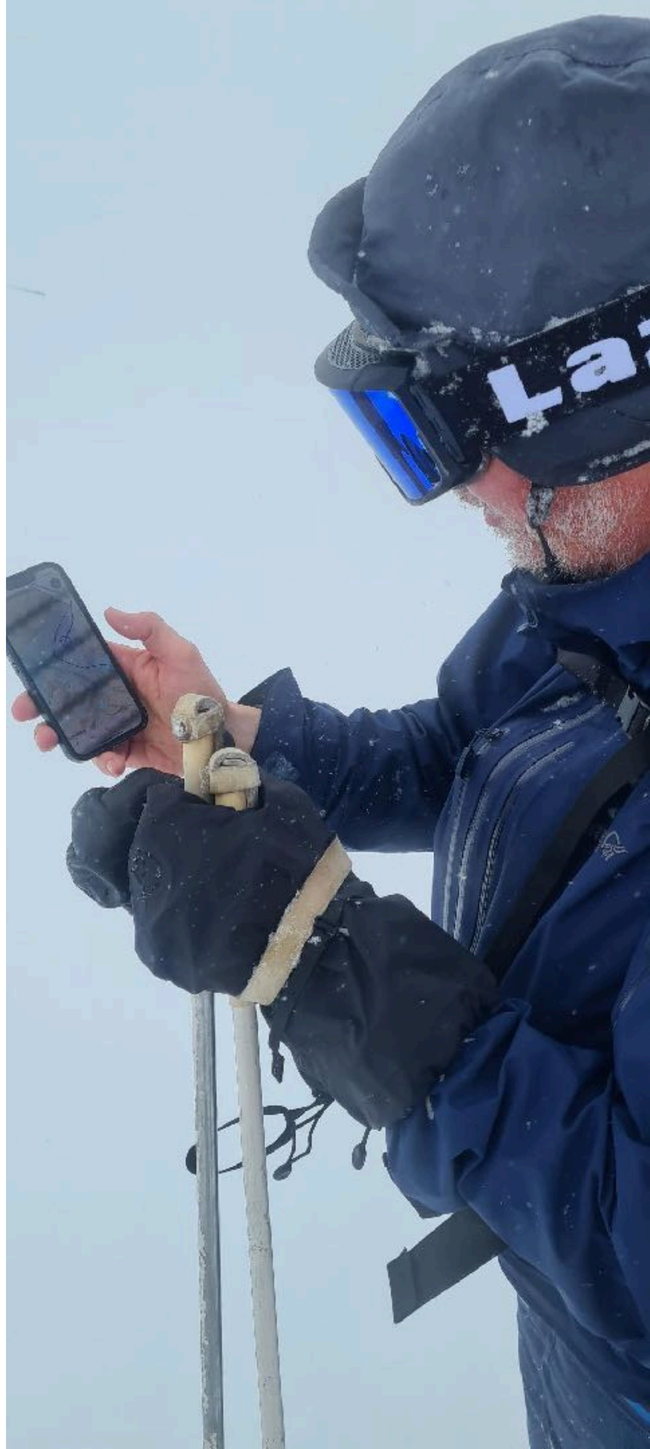
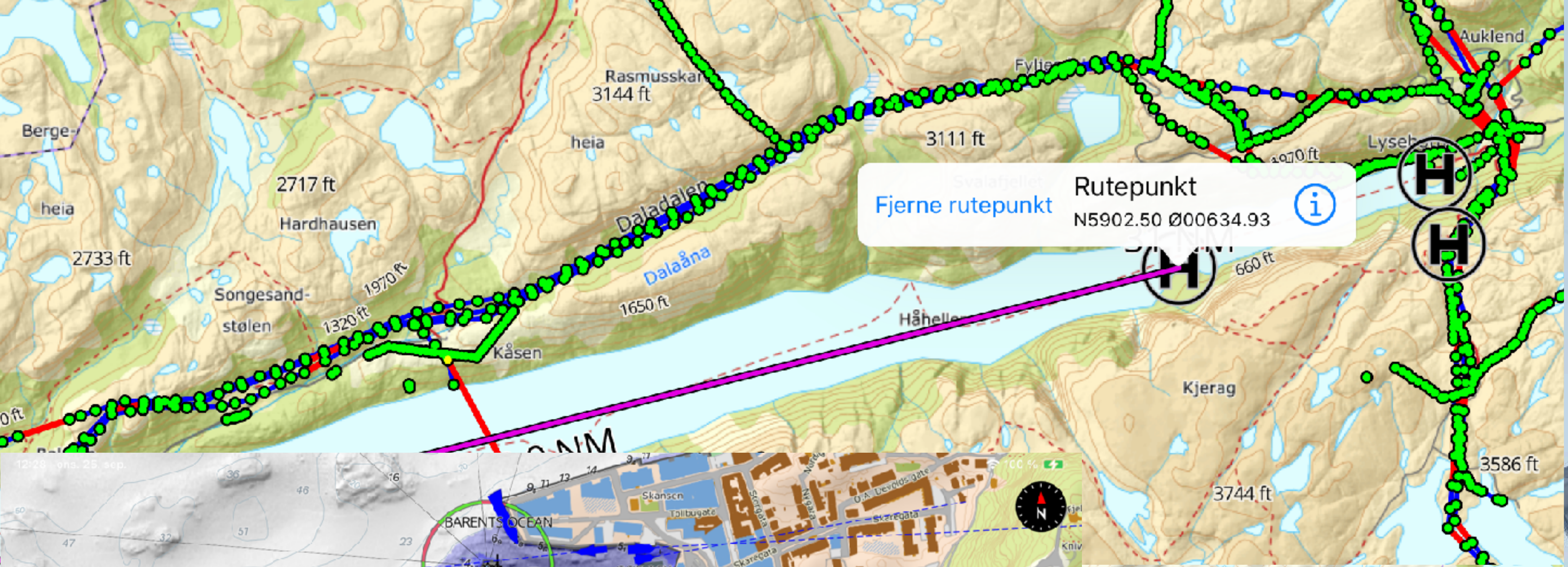
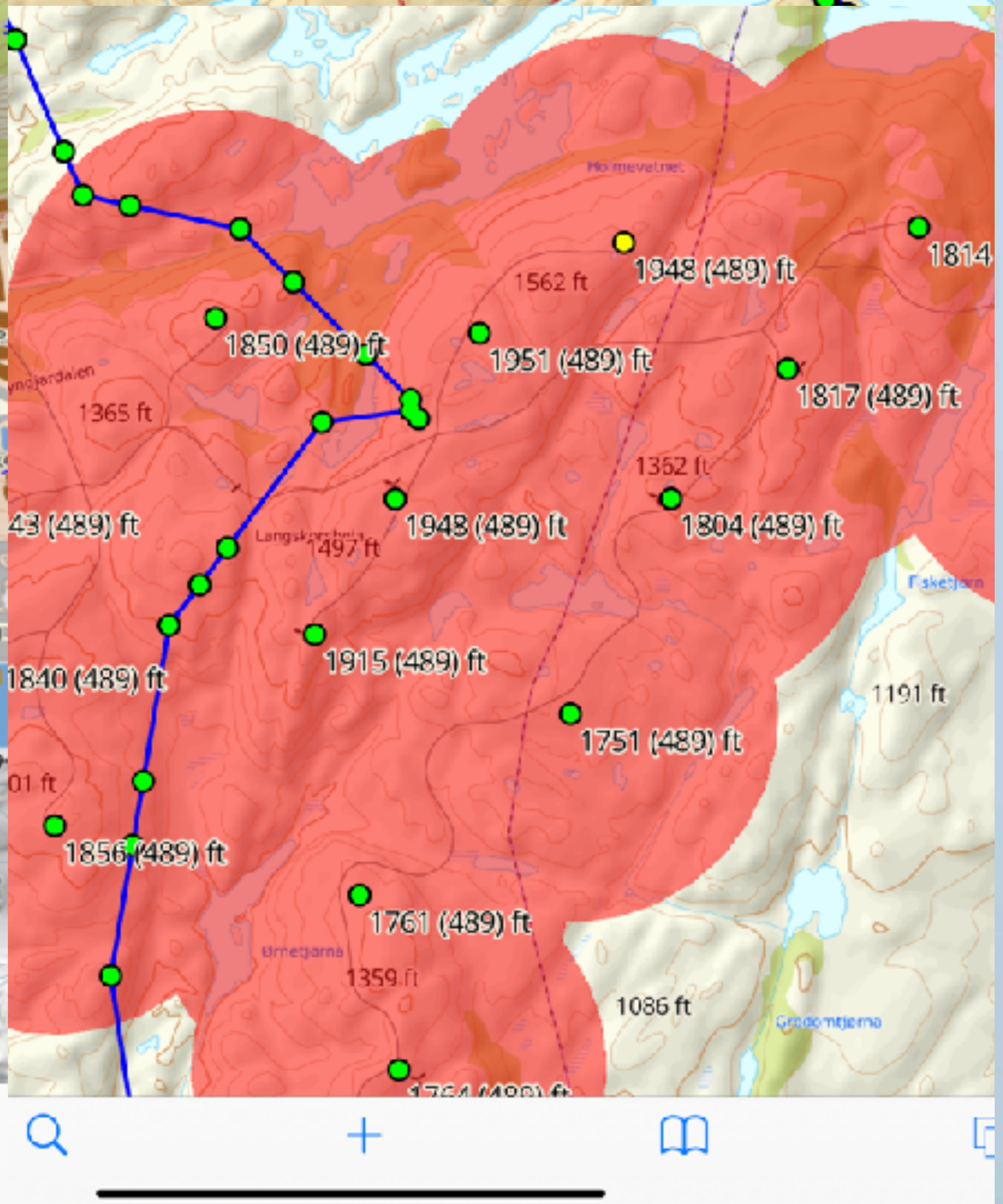
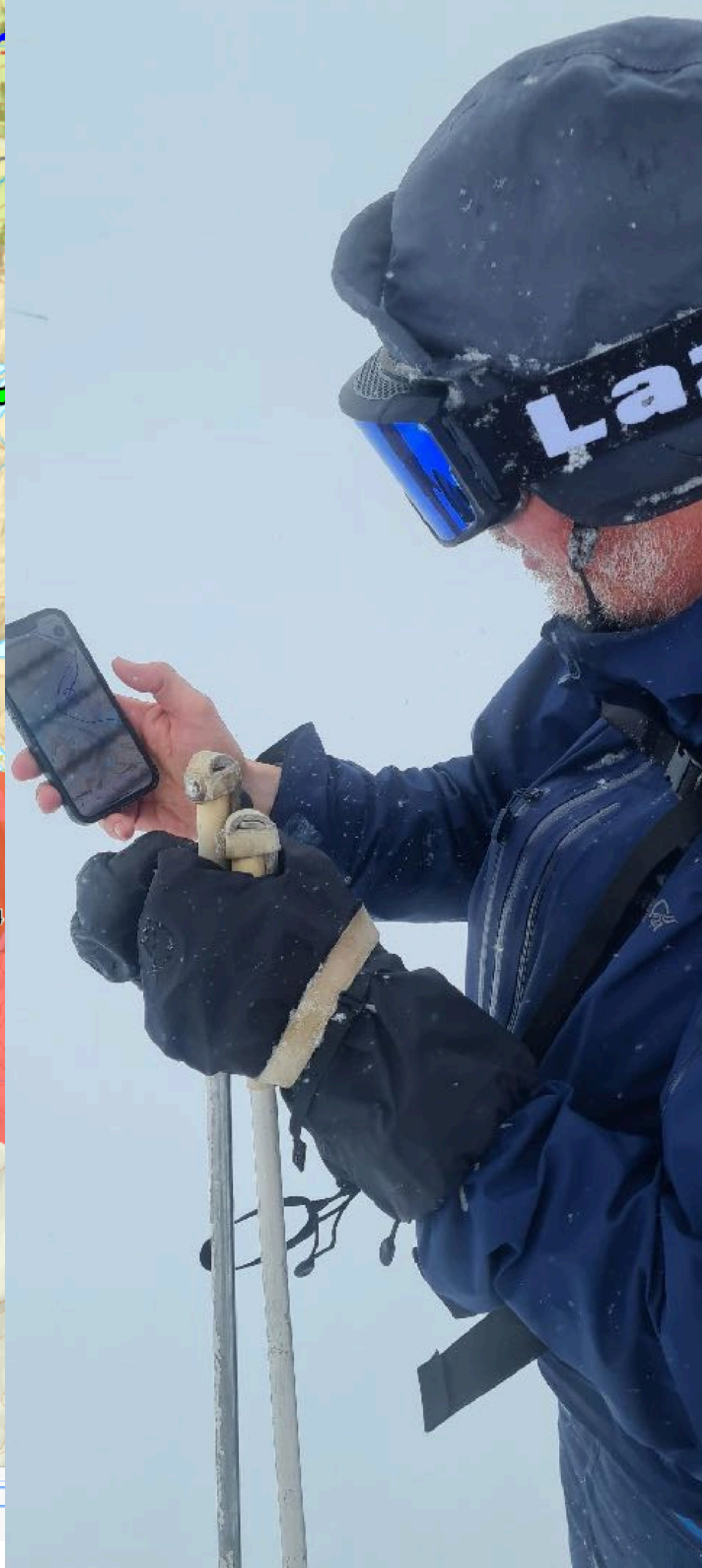
Ditt kart i din app!

MapLibre, PostGIS, raster, vector, tiles

Tore Halset, Leder teknologi, Electronic Chart Centre AS, 2024-10-17.




Rutepunkt
N5902.50 Ø00634.93
Fjerne rutepunkt
Rasmusskar
3144 ft
heia
3111 ft
Auklend
Berge-
2717 ft
Hardhausen
heia
2733 ft
Daladalen
Dalaåna
Songesand-
stølen
1970 ft
1320 ft
1650 ft
Kåsen
Håhelle
660 ft
Kjerag
3586 ft
3744 ft

BARENTS OCEAN
Ålesund
Oc 6s
HAVOERN
SKANSEN
ERKNA
Storhaugen
Aspøya
Ålesund kirke
Kirkegata
Brunholmgata
Ålesund museum
Rådstugata
Brosundet
Keiser Wilhelms gate
Ålesundsvegen
Parkgata
Byparken
Skansen
Tollbugata
Korsen
Løvenvoldgata
Storgata
Apotekergata
Brøggerplana
Prestebrygga
KEISER WILHELM
NOERVOEY
BOLETTE
AIDAPRIMA
FlW 5s 1M
Nedre Strandgate
Øvre Strandgate
Kartverket
80 m
0.06 NM

1948 (489) ft
1850 (489) ft
1951 (489) ft
1817 (489) ft
1562 ft
1365 ft
1352 ft
1948 (489) ft
1804 (489) ft
1497 ft
1915 (489) ft
1840 (489) ft
1751 (489) ft
1856 (489) ft
1761 (489) ft
1359 ft
1191 ft
1086 ft


-Å, Scheisse.

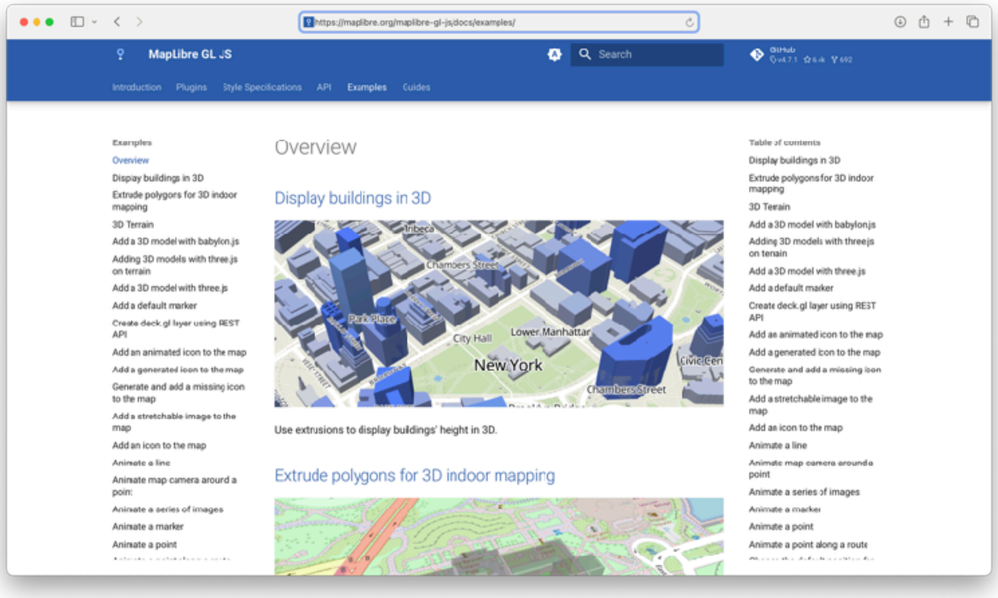
-LA Tromsø, 53 kaller. Over.

Agenda

- Spre open source kartglede
- MapLibre GL JS. Open Source map library for web.
- MapLibre Native. Tilsvarende, men for iOS og Android.
- PostGIS utvidelse til PostgreSQL for lagring, spørring og indeksering av sted.
- Noen utfordringer.
- https://github.com/halset/hellostavanger2024

MapLibre

- Fork av Mapbox sine(e) siste commit før de gav opp åpen kildekode.
- MapLibre GL JS for web.
- MapLibre Native for iOS, Android og andre platformer.
- Sponset av AWS, Meta, Microsoft med flere.
- Raster / vector, interaktivitet, raskt.
- Gode eksempler og dokumentasjon.



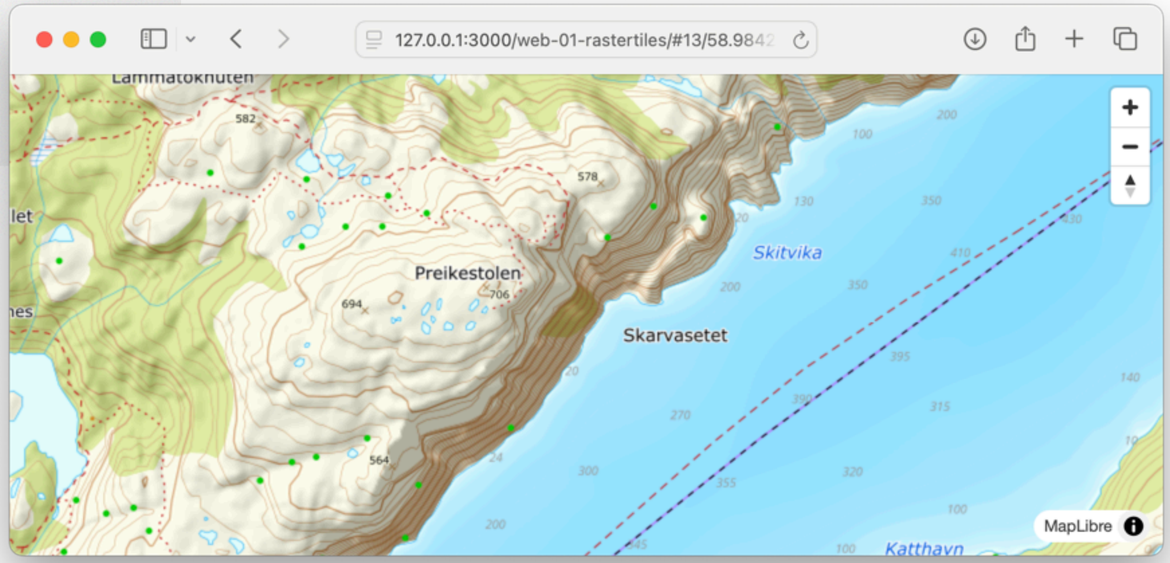
MapLibre GL JS - raster tiles

```
<body>
<div id="map"></div>

<script>
    const map = new maplibregl.Map({
        container: 'map', // container id
        style: 'style.json', //stylesheet location - or it can be inline json object here
        center: [6.1905, 58.98424], // starting position
        zoom: 13, // starting zoom
        hash: true // bookmarkable map position
    });

    map.addControl(new maplibregl.NavigationControl());
</script>
</body>
```

```
{
    "version": 8,
    "sources": {
        "topo": {
            "type": "raster",
            "tiles": [
                "https://cache.kartverket.no/topo/v1/wmts/1.0.0/default/googlemaps/{z}/{y}/{x}.png"
            ],
            "tileSize": 256
        }
    },
    "layers": [
        {
            "id": "topo",
            "type": "raster",
            "source": "topo",
            "paint": {
            }
        }
    ]
}
```



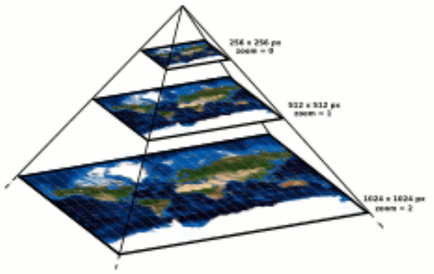
CONVERSION OF COORDINATES USED IN GDAL2TILES FOR GOOGLE MAPS COMPATIBLE TILE GENERATION:

GEODETIC COORDINATES
LATITUDE LONGITUDE
WGS 84 (EPSG:4326)

Coordinates used in KML files and also in consumer GPS devices for locating position on Earth by latitude and longitude using WGS84 Geodetic Datum.

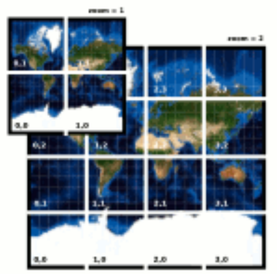
SPHERICAL MERCATOR
METERS
EPSG:3785 / EPSG:900913

Projected coordinates from global Spherical Mercator are measured in meters. They are useful for raster tile generation and also for WMS service.



PYRAMID COORDINATES
XYZ PIXELS / ZOOM
WEB VIEWERS

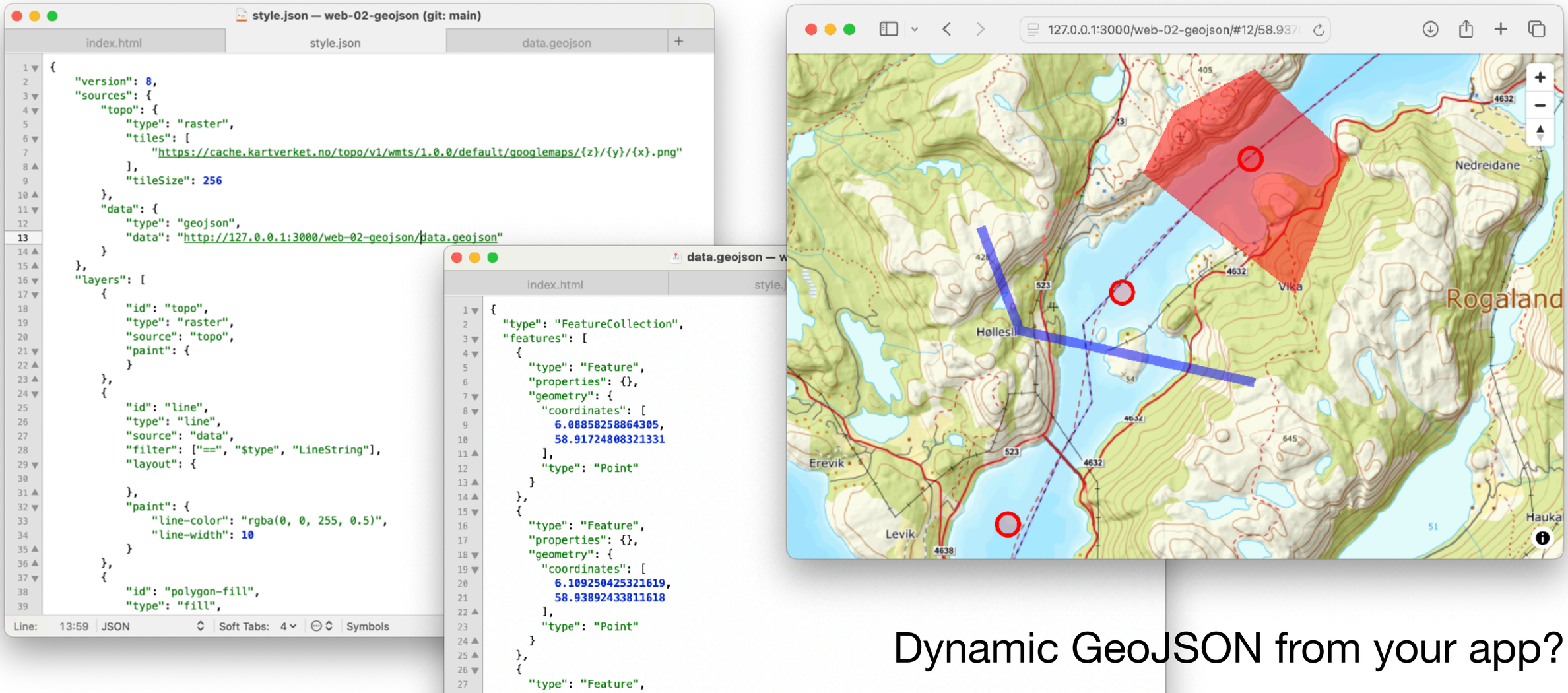
Pixel coordinates for each level of pyramid. Top level (zoom=0) has 256x256 pixels, next level 512x512 pixels, then the side is always doubled.



TILE INDEX
XYZ TILE / ZOOM
TILE MAP SERVICE

Coordinates of a tile in pyramid. There is one tile on the top of pyramid, then 4 tiles, 16 tiles, etc. All tiles have the same size, usually 256x256 pixels.

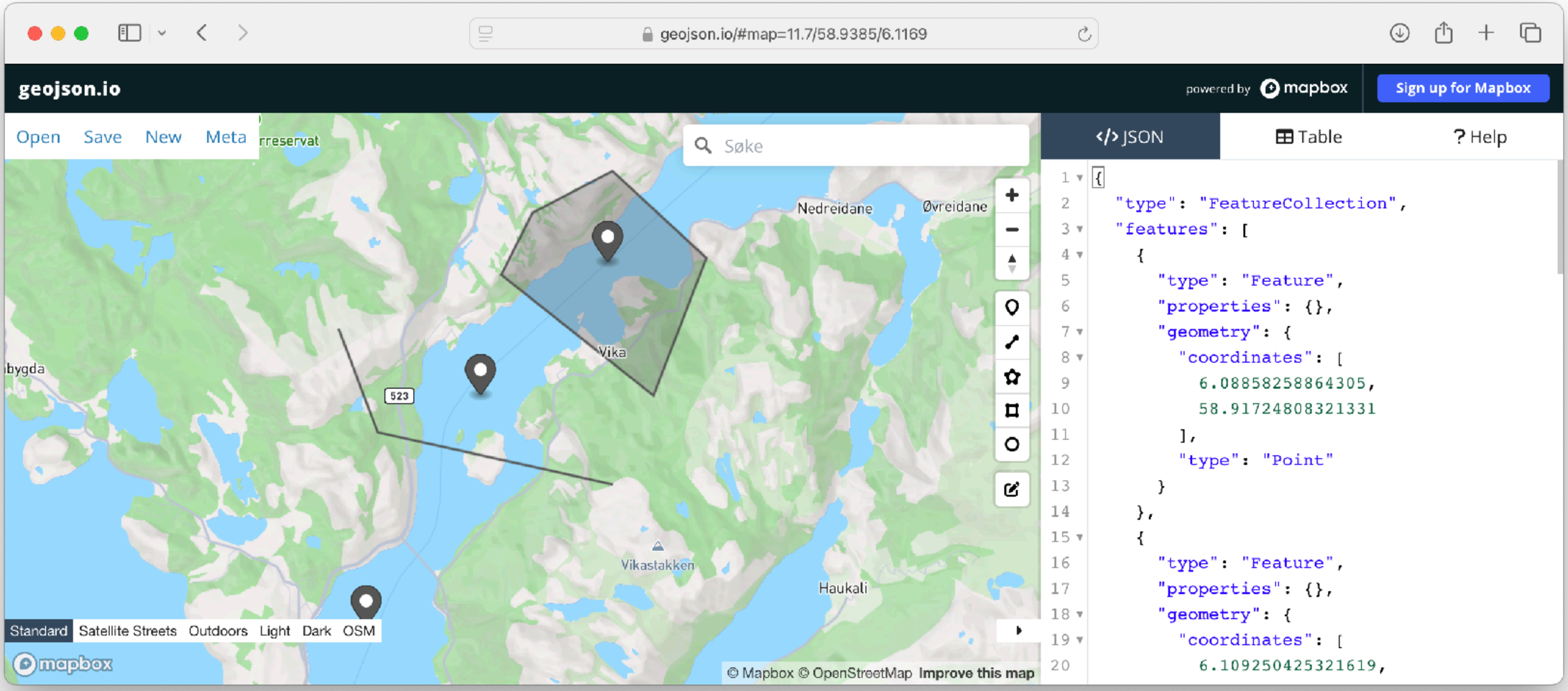
MapLibre GL JS - GeoJSON



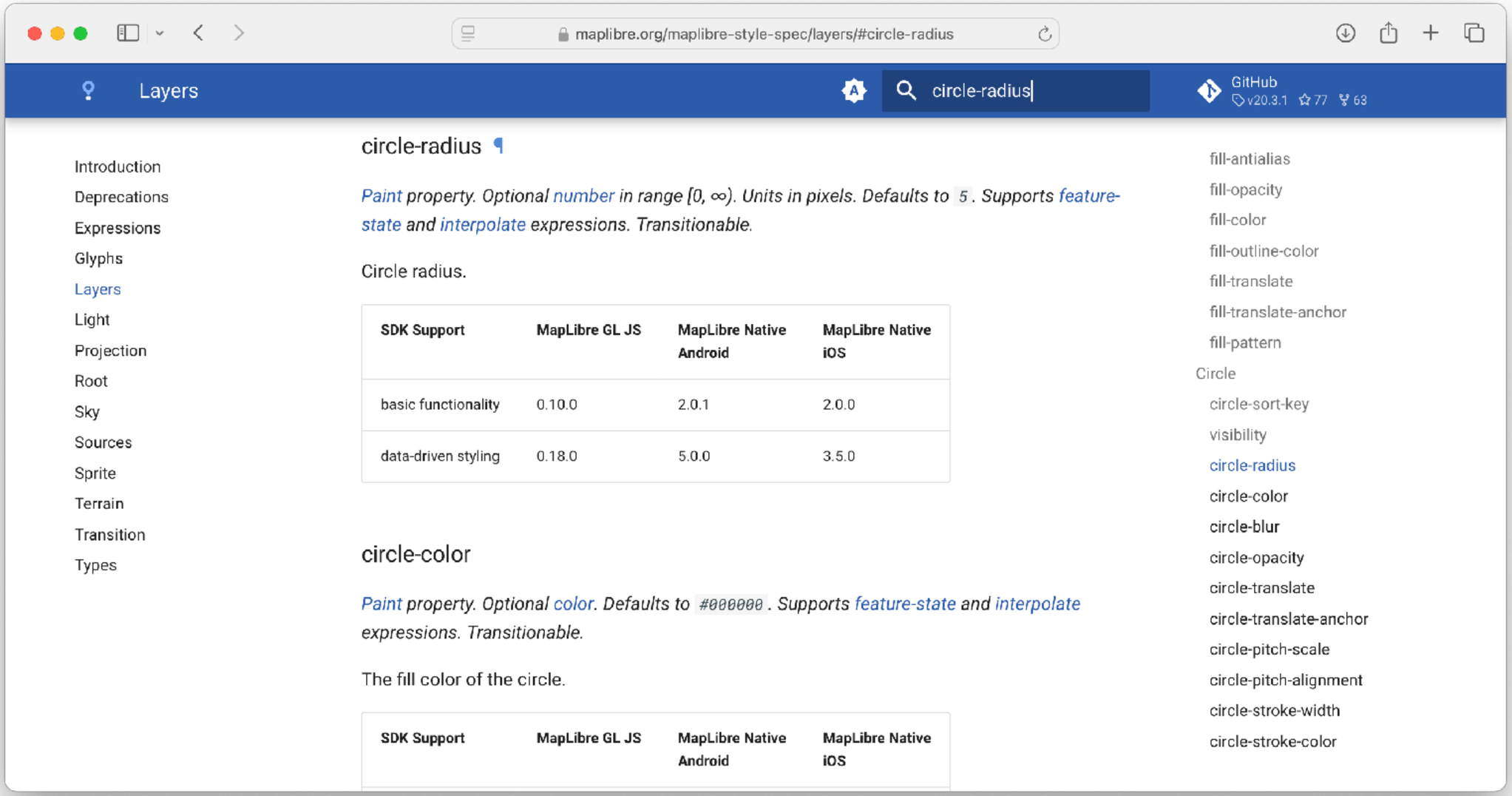
Dynamic GeoJSON from your app?

geojson.io

Nyttig for GeoJSON debugging++



MapLibre Style Spec



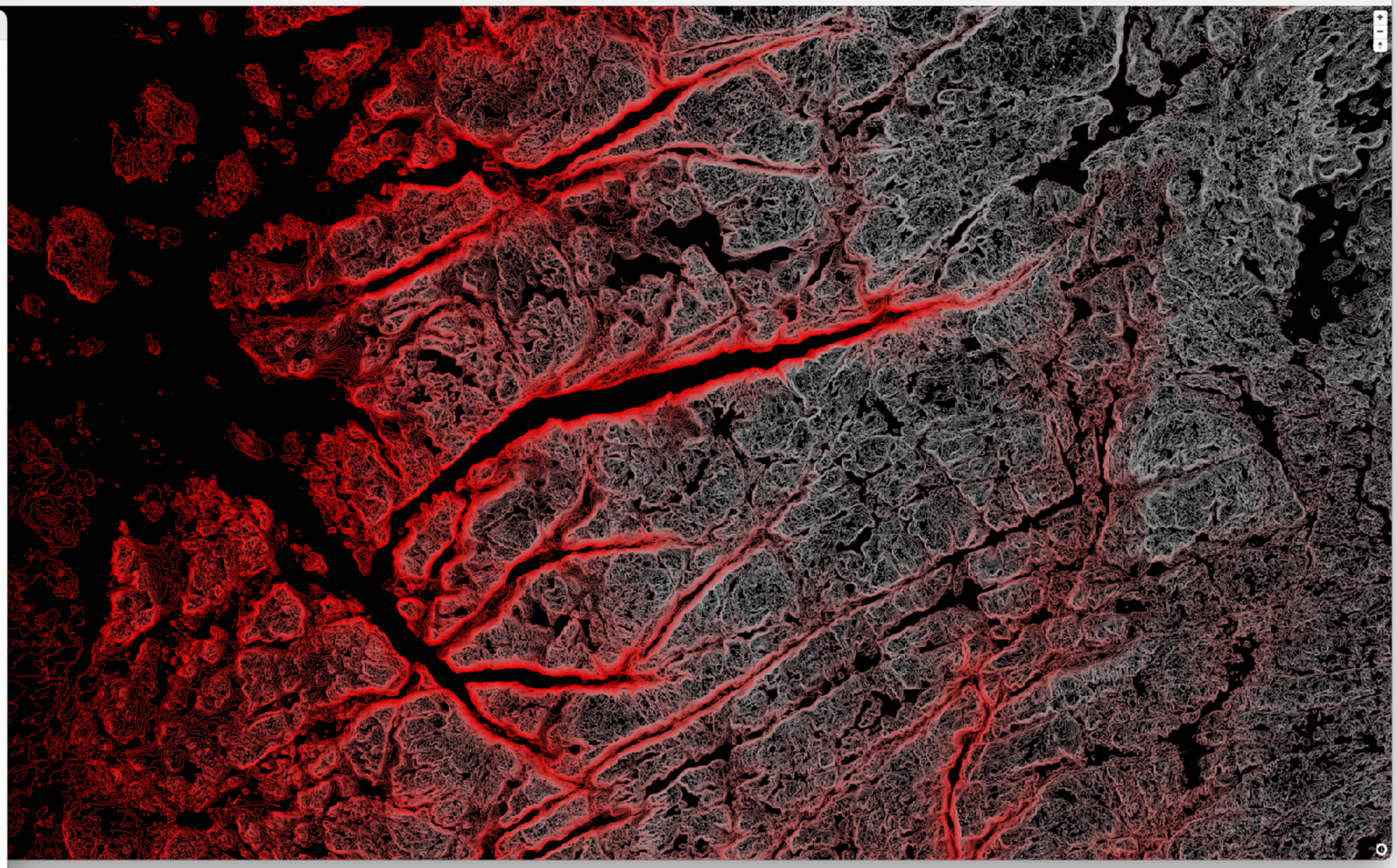
MapLibre - vector tiles fra disk

style.json — web-03-vector-tiles (git: main)

```
{
    "version": 8,
    "sources": {
        "hoyde": {
            "type": "vector",
            "tiles": [
                "http://127.0.0.1:3000/web-03-vector-tiles/tiles/{z}/{x}/{y}.pbf"
            ],
            "minzoom": 5,
            "maxzoom": 10
        }
    },
    "layers": [
        {
            "id": "background",
            "type": "background",
            "paint": {
                "background-color": "black"
            }
        },
        {
            "id": "line",
            "type": "line",
            "source": "hoyde",
            "source-layer": "N50_Høyde_senterlinje",
            "filter": [
                "==",
                "$type",
                "LineString"
            ],
            "paint": {
                "line-color": [
                    "interpolate",
                    [
                        "linear"
                    ],
                    [
                        "get",
                        "hoyde"
                    ],
                    0,
                    "#f00",
                    1000,
                    "#aaa"
                ],
                "line-width": 1
            }
        }
    ]
}
```

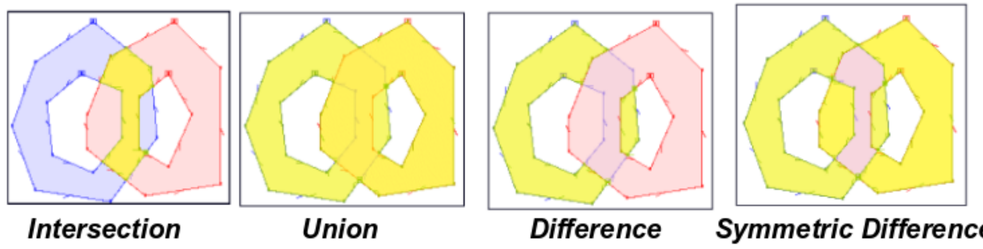
Line: 8:15 JSON Soft Tabs: 4

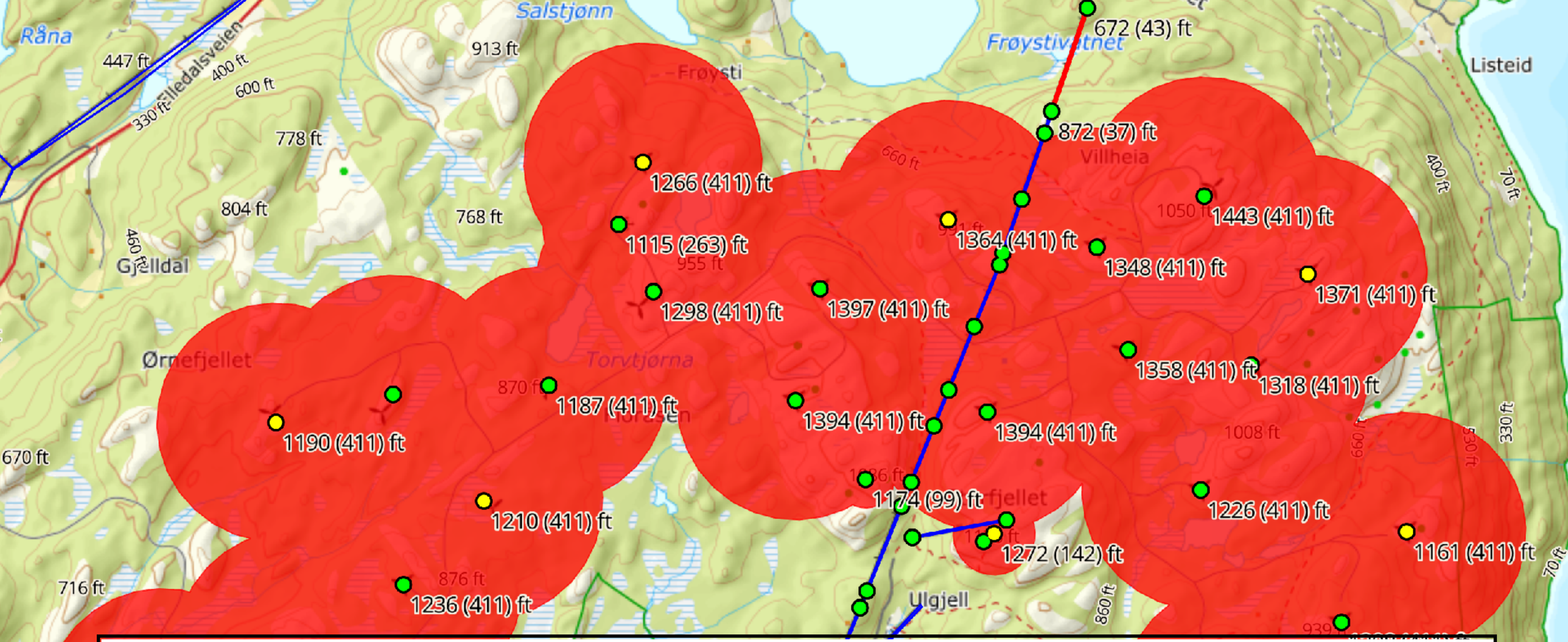
127.0.0.1:3000/web-03-vector-tiles/#10.32/58.9914/6.4191



PostGIS

- Tillegg til PostgreSQL database.
- For lagring, spørring og indeksering av geometri og sted.
- SQL-funksjoner for å lese inn, transformere eksportere data og gjøre analyse.
- Import: ST_GeomFromGeoJSON osv.
- Eksport: ST_AsGeoJSON, ST_AsMVT osv.
- Analyse: ST_Intersects, ST_Intersection, ST_Buffer osv.






```
select

    ST_UnaryUnion(ST_Buffer(geom::geography, "høyde"::float
* 3.0)::geometry)

from table;
```

API-tilgang til PostGIS?

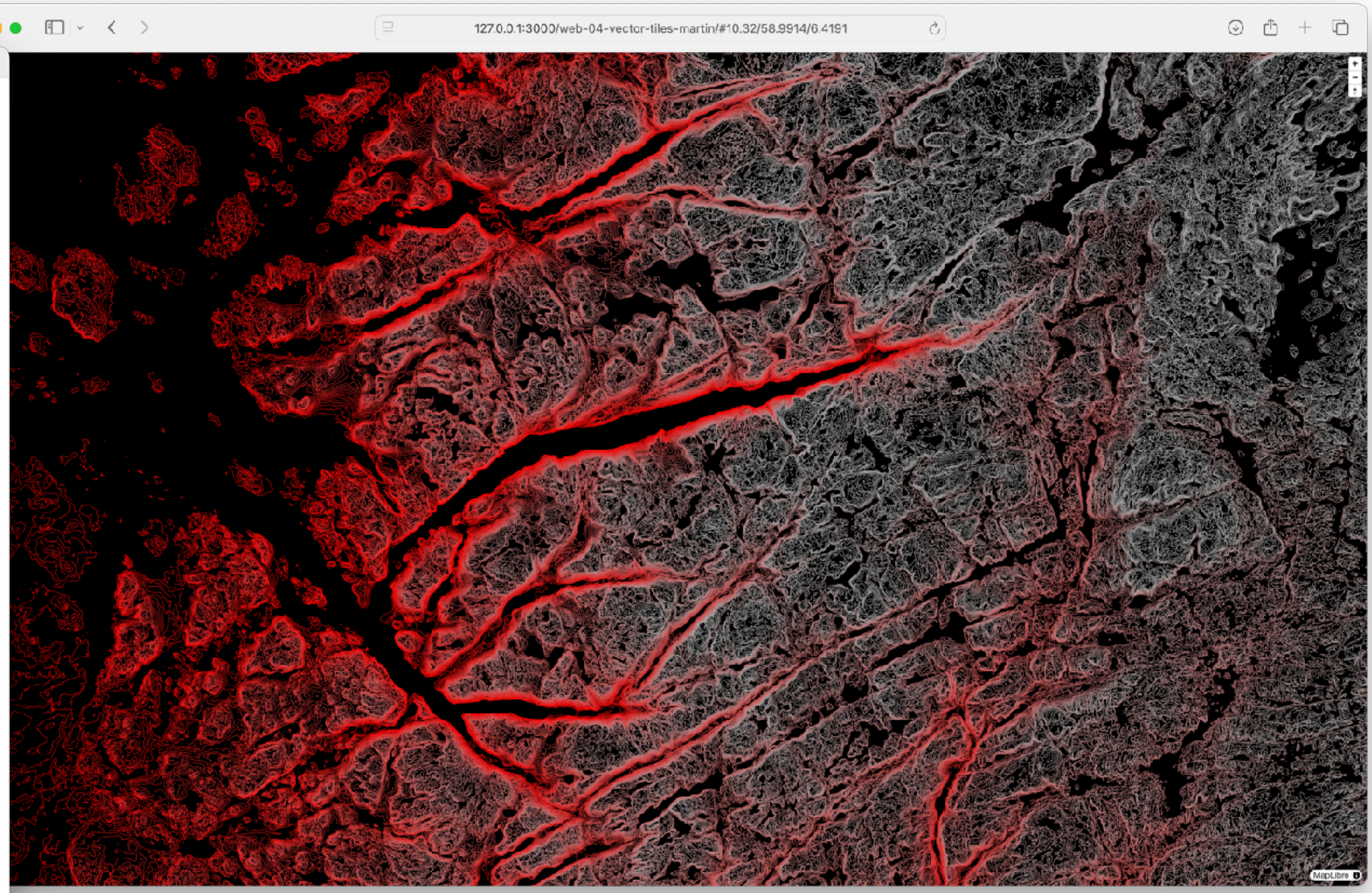
- PostGIS brukes med SQL, så kan bygges inn i alle språk som støtter SQL.
- F.eks. Java med JDBC. Og så ST_AsMVT for å lage vector tiles fra PostGIS. Eller java-vector-tile om ST_AsMVT ikke strekker til.
- Eller en ferdig tile-server som f.eks. MapLibre Martin som kan dynamisk dele ut PostGIS-tabeller som vector tiles.

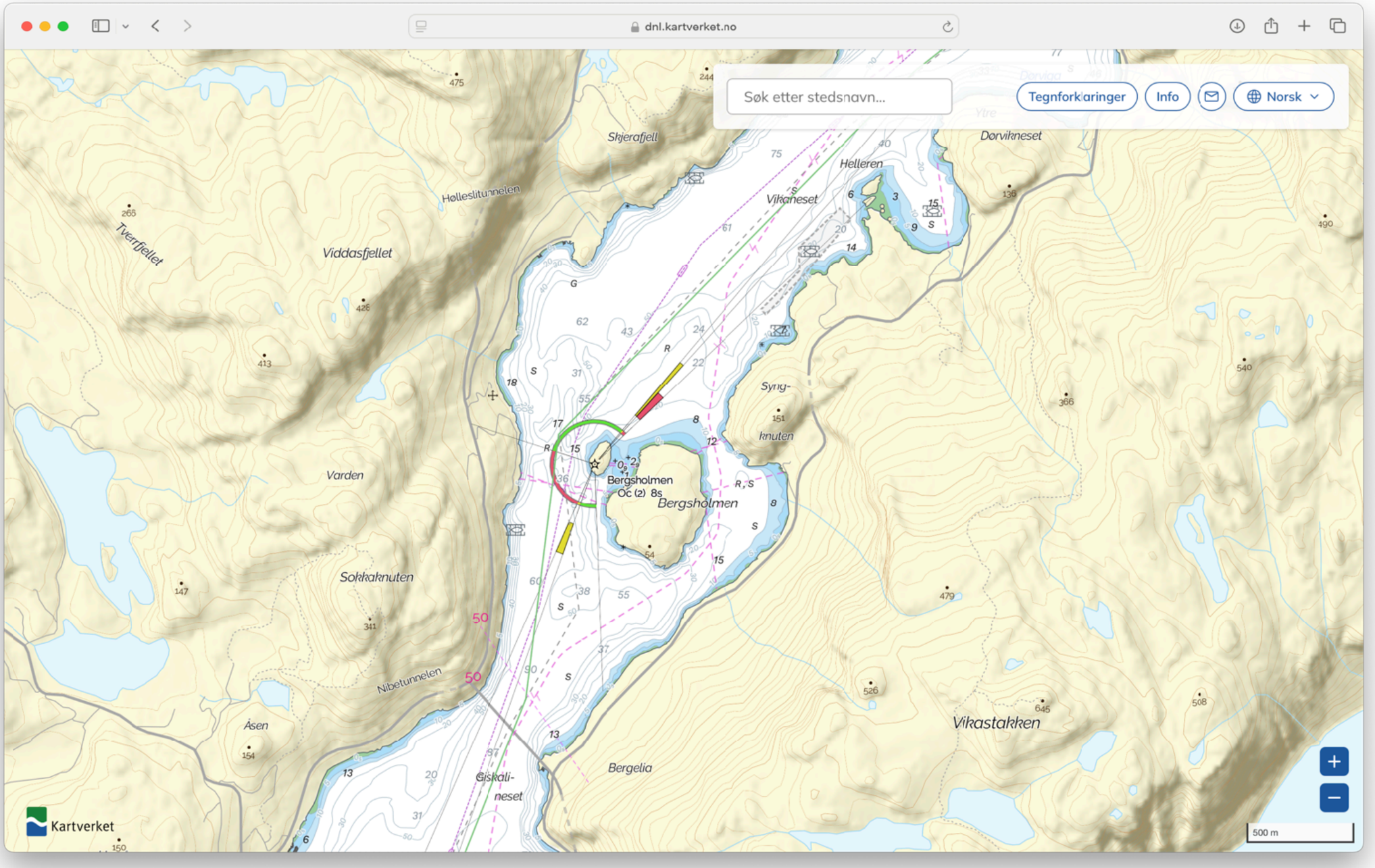
MapLibre - vector tiles fra Martin

style.json — web-04-vector-tiles-martin (git: main)

```
{
    "version": 8,
    "sources": {
        "hoyde": {
            "type": "vector",
            "tiles": [
                "http://127.0.0.1:3001/table.public.hoyde.shape/{z}/{x}/{y}"
            ]
        }
    },
    "layers": [
        {
            "id": "background",
            "type": "background",
            "paint": {
                "background-color": "black"
            }
        },
        {
            "id": "line",
            "type": "line",
            "source": "hoyde",
            "source-layer": "table.public.hoyde.shape",
            "filter": [
                "==",
                "$type",
                "LineString"
            ],
            "paint": {
                "line-color": [
                    "interpolate",
                    [
                        "linear"
                    ],
                    [
                        "get",
                        "hoyde"
                    ],
                    0,
                    "#f00",
                    1000,
                    "#aaa"
                ],
                "line-width": 1
            }
        }
    ]
}
```

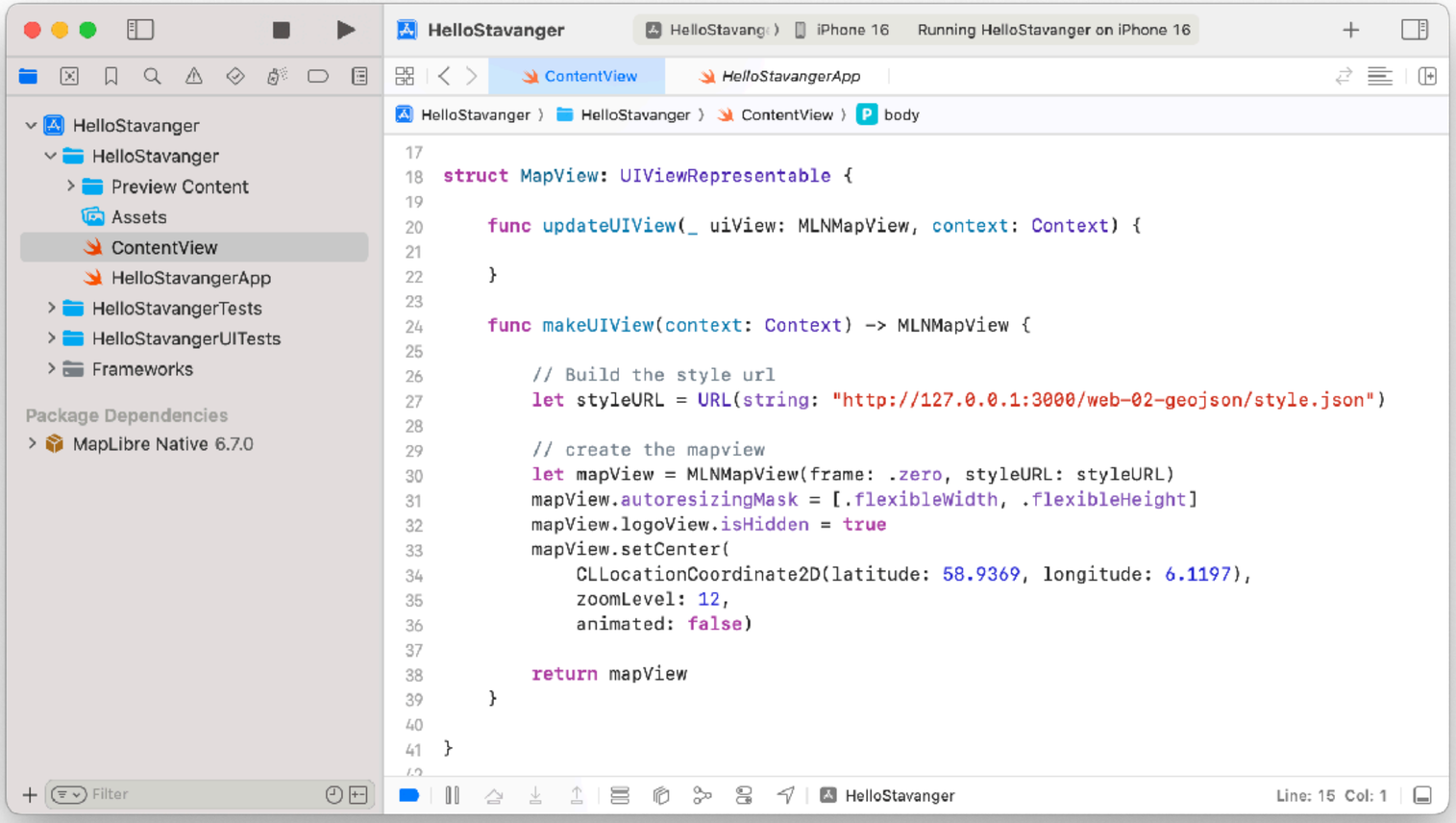
Line: 44 JSON Soft Tabs: 4





Eksempel på kart med MapLibre / Mapbox: https://dnl.kartverket.no/

MapLibre Native for iOS




```swift
struct MapView: UIViewRepresentable {

    func updateUIView(_ uiView: MLNMapView, context: Context) {

    }

    func makeUIView(context: Context) -> MLNMapView {

        // Build the style url
        let styleURL = URL(string: "http://127.0.0.1:3000/web-02-geojson/style.json")

        // create the mapview
        let mapView = MLNMapView(frame: .zero, styleURL: styleURL)
        mapView.autoresizingMask = [.flexibleWidth, .flexibleHeight]
        mapView.logoView.isHidden = true
        mapView.setCenter(
            CLLocationCoordinate2D(latitude: 58.9369, longitude: 6.1197),
            zoomLevel: 12,
            animated: false)

        return mapView
    }

}
```

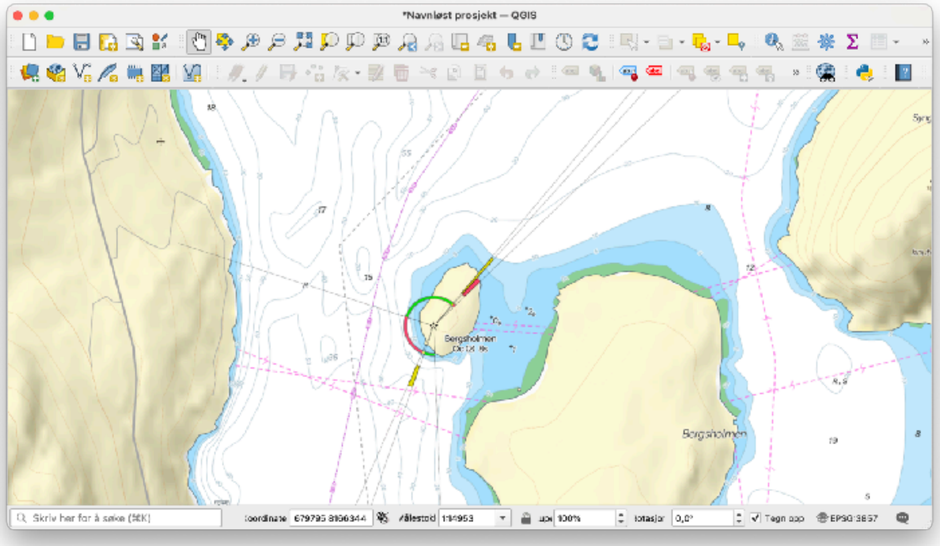
Tiles & data - så mange varianter

Format	Bra til	Programvare	Pass på!
Raster tiles	Bilder. Ferdig-tegnet vektordata.	Støttet av «alle»	Tekst roterer. Ikke dynamisk endring av tegneregler. Vanskelig interaktivitet.
GeoJSON	< ~20MB? vektor data. Interaktivitet. Tegneregler uavhengig av data. Enkelt.	Støttet av «alle»	Best for små datamengder. Kun en feature type pr fil.
Vector tiles	For mer vektor data. Interaktivitet. Tegneregler uavhengig av data.	Best i MapLibre og Mapbox	Complicated drawing rules? Synthetic features?
3D Tiles	3D terreng og objekter	Fungerer best med CesiumJS, men flere på vei.	

Så mange tiles! Hvordan kan de pakkes?

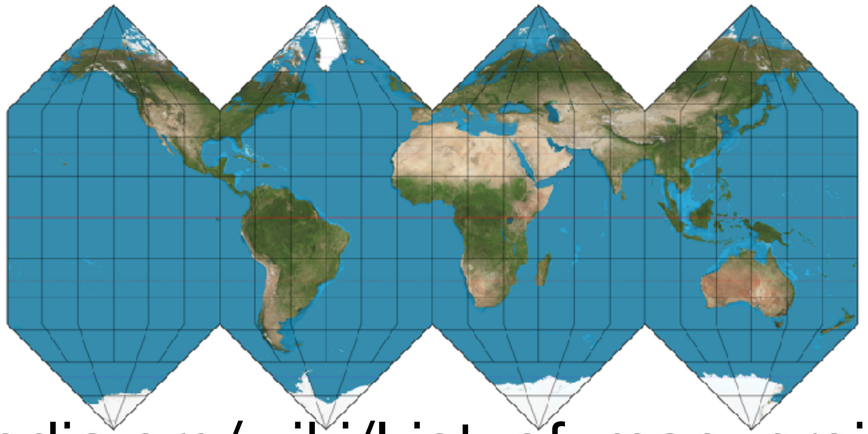
- Millioner av tiles (raster/vektor) kan være tungt å lage og dele.
- PMTiles organiserer tiles smart i en fil slik at det fungerer med HTTP byte range requester.
- SQLite varianter: MBTiles, GeoPackage.

```
Nedlastinger — sqlite3 Rogaland_EPSG_3857_12.5K_Standard.gpkg — 88×17
halset@void-mbp Downloads % sqlite3 Rogaland_EPSG_3857_12.5K_Standard.gpkg
SQLite version 3.37.0 2021-11-27 14:13:22
Enter ".help" for usage hints.
sqlite> select zoom_level, count(*) from tile0 group by zoom_level order by zoom_level;
0|1
1|2
2|6
3|20
4|61
5|205
6|737
7|2778
8|10772
9|42376
10|168023
11|669186
sqlite>
```



Projeksjoner?

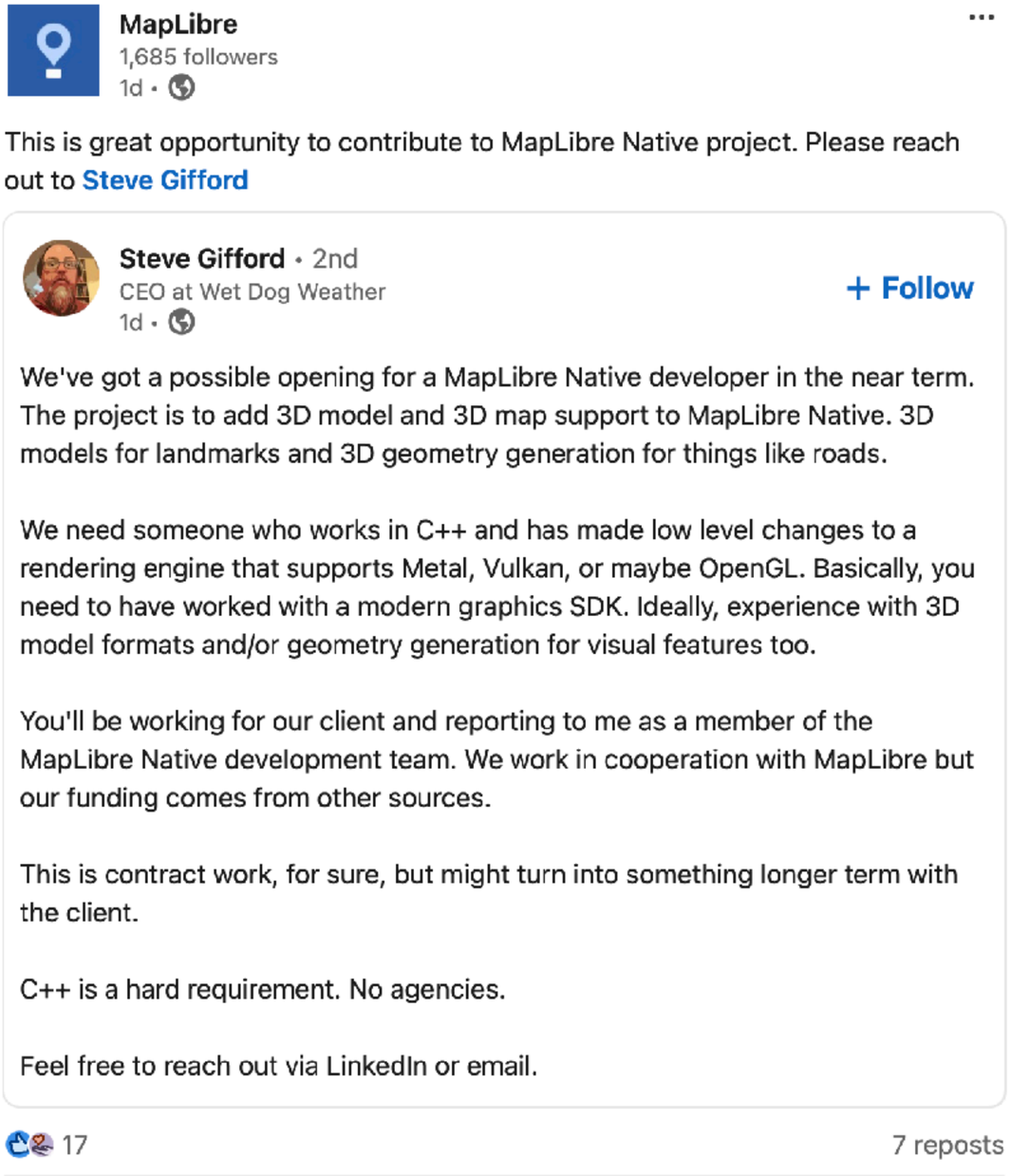
- Altså hvordan den runde(?) jorda kan skvises ut på en flat skjerm.
- MapLibre er dessverre foreløpig best på Google Mercator :/
- Man kan lure systemet ved å transformere serverside, men ikke helt rett fram.
- Sjekk ut LeafletJS eller OpenLayers, men de er ikke like gode på vector tiles.



Fra https://en.wikipedia.org/wiki/List_of_map_projections

3D?

- MapLibre-GL-JS har støtte for terreng / elevasjon.
- MapLibre Native har ikke støtte for 3D, men flere jobber for å få det til.
- Sjekk ut Mapbox, deck.gl, CesiumJS



MapLibre
1,685 followers
1d •

This is great opportunity to contribute to MapLibre Native project. Please reach out to **Steve Gifford**

Steve Gifford • 2nd
CEO at Wet Dog Weather
1d •
+ Follow

We've got a possible opening for a MapLibre Native developer in the near term. The project is to add 3D model and 3D map support to MapLibre Native. 3D models for landmarks and 3D geometry generation for things like roads.

We need someone who works in C++ and has made low level changes to a rendering engine that supports Metal, Vulkan, or maybe OpenGL. Basically, you need to have worked with a modern graphics SDK. Ideally, experience with 3D model formats and/or geometry generation for visual features too.

You'll be working for our client and reporting to me as a member of the MapLibre Native development team. We work in cooperation with MapLibre but our funding comes from other sources.

This is contract work, for sure, but might turn into something longer term with the client.

C++ is a hard requirement. No agencies.

Feel free to reach out via LinkedIn or email.

17 7 reposts

Noen som vil lage kart?

#30DayMapChallenge 2024

Official categories for November 2024

1. Points
2. Lines
3. Polygons
4. Hexagons
5. A journey
6. Raster
7. Vintage style
8. Data: HDX
9. AI only
10. Pen & paper
11. Arctic
12. Time and space
13. A new tool
14. A world map
15. Data: My data
16. Choropleth
17. Collaborative map
18. 3D
19. Typography
20. Data: OpenStreetMap
21. Conflict
22. 2 colours
23. Memory
24. Only circular shapes
25. Heat
26. Map projections
27. Micromapping
28. The blue planet
29. Data: Overture
30. The final map

Create a map that suits the daily themes in November and post your map to social media using hashtag **#30DayMapChallenge**. More information from 30DayMapChallenge.com

https://30daymapchallenge.com/

Spørsmål?

https://github.com/halset/hellostavanger2024

https://apps.apple.com/no/app/navida/id356821974?l=nb

https://www.finn.no/job/fulltime/search.html?orgId=4634415