

**Council**

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**Report and recommendations to the Council of the
International Seabed Authority relating to an application
for approval of a plan of work for exploration by the
Federal Republic of Germany represented by the German
Federal Institute for Geosciences and Natural Resources**

Prepared by the Legal and Technical Commission

I. Introduction

1. On 21 July 2005, the Secretary-General of the International Seabed Authority received a new application for the approval of a plan of work for exploration for polymetallic nodules in the Area. The application was submitted pursuant to the Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area (“the Regulations”) by the Federal Republic of Germany represented by the German Federal Institute for Geosciences and Natural Resources. The application covers two distinct regions of the Pacific nodule belt covering a total area of 149,976 square kilometres.

2. In accordance with the Regulations, on 28 July 2005, the Secretary-General notified all members of the Authority of the receipt of the application and circulated information of a general nature concerning the application. The Secretary-General also placed consideration of the application as an item on the agenda of the Legal and Technical Commission at its meeting, held from 8 to 19 August 2005.

**II. Methodology for consideration of the application by the
Legal and Technical Commission**

3. The Legal and Technical Commission met to consider the application on 11 and 12 and from 15 to 17 August 2005. Prior to commencing a detailed examination of the application, the Commission invited the applicant’s representative, Mr. Michael Wiedicke-Hombach, to make a presentation of the

application. The Commission then structured its work on the application as follows: working groups were established to deal with (a) legal issues; (b) the proposed plan of work for exploration; and (c) technical issues related to the designation of the reserved area. The working groups then reported on their work to the Commission as a whole. When necessary during its deliberations, the Commission invited the representative of the applicant to clarify certain technical issues and to respond to specific queries on the details of the application.¹

4. The Commission noted that, in keeping with the scheme established in annex III, article 6, of the United Nations Convention on the Law of the Sea, it is first required to make an objective determination as to whether the applicant has complied with the Regulations as they relate to the form of applications, has given the necessary undertaking specified in regulation 14 of the Regulations and assurances, possesses the necessary financial and technical capability and (as appropriate) has satisfactorily discharged its obligations under any previous contract with the Authority. The Commission is then required to determine, in accordance with regulation 21(4) and its procedures, whether the proposed plan of work will provide for effective protection of human health and safety and effective protection and preservation of the marine environment and will ensure that installations are not established where interference may be caused to the use of recognized sea lanes essential to international navigation or in areas of intense fishing activity. Regulation 21(5) of the Regulations goes on to provide that:

If the Commission makes the determinations specified in paragraph 3 and determines that the proposed plan of work for exploration meets the requirements of paragraph 4, the Commission shall recommend approval of the plan of work for exploration to the Council.

5. In considering the proposed plan of work for exploration, the Commission had regard to the principles, policies and objectives relating to activities in the Area as provided for in part XI and annex III of the Convention and in the Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 1994 (“the Agreement”).

III. Summary of basic information regarding the application

A. Identification of the applicant

6. Name of applicant: Federal Republic of Germany represented by the German Federal Institute for Geosciences and Natural Resources.

7. Address of applicant:

- (a) Street address: Stilleweg 2, D-30655, Hannover, Germany
- (b) Postal address: Postfach 51-01-53, D-306301, Hannover, Germany
- (c) Telephone number: +49.511.643-0

¹ Mr. Wiedicke-Hombach was elected by the Council as a member of the Legal and Technical Commission on 16 August 2005. However, in view of his position as a representative of the German Federal Institute for Geosciences and Natural Resources (BGR), Mr. Wiedicke-Hombach took no part in the deliberations of the Commission relating to the application.

- (d) Facsimile number: +49.511.643-23 04
 - (e) Electronic mail address: poststelle@bgr.de
8. Applicant's designated representative:
- (a) Name: Professor Friedrich-Wilhelm Wellmer
 - (b) Address: (same as 7)
 - (c) Telephone number: +49.511.643-2244
 - (d) Facsimile number: +49.511.643-3676
 - (e) Electronic mail address: f.wellmer@bgr.de
9. Date of deposit of its instrument of ratification of, or accession or succession to, the 1982 United Nations Convention on the Law of the Sea and the date of its consent to be bound by the Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982: 14 October 1994

B. Area of application

10. The application area of Germany covers a total of 149,976 square kilometres in the Clarion-Clipperton Zone of the Pacific Ocean. The area is divided into two regions. The Western region ("Area W") covers an area of 34,080 square kilometres and has an average water depth of 4,850 metres. The Eastern region ("Area E") covers an area of 115,896 square kilometres and has an average water depth of 4,200 metres. The coordinates and general location of the areas under application are shown in annex I.

C. Other information

- 11. Date of receipt of application: 21 July 2005.
- 12. Previous contracts with the Authority: the applicant has not been previously awarded any contract with the Authority.
- 13. Undertakings: the applicant attached a written undertaking signed by the President of the German Federal Institute for Geosciences and Natural Resources stating that it will comply with regulation 14 of the Regulations.

IV. Examination of information and technical data submitted by the applicant

- 14. The following technical documents were submitted in the application:
 - (a) Information relating to the area under application:
 - (i) Boundaries of the area under application according to the World Geodetic System 1984 (WGS 84);
 - (ii) Chart and a list of the coordinates dividing the total area into two parts of equal estimated commercial value;

- (iii) Data on the areas under application:
- a. Data on the location, survey and evaluation of the polymetallic nodules in the area;
 - b. Description of the technology related to the recovery and processing of polymetallic nodules;
 - Exploration vessels
 - Navigation systems
 - Sampling equipment
 - Free-fall grab (optional with camera)
 - Box corer
 - Television system
 - Echo sounding
 - Seismo-acoustic methods
 - Chemical analysis
 - c. Map of the physical and geological characteristics of the area under application (seabed topography, bathymetry and bottom currents);
 - Seabed topography and bathymetry
 - Bottom currents
 - d. Data on the average density (abundance of polymetallic nodules with abundance map showing the location of sampling sites);
 - e. Data on the average elemental content of metals of economic interest (grade) based on chemical assays in (dry) weight per cent and associated grade maps;
 - f. Combined maps of abundance and grade of polymetallic nodules;
 - g. Calculation on the estimated commercial value of the two areas;
 - h. A description of the techniques used by the applicant;
- (b) Information on wind speed and direction, wave height, period and direction, current speed and direction, water salinity, temperature and biological communities;
- (i) Seasonal environmental parameters in areas “W” and “E”;
 - (ii) Wind speed and direction;
 - (iii) Wave height, period and direction;
 - (iv) Surface current speeds and direction;
 - (v) Water mass characteristics (temperature, salinity, oxygen, phosphate);
 - (vi) Biological communities;
 - (vii) Environmental parameters during the test period of recovery of nodules in areas “W” and “E”;

- (c) References;
- (d) Certificate of sponsorship issued by the sponsoring State;
- (e) Data author, technical device used for recovery, geographic coordinates, water depths, and data on the average density (abundance) and elemental content of the polymetallic nodule samples;
- (f) Information to enable the Council to determine whether the applicant is technically capable of carrying out the proposed plan of work for exploration;
- (g) Plan of work for exploration;
- (h) Training programme (in reference to articles 143 and 144 of the United Nations Convention of the Law of the Sea);
- (i) Technical details of the research vessels used for the recovery of nodules and geophysical mapping of the area under application.

15. It was noted that all technical data submitted in the application had been gathered using standard and recognized methods. The representative of the applicant provided clarifications as required on the information and technical data supplied.

V. Consideration of financial and technical qualifications of the applicant

16. The applicant declares that the German Federal Institute for Geosciences and Natural Resources (BGR) is the geoscientific institution of the German Federal Government. BGR is the successor institution to the data and information obtained by Preussag AG and the German consortium Arbeitsgemeinschaft meerestechnisch gewinbarer Rohstoffe (AMR) in the 1970s and 1980s. Preussag AG, a member of the consortium Ocean Management Inc. (OMI), but sponsored by the Federal Republic of Germany, had previously obtained a manganese nodule exploration licence in 1984 and had carried out substantial activities in the Area, including a pilot-mining test in the manganese nodule belt of the Central Pacific.

17. The Federal Republic of Germany has certified, as part of the application, that an amount in excess of US\$ 30 million was expended in research and exploration activities, including in the location, survey and evaluation of the area referred to in the plan of work for exploration. In accordance with regulation 12(2), of the Regulations, and paragraph 6 (a) (i) of section 1 of the annex to the 1994 Agreement, the applicant shall therefore be considered to have met the financial and technical qualifications necessary for approval of the plan of work for exploration.

18. The Federal Republic of Germany declares that it has the necessary financial resources to meet the estimated costs of the proposed plan of work for exploration.

VI. Consideration of data and information submitted for the designation of a reserved area and determination of equal estimated commercial value

19. The applicant indicated the coordinates dividing the area under application into two areas of equal estimated commercial value. The Council, on the recommendation of the Commission, shall designate one of these areas as the area reserved for the Authority. The other area will become the applicant's exploration area. The calculation of the estimated commercial value was done by the applicant in several steps, which are briefly described below.

A. Methodology used by the applicant in calculation of the estimated commercial value

20. The first step was to define the amount of metals, specifically for copper, nickel and cobalt, for each sampling site in the area under application. This was achieved by multiplying the content of these metals (percentage of dry weight) as derived from chemical analyses with the nodule abundance (kg/m^2) at each site. Thus, the so-called metal density for copper, nickel and cobalt was determined (in kg/m^2) for each site.

21. The second step was to define the commercial value for the calculated metal densities at each site. This is achieved by multiplying the metal densities with the commodity prices for the three metals as quoted in May 2005 in the London publication *Metal Bulletin*. Prices were listed at: copper, \$3.31/kg; nickel, \$16.05/kg; and cobalt, \$74.78/kg. The resulting values of these three metals were then added to define the commercial value of each sampling site (in $\text{US}\$/\text{m}^2$).

22. The third step was to apply statistical methods to the results from sampling sites to be able to calculate the commercial value for the entire area under application. The method employed was the Krigging method, which accommodates regional sampling concentration and also evaluates large distances between individual sampling sites to arrive at an evenly distributed grid of data points; this grid then is used to produce a map of the estimated commercial value in increments of $\text{\$/m}^2$.

23. The last step was to divide the area into two parts of equal estimated commercial value. This was achieved iteratively, by first dividing the area and then calculating the areal size of each commercial-value increment. The results for all increments were then added. If in using this method the commercial values of two sub-areas were found to differ, the process was repeated with a slight geographical shift of the segment boundary. The remaining solution should also consider that sufficient sampling sites were included in each sub-area. The favoured solution suggests subdividing the western application area into an eastern and a western segment and the larger eastern area into a northern and southern segment.

24. The Commission noted that the applicant had expressed no preference with respect to the selection of the reserved area, but had left it to the Commission to make a recommendation to the Council based on its evaluation of the data and information submitted.

B. Evaluation

1. Bathymetry

25. The examination of bathymetric features in the application area was carried out by checking and comparing all maps and information provided by the applicant. The nature of the data available only allows the possibility of a regional analysis of the bathymetry and seafloor geomorphology.

26. The Commission was provided with charts of Krigged bathymetry based on widely spaced data points, along with regional geomorphological interpretative maps for the two areas. In addition to this, the proposal contains a descriptive summary of the seafloor features typically observed in the region.

27. While the bathymetric data and the geomorphological interpretations provide a general understanding of the seafloor topography and relief variations, there is insufficient information to quantify any significant differences between the areas, which might affect nodule abundance or exploration/exploitation operations.

28. Furthermore, owing to scarce data coverage, the Commission decided that it is not meaningful to assess the effect that the extrapolated bathymetry may have on the commercial value of these areas.

2. Nodule abundance and metal content

29. The application area covers two distinct regions. Each region was further divided by the applicant into two sectors, so as to produce two areas (sector W1 + sector E1 and sector W2 + sector E2) each covering approximately 75,000 square kilometres and having equal estimated commercial value. The coordinates and general location of sectors W1 and E1 and sectors W2 and E2 are shown in annex II to the present report. Sectors W1 (15,623 square kilometres) and E1 (61,648 square kilometres) have an aggregate area of 77,271 square kilometres; sectors W2 (18,462 square kilometres) and E2 (54,284 square kilometres) have an aggregate area of 72,746 square kilometres.² The difference between the areas is 4,525 square kilometres.

30. The application is based on data collected during the period from 1976 to 1978. The application area has a total of 624 nodule sampling stations. Sectors W1 and W2 have a total of 267 stations and sectors E1 and E2 have 357 stations. The nodule sampling stations are randomly distributed; sectors W1 and W2 have more regular distribution compared to sectors E1 and E2. In sectors E1 and E2 the nodule sampling stations are concentrated in the eastern part while the rest of the areas are irregularly sampled. The south-western portion has not been sampled at all.

² There is a small difference (of about 0.03 per cent) in the sizes in square kilometres of areas E and W compared to that of sectors E1 plus E2 and W1 plus W2, respectively. This difference is due to calculation of distances between meridians on the surface of the globe while the calculation of the sizes of areas E and W was based on a two-dimensional plane surface. For the calculation of each of the sectors its individual corrected latitudinal lengths were defined while for calculating the total size of area W the latitudinal reference used was 12.88°N; the same holds true for the area E with the latitudinal reference used for calculation being 11.43°N.

31. The applicant defined commercial values as the same as combined metal values without the subtraction of investment and production costs. These make areas of high average content more favourable than the areas with high metal and abundance.

C. Summary and conclusions relating to the determination of equal estimated commercial value

32. The data in the two areas (W1+E1 and W2+E2) has been analysed and the following observations are made with regard to the nodule abundance and metal content:

(a) The bathymetric data do not indicate any special preference in the selection of the reserved area;

(b) Sectors W1 (15,623 square kilometres) and E1 (61,648 square kilometres) have an aggregate area of 77,271 square kilometres; sectors W2 (18,462 square kilometres) and E2 (54,284 square kilometres) have an aggregate area of 72,746 square kilometres. The difference between the areas is 4,525 square kilometres;

(c) Sectors W1 and E1 have a total of 329 sampling stations while sectors W2 and E2 have 295 sampling stations;

(d) The average abundance in both areas is nearly comparable with sectors W2 and E2 having 11.04 kg/m² and sectors W1 and E1 having 11.135 kg/m²;

(e) The variance and standard deviation of the abundance in sectors W2 and E2 areas is considerably higher than that in sectors W1 and E1;

(f) The copper, nickel and cobalt content is marginally higher in sectors W1 and E1 (1.0689, 1.33, 0.18 per cent respectively) compared to sectors W2 and E2 (1.0683, 1.289, 0.171 per cent respectively);

(g) The commercial value as provided in the document for the two areas is nearly the same.

33. Evaluation of charts provided in the application shows that sectors W2 and E2 have large pockets of high commercial value (up to \$9/m²). Sectors W1 and E1 have a larger number of smaller size pockets of high commercial value (up to \$6/m²). From a commercial point of view, sector W2, which has a pocket of high commercial value, may be beneficial as the returns will be higher in the area. Around 20 per cent of sector W2 has a very high commercial value.

34. However, if the area has to be considered as a whole, there are around five or six smaller size pockets of high commercial value in sectors W1 and E1. But the high commercial value in sectors W1 and E1 is not more than in \$6/m² in most of the area. Sectors W2 and E2 are comparatively less sampled and also the abundance values show larger variability with high standard deviation values.

35. Based on the results of investigations and analysis of the data available at the present level of prospecting and exploration and taking into consideration the attendant uncertainty in the estimates, the Commission was of the view that both areas offered similar potentials in terms of finding competitive mine sites. However, based on the above considerations as to nodule abundance and metal contents, the

Commission decided to recommend to the Council to designate sectors W2 and E2 as the area reserved for the Authority.

VII. Consideration of data and information submitted for approval of the plan of work for exploration

36. In accordance with regulation 18 of the Regulations, the application included data and information for approval of the plan of work for exploration:

(a) A general description and a schedule of the proposed exploration programme, including the programme of activities for the immediate five-year period, such as studies to be undertaken in respect of the environmental, technical, economic and other appropriate factors that must be taken into account in exploration (Application, attachment 5, section (a));

(b) A description of the programme for oceanographic and environmental baseline studies in accordance with the Regulations and environmental rules, regulations and procedures established by the Authority that would enable an assessment of the potential environmental impact of the proposed exploration activities, taking into account any recommendations issued by the Legal and Technical Commission (Application, attachment 5, section (b));

(c) A preliminary assessment of the possible impact of the proposed exploration activities on the marine environment (Application, attachment 5, section (c));

(d) A description of proposed measures for the prevention, reduction and control of pollution and other hazards, as well as possible impacts, to the marine environment (Application, attachment 5, section (d));

(e) A schedule of anticipated yearly expenditures in respect of the programme of activities for the immediate five-year period (Application, attachment 5, section (a) and page 96).

VIII. Training programme

37. In accordance with regulation 27 of the Regulations and articles 143 and 144 of the Convention, the application included a proposed training programme, described in Attachment 7 to the application as follows:

“(a) ISA shall define two persons to participate in German marine research cruises of opportunity. Participants will take part in the cruise and the work at sea and will then visit BGR in Hannover for a time period of four to six weeks. The training will include instructions on modern geophysical and geological survey methods, selection of suitable sites for sampling, conservation of samples taken in part for highly specialized investigations; training in Hannover will focus on planning and conceptual work and completion of a cruise report.

“Cruises:

- I. 2006: RV SONNE cruise off Sumatra/Indonesia

II. 2008: RV SONNE cruise to the licence area, central Pacific

III. 2010: cruise to be determined

“The costs equivalents for these measures are estimated to be 60,000 euro

“(b) BGR together with the German institutes Geomar in Kiel, the University of Bremen and the Centre for Tropical Marine Ecology (ZMT) in Bremen will organize a four-month training course for two participants, to be selected by the ISA. This course will address issues of marine management.

“The cost equivalents for these measures are estimated to be 30,000 euro.”

38. The Commission would suggest that the applicant should provide a more detailed elaboration of the proposed training programme prior to drawing up of the contract for exploration.

IX. Conclusion and recommendations

39. Having examined the particulars submitted by the applicant, which are summarized in parts III and V above, the Commission is satisfied that the application has been duly submitted in accordance with the Regulations and that the applicant:

(a) Has complied with the provisions of the Regulations;

(b) Has given the undertakings and assurances specified in regulation 14;

(c) Possesses the financial and technical capability to carry out the proposed plan of work for exploration.

40. The Commission is satisfied that none of the conditions in regulation 21(6) of the Regulations apply.

41. With respect to the designation of a reserved area, the Commission recommends that the Council designate sectors W2 and E2, as shown in annex II, as the reserved area. The Commission recommends that sectors W1 and E1, as shown in annex II, be allocated to the applicant as its exploration area.

42. With respect to the proposed plan of work for exploration, the Commission is satisfied that the proposed plan of work for exploration will:

(a) Provide for effective protection of human health and safety;

(b) Provide for effective protection and preservation of the marine environment;

(c) Ensure that installations are not established where interference may be caused to the use of recognized sea lanes essential to international navigation or in areas of intense fishing activity.

43. Accordingly, pursuant to the 1994 Agreement, annex, section 1, paragraph 6(a)(i), and regulation 21(5), of the Regulations, the Commission recommends to the Council approval of the plan of work for exploration submitted by the Federal Republic of Germany.

Annex I

Coordinates and map of general location of the area under application

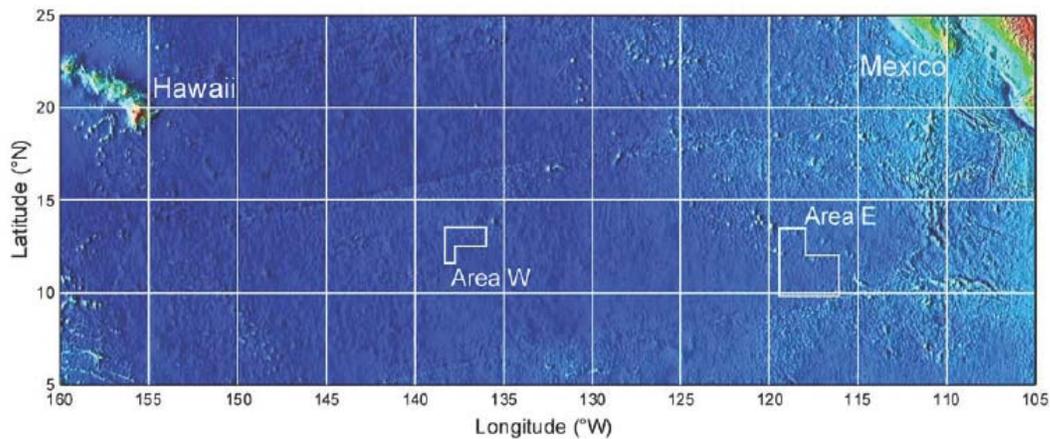
Area “W”

Starting point 1:	N 13°30’/W 138°22’
E to 2:	N 13°30’/W 136°00’
S to 3:	N 12°30’/W 136°00’
W to 4:	N 12°30’/W 137°50’
S to 5:	N 11°38’/W 137°50’
W to 6:	N 11°38’/W 138°22’ return
N to Starting point 1:	N 13°30’/W 138°22’

Area “E”

Starting point 1:	N 13°26’/W 119°25’
E to 2:	N 13°26’/W 118°00’
S to 3:	N 12°00’/W 118°00’
E to 4:	N 12°00’/W 116°04’
S to 5:	N 09°45’/W 116°04’
W to 6:	N 09°45’/W 119°25’ return
N to Starting point 1:	N 13°26’/W 119°25’

The total area under application amounts to 149,976 square kilometres. Area “W” has a total area of 34,080 kilometres, Area “E” has a total area of 115,896 square kilometres.



Annex II

Delineation of proposed reserved area and exploration area

Sector W1

Starting point 1:	N 13°30'/W 138°22'
E to 2:	N 13°30'/W 137°32'
S to 3:	N 12°30'/W 137°32'
W to 4:	N 12°30'/W 137°50'
S to 5:	N 11°38'/W 137°50'
W to 6:	N 11°38'/W 138°22' return
N to Starting point 1:	N 13°30'/W 138°22'

Sector W2

Starting point 1:	N 13°30'/W 137°32'
E to 2:	N 13°30'/W 136°00'
S to 3:	N 12°30'/W 136°00'
W to 4:	N 12°30'/W 137°32' return
N to Starting point 1:	N 13°30'/W 137°32'

Sector E1

Starting point 1:	N 13°26'/W 119°25'
E to 2:	N 13°26'/W 118°00'
S to 3:	N 12°00'/W 118°00'
E to 4:	N 12°00'/W 116°04'
S to 5:	N 11°05'/W 116°04'
W to 6:	N 11°05'/W 119°25' return
N to Starting point 1:	N 13°26'/W 119°25'

Sector E2

Starting point 1:	N 11°05'/W 119°25'
E to 2:	N 11°05'/W 116°04'
S to 3:	N 09°45'/W 116°04'
W to 4:	N 09°45'/W 119°25' return
N to Starting point 1:	N 11°05'/W 119°25'

