Optimalisering/automatisering av modellering og beregninger innen geoteknikk

Jonas Lindgård

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Innhold

- Digitalisering innen geoteknikk
- Optimalisering og automatisering innen geoteknikk
  - Masteroppgave
  - Modellering
  - Beregninger
- Fordeler
- Utfordringer
- Avsluttende tanker

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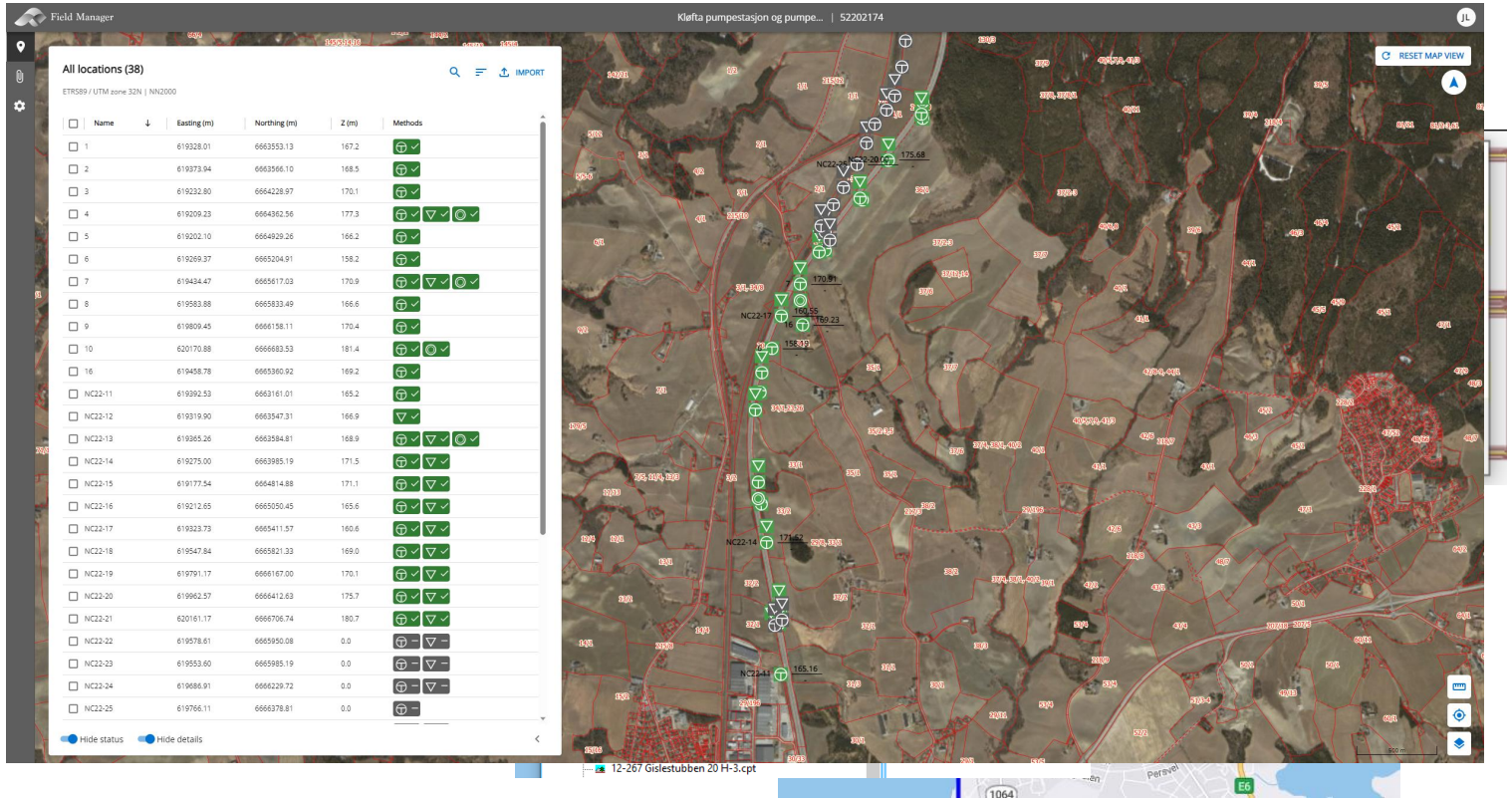
Geoteknikk – digital dinosaur

- Geoteknikk vært en dinosaur mtp. digitale prosesser i lang tid
  - Skjedd veldig lite siste 20 årene
  - Vi har veldig mange prosesser som er repetitive og kunne vært løst på mye bedre måter
  - Men så…



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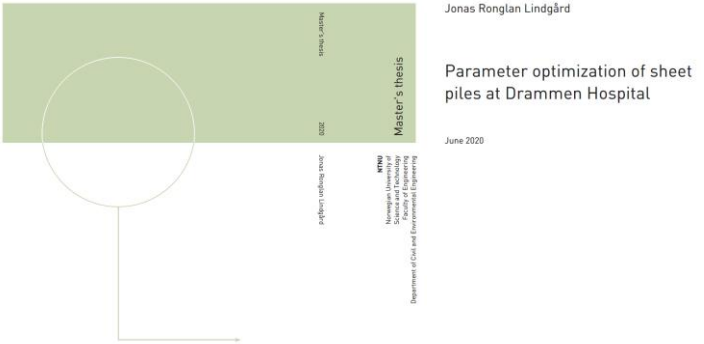
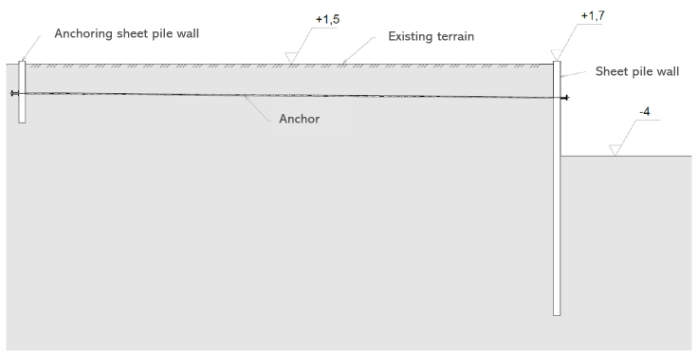
Masteroppgave

- Drammen sykehus
- Se på muligheter for optimalisering av spuntdesignet





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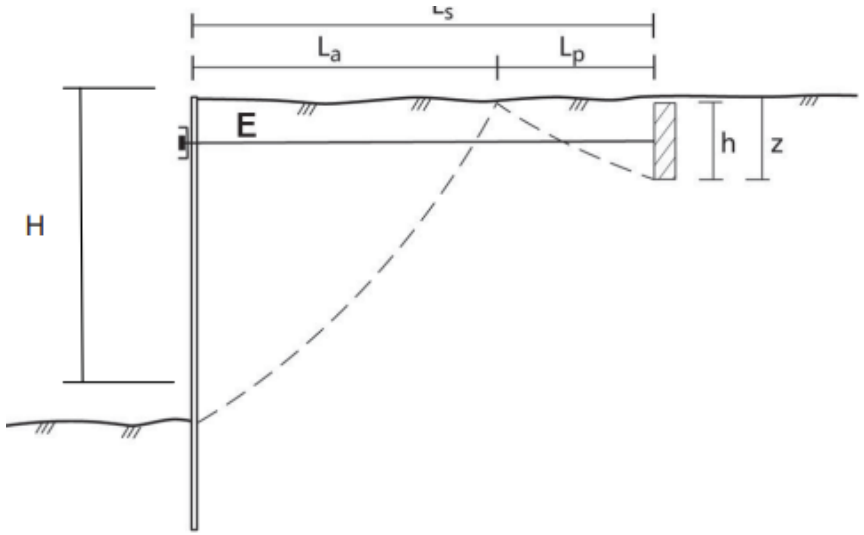
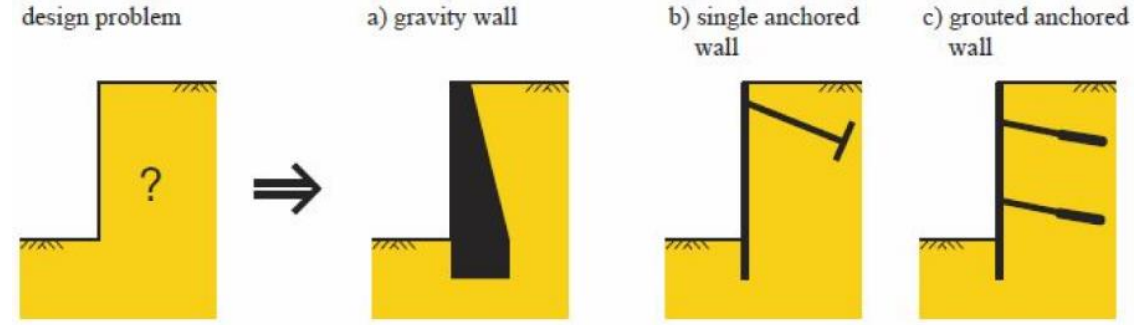
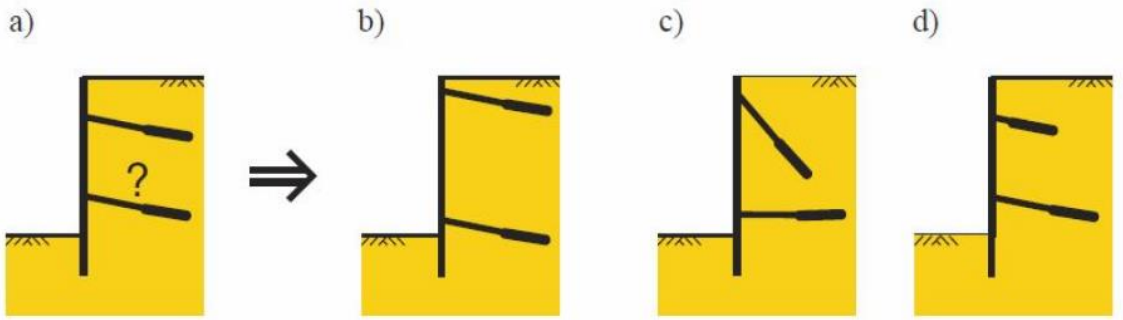
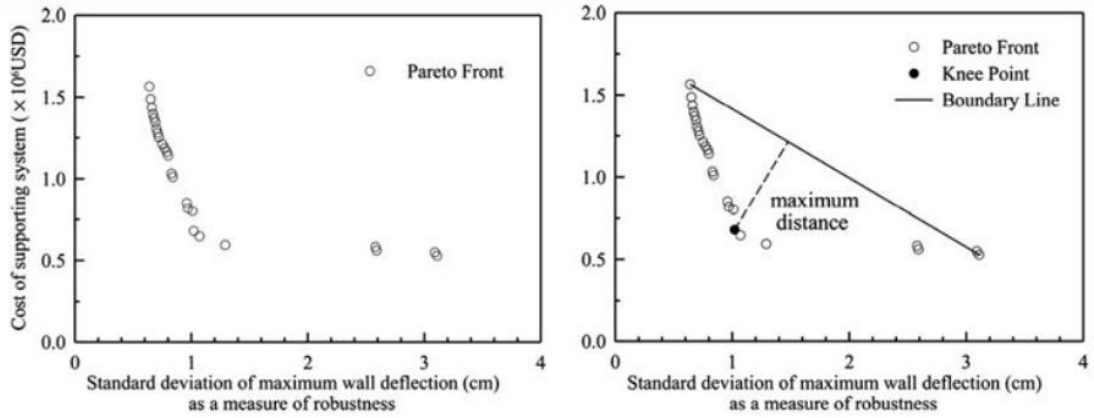
Generelt om optimalisering

- Valg av løsning
- Geometrisk/strukturell optimalisering
- Mange design kan tilfredsstille kravene
  - Robusthet
  - Pris









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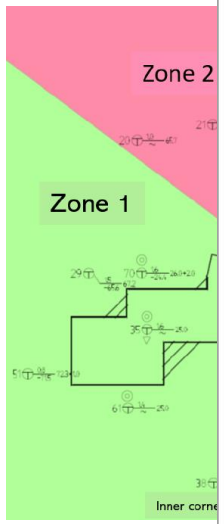
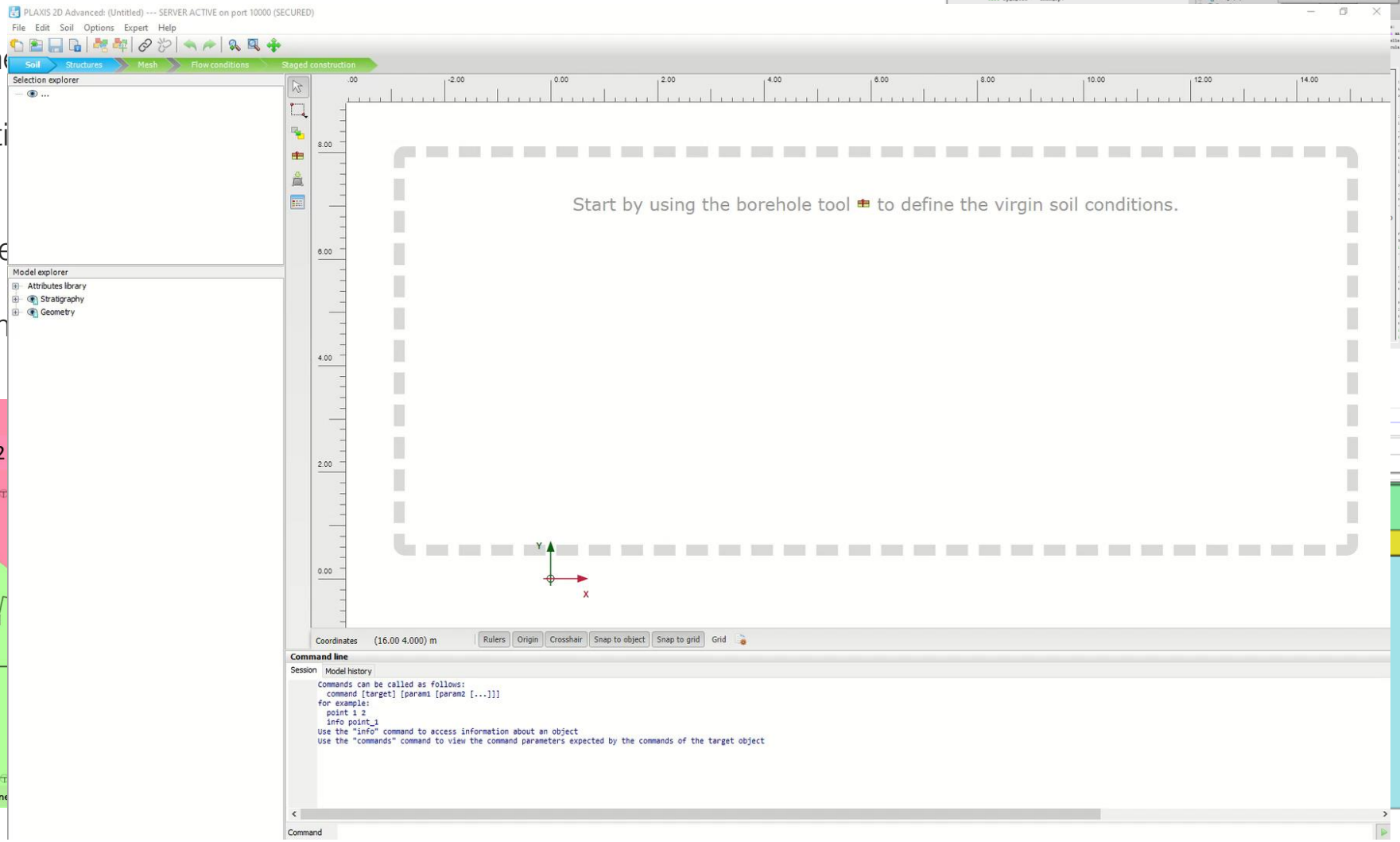
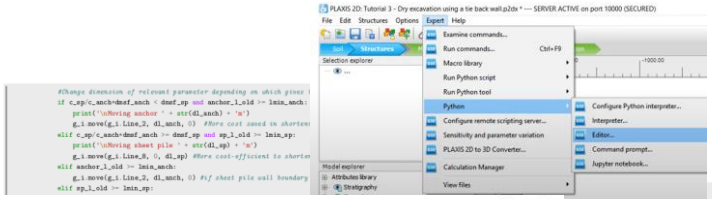
Problemstilling

- Mange sone
- Lang kjøreti
  faser
- Utfordrende
- Python til m







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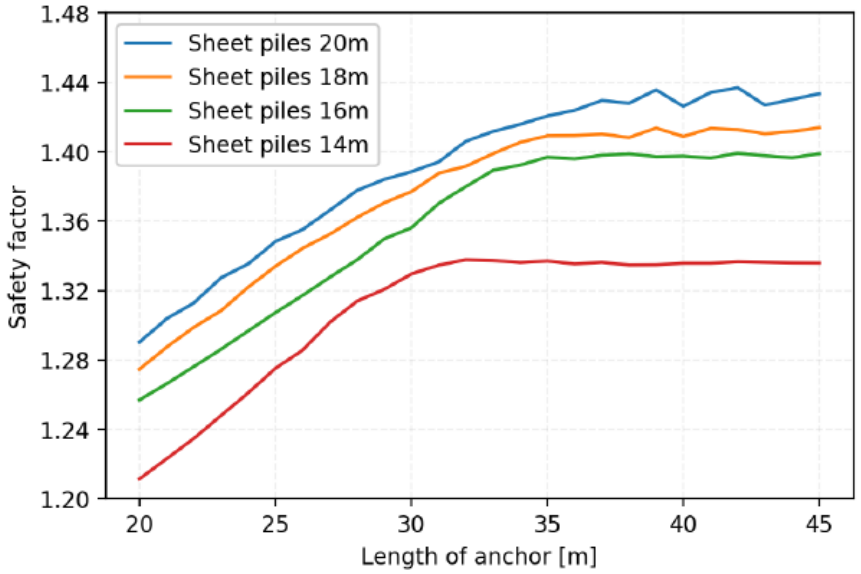
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Sheet piles 18m
Sheet piles 16m
Sheet piles 14m
Safety factor
Length of anchor [m]
1.48
1.44
1.40
1.36
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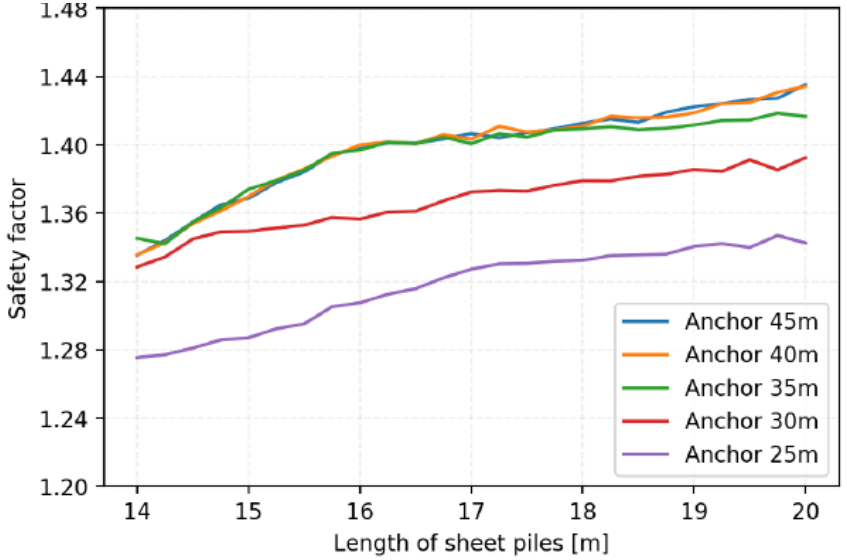
1.24
1.20
20
25
30
35
40
45


Anchor 45m
Anchor 40m
Anchor 35m
Anchor 30m
Anchor 25m
Safety factor
Length of sheet piles [m]
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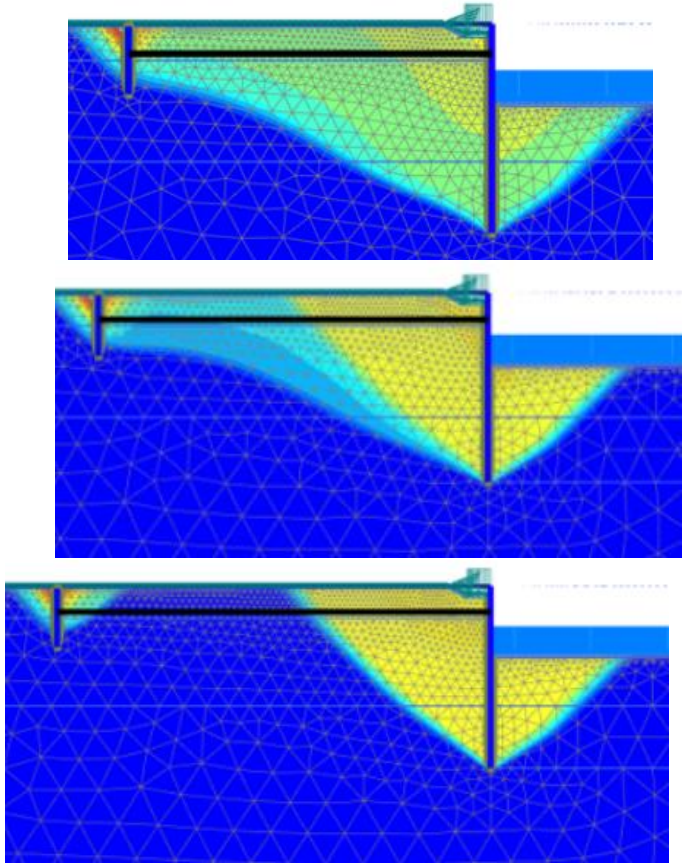
1.44
1.40
1.36
1.32
1.28
1.24
1.20
14
15
16
17
18
19
20



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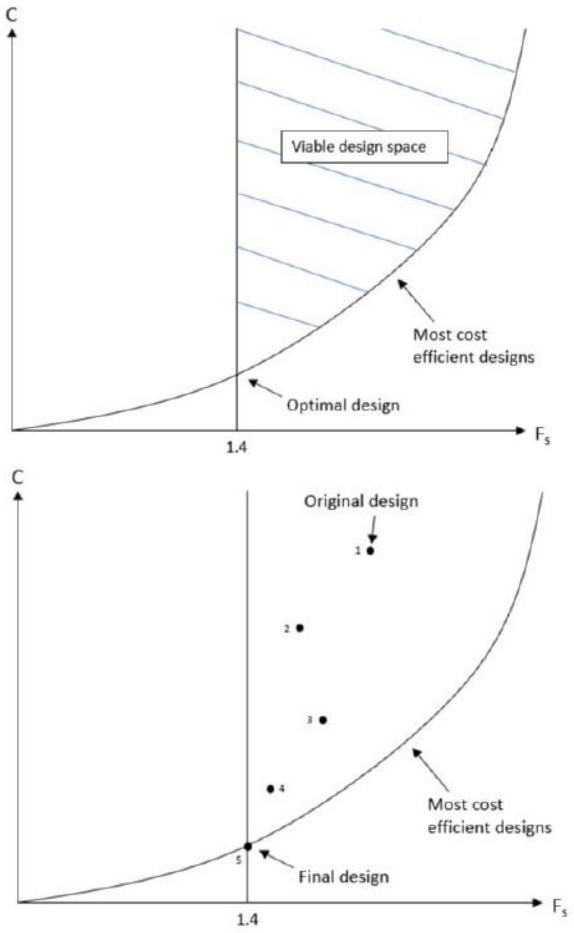
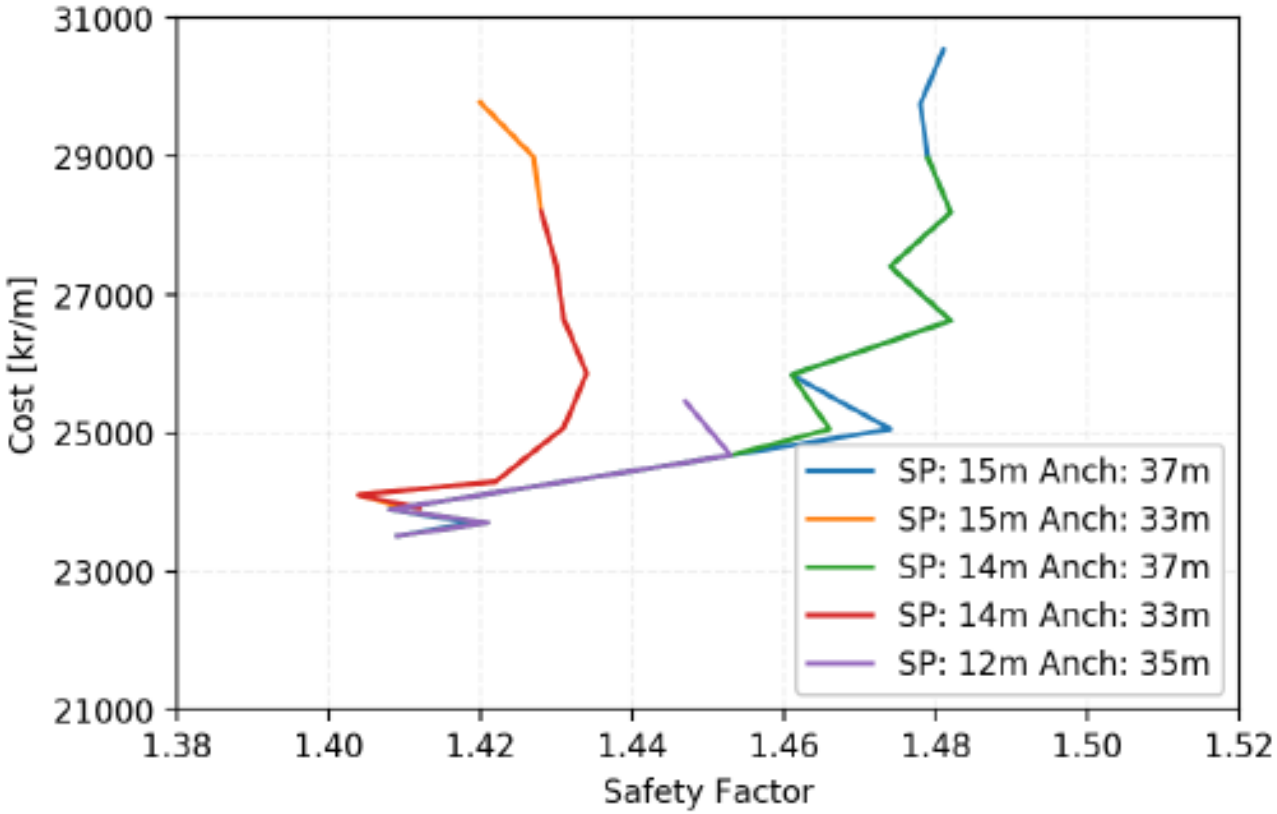
Kostnadsoptimalisering





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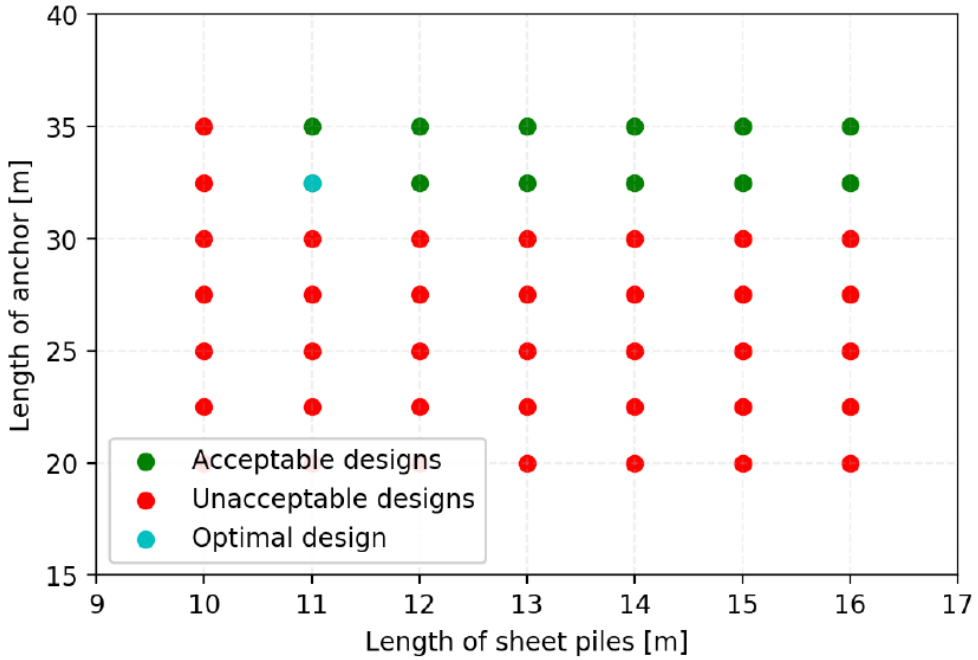
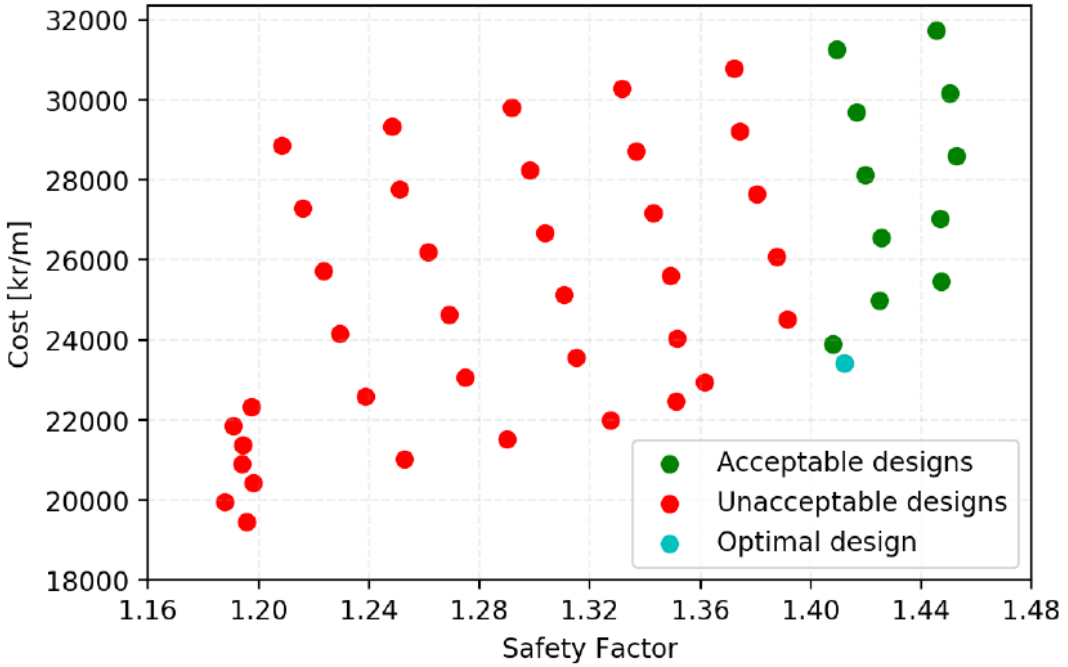
Brute force





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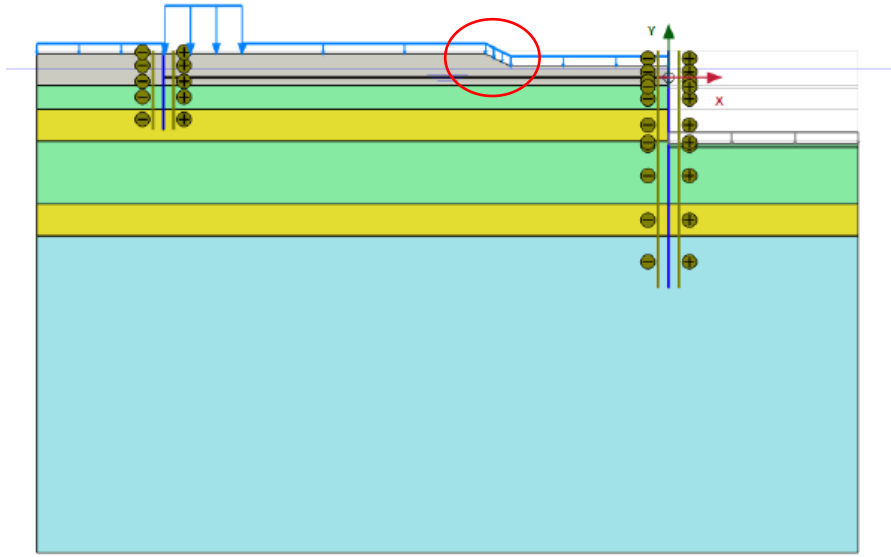
Automatisert modellering

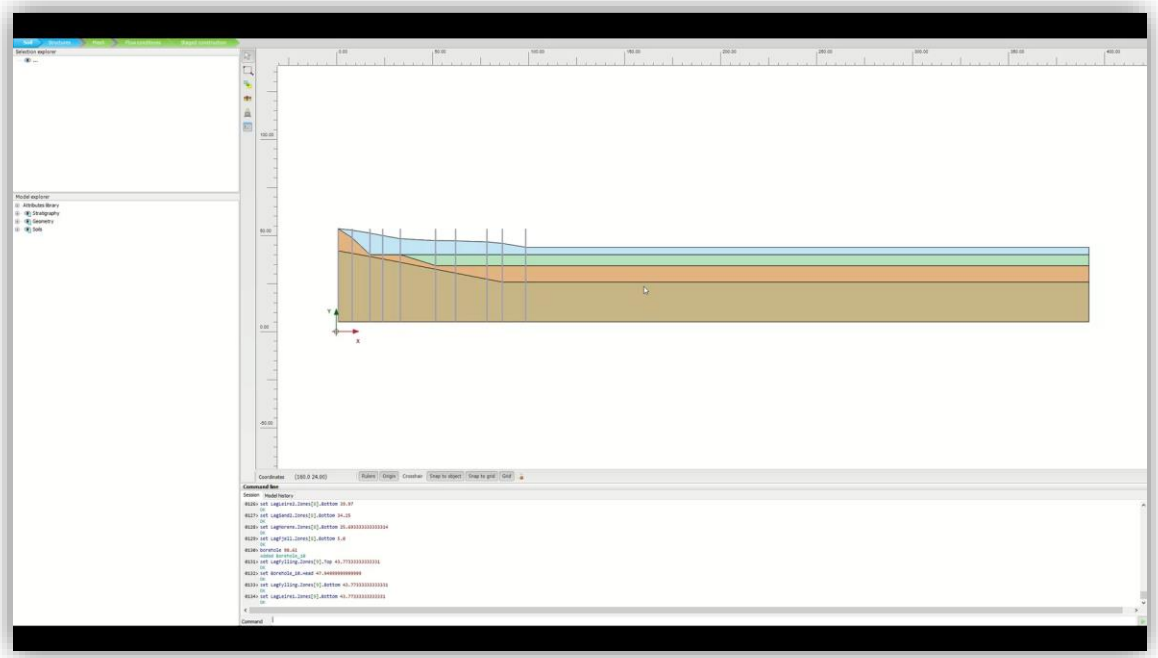
Fordeler

- Enkelt å gjøre mindre justeringer i mange modeller
- Raskt hente ut snitt til for eksempel terrenganalyse

Ulemper

- Utgravingsfaser kan være tungvint
  - Poretrykk
  - Stivere
  - Polygone name
- «Kompleks» geometri tidkrevende





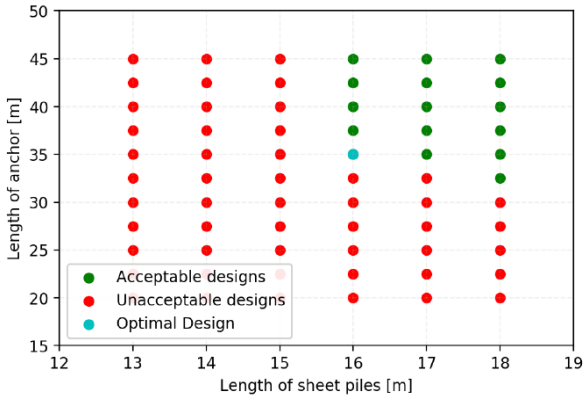
Automatiserte beregninger

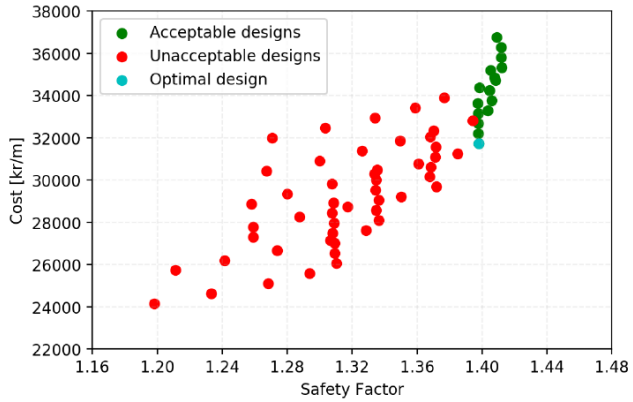
Fordeler

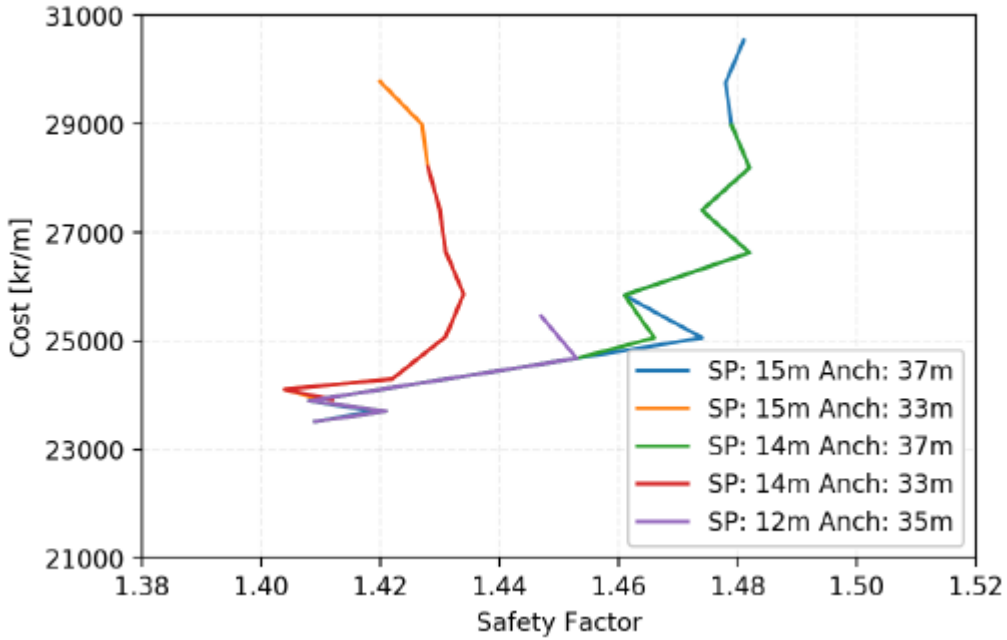
- Tillater store mengder analyser
  - Stor datamengde
  - Kan kjøres over natta
  - Fokus på andre oppgaver
- Optimalisering
  - Kostnad
  - CO2

Ulemper

- Tidsbruk
- Robusthet vs. optimalisert
- Mangelfullt prisgrunnlag
- Skalerbarhet av optimalisering







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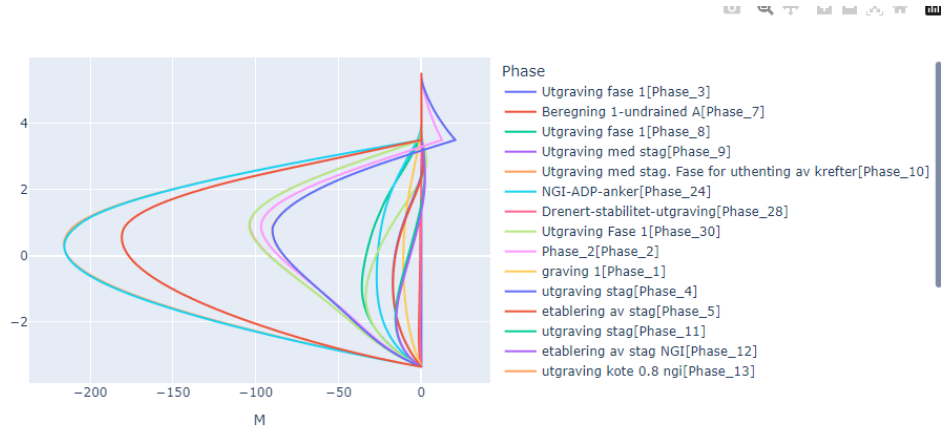
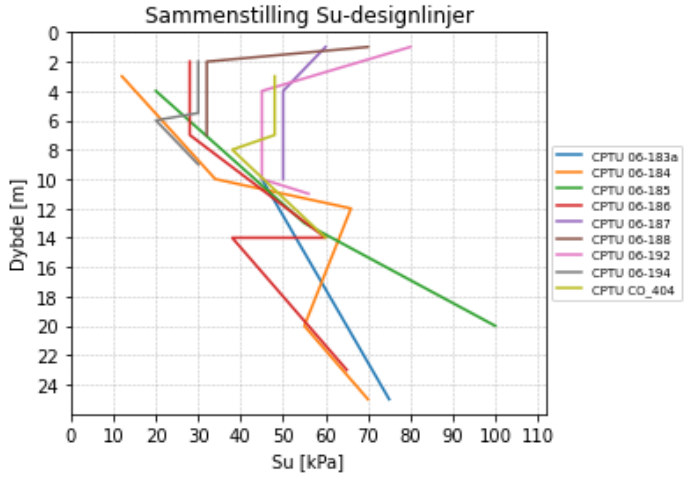
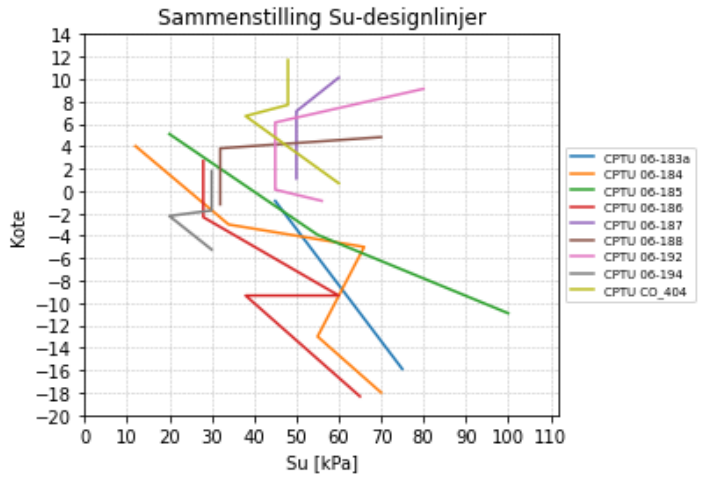
Avsluttende tanker

- Stort potensiale innen automatisering/skripting i byggebransjen generelt, men kanskje særlig i geoteknikk
  - Modellering
  - Effektivisering av arbeidsprosesser
  - Optimaliserte løsninger
  - Bedre arbeidsflyt
  - Utnytte verktøyene våre maksimalt
  - ChatGBT
- Lete etter muligheter i prosjekt
  - Ikke nødvendigvis super tidkrevende
- De yngre medarbeiderne som må være pådrivere for dette skiftet
  - Pushe på bedriftene







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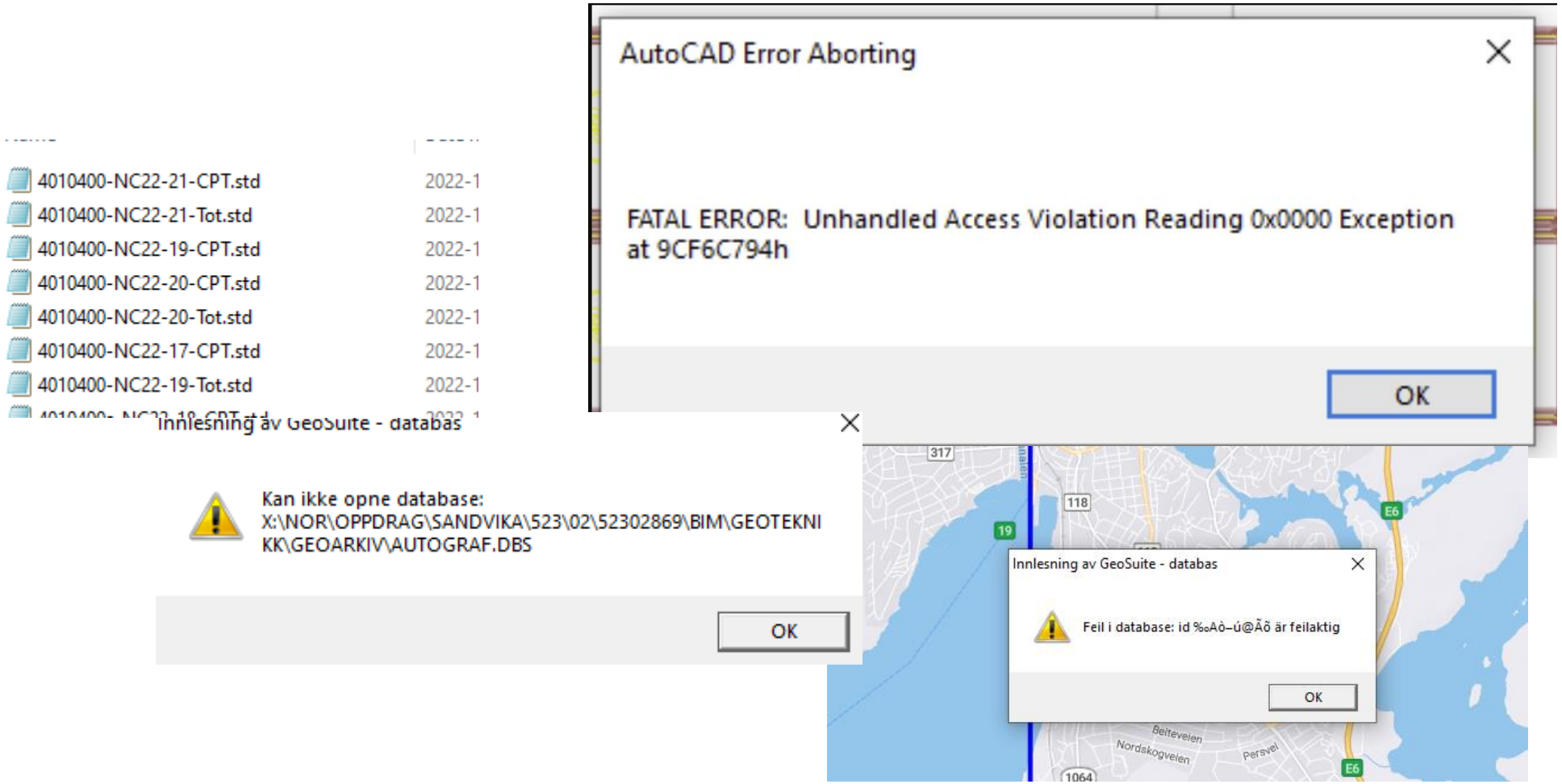
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4010400-NC22-21-Tot.std 2022-1
4010400-NC22-19-CPT.std 2022-1
4010400-NC22-20-CPT.std 2022-1
4010400-NC22-20-Tot.std 2022-1
4010400-NC22-17-CPT.std 2022-1
4010400-NC22-19-Tot.std 2022-1
AutoCAD Error Aborting
FATAL ERROR: Unhandled Access Violation Reading 0x0000 Exception at 9CF6C794h
OK
Innlesning av GeoSuite - databas
Kan ikke opne database:
X:\NOR\OPPDRAG\SANDVIKA\523\02\52302869\BIM\GEOTEKNIKK\GEOARKIV\AUTOGRAF.DBS
OK
317
118
19
E6
Innlesning av GeoSuite - databas
Feil i database: id ‰Aò–ú@Ãõ är feilaktig
OK
Beitevelen
Nordskogveien
Persvei
1064
E6

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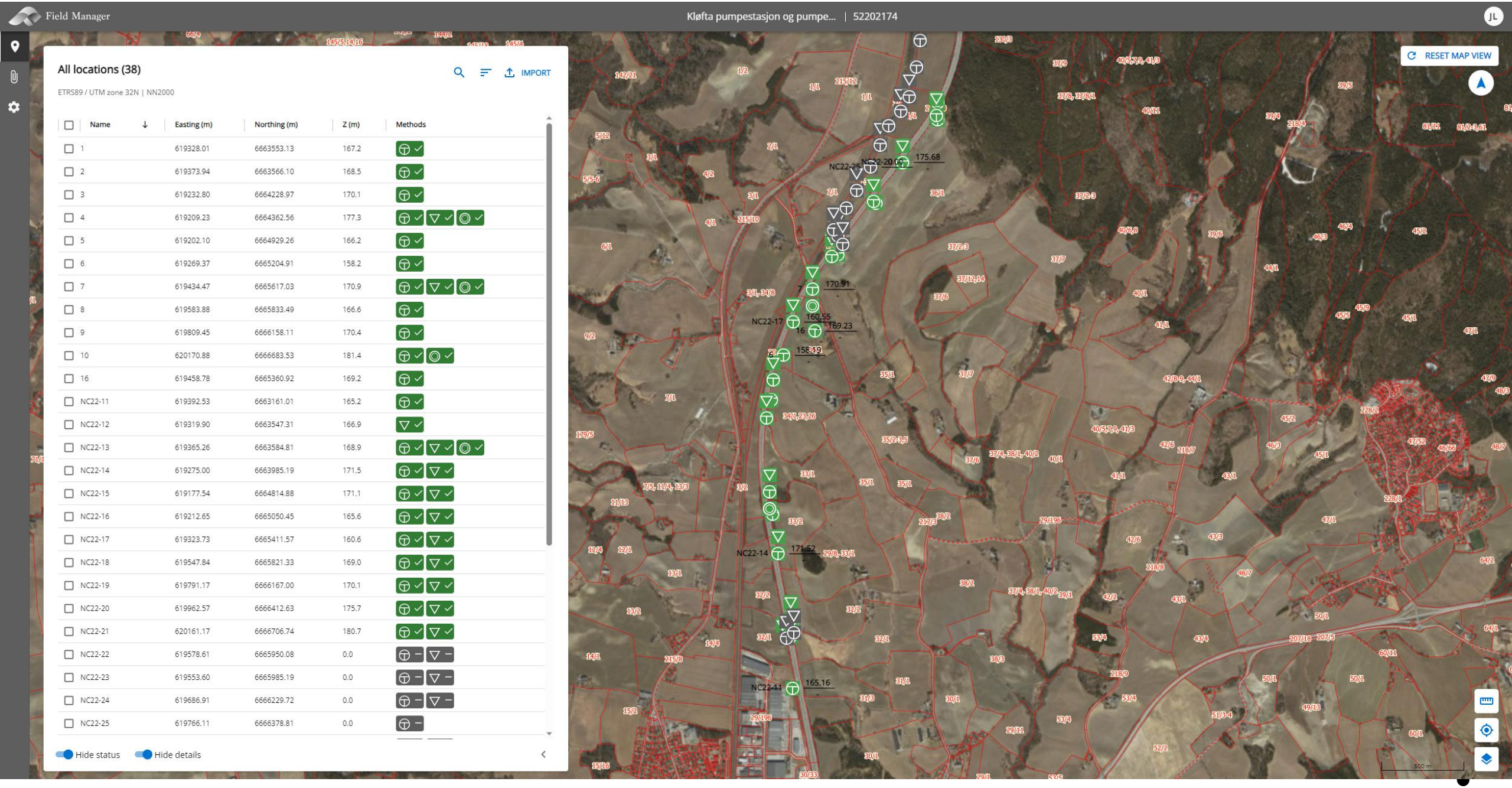
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Kløfta pumpestasjon og pumpe... | 52202174
JL
All locations (38)
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Name
Easting (m)
Northing (m)
Z (m)
Methods
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2 619373.94 6663566.10 168.5
3 619232.80 6664228.97 170.1
4 619209.23 6664362.56 177.3
5 619202.10 6664929.26 166.2
6 619269.37 6665204.91 158.2
7 619434.47 6665617.03 170.9
8 619583.88 6665833.49 166.6
9 619809.45 6666158.11 170.4
10 620170.88 6666683.53 181.4
16 619458.78 6665360.92 169.2
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Hide details
RESET MAP VIEW
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NC22-20
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7
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NC22-17
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16
169.23
29
158.19
NC22-14
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NC22-11
165.16
500 m

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Every day we improve everyday life