



DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
KAGAWARAN NG KAPALIGIRAN AT LIKAS YAMAN



MEMORANDUM

TO : The Regional Executive Directors
DENR IX, X, XI, XII and XIII

FROM : The Undersecretary
Field Operations – Mindanao

SUBJECT : **MANUAL ON THE DELINEATION OF MEAN HIGH WATER LINE (MHWL)**

DATE : 16 FEB 2024

This is to furnish your offices a copy of the Manual on the Delineation of Mean High Water Line (MHWL) dated 01 December 2023 from the National Mapping and Resource Information Authority (NAMRIA) which was transmitted to this office by the Undersecretary for Policy, Planning and International Affairs through a memorandum dated 13 February 2023.

The said manual provides the procedures for delineating MHWL along applicable coastal areas nationwide as a reference to no-build zones, other legal easements, or foreshore areas. In addition, it provides the location of the reference line for the measurement of legal easements and foreshore areas along shorelines.

For information, reference and guidance.


JOSELIN MARCUS E. FRAGADA, CESO III

Copy Furnished:

- The Undersecretary for Policy, Planning and International Affairs
- The Assistant Secretary for Field Operations – Western Mindanao
- The Assistant Secretary for Field Operations – Eastern Mindanao

Visayas Avenue, Diliman, Quezon City 1100, Philippines
www.denr.gov.ph



DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
KAGAWARAN NG KAPALIGIRAN AT LIKAS YAMAN



MEMORANDUM

FOR/TO : **The Undersecretary**
Field Operations – Luzon, Visayas, and Environment

The Undersecretary
Field Operations – Mindanao

The Assistant Secretary
International Affairs
Director, Biodiversity Management Bureau
in concurrent capacity

The OIC Assistant Secretary
Field Operations – Western Mindanao
Director, Forest Management Bureau
in concurrent capacity

FROM : **The Undersecretary**
Policy, Planning, and International Affairs

SUBJECT : **MANUAL ON THE DELINEATION OF MEAN HIGH WATER
LINE (MHWL)**

DATE : FEB 13 2024

This is to respectfully provide your Office with a copy of the National Mapping and Resource Information Authority's (NAMRIA) Manual on the Delineation of Mean High Water Line (MHWL) dated 1 December 2023.

The said manual provides the procedures for delineating MHWL along applicable coastal areas nationwide as a reference to no-build zones, other legal easements, or foreshore areas. In addition, it provides the location of the reference line for the measurement of legal easements and foreshore areas along shorelines.

For your information and reference.


ATTY. JONAS R. LEONES

Undersecretary for Policy, Planning and International Affairs <ouppia@denr.gov.ph> ⁰²⁷⁶

NAMRIA Manual on the Delineation of Mean High Water Line

planning NAMRIA <planning@namria.gov.ph>

Wed, Jan 31, 2024 at 1:20 PM

To: "Undersecretary for Policy, Planning and International Affairs" <ouppia@denr.gov.ph>

Good day!

Attached herewith is the NAMRIA Memorandum to the Undersecretary for Policy, Planning, and International Affairs concerning the action item during the Pre-Reprogramming Hybrid Meeting held on January 19, 2024, we are providing you herewith a copy of the aforementioned manual.

For your reference.

Thank you

Jarence B, Garrate
Project Development Assistant III
Policy Development and Implementation Section
Policy and Planning Division
Support Services Branch
National Mapping and Resource Information Authority
Lawton Avenue, Fort Andres Bonifacio, 1634 Taguig City, Philippines



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NAMRIA Memorandum_ Manual on the Delineation of Mean High Water Line.pdf

2769K



Republic of the Philippines
Department of Environment and Natural Resources
NATIONAL MAPPING AND RESOURCE INFORMATION AUTHORITY
www.namria.gov.ph

MEMORANDUM

FOR : **The Undersecretary**
Policy, Planning and International Affairs
Department of Environment and Natural Resources (DENR)

FROM : The Administrator
National Mapping and Resource Information Authority
(NAMRIA)

SUBJECT : **NAMRIA Manual on the Delineation of Mean High Water
Line (MHWL)**

DATE : JAN 30 2024

In line with our agency's mandate to provide map-making services to the DENR and other government agencies and the NAMRIA Strategic Plan 2021-2028 commitments on Policy Reform, the Manual on the Delineation of MHWL was formulated by the NAMRIA and issued on December 01, 2023. In this regard and in response to the action item during the Pre-Reprogramming Hybrid Meeting held on January 19, 2024, we are providing you herewith a copy of the aforementioned manual.

The NAMRIA strongly supports the DENR's program for Green Economy Models and Coastal and Marine Ecosystems. This manual provides the procedures for delineating MHWL along applicable coastal areas nationwide as a reference to no-build zones, other legal easements, or foreshore areas. In addition, it provides the location of the reference line for the measurement of legal easements and foreshore areas along shorelines.

An inter-branch actual fieldwork was conducted on 03-11 October 2022 along the coastal areas in Puerto Galera, Oriental Mindoro to validate various methods for the delineation. The most acceptable method at the moment is the use of tidal predictions. The approved technical manual has undergone the NAMRIA policy formulation process by the Policy Technical Working Group and was reviewed and deliberated on by the NAMRIA Policy Reform Steering Committee Meeting on 30 January 2023, 04 May 2023, and 21 September 2023.

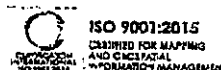
For your reference.



Usec. **PETER N. TIANGCO, PhD, CESO I**

NAMRIA OFFICES:

Lawton Avenue, Fort Bonifacio, 1634 Taguig City, PH ☎ (632) 8810-4831 to 41
421 Barraca St., San Nicolas, 1010 Manila, PH ☎ (632) 8241-3494 to 98



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DEC 01 2023

ADMINISTRATIVE ORDER

NO. 2023 - 102 *gr*

SUBJECT: Manual on the Delineation of Mean High Water Line (MHWL)

Pursuant to the mandates of the National Mapping and Resource Information Authority (NAMRIA), as provided for in Section 22(a) of Executive Order (EO) No. 192 or the Reorganization Act of the Department of Environment and Natural Resources (DENR) and in accordance with Article 51 of Presidential Decree (PD) 1067 or The Water Code of the Philippines, Sections 54 and 55, Article 11 of the DENR Administrative Order (DAO) 2007-29 on the Revised Regulation on Land Surveys, and Section 6 of DAO 2021-07 or the Guidelines on the Establishment of Legal Easements Along the Seas, Rivers, Lakes, Esteros, and Creeks, this manual is hereby issued for the guidance of all concerned.

SECTION 1. Basic Policy. In line with the NAMRIA's mandate to provide map-making services to the DENR and other government agencies and to act as the central mapping agency to support the conservation, management, development, and proper utilization of the country's environment and natural resources, the NAMRIA shall issue guidelines for locating the reference line for measuring legal easements and foreshore areas along shorelines.

SECTION 2. Objective. This manual shall provide guidelines on the delineation of the Mean High Water Line (MHWL) as a reference for no-build zones, legal easements, and foreshore areas along applicable coastal regions nationwide.

SECTION 3. Scope and Coverage. This manual covers the nationwide delineation of the MHWL for coastal areas affected by tides, such as shorelines facing oceans or seas. It shall not be applied under the following conditions:

- a. Water areas such as lakes, rivers, streams, esterros, creeks, and other similar bodies of water;
- b. Areas where the shoreline intersects a cliff such that the intersection is the natural boundary of the MHWL;
- c. Coastal areas as defined under the Expanded National Integrated Protected Area System (ENIPAS); and
- d. Where shorelines are altered due to natural processes or man-made activities.

1 | Page *gr*

SECTION 4. Definition of Terms. The words, phrases, or terms used herein, unless the context otherwise indicates, shall have the following meanings:

- 4.1. **Backwash Wave** – a wave that forms when a mass of water (from swash) goes back to the ocean and encounters a regular wave (in a wet beach) in an opposite direction.
- 4.2. **Cliff** – a land mass that is vertically or nearly vertically sloped at the coast.
- 4.3. **Comparison of Simultaneous Observations** – a method of reducing tidal datums of subordinate tide stations into its equivalent National Tidal Datum Epoch (NTDE) values.
- 4.4. **Control Tide Station** – a primary/standard tide station used as a reference station for the comparison of simultaneous observations.
- 4.5. **Delineation** – the act of describing the limits or boundaries by drawing lines or outlines.
- 4.6. **Elevation** – the vertical distance of a particular point with respect to a selected datum, e.g., mean sea level.
- 4.7. **Geodetic Control Point (GCP)** – a monumented or otherwise marked, survey point established for the purpose of providing geodetic reference for mapping and charting activities and for a wide variety of engineering and scientific applications. A control point is normally identified by a number, an alphanumeric symbol, or a concise, intelligible name which is usually stamped on the disk marker.
- 4.8. **Global Navigation Satellite System (GNSS)** – a general term describing any satellite constellation that provides positioning, navigation, and timing services on a global or regional basis.
- 4.9. **Harmonic Analysis** – a method used to analyze tides and often used in software applications to derive harmonic constants, e.g., Tidal Analysis Software Kit (TASK) and ASEAN tidal analysis software.
- 4.10. **Harmonic Constants** – amplitudes and time lags of the harmonic constituents of the tide or tidal current at any place.
- 4.11. **Legal Easement** – an easement by necessity constituted by law which has for its object either for public use or the interest of private persons. For the purpose of recreation, navigation, floatage, fishing, and salvage, the bank of esteros, arroyos, creeks, and rivers throughout their entire lengths, situated in urban areas, agricultural areas, and forested areas shall be subject to the three (3) meters, 20 meters, 40 meters easement for public use, respectively.
- 4.12. **Mean High Water (MHW)** – a tidal datum; the average of the high-water heights at a tide station over a 19-year period.

- 4.13. Mean High Water Point (MHWP) point/s of the intersection between the shore and the MHW datum plane.
- 4.14. Mean High Water Line (MHWL) – a line derived from the connections of a series of MHWP.
- 4.15. National Tidal Datum Epoch (NTDE) the specific 19-year period adopted by the NAMRIA for which mean tidal values are obtained for tidal datums.
- 4.16. Primary/Standard Tide Station – a tide station where continuous observations have been made over a minimum of 19 years.
- 4.17. Salvage Zone - land measuring 20 meters from the shoreline for easement purposes.
- 4.18. Secondary Tide Station – a tide station where continuous observations have been made over a minimum period of one (1) year but less than 19 years.
- 4.19. Subordinate Tide Station – a tide station where continuous observations have been made over a minimum period of 30 days but less than one (1) year.
- 4.20. Table Hourly Values – tabulation of hourly mean values to produce a daily mean and monthly mean value.
- 4.21. Tidal Datum a base elevation used as a reference from which to reckon heights or depths.
- 4.22. Tide – the periodic rise and fall of a body of water due principally to the gravitational interactions between the sun, moon, and earth.
- 4.23. Tide and Current Tables an annual NAMRIA publication of predicted tides and currents.
- 4.24. Tide Gauge -- a device for measuring the rise and fall of the tide; can either be analog or digital.
- 4.25. Tide Gauge Benchmark (TGBM) – a permanent, stable object containing a marked point of known elevation with respect to a datum used as a reference level for tidal observations.
- 4.26. Tide Staff – a tide gauge consisting of a vertical graduated pole from which the height of the tide at any time can be read directly.

SECTION 5. Establishment of Mean High Water (MHW) Datum. The following section shall describe the actual procedures in the establishment of the MHW datum.

5.1. Tidal Datum from Primary and Secondary Tide Stations

The MHW tidal datum can be obtained from primary and/or secondary tide stations that are established and maintained by the NAMRIA. The MHW tidal

datum obtained from the agency's primary and secondary tide stations shall be used as a reference for the survey area/s without any reduction of the mean tidal value.

5.2. Tidal Datum from Subordinate Tide Station

In coastal areas, the tidal datum serves as the reference local datum and is used to determine the height of the water as it relates to land. In cases where a local datum is not known, the NAMRIA shall establish a subordinate tide station and conduct tidal observations in accordance with the NAMRIA Quality Management and Operations Manual on Physical Oceanography (NQMOM-PO).

5.2.1. Tidal Observations

In general, tidal observation shall be conducted continuously for at least 30 days using a tide gauge recording/reading of 10-minute intervals and a tide staff for visual tide comparison. The observer shall conduct visual tide staff readings at least twice daily, morning and afternoon for the duration of the tidal observation and record these readings using the Check Sheet¹. In conjunction with the tidal observation, at least five (5) TGBM shall be established to refer the tidal elevation to the ground. The Criteria for the establishment of TGBM shall be referred to the NAMRIA QMOM-PO.

5.2.2. Tidal data processing and analysis

In tidal data processing, it is important to check for errors. Ten (10)-minute recordings should be reduced to hourly values. To adjust hourly data for discrepancies between visual tide staff readings and recorded tidal data, use the Comparative Readings worksheet. Apply the difference to reduce the zero-tide staff (OTS).

Tidal analysis can be performed using harmonic analysis. Harmonic constants can be derived using various software applications, including Tidal Analysis Software Kit (TASK) and ASEAN tidal analysis software.

5.2.3 Comparison of Simultaneous Tidal Observations

To compute the local tidal datum, use the High and Low Waters worksheet. The computed local tidal datum obtained from tidal observations shall be reduced using the Comparison of Simultaneous Tidal Observation technique, which is provided in the Comparison of Simultaneous Observations worksheet.

This technique uses a primary tide station as a control station to reduce subordinate station tidal data to its equivalent National Tidal Datum Epoch

¹ All forms used in this Manual shall conform with the current templates uploaded in the NAMRIA Forms Portal.

(NTDE) 19-year mean values. In the conduct of this technique, it is important to select a suitable primary tide station with similar tidal characteristics to that of the subordinate station.

5.3. Tidal Data Validation

The surveyor shall submit the results of their tidal observation to the Physical Oceanography Division, Hydrography Branch for validation and certification.

SECTION 6. Delineation of MHW Line Using of Tidal Prediction. To determine the MHW points or lines at the coastline of a particular area, tidal prediction is the most common and practical method used. This method is suitable for project sites that are located within 10 kilometers from a tide station. If the project site is situated farther than this distance, tidal observation must be conducted in accordance with Section 5 of this manual.

The MHW points/line is the intersection between the planes of the coast and the MHW. The NAMRIA Tide and Current Tables only provides the times of high and low waters at a specific tide station; however, the MHW time can be interpolated from tidal predictions.

Determination of the MHW points on the shore shall be done only during calm sea conditions or with no prevailing local weather disturbance. Furthermore, the observation shall be done during the times of the MHW.

6.1. The following are the steps to actually determine the MHWL.

6.1.1. Generate tidal predictions of the tide station at 10-minute intervals of the intended survey period.

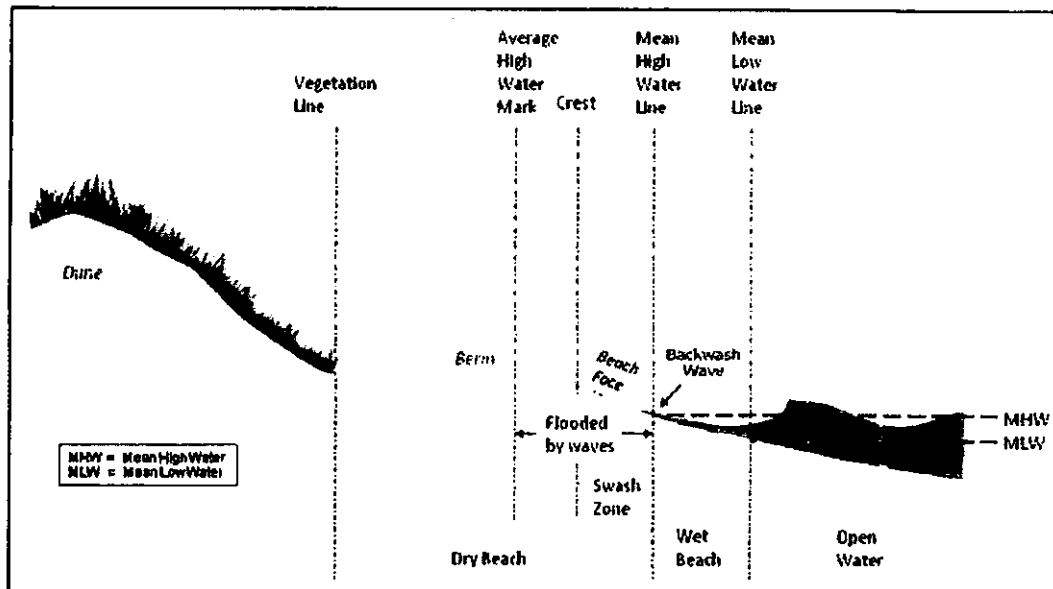
6.1.2. From the 10-minute interval tidal predictions, determine the dates and times of the MHW. In determining the time frame for actual identification, a +/- 5cm value of the MHW within the prediction table is still acceptable.

6.1.3. On the ground, identify specific points along the relevant coastline during the MHW. The number of points to be marked should be determined based on the configuration of the coastline. For a curved coastline, the number of points shall be identified so as not to cut off a great portion of the coast.

6.1.4. The MHW point shall be identified by averaging at least three consecutive backwash waves observed during MHW, and marking or staking the identified MHW points. (Please see Figure 1 on the next page).

6.1.5. Use appropriate survey methods (e.g., GNSS, Total Station) to derive the geodetic position of MHW points, connecting them consecutively to derive the MHWL.

Figure I. Legal and Geological Zonation along the Beach (Backwash Wave)²



SECTION 7. Responsibilities.

The NAMRIA branches shall have the following responsibilities:

7.1. Hydrography Branch (HB)

- 7.1.1. Provides tidal predictions of the reference tide station
- 7.1.2. Conducts tidal observations to establish new local tidal datums
- 7.1.3. Processes and analyze tidal data
- 7.1.4. Conducts the actual field survey for the delineation of the MHWL
- 7.1.5. Conducts GNSS-RTK survey on the identified MHW points

7.2. Mapping and Geodesy Branch

- 7.2.1. Provides horizontal control points (i.e., GCPs)
- 7.2.2. Establishes new control points for the survey

² Source: Titus, James G., *Rolling Easements, Climate Ready Estuaries Program, U.S. Environmental Protection Agency, June 2010*

7.2.3. Conducts the actual field survey for the delineation of the MHWL

7.2.4. Conducts GNSS-RTK survey on the identified MHW points

7.3. Other branches may conduct the actual delineation of the MHW line with the supervision of the HB.

SECTION 8. Separability Clause. If any provision of this Order shall be held invalid or inconsistent with existing laws and regulations, the other portions or provisions hereof which are not affected shall continue in full force and effect.

SECTION 9. Repealing Clause. All Orders and other similar issuance inconsistent herewith are hereby revoked, amended, or modified accordingly.

SECTION 10. Effectivity. This Order shall take effect upon signing.


Uscc **PETER N. TIANGCO, PhD, CESO I**
Administrator

APPENDIX 3. NAMRIA-PO-Form10 Rev01

HIGH AND LOW WATERS



NAMRIA Form 10 Rev 01

Page

Station			Latitude	
Observations Begin		End	Longitude	
Time Meridian			Distance below Bench Mark (if any made)	
Height Datum				

Date Year	Moon's Transit (Greenwich Time) (GMT)	Time of		Lunar Interval		Height of		Remarks
		High Water	Low Water	High Water	Low Water	High Water	Low Water	
month day	0000	0000	0000	0000	0000	meter	meter	
1	
2	
3	
4	
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10/19/14

APPENDIX 3. NAMRIA-PO-Form10 Rev01

HIGH AND LOW WATERS



NAMRIA Form 10

17
Sum Carried Forward									
Station					Latitude				
Date of Highest Tide				Height		Longitude			
Date of Lowest Tide				Height					
(k1+Q1)+M2 OR 2(DMO+OLO)/No				F(Mn)		FX			

Date Year:	Moon's Transit (Greatest near 0000)	Time of High Water	Lunatic Interval		Height of		High Water	Low Water	Remarks
			High Water	Low Water	High Water	Low Water			
moon day	hour	MOON	MOON	MOON	MOON	order	order		
Bought Forward									
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
Sum							HHW	LLW	Sum

COMPARISON OF SIMULTANEOUS OBSERVATIONS



NAMRIA 10 Form 11

Differences and ratios (3), (23), (24), (25), (26)					
Corrected values for subordinate station					
Mean LSW on staff at subordinate station = $MTL - 1/2MN =$					
Mean LSW on staff at subordinate station = $MTL - 1/2MN - DLQ =$					
Mean HW on staff at subordinate station = $MTL + 1/2MN =$					
Mean HW on staff at subordinate station = $MTL + 1/2MN + DHQ =$					

Computed by:				
	Name	Signature	Designation	Date
Checked by:				
	Name	Signature	Designation	Date