

BOSTON GROUNDWATER TRUST (BGwT)
BOARD MEETING
January 19th, 2023

The Board of Trustees of the Boston Groundwater Trust met in the Patriot meeting room at the Lenox Hotel located at 710 Boylston Street, Boston, MA. The Executive Director electronically distributed the meeting notice and agenda to the City Clerk at Boston City Hall in accordance with the provisions of the Commonwealth of Massachusetts' Open Meeting Law.

Mr. Robert Whitney, co-chair, read the following statement:

"I, Robert Whitney, co-chair of the Boston Groundwater Trust, am calling this meeting to order at 4:15 pm. In accordance with the Commonwealth of Massachusetts Executive Order Suspending Certain Provisions of the Open Meeting Law, we are conducting this meeting on-line. To ensure public access to the deliberations of the BOSTON GROUNDWATER TRUST, the public may access this meeting through telephone and video conferencing. Members of the public will have an opportunity to ask questions and provide public comment. To do so please, "raise your hand" in the application via the Zoom meeting platform. If you are calling in and cannot use the platform, you can send your questions to staff via email at csimonelli@bgwt.org or via Twitter by tagging the Twitter handle @BOSTONGWT and using the hashtag #JAN23MTG."

The following trustees were present at the Lenox Hotel:

Mr. Peter Shilland, Ellis Neighborhood Association
Mr. Tim Mitchell, Neighborhood Association of the Back Bay (Arrived at 4:48pm)

The following trustees were present virtually:

Mr. Robert Whitney, Beacon Hill Civic Association
Ms. Angie Liou, Asian Community Development Corporation (Left meeting at 5:00pm)
Ms. Janine Commerford, Greater Boston Real Estate Board
Ms. Leah Camhi, Fenway Community Development Corporation

Also present at the Lenox Hotel were:

Mr. Christian Simonelli, Executive Director; Mr. Abdulrhman Almalki, Student from Northeastern University

Also present virtually were:

Ms. Beatrice Nessen, Boston Preservation Alliance
Mr. Jagrat Jariwala, PE, Principal Civil Engineer, SkyGeo
Ms. Jacqueline Salzer, PhD, Director of Technical Services, SkyGeo
Ms. Katherine Eshel, Chief of Staff, Environment, Energy and Open Space City of Boston

1. Presentation from SkyGeo on Geotechnical Monitoring

Mr. Jagrat Jariwala and Ms. Jacqueline Salzer, both of SkyGeo, described InSAR (Interferometric Synthetic Aperture Radar), a satellite technology used to provide millimeter-accurate displacement data. This radar image data provides the means for estimating relative ground movements. Mr. Jariwala reviewed how this technology could be used to acquire data on potential settlement of Boston buildings. He covered the following points during his presentation to the Board:

- A description of how everything – buildings, infrastructure, etc. - is moving on a millimeter scale, on a daily to weekly basis, for a variety of reasons including settling/subsidence.
- Insight into current subsidence rates.
- Analysis of the data can indicate which buildings may be settling.
- A case study in Amsterdam and how the technology was used to reveal a manual surveying error.

Mr. Jariwala and Ms. Salzer took questions during and following the presentation. Discussion followed. Please see attached copy of presentation for reference.

2. Adoption of November 17th, 2022, Board Meeting Minutes

Meeting minutes were previously emailed to Board members for review. Discussion followed.

Mr. Mitchell, Trustee moved to adopt the minutes. Mr. Whitney seconded the motion.

Voted: To accept the Board meeting minutes.

3. Financial Report

Mr. Whitney and Mr. Simonelli reviewed the Trust's financials. Discussion followed.

4. BluCloud Inc. Update and Review of Letter of Intent

Mr. Simonelli updated the Board on the status of the 5 remote readings units currently deployed. He noted that 2 new units were shipped and that he would install those in two wells. Discussion and review of the letter of intent provided by BluCloud followed.

5. 2023 Trustee Meeting Dates

Mr. Simonelli reviewed the proposed meeting dates for the 2023 Board meetings. Mr. Simonelli stated that per the organization declaration of trust the Trustees may schedule meetings as deemed necessary, but the Board is only required to meet four (4) times each year. Discussion followed.

The Board decided to maintain the proposed March 16th, 2023, meeting date and revisit the proposed 2023 meeting dates as needed.

6. **Executive Director's Report**

BGwT Executive Director Mr. Christian Simonelli distributed his report. Discussion followed. Refer to the attached *Executive Director's Report January 19th, 2023*, for a complete list of activities. Discussion followed.

Mr. Mitchell, moved to adjourn the meeting. Mr. Whitney seconded the motion. The meeting adjourned at 5:37p.m.

NEXT MEETING: March 16th, 2022 @ 4:00 pm, at the Lenox Hotel with a virtual attendance option.

Notes submitted by Christian Simonelli, BGwT Executive Director, 1/23/2023.

SkyGeo

InSAR applications for
climate change adaptation
in urban areas

Jagrat Jaiswal, PE - Principal Civil Engineer
jagrat.jaiswal@skygeo.com

Dr. Jacqueline Salzer - Director, Technical Services
jacqueline.salzer@skygeo.com



There is geotechnical risk everywhere



Some events are predicted, but many come
as a surprise

The Earth is moving everywhere



Everything moves at the millimetre scale

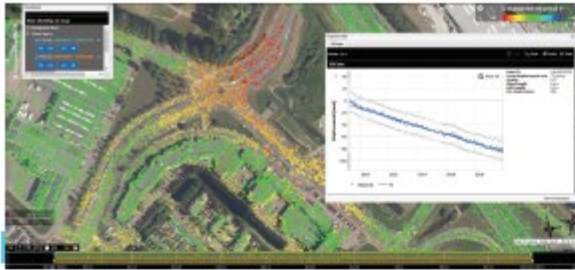
SkyGeo

But when everything is moving,
which movements are important?



SkyGeo

We can estimate how everything is moving on a millimetre scale, on a daily to weekly basis



Location - Krimpen aan den IJssel

Between the Maas and IJssel rivers

Build on peat soil

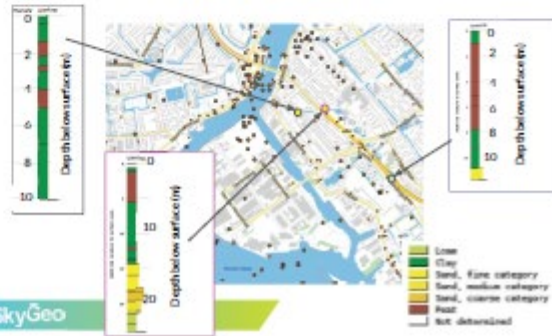


SkyGeo

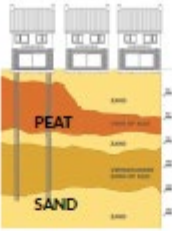
Case:
Oud-Krimpen



SkyGeo



SkyGeo

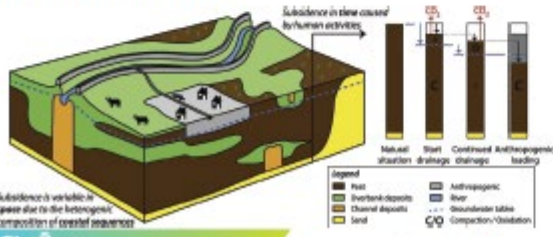


SkyGeo



Climate change effects: damage to the foundation

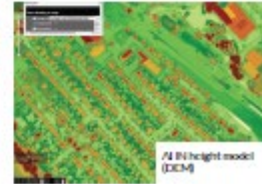
Oxidation of peat soils



SkyGeo

The approach

- Goal: insight into current subsidence rates
- Using a combination of remote sensing data + ground-based data
 - High resolution SAR imagery (TerraSAR X)
 - LIDAR DCM (for DEM / AI IN)
 - Building shapes (BAG)



AI IN height model (DCM)

SkyGeo

The start - InSAR 'coloured dots'



SkyGeo

Quantify, visualise, communicate



SkyGeo

Aggregation of points onto houses → Average displacement rate per property

Sifting through the data



SkyGeo

Separation of points on buildings vs ground

Settlement rate per property



Summary

- Quantitative, data-based insight into locations and timings of risk
- Support budget allocation
- Clear visualisation of results which can effectively communicate areas of concern
- Possible integration of groundwater level data with settlement estimations

SkyGeo

Do we need to do a foundation investigation?

- Conventional stability data 2011-21 show 31 cm lean, from 6 cm towards the church to 25 cm towards canal
- This amount of lean would require a foundation investigation to inspect
 - Multi million euro operation
 - Closing one of the busiest streets in Amsterdam

=> SkyGeo to double check the conventional measurements



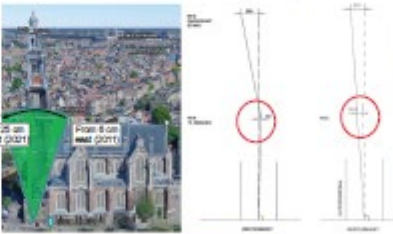
SkyGeo

Case: Amsterdam Church Tower



SkyGeo

Survey surprises



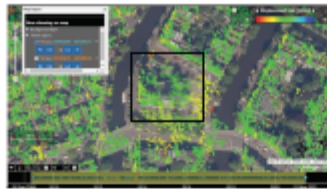
In 2011 the tower leaned 60 mm towards the church and in 2021 its tilting 250 mm towards Prinsengracht

Hence a 310 mm change in direction at the middle of the tower

SkyGeo

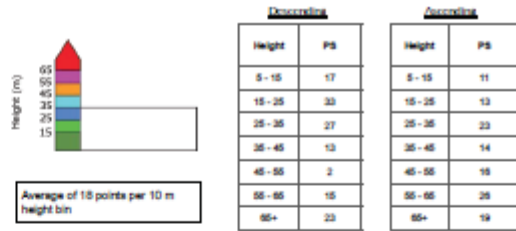
This is the start, the first 10% of the work

- Historical investigation with 12 years of data (2009 to 2021)
- Go from 2 points 1x/10 year to 11 day frequency over 12 years and 1000+ points on the building
- The new game is searching through the data



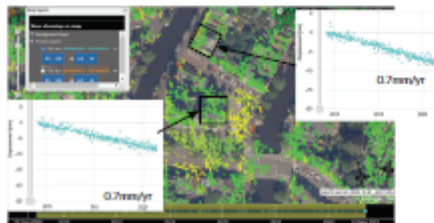
SkyGeo

Does the magnitude of displacement differ with height?



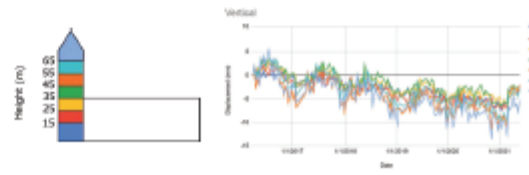
SkyGeo

General subsidence trend of church in line with surrounding area



SkyGeo

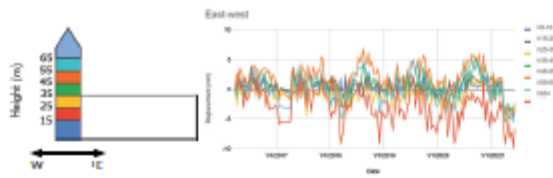
Vertical decomposition per height interval



Total vertical displacement less than 10 mm over 4 years. So < 3 mm over 10 years

SkyGeo

Horizontal (east-west)



Total easterly displacement < 10 mm

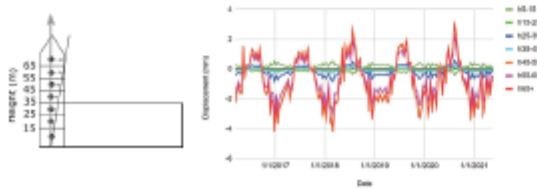
SkyGeo

Summary

- InSAR shows much smaller tilt and lean than conventional measurements, subsiding at about 1 - 2 mm/yr and moving westward at 1 mm/yr (2016 to 2020)
- Full on-site underground investigation postponed confidently based on the InSAR results
- Multi million euro expenditure postponed

SkyGeo

Greater seasonal component at height



Isolate temperature component - this is real deformation, only due to temperature variations

SkyGeo

EXECUTIVE DIRECTOR'S REPORT
January 19th, 2023

1. **Readings** - Completed seven set of readings in 2022. Started 1st set of readings for 2023 on January 11th.
2. **Meetings and Calls** -
 - Google met with City's new Green Infrastructure (GI) Working Groups on the following dates:
 - GI Coordination/Maintenance: 11/18, 12/2, 12/16, 1/13
 - GI Policy: 11/18, 12/9, 1/6
 - GI Working Group: 12/8
 - Google met with Daniel McCormack and Justin Comeau of BluCloud to review next steps on purchasing additional remote reading units. (11/21)
 - Along with John Sullivan, Chief Engineer, BWSC, I testified before the City Council committee on planning and transportation order for a hearing on increasing Green Stormwater Infrastructure Capacity at Boston Water & Sewer and the City of Boston. (11/29)
 - Met with Ty Gupta, developer for the project located at 149 Charles Street in lower Beacon Hill to review current work at the site. (11/29)
 - Zoomed with Ryan McNeil, new Project Manager at DOT, to discuss the current task list for DOT. (12/1)
 - Microsoft Teams met with Mike Atwood, PE, Haley & Aldrich, to review upcoming project at 146 Commonwealth Avenue in the Back Bay. (12/8)
 - Zoomed with John Sullivan, Chief Engineer, BWSC, and Jean-Luc Teixeira, newly appointed Superintendent of Asset Management/CMOM Director, BWSC, to review hot spot areas and BWSC's approach to repairs. (12/14)
 - Zoomed with Inspectional Services Department (ISD) staff Edward Coburn, Assistant Commissioner and General Counsel, Marc Joseph, Deputy Commissioner Inspector of Buildings, and Christopher English, Interim Assistant Commissioner for Plans and Zoning, to review our request for flagging and notifying us when an applicant files to either dig a test pit or repair/underpin a building foundation. (12/19)
 - Spoke with Justin Comeau of BluCloud to review performance of the 5 remote readers and 2 new trail units for deployment. (1/5)
 - Spoke with Rick Smith, Vice President Business Development at Vicinity Energy to review their recharge condensate program. (1/5)
 - Testified via Zoom the Zoning Board of Appeals hearings in December & January.
 - Communicated with residents, engineers, attorneys, & developers throughout the GCOD to discuss ZBA procedures and advised them on what they need to submit to meet the GCOD zoning.
3. **City & State Agency Updates**- All agencies will provide updates on their efforts to address groundwater at the next City-State Groundwater Working Group meeting on Thursday January 26th.

