DIV. 5002019 ONTARIO LTD

V.A.S.E

PRO

VIBRATIONS – ACCELERATION, VELOCITY, FREQUENCY
SMALL MOVEMENTTS - LINEAR
REMOTE SITES – INTELLIGENT SYSTEMS

V.A.SE. PRO

a division of 5002019 Ontario Ltd.

www.vasepro.ltd

437-345-4500

GENERAL

V.A.S.E. Pro offers with its technology and staff:

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Vibration monitoring of moving vehicles

Acceleration monitoring of passenger seating and standing areas

Roll and Tilt monitoring of passenger compartments, walking areas, and hallways.

Acceleration monitoring of fruit shipping containers.

Acceleration monitoring of dry goods shipping areas.

Accelerations monitoring of goods on conveyors.

Seismic Site Classification for structural engineers, geotechnical engineers, owners.

Infrastructure Embankment and Hillside monitoring for movement and softening

Our goal is to bring our clients solutions that reduce the risk to people, goods, vehicles, structures, and their assets when experiencing discomfort or damage due to in transit motions.

COMPANY OFFERINGS

Measurement of Accelerations
Measurement of Peak Particle Velocity
Movement monitoring
Seismic Site Class
Transportation Infrastructure System Movement Monitoring

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V.A.S.E
PRO

V.A.S.E. Pro

(a division 5002019 Ontario Ltd)

President

John Van Egmond

Movements

Acceleration

100 Hz, 300 Hz
-7g to +7g

Tilt, Roll, PPV

Tilt, Roll
-15^o to +15^0

Acceleration

For moving vehicles, ships, planes, trains, conveyors, etc.

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Julie@vasepro.ltd

Seismic Site Class

Ontario

Julie VanderMeulen

Julie@vasepro.ltd

Nicole Millette

Nicole@vasepro.ltd

Embankments , Hills, in/on soil Infrastructure

Brampton

Julie vanderMeulen

Niagara

Dayo Adeyemo

Yellowknife

John Westergreen

Africa

Uba Ikedionwu

World

John Van Egmond

Geotechnical Engineers, Structural Engineers! Want more reliable Site Class Estimates for your clients?

If so, our ReMI method, using ambient noise level techniques in the urban environment may be for you.

Clients for whom our staff have provided Seismic Site Class includes:

Egmond Associates Ltd
Department of Public Works, Northwest Territories
Private Homeowners
CMT Engineers
Ross Anglin Construction

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PRO

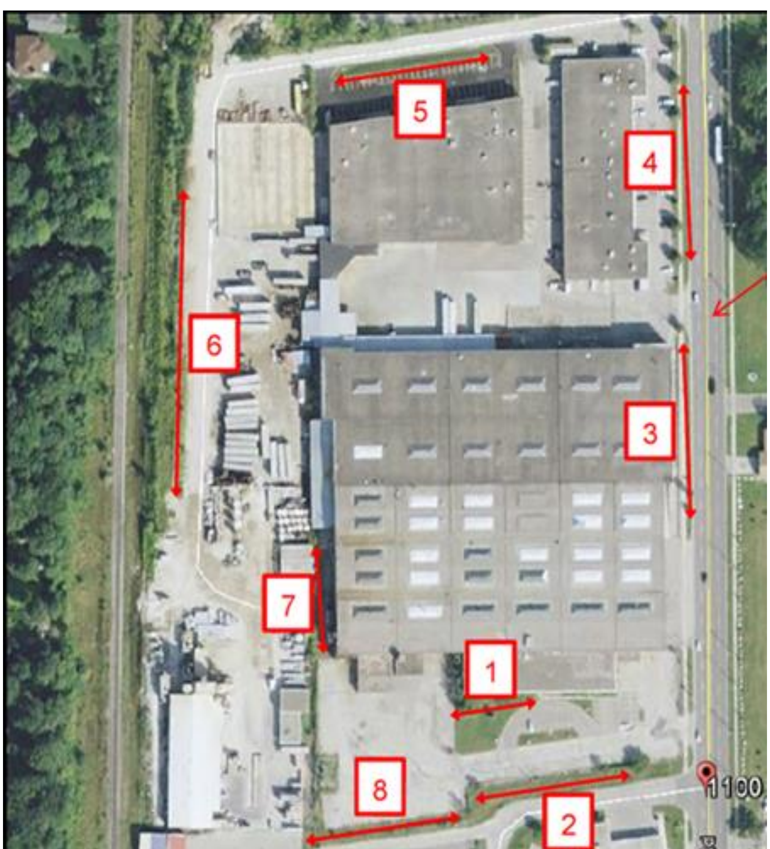
Seismic

V.A.S.E. Pro carry out seismic analysis of sites using existing background seismic noise to carry out the analysis. The advantage is V.A.S.E. Pro can set up quickly and there is no need for explosives, heavy hammers, drill holes nor the like. From V.A.S.E. Pro seismic methods we provide such services as:

1. Seismic Site Class
2. Soil layer tracing and analysis
3. Soil layer bearing capacity analysis.

Seismic Site Class

A US consultant was designing a building repurposing for an industrial facility. The client had information suggesting a possible Class D site. Our work was to confirm that value or provide another class. V.A.S.E. Pro tests indicated a Class C site saving the client foundation and structural costs.



Seismic solutions by V.A.S.E. Pro can normally be implemented in less than a week, often within the same day.

The site class is more accurate than would be extrapolated from shallow borehole logs.

Further, the ability to use the seismic data to estimate both shallow and deep bearing values without drilling and in a short time frame allows for earlier preliminary design and for "cheap" confirmation of the range of bearing capacity values derived by expensive deep test holes.

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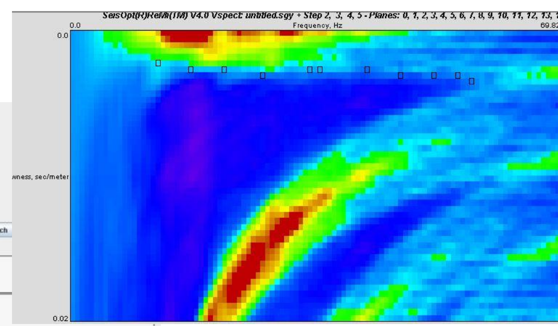
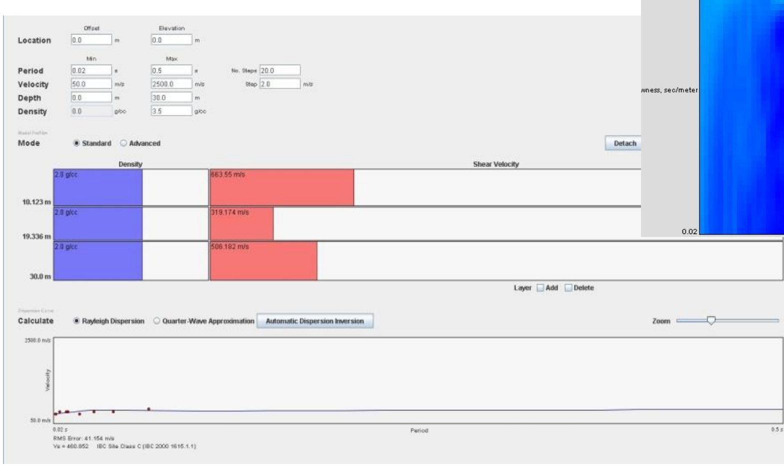
1. Seismic Site Class
2. Soil layer tracing and analysis
3. Soil layer bearing capacity prediction.

Seismic Site Class

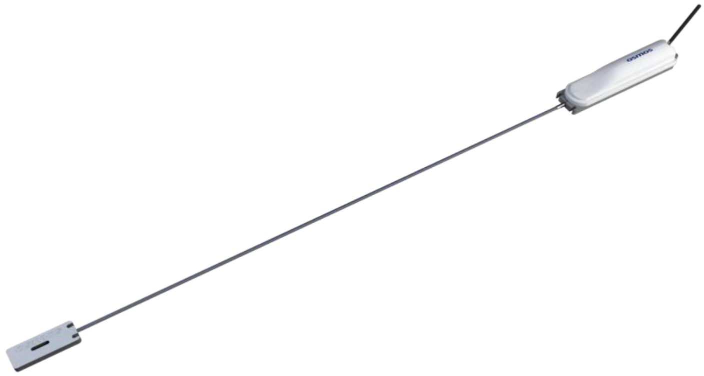
A design build contractor was putting an custom addition onto a prestige rural site. The designer required the Seismic Site Class. A detailed data set was obtained using ambient data. A series of data points were picked.





Our work confirmed a Class C site with a shear wave velocity of about 90 m/second.

Seismic solutions by V.A.S.E. Pro can normally be implemented in less than a week, often within the same day. The site class is more accurate than would be extrapolated from shallow borehole logs. Further, the ability to use the seismic data to estimate both shallow and deep bearing values without drilling and in a short time frame allows for earlier preliminary design and for “cheap” confirmation of the range of bearing capacity values derived by expensive deep test holes.



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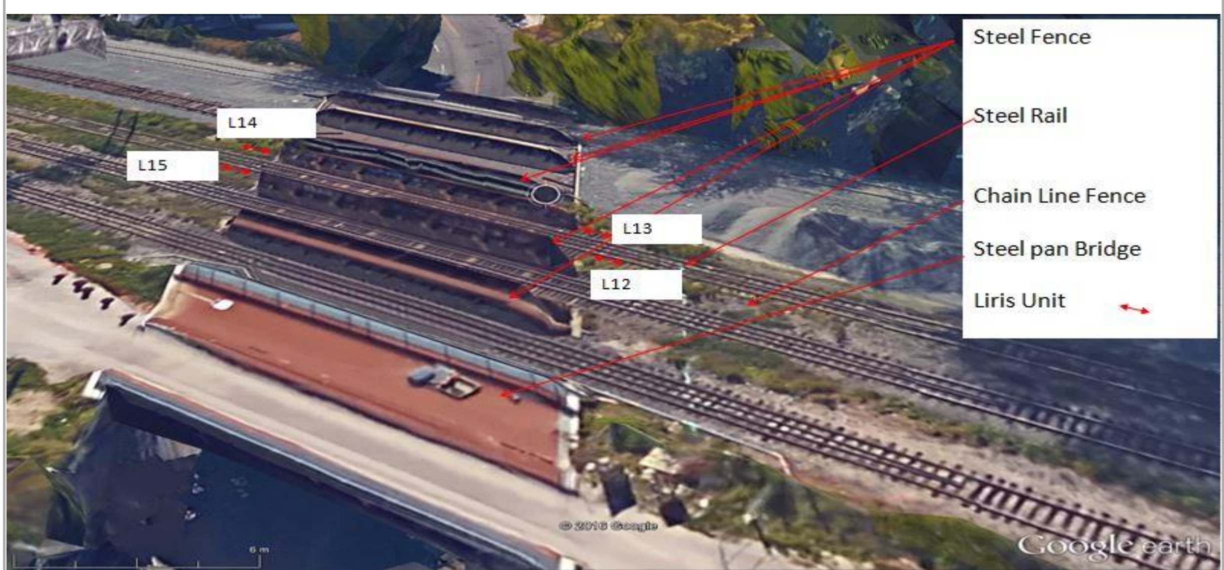
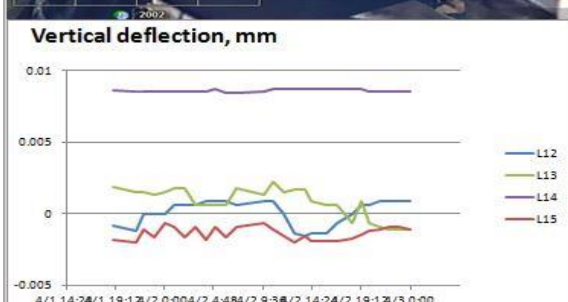
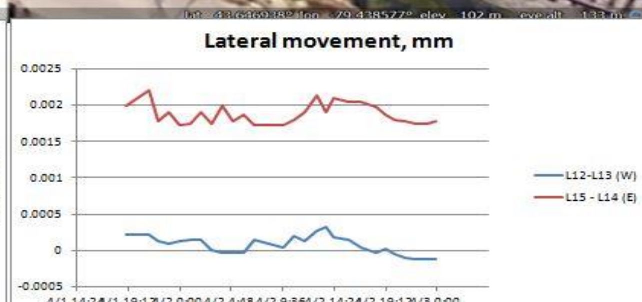
V.A.S.E PRO

Monitoring
Movement due to excavation/construction. Let us help you with your monitoring needs.

Rail Line Movement
V.A.S.E. Pro team was retained to measure movement of rail lines. While the specification called for traditional on line surveying, the corridor was so busy one could not get on long enough to take readings. Instead the V.A.S.E. Pro installed four LIRIS units, able to be read from below the bridge carrying the rail. We were able to show movements vertically and horizontally were very low, and that thermal movement of the track exceeded the movement due to construction.







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Passenger Comfort and Train Design

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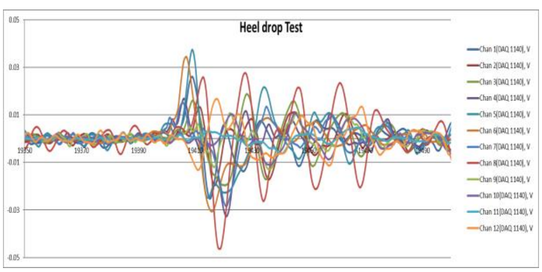
A passenger transit system is designing a new rail car and track configuration.

The design the rail car the design team uses VAMPIRE, a British Rail vehicle dynamics model. The model includes various design parameters such as damping, yaw, stiffness, length and so on.
To verify the parameters used in new rail car design, the intent was to measures acceleration and roll in 2 axis. The data from the measurement program was to validate those parameters using the actual train results and a VAMPIRE model of the actual train.

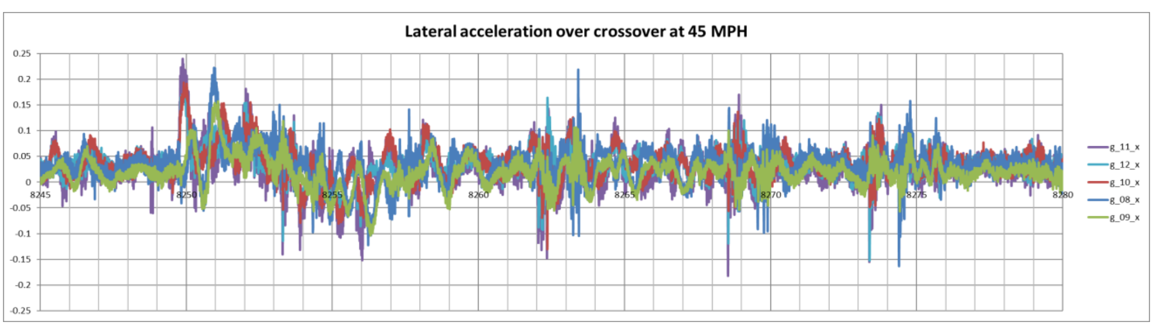
The data will help determine the dynamic characteristics of spring, dash-pot and like elements used in the new design if these can be confirmed by the data and subsequent analysis of the existing car. The verified parameters will then be used in the new design to enhance customer comfort while achieving higher speeds over the existing system.

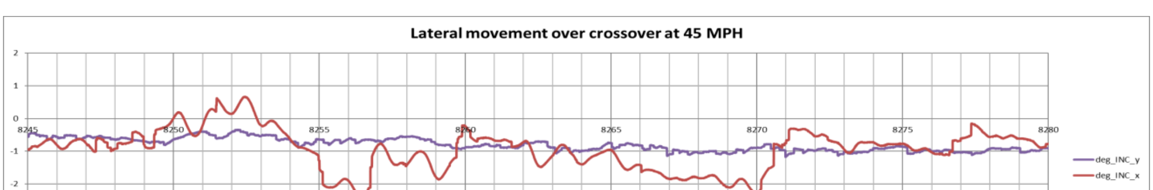
The program data was developed using 5 3 axis accelerometers, a 2 axis tiltmeter, and 12 omnidirectional peak particle velocity meters. The equipment ran and recorded location, acceleration, time and the like at up to 300 Hz with a 100 Hz antialiasing filter in five minute file increments for six hours for speeds up to 140 kph. Data included a video log of the test route and over 500 manually collected visual observations (track number, weather, track support track traffic, crossovers, and a dozen heel drop tests.



The results were compiled to provide accelerations, tilt, time, and the like.

Accelerations in general corresponded to values anticipated by the VAMPIRE model. Below are samples of the accelerations and tilts at 5 locations in the train cabin.





Accelerations under 0.25 g.
Tilt under 2degrees.
Correlation of tilt and acceleration is “apparent”

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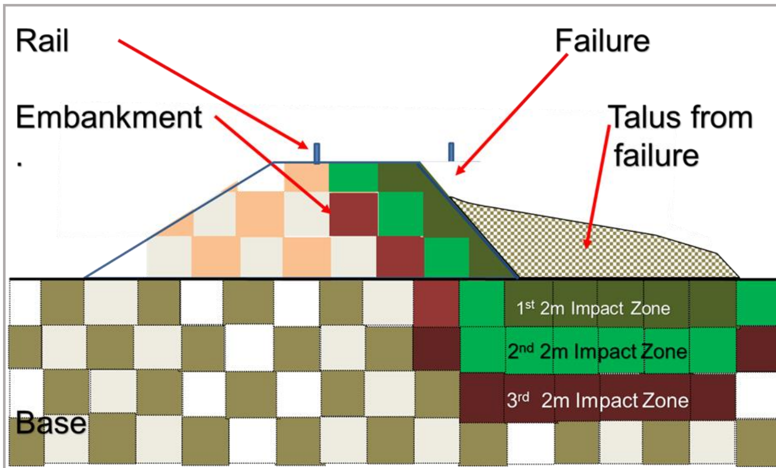

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V.A.S.E PRO

Transportation , Pipeline, Dam, and Large Infrastructure Monitoring

V.A.S.E. Pro have reviewed the costs and range of monitoring transportation infrastructure using conventional techniques such as inclinometers, tiltmeters, strain gauges, survey points, visual observations, etc. for large infrastructure. V.A.S.E. Pro appreciates the technology above and the good data that can be achieved. However, the data is often sporadic in nature, of limited zone of investigation, and false positives can be costly to investigate. Further repairs and maintenance can be difficult.

V.A.S.E. Pro have developed with IBM, Egmond Associates Ltd, RMF manufacturing, and a telecommunications provider, a new approach to monitoring long linear infrastructures (rail, road, pipes).

Our new approach intent is to have multiple redundant detectors reporting to the infrastructure group at our clients in such a way as to anticipate detect or predicate failures of slopes, embankments, surfaces so that trains, vehicles, maintenance operations can be adjusted before failures.

The insurance for rail firms can be in the multiples of millions and the losses can reach to billions.
Failures of hillsides and dams can cause losses of life and of goods and assets. Each year thousands are injured from slides of soil.
Pipe line failures due to collapse of embankments and hillsides happen every year and can cause loss of like and of habitat.

The V.A.S.E. Pro team offer owners and users of large infrastructure tools to reduce the risks of failure for embankments, soil surfaces, dams, tracks and roads.

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Vehicle Movement monitoring

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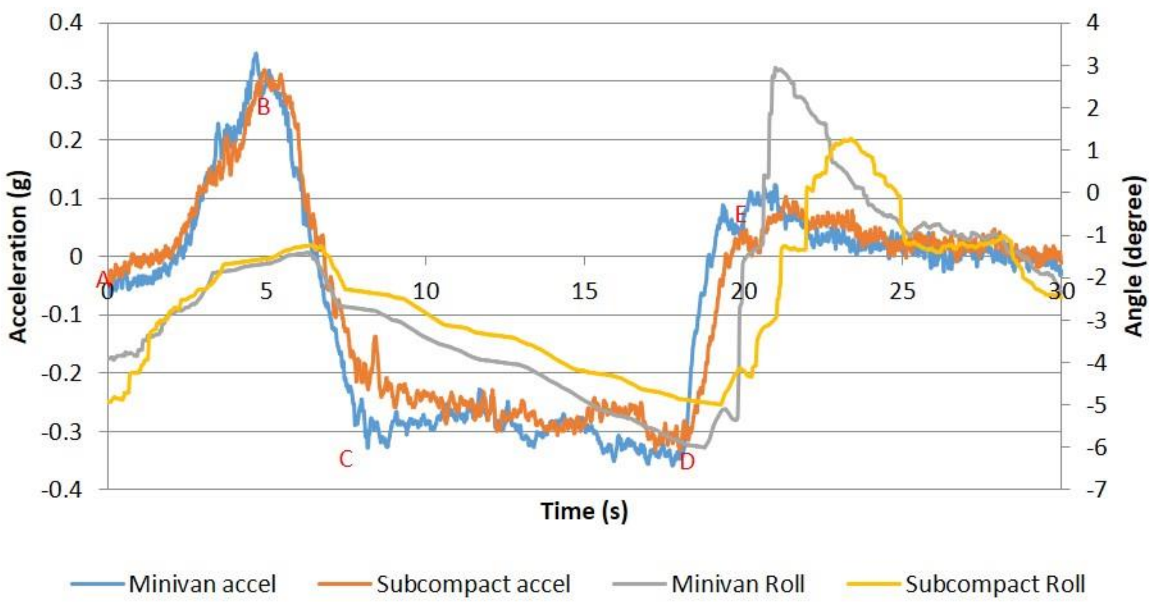
As a demonstration for the use of accelerometers and tilt meters in vehicle monitoring applications, V.A.S.E. Pro installed transducers in two different vehicles. The vehicles were driven through a section of road with features than can cause significant vibration to the interior of the vehicle.

Example: Traffic circle – Lateral Acceleration



Here we see starting at point A the vehicles start accelerating to the right into the turn at point B. The vehicle rolls to the left.
Point B is the maximum rightward acceleration where the vehicles then accelerate leftwards into the circle from C to D. The vehicles exhibit body roll to the right, which could cause rollover if the acceleration is too high.
At point D the vehicles accelerate out of the curve through point E at a much shallower angle than the entrance to the circle, so the rightward acceleration is smaller.

Potential applications:
Designing automotive tires for handling characteristics.
Testing vehicle suspensions and centre of gravity for rollover safety.

Item	Firm A	Firm A Related Costs	Firm B	Firm B Related Costs
KM Estimate	32000		12,000	
Cost Rate Value Used per Incident		$250,000		$250,000
Incidents Over 15 years	15500		5500	
Km per incident based on 15 years data	2.06		2.18	
Cost of All Incidents Based on Average Cost Allowance Shown		$3,875,000,000.00		$1,375,000,000.00
Number of Main Line and Non Main Line Derail Events From data	5190		4067	
Percent of All Incidents for Firm representing embankment failure or hillside failure	6%		6%	
Failure Embankment Related Cost Assuming Only A percent of Derailments relate to Embankments		$77,850,000.00		$61,005,000.00
Number of Incidents Above involving Embankments based on Percent above	931		348	
Cost Estimated Embankment Involved		$232,750,000.00		$87,000,000.00
Percent Derail Incidentes From Settlement or movement	10%		10%	
Number Incidends due to settlement or movement of rail bed	520		407	
Cost Estimated Settlement Involved		$130,000,000.00		$101,750,000.00
Total Estimate Cost of Incidents Involving Soil, Rock, or Water over 15 years		$440,600,000.00		$249,755,000.00
Total Soil Cost as Percent of total		11.4%		18.2%

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The chart above, is an adaptation of rail statistics within a nation. Two example railways are analyzed using example values and estimates. The chart provide estimates on the numbers and costs of rail incidents that relate to soil, slope or embankment issues.

Note many incidents will have smaller costs (under say $20,000 (2019 dollars)) but some incidents can cause impact exceeding $500 million dollars.

Example Rail Incidents, different lengths and rates

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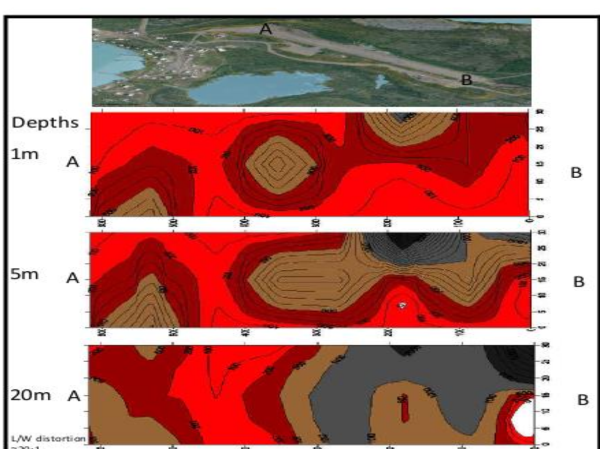
V.A.S.E PRO

Seismic to Determine Generator Location - Case Study

V.A.S.E. Pro carried out seismic analysis of a site in Colville Lake, NT to determine the location for a possible generator on an abandoned runway. Colville Lake is a community of under 150 people. Electricity is provided by Northwest Territories Power Corporation using diesel generators and solar equipment . A new location was required for the power plant.

A geotechnical investigation was proposed of a recently abandoned runway. V.A.S.E. Pro proposed a ReMi based seismic survey to evaluate the best location on the runway.

The ReMi method, uses seismic waves and a spectral analysis of background seismic noise. The data is converted to shear wave velocities and the range of bearing capacities was then estimated based on a correlation of shear wave velocity to soil strength. V.A.S.E. Pro carried out a total of 26 seismic lines over the course of 2 days . A total of 2100m of runway was evaluated using about 780,000 data points.
The results indicated shear wave velocities ranging from as low as 68 metres/ second to over 5000 metres/second The results also indicated that shear wave velocities in general increased with depth, although between 11m and 20m, about 50% of the shear wave velocities on the day of the test were below higher elevation values. In the upper layer over 90% of the shear wave velocities exceeded those at shallower depth. The findings suggest the runway materials at depth were likely to be softer or that there are softer areas below about 5m. The shear wave velocities also suggested the edges had softer zones than the centre of the runway. By 30m there was again a trend to toward increasing shear wave velocity.



Location Selection

The optimal location for placing the generator based on the analysis of the results and temperature changes was found to be near the community where rock appeared shallower and seasonal impacts on bearing values were lowest.

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NOTES

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Comments_____________________________________

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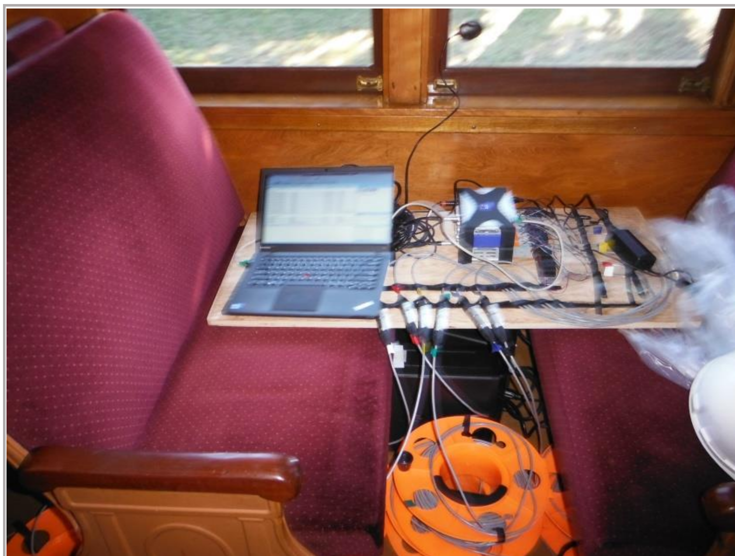
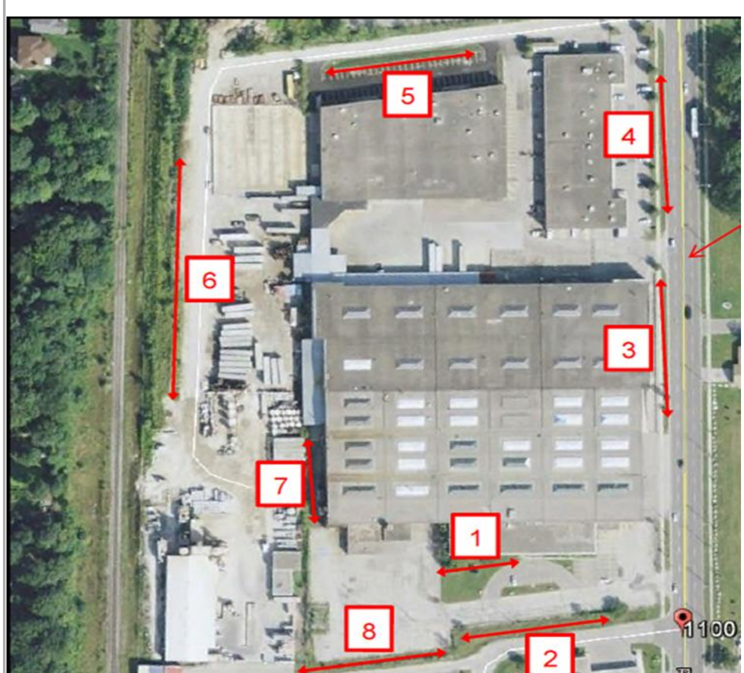


Can you guess which is which?

Not resting on a heritage train

A maitake mushroom growing wild

Analysis of an existing site



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V.A.S.E PRO

MOBLIZATION LOCATIONS

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World
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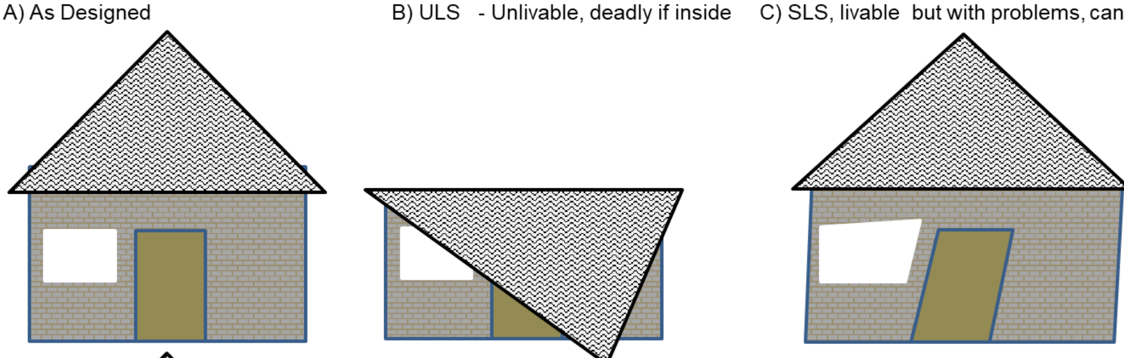
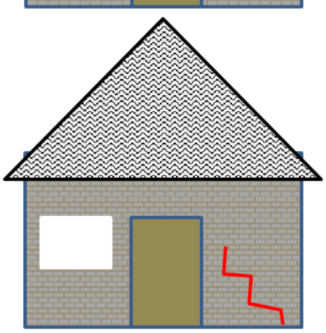
A) As Designed B) ULS - Unlivable, deadly if inside C) SLS, livable but with problems, can get out





Here is the same house with a crack of less than 1mm at 20 years old.

What if a that “minor” visible crack is defined as unsuitable, as an “SLS”. by the owner after construction? What could that mean for design? Let us define the SLS values before design and limit exposure to claims post handover.

Could an SLS of this type result in beams and columns and connections not needed for ULS? Would one have to recalculate the new ULS for the actual beams and columns and connections?

Ultimate Limit State – ULS – Collapse and death possible
Serviceability Limit State (SLS)– Conventional: designed items suffers in serviceability but remains intact.
SLS- Unknown – If SLS are condition that the owner does not want, a member of the public may fall on after slipping on a shiny clean stone floor in new hard soled shoes, or “nuisance repeat offending maintenance items, “minor” cracks that appear and “need” to be repaired from time to time, are those SLS failures. If so let those be specifically known to the designer, because the middle of a litigation is not the time to deal with SLS.

Design Consideration