of excavation equipment included in each equipment group.

Group	Excavation Equipment Type	
Hoe/Trencher	Backhoe/Trackhoe	Trencher
Hand Tools	Hand Tools	Probing Device
Drilling	Auger	Directional Drilling
	Boring	Drilling
Vacuum Equipment	Vacuum Equipment	
Other	Data Not Collected	Explosives
	Farm Equipment	Grader/Scraper
	Milling Equipment	Other

Table 3: List of Equipment Groups

Figure 7 illustrates a distribution of events caused by various groups of excavation equipment.
In 2017 the Hoe/Trencher group continues to account for the largest volume of events.
Efforts should be made by reporting groups to minimize listing equipment as “Other” in order to improve the accuracy of data.



	Hoe/Trencher	Hand Tools	Drilling	Vacuum Equipment	Other
2015	2541	790	441	13	910
2016	2427	715	465	19	971
2017	2856	743	624	13	913

Figure 7: Submitted Facility Events by Excavation Equipment Group

2.6 FACILITY EVENTS BY ROOT CAUSE

Table 4a details the Root Cause subcategories included in each main category. Refer to the Root Cause Tip Card (Appendix B) for a more detailed breakdown of the meaning of each Root Cause subcategory. Depending upon which reporting stakeholder submitted the data for a facility event, Root Cause volumes can vary significantly.

2017 Root Causes and Subcategories		
Root Cause Category	**Root Cause Subcategory**	
Excavation Practices Not Sufficient	Failure to maintain the marks*	Failure to support exposed facilities*
	Failure to use hand tools where required***	Failure to verify location by test-hole (pot-holing)*
	Improper backfilling*	Other insufficient excavation practices*
	Failure to maintain clearance	
Locating Practices Not Sufficient*	Facility could not be found/located*	Facility marking or location not sufficient
	Facility was not located or marked	Incorrect facility records/maps***
Miscellaneous Root Causes	Abandoned facility**	Data Not Collected***
	Deteriorated facility*	One-Call center error***
	One-Call notification center error*	Other***
	Previous damage*	
One Call Notification Practices Not Sufficient*	No notification made to the one-call center*	Notification to one-call center made but not sufficient
	Wrong information provided*	

* indicates Category\Subcategory change in 2018

** Moved to Locating Issue

*** Deleted from Report

Table 4a: 2017 Root Cause Category and Subcategory

Table 4b denotes the new data standard for the 2018 DIRT Form which has been implemented alongside Table 4a.

2018 Root Causes and Subcategories		
Root Cause Category	**Root Cause Subcategory**	
Excavation Practices Not Sufficient	Marks faded or not maintained	Excavator failed to protect/shore facilities
		Excavator dug prior to verifying marks by test-hole (pothole)
	Improper backfilling practices	Improper excavation practice not listed above
	Failure to maintain clearance	
Locating Issue	Facility not marked due to: Abandoned Facility	Facility not marked due to: Unlocatable Facility
	Facility not marked due to: Incorrect Facility records/maps	Facility marked inaccurately due to: Abandoned facility
	Facility not marked due to: Locator error+	Facility marked inaccurately due to: Incorrect facility records/maps
	Facility not marked due to: No response from Operator/contract locator+	Facility marked inaccurately due to: Locator error
	Facility not marked due to : Tracer wire issue+	Facility marked inaccurately due to: Tracer wire issue
Miscellaneous Root Causes		
	Deteriorated facility	
	One-Call notification center error	Root Cause not listed (comment required)+
	Previous damage	
Notification Issue	No notification made to the one-call center/811	Excavator dug outside area described on ticket+
	Excavator provided incorrect notification information	Excavator dug prior to valid start date/time+
		Excavator dug after valid ticket expired+

\+ New Category\Subcategory

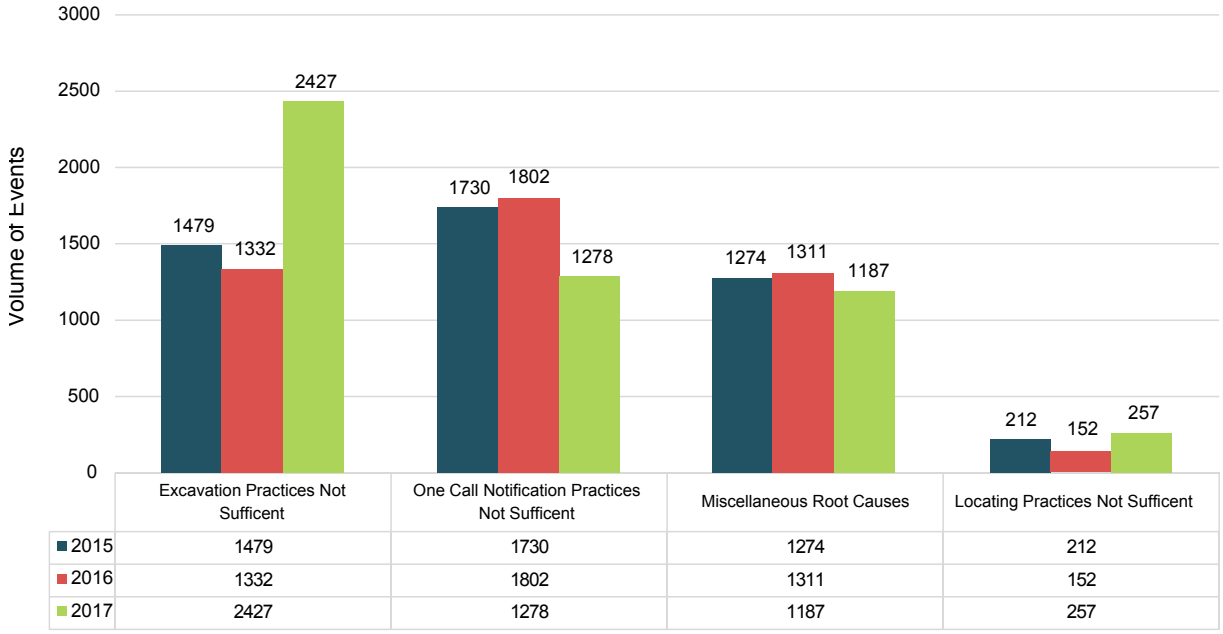
Table 4b: 2018 Root Cause Category and Subcategory

In order to develop useful educational tools to improve the damage prevention performance in Ontario, it is important to examine the causes of reported events. To further understand the most common reasons for facility events, the distribution of Root Cause subcategories will be examined on the following pages.

Figure 8 illustrates the distribution of events by Root Cause category. The most common identified causes of events are a result of Excavation Practices Not Sufficient, One Call Notification Practices Not Sufficient and Miscellaneous Root Causes.

Emphasis should be made to reduce events due to Excavation Practices Not Sufficient by providing targeted outreach/ educational information to excavators to reduce events due this root cause.

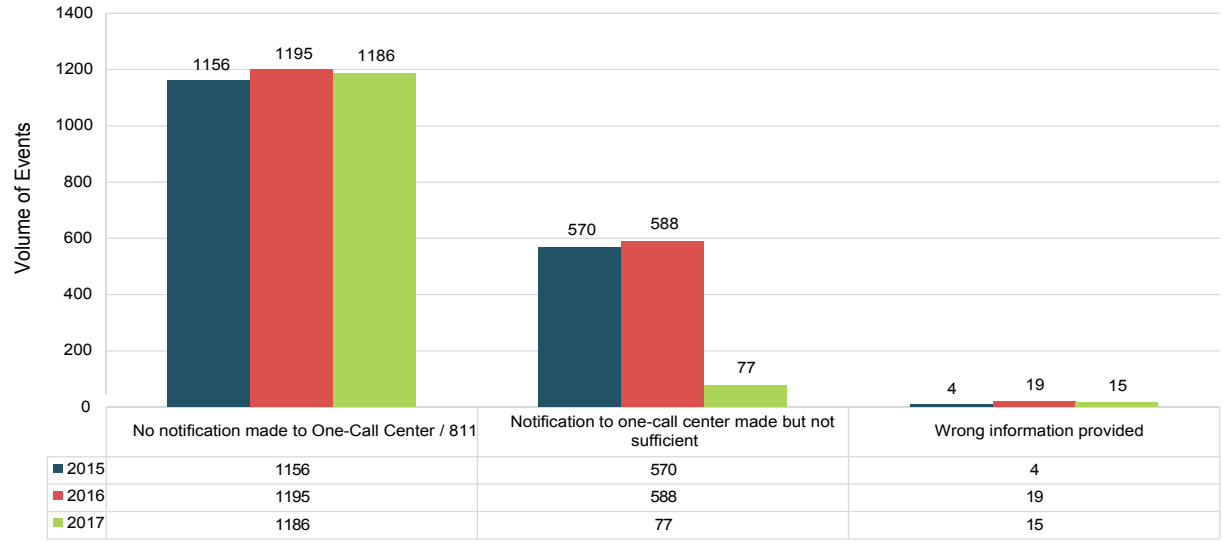
In order to improve the completeness of data, efforts should be made by reporting groups to minimize using Miscellaneous Root Causes.



	Excavation Practices Not Sufficent	One Call Notification Practices Not Sufficent	Miscellaneous Root Causes	Locating Practices Not Sufficent
2015	1479	1730	1274	212
2016	1332	1802	1311	152
2017	2427	1278	1187	257

Figure 8: Facility Events by Root Cause Category

Figure 9 illustrates a breakdown of the Root Cause subcategories for One Call Notification Practices Not Sufficient. This figure illustrates the need to continuously increase excavator and general public awareness about calling to request a locate before digging starts. There has been a significant drop in Notification to One Call Centre Made but Not Sufficient. This subcategory includes instances such as inadequate information or not allowing sufficient lead times for a locate request.

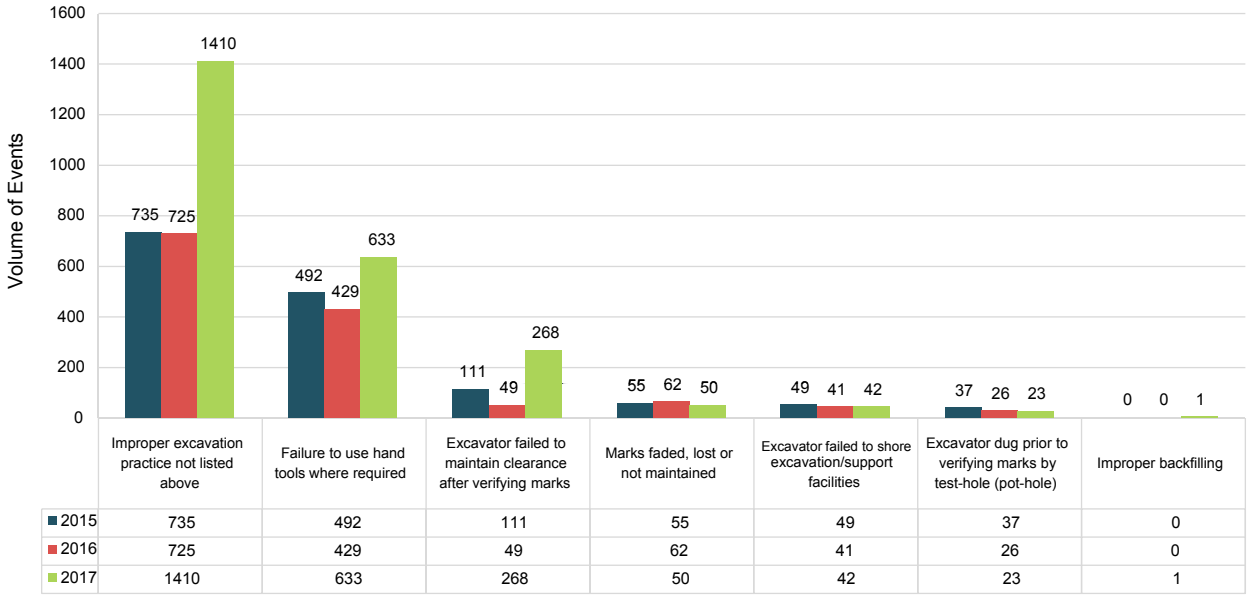


	No notification made to One-Call Center / 811	Notification to one-call center made but not sufficient	Wrong information provided
2015	1156	570	4
2016	1195	588	19
2017	1186	77	15

Figure 9: Facility Events by One Call Notification Practices Not Sufficient

Figure 10 illustrates a breakdown of the Root Cause subcategories for Excavation Practices Not Sufficient for the past three years. As seen below, Improper Excavation Practice Not Listed Above has seen a dramatic increase over the previous year. This Root Cause subcategory is defined as any other excavator error, which cannot be classified as one of the other seven Root Cause subcategories within Excavation Practices Not Sufficient. Please see Appendix B.

The next highest Root Cause subcategory is the failure to use hand tools where required. This needs to be examined to see if this choice is due to an assumption that manually operated equipment (eg: manual post hole digger) is considered digging by hand.

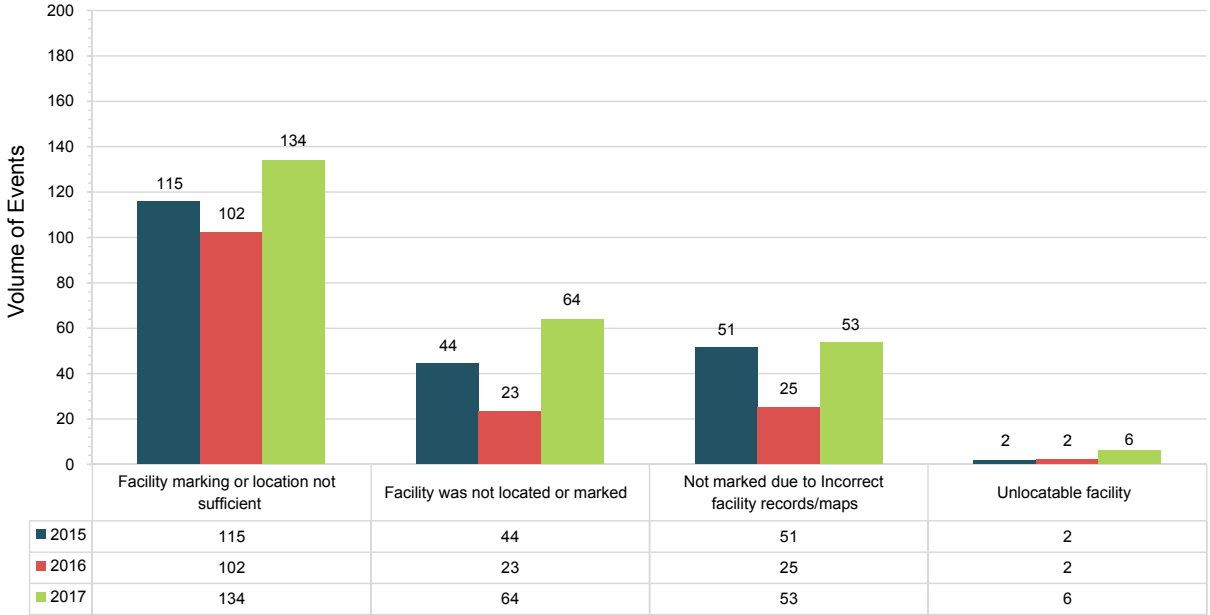


	Improper excavation practice not listed above	Failure to use hand tools where required	Excavator failed to maintain clearance after verifying marks	Marks faded, lost or not maintained	Excavator failed to shore excavation/support facilities	Excavator dug prior to verifying marks by test-hole (pot-hole)	Improper backfilling
2015	735	492	111	55	49	37	0
2016	725	429	49	62	41	26	0
2017	1410	633	268	50	42	23	1

Figure 10: Facility Events by Excavation Practices Not Sufficient

Figure 11 illustrates a breakdown of the Root Cause subcategories for Locating Practices Not Sufficient for the past three years. The most prevalent Root Cause subcategory is Facility Marking or Location Not Sufficient. Refer to Root Tip Card (Appendix B) for examples of Facility Marking or Location Not Sufficient events.

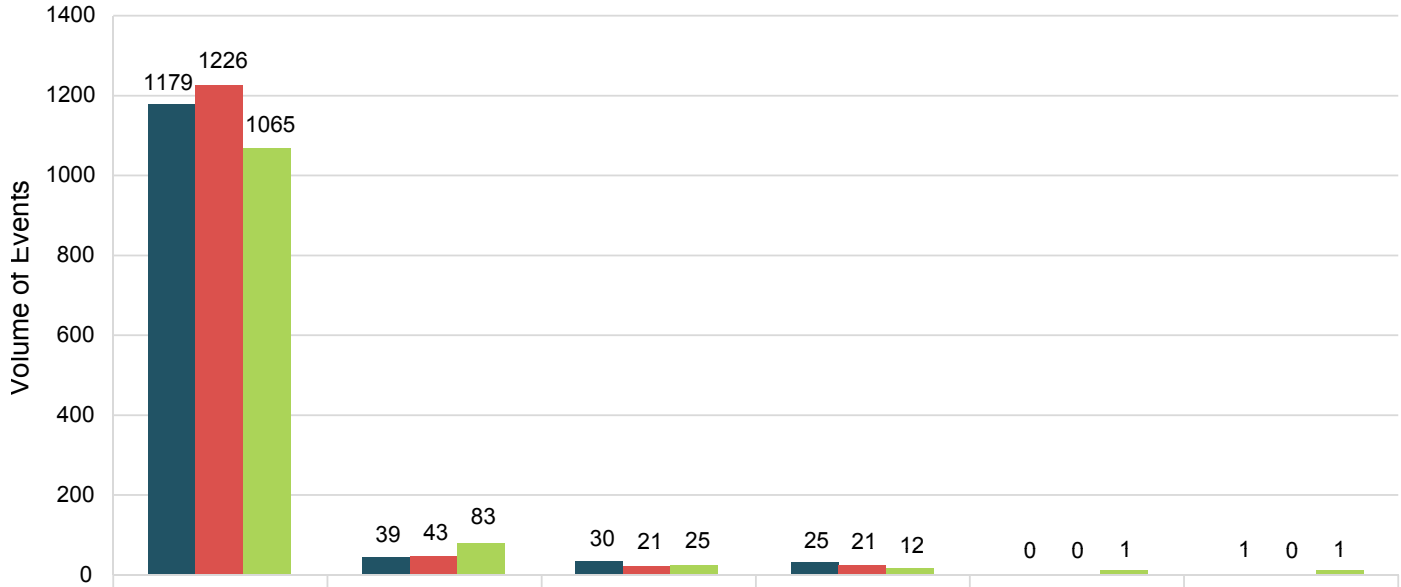
2017 has seen a significant increase across all categories.



	Facility marking or location not sufficient	Facility was not located or marked	Not marked due to Incorrect facility records/maps	Unlocatable facility
2015	115	44	51	2
2016	102	23	25	2
2017	134	64	53	6

Figure 11: Facility Events by Locating Practices Not Sufficient

Figure 12 illustrates a breakdown of the Root Cause subcategories for Facility Events by Miscellaneous Root Cause. This figure illustrates the need for stakeholders to be sure and complete the Root Cause field. The Data Not Collected subcategory is a measure of all events where a Root Cause was not selected. With the 2018 DIRT changes this is being replaced by Root Cause Not Listed Above. Hopefully this will address the Data Not Collected catch-all issue. This is dependent on how submitters input on the requested comment.

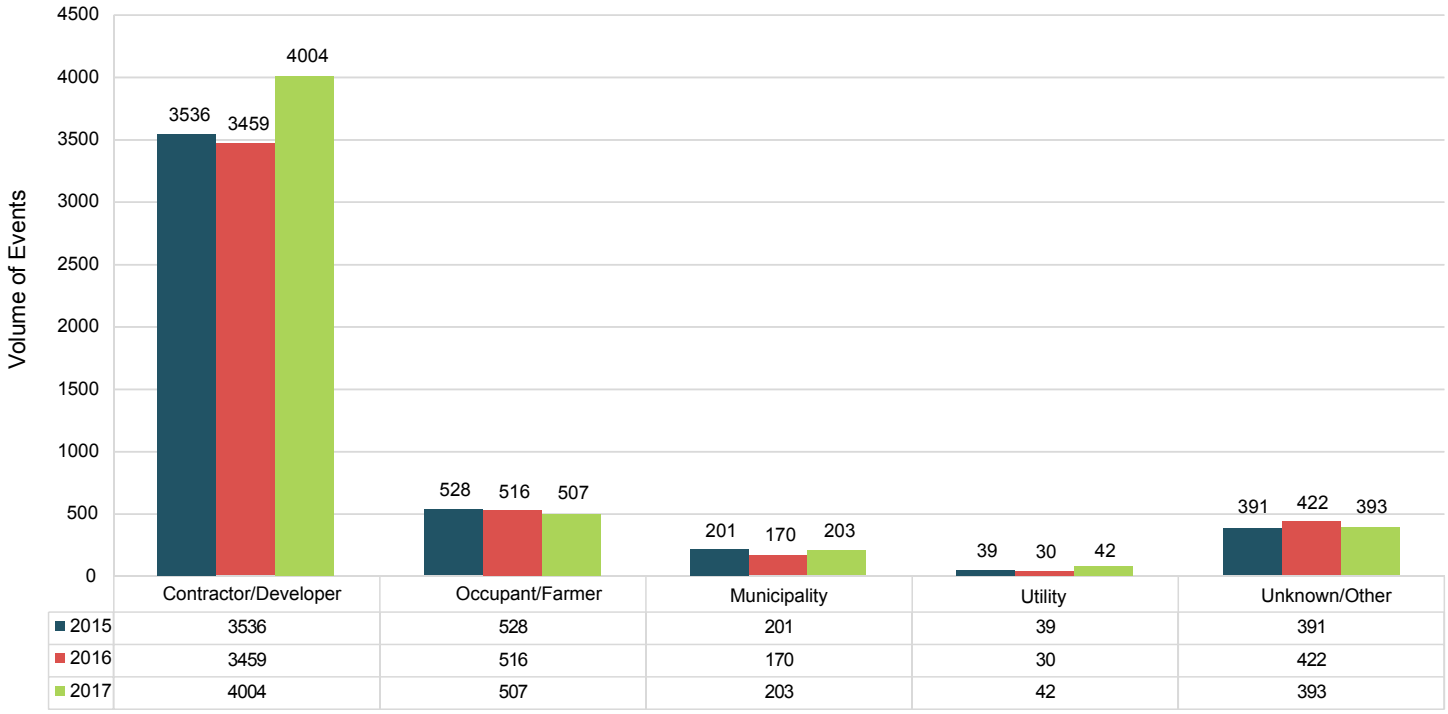


	Data Not Collected	Root Cause not listed above (comment required)	Abandoned facility	Deteriorated facility	Previous damage	One-Call Center error
2015	1179	39	30	25	0	1
2016	1226	43	21	21	0	0
2017	1065	83	25	12	1	1

Figure 12: Facility Events by Miscellaneous Root Cause

2.7 FACILITY EVENTS BY EXCAVATOR GROUP

Figure 13 illustrates the distribution of events by Type of Excavator showing that Contractor/Developer continues to be involved in the majority of the reported events. In order to develop useful educational tools to improve the damage prevention performance in Ontario, it is important to examine the parties causing reported events. Additional analysis of these groups is provided in the 3.0 Multi-Field Analysis section of this report.



	Contractor/Developer	Occupant/Farmer	Municipality	Utility	Unknown/Other
2015	3536	528	201	39	391
2016	3459	516	170	30	422
2017	4004	507	203	42	393

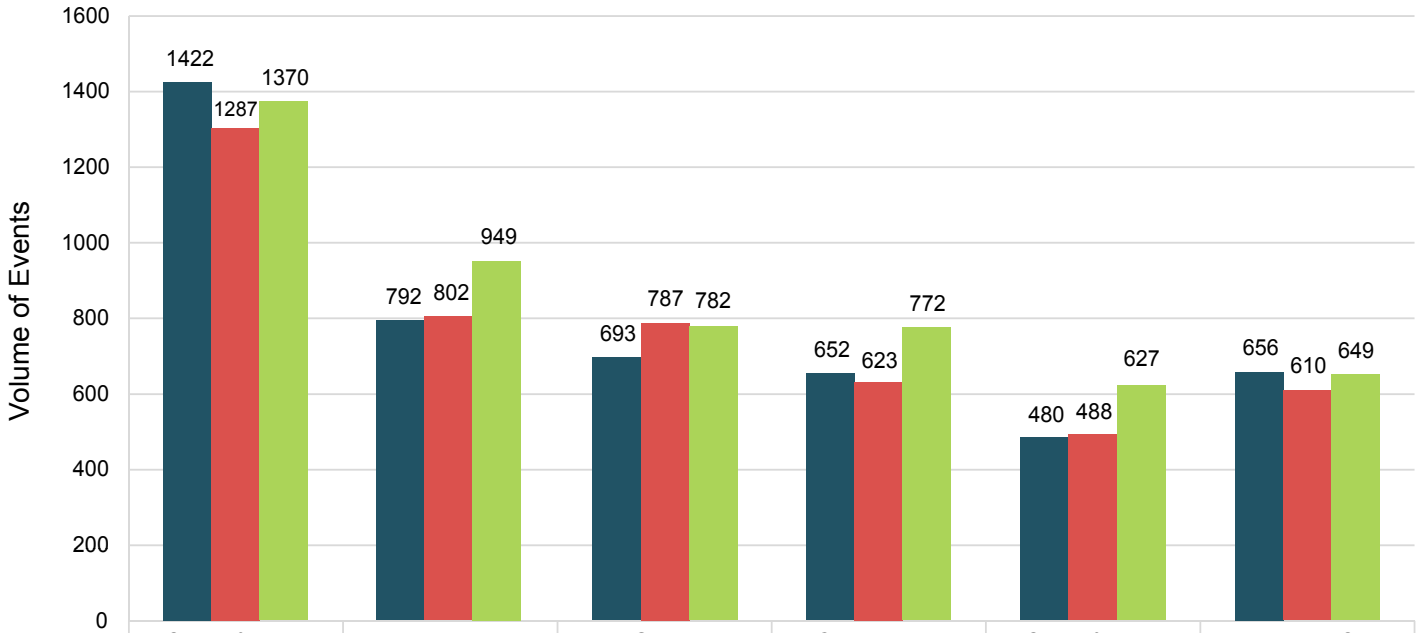
Figure 13: Facility Events by Type of Excavator

2.8 FACILITY EVENTS BY TYPE OF WORK PERFORMED

In order to develop useful educational tools to improve the damage prevention performance in Ontario, we will examine the common Types of Work causing these events below.

Figure 14 illustrates a distribution of Events by Type of Work Performed. It is seen that the Sewer & Water and Utility groups continue to be involved in the majority of events submitted. Also, of concern are the Construction and the Street & Road industries which have shown an increase in 2017.

Those who are responsible for submitting events should strive to reduce the amount listed as Unknown/Other in order to improve data completeness and accuracy.



	Sewer & Water	Utility	Green	Construction	Street & Road	Unknown / Other
2015	1422	792	693	652	480	656
2016	1287	802	787	623	488	610
2017	1370	949	782	772	627	649

Figure 14: Facility Events by Type of Work Performed

Table 5 illustrates the largest Type of Work Performed. When broken down into identifiable sub groups, Water is first with 895 events, followed by Building Construction with 526, followed by Telecommunications with 522 events. This takes into account over one third of events and would provide the greatest impact in being reduced.

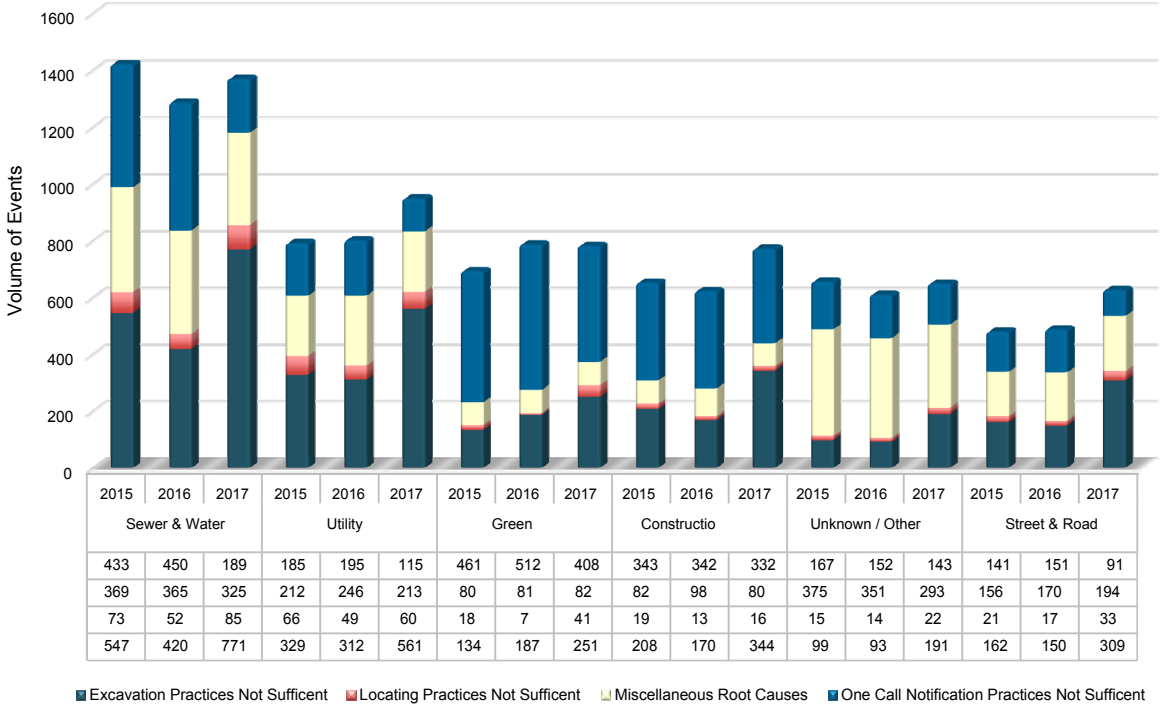
Group & Type of Work	2015	2016	2017
Construction			
Bldg. Construction	417	377	526
Driveway	137	144	135
Site Development	53	45	62
Grading	33	40	38
Bldg. Demolition	12	17	11
Green			
Fencing	362	424	428
Landscaping	318	351	338
Irrigation	11	8	11
Agriculture	1	2	4
Waterway Improvement	1	2	1
Sewer & Water			
Water	953	790	895
Sewer	286	331	315
Drainage	183	166	160
Street & Road			
Road Work	275	329	337
Curb/Sidewalk	82	66	115
Storm Drain/Culvert	75	46	105
Pole	30	19	34
Street Light	3	8	16
Traffic Sign	10	11	13
Traffic Signal	4	9	6
Public Transit Authority			1
Railroad	1		
Utility			
Telecommunications	329	305	522
Electric	299	294	278
Natural Gas	106	123	109
Cable TV	58	79	40
Liquid Pipeline		1	
Unknown / Other			
Unknown/Other	651	599	631
Data Not Collected	4	10	17
Engineering/Surveying	1	1	1

Table 5: List of Work Included in Each Work Group

3.0 MULTI-FIELD ANALYSIS

3.1 ANALYSIS OF ROOT CAUSE AND FACILITIES AFFECTED BY TYPES OF WORK

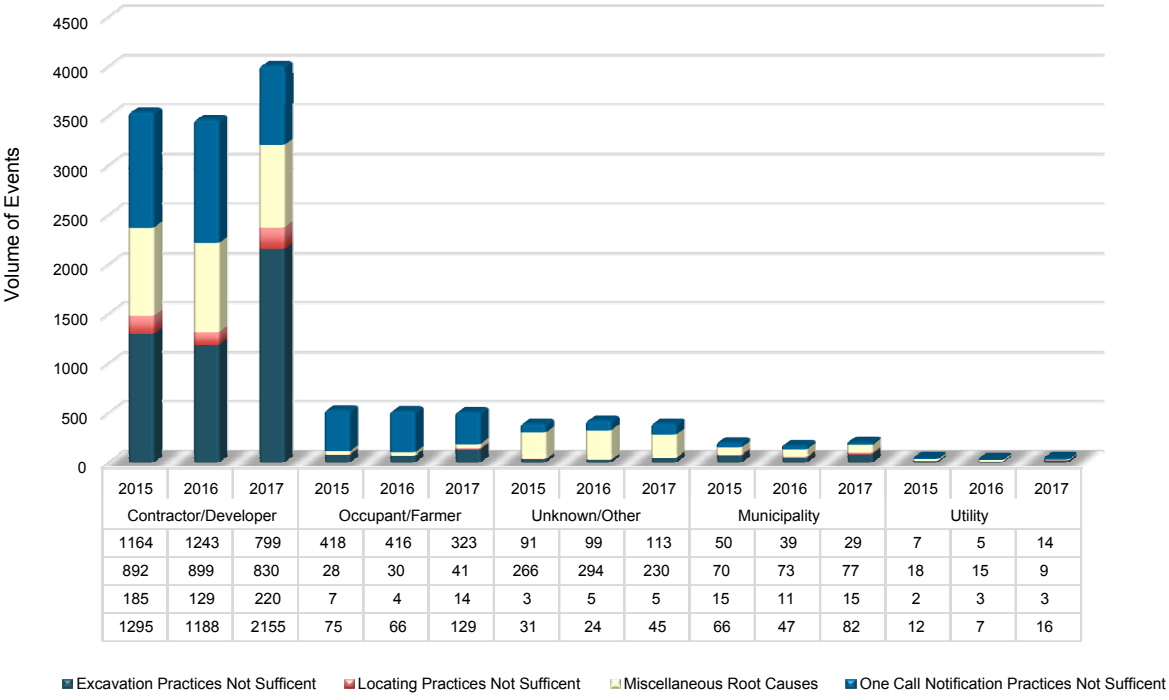
The following charts illustrate the known Root Causes of events for the six work groups of Sewer and Water, Utility, Green, Construction, Unknown/Other and Street & Road Work for the years 2015, 2016 and 2017.



2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017
Sewer & Water			Utility			Green			Constructio			Unknown / Other			Street & Road		
433	450	189	185	195	115	461	512	408	343	342	332	167	152	143	141	151	91
369	365	325	212	246	213	80	81	82	82	98	80	375	351	293	156	170	194
73	52	85	66	49	60	18	7	41	19	13	16	15	14	22	21	17	33
547	420	771	329	312	561	134	187	251	208	170	344	99	93	191	162	150	309

Figure 15: Facility Events by Root Cause Group and Industry

Figure 16 illustrates that the Contractor/Developer excavator type still represents the majority of events submitted under Excavation Practices Not Sufficient category, and has seen an increase in 2017.



2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017
Contractor/Developer			Occupant/Farmer			Unknown/Other			Municipality			Utility		
1164	1243	799	418	416	323	91	99	113	50	39	29	7	5	14
892	899	830	28	30	41	266	294	230	70	73	77	18	15	9
185	129	220	7	4	14	3	5	5	15	11	15	2	3	3
1295	1188	2155	75	66	129	31	24	45	66	47	82	12	7	16

Figure 16: Facility Events by Root Cause Category and Excavator Type

Figure 17 illustrates the damage ratio relative to the volume of events over the past decade. Industry practice is to measure damage prevention performance by the volume of damages per thousand notifications.

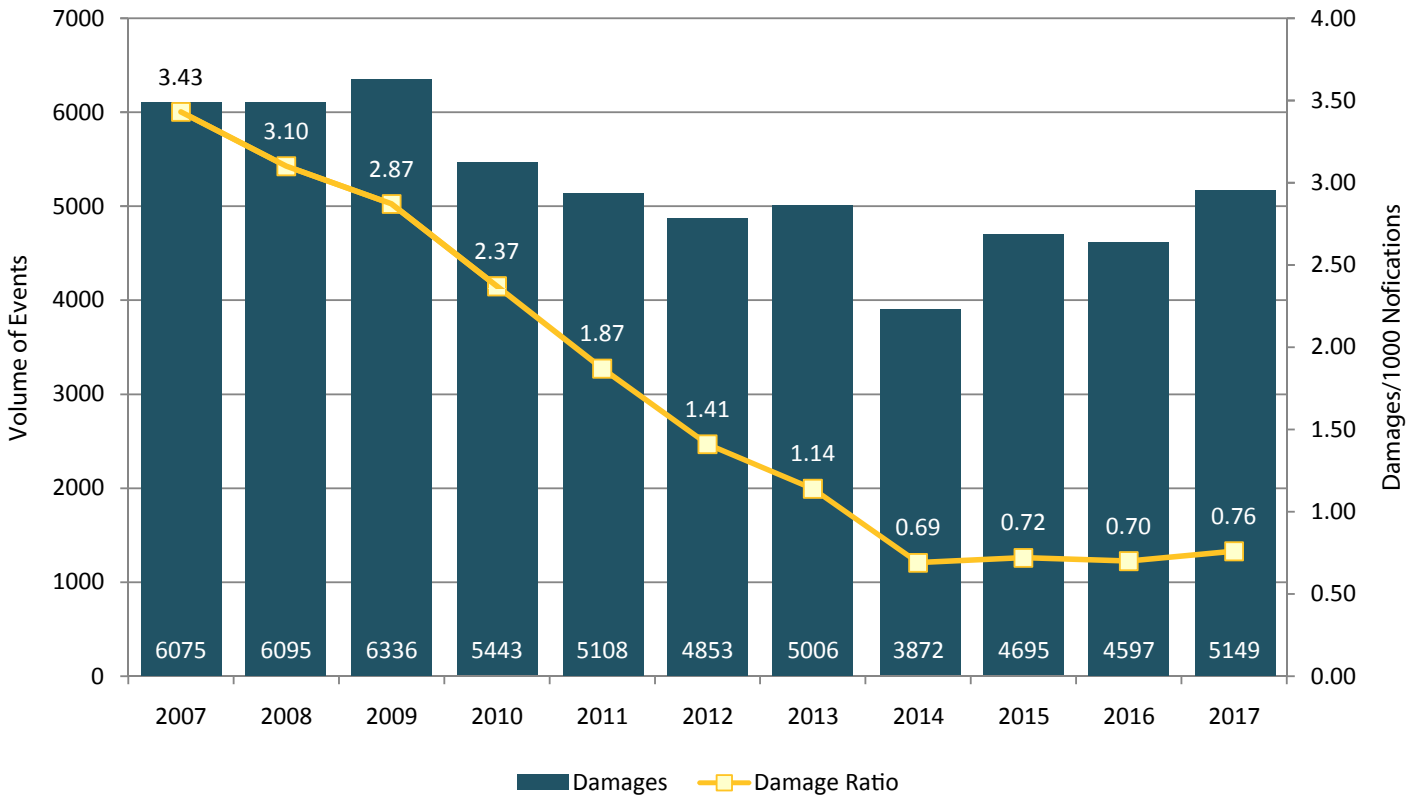


Figure 17: Damage Ratio- Damages/1000 Notifications

Figure 18: History of Notifications
This graph demonstrates that up until 2015, notifications rose significantly as major stakeholders became members of Ontario One Call.

Any further changes would be due to outside economic events.

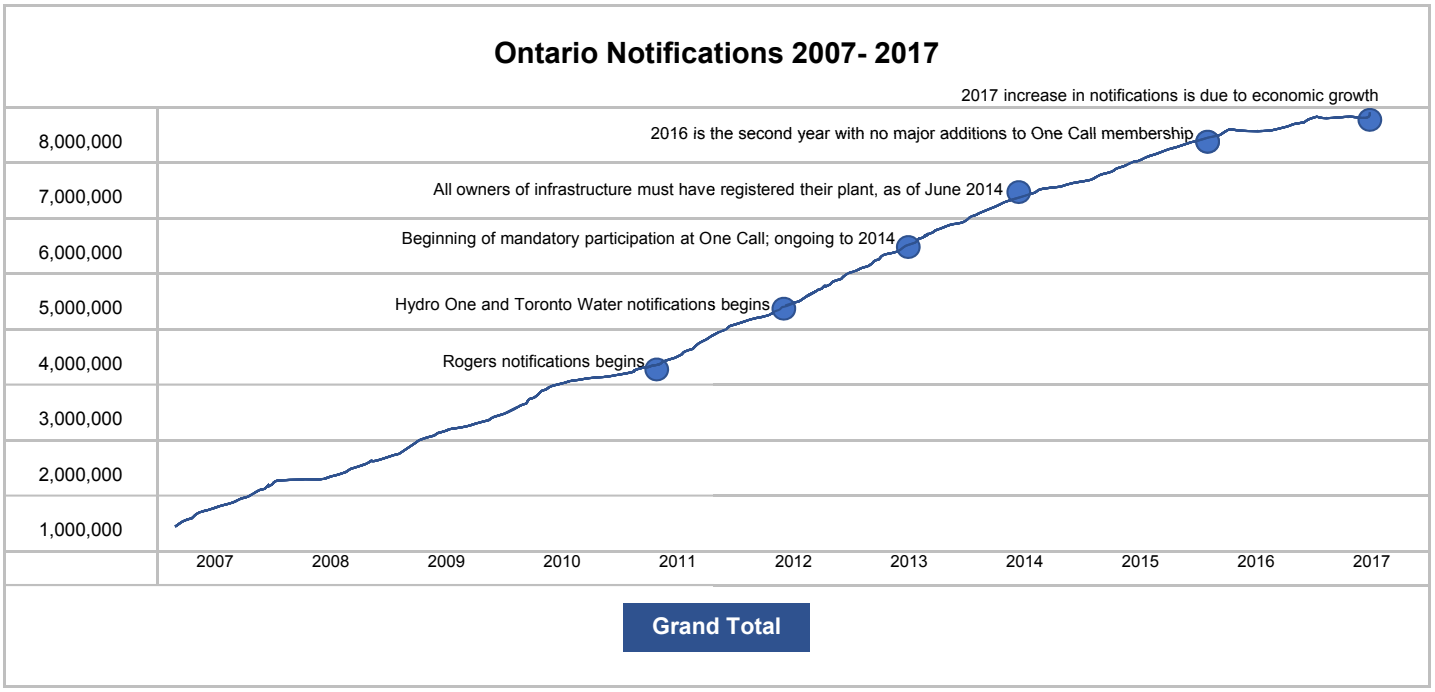


Figure 18: History of Notifications

4.0 REGIONAL PARTNER DATA

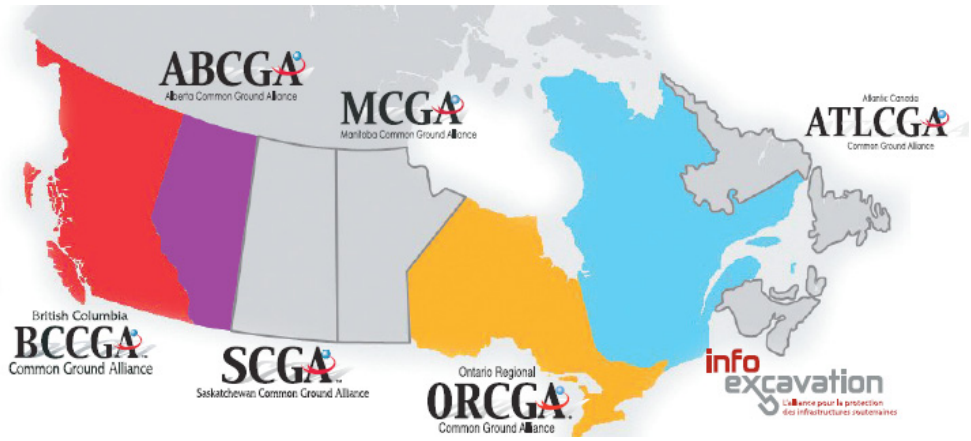
We would like begin this year's remarks by thanking Sher Kirk for her contribution as Chair of the CCGA Data Reporting and Evaluation Committee (DREC). This committee collects anonymous information relating to damages of underground infrastructure reported in each province. In British Columbia, Alberta, Saskatchewan, Ontario,and Quebec, the data is collected through voluntary submission of information into a Virtual Private DIRT (Damage Information Reporting Tool) database. In Atlantic Canada, information is reported directly by participating infrastructure owners. Manitoba does not currently submit data to the CCGA DREC.

The purpose of the National DIRT Report is to identify national trends over time. As discussed in previous years, the challenge is that only Quebec, Ontario and to a lesser-extent, British Columbia have collected enough data over a significant amount of time to begin identifying trends with real confidence in the data. As new provinces submit data this requires re-balancing the dataset, which in turn can impact trend analysis if you are looking at specific regions.

The national data does have value, but in its current state, the data has to be analyzed in deeper detail in order to fully appreciate its indications. For example, currently much of the national data is submitted by the major utility and pipeline operators. This has the effect of creating a picture that the bulk of damage occurs only to these facilities.To gain an accurate picture we need to gather data from all organizations that own, operate and work around underground infrastructure. Our challenge nationally over the next 3 years, data will be continue to increase and improve the quality of data to where it will have enormous value in making recommendations on a national scale as well as giving the damage prevention industry a relatively accurate estimate of the societal costs of third party damages on underground infrastructure.

We hope that the presentation of National Data is useful to your organization. We encourage you to participate in reporting damages to your provincial CGA or provincial Virtual Private DIRT and say thank you to everyone who already does so. The data collected can have significant impact on training, education and marketing initiatives in the damage prevention industry.

Ian Turnbull
Co-Chair, Data Reporting and Evaluation Committee
Damage Prevention & Emergency Services Manager
FortisBC Energy Inc.



National Report on Damage to Underground Infrastructure

DAMAGE PREVENTION SYMPOSIUM

CCGA Canadian Common Ground Alliance

Highlights 2014, 2015 and 2016

The Common Ground Alliance (CGA) created the Damage Information Reporting Tool (DIRT) in 2003 to document damages to underground infrastructure. Six Canadian regions currently report damages to the CCGA's Damage Reporting and Evaluation Committee.

INTERPRETING THE DATA

This report contains preliminary findings for 2016. A comprehensive report will be published online in October.

- Reporting in DIRT is voluntary; therefore, the data analyzed is not representative of all damages that have occurred.
- Percentages are calculated on totals of reported damages omitting data where the response was "not collected".

	Number of reported damages			Damages per business day*			Population 2016**	Damages per 1,000 locate requests	Damages per 1,000 notifications
	2014	2015	2016	2014	2015	2016			
Alberta	2,934	2,645	4,356	12	10.4	17.1	4,252,900	10.8	2.7
Atlantic	-	21	17	-	0.8	.07	2,385,000	1.0	0.6
B.C.	1,315	1,131	1,270	5	4.5	5.0	4,751,600	7.0	1.6
Saskatchewan	682	788	632	3	3.1	2.4	1,150,600	4.8	1.6
Ontario	3,809	4,434	4,563	15	17.5	17.9	13,413,700	4.6	0.6
Quebec	1,198	1,088	1,151	5	4.8	4.5	8,326,100	5.0	2.2
TOTAL	**9,938**	**10,107**	**11,989**	**40**	**40**	**47**	**34,279,900**	**6.3**	**1.0**

* 254 business days per year **Source: Statistics Canada

2016 AT A GLANCE

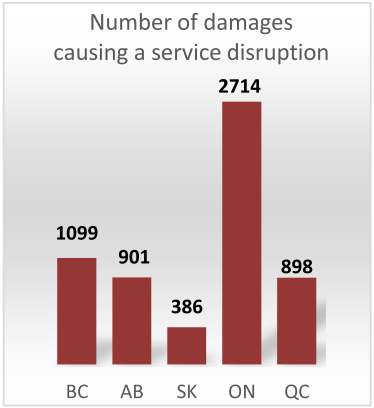
The number of reported damages across Canada increased in 2016. However, the CCGA attributes the escalation in reports to greater awareness of the benefits of the DIRT tool across all sectors.

As more stakeholders participate, the number of reports rises, moving the number of reports closer to a more accurate reflection of the actual number of damages. There are still only a fraction of the damages occurring being reported in DIRT.

The ratio of the number of damages per 1,000 notifications can be compared between the reporting provinces. The reference criteria used for the comparison illustrates, for example, that while the number of damages are higher in Ontario, the ratio of damages to excavation activity is lower than that of other provinces.

SOCIETAL COSTS IN CANADA WERE ESTIMATED AT $975 MILLION.

Significant impact of damage to underground infrastructure relates to societal costs including, emergency response, evacuation, environmental contamination, down-time, interruption / loss of production and sales, and redirection of safety services such as 9-1-1.



In each case, Responders are deployed to the incident initiating a cost to the community tax base. CIRANO (Center For Interuniversity Research and Analysis for Organizations – cirano.qc.ca/en) developed a cost-calculation tool for Info-Excavation. When applied to Canada-wide data, the result gives a conservative estimate of the annual cost of damages to underground infrastructure. The societal costs are likely much higher when we consider that not all damages are reported into DIRT and likely are well in excess of 1 billion dollars.

Ontario Regional ORCGA Common Ground Alliance CELEBRATING 15 YEARS

43% OF DAMAGES WERE THE RESULT OF NO LOCATES

Failure to request locates and insufficient information provided to the One Call Centre are the most common causes for damage to occur during excavation.

Both Alberta and Ontario reported significant increases in the number of reports where notification to the One Call Centre was insufficient or incorrect information was given to the One Call Centre. Further investigation is required to determine the reason for this change and whether it is a reporting change or the result of a procedural change.

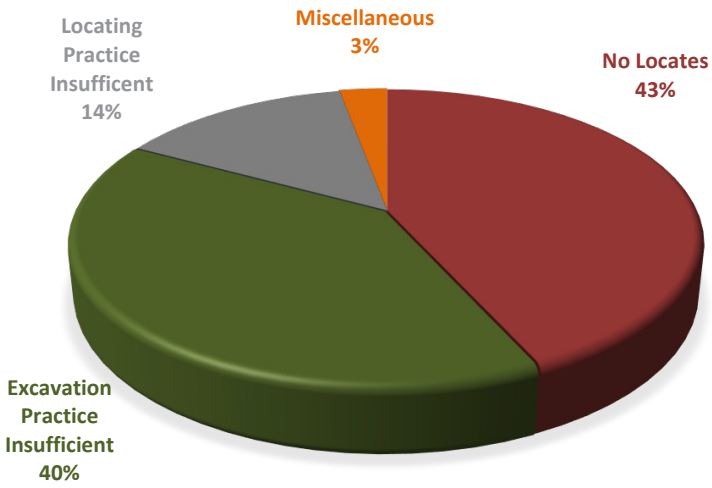
Education of DIRT users continues to be a top priority to ensure consistent and accurate reporting in the Root Cause categories.

31% OF DAMAGES OCCUR DURING WATER/SEWER WORK

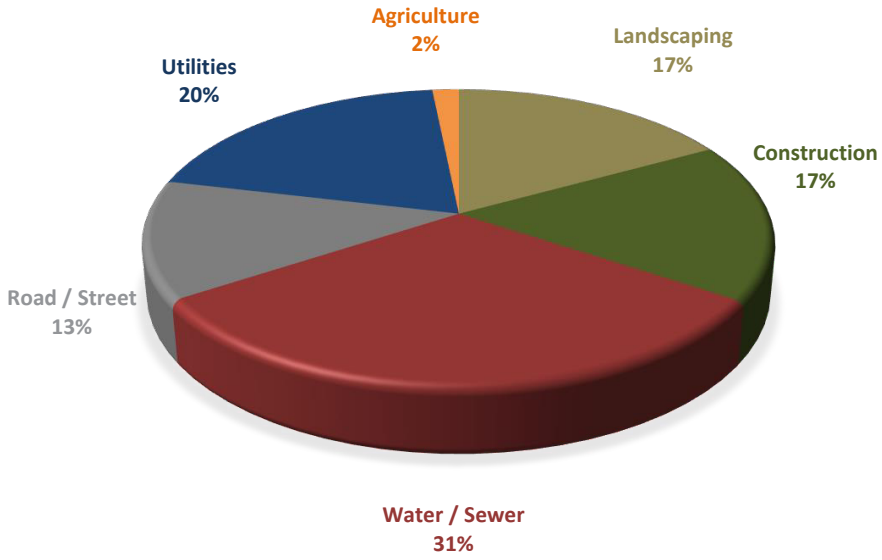
The most common type of excavation taking place when a damage occurs continues to be Water and Sewer Work. British Columbia reported a significant increase in Water and Sewer and decrease in Construction in this category in 2016. It is unclear if the change is due to an anomaly in how users are entering information into DIRT or a change in how damages are being classified. However, the 2016 reporting percentages do bring BC in line with the other provinces rather than being an outlier.

Backhoes and track hoes remain the excavation equipment most often used in all provinces when damage occurs (53% overall). Hand tools were the second highest most common equipment used when damage occurred (23%).

ROOT CAUSE OF DAMAGES



DAMAGE BY TYPE OF EXCAVATION



Register with DIRT and Be Part of the Damage Prevention Solution

The Canadian Common Ground Alliance (CCGA) invites you to register with Regional Partner Virtual DIRT and report damages to Canada's buried infrastructure. Doing so will allow more thorough analysis and enable damage prevention and safety solutions that will benefit all Canadians

THE MORE INFORMATION WE HAVE ON DAMAGES, THE MORE EFFECTIVELY WE CAN TARGET OUR DAMAGE PREVENTION EFFORTS.

Alberta: cga-dirt.com/ab
British Columbia: cga-dirt.com/bc
Ontario: cga-dirt.com/orcga
Quebec: cga-dirt.com/qcvpd
Saskatchewan: www.cga-dirt.com/scga

5.0 ARTICLES

ARTICLE NO. 1

The Hidden Cost of Damages to Underground Infrastructure

An excavator makes a rash decision to perform a 30m bore shot without obtaining locates which results in aneight-inch natural gas linepuncture. This incident was situated in a dense urban neighbourhood.

This poor decision sets off a cascade of events.The loud hissing sound signals the release of gas into the air. Fire Rescue and Police Services are alerted. Traffic is diverted to avoid potential danger, snarling traffic for both the morning and evening rush hours.Local businesses are shutdown;schools and households are evacuated. Electricity in the area is immediately cut off. TSSA and natural gas facility personnel quickly arrive onsite to assess the damage. Ontario One Call is notified and dispatches an emergency locate. Gas crews are brought in to cap the leak. Homeowners and busi-nesses have their gas appliances relitbefore being allowed to return.

Underground infrastructure damages,as described in the scenario above,have societal costs that go well beyond the direct cost of repairs.

Direct Costs arise fromrepairing the damage and are related to the:

- Costs of replacement materials used
- Costs of materials used
- Labour costs
- Administrative costs needed to rehabilitate the damaged infrastructures.

Indirect Costsarise from the damage and its economic assessment of all resulting disruptions. They are varied and can cover awide range of areas, such as:

- Service disruption following damages to infrastructures
- Intervention of emergency services
- Evacuating businesses and residential sectors
- Risk of injury and death
- Loss of product
- Environmental impact
- Economic impact on businesses and companies
- Work delays
- Administrative and legal costs
- Negative impact for owner companies
- Disturbances to neighbouring lands and infrastructures
- Traffic disturbances.

Indirect costs are difficult to quantify and rarely considered when making decisions related to excavation work or damage prevention.

For this reason, the Canadian Common Ground Alliance commissioned the Centre for Interuniversity Research and Analysis of Organizations (CIRANO), to develop a societal cost formula and tool. When applied to DIRT Report data, this formula would provide a defendable estimate of the costs society bears in relation to damaged underground infrastructure.

The ORCGA Reporting and Evaluating Committee will begin to utilize the data extracted from the CIRANO tool to highlight Ontario issues for the 2017 DIRT Report.

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	2015	2016	2017
Reported Damages	4695	4597	5149
Reported Outage reported	119	114	65
Socio-Economic Cost	$747,844,718	$618,986,353	$666,030,845

If you are interested in the methodology, please refer to the study titled:
A Socio-Economic Cost Assessment Regarding Damages to Underground Infrastructures on the ORCGA website.

ARTICLE NO. 2

Safe Excavation: A Step by Step Process
By: Kevin Vine

In 2016 it was estimated that nearly $975 million was spent in Canada on societal costs related to damage to underground plant; this figure refers to costs associated with emergency response, evacuation, environmental contamination, interruption to service, and the use of safety services such as 911. According to the Canadian Common Ground Alliance (CCGA) DIRT Report, 43% of the damages that occurred in 2016 were a result of not securing locates prior to digging or not providing sufficient information to provincial One Callcentres.

There's no doubt that contacting your provincial One Call notification centre to have pipelines and utilities located prior to digging or drilling is the most important step a contractor or homeowner can take to ensure project safety. However, committing to damage prevention extends far beyond Call or Click Before You Dig. There are vital subsequent steps that need to be taken to ensure safety on an excavation project.

Plan ahead. As a best practice, try to request your locate at least 5 days in advance to ensure enough time is provided in order to avoid project delays. If you need your locate completed sooner, you can provide your anticipated dig date to Ontario One Call. Members of Ontario One Call will try to meet your request timelines as best they can, depending on their available resources and your particular situation.

Emergency locates are available to utilities, municipalities and their respective contractors to deal with serious, life threatening emergencies.

Mark your site. Where possible, white-line the boundaries of your project site prior to having locates performed. This involves pre-marking your dig or drill site with white paint, flags, stakes or a combination in order to accurately communicate the boundaries of excavation to both the Locate Service Provider and facility owners.

Wait for everyone to respond. Make sure you receive a complete locate package for all utilities within your project site before proceeding with construction work. All utilities present on the site should be marked with spray paint, flags, or both, and you should be provided with documentation confirming completion. Take time to read and understand the locate documentation.Protect field markings and sweep away any dirt that may be covering them.

Respect the marks. Once utilities are located and marked on your project site, there are a few best practices to keep in mind. The excavator should carefully hand dig around the marks to the depth of the excavation. Never dig directly on top of the marks as this is always an unsafe practice. Even minor inaccuracies or discrepancies in depth data could create a dangerous situation. Be sure to limit excavation to the area covered by the utility locate request. If the limits of the project site change, submit an additional locate request through your provincial One Call notification centre. For many utilities, ground marks are considered valid for one month, after which time they should be repainted. Be sure to check the expiration date of your marks, which you can find on the locate ticket. It's also a good idea to become familiar with the spray paint colour coding so that you understand what type of utilities are buried on your project site.

Don't run on instinct. Utility damages have been known to occur even when the utility has been accurately located, the work area has been marked and the marks are valid. How does this happen? Often it comes down to relying on assumptions. Assumptions about the depth of buried utilities can create a dangerous situation. An excavator digs down a few meters and when nothing is detected, continues to drill, until contact is made. If depth data is required, it may be necessary to perform test pits as part of the utility locating process.

Arm yourself with knowledge. It's important to have a general understanding of locating processes and technology so that you'll know what is required for your particular project. With the wide variety of lines that run underground – power, communications, gas, sewer, water, etc., different detection techniques are often required for different types of buried lines. For instance, metal cables and pipes can be detected using standard Electromagnetic (EM) induction techniques, whereas non-metallic utilities such as clay or plastic pipes, require additional techniques such as Ground Penetrating Radar (GPR).

EM is a common locating tool that operates by sensing either a background signal or a signal introduced into a conductive utility line using a transmitter. In order for this technique to work effectively, there must be a direct connection to a piece of utility hardware and the utility must be comprised of a conductive material, such as a metal pipe or cable. GPR is a non-destructive geophysical tool that transmits high frequency radio waves into the ground and analyzes the reflected energy to create a profile of the subsurface features. It is extremely effective at locating buried non-conductive linear infrastructure such as PVC pipes, concrete sewers and other utilities. An additional advantage lies in the fact that a direct connection is not required to discern utilities and other underground features.

Assess qualifications. Working with a qualified Locate Service Provider is key to reducing risk, ensuring accuracy and transferring liability. Ask a few key questions of the service provider that will be locating utilities within your project site to ensure they are properly qualified. For example, what is the training program in place for Field Technicians? Does the company abide by a Health & Safety policy? What is the Quality Management process? Does the service provider have experience successfully completing projects of a similar size and scope? What level of accuracy can be expected? Is there a damage investigation process in place? Working with a qualified service provider will greatly reduce your level of risk.

Communicate consistently. Damage prevention is a shared effort and there are often many stakeholders involved, so communication plays a big role in ensuring safety.Make sure that everyone on your project team is briefed on the One Call process. When placing your locate request, be sure to provide the One Call notification centrewith as much information as possible. For example, the contact information of the person that will be excavating, when and where this will occur, the maximum depth of excavation and the method of excavation. Always follow up on the status of your locate request prior to proceeding with the work and be sure to communicate the status to your team.

A final thought. When it comes to safe excavation, the key lies in awareness. The good news is that there are plenty of resources available to arm yourself with the knowledge you need to minimize risk. A good place to start is the Ontario Regional Common Ground Alliance (ORCGA) website www.orcga.com where you can find numerous educational resources, marketing materials, industry updates and best practice documents.

Kevin Vine is the President of multiVIEW Locates Inc., a utility locating company with almost 30 years of experience in Private and Public Utility Locating, Concrete Scanning, Vacuum Excavation, CCTV Sewer Inspection, and Subsurface Utility Engineering.

It's important to have a general understanding of locating technology so that you'll know which one to apply to your specific project. GPR, pictured here, is ideal for locating non-conductive buried assets such as clay and PVC pipes.

ARTICLE NO. 3

Damages To Underground Infrastructure Can Create After Shocks

Each and every time someone fails to follow industry best practices for obtaining utility locates or digging near existing utilities, that failure not only impacts the person who erred, but the safety and investments of hundreds or perhaps thousands of persons and businesses.

A Little Water Never Hurt Anyone

An employee of a construction contractor may have omitted to request utility locates for all of the areas in which an excavation is planned or simply got tired of waiting for the municipal water system to provide a locate. The employee wrongly believes that as long as he has locates for gas and electrical lines, there is minimal risk for the proposed dig. Consider what happens if a watermain is damaged. A small leak or disruption of water supply to a few local residents may not be the only consequence. Pressurized water can quickly wash away large quantities of soil. A watermain break, unrelated to any construction, created a sink hole in Toronto in January 2018. The water quickly washed away all nearby soil creating a large sinkhole. So much soil was washed away that gas distribution pipes were left dangerously dangling in the cavity. The city and local authorities were concerned that the gas lines could break at any moment. Roads had to be closed for several days and the cost of the repair crews was enormous because watermain repair crews and equipment had to wait until the gas lines were safely isolated and supported. The commute of thousands of workers was impacted and many local businesses were adversely impacted by the closure of a vital roadway.

Damaging any underground utility can have far reaching consequences. In January 2013, a broken watermain in downtown Toronto resulted in a large subsurface flow of water that entered into the basement area of a nearby high-rise condominium. The water shorted out local electrical transformers and the associated explosion and fire required that the entire transformer electrical system be replaced. On top of that, hundreds of residents in the building were evacuated for 5 months because there was no electrical power for elevators, ventilation, lighting or other resident needs.

On September 20, 2017 construction crews working on the Eglinton Crosstown transit line damaged Rogers fibre cables and knocked out phone, cable and internet service to more than 3,000 customers for more than 48 hours. This was not just an inconvenience for watching a favorite TV program, it affected a large number of businesses that depend on the internet to communicate with clients and suppliers and also compromised access to emergency services such as fire or ambulance.

No Room for Error

A construction contractor was hired to install cathodic protection on cast iron watermains. This meant that electrical connectors needed to be welded directly onto the buried watermain at intervals of approximately every 10 metres. As the project was several kilometres in length, a vacuum excavator truck was used to minimize excavation costs and disruption to local residents and businesses. The vacuum technology had the added benefit of safely exposing any other utilities such as telecom cables or gas lines that might be located between the ground surface and the watermain. The vacuum truck excavated a narrow shaft from the grass median down to the upper surface of the pipe. As the watermain was about 6 to 8 feet below the surface, the installer needed to use an insulated pole to bring the welding rod into direct contact with the watermain. Along one section, a gas pipe had been previously installed only inches away from and parallel to the watermain, leaving very little room for error. The end result was unintended damage to the gas pipe.

Given the growing density of subsurface infrastructure, there will always be situations where neces-

sary work must be performed in less than ideal conditions. It is the responsibility of the contractor to ensure that the likelihood of damage to underground infrastructure is minimized as much as possible. In the circumstances of this case, the installer could have taken additional time to either expand the diameter of the existing excavation or
vacuum alternate access holes nearby which would avoid the need to bring a live welding rod close to the surface of a gas pipe. Not only did the contractor incur the costs of the delay and financial obligation for the repair of the pipe, the contractor also had to retain legal counsel to respond to regulatory charges and pay the resulting fines resulting from TSSA charges.

Maintaining Vigilance

In many older residential neighborhoods dating back to the 1920's and 1930's, water service laterals were constructed with lead pipes to connect homes to the city watermain. Many of these laterals were replaced with half inch diameter copper tubing and the lead lines were abandoned in place. More recently, renovated homes or new construction require that the older half inch supply lines be replaced with three quarter inch pipe. Similarly, gas distributors will install new gas laterals every few decades and leave the old lines in place, resulting in a maze of abandoned lines crisscrossing the roadway subsurface. At a recent water line replacement project in west Toronto, locates were requested and duly marked, however the construction contractor had safely exposed an abandoned line thinking that it was the active gas line and then accidentally cut into a live gas pipe. The project was immediately stopped, the road was closed to traffic and emergency services and the gas company were called in to oversee and complete the necessary repairs. The contractor was responsible for the value of lost gas that had escaped from the break as well as the gas line repair crew costs and materials.

Infrastructure density will continue to grow with time and that means that contractors must be even more diligent to ensure that they have correctly located and safely exposed and supported all active utility infrastructure.

6.0 EXCAVATOR OF THE YEAR

The Excavator of the Year distinction is presented to an excavator with the best-in-class safe digging practices. Each year a subset of the R&E Committee, consisting of representatives of each of the utilities, is tasked with reviewing each contractor's individual damage ratio. The damage ratio is dependent on the volume of locates, of which each excavator must have a minimum of 500, measured against the number of digging related damages to the underground structure. The recipient of the award is the excavator with the lowest ratio who best reflects the type of work in each category represented.

GAS

npl CANADA

HOMEBUILDER

RCC WATERPROOFING

ELECTRIC

ELECTRICAL TM3 CONTRACTORS

LANDSCAPE

Royal Oak Tree Services
Tree Health at Heart

ROAD BUILDER

POWELL CONTRACTING LTD.

SEWER/WATER

FER-PAL INFRASTRUCTURE

TELECOMMUNICATIONS

Trinity Communication Services Ltd.

MOST IMPROVED

TAGGART CONSTRUCTION LIMITED

7.0 APPENDICES

APPENDIX A

REPORT FINDINGS
DATA QUALITY INDEX INDICATIONS

Table 6 indicates the Data Quality Index (DQI) for each individual part of the DIRT Field Form. The DQI is a measure of data quality and consists of the evaluation of each organization that submitted records, in addition to the evaluation of each record submitted to DIRT. The overall average DQI is 74.1%.

The weight assigned to the various DIRT parts varies based upon its value in analyzing the event for damage prevention purposes, with Root Cause receiving the largest weight. The overall DQI for a set of records can be obtained by averaging the individual DQI of each record. The “2017 DQI” column in the table below represents the average of all 5149 submitted events in the 2017 dataset.

DIRT Parts	Relative Weight	2015 DQ I	2016 DQI	2017 DQI
A: Who is submitting this information?	5%	100.0	100.0	100.0
B: Date and Location of the event	12%	77.6	77.4	79.7
C: Affected Facility Information	12%	90.9	90.4	91.4
D: Excavation Information	14%	86.8	86.0	87.9
E&F: Notification, Locating, Marking	12%	90.4	89.6	90.9
G: Excavator Downtime	6%	13.9	13.5	17.3
H: Description of Damage	14%	33.4	36.4	34.4
I: Description of the Root Cause	25%	74.1	72.5	77.9
Total Weighted DQI	100%	72.3	72.0	74.1

Table 6: DIRT Submission Parts and DQI

Of the various parts of the damage report, Parts G: Excavator Downtime and H: Description of Damage are often not included, as most of the organizations inputting data into DIRT do not track this information.

Appendix B: Root Cause Tip Card

OPERATOR ISSUES

Facility Was Not Located or Marked
No locating or marking was completed prior to excavation activities.

Example: The company received a valid ticket, but did not mark, locate, or communicate with excavator prior to start of work.

Facility Marking or Location Not Sufficient
Includes all areas where marking was insufficient.

Example: Locator marked the work zone, but missed a service.
Locator misread the ticket and did not locate the entire work zone.
Facility was outside the tolerance zone.

Facility Could Not be Found/Located
Type of facility, depth, or lack of records prevented locating of facility.

Example: Plastic pipelines installed without tracer wires.
HDD installed facilities at depths that cannot be located.

Abandoned Facility
This damage was caused by an abandoned facility issue.

Example: The abandoned facility may have been located, instead of the active facility.
An abandoned facility may have been located, but it may have been found active after the excavation exposed the facility or damaged it.

Incorrect Facility Records/Maps
Incorrect facility records or maps led to an incorrect locate. (This does not include facilities missing from maps.)

Example: Records show the facility located on the wrong side of the street, and ticket was cleared.

Deteriorated Facility
Those situations in which an excavation disrupts the soil around the facility resulting in damage, failure or interruption of service. However, the deterioration and not the excavation caused the facility damage.

Example: An excavator reports a gas odor, investigation proves it is coming from an old cast iron pipeline.

Previous Damage
A significant period of time has passed from the actual damage to the failure or discovery of the damages.

Example: Pipe coating was damaged during a previous excavation and was not reported. Subsequently, a corrosion leak occurred.

EXCAVATOR ISSUES

No Notification Made to the One-Call Center
Excavator did not call the one-call center, includes occasions when notification was not required.

Excavation Practices Not Sufficient
The excavator did not use proper care or follow the correct procedures when excavating near a facility. Optionally, choose one of the following 2nd-level causes:

Failure to Maintain Clearances While Using Power Equipment - as defined by applicable state regulations or underground facility owner.
Failure to Maintain Marks - The marks deteriorated or were lost and the excavator failed to request that they be restored/refreshed.
Failure to Support Exposed Facilities - Facility damage due to lack of support in accordance with generally accepted engineering practices or instructions provided by the facility operator.
Failure to Use Hand Tools - Failure to use hand tools where required.
Failure to Verify Facility by Test Hole - Some state regulations define a “tolerance zone” around buried facilities and require the accuracy of the facility marks be verified by exposing the facility by hand digging prior to excavation within the tolerance zone, or require hand digging or special precautions when working within the tolerance zone.
Improper Backfilling - Damage caused by improper materials (ex: large/sharp rocks) in the backfill or improper compaction of the backfill.

Wrong Information Provided
This damage occurred because an excavator provided the wrong excavation location to the notification center, or there was a miscommunication between stakeholders.

Example: Excavator used ITE to notify and indicated the wrong dig site.
After speaking with excavator, the locator incorrectly cleared a ticket.

Notification to the One-Call Center Made, But Not Sufficient
The excavator contacted the notification center, but did not provide sufficient information, or the excavator did not provide sufficient notification time according to state law.

Example: Excavator did not wait 48 hours before digging.
Excavator was excavating on an expired ticket.

ONE-CALL CENTER ISSUES

One-Call Center Notification Error
Includes all issues related to the center such as incorrectly entered data, ticket transmission failures, and stakeholder omissions, et al.

Example: This would include damages that occurred because the center’s database registry had not been updated to reflect correct location of gas facilities.
The one-call center system crashed and failed to deliver the ticket.

CGA Common Ground Alliance

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DIRT

Appendix C: FRESH DIRT (beginning 2018)

Rev: 11/7/2017
'*' indicates a Required Field

Damage Information Reporting Tool (DIRT) - Field Form

Part A – Original Source of Event Information

Who is providing the information? ☐ Electric ☐ Engineer/Design ☐ Equipment Manufacturer
☐ Excavator ☐ Liquid Pipeline ☐ Locator ☐ Natural Gas ☐ Private Water
☐ Public Works ☐ Railroad ☐ Road Builders ☐ Federal / State Regulator
☐ Telecommunications ☐ Unknown/Other
Name of person providing the information:

Part B – Type, Date, and Location of Event

Type of Event: DIRT Event ☐ Underground Damage ☐ Underground Near Miss
Non-DIRT Event ☐ Above Grade ☐ Aerial ☐ Natural Cause ☐ Submarine

***Date of Event:** (MM/DD/YYYY)

***Country** ***State** ***County** **City**

Street address: **Nearest Intersection:**

Latitude/Longitude: Lat: Lon ☐ Decimal Degrees ☐ D M S

***Right-of-Way where event occurred**
Public: ☐ City Street ☐ State Highway ☐ County Road ☐ Interstate Highway ☐ Public-Other
Private: ☐ Private Business ☐ Private Land Owner ☐ Private Easement
☐ Pipeline ☐ Power /Transmission Line ☐ Dedicated Public Utility Easement
☐ Federal Land ☐ Railroad ☐ Unknown/Other

Part C – Affected Facility Information

***What type of facility operation was affected?** ☐ Cable Television ☐ Electric ☐ Liquid Pipeline
☐ Natural Gas ☐ Sewer ☐ Steam ☐ Telecommunications ☐ Water ☐ Unknown/Other

***What type of facility was affected?** ☐ Distribution ☐ Gathering ☐ Service/Drop ☐ Transmission ☐ Unknown/Other
Was the facility part of a joint trench? ☐ Yes ☐ No ☐ Unknown
Did this event involve a Cross Bore? ☐ Yes ☐ No
Was facility owner One Call Center member? ☐ Yes ☐ No ☐ Unknown
If No, is facility owner exempt from One Call Center membership? ☐ Yes ☐ No ☐ Unknown
Measured Depth From Grade ☐ Embedded in concrete/asphalt pavement ☐ <18" / 46 cm ☐ 18" – 36" / 46 - 91 cm ☐ >36" / 91 cm Measured depth from grade _____in/cm

Part D – Excavation Information

***Type of Excavator** ☐ Contractor ☐ County ☐ Developer ☐ Farmer ☐ Municipality
☐ Occupant ☐ Railroad ☐ State ☐ Utility ☐ Unknown/Other

***Type of Excavation Equipment** ☐ Auger ☐ Backhoe/Trackhoe ☐ Boring ☐ Bulldozer
☐ Drilling ☐ Directional Drilling ☐ Explosives ☐ Farm Equipment ☐ Grader/Scraper ☐ Hand Tools
☐ Milling Equipment ☐ Probing Device ☐ Trencher ☐ Vacuum Equipment ☐ Unknown/Other

***Type of Work Performed** ☐ Agriculture ☐ Bldg. Construction ☐ Bldg. Demolition ☐ Cable Television
☐ Curb/Sidewalk ☐ Drainage ☐ Driveway ☐ Electric ☐ Engineering/Survey
☐ Fencing ☐ Grading ☐ Irrigation ☐ Landscaping ☐ Liquid Pipeline ☐ Milling
☐ Natural Gas ☐ Pole ☐ Public Transit Auth. ☐ Railroad ☐ Road Work ☐ Sewer
☐ Site Development ☐ Steam ☐ Storm Drain/Culvert ☐ Street Light ☐ Telecommunication
☐ Traffic Signal ☐ Traffic Sign ☐ Water ☐ Waterway Improvement ☐ Unknown/Other

Part E – Notification and Locating

***Was the One-Call Center notified?** ☐ Yes ☐ No Ticket Number

If Yes, type of locator ☐ Facility Owner ☐ Contract Locator ☐ Unknown/Other

If No, is excavation activity and/or excavator type exempt from notification? ☐ Yes ☐ No ☐ Unknown

Was work area white-lined? ☐ Yes ☐ No ☐ Unknown

Part F – Intentionally left blank

Part G – Excavator Downtime

Did Excavator incur down time? ☐ Yes ☐ No

If yes, how much time? ☐ < 1 hr ☐ 1 -<2 hrs ☐ 2-<3 hrs ☐ 3+ hrs Exact Value _____ ☐ Unknown

Estimated cost of down time? ☐ $0 ☐ $1 -1000 ☐ $1,001 - 5,000 ☐ $5,001 - 25,000
☐ $25,001 - 50,000 ☐ >$50,000 Exact Value _____ ☐ Unknown

Part H – Interruption and Restoration

***Did the damage cause an interruption in service?** ☐ Yes ☐ No ☐ Unknown

If yes, duration of interruption ☐ < 1 hr ☐ 1 - <6 hrs ☐ 6 - <12 hrs ☐ 12 - <24 hrs ☐ 24 - <48 hrs
☐ 48+ hrs Exact Value _____hrs ☐ Unknown

Approximately how many customers were affected?
☐ Unknown ☐ 0 ☐ 1 ☐ 2 - 10 ☐ 11 - 50 ☐ 51+ Exact Value _____

Estimated cost of damage / repair/restoration: ☐ $0 ☐ $1 - 1,000 ☐ $1,001- 5,000 ☐ $5,001 - 25,000
☐ $25,001 - 50,000 ☐ > $50,000 Exact Value _____ ☐ Unknown

*Part I – Root Cause Select only one

Notification Issue
- ☐ No notification made to One Call Center/ 811
- ☐ Excavator dug outside area described on ticket
- ☐ Excavator dug prior to valid start date/time
- ☐ Excavator dug after valid ticket expired
- ☐ Excavator provided incorrect notification information

Excavation Issue
- ☐ Excavator dug prior to verifying marks by test-hole (pothole)
- ☐ Excavator failed to maintain clearance after verifying marks
- ☐ Excavator failed to protect/shore support facilities
- ☐ Improper backfilling practices
- ☐ Marks faded or not maintained
- ☐ Improper excavation practice not listed above

Locating Issue

Facility not marked due to:
- ☐ Abandoned facility
- ☐ Incorrect facility records/maps
- ☐ Locator error
- ☐ No response from operator/contract locator
- ☐ Tracer wire issue
- ☐ Unlocatable Facility

Facility marked inaccurately due to
- ☐ Abandoned facility
- ☐ Incorrect facility records/maps
- ☐ Locator error
- ☐ Tracer wire issue _____

Miscellaneous Root Causes
- ☐ Deteriorated facility
- ☐ One Call Center Error
- ☐ Previous damage
- ☐ Root Cause not listed (comment required)

Part J – Additional Comments

Part Z – Images and Attachments: List the file names of any images and attachments to submit with this report

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APPENDIX D: GLOSSARY OF TERMS

Abandoned Line or Facility: Any underground or submerged line or facility no longer in use.

Alternate Locate Agreement (ALA): A contractual agreement between a facility owner and an excavator that allows the excavator to proceed with their excavation work without receiving a traditional field locate.

Backfill: The act of filling the void created by excavating or the material used to fill the void.

CCGA: The Canadian Common Ground Alliance's (CCGA) primary role is to manage damage prevention issues of national interest that Regional Partners consider best addressed through a single voice.

CGA: The Common Ground Alliance (CGA) is a member-driven association dedicated to ensuring public safety, environmental protection, and the integrity of services by promoting effective damage prevention practices.

Compliance: Adherence to acts and regulations.

Damage: Any impact, stress and/or exposure that results in the need to repair an underground facility due to a weakening or the partial or complete destruction of the facility, including, but not limited to, the protective coating, lateral support, cathodic protection or the housing for the line, device or facility.

Daylighting: The exposure of underground utility infrastructure by minimally intrusive excavation practices to ascertain precise horizontal and vertical position or other attributes. (Note: may also be referred to as "potholing" or "test pitting".)

Demolition Work: The intentional, partial or complete destruction by any means of a structure served by, or adjacent, to an underground line or facility.

DIRT: Damage Information Reporting Tool.

Downtime: Lost time reported by a stakeholder on the Damage Information Reporting Tool (DIRT) field form for an excavation project due to failure of one or more stakeholders to comply with applicable damage prevention regulations.

DQI: The Data Quality Index (DQI) is a measure of data quality and consists of the evaluation of each organization that submitted records, in addition to the evaluation of each record submitted to DIRT. Event: The occurrence of an underground infrastructure damage, near miss, or downtime.

Excavate or Excavation: An operation using equipment or explosives to move earth, rock or other material below existing grade. (Note: Excavation can include augering, blasting, boring, coring, digging, ditching, dredging, drilling, driving-in, grading, plowing-in, pulling-in, ripping, scraping, trenching and vacuuming).

Excavator: Any person proposing to or engaging in excavation or demolition work for themselves or for another person.

Facility: See Utility Infrastructure.

Facility Owner/Operator: Any person, utility, municipality, authority, political subdivision, or other person or entity who owns, operates, or controls the operation of an underground line/facility.

Grade (noun): The surface elevation.

Grade (verb): The act of changing the surface elevation.

Joint Trench: A trench containing two or more underground infrastructures that are buried together by design or agreement.

Locate (noun): The provision of location information by an underground facility owner (or their agent) in the form of ground surface markings and/or facility location documentation, such as drawings, mapping, numeric description or other written documentation.

Locate (verb): The process of an underground plant owner/operator or their agent providing information to an excavator which enables them to determine the location of a facility.

Locate Request: A communication between an excavator and the facility owner/operator or their agent (usually the One Call Centre) in which a request for locating underground facilities is processed.

Locator: A person whose job is to locate underground infrastructure.

Near Miss: An event where damage did not occur, but a clear potential for damage was identified.

Notifications: Ticket data transmitted to underground infrastructure owners.

One Call Centre: A system which provides a single point of contact to notify facility owners/operators of proposed excavation activities.

ORCGA: The Ontario Regional Common Ground Alliance (ORCGA) is a Regional Partner of both the Common Ground Alliance (CGA) and the Canadian Common Ground Alliance (CCGA). It is a non-profit organization promoting efficient and effective damage prevention for Ontario's vital underground infrastructure.

Person: Any individual or legal entity, public or private.

Public: The general population or community at large.

Root Cause: The primary reason an event occurred.

Test Hole(s): Exposure of a facility by safe excavation practices used to ascertain the precise horizontal and vertical position of underground lines or facilities.

Ticket: All data required from an excavator to transmit a valid notification to the underground infrastructure owner.

Ticket number: A unique identification number assigned by the one call center to each locate request.

Tolerance Zone: The space in which a line or facility is located and in which special care is to be taken.

Underground: Beneath the ground surface or submerged, including where exposed by temporary excavation.

Utility Infrastructure: a cable, line, pipe, conduit, or structure used to gather, store, or convey products or services. (Note: may also be referred toas "facility" or "plant".)

Vacuum Excavation: A means of soil extraction through vacuum where water or air jet devices are commonly used for breaking the ground.

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