

# **Consolidated Observation Requirements List (CORL)**

## **NOAA Program Observation Requirements Document (PORD)**

**FINAL with Requirements Validation  
Version 1.1  
FY2013**

**Weather Ready Nation (WRN) Goal**

**Improved Freshwater Resource  
Management (IWF) Objective**

**December 10, 2012**

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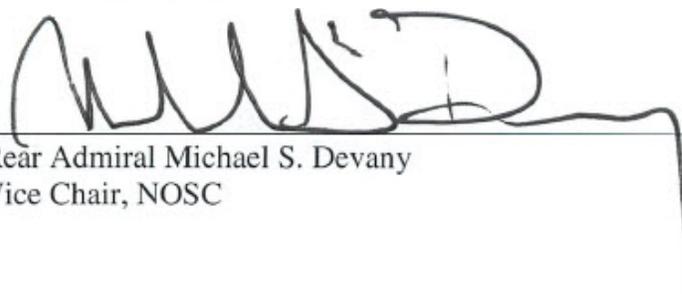
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## Signatures

### Observation Requirement Validation

#### **NOSC Endorsement**

The NOSC has received the Improved Freshwater Resource Management Objective's Observation Requirements with Goal Lead and Line Office concurrence, and is satisfied with the Level-of-Validation provided for the Priority-1 Requirements.

 _____ Dr. Kathryn Sullivan Chair, NOSC	1/24/13 _____ Date	 _____ Endorsed
 _____ Mary Kicza Vice Chair, NOSC	1/3/13 _____ Date	 _____ Endorsed
 _____ Laura Furgione Vice Chair, NOSC	1/4/13 _____ Date	 _____ Endorsed
 _____ Rear Admiral Michael S. Devany Vice Chair, NOSC	1/24/13 _____ Date	 _____ Endorsed

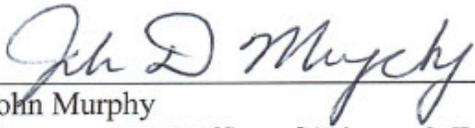
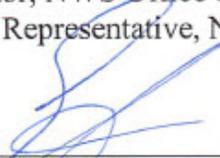
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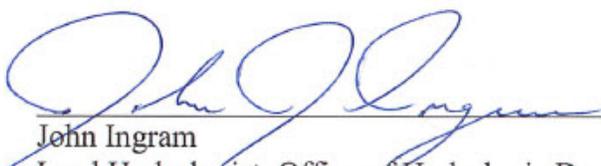
**NOSC and Line Office Concurrence**

The Improved Freshwater Resource Management Objective's NOSC and Line Office Representatives concur with the Observation Requirements and are satisfied with the Level-of-Validation provided for the Priority-1 Requirements.

 _____ John Murphy Director, NWS Office of Science & Technology NWS Representative, NOSC	<u>18 Dec 12</u> Date	 _____ Concurred
 _____ Ed Johnson Goal Lead, Weather and Water Goal	<u>12/11/12</u> Date	 _____ Concurred
 _____ Jason Tuell Acting Director, Office of Hydrologic Development	<u>12/11/12</u> Date	 _____ Concurred

**Program Manager Validation**

The Improved Freshwater Resource Management Program Manager has validated the Priority-1 Observation Requirements by providing the Documentation listed in Appendix B as evidence of a substantiated basis for each of the five key attributes of those requirements.

 _____ John Ingram Lead Hydrologist, Office of Hydrologic Development	<u>12-11-12</u> Date	 _____ Validated
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**Observation Requirement Verification**

The Program Manager, with Program Membership concurrence, has verified that the Improved Freshwater Resource Management Objective's Observation Requirements, as documented in the CORL and reproduced in this document, comprise the Improved Freshwater Resource Management Objective's Threshold and Objective level requirements for environmental observations, and are ready for Validation.

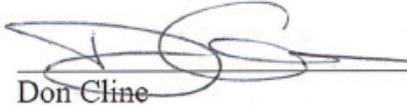
**Program Manager Verification**

  
\_\_\_\_\_  
John Ingram  
Lead Hydrologist, Office of Hydrologic Development

12-11-12  
Date

✓  
Verified

**Program Membership Concurrence**

  
\_\_\_\_\_  
Don Cline

12/12/12  
Date

✓  
Concurred

  
\_\_\_\_\_  
David Kitzmiller

01/02/2013  
Date

✓  
Concurred

  
\_\_\_\_\_  
Michael Smith

12/18/2012  
Date

✓  
Concurred

  
\_\_\_\_\_  
Brian Cosgrove

12/19/12  
Date

✓  
Concurred

## 1. Program Summary

Managing freshwater quantity and quality is one of the most significant challenges the U.S. must address in the 21st century. Demands for water continue to escalate, driven by agricultural, energy, commercial, and residential usage, particularly in urban areas. Sustained growth requires viable long-term municipal water supplies and, by extension, sophisticated predictions and management practices. The Nation's water resource managers need new and better integrated information to manage limited or excessive water supplies more proactively and effectively in a changing and uncertain environment. Working with core partners—the USGS and the USACE—NOAA will integrate and extend its water prediction capabilities to provide information and forecasts for a full suite of water services. NOAA will improve its outreach to resource managers to improve their understanding and application of models and forecasts as they make decisions and manage risk. Interrelated to NOAA's objective to improve coastal water quality in the Resilient Coastal Communities and Economies goal, this objective applies to all coastal and inland waterways and addresses challenges associated with too much, not enough, or poor quality water.

To achieve this objective, NOAA and its partners will enhance the integration and utility of water services by developing integrated decision-support tools for water resource managers based on high resolution summit-to-sea data and information. NOAA will expand water services by providing forecasts for such parameters as water quality, flow, temperature, dissolved oxygen content, and soil moisture conditions for inland and coastal watersheds. Improved and expanded water services will require new technologies to increase information access and dissemination, as well as research and development to advance understanding of precipitation, temperature, evaporation and other hydrologic processes in an Earth system framework. NOAA will improve modeling and prediction capabilities by implementing high-resolution hydrologic and hydraulic models, integrating long-range weather and water forecasting, and improving the confidence of hydrologic forecasts. Critical to NOAA's success will be the ability to expand river, surface, and remote observations, and leverage the observations of partners.

## 2. Observation Requirements Summary

The **Improved Freshwater Resource Management** Objective of NOAA's Weather Ready Nation Goal requires a total of 50 environmental observation requirements to address its mission. The following graphs provide a breakdown of these requirements by mission Priority, environmental Discipline and Type.

Total Records: 50

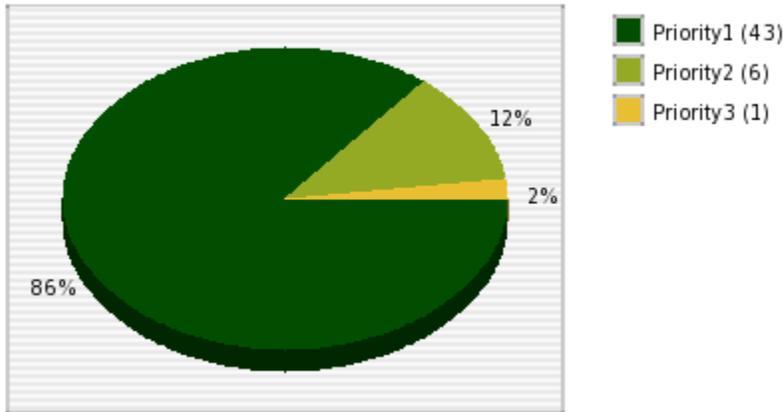
### 2.1 Observation Requirements by Priority

The Improved Freshwater Resource Management Objective's observation requirements are distributed among priority levels as follows:

- 43 = **Priority 1, Mission Critical:** Cannot meet operational mission objectives without this data.
- 6 = **Priority 2, Mission Optimal:** Data not critical but would provide significant improvement to operational capability.

1 = **Priority 3, Mission Enhancing:** Needed to enhance state of knowledge / assess potential for operational capability.

The following chart provides the distribution of the Improved Freshwater Resource Management Objective's requirements by priority.



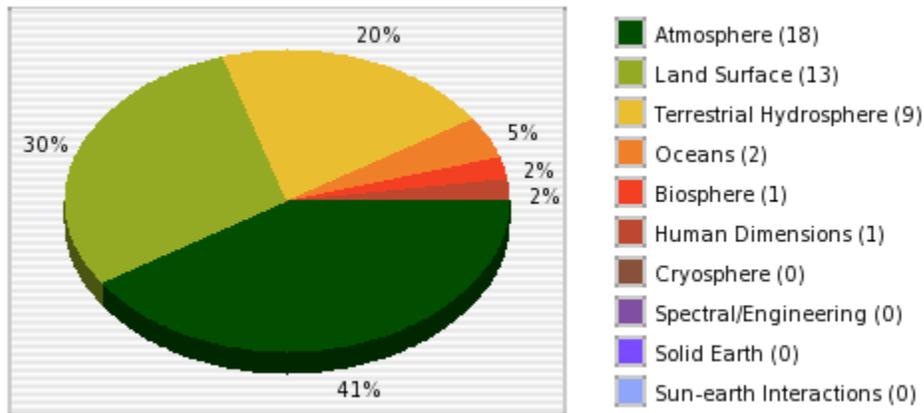
**Figure 1: WRN-IWF Observation Requirements by Priority (%)**

## 2.2 Observation Requirements by Discipline

The Improved Freshwater Resource Management Objective's observation requirements are distributed among environmental disciplines as follows:

- 18 = Atmosphere
- 1 = Biosphere
- 0 = Cryosphere
- 1 = Human Dimensions
- 9 = Terrestrial Hydrosphere
- 13 = Land Surface
- 2 = Oceans
- 0 = Solid Earth
- 0 = Spectral/Engineering
- 0 = Sun-earth Interactions

The following chart provides the distribution of the Improved Freshwater Resource Management Objective's requirements by discipline.



**Figure 2: IFRM Observation Requirements by Discipline.**

### **2.3 Observation Requirements by Type**

The Improved Freshwater Resource Management Objective's observation requirements are distributed among types as follows:

- 0 = Biological
- 0 = Chemical
- 29 = Physical
- 0 = Social
- 0 = Socio-economic
- 0 = Other

The following Chart gives the distribution of the Improved Freshwater Resource Management Objective's requirements by type.

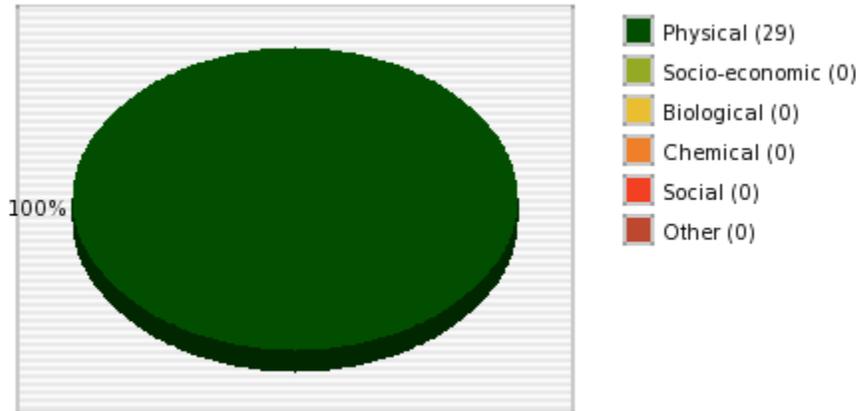


Figure 3: WRN-IWF Observation Requirements by Type.

### 3. Observation Requirements Mapping to Performance Measures

The following table provides the listing of observation requirements for the **Improved Freshwater Resource Management** Objective of NOAA's Weather Ready Nation Goal by GPRA and Corporate (NOAA) Performance Measures, and Regional Collaboration Priorities (RC).

**GPRA-1:** WRN-LFW, WRN-IWF Flash Flood Warnings - Lead Time

**GPRA-2:** WRN-LFW, WRN-IWF Flash Flood Warnings - Accuracy

**NOAA-1:** WRN-IWF Lead time for river flood warnings

The IWF Objective has determined that all Priority 1 IWF Objective observing requirements map to these three Performance Measures.

### 4. Status of Objective List

As shown in Appendix A, each NOAA Observation Requirement is further specified by spatial, temporal and accuracy related attributes at both Threshold and Objective levels. The following table provides the attribute completion status of the observation requirements list for the Improved Freshwater Resource Management Objective. All attributes at the Priority-1/Threshold Level must be completed to allow for observation gap analyses to be conducted.

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**Table 1: WRN-IWF Observation Requirement Attributes Remaining [blank] or [tbs]**

<b>Priority</b>	<b>Key Threshold Attributes</b>	<b>Objective Attributes</b>
1	0	0
2	0	0
3	0	0
<b>Total</b>	0	0

Note: The five key attributes are: Geographic Coverage, Vertical Resolution, Horizontal Resolution, Measurement Accuracy, and Sampling Interval.

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## Appendix A Improved Freshwater Resource Management Objective, Observation Requirements

Key: V=value, U=units, W=weight

Observation Requirement	Obs Req Prty	T/O	Geo Coverage		Vertical Resolution			Horizontal Resolution			Measurement Accuracy			Sampling Interval			Data Latency		
			V	W	V	U	W	V	U	W	V	U	W	V	U	W	V	U	W
Air Temperature: Profiles	1	T	North America+US Territories	20	0.5	km	20	10	km	20	1	K	10	15	min	10	15	min	20
		O	North America+US Territories	20	0.5	km	20	1	km	20	0.5	K	10	15	min	10	15	min	20
Air Temperature: Surface	1	T	North America+US Territories	20	na	na	na	1	km	20	1	K	20	15	min	20	15	min	20
		O	North America+US Territories	20	na	na	na	1	km	20	0.5	K	20	15	min	20	15	min	20
Channel Bathymetry (episodic - post major event)	1	T	North America+US Territories	20	na	na	na	100	m	20	10	cm	20	1	yr	20	1	wk	20
		O	North America+US Territories	20	na	na	na	0.1	km	20	0.1	m	20	1	yr	20	7	day	20
Channel Structures	1	T	North America+US Territories	25	na	na	na	na	na	na	10	cm	25	1	yr	25	1	mon	25
		O	North America+US Territories	25	na	na	na	na	na	na	10	cm	25	1	yr	25	1	mon	25
Evapotranspiration	1	T	North America+US Territories	20	na	na	na	1	km	20	10	%	20	1	hr	20	15	min	20
		O	North America+US Territories	20	na	na	na	1	km	20	10	%	20	15	min	20	15	min	20
Flood/Standing Water (Imagery)	1	T	North America+US Territories	20	na	na	na	5	m	20	1	m	20	1	hr	20	30	min	20
		O	North America+US Territories	20	na	na	na	5	m	20	1	m	20	1	hr	20	30	min	20
Floodplain Topography	1	T	North America+US Territories	20	na	na	na	30	m	20	10	cm	20	10	yr	20	1	mon	20
		O	North America+US Territories	20	na	na	na	30	m	20	0.1	m	20	10	yr	20	1	mon	20
Forest Density	1	T	North America+US Territories	25	na	na	na	30	m	20	5	%	15	1	day	20	1	mon	20
		O	North America+US Territories	25	na	na	na	30	m	20	5	%	15	1	day	20	1	mon	20
Freezing Level	1	T	North America+US Territories	20	na	na	na	5	km	20	100	m	20	6	hr	20	15	min	20
		O	North America+US Territories	20	na	na	na	1	km	20	50	m	20	1	hr	20	15	min	20
Frost Depth	1	T	North America+US Territories	20	na	na	na	5	km	20	10	%	20	12	hr	20	1	hr	20
		O	North America+US Territories	20	na	na	na	1	km	20	10	%	20	6	hr	20	1	hr	20
Imagery: Cloud	1	T	North America+US Territories	30	na	na	na	1	km	20	na	na	na	15	min	30	15	min	20
		O	North America+US Territories	30	na	na	na	0.5	km	20	na	na	na	5	min	30	5	min	20
Incoming Longwave Radiation: Surface	1	T	North America+US Territories	20	na	na	na	10	km	20	1	W/m^2	20	15	min	20	15	min	20
		O	North America+US Territories	20	na	na	na	1	km	20	0.5	W/m^2	20	15	min	20	15	min	20

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Observation Requirement	Obs Req Prty	T/O	Geo Coverage		Vertical Resolution			Horizontal Resolution			Measurement Accuracy			Sampling Interval			Data Latency		
			V	W	V	U	W	V	U	W	V	U	W	V	U	W	V	U	W
Incoming Shortwave Radiation: Surface	1	T	North America+US Territories	20	na	na	na	10	km	20	1	W/m^2	20	15	min	20	15	min	20
		O	North America+US Territories	20	na	na	na	1	km	20	0.5	W/m^2	20	15	min	20	15	min	20
Land Use-Land Cover	1	T	North America+US Territories	25	na	na	na	30	m	20	5	%	15	1	day	20	1	hr	20
		O	North America+US Territories	25	na	na	na	30	m	20	5	%	15	1	day	20	1	hr	20
Lightning Detection	1	T	North America+US Territories	20	na	na	na	2	km	20	20	%	20	1	sec	20	1	min	20
		O	North America+US Territories	20	na	na	na	1	km	20	5	%	20	1	sec	20	1	sec	20
Ocean Storm Surges	1	T	North America+US Territories	20	na	na	na	na	na	na	30	cm	30	6	hr	30	15	min	20
		O	North America+US Territories	20	na	na	na	na	na	na	0.3	m	30	1	hr	30	15	min	20
Precipitation Amount	1	T	North America+US Territories	20	na	na	na	1	km	20	1	mm	25	6	min	15	3	min	20
		O	North America+US Territories	20	na	na	na	0.5	km	20	0.25	mm	25	1	min	15	1	min	20
Precipitation Rate	1	T	North America+US Territories	20	na	na	na	1	km	20	1	mm/hr	25	6	min	15	3	min	20
		O	North America+US Territories	20	na	na	na	0.5	km	20	0.25	mm/hr	25	1	min	15	1	min	20
Precipitation Type	1	T	North America+US Territories	25	na	na	na	1	km	25	5	%	10	6	min	25	3	min	15
		O	North America+US Territories	25	na	na	na	0.5	km	25	5	%	10	1	min	25	1	min	15
Relative Humidity	1	T	North America+US Territories	20	na	na	na	1	km	20	10	%	20	15	min	20	15	min	20
		O	North America+US Territories	20	na	na	na	1	km	20	5	%	20	15	min	20	15	min	20
Reservoir Releases	1	T	North America+US Territories	20	na	na	na	na	na	na	5	%	30	1	hr	30	15	min	20
		O	North America+US Territories	20	na	na	na	na	na	na	5	%	30	1	hr	30	15	min	20
River and Reservoir Height Data	1	T	North America+US Territories	25	na	na	na	na	na	na	1	cm	25	15	min	25	5	min	25
		O	North America+US Territories	25	na	na	na	na	na	na	0.01	m	25	15	min	25	5	min	25
Snow Cover	1	T	North America+US Territories	20	na	na	na	0.5	km	20	10	%	20	3	hr	20	3	hr	20
		O	North America+US Territories	20	na	na	na	0.1	km	20	5	%	20	1	hr	20	1	hr	20
Snow Density	1	T	North America+US Territories	20	na	na	na	0.5	km	20	10	%	20	3	hr	20	3	hr	20
		O	North America+US Territories	20	na	na	na	0.1	km	20	5	%	20	1	hr	20	1	hr	20
Snow Depth (Deep, 1 to 10 meters)	1	T	North America+US Territories	20	na	na	na	0.5	km	20	10	%	20	3	hr	20	3	hr	20
		O	North America+US Territories	20	na	na	na	0.1	km	20	5	%	20	1	hr	20	1	hr	20
Snow Depth (Shallow, 0 to 1 meter)	1	T	North America+US Territories	20	na	na	na	0.5	km	20	10	cm	20	3	hr	20	3	hr	20
		O	North America+US Territories	20	na	na	na	0.1	km	20	5	cm	20	1	hr	20	1	hr	20
Snow Water Equivalent (Deep, 0.3 to 3	1	T	North America+US Territories	20	na	na	na	0.5	km	20	10	%	20	3	hr	20	3	hr	20

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**WRN-HYD (IWF)**

**December 10, 2012**

Observation Requirement	Obs Req Prty	T/O	Geo Coverage		Vertical Resolution			Horizontal Resolution			Measurement Accuracy			Sampling Interval			Data Latency		
			V	W	V	U	W	V	U	W	V	U	W	V	U	W	V	U	W
meters)		O	North America+US Territories	20	na	na	na	0.1	km	20	5	%	20	1	hr	20	1	hr	20
Snow Water Equivalent (Shallow, 0 to 0.3 meters)	1	T	North America+US Territories	20	na	na	na	0.5	km	20	3	cm	20	3	hr	20	3	hr	20
		O	North America+US Territories	20	na	na	na	0.1	km	20	1.5	cm	20	1	hr	20	1	hr	20
Soil Moisture: Shallow (0 to 20cm) Profile	1	T	North America+US Territories	20	5	cm	15	1	km	15	10	%	10	1	hr	10	30	min	10
		O	North America+US Territories	20	5	cm	15	1	km	15	5	%	10	1	hr	10	30	min	10
Soil Properties (Soil Bulk Density)	1	T	North America+US Territories	20	5	cm	20	0.5	km	20	na	na	na	10	yr	20	1	yr	20
		O	North America+US Territories	20	2.5	cm	20	250	m	20	na	na	na	10	yr	20	1	yr	20
Soil Properties (Soil Porosity)	1	T	North America+US Territories	20	5	cm	20	0.5	km	20	na	na	na	10	yr	20	1	yr	20
		O	North America+US Territories	20	2.5	cm	20	250	m	20	na	na	na	10	yr	20	1	yr	20
Soil Properties (Soil Type)	1	T	North America+US Territories	20	5	cm	20	0.5	km	20	na	na	na	10	yr	20	1	yr	20
		O	North America+US Territories	20	2.5	cm	20	250	m	20	na	na	na	10	yr	20	1	yr	20
Soil Properties (Thermal Conductivity)	1	T	North America+US Territories	20	5	cm	20	0.5	km	20	na	na	na	10	yr	20	1	yr	20
		O	North America+US Territories	20	2.5	cm	20	250	m	20	na	na	na	10	yr	20	1	yr	20
Soil Temperature: Deep (20-150cm) Profile	1	T	North America+US Territories	20	10	cm	15	1	km	15	3	K	10	1	hr	10	30	min	10
		O	North America+US Territories	20	10	cm	15	1	km	15	3	K	10	1	hr	10	30	min	10
Soil Temperature: Shallow (0-20cm) Profile	1	T	North America+US Territories	20	5	cm	15	1	km	15	1	K	10	1	hr	10	30	min	10
		O	North America+US Territories	20	5	cm	15	1	km	15	1	K	10	1	hr	10	30	min	10
Soil Temperature: Surface	1	T	North America+US Territories	20	na	na	na	1	km	20	1	K	20	1	hr	20	30	min	20
		O	North America+US Territories	20	na	na	na	1	km	20	1	K	20	30	min	20	30	min	20
Surface Soil Moisture: Surface	1	T	North America+US Territories	20	na	na	na	1	km	20	10	%	20	1	hr	20	30	min	20
		O	North America+US Territories	20	na	na	na	1	km	20	5	%	20	1	hr	20	30	min	20
Surface Water Discharge (volume)	1	T	North America+US Territories	20	na	na	na	at gauge	na	20	5	%	20	15	min	20	3	min	20
		O	North America+US Territories	20	na	na	na	25	m	20	1	%	20	5	min	20	3	min	20
Surface Water: Channel Characteristics (Width)	1	T	North America+US Territories	25	na	na	na	at gauge	na	0	5	%	25	1	yr	25	1	day	25
		O	North America+US Territories	25	na	na	na	at gauge	na	na	1	%	25	1	yr	25	1	day	25
Tide Height	1	T	North America+US Territories	20	1	cm	20	na	na	na	8	cm	20	5	min	20	5	min	20
		O	North America+US Territories	20	0.01	m	20	na	na	na	0.08	m	20	5	min	20	5	min	20
Upward Longwave Radiation: Surface	1	T	North America+US Territories	20	na	na	na	10	km	20	1	W/m^2	20	15	min	20	15	min	20

# NOAA Program Observation Requirements Document (PORD)

**WRN-HYD (IWF)**

**December 10, 2012**

Observation Requirement	Obs Req Prty	T/O	Geo Coverage		Vertical Resolution			Horizontal Resolution			Measurement Accuracy			Sampling Interval			Data Latency		
			V	W	V	U	W	V	U	W	V	U	W	V	U	W			
		O	North America+US Territories	20	na	na	na	1	km	20	0.5	W/m^2	20	15	min	20	15	min	20
Wind Direction: Surface	1	T	North America+US Territories	20	na	na	na	10	km	20	5	deg	20	15	min	20	5	min	20
		O	North America+US Territories	20	na	na	na	1	km	20	2.5	degrees	20	15	min	20	5	min	20
Wind Speed: Surface	1	T	North America+US Territories	20	na	na	na	10	km	20	1	m/sec	20	15	min	20	5	min	20
		O	North America+US Territories	20	na	na	na	1	km	20	0.5	m/sec	20	15	min	20	5	min	20
Cloud Cover: Amount	2	T	North America+US Territories	20	na	na	na	10	km	20	10	%	20	15	min	20	15	min	20
		O	North America+US Territories	20	na	na	na	10	km	20	5	%	20	15	min	20	15	min	20
High Resolution Floodplain Topography (bare Earth with including manmade structures, e.g. LIDAR)	2	T	North America+US Territories	25	na	na	na	5	m	25	0.1	m	20	5	yr	25	6	mon	5
		O	North America+US Territories	25	na	na	na	2	m	25	0.1	m	20	5	yr	25	6	mon	5
River Ice Conditions	2	T	North America+US Territories	20	na	na	na	30	m	20	30	m	20	1	day	20	3	hr	20
		O	North America+US Territories	20	na	na	na	30	m	20	30	m	20	1	hr	20	1	hr	20
Soil Moisture: Deep (20 to 150cm) Profile	2	T	North America+US Territories	20	10	cm	15	1	km	15	20	%	10	1	hr	10	30	min	10
		O	North America+US Territories	20	10	cm	15	1	km	15	10	%	10	1	hr	10	30	min	10
Wind Direction: Profiles	2	T	North America+US Territories	20	0.5	km	20	10	km	20	30	deg	10	15	min	10	5	min	20
		O	North America+US Territories	20	0.1	km	20	4	km	20	30	deg	10	15	min	10	5	min	20
Wind Speed: Profiles	2	T	North America+US Territories	20	0.5	km	20	10	km	20	1	m/sec	10	15	min	10	5	min	20
		O	North America+US Territories	20	0.1	km	20	4	km	20	0.5	m/sec	10	15	min	10	5	min	20
Cloud Liquid Water/Ice	3	T	North America+US Territories	20	100	m	15	1	km	15	0.5	g/m^3	15	5	min	15	1	min	20
		O	North America+US Territories	20	50	m	15	0.25	km	15	0.5	g/m^3	15	1	min	15	1	min	20

## Appendix B WRN-IWF, Priority-1 Requirements Validation

### Appendix B.1 Validation Documents Submitted

The following Validation Documents have been submitted in support of the WRN-IWF Objective's Priority-1 Observation Requirements.

**Table B-1: Validation Documents provided to support Priority- Requirements**

#	Validation Document Title	Document Type
1	Objective Charter for Improved Freshwater Resource Management Objective	NOAA NGSP
2	Office of Hydrologic Development Hydrology Laboratory Strategic Science Plan (April 2010) (with supplementary tables validated by SMEs)	NOAA Science Plan

### Appendix B.2 Validation Documents Mapping to Observation Requirements

Improved Freshwater Resource Management Objective and Technology Planning and Integration Office (TPIO) representatives worked jointly to identify references to validate both the need for an observation requirement and its specific measurement attributes. These validation documents support one or more of the Priority-1 Requirements as shown in Table B-2 below. For occurrences where validation documents could not be identified, Objective Subject Matter Experts (SME) justifications are provided.

**Table B-2: Validation Document Mapping to Observation Requirement**

Observation Requirement	Priority	Document[s] Submitted
All IWF Objective Requirements	1, 2, 3	1,2

### Appendix B.3 Validation Assessment for Priority-1 Requirements

Improved Freshwater Resource Management Objective and TPIO representatives worked jointly to review the submitted documentation, and identify the "level of validation" for the Threshold value of each of the five key attributes of each Priority-1 Observation Requirement.

**Table B-3: Level of Validation for each Priority 1 Requirement Attribute**

Observation Requirement	Attribute Validated				
	Geo Cov	Vert Res	Horiz Res	MeaAcc	Samp Intvl
Air Temperature: Profiles	North America + US Territories	0.5 km	10 km	1 K	15 min
Air Temperature: Surface	North America + US Territories	na	1 km	1 K	15 min
Channel Bathymetry (episodic - post major event)	North America + US Territories	na	0.1 km	0.1 m	1 yr

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Observation Requirement	Attribute Validated				
	Geo Cov	Vert Res	Horiz Res	MeaAcc	Samp Intvl
Channel Structures	North America + US Territories	na	na	10 cm	1 yr
Evapotranspiration	North America + US Territories	na	1 km	10%	1 hr
Flood/Standing Water (Imagery)	North America + US Territories	na	5 m	1 m	1 hr
Floodplain Topography	North America + US Territories	na	30 m	0.1 m	10 yr
Forest Density	North America + US Territories	na	30 m	5%	1 day
Freezing Level	North America + US Territories	na	5 km	100 m	6 hr
Frost Depth	North America + US Territories	na	5 km	10%	12 hr
Imagery: Cloud	North America + US Territories	na	1 km	na	15 min
Incoming Longwave Radiation: Surface	North America + US Territories	na	10 km	1 W/m <sup>2</sup>	15 min
Incoming Shortwave Radiation: Surface	North America + US Territories	na	10 km	1 W/m <sup>2</sup>	15 min
Land Use-Land Cover	North America + US Territories	na	30 m	5%	1 day
Lightning Detection	North America + US Territories	na	2 km	20%	1 sec
Ocean Storm Surges	North America + US Territories	na	na	0.3 m	6 hr
Precipitation Amount	North America + US Territories	na	1 km	1 mm	6 min
Precipitation Rate	North America + US Territories	na	1 km	1 mm/hr	6 min
Precipitation Type	North America + US Territories	na	1 km	5%	6 min
Relative Humidity	North America + US Territories	na	1 km	10%	15 min
Reservoir Releases	North America + US Territories	na	na	5%	1 hr
River and Reservoir Height Data	North America + US Territories	na	na	0.01 m	15 min
Snow Cover	North America + US Territories	na	0.5 km	10%	3 hr
Snow Density	North America + US Territories	na	0.5 km	10%	3 hr
Snow Depth (Deep, 1 to 10 meters)	North America + US Territories	na	0.5 km	10%	3 hr
Snow Depth (Shallow, 0 to 1 meter)	North America + US Territories	na	0.5 km	10 cm	3 hr
Snow Water Equivalent (Deep, 0.3 to 3 meters)	North America + US Territories	na	0.5 km	10%	3 hr

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Observation Requirement	Attribute Validated				
	Geo Cov	Vert Res	Horiz Res	MeaAcc	Samp Intvl
Snow Water Equivalent (Shallow, 0 to 0.3 meters)	North America + US Territories	na	0.5 km	3 cm	3 hr
Soil Moisture: Shallow (0 to 20cm) Profile	North America + US Territories	5 cm	1 km	10%	1 hr
Soil Properties (Soil Bulk Density)	North America + US Territories	5 cm	0.5 km	na	10 yr
Soil Properties (Soil Porosity)	North America + US Territories	5 cm	0.5 km	na	10 yr
Soil Properties (Soil Type)	North America + US Territories	5 cm	0.5 km	na	10 yr
Soil Properties (Thermal Conductivity)	North America + US Territories	5 cm	0.5 km	na	10 yr
Soil Temperature: Deep (20-150cm) Profile	North America + US Territories	10 cm	1 km	3 K	1 hr
Soil Temperature: Shallow (0-20cm) Profile	North America + US Territories	5 cm	1 km	1 K	1 hr
Soil Temperature: Surface	North America + US Territories	na	1 km	1 K	1 hr
Surface Soil Moisture: Surface	North America + US Territories	na	1 km	10%	1 hr
Surface Water Discharge (volume)	North America + US Territories	na	At gauge	5%	15 min
Surface Water: Channel Characteristics (Width)	North America + US Territories	na	At gauge	5%	1 yr
Tide Height	North America + US Territories	1 cm	na	8 cm	5 min
Upward Longwave Radiation: Surface	North America + US Territories	na	10 km	1 W/m <sup>2</sup>	15 min
Wind Direction: Surface	North America + US Territories	na	10 km	5 deg	15 min
Wind Speed: Surface	North America + US Territories	na	10 km	1 m/s	15 min

### Legend: Level of Validation

Direct Validation Documentation Submitted	
Associated Validation Documentation Submitted	
SME Consensus Validation Documentation Submitted	
Not Validated	
Attribute not applicable	

## Appendix C Objective Acronym List

Acronym	Definition
CL-COM	Climate - Observations and Monitoring
CL-CRM	Climate - Research & Modeling
WRN-AWX	Weather Ready Nation - Aviation Weather
RE-GEO	Resilient Communities and Economy - Geodesy
RE-MTS	Resilient Communities and Economy - Marine Transportation Systems
WRN-MWX	Weather Ready Nation - Marine Weather
WRN-SFX	Weather Ready Nation - Surface Weather
HE-AQC	Healthy Ecosystem - Aquaculture
HE-CMR	Resilient Communities and Economy - Coastal Marine Resources
HE-HAB	Healthy Ecosystem - Corals
HU-ESSA	Holistic Understanding - Ecosystem Science and Assessment
RE/HU-HAB	Resilient Communities and Economy/Holistic Understanding - Habitat
Ent-MOD	Enterprise Goal - Environmental Modeling
Ent/OBS-IOOS	Enterprise Goal/Integrated Observations - Integrated Ocean Observing System
Ent/OBS-TPIO	Enterprise Goal/Integrated Observations - Technical Requirements, Planning and Integration
WRN-AQL	Weather Ready Nation - Air Quality
IWF	Weather Ready Nation - Improved Freshwater Resource Management
WRN--LFW	Weather Ready Nation - Local Forecasts and Warnings
WRN-SWX	Weather Ready Nation - Space Weather

## Appendix D PORD Table Column Definitions

[Note: In PORA tables "V" = attribute value, "U" = attribute units, "W" = attribute weight]

**Attribute Weight:** Attribute weight: relative weight of each of the basic attributes, a value from 1 to 100, with the most important of the attributes given the highest relative value. All weights across a requirement row should add up to 100.

Observational Requirement Title	Geographic Coverage Weight	Vertical Resolution Weight	Horizontal Resolution Weight	Measurement Accuracy Weight	Sampling Interval Weight	Number of ODS/Flt Hrs/HODs Weight*
Air Temperature: Surface	50	0	10	30	10	0
Land Cover	0	0	30	50	20	0
Water Vapor: Profiles	20	30	10	30	10	0
At Sea Data Collection	20	10	10	10	10	40
Airborne Data Collection	30	10	10	10	10	30

\*Only for Objectives that have At Sea Data Collection, Flight Hours, or Human Observer Observation Requirements

**Data Latency (Data Ltncy):** Elapsed time from data acquisition until delivery of data to the user. Latest time by which an element can be delivered and still be useful to the customer.

**Data Latency Units:** Measurement units for data latency of the element.

Use:

- "sec" for 1-59 seconds
- "min" for 1-59 mins
- "hr" for 1-23 hours
- "day" for 1-6 days
- "wk" for 1-3 wks
- Etc.

**Data Latency Weight:** See "Attribute Weights."

**Geographic Coverage (Geo Cov):** Geographic coverage categories can be defined as needed for the Objective. See separate list of Geo Cov category definitions.

**Geographic Coverage Weight:** See "Attribute Weights."

**GPRA:** Government Performance and Results Act

**Horizontal Resolution (Horiz Res):** The smallest horizontal increment needed of the data. Spatial granularity in the horizontal with which information and data are required.

**Horizontal Resolution Units:** Measurement units for horizontal resolution of the element. Use:

- "km" for kilometers
- "m" for meters

Etc.

**Horizontal Resolution Weight:** See “Attribute Weights.”

**Long-Term Stability (Long Stab):** The maximum excursion of the short-term average measured value of a parameter under identical conditions over a stated period of time (e.g. decade). The smaller the maximum excursion, the greater the stability of the observations. The short-average is the average of a sufficient number of successive measurements of the variable under identical conditions such that the random error is negligible relative to the systematic error.

**Long-Term Stability Units:** Measurement units for Long-Term Stability of the element.

**Long-Term Stability Weight:** See “Attribute Weights.”

**Measurement Accuracy (Msmnt Accy):** The systematic error, as specified by the difference between a measured or derived parameter and its true value in the absence of random errors.

**Measurement Accuracy Units:** Measurement units for Measurement Accuracy of the element. If possible use %.

**Measurement Accuracy Weight:** See “Attribute Weights.”

**Measurement (Meas Range) Range Low:** Lowest value of range of parameter, within which the parameters must be measurable or reportable (e.g., for temperature 273 to 303 Kelvin enter 273)"

**Measurement Range High:** Highest value of range of parameter, within which the parameters must be measurable or reportable (e.g., for temperature 273 to 303 Kelvin enter 203)"

**Measurement Range Units:** Measurement units for measurement range of the element. For example: Kelvin enter “K”

**Measurement Range Weight:** See “Attribute Weights.”

**Number of ODS/Flt Hrs/HODs:** Number of Operating Days at Sea (ODS), Flight Hours (Flt Hrs), or Human Observer Days (HODs)

**Number of ODS/Flt Hrs/HODs Units:** Measurement units for Number of Operating Days at Sea (ODS), Flight Hours (Flt Hrs), or Human Observer Days (HODs)

**Number of ODS/Flt Hrs/HOD Weight:** See “Attribute Weights.”

**Observational Requirement:** Requirement Name

**Observational Requirement Priority (Obs Req Prty):**

“1” = Mission Critical / Cannot meet operational mission objectives without this data. Not having these data will prevent performance of the mission or preclude satisfactory mission accomplishment.

“2” = Mission Optimal / Data not critical but would provide significant improvement to operational capability.

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“3” = Mission Enhancing / Needed to enhance state of knowledge / assess potential for operational capability.

**RC:** Regional Collaboration Priorities

**Sampling Interval (Smplng Intvl):** Average time interval between consecutive measurements of the same area of the environment.

**Sampling Interval Units:** Measurement units for sampling interval of the element. For example: Use:

"sec" for 1-59 seconds

"min" for 1-59 mins

"hr" for 1-23 hours

"day" for 1-6 days

"wk" for 1-3 wks

Etc.

**Sampling Interval Weight:** See “Attribute Weights.”

**Threshold (T)/Objective (O):** Threshold is the minimum acceptable specification. Objective is the optimal specification that, if met, would significantly enhance meeting the mission.

**T/O:** Threshold/Objective. See definitions above.

**Type:** Observation requirement type

"B" = Biological

"C" = Chemical

"P" = Physical

“S” = Socio-economic

“E” = Economic

**Vertical Range (Vert Range) Low:** Lowest value of vertical range of parameter, within which the parameters must be measurable or reportable (e.g., for temperature profile with vertical range of surface to 15 kilometers enter 0)"

**Vertical Range High:** Highest value of vertical range of parameter, within which the parameters must be measurable or reportable (e.g., for temperature profile with vertical range of surface to 15 kilometers enter 15)"

**Vertical Range Units:** Measurement units for vertical resolution of the element.

Use:

“km” for kilometers

“m” for meters

“hPa” for hectopascal

Etc.

**Vertical Range Weight:** See “Attribute Weights.”

**Vertical Resolution (Vert Res):** The smallest height increment of the data. Spatial granularity in the vertical with which information and data are provided, For example: distance between adjacent vertical grid points in a radiosonde observation.

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**Vertical Resolution Units:** Measurement units for vertical resolution of the element.

Use:

“km” for kilometers

“m” for meters

Etc.

**Vertical Resolution Weight:** See “Attribute Weights.”

**Weight:** See “Attribute Weights.”

## Geographic Coverage Table

CORL Geographic Coverage Category*	Definition*
Arctic	TBD; definition to be added by NOS and TPIO agreement
Coastal Global	The coast is defined as the part of the land adjoining or near the ocean. Coastal is a few km either side of water/land boundary. Includes both littoral and sub littoral ( <a href="http://en.wikipedia.org/wiki/Littoral_zone">http://en.wikipedia.org/wiki/Littoral_zone</a> ).
Coastal US	The coast is defined as the part of the land adjoining or near the ocean.
Conus	Contiguous U.S. rectangle, 3000 km N/S by approx 5000 km E/W.
CONUS+AK+HI	Contiguous U.S. rectangle, 3000 km N/S by approx 5000 km E/W. Plus Alaska and Hawaii.
CONUS+AK+HI+US EEZ	Contiguous U.S. rectangle, 3000 km N/S by approx 5000 km E/W. Plus Alaska, Hawaii and US Exclusive Economic Zone (see below for definition of EEZ.)
CONUS+AK+HI+US Territories	Contiguous U.S. rectangle, 3000 km N/S by approx 5000 km E/W. Plus Alaska, Hawaii, US EEZ and US Territories (Palmyra Atoll, U.S. coastal waters out to 12 nautical miles, U.S. flag vessels at sea, Guam, Northern Mariana Islands (commonwealth), Puerto Rico (commonwealth), United States Virgin Islands, American Samoa, Wake Island, Midway Islands, Johnston Atoll, Baker Island, Howland Island, Jarvis Island, Kingman Reef, Bajo Nuevo Bank, Serranilla Bank, Navassa Island)
Equatorial EEZ	The Equatorial EEZ starts at the coast of all states/countries within the equatorial regions of the world (limited in latitude by the Tropic of Cancer in the northern hemisphere at approximately 23°26' (23.4°) N latitude and the Tropic of Capricorn in the southern hemisphere at 23°26' (23.4°) S latitude) and extends 200 nautical miles (370 kilometers) out into the sea, perpendicular to the baseline.
EEZ Global	Under the law of the sea, an Exclusive Economic Zone (EEZ) is a sea zone over which a state has special rights over the exploration and use of marine resources. Generally a state's EEZ extends to a distance of 200 nautical miles (370 km) out from its coast. The exception to this rule occurs when EEZs would overlap; that is, state coastal baselines are less than 400 nautical miles apart. When an overlap occurs, it is up to the states to delineate the actual boundary. Generally, any point within an overlapping area defaults to the most proximate state. States also have rights to the seabed of the continental shelf up to 350 nautical miles from the coast, where this extends beyond the EEZ, but this does not form part of their EEZ.
EEZ US	The Exclusive Economic Zone starts at the coastal baseline and extends 200 nautical miles out into the sea, perpendicular to the baseline. Thus, the EEZ overlaps both the contiguous zone and US territorial waters.
Equatorial EEZ	The Equatorial EEZ starts at the coast of all states/countries within the equatorial regions of the world (limited in latitude by the Tropic of Cancer in the northern hemisphere at approximately 23°26' (23.4°) N latitude and the Tropic of Capricorn in the southern hemisphere at 23°26' (23.4°) S latitude) and extends 200 nautical miles (370 kilometers) out into the sea, perpendicular to the baseline.

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CORL Geographic Coverage Category*	Definition*
Equatorial Ocean	Seated in the equatorial regions of the world, limited in latitude by the Tropic of Cancer in the northern hemisphere at approximately 23°26' (23.4°) N latitude and the Tropic of Capricorn in the southern hemisphere at 23°26' (23.4°) S latitude
Global	Of, relating to, or involving the entire earth; worldwide. ( <a href="http://www.thefreedictionary.com/global">http://www.thefreedictionary.com/global</a> )
Global Land	The continents and islands that cover nearly 30% of the surface of the earth.
Global Ocean	The whole body of salt water that covers 71% of the surface of the earth.
Great Lakes	One of the eight NOAA identified ecosystem regions.
Gulf of Mexico	One of the eight NOAA identified ecosystem regions.
Hemi US	Hemispheric coverage centered on the US.
North America + US Territories	The United States, including AK, HI and U.S. Territories, plus Canada and Mexico
Offshore	The zone beyond the near shore zone where sediment motion induced by waves alone effectively ceases and where the influence of the sea bed on wave action has become small in comparison with the effect of wind; the portion of the littoral system that is always submerged.
Pacific Island Complex	One of the eight NOAA identified ecosystem regions.
Point Source	A single identifiable localized source; has negligible extent.
tbs	to be specified
TC/Marine/Surface Analysis AOR	Area of Responsibility used by the Hurricane Center to describe the irregular area that they monitor and make forecasts for
Tropics (30N-30S)	Seated in the equatorial regions of the world, limited in latitude by 30N-30S
Other	Other geo cov category as defined by program. Program provides specific details/definition.
35 deg Pitch Angle	Pitch angle is the position angle between the geocentric north pole and the solar rotational north pole measured eastward from geocentric north.
3-axis orthogonal	3-axis orthogonal refers to 3 measurements made at 90 degrees to each other to define a vector
GEO In-situ, Global	A local geosynchronous observation required at multiple locations in that orbit
Greater than 30 deg N and S	The components of the geomagnetic field at the surface of the Earth. These elements are usually denoted thus in the literature: X-the geographic northward component; Y - the geographic eastward component However, in NOAA use, the geomagnetic northward and geomagnetic eastward components are called the H and D components. The H axis direction is defined by the mean direction of the horizontal component relative to the geomagnetic north by using the small-angle approximation. Thus the D component = H (the horizontal intensity) multiplied by delta D (the declination angle relative to geomagnetic north, expressed in radians).
Greater than 75 deg N Geomagnetic	The components of the geomagnetic field at the surface of the Earth. These elements are usually denoted thus in the literature: X-the geographic northward component; Y - the geographic eastward component However, in NOAA use, the geomagnetic northward and geomagnetic eastward components are called the H and D components. The H axis direction is defined by the mean direction of the horizontal component relative to the geomagnetic north by using the small-angle approximation. Thus the D component = H (the horizontal intensity) multiplied by delta D (the declination angle relative to geomagnetic north, expressed in radians).
Heliocentric	A location relative to the center of the sun, or in some cases, relative to the center of the observed solar disk.

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CORL Geographic Coverage Category*	Definition*
L1 In-situ	An observation made at the solar Lagrange point, or liberation point, between Earth and sun. At this position a satellite can remain between Earth and sun as Earth revolves about the sun. It is about 99 % of the distance from sun to Earth or 0.99 AU (astronomical units) from the Sun. The location is about 1.5 million km from Earth or about 230 Earth radii from Earth towards the sun.
LEO In-situ, Polar	A local observation made in low-Earth polar orbit

Note: "Targeted" can be added to any of the above