BSHC18_C5_SE

THE SWEDISH AND FINNISH WORKING GROUP FOR HARMONIZING DEPTH INFORMATION IN NEIGHBORING ENCs

STATUS REPORT

SWEDISH MARITIME ADMINISTRATION

SE-601 78 Norrköping
Tel: +46 771 63 00 00
Fax: +46 11 10 19 49

Background

At the 17th Baltic Sea Hydrographic Commission Conference it was decided that Sweden and Finland were to form a pilot project with the aim of improving the harmonisation of depth information in ENCs and paper charts. The Terms of Reference of the working group is included in Annex A of this report.

Current members of the working group:
Hans Engberg (SE, Chair)
Anita Bodin (SE)
Florence Pendrill (SE)
Anna Löfstrand (SE)
Maarit Mikkelsson (FI)/Outi Eskola (FI)
Mikko Hovi (FI)
Jenni Silvennoinen (FI)

Start-up Meeting

The Start-up Meeting was held at the Swedish Maritime Administration the 7th of February 2013. The main purpose of the meeting was to get a common understanding of the task at hand and to decide on the procedures.

A general approach was suggested:

1. Go through the border area in all scale bands to identify issues
2. Find potential solutions
3. Pick pilot area/s
4. Consider the consequences (e.g. workload, consistency with rest of charts)

At the meeting Finland's and Sweden's existing guidelines relating to depth information were presented and discussed. Similarities, differences, and a number of remaining questions were identified.

Overall consensus was to work through the Action points from the meeting and generally to focus on:

1. The density of soundings
2. The generalization of contours, including the technical side of automatic contouring
3. Along with the general approach of going through the scale bands to identify inconsistencies

International Standards and Guidelines

A number of paragraphs in S-4 relate to depth information and were considered to be of relevance for the work of the group. A compilation of the relevant paragraphs is included in Annex B of this report.

All the paragraphs are well known to the chart production of both offices. The problem being that in many cases they are not detailed enough leaving room to different implementations and consequently to disharmony.

Any new guideline or action proposed by this working group will of course not deviate from the international standard. However, we do not consider proposing an implementation of the standard series of depth contours, i.e. changing the 3 m and 6 m depth contour to 2 m and 5 m.

Analysis of Hydrographic Data Production

Soundings

Sweden and Finland have different approaches for selection of chart soundings from source. Sweden makes automatic selections from grids of varying sizes. Firstly minimum soundings and maximum soundings are selected and secondly general soundings are selected to fill the area with sounding. From this selection of soundings the cartographer then chooses the chart soundings.

In Finland the selected soundings are from a 30 m grid. The sounding density is decided by a radius depending on chart scale. The cartographer chooses the chart soundings from the selected soundings.

As an aid the following radiuses are used for different scale bands:
Berthing – 50 m or 100 m
Harbour – 200 m or 250 m
Approach – 400 m (in lake area) or 500 m
Coastal – 1 000 m
General – 2 500 m

The guidelines for rounding of soundings are also different between the countries. Sweden follows S-4:B-412, while Finland only shows nearest decimetre down to 20 m in the paper charts. In the Finnish ENCs all soundings are rounded to the nearest decimetre.

Depth contours

Sweden and Finland use different true values for the depth contours. This is of little importance for most areas. The true difference of maximum 1 meter can possibly become an issue in chart scale if the sea bed is very flat.

Depth Contour	Sweden, True value	Finland, True value
3 m	3.00	3.09
6 m	6.00	6.09
10 m	10.00	10.09
15 m	15.00	15.09
20 m	20.00	20.99
30 m	30.00	--
50 m	50.00	50.99
100 m	100.00	100.99
200 m	200.00	200.99
300 m	300.00	300.99

With regard to generalization Finland makes all generalization by hand. However, the depth contours are often less generalized than the Swedish depth contours. Sweden has the help of a generalization application, but generalization by hand is still necessary in almost all cases. For areas where there are new surveys generalization is made to fit with the generalization level of the existing chart.

A comprehensive description on how soundings and depth contours are generated by the Swedish Maritime Administration is included in Annex C of this report.

Inconsistencies between Swedish and Finnish depth information

General

Sweden and Finland have different production tools and production methods. The underlying technology contributes to some inconsistencies. Technical environments not being easily changed, the effects of using different technology must to be managed in the best way possible.

There are also a number of inconsistencies that originates from different traditions and practices. And even thought entire chart portfolios are not updated without a struggle the most problematic areas could be addressed by new guidelines thereby improving the harmonization.

The differences in representation are generally more noticeable in the shallower and congested geographical areas of the Åland Sea, Northern Quark and Torneå.

The following inconsistencies have been indentified:

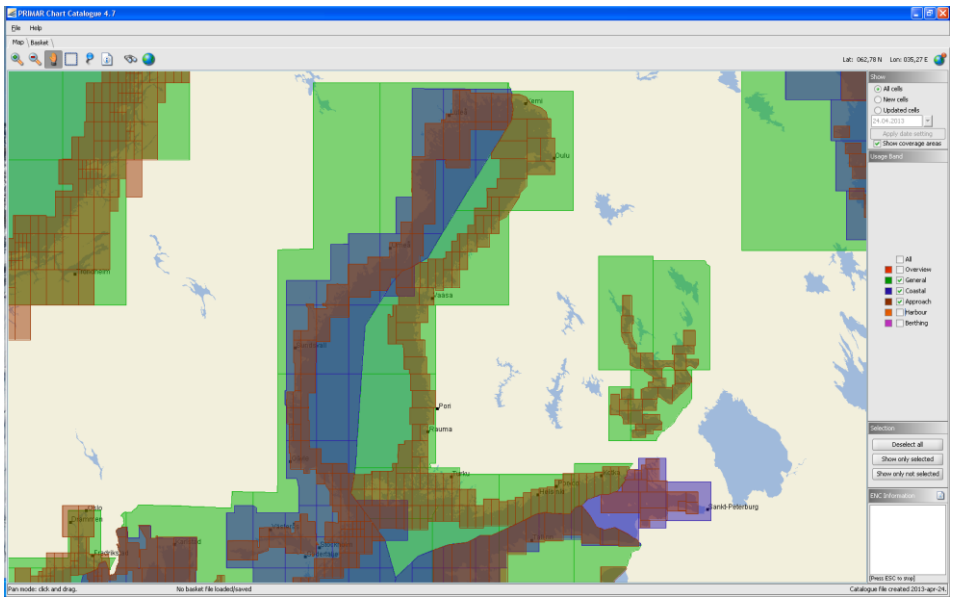
1. Mismatch of Navigational Purposes
2. Sounding density
3. Scamin settings on soundings
4. Scamin settings on depth contours
5. Representation of depressions
6. Mismatch of depth contours
7. Generalization of depth contours
8. Non equivalent depth contours
9. Rounding of soundings

A lot of work has already been done by Finland trying to connect depth contours at the border and creating the internationally promoted 5 meter overlap. It should be recognized that without these efforts the situation would be much worse than it currently is. However, there are still a number of issues that should be addressed to improve the depiction of depth information in ENCs and paper charts.

Types of inconsistencies

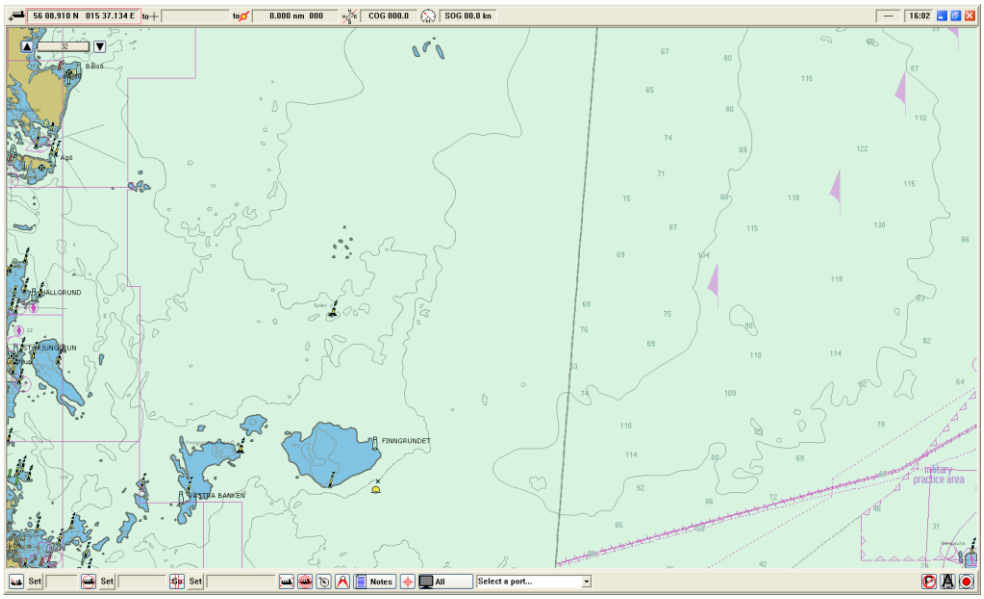
Mismatch of Navigational Purposes

Sweden has Coastal ENCs. Finland does not have Coastal ENCs apart from the Åland Sea and the Northern Quark. This situation basically means that the generalization level of the Finnish General ENCs have to match the generalization levels of both the Swedish Coastal and General ENCs. Finland has started to investigate how General ENCs could be produced.



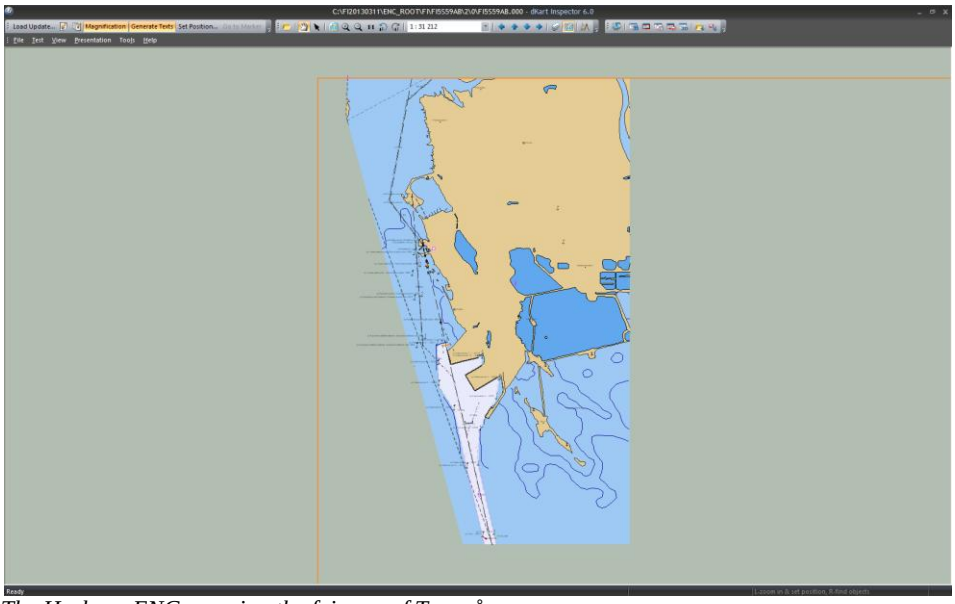
There are no Finnish ENCs in Navigational Purpose Coastal

The compilation scales of the Swedish and Finnish ENCs are the same. In the areas where there are no Finnish Approach ENCs the Finnish General ENCs will be displayed together with Swedish Coastal ENCs. Between the scales 1:90 000 and 1:180 000 the Finnish General ENCs are viewed in overscale.



No Swedish soundings shown beyond 1:349999 Selected Finnish sounding shown to 1:699999 SE/Costal - FI/General

In Torneå Finland has a Harbour ENC but Sweden has not. Through an earlier agreement Finland covers the fairway of Torneå. The situation is therefore not alarming.

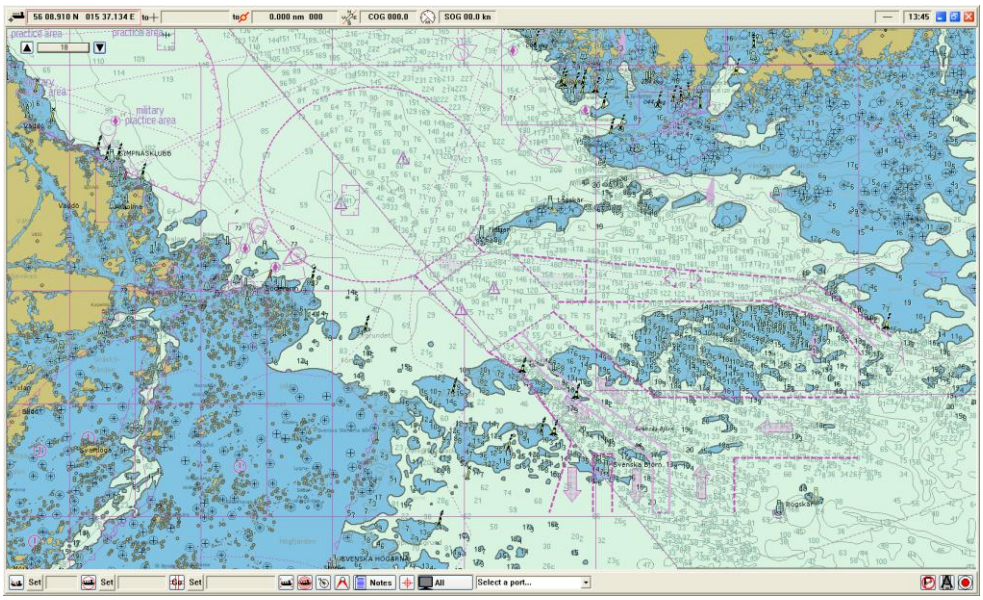


The Harbour ENC covering the fairway of Torneå

Sounding density

The differences in sounding density are most striking. Soundings being less dense on the Swedish side of the border. Finland has guidelines regarding standard sounding distances for the selection of soundings from which the cartographer chooses the chart soundings.

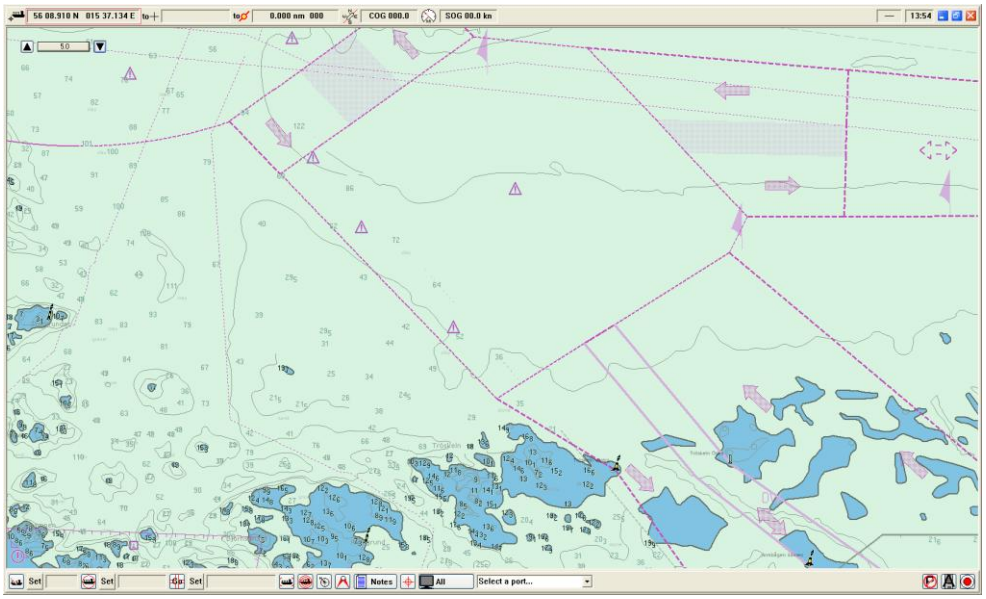
The sounding density in Swedish charts is a result of the cartographer's choice when producing every specific chart. The sounding density can also be quite differentiated inside a Swedish chart depending on when an area has been surveyed. The reason mainly being that now days the hydrographic production tools first choose minimum and maximum soundings and secondly general soundings. The density of the general soundings is finally matched by a cartographer to the density of the existing chart.



More dense soundings on Finnish side of the border *Coastal*

Scamin settings on soundings

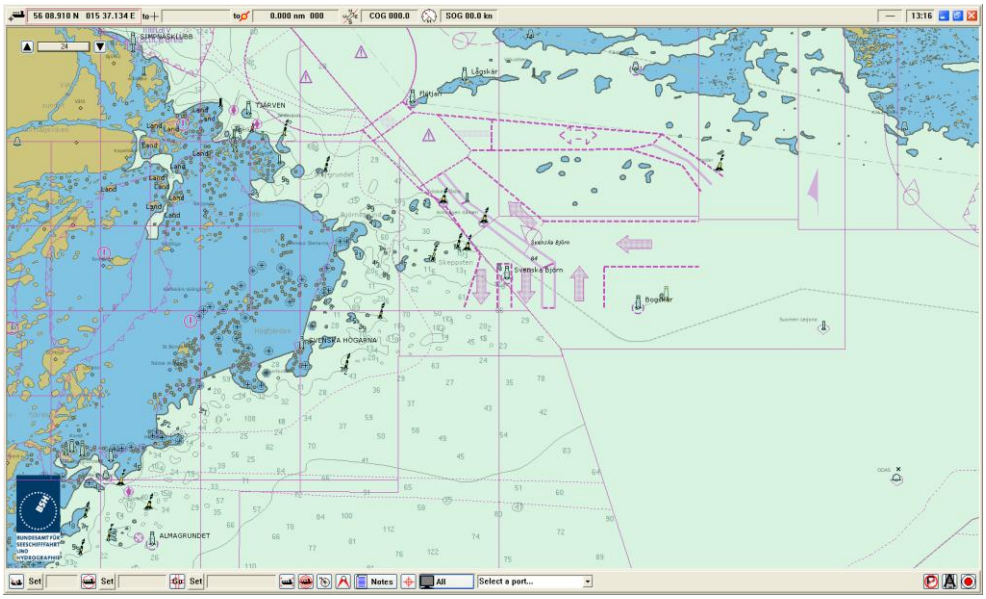
The Baltic Sea ENC Harmonization Working Group decided on Scamin values for soundings. Sweden follows these guidelines. Finland does not follow them in all areas yet, but will do so in 2014.



Scamin on Soundings 51000/FI and 89999/SE *Approach*

Scamin settings on depth contours

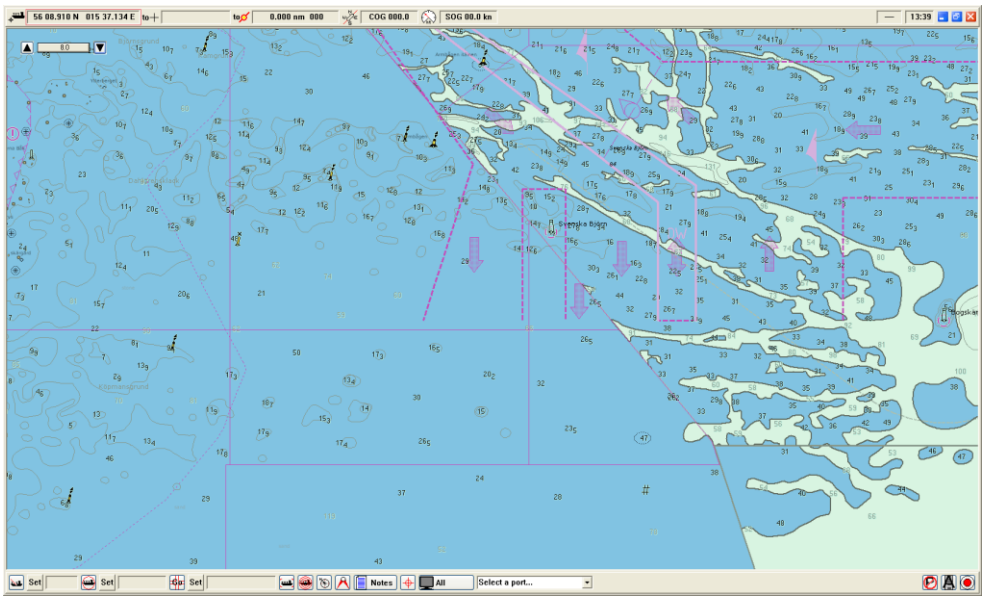
The Baltic Sea ENC Harmonization Working Group decided that there should not be Scamin values set for depth contours. Sweden follows these guidelines. Finland has Scamin set for depth contours in General ENCs.



Scamin set on Finnish depth contours (349999) *General*

Representation of depressions

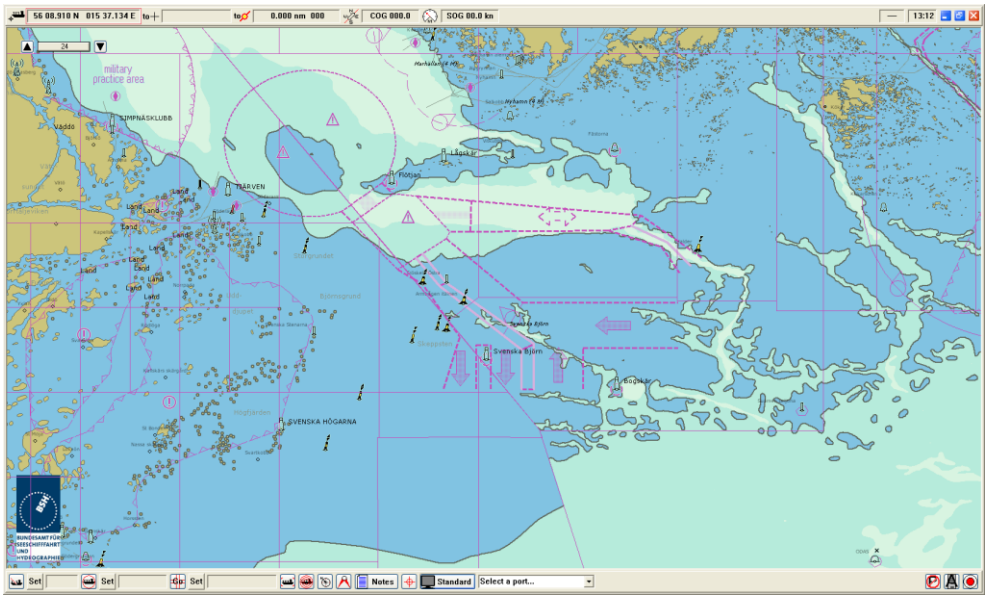
Sometimes Sweden has chosen to not depict depressions with depth contours, only with soundings. In Finnish charts every sounding is placed in a depth area with the relevant depth range.



No Swedish 50 m depth contour in area south of TSS *Coastal*

Mismatch of depth contours

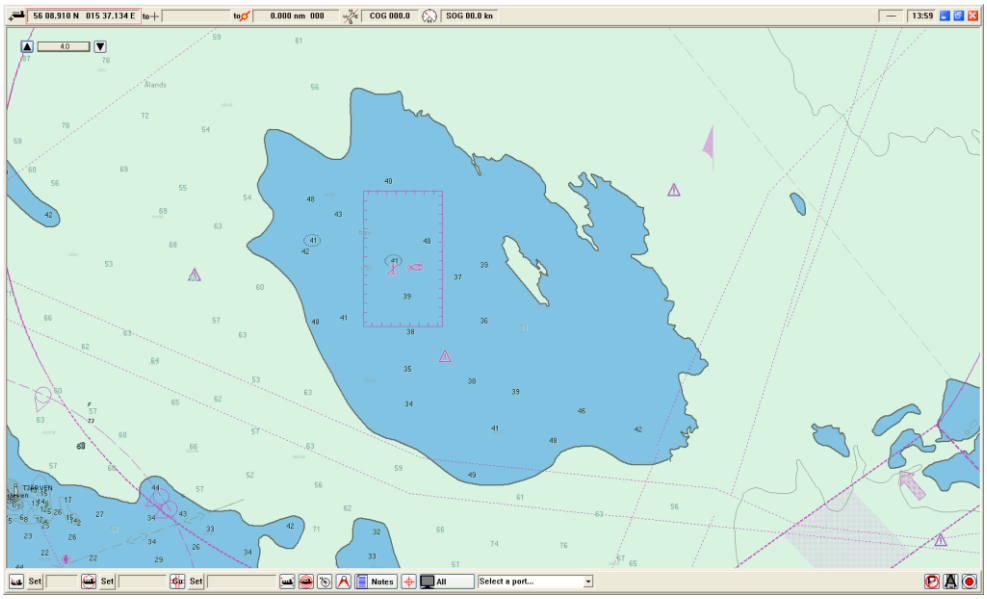
In many places the depth contours simply do not match. Since the information originates from different source data this is what could be expected. It has earlier been stated that work has been done to help the situation, but there are many places that should be revisited.



Mismatch of 50 m depth contour *General*

Generalization of depth contours

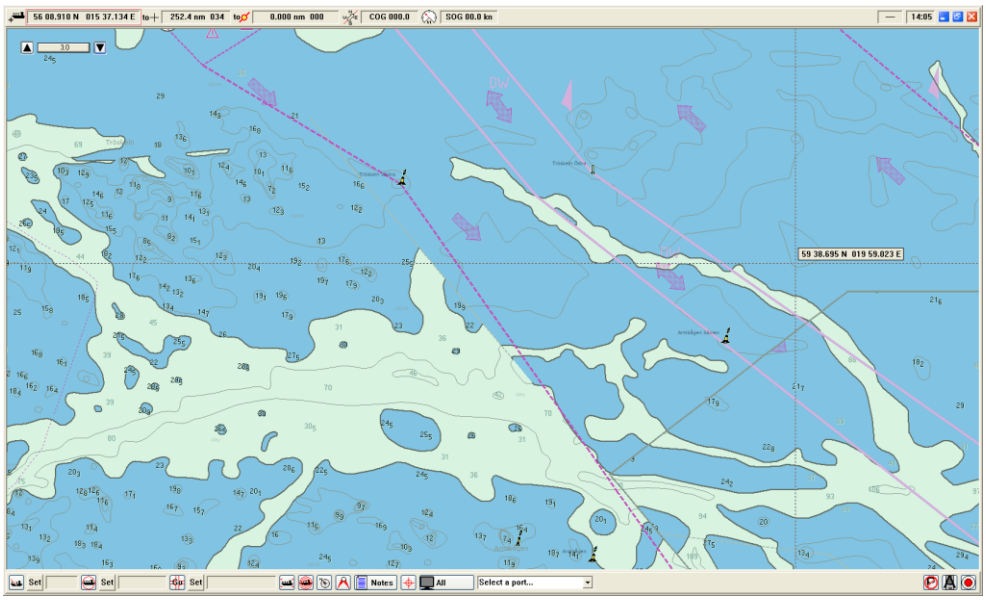
The differences in the generalization of depth contours are almost as striking as the differences in sounding density, Finland basically showing a lot more detail of the contours.



More detailed depth contours on the Finnish side of the border *Approach*

Non equivalent depth contours

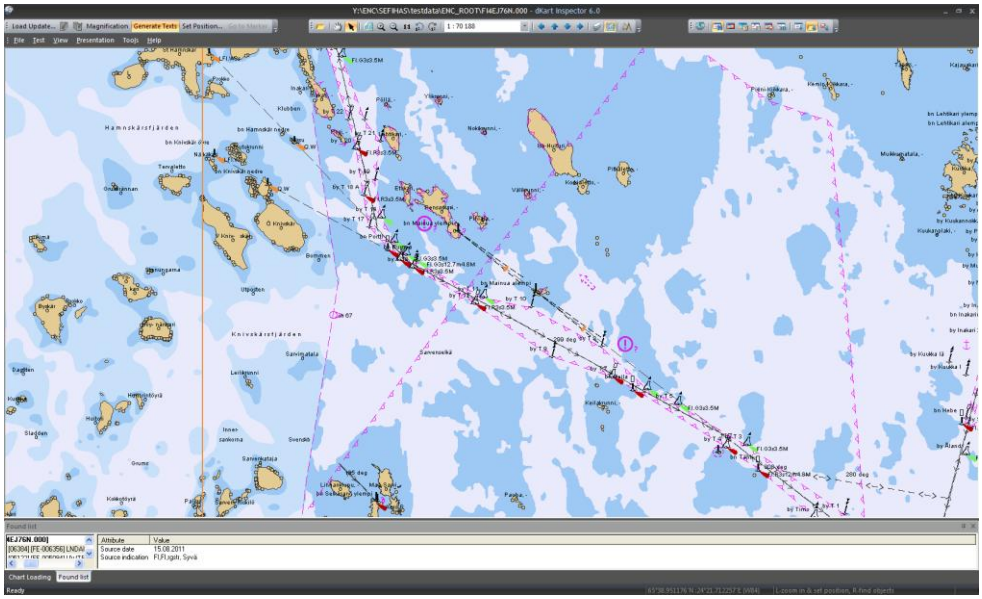
Sweden has a 30 m depth contour in some areas and has a plan to introduce a 30 m depth contour all along the coast. Finland has not any 30 m depth contours.



No Finnish 30 m depth contour *Approach*

Sweden has generally a 15 m depth contour in Approach and in Åland Sea and Northern Quark in Coastal. Finland has only sparsely encoded a 15 m depth contour in Åland Sea and Northern Quark.

The most shallow depth area Finland encodes is between 0-10 meters. There are only loose 3 and 6 m depth contours. Sweden has depth contours with relevant depth areas for 0-3 m, 3-6 and 6-10 for Navigational Purposes Berthing, Harbour and Approach. In Swedish Coastal and General ENCs the most shallow depth area is 0-10 meters.

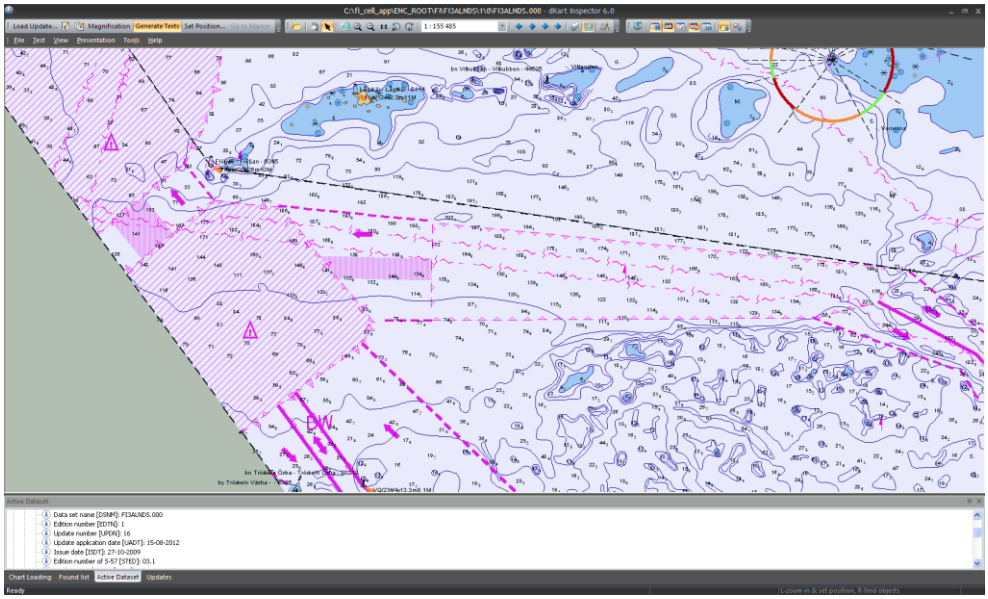


No Finnish 3 m and 6 m depth contours *Approach*

Rounding of soundings

Sweden follows S-4:B-412, i.e. soundings being rounded to nearest decimeters for soundings down to 21 meters, to nearest half meters between 21 and 31 meters and to nearest meter for soundings beyond 31 meters. The same rules apply to both paper charts and ENCs.

Finland's ENCs are different from the paper charts in the way soundings are rounded. The rounding rules for paper charts are applied during the cartographic finishing process. The current Finnish guideline for paper charts states that soundings are to be rounded to nearest decimeter down to 20 m. The soundings in the ENCs are never rounded to nearest half meter or nearest meter, but always show the nearest decimeter. However, the ECDIS will round the soundings during its visualization process following the rules set in S-52. This means that an ENC user will see the soundings down to 31 meters rounded down to dearest decimeter and soundings beyond 31 meters rounded down to nearest meter.



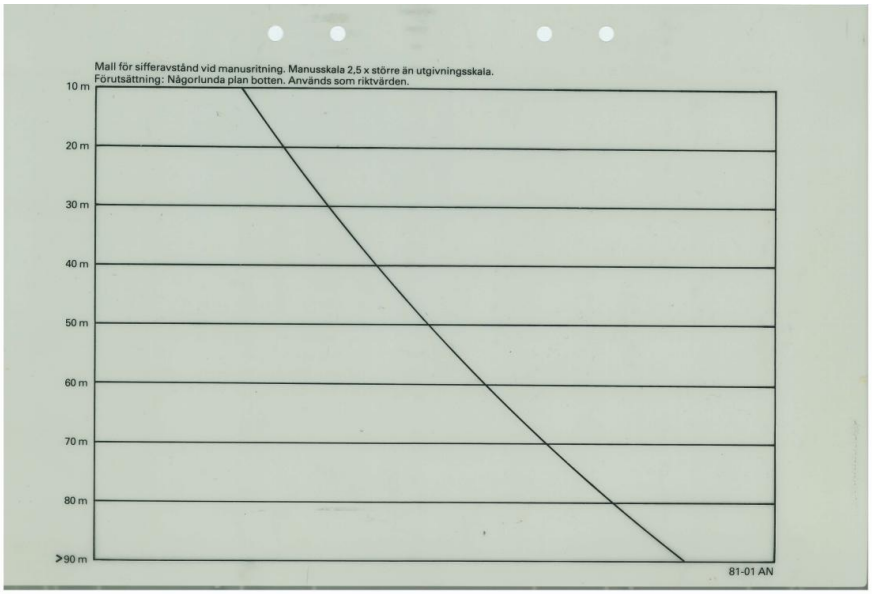
The soundings in the Finnish ENCs have decimeters beyond 20 m. In ECDIS soundings are rounded to nearest meter beyond 31 m. *Costal*

Guideline regarding the density of soundings

A common guideline regarding sounding density should be developped. The working group has only discussed the issue in general terms so far. It is obvious that such guidelines must be tested and refined before they can be agreed upon.

During the first investigations an old Swedish template for sounding density was found. The template translates to the following Chart distances:

Depth area [m]	Chart Distance [mm]
10	20
20	25
30	31
50	45
100	80
200	80



Old Swedish template for sounding density of reasonable flat sea beds

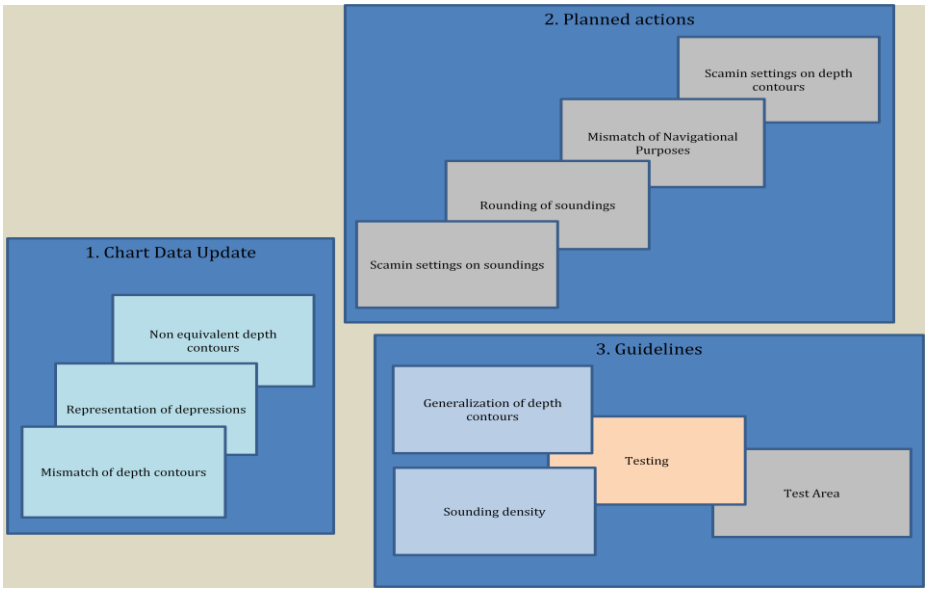
Swedish charts being quite differentiated with regard to sounding density it is difficult to see to which extent the template had been used in the production. Since the general opinion is that the template suggests a distance between soundings that would lead to a very sparse depiction some other guideline is considered necessary.

The following principles are the baseline for the work ahead:

1. There should be a standard distance between general soundings.
2. The shallow and deep spots of the seabed should be presented.
3. On flat sea beds soundings should be less dense.
4. Soundings should become less dense as depth increases.

Recommended actions

The different types of inconsistencies call for different actions. The actions can be grouped into three blocks. The first block being an update of the chart data, the second block being already planned actions for which this working group needs take no further action and the third block being the development of new guidelines.

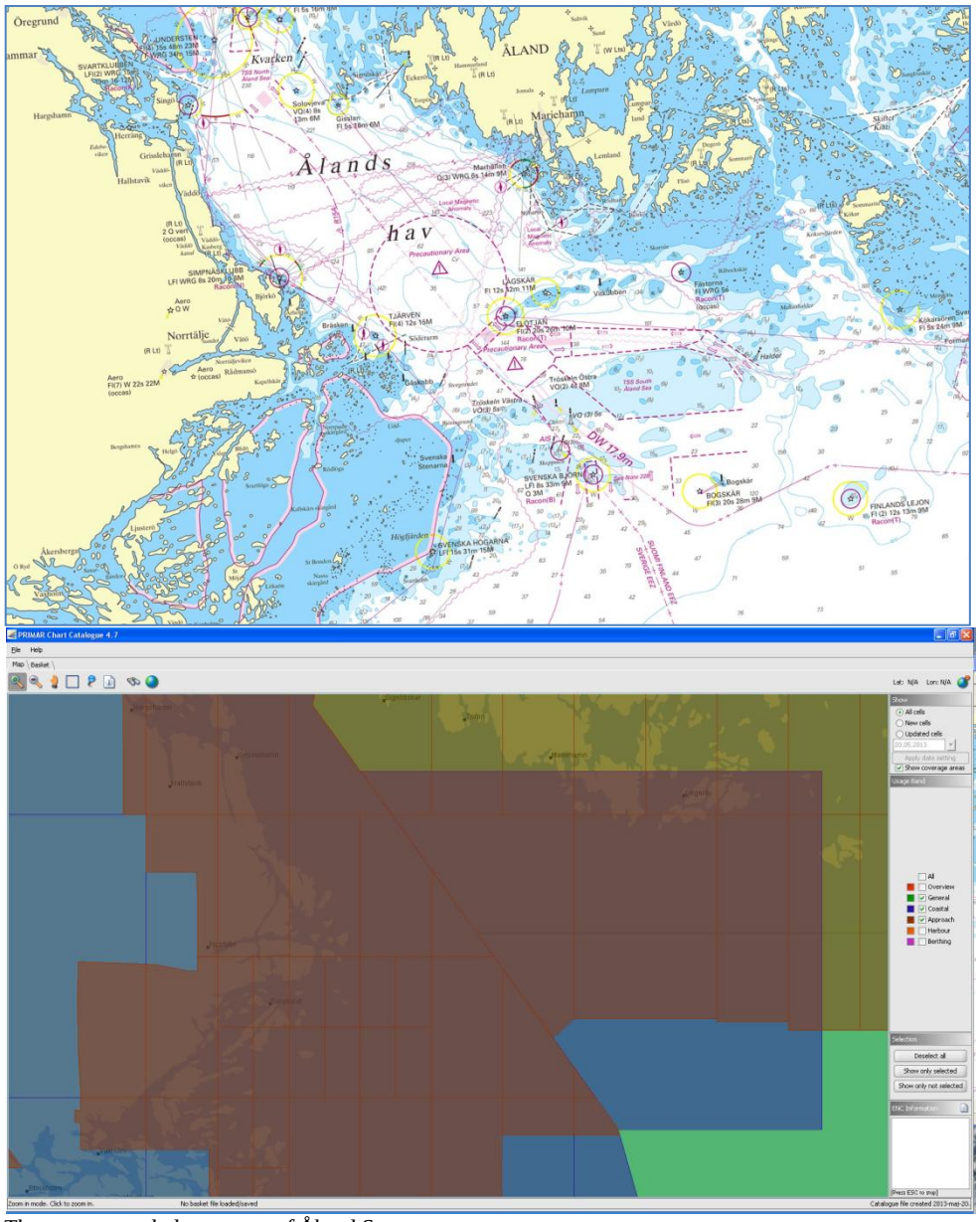


1. The chart data update should be done in close cooperation between a contact person in Sweden and a contact person in Finland. The work should basically consist of going through the border area updating the depth information, i.e. connecting depth contours at the border, adding depth contours around depressions (at least where the lack of a depth contour effects the safety contour in a bad way) and adding the equivalent depth contours (e.g. 30 m).

2. The planned actions are all work that Finland plan to do, e.g. the Scamin settings on soundings will be fixed by the end of 2014. It is noted that regarding the rounding of soundings no commitment has yet been made.

3. Because of the transition to RH2000 Sweden plans to make new editions of all charts. This work is to be completed by 2020. It is for these new charts editions, along the north coast, that the guidelines regarding sounding density and generalization of depth contours could be implemented. In order to develop guidelines, especially for sounding density, a test area is necessary. The Ålands Sea is the recommended test area partly because of the Traffic Separation Scheme and partly because Finland and Sweden both have Coastal ENCs in the area.

The result of the third block should be finalized guidelines and chart products in the test area updated in accordance with the guidelines.



The recommended test area of Åland Sea

Annex A

Terms of Reference and Rules of Procedures for The Swedish and Finnish working group for harmonizing of depth information in neighboring ENCs

The BSHC at its 17th Conference recognized the need to improve the harmonization of the depiction of soundings and depth contours in neighboring countries ENCs. Sweden and Finland agreed to form a working group with that aim.

The Working Group shall

1) Analyze the current situation through the scale bands in order to propose a guideline for depiction rules for selection of soundings and generalization of depth contours

2) Study existing guidelines and recommendations issued by the IHO

3) Identify the geographic areas where the harmonization of the depiction of soundings and depth contours should be improved between Sweden and Finland

4) Propose an implementation plan for harmonization of the ENC portfolios with regard to the depiction of soundings and depth contours in the identified geographic areas

5) Provide a Progress Report to the BSHC 18th Conference

6) Send a report to the relevant IHO working group, if deemed appropriate by BSHC 18

7) Report regularly to the Steering Committee

Rules of procedures

- Sweden and Finland will participate in the working group

- The Steering Committee will consist of Mr Rainer Mustaniemi (FTA), Mrs. Maarit Mikkellsson (FTA), Mr Patrik Wiberg (SMA) and Mr Magnus Wallhagen (SMA) - The WG will be chaired by Mr Hans Engberg (SMA)

- The WG should as far as possible work in accordance with existing guidelines and recommendations issued by the IHO and the RENCs

- The work of the WG should primarily be carried out by correspondence + 2 meetings (Kick Off and after tasks 1, 2 and 3 progress report).

Annex B

International Standards and Guidelines

The following paragraphs in S-4 relate to depth information and were considered to be of relevance for the work of the group.

B-403.1 Generalization of depth portrayal *(see also B-410). When a survey or chart is reduced in scale the generalization that is required has several effects:*

a. Deeper soundings tend to be eliminated while the shoaler ones are retained for safety. Sufficient numbers of deeper soundings should be retained to show the full range of depth. This is to assist the navigator who uses his echo sounder to help verify his position, or the mariner choosing an anchorage of suitable depth.

b. Generalization proceeds by the inclusion of shoals lying to seaward of the principal contour, and by the smoothing of severely indented contours, with the effect of pushing the contours seaward. However, as a shoal which rises steeply from deep water is much more of a hazard than one which rises gradually, the cartographer must ensure that the contours are not pushed seaward unduly. If he gives the impression that a mariner will get warning of too close an approach to the danger, by relying on his echo sounder to show gradually shoaling depth - when the danger is, in fact 'steep-to' - he may seriously mislead and endanger the chart user.

c. With the 'expansion' of shoals, described above, it may become increasingly difficult to find space on a chart to show the line of deepest soundings through a channel, or even to show a channel at all. Yet even at small scales it is important to show the usable channels and indicate their least depth. The cartographer may have to make greater use of depth contours than soundings in depicting narrow channels.

d. Even such dangers as drying rocks and islets require generalization in coastal areas. This is in recognition of the principle that, whereas they are particularly dangerous in isolation and must then be shown as precisely as possible, where they occur in groups a selection of representative symbols is permissible, showing the outermost ones as individually as space permits.

B-410 REPRESENTATION OF DEPTH: GENERAL

Some of the principles of depth depiction are summarized below (see also B-403.1):

a. The least depth over shoals and banks, and over sills (bars) in navigable channels, must be shown. Particular attention should also be paid to full and accurate representation of all other 'critical' areas, eg on and adjacent to leading lines, controlling depths in fairways and along recommended tracks, in anchorages, alongside jetties, quays and berths and in the entrances to harbours and basins. Maximum as well as minimum depth should be shown where possible, eg to show the line of deepest water in narrow channels. However, deeper soundings on the sloping side of a bank near to the crest line should not be selected if they could give the impression that there is a deeper passage across the crest between shoaler soundings.

b. Soundings and contours must be used to complement each other in giving a reasonable representation of the seabed, including all significant breaks of slope (see also B-411.5).

c. The density of soundings should be determined by the type of seabed. Flat or evenly sloping areas, and banks of unconsolidated sediment, should have a minimum of soundings, fairly evenly spaced, but gradually becoming more widely spaced as the depth increases. Irregular bottom topography should be represented by a denser, and probably irregular, pattern of soundings. A steep gradient should be represented by close contours, undistorted by soundings.

d. In changeable areas, where surveys of different dates adjoin and do not match exactly, gaps in the contours and tints may be left to indicate the discontinuity of depth to the navigator (see B-416.1).

e. Where practicable, soundings on smaller scale charts should be selected from those shown on the larger scales.

f. In areas navigable only at high water, drying heights must be charted according to the same principles as soundings.

g. Where surveys are inadequate, it may be advisable to omit some of the standard contour lines, but those contours outlining blue tints should be as complete as possible (even if shown as approximate contours - see B-411.2).

B-412 SOUNDINGS

Charted soundings must represent the depth measured from Chart Datum to the sea floor placed in such a way that the centre of gravity (geometric centre) of the set of numerals coincides with the position referred to.

***Rounding of depths**, including drying heights, must always be on the safe (shoaler) side, ie: soundings must be rounded down and drying heights rounded up, if necessary. The rounding should be:*

For depths
• to the nearest decimetre between 0,1 and 21m:
*0,001 to 0,099 rounds **down** to nearest decimetre eg: a recorded depth of 4,38m rounds down to 4,3m.*

• to the nearest half metre from 21 to 31m:
*0,001 to 0,499 rounds **down** to 0,0 eg: a recorded depth of 23,49 rounds **down** to 23m;*
*0,500 to 0,999 rounds **down** to 0,5 eg: a recorded depth of 23,51 rounds **down** to 23,5m.*

• thereafter, to the nearest metre:
*0,001 to 0,999 rounds **down** to 0,0 eg: a recorded depth of 31,85m rounds **down** to 31m.*

For drying heights
*• to the nearest decimetre:0,001 to 0,099 rounds **up** to nearest decimetre eg: a recorded drying height of -2,32m rounds **up** to -2,4m*

However, these soundings must be adjusted as a function of the degree of accuracy with which depths were actually measured, so that the precision with which soundings are recorded on charts can never be misleading as to the accuracy of such soundings.

B-411 DEPTH CONTOURS AND SHALLOW WATER TINT

The standard series of depth contour lines *to be charted is: drying line (where tides are appreciable), 2, 5, 10, 20, 30, 50, 100, 200, 300, 400, 500, 1000, 2000m, etc. The 2 and 5m contours may be omitted where they serve no useful purpose. It is not necessary for the complete sequence of contours to be shown, eg on steep slopes and around isolated pinnacles.*

Supplementary contours*, eg at 3, 8, 15, 25, 40, 75m and multiples of 10 or 100m may be shown, if the available data permit, to delineate particular bathymetric features where soundings would otherwise be the only depth information over a large area, or for the benefit of particular categories of shipping. The 2500m contour may be required for measuring continental shelf limits (see UNCLOS Article 76)*

Other contours*. In waters where the 4 or 6 metres contours have been surveyed and charted these contours may be shown in place of the standard ones, provided they are labelled with their values (even where otherwise defined by a shallow water tint).*

B-411.1 Line symbol*. Depth contours should be shown as continuous black lines of approximately 0,1mm width. Alternatively, blue contours may be used, especially in complex areas, to avoid breaking the contours for other detail. Where a certain contour is to be emphasized, this should be achieved by the use of a shallow water tint (see B-411.6). Thicker lines may be used to emphasize certain standard contours but this practice is not recommended.*

Depth contours must be drawn in such a way that no sounding having exactly the same value as the contour line will appear on the deep-water side of the contour, except where the soundings represent isolated shoals. In this case, they must be encircled by a depth contour of the same value or by a danger line (see B-411.4).

B-411.5 Generalization of contours. *Contours should be smoothed only where it is necessary to remove intricacies which would confuse mariners. Where necessary, smoothing will include deeper water within shoaler contours (ie it must be shoal-biased), but an attempt to retain a reasonable representation of the seabed should be made. The fact that the intricacy of contours gives some guidance on the adequacy of the survey in areas of irregular depths should be taken into account.*

Depth contours and soundings in Swedish Nautical Charts

Introduction

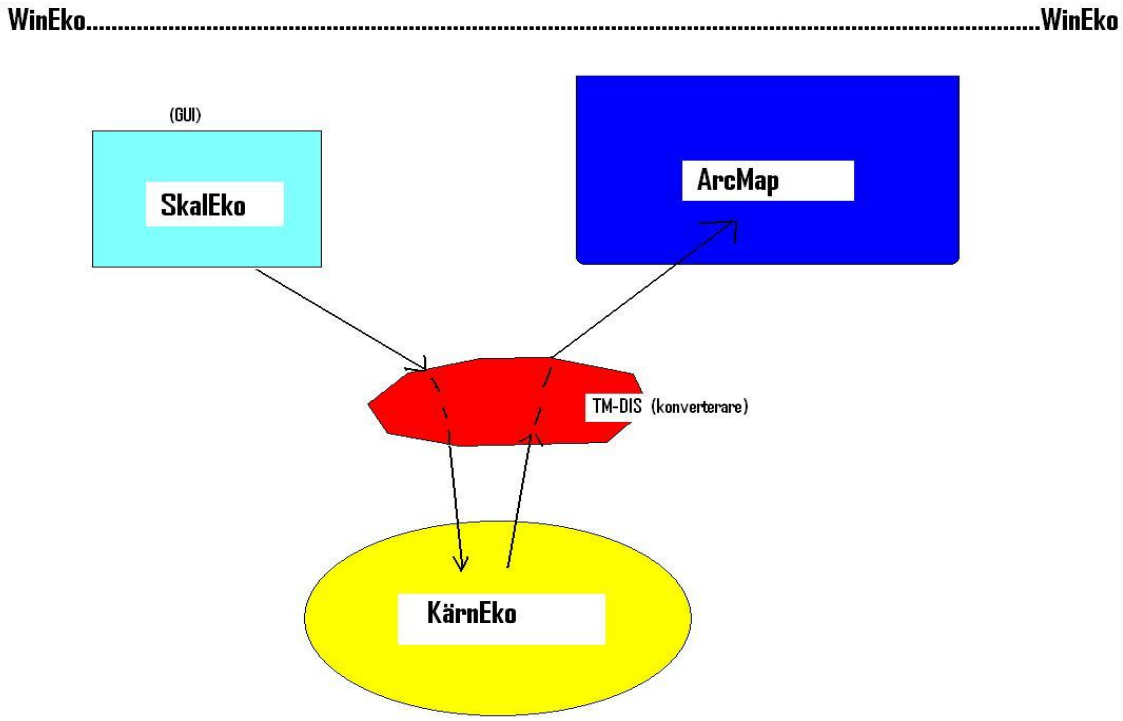
This is a short description of how Swedish nautical charts/ENC are produced with regards to depth contours and soundings.

Objective

Attempt to harmonize nautical depth information between Sweden and Finland.

Terrain model

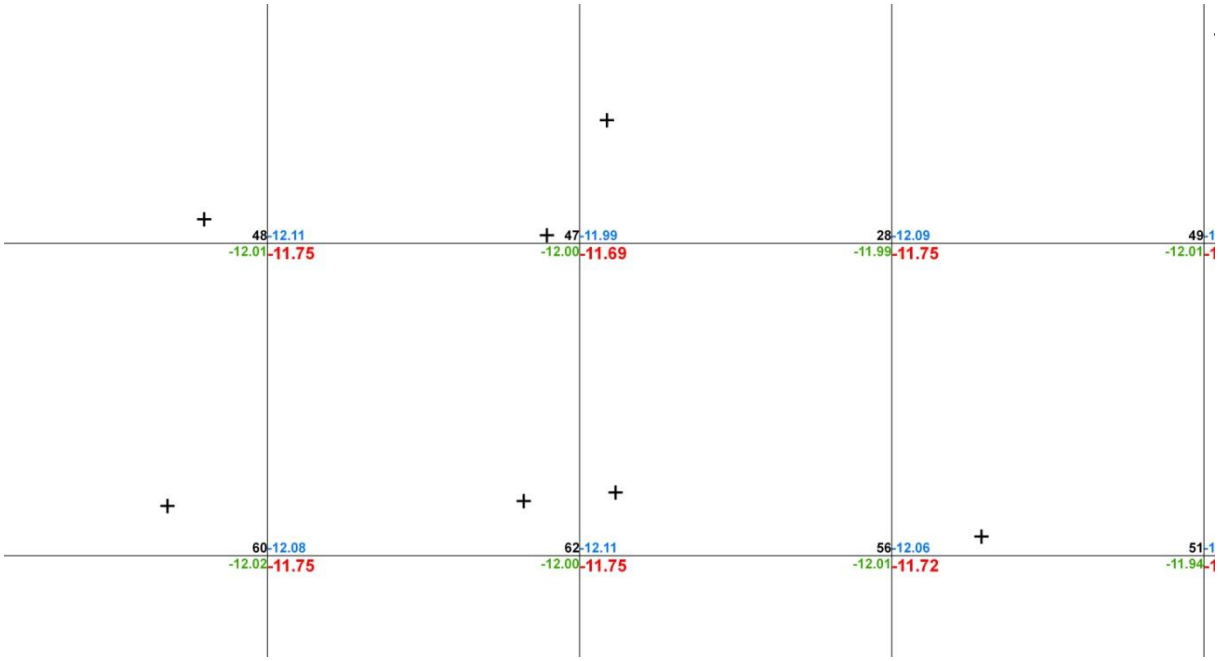
The Swedish Maritime Administration (SMA) uses its own terrain model, which is adapted for nautical purposes. *WinEko* is used as a collective term for the four following components: *SkalEko (Eng."ShellEko")*, *KärnEko* (*Eng. "coreEko";* the terrain model), *TM-DIS* and ArcMap.



The grid cells in WinEko (*KärnEko*) are rectangular and generally square and their size is adapted depending on product, purpose and terrain. For example:

1–2 m for harbours, often harbour plans
5–10 m for nautical charts inshore/inside the archipelago (scales 1:25 000 – 1:50 000)
20 m for nautical charts outside the archipelago (scale 1:50 000)
100 m for scale 1:250 000

Each cell stores the minimum, maximum and average depth as well as the number of soundings per cell. The position for the minimum depth is also kept for each grid cell.



For the z-axis, depths are stored as negative values, whereas heights on land are stored as positive values. It is possible to use both simultaneously.
Currently, the maximum number of grid cells we can work with is approximately 50 million. The capacity is expected to increase significantly when 64-bit desktop for ArcMap will be introduced.

"Reading" of soundings

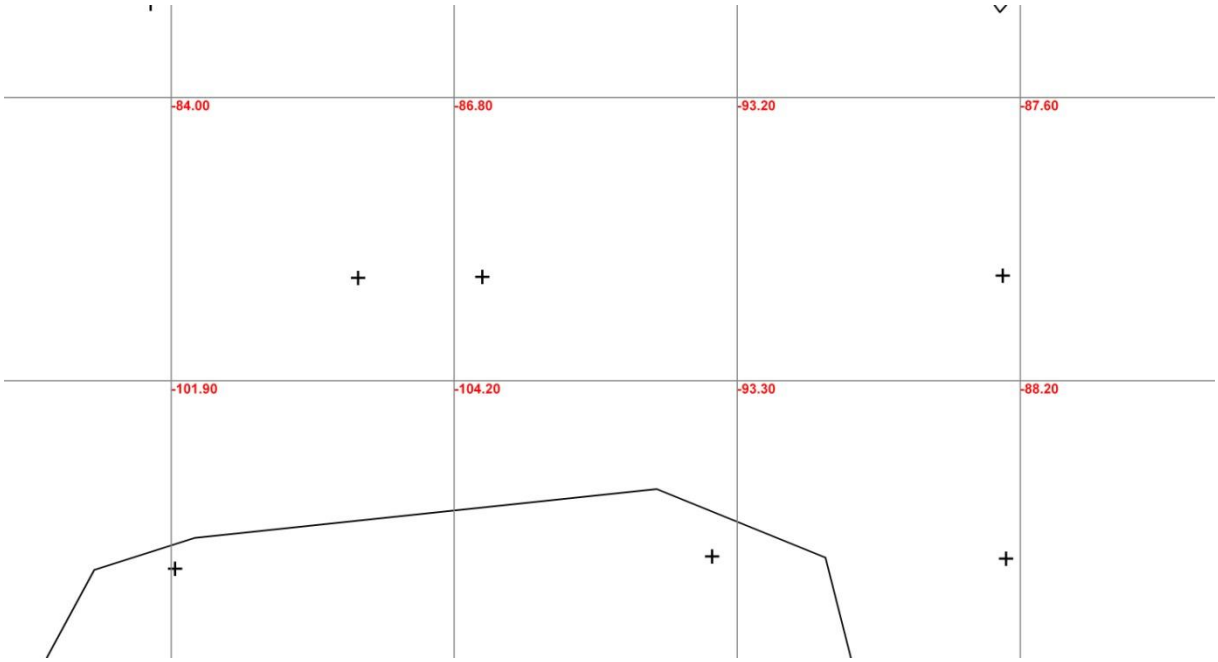
All available soundings for a given surface are read into the terrain model, where the selection/calculation is then done as specified above. For nautical charts, the soundings used are always from our depth database (DIS; *Depth Database Information System*). Other products are occasionally created from files instead. The potential number of readable depths is in principle unlimited.

"Blomning" (Interpolation)

Where input data for the terrain model is sparse (e.g. old soundings done by lead line; Swe. *handlod*), empty grid cells need to be filled with "faked" sounding values. We call this *blomning (Eng. "flowering"*). In order to create a smoother terrain between measured (i.e. not "faked") soundings, a grid filter is applied using adjacent measured sounding values.

Contouring

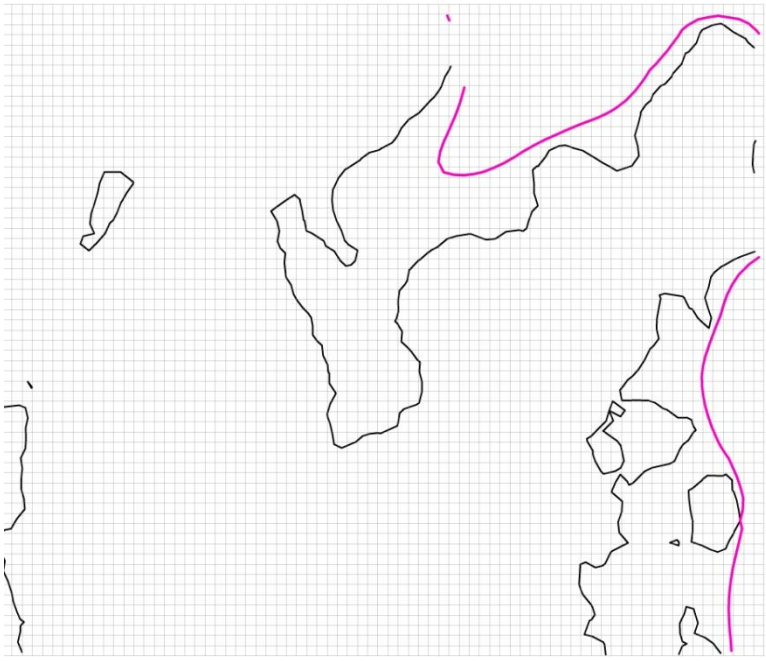
Contours are normally interpolated between the minimum depths of the grid cells, based on their retained sounding positions. This way, each cell contributes with a vector, whose length will depend on the sounding position.



Generalization, contours

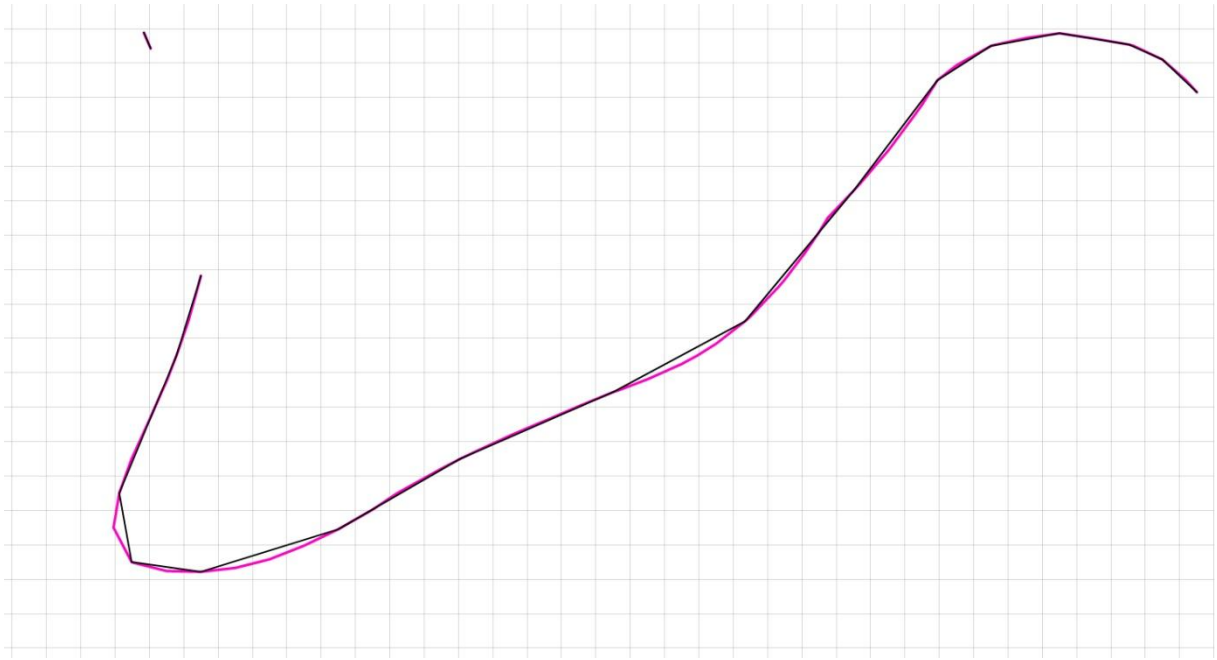
We are currently testing automatic generalization of the terrain model. The generalization is driven by the nautical requirement of only permitting the terrain to be made shallower, and is done using a grid filter.

Generalization is primarily used in production of “new” nautical charts, but the aim is to expand its use to also include normal updates following new hydrographic surveys. Automated methods can save time even if they only get you part of the way.



Vector reduction of contours

Where generalization is used, vector reduction is needed in connection with contouring to avoid too many vectors for ENC purposes. This vector reduction is driven by requirements on vector length as well as how much they are allowed to deviate from the original contour. These requirements vary depending on whether the contour moves over shallower or over deeper waters. The same parameter can be used regardless of the grid cell size, as the three values for the parameter are expressed as percentages of the grid cell. The three parameter values are: maximum length of the vector; one delta value for deeper; and another – significantly smaller – delta value for shallower. The delta values are calculated against the original vector for the contour (i.e. comparing the distance between the reduced contour and the original).



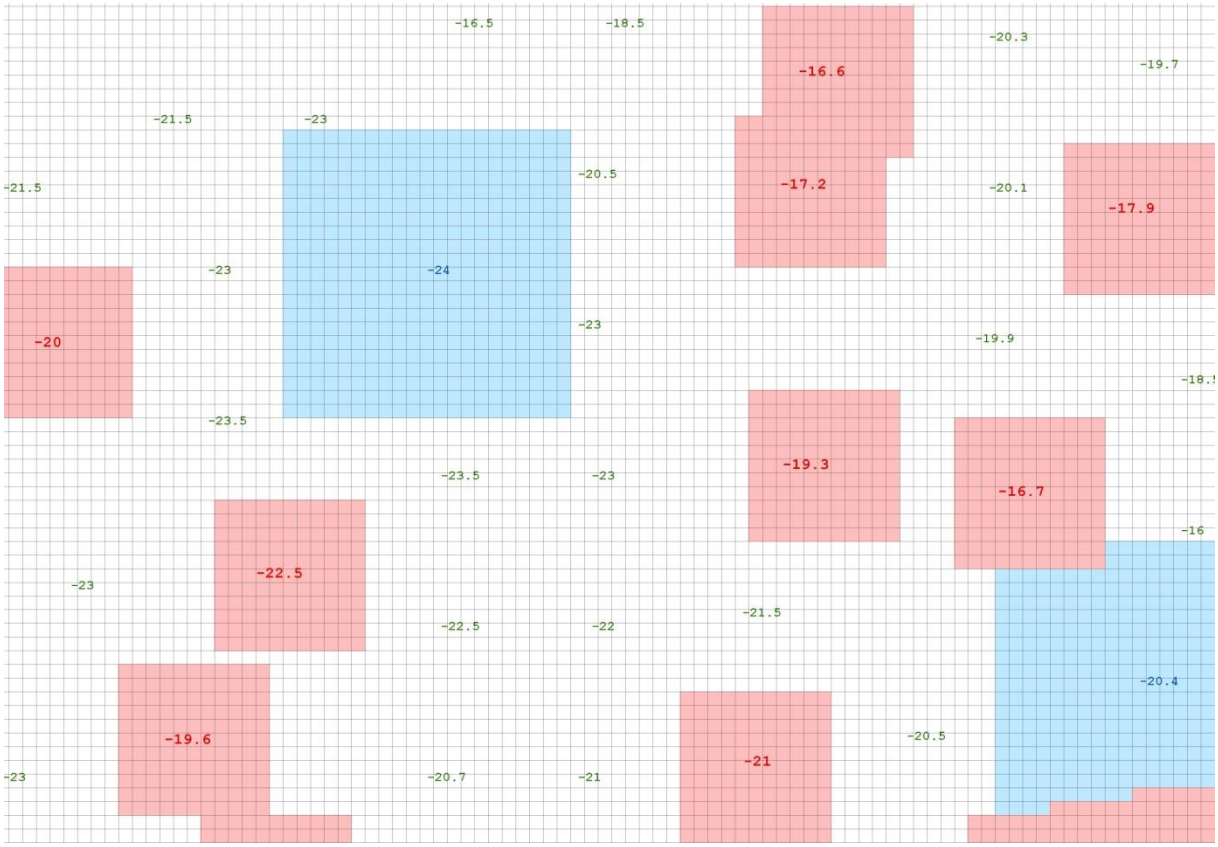
Number filtering (soundings)

Key soundings are selected from the terrain model as follows:

First, significant peaks in the terrain are selected; the distance between the peaks will depend on the choice of number of grid cells in between. The entire grid is searched cell-by-cell. Briefly put, the requirement is that all surrounding cells shall be deeper than the current cell to be “labeled” a peak. Here, the algorithm works with the shallowest sounding value (the minimum depth) for each cell.

Second, a corresponding search is done for depressions/deeper soundings. Here, the cells’ maximum depth is used.

Finally, areas where no peaks or depressions have been identified are filled with general soundings. These are applied only to empty areas and the sounding values come from the cells’ minimum depth values. No requirements with regard to surroundings are applied, other than number of grid cells to peak or depression.



In connection with the number filtering, we have a number of pre-prepared parameters which we choose between, depending on whether we want a higher or lower density of soundings. The parameters for peaks, depressions and general soundings can be controlled individually.

Rounding of significant figures

The by (filtering) selected significant figures are rounded in accordance with international standards (B-412).

There is one decimal for z for 0 – 21 m and 1 dm resolution. The centimeters are truncated
E.g. 9.98 = 9.9

Between 21 and 31 m, it is also one decimal but resolution is ½ meter. The remainder is truncated.
E.g. 24.98 = 24.5 and 24.48 = 24

After 31 m, entire meters are applied and everything truncated.
E.g. 34.78 = 34

Cartographic editing

Please note that the final contours and sounding selection for the nautical charts is still, in the year 2013, largely done manually by cartographic work in Radius Vision.

In general, an original contour and a dense sounding file from WinEko will constitute the grounds for subsequent cartographic work. Today, it is common that the same person will work with both WinEko and Radius Vision.

To date, it is only during the creation of new charts that generalized and vector-reduced contours are used. A more sparse selection of soundings, which could overall be fit for use in nautical charts, is of course possible to do automatically. In WinEko, there are tools for manually removing/adding a sounding.

Bengt Dannelin ing.

Sjöfartsverket 20130301