Paper for Consideration by the ENCWG

Polar areas and how to join spatial points

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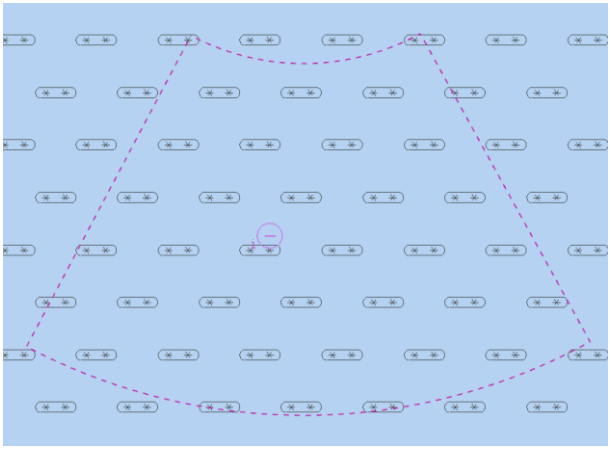
Executive Summary:	This paper is about undefined method how to join spatial points in charts available in polar areas.
Related Documents:	S-52 Ed 4.0.2 S-57 UOC (Use of Object Catalogue) S-64 Ed 3.0.2
Related Projects:	N/A

Introduction / Background

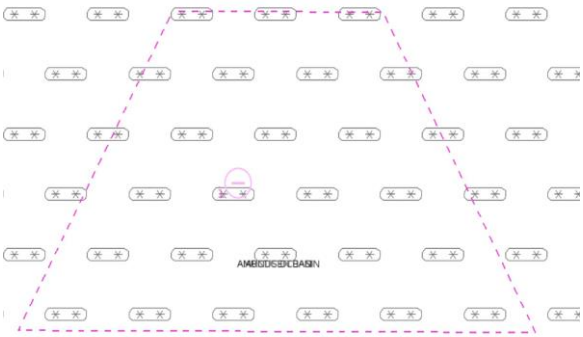
1. S-64 contain test 3.9.2 for extreme high latitudes. It includes three separate test items. This paper is related to the second test item to see detailed chart around point 89°22.000'N 90°00.000'E.

Analysis/Discussion

2. A screen sample pair illustrate the issue



Current screen sample in S-64



Another way to interpret drawing

3. The restricted area is defined only by corner coordinates. Below is the list of spatial points

89.6333972, 62.2671002
89.6333972, 118.9595721
89.0989499, 118.9595721
89.0989499, 62.2671002
89.6333972, 62.2671002

4. The issue is what is the method to join the spatial points: by loxodrome or by orthodrome. The S-57 and S-52 are silent about this detail. But traditionally ENC chart for ECDIS has been drawn based on Mercator projection and therefore assuming that joining of spatial point is based on loxodromes. If an orthodrome i.e. great circle has been needed, it has been made using enough intermediate points to make it to be like piecewise loxodromic passing through each intermediate point of the orthodrome.

5. The test charts in S-64 for polar areas (for example AA1NPOLA and AA1NPOL3) contain a lot of charted information (depth contours, depth areas, land areas, etc.) but all of these have a lot of spatial points. Result is don't care how to join the spatial points as the distance between points is so short that in practice both loxodrome and orthodrome provide same result.

6. But the example of the restricted area in S-64 is defined only by four corner points leaving open how exactly the points should be joined. The examples of restricted areas in the test data set itself are significant features i.e. really testing correct implementation and therefore they should remain as part of the test

7. There are multiple ways how to solve the issue, for example

A. Require in S-57 that in polar areas the distance between spatial points is less than a set value. This would guarantee that there is enough intermediate points in the spatial list. This solution could be published as an S-57 encoding bulleting for ENC producers and the S-58 could be amended to have a new validation test that if the latitude is above a set value then check that the distance between spatial points is less than the set value.
B. Specify in S-52 how to join spatial points. The obvious candidate for this specification is the current de facto method i.e. loxodrome. This would clarify the situation both for ECDIS manufacturers and for ENC producers. Both would know what happens. Obviously also in this case there should an S-57 encoding bulletin explaining for ENC producers that they need to have enough spatial points. However, in this case there would be no new S-58 validation test as it would be the responsibility of the individual ENC producer to behave well enough.
C. A mix of method A and B

8. Based on the method of solving the situation the test data set related to test 3.9.2 might need to be amended (i.e. more spatial points added) or the screen sample might need to be amended to reflect the decisions made.

Conclusions

9. There is a need to do something.

Recommendations

10. The best would specify method of joining in the S-52, specify max distance between spatial points in the S-57 UOC and finally include appropriate test in S-58. Obviously, the S-64 should finally be amended to be compliant with the decisions made.

Justification and Impacts

11. Something shall be done as otherwise use of ENC charts in extreme latitude would not be safe

Action Required of ENCWG

The ENCWG is invited to:

a) consider what to do