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## BSHC Chart Datum, Water level and Currents Working Group (CDWCWG)

### CDWCWG Report to the BSHC 29<sup>th</sup> Conference

The CDWCWG Terms of Reference ([TORs](#)) requests the CDWCWG to report annually to the BSHC.

#### 1. Status of Work of CDWCWG since BSHC 28<sup>th</sup> Conference

Since the BSHC 22<sup>nd</sup> Conference 2017, *Mr Thomas Hammarklint* has acted as a Chair.

At the [BSHC 28th Conference](#), 2023, the new name of the working group was approved and changed from Chart Datum Working Group (CDWG) to Chart Datum, Water level and Currents Working Group (CDWCWG), with the important addition or subtitle: "To implement a common reference system, S-104 and S-111 in the Baltic Sea". The [TORs](#) and [Work Programme](#) (Annex 1 and 2) were also approved. In addition, a transition period road map and time line have been updated ([CDWCWG Roadmap](#)). The BSHC CDWCWG - web pages ([CDWCWG Website](#)) were also updated and maintained.

CDWCWG has supported the implementation of the Baltic Sea Chart Datum 2000 (BSCD2000) and reviewed the progress of implementation, developed and released a first version of the [BSCD2000](#) Height Transformation Grid (Geoid Model) for the Baltic Sea and on behalf of the BSHC began planning for the coordination of the implementation of IHO products S-104 Water Level Information and S-111 Surface Currents. The working group has cooperated with several international bodies and projects, i.e. the Interreg project [Baltic Sea e-Nav Partner meeting](#) in Helsinki, 17-18 April 2024. The work has been presented at numerous national and international conferences and meetings.

A face-to-face Chart Datum Working Group meeting ([CDWCWG1 Minutes](#)) was held 26-27 March 2024 in Helsinki, Finland. Several new experts and members dealing with the implementation of S-104 and S-111 were welcomed to the working group.

All the BSHC member states have nominated members to the working group, however not all have been active or participated at the meetings. Observers and experts are nominated from Swedish National Land Survey, Swedish Meteorological and Hydrological Institute, National Land Survey of Finland, Finnish Meteorological Institute, Tallinn University of Technology (Estonia), Institute of Geodesy and Cartography (Poland), Federal Agency for Cartography and Geodesy (Germany), and Norwegian Mapping Authority and contributes greatly to the activities within the CDWCWG's area of interest and responsibility.

Baltic Operational Oceanographic System ([BOOS](#)) has nominated a Point of Contact (CDWCWG Chair), mainly to cooperate on the transition to BSCD2000 for water level information (tide gauge observations and water level forecasts and warnings). Already in 2014, BSHC and BOOS signed a Memorandum of Understanding ([MoU](#)) to collaborate on this.



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|-------------------------------|----------------------|------------------------------------|
| <b>Members of CDWCWG:</b>     | Denmark              | Mr Nikolaj Møller                  |
|                               | Denmark              | Mr Kristian Villadsen Kristmar     |
|                               | Estonia              | Mrs Gabriela Kotsulim              |
|                               | Finland              | Mr Jyrki Mononen                   |
|                               | Germany              | Dr Patrik Westfeld                 |
|                               | Latvia               | Mr Bruno Špēls                     |
|                               | Lithuania            | Mr Mindaugas Zakarauskas           |
|                               | Poland               | Mr Witold Stasiak                  |
|                               | Poland               | Mrs Alicja Olszewska               |
|                               | Russia               | Mr Leonid Shalnov                  |
|                               | Russia               | Dr Sergey V. Reshetniak            |
|                               | Sweden               | Mr Thomas Hammarklint (Chair)      |
|                               | Sweden               | Mr Lars Jakobsson                  |
| Sweden                        | Mr Henrik Tengbert   |                                    |
| <b>Observers and Experts:</b> | Estonia              | Prof. Artu Ellmann                 |
|                               | Estonia              | Dr Sander Varbla                   |
|                               | Estonia              | Dr Nicole Camille Delpeche-Ellmann |
|                               | Finland              | Mr Jarmo Mäkinen                   |
|                               | Finland              | Mrs Anni Jokiniemi                 |
|                               | Finland              | Dr Jani Särkkä                     |
|                               | Finland              | Dr Mirjam Bilker-Koivula           |
|                               | Finland              | Dr Timo Saari                      |
|                               | Germany              | Dr Gunter Liebsch                  |
|                               | Germany              | Dr Joachim Schwabe                 |
|                               | Latvia               | Mr Armands Murans                  |
|                               | Latvia               | Mr Kristis Dzenis                  |
|                               | Lithuania            | Mr Emilis Tertelis                 |
|                               | Lithuania            | Mr Romuald Obuchovski              |
|                               | Norway               | Mr Aksel Voldsund                  |
|                               | Poland               | Mr Krzysztof Pyrchla               |
|                               | Poland               | Mrs Małgorzata Pająk               |
|                               | Poland               | Dr Monika Wilde-Piórko             |
|                               | Poland               | Dr Małgorzata Szelachowska         |
| Sweden                        | Dr Jonas Ågren       |                                    |
| Sweden                        | Dr Per-Anders Olsson |                                    |
| Sweden                        | Mrs Johanna Linders  |                                    |

The [List of Members](#) and other documents can be found at the [CDWCWG Website](#).



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### 3. CDWCWG 1<sup>st</sup> meeting, 26-27 March 2024 in Helsinki, Finland

An ordinary working group meeting (physical meeting only). Focus on the meeting was to review national plans and status of implementation of the Baltic Sea Chart Datum 2000, S-104 and S-111 ([Summary of the Implementation Status 2024](#)).

The [TORs](#) and [Work Programme](#) (Annex 1 and 2), have been approved by the members states at BSHC28. Several new actions to be handled within the working group have been listed in the [CDWCWG1 Action list](#). For example, we decided how to continue the transition to Baltic Sea Chart Datum 2000 for all water level observations from stations located in the Baltic Sea that reaches the Baltic Sea, Marine Copernicus and EMODNET Data Portals (Action #12-15, [Reference levels in the Baltic Sea](#)). From these services, almost all oceanographic observations from stations located in the Baltic Sea can be downloaded.

### 4. The results of the CDWCWG during 2023-2024

CDWCWG has promoted studies and development of a common geoid model for the Baltic Sea by supporting the FAMOS-projects. Within FAMOS-project several gravity-surveying campaigns were executed in the Baltic Sea during 2015-2018 and interim geoid models have been calculated during 2018 and further computations have been executed since 2020 within the FAMOS Continuation project (as an activity within the working group). A first version of the BSCD2000 Height Transformation Grid (Geoid model) was released in November 2023 ([BSCD 2000 Landing Page](#)).

A good geoid model or height transformation grid for the whole Baltic Sea is an essential component for the Baltic Sea Chart Datum 2000. A [release note](#) has been published as an article in the International Hydrographic Review (IHR). An [article](#) about the CDWCWG work and the implementation of the Baltic Sea Chart Datum 2000 was published in the International Hydrographic Review (IHR) already in May 2020.

The [Specification for the Baltic Sea Chart Datum 2000](#) have been updated. The specification is an essential document for applying and realizing the Baltic Sea Chart Datum 2000 in all BSHC member states. Baltic Sea Chart Datum 2000 has been registered in [IHO Geospatial Information Registry as chart datum number 44](#).

In cooperation with members states and BOOS partners, the CDWCWG have compiled a [Table](#) of the mean sea level in the Baltic Sea Chart Datum 2000 (BSCD2000), at sea level stations located in the Baltic Sea (see [Map](#)).



The CDWCWG work have been or will be presented at the following conferences and meetings in 2023-2025:

- NSHC TWG25, 7 February 2023, VTC [[Minutes](#)]
- TWCWG7, 28 February - 2 March 2023, VTC
- BSHC CDWG14, 28-29 March 2023, Göteborg, Sweden [[Presentation](#), [Minutes](#)]
- BOOS, 9-11 May 2023, Helsinki, Finland [[Presentation](#)]
- EUREF Symposium, 23-26 May 2023, Göteborg, Sweden
- BSHC28, 19-21 September 2023, Helsinki, Finland [[Report](#), [Presentation](#)]
- NSHC TWG26, 6-7 February 2024, Göteborg, Sweden [[Presentation](#), [Minutes](#)]
- TWCWG8, 20-23 February 2024, VTC
- BSHC CDWCWG1, 26-27 March 2024, Helsinki, Finland [[Presentation](#), [Minutes](#)]
- Kartdagarna, 16-18 April 2024, Göteborg, Sweden
- BOOS, 6-8 May 2024, Copenhagen, Denmark [[Presentation](#)]
- BSHC29, 17-19 September 2024, Tallinn, Estonia [[Report](#), [Presentation](#)]
- TWCWG9, 19-22 November 2024, Monaco
- NSHC TWG27, 4-5 February 2025, United Kingdom [[Presentation](#), [Minutes](#)]
- BSHC CDWCWG2, 25-26 March 2025, Tallinn, Estonia [[Presentation](#), [Minutes](#)]
- Kartdagarna, 8-10 April 2025, Skellefteå, Sweden
- BOOS, 5-7 May 2025, TBC
- BSHC30, 16-18 September 2025, TBC
- TWCWG10, November 2025, TBC

## 5. Status June 2024

Until now, one of the most important tasks for the working group has been to review national plans and status of implementation of the BSCD2000, S-104 and S-111. It can be concluded that most member states have made actions to implement the common vertical datum, see the [Summary of the Implementation Status 2024](#) and started actions to implement S-104 and S-111. The detailed status of all member states can be found on the [CDWCWG Website](#).

The first version of the BSCD2000 Height Transformation Grid (Geoid model) has been released in November 2023 ([BSCD2000 Landing Page](#)). A [BSCD2000 Continuity Management Plan](#) (Version 1-1) has been produced for the long-term management of BSCD2000.



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## 6. Future work of the CDWCWG

Already at the [BSHC27 Conference](#), the working group was tasked to coordinate the implementation of the IHO products S-104 Water Level and S-111 Surface Currents in the Baltic Sea. This will be the major focus for the working group over the next years. This is a long-term commitment and requires focus from the working group to successfully complete the task.

Also, a closer cooperation with Baltic Sea Operational Oceanographic System ([BOOS](#)) and North Sea Hydrographic Commission (NSHC) are needed, to invite members and experts dealing with water level and current information, necessary to implement the products S-104 Water Level and S-111 Surface Currents (Annex 3 and 4). Especially, the exchange with the NSHC Tidal Working Group ([TWG](#)) will be strengthened. With regard to the implementation of S-104 and S-111, both working groups will encounter similar issues and it could be worth trying to harmonize as much as possible.

However, CDWCWG will continue to guide and follow up the progress of the implementation of the harmonised vertical reference, following the [TORs](#) and [Work Programme](#) (Annex 1 and 2), even if the focus changes. These tasks will be coordinated by the CDWCWG, but will be carried out more in sub-groups of the CDWCWG with specially dedicated activity leaders. Such activities are for example to develop the "the specification for Baltic Sea Chart Datum 2000", finalize the BSCD2000 Height Transformation Grid for the whole Baltic Sea and promote studies and further development of dynamic topography of sea surface and promote improving precise real-time GNSS navigation.

The future work until 2027 of the CDWCWG ([Roadmap](#)) has been updated and expanded to include the implementation of S-104 and S-111.

Continue cooperation with BOOS concerning water level information. Cooperation is important for the implementation and usage of the harmonised vertical reference. Continue communication with relevant organisations and inform users by giving presentations and participating in relevant conferences.

To activate all the member states to send representatives to the CDWCWG meetings. The CDWCWG plans to have its next meeting ([CDWCWG2](#)) 25-26 March 2025 in Tallinn, Estonia.

## 7. Actions for the BSHC 29<sup>th</sup> Conference

The BSHC 29<sup>th</sup> Conference is invited to:

1. Note this report
2. Give further guidance to CDWCWG, as seen appropriate



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29<sup>th</sup> BSHC Conference  
17-19 September 2024  
Tallinn, Estonia

**Agenda Item C.3**  
**CDWCWG Report**  
**Sweden**

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## Annex 1. Terms of Reference (TOR)

### **BSHC Chart Datum, Water level and Currents Working Group (CDWCWG) Terms of Reference 20 September 2023**

#### **Approved by the BSHC 28<sup>th</sup> Conference, 19-21 September 2023**

The BSHC18 (September 2013) decided to continue CDWCWG work and wished the harmonized Baltic Sea vertical reference to be implemented.

#### **The Working Group should**

Report to the BSHC Conferences.

1. To continue implementation of the Baltic Sea Chart Datum 2000 (EVRS with land-uplift epoch 2000).
2. To prepare the road map for transition, including e.g.:
  - to establish a network of relevant bodies involved into the transition and efficiently communicate and give guidance within this network
  - to invite relevant bodies to inform the users
  - to review of progress of national plans and actions
  - to propose harmonization actions.
3. To cooperate with relevant bodies on water level related issues e.g.:
  - to promote studies on the validation, status and distribution of water level information, and to promote studies on interpolation and prediction of water levels
  - to promote studies on displaying schemes for joint Baltic Sea water level information
  - to promote studies on recommendations to IHO bodies how the sea level and its variations should be shown on nautical paper and ENC charts and publications, and conveying water level information to mariners [ref. IHO Technical Resolutions].
4. To support development of a common harmonized height reference, including further development of a common geoid model for the whole Baltic Sea area:



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- to promote geoid computations and gravity measurements in the Baltic sea, as is needed to realize the Baltic Sea Chart Datum 2000
  - to coordinate the finalization of the BSCD2000 height reference grid
  - to establish a continuity management (future updates) of the BSCD2000 height reference grid
  - to distribute BSCD2000 data products
  - to support geoid and oceanographic studies relevant to these purposes.
5. To cooperate with relevant international bodies, for example organizations responsible for delivering water level and currents information (e.g. BOOS, NOOS) and geodetic infrastructure (e.g. EUREF and NKG).
  6. To liaise with relevant IHO bodies and study relevant IHO resolutions and specifications.
  7. To coordinate the implementation of the IHO S-100 products S-104 Water Level Information and S-111 Surface Currents in the Baltic Sea:
    - to invite meteorological and oceanographic institutes to the working group to strengthen the implementation.





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29<sup>th</sup> BSHC Conference  
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## Annex 2. Work Programme

### **BSHC Chart Datum, Water level and Currents Working Group (CDWCWG) Work Programme 20 September 2023**

**Approved by the BSHC 28<sup>th</sup> Conference, 19-21 September 2023**

Note: This Work Programme includes those Tasks which were identified as the priority issues and which are expected to be fostered from 2023 and onwards bearing in mind the resources the BSHC members have.

Tasks:

1. Guide the implementation process of vertical reference within the Baltic Sea region.
  - a. To monitor and follow up the status of the relevant actions identified.
  - b. To ensure efficient communication with relevant bodies.
  - c. To propagate and explain the idea of harmonized chart datum.
  - d. To foster national efforts for realization and coordinate the implementation of S-104 and S-111 in the Baltic Sea.
2. Review of progress of national plans and actions.
3. Propose harmonization actions.
4. Promote studies and further development of a common geoid model and dynamic topography for the whole Baltic Sea, mainly by supporting and collaborating with relevant projects, e.g. organizing ship time for gravity measurements. Invite member states to consider gravity measurements and geoid computation and provide an overview where additional gravity measurements are needed.
5. Promote improvement of precise real-time GNSS navigation for the future.
6. Cooperate with BOOS and invite other relevant institutes and organizations for the implementation of S-104 and S-111 in the Baltic Sea.
7. Support other IHO working groups and European projects in issues concerning water level, currents and reference systems.

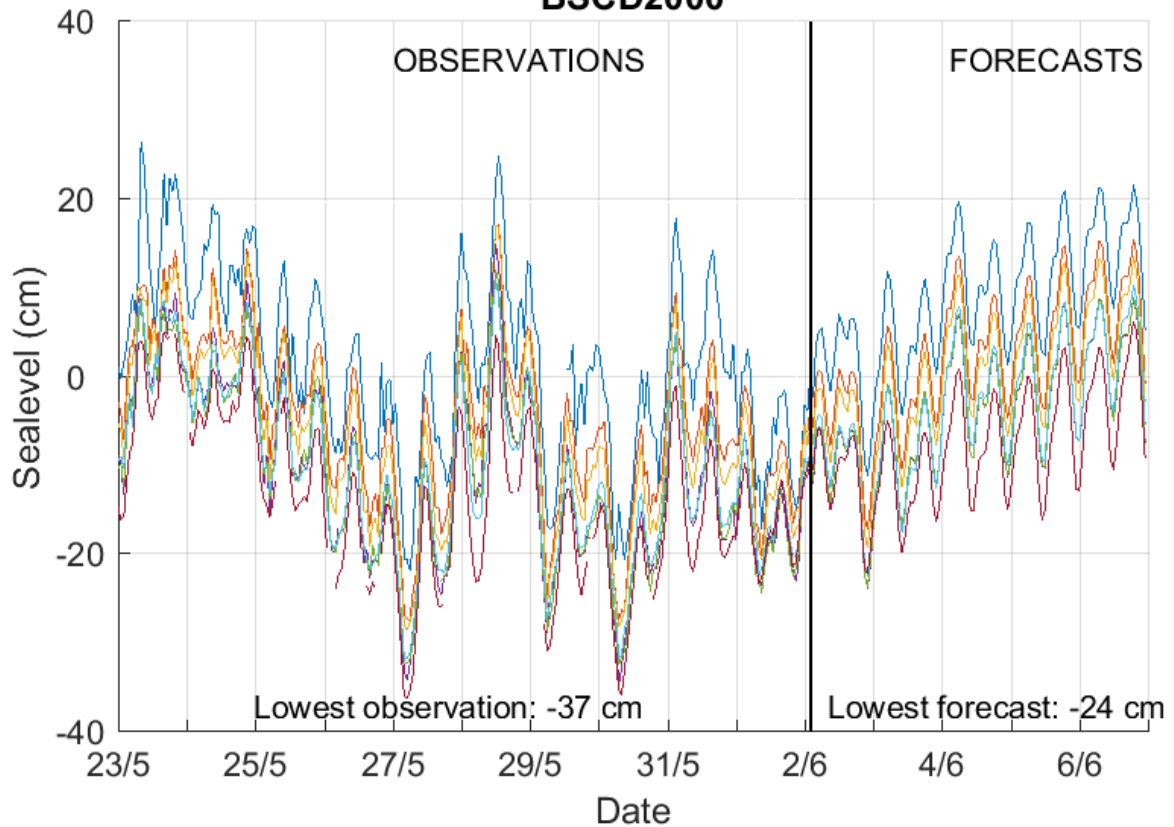




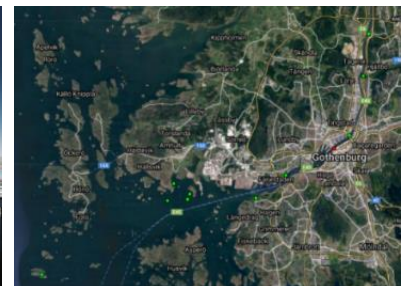
### Annex 3. Example of a potential S-104 Water Level product (Port of Göteborg and upstream Göta River)



#### Sealevels Göteborg 2023-05-23 to 2023-06-06 Issued: 2023-06-02 02:00 UTC BSCD2000



- Agnesberg
- Tingstad
- Hisingsbron
- Eriksberg
- Tångudden
- Krossholmen
- Vinga





## Annex 4. Example of a potential S-111 Surface Current product (Trollhättan Locks Area, Göta River)

