



# **NOAA Environmental Observation Requirements Collection**

**February 9, 2005**

**NOAA IUAOS/Climate Workshop I**

**Pamela Taylor, NOAA Observation Requirements**



# Overview



- **Background of:**
  - **NOSC: NOAA Observing System Council**
  - **NOSA: NOAA Observing System Architecture**
  - **CORL: NOAA Consolidated Obs Req List**
- **CORL Requirements Collection Process/Status**
- **CORL and IUAOS/Climate**



# Background - NOSC

- **Why**

- **May 2002: NOAA Program Review Team Recommendation #32**

- Develop a NOAA Observing Systems Architecture (NOSA) to assess current capabilities and identify short-term actions
    - Base prospective observing systems on *validated requirements*, consistent with a target architecture, and address data utilization and archive
    - to transition requirements identification from *stove-piped, technology-driven, platform-oriented* to *integrated, user needs-driven, mission-oriented*
    - Conduct a systemic review of all other observing systems
  - **NOAA Strategic Plan**
    - **Develop integrated global environmental observation and data management system**

# Background: NEC Decisions

- **Establish Observing Systems Council**
- **Establish NOAA Observing Systems Architect**
- **Matrix managed within NESDIS**
- **Implement observing systems architecture toolset across NOAA**
- **Document baseline NOAA Observing Systems Architecture (NOSA)**
- **Develop target (10-20 years) NOSA**

# **NOAA Observing Systems Council (NOSC)**

- **Principal advisory body to the Under Secretary for NOAA's Earth observation and data management (end-to-end) activities**
- **Principal coordinating body to White House Committee on Environment and Natural Resources (CENR) Subcommittee on Earth Observations**
- **Membership**
  - **Co-Chaired by AA NESDIS and AA NWS**
  - **AA representatives from each Line Office and appropriate Program leads**

# NOSC (cont'd)

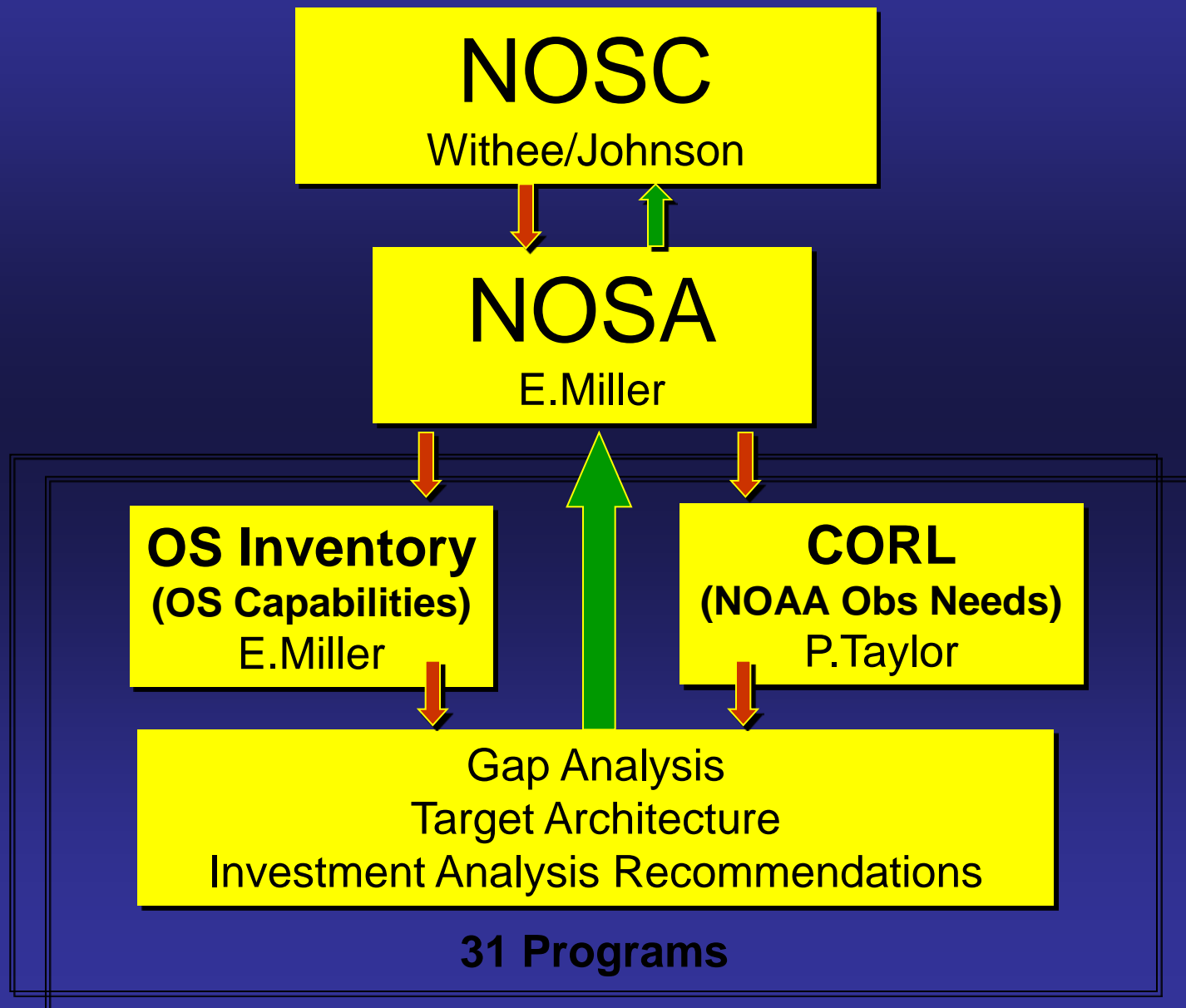
- **Function**

- Reviews observing system requirements
- Analyzes architecture alternatives and risks
- Recommends acquisition of appropriate observing systems to meet NOAA, national, and international architecture requirements
- Coordinates NOAA's participation in national and international earth observation efforts
- Provides corporate oversight of NOAA Observing Systems Architect (NOSA)

# **Further Benefits to NOAA**

- **Provides integrated view of NOAA's observing systems linked to mission requirements**
- **Provide framework for future requirements & costs**
- **Reveal how changes in funding levels for one system will impact many others**
- **Reveals gaps and duplication**
- **Results in more cost-effective overall observation system**
- **Facilitates accessibility to all NOAA observations by all NOAA customers**
- **Facilitate partnering at all levels**
- **Identify opportunities for migration of research to operations**

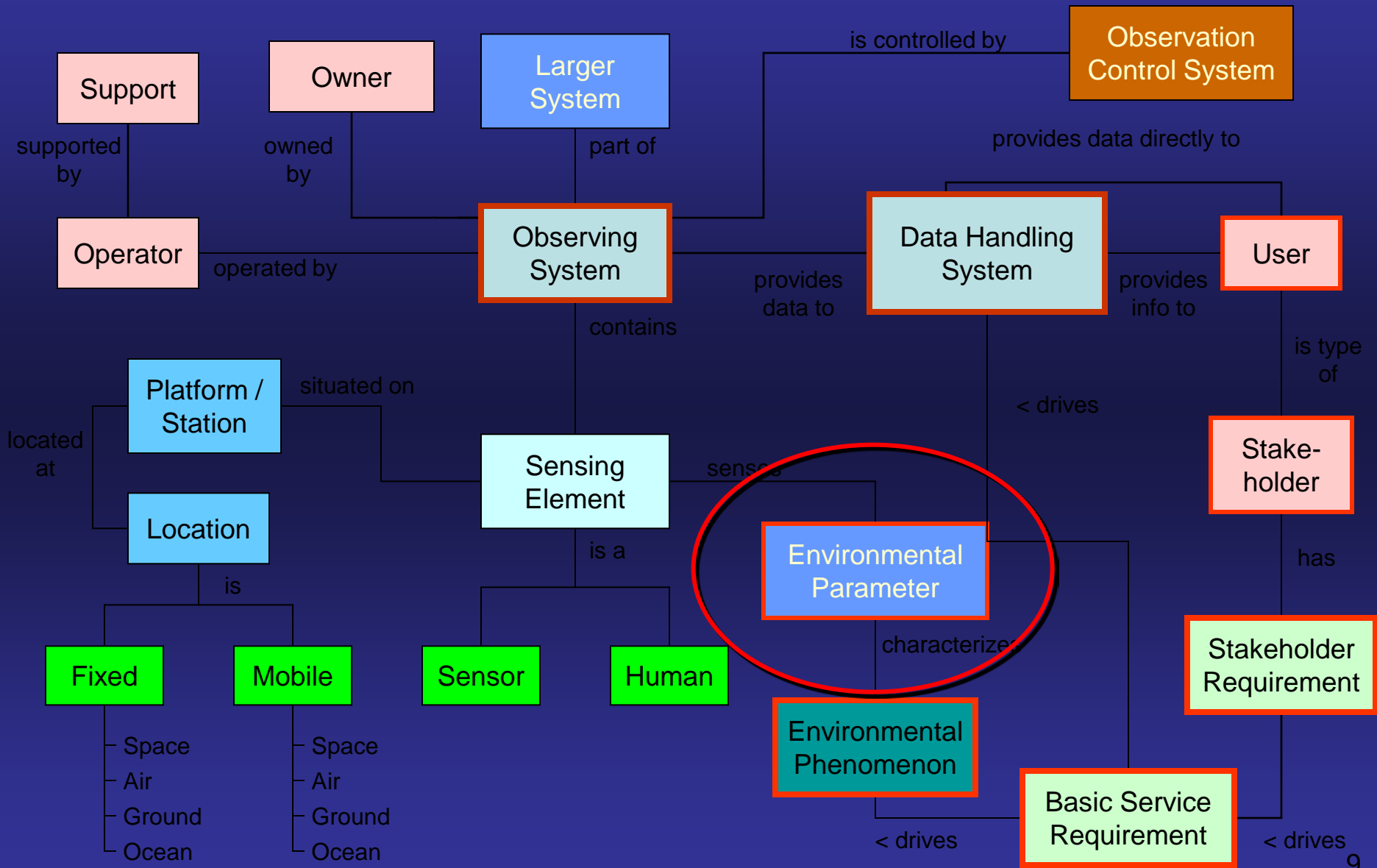
# Overview



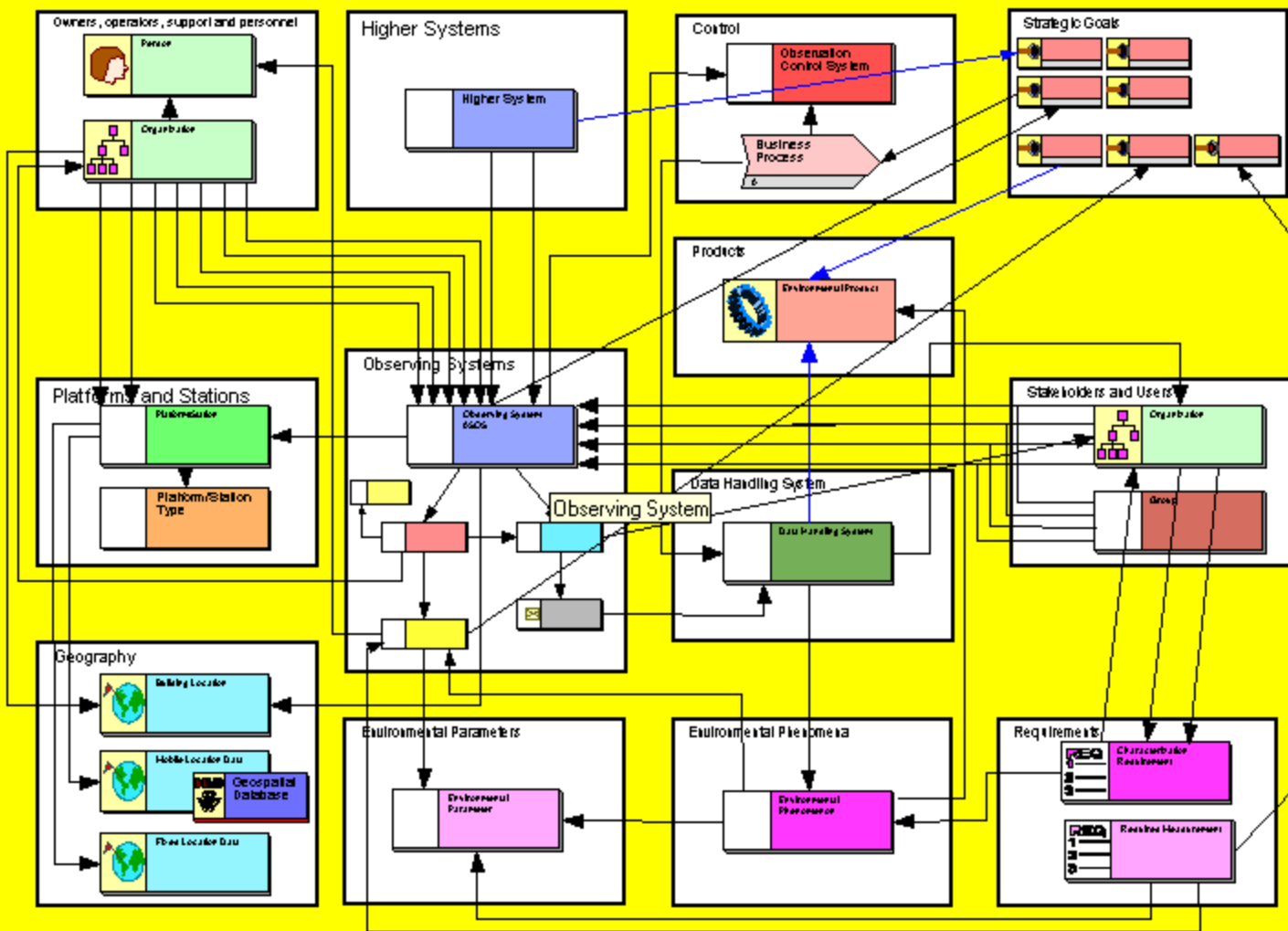




# NOSA -Observing System Architecture Relationship Diagram



# Observing System Architecture

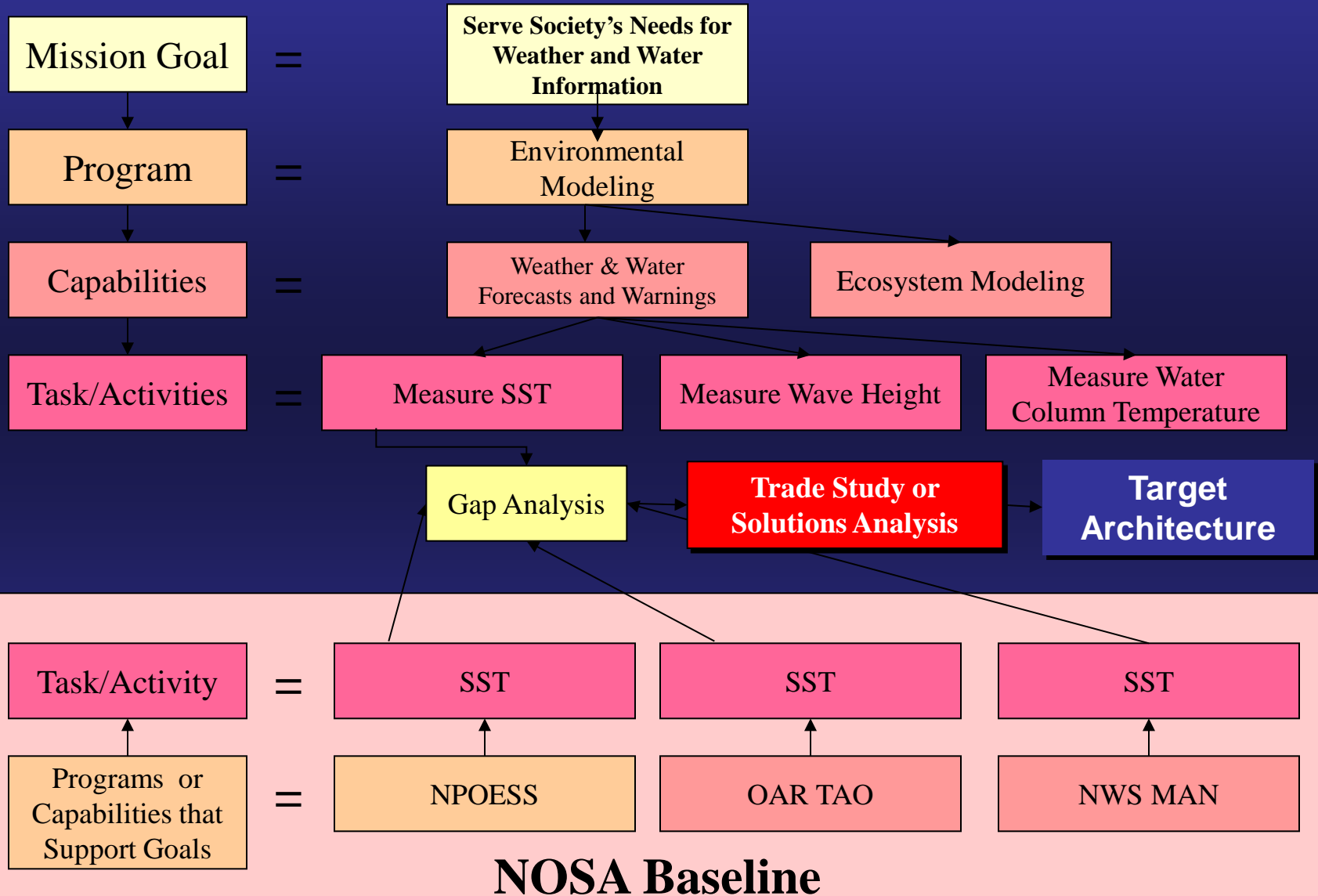


NOSA / Reqs / TOP / Queries / NOAA EA / Goal / ATC / Sfc Temp / KQ /

factor is now 0.590047

R/W Zoom: 0.5900 1

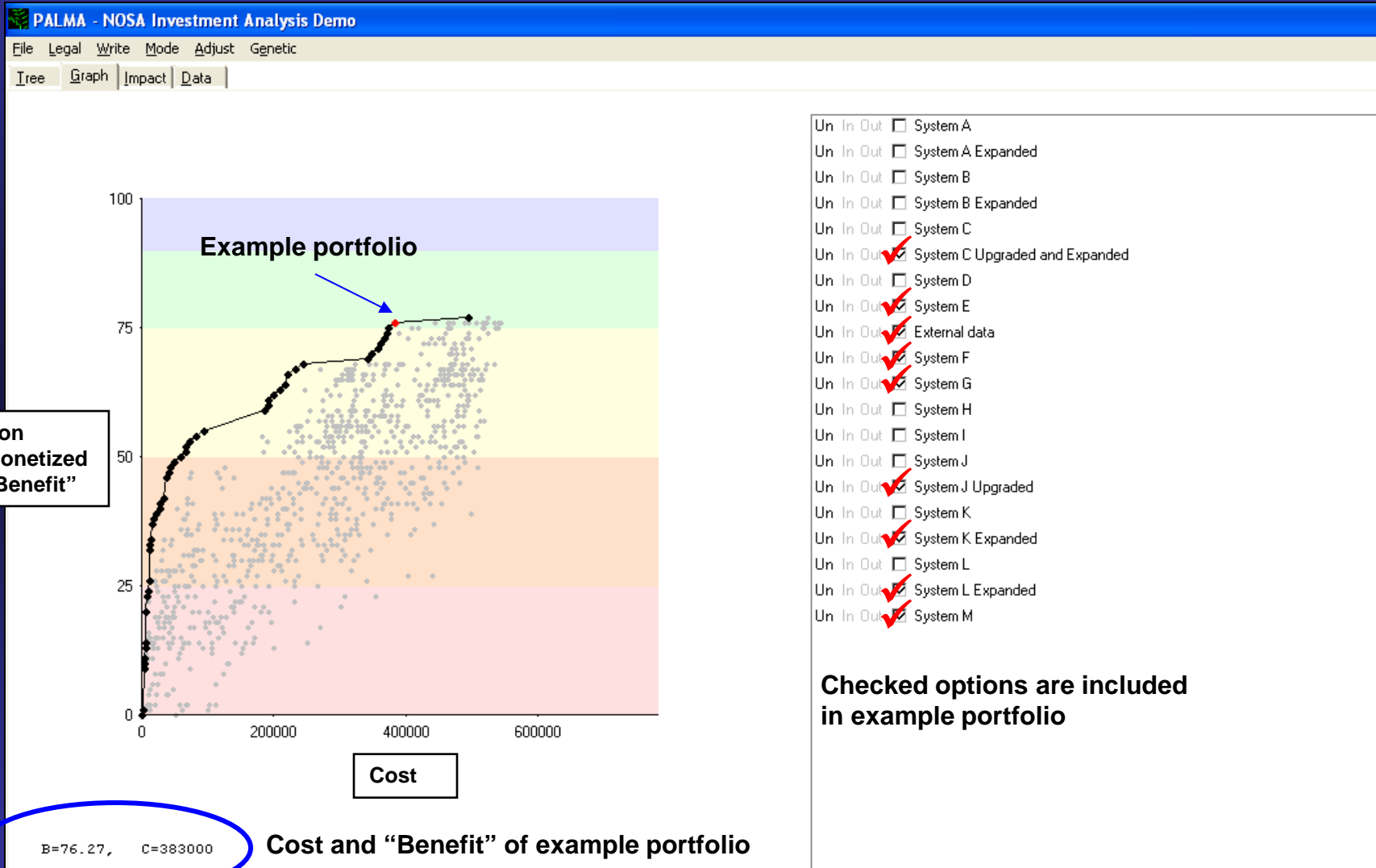
# Requirements Gap Analysis leading to a Target Architecture



# Observing System Gaps in SST Requirement

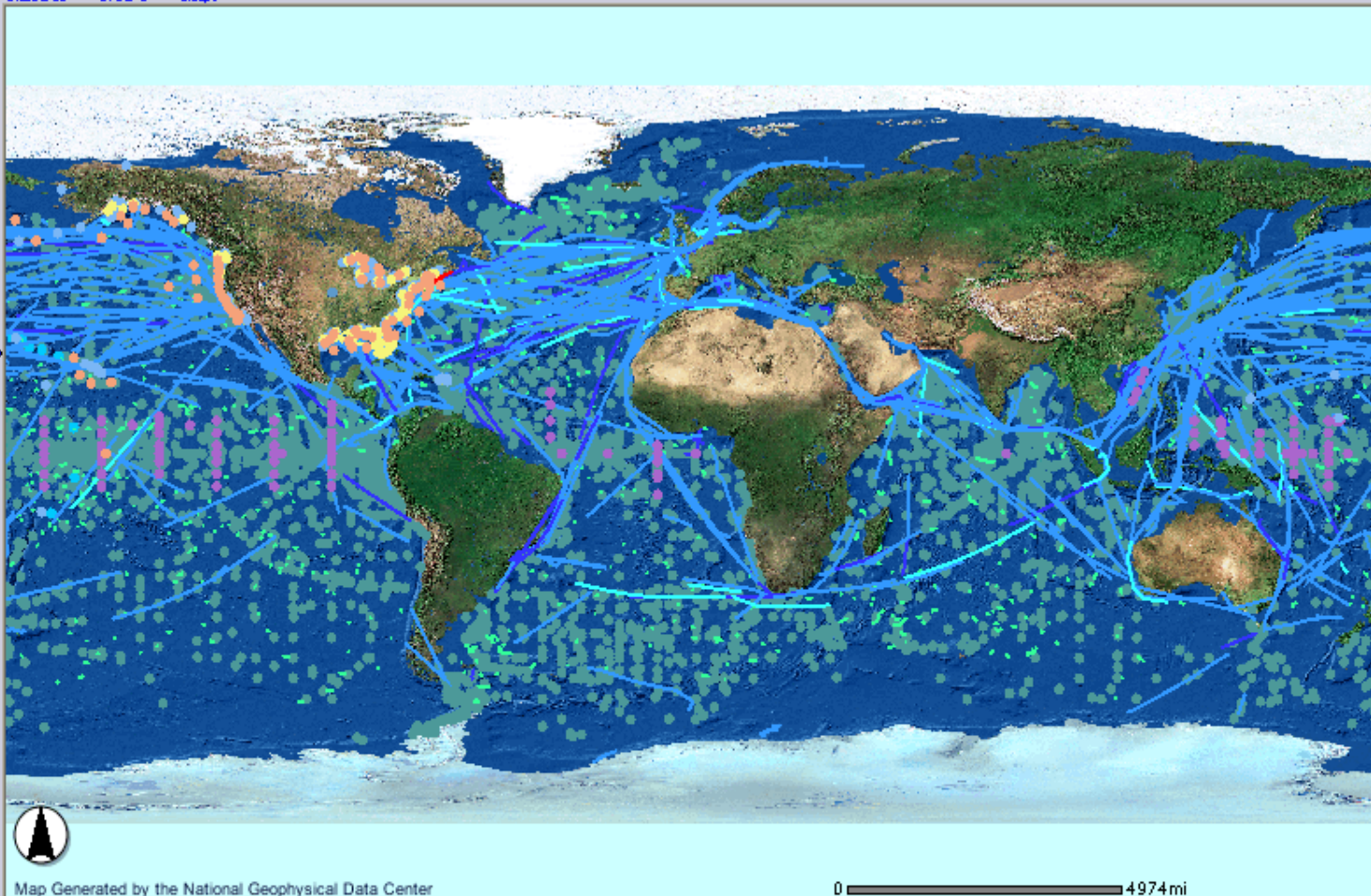
Observational Requirement	User	Priority	Threshold	Coverage	Horizontal Resolution	Horizontal Resolution	Mapping Accuracy Units	Mapping Accuracy	Measurement Range Units	Measurement Range - Low	Measurement Range - High	Measurement Accuracy Units	Measurement Accuracy	Sampling Interval
Sea Surface Temps: Hemispheric	NWS/NC EP/OPC	1	Threshold	Hemispheric	kilometers	2	kilometers (km)	0.5	degrees Kelvin (K)	271	313	degrees Kelvin (K)	1	60
Sea Surface Temps: Hemispheric	NWS/NC EP/OPC	1	Object	Hemispheric	kilometers	.5	kilometers (km)	.2	degrees Kelvin (K)	271	313	degrees Kelvin (K)	1	15
<a href="#">NESDIS-DMSP-Sea Surface Temperature</a>					0.55 km	0.55 km	OLS: 3.7-9.3 km	OLS: 3.7-9.3 km	%RH	190	310	+/- 2	+/- 2	12
<a href="#">NESDIS-GOES IM-Sea Surface Temperature</a>					6 km	6 km	2 km	2 km	cm-3	273	308	0.6 K	0.6 K	1
<a href="#">NESDIS-GOES NOP-Sea Surface Temperature</a>					6 km	6 km	2 km	2 km	degrees Kelvin (K)	273	308	0.6 K	0.6 K	1
<a href="#">NESDIS-NPOESS-Sea Surface Temperature</a>									cm-3					
<a href="#">NESDIS-POES-SST</a>				Global	1-100 km	1-100 km	Mapping accuracy is 1-6 km, although the necessary threshold is 1.3	Mapping accuracy is 1-6 km, although the necessary threshold is 1.3	Degrees Celsius	-2 degree Celsius (typically)	40 degree Celsius (typically)	within 0.5 degrees C	within 0.5 degrees C	Every 6 Hours
<a href="#">NMFS-CREWS-SST</a>									Degrees Celsius	-5	35	.002	.002	1
<a href="#">NMFS-CREWS-Water Temperature</a>									Degrees Celsius	-5	35	.002	.002	
<a href="#">NOS-NWLN-WATER TEMPERATURE</a>									Degrees Celsius	-5 Deg. C	+40 Deg. C	+/- 0.2 Deg. C	+/- 0.2 Deg. C	hourly
<a href="#">NOS-PORTS-WATER TEMPERATURE</a>									Degrees Celsius	-5 Deg. C	+40 Deg. C	+/- 0.2 Deg. C	+/- 0.2 Deg. C	hourly
<a href="#">NOS-SWMP-WATER TEMPERATURE</a>									Degrees Celsius	-5	45	+/- 0.15 C	+/- 0.15 C	30
<a href="#">NWS-BOY-Sea surface temperature</a>									Degrees Celsius	-5	40	+/- 1	+/- 1	60
<a href="#">NWS-MAN-Sea surface temperature</a>									Degrees Celsius	-5	40	+/- 1	+/- 1	60
<a href="#">QAR - Stratus - Subsurface - Sea Surface Temp</a>									Degrees Celsius	-5	35	0.002 - 0.005	0.002 - 0.005	varies from 5 to 120 minutes
<a href="#">QAR - Stratus - Subsurface - Water Temperature</a>									Degrees Celsius	varies by sensor	varies by sensor	varies by sensor	varies by sensor	varies from 5 to 120
<a href="#">QAR-AOML-GOOS-SVP-SST</a>									Degrees Celsius	-2	+42	+/- 0.3	+/- 0.3	Every 3 hours
<a href="#">QAR-AOML-GOOS-Sub Surface Temperature</a>				Global	4 to 24 observations/day	4 to 24 observations/day	By using GPS we realize a location accuracy of + or	+ or - 20 meters.	Degrees Celsius	-2	+40	0.15	0.15	10
<a href="#">QAR-Argo-Ocean Temperature Profile</a>									Degrees Celsius	-5	35	.001	.001	10
<a href="#">QAR-TAO-OceanTemp</a>									Degrees Celsius	0	40	0.01	0.01	10

# Notional Portfolio Analysis Result





NOAA &gt; NESDIS &gt; NGDC &gt; Maps



Map Generated by the National Geophysical Data Center

0 4974 mi



## LAYERS

- ☒ Base layers
- ☐ Argo
- ☐ NESDIS
- ☐ NMFS
- ☒ NOS
  - ☐ ☐ NOS-CO-OPS
  - ☐ ☐ NOS-CORS
  - ☐ ☐ NOS-NCOP
  - ☐ ☐ NOS-NST MUSE
  - ☒ ☐ NOS-NWLON
  - ☒ ☐ NOS-PORTS
  - ☒ ☐ NOS-SWMP
- ☐ NWS
- ☐ OAR
- ☐ OSEI Images
- ☐ Global Networks
- ☒ NOAA Ships
- ☐ Background Images

Refresh Map

☒ Auto Refresh

Help:

A closed group, click to open.

A group, click to close.

Rec	Station Info	Name	State	Latitude	Longitude	Continuous Data Starts	Data Length	Water Level	Water Temperature	Water Conductivity	Air Temperature
1	<a href="#">Get the Data</a>	VIRGINIA KEY, BISCAYNE BAY	FLORIDA	25.73167	-80.16167	1994	8	x	x		x

Identify

[About the Database](#)

help

# NOSA Near Term Tasks

- **Therefore, first step in developing NOSA, is to identify and document all NOAA Observational Requirements**
  - Develop a more formal NOAA Observation Requirements Collection Process
  - Produce a NOAA Consolidated Observation Requirements List (CORL) database
- **Provide PR08 efficiency and investment recommendations**
  - Objective: Provide NOAA Leadership with information to assist in building a NOAA-wide portfolio of observing system investments
  - Optimal portfolio: the combination of observing system investments that provides the greatest value within a given budget (recognizes legal mandates and other drivers)
- **Goal: Develop repeatable process to support '08 PPBES cycle and beyond**





# CORL: Background

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- **Scope**
  - Initial focus on supporting a NOAA-wide observing system architecture (for 4 NOAA Goal Teams/31 NOAA Programs) that allows central planning, system integration
  - Plan to be part of an integrated global environmental observation and data management system
- **How**
  - **7-Step Process:** From Observation Requirements Identification, Translation and Standardization through Validation and Annual Updating



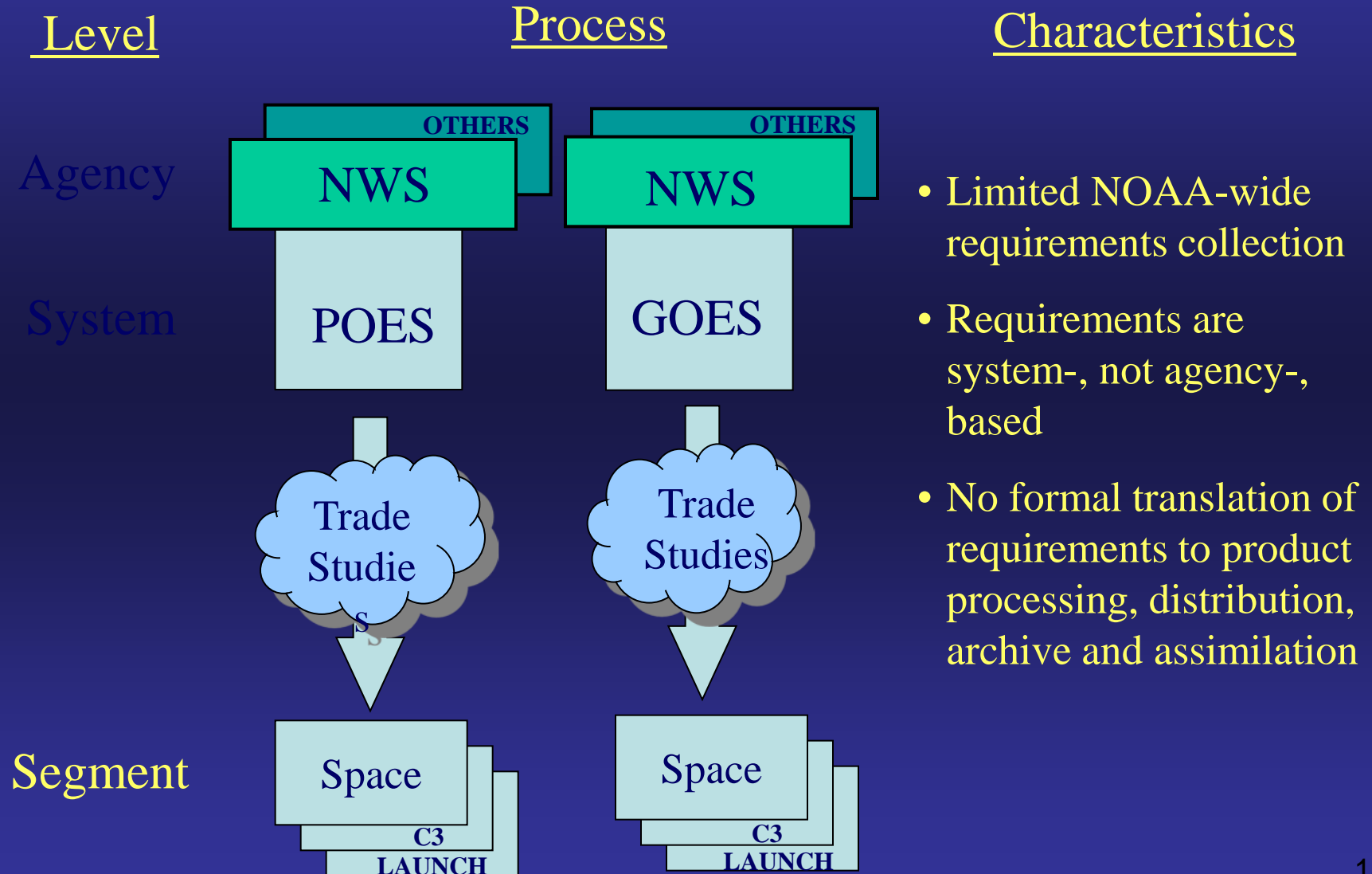


# Observational Requirements Collection Process Description – 7 Steps

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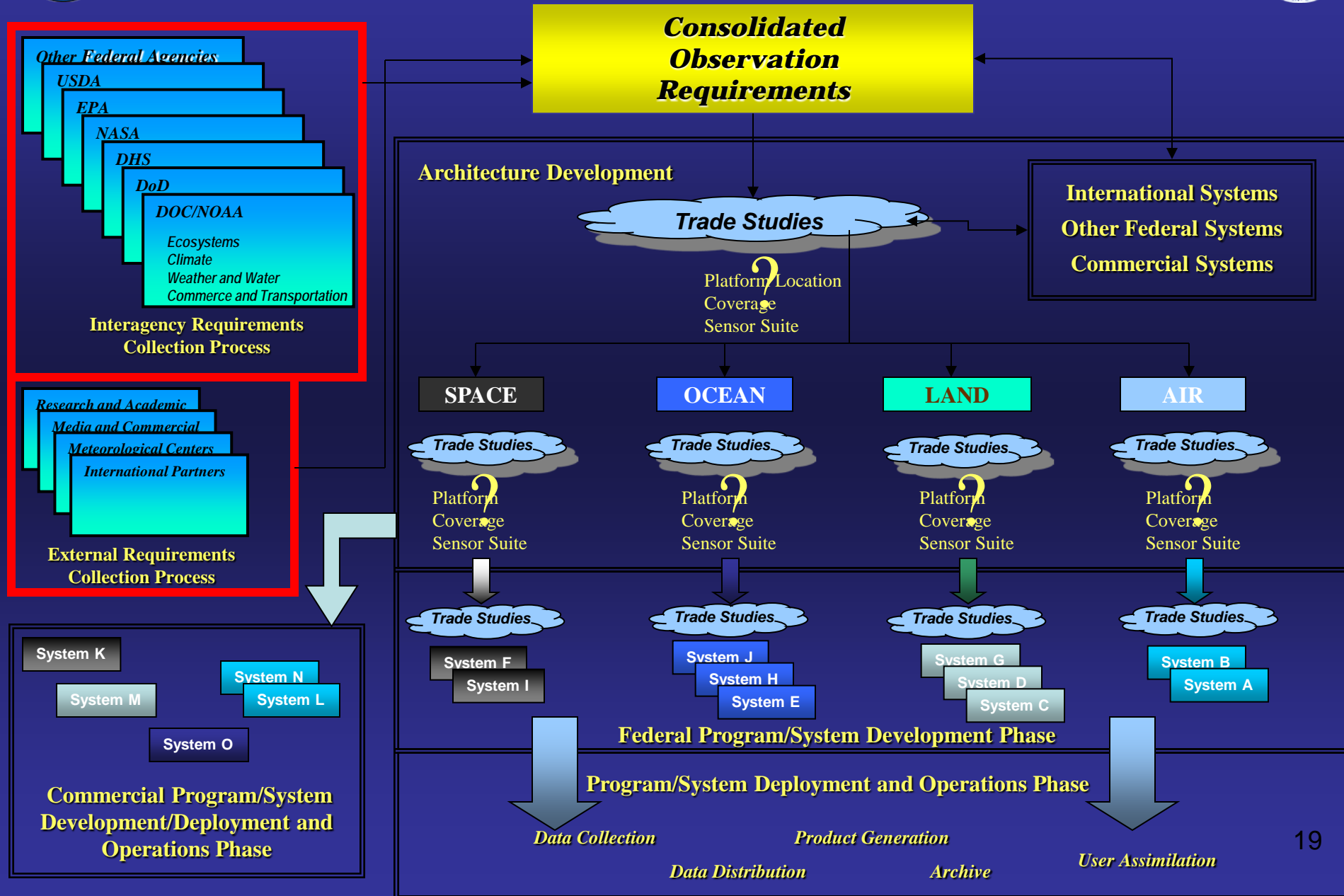
1. *Identification and Collection* – current documentation
2. *Translation and Standardization* – MORL/GCMD
3. *Revision and Prioritization* – by program
4. *Validation* – by parameter, attribute, approval levels
5. *Consolidation* – all MORLs to CORL
6. *Interfaces* – with NOSA and PPBES
7. *Maintaining Currency* – annual Review of Req, Jan-Feb prior to NOAA PPBES cycle

# Requirements Process - Past





# Requirements Identification to Systems Allocation





# NOAA Mission Goal Teams

## Ecosystem Goal

*Habitat*

*Corals*

*Coastal and Marine Resources*

Protected Species

Fisheries Management

*Aquaculture*

Enforcement

*Ecosystem Research*

*Ecosystem Observations (9)*

## Weather and Water Goal

*Local Forecasts and Warnings*

*Space Weather*

*Hydrology*

*Air Quality*

*Environmental Modeling*

Science, Technology, and Infusion

*Coasts, Estuaries and Oceans*

## Climate Goal

*Climate Observations & Analysis (3)*

- *Atmosphere*

- *Ocean*

- *Land*

*Climate Forcing*

*Climate Predictions & Projections*

*Climate & Ecosystems*

Regional Decision Support

## Commerce and Transportation Goal

*Marine Transportation Systems*

*Aviation Weather*

*Marine Weather*

*Geodesy*

NOAA Emergency Response

Commercial and Remote

Sensing Licensing

*Surface Weather*

*Programs with observational requirements are in red italics  
(x) = number of SubPrograms*



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# Obs Reqs Disciplines and Attributes

## Disciplines

- Atmosphere
- Radiance Or Imagery
- Land Surface
- Solid Earth
- Cryosphere
- Biosphere
- Oceans
- Hydrosphere
- Human Dimensions
- Sun-earth Interactions

## Attributes

- User Info (POC, Phone, Email)
- Observational Requirement
- Observational Requirement Priority
- Global Climate Master Change (GCMD):  
Topic/Discipline, Term, Variable
- Observational Requirement Type:  
Biological, Chemical, Physical
- Timeline
- Threshold/Objective
- Geographic Coverage
- Vertical Range
- Vertical Resolution
- Horizontal Resolution
- Mapping Accuracy
- Measurement Range
- Measurement Accuracy
- Measurement Precision
- Sampling Interval
- Data Latency
- Long-Term Stability
- Associated NOAA Program Outcome



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# Prioritization – 2 Levels

## 1) Parameter Prioritization

Priority 1 – Mission Critical

Priority 2 – Mission Optimal

Priority 3 - Mission Enhancing

## 2) Example Attribute Prioritization

Goal	Geo Cov	Vert Res	Horz Res	Msmnt Acc	Msmnt Pre	Samp Int	Data Lat	LTS
W&W	CONUS	2	1	1-2	2	1	1	3
CLI	Global	1	2	1	1	2	3	1





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# Significant Milestones

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- **Spring 2004**
  - Translated NOAA LO requirements to NOAA Program needs
  - Defined naming convention; standardized template schema
  - Developed 27 draft MORLs
- **Summer 2004**
  - Incorporated and updated with FY07 Program Baseline Assessments
  - Developed phased-approach schedule for CORL publication in Spring 2005
- **Fall 2004**
  - Completed Phase 1 identification of *Priority-1* observation requirements and *Threshold level* attributes
  - Transitioned over 1400 Obs Reqs (67K attribute values) from Program Excel spreadsheets to on-line relational (CasaNOSA) database
- **Winter 2004-2005**
  - Uploaded all Phase 1 Draft MORLs to NOSA Web site
  - Data Call for Phase 2 (Priority 2&3, Threshold & Objective Levels)
- **Planned April May 2005**
  - Generation of first CORL representing 31 NOAA Programs



# [www.nosa.noaa.gov](http://www.nosa.noaa.gov)



## NOAA Observing Systems Architecture (NOSA)

Wed Jan 05 2005 12:05:27 GMT-0500 (Eastern Standard Time)

### Site Information

- [About NOSA](#)
- [About Architecture](#)
- [Observing System Inventory](#)
- [Relationship to PPBES](#)
- [NOAA Programs and Environmental Observation Requirements](#)
- [Observation Requirements vs System Capabilities Tool](#)
- [How is NOSA used?](#)
- [Target Architecture](#)
- [Strategic Direction \(pdf\)](#)
- [NOAA Observing Systems Council\(NOSC\)](#)



[NOSA Interactive Map](#)



[NOSA in Your Neighborhood](#)

### Featured Observing System

#### [OAR/PMEL Fisheries Oceanography Coordinated Investigations\(FOCI\)](#)

FOCI (NOAA/PMEL and NOAA/AFSC Fisheries-Oceanography Coordinated Investigations) conducts research to better understand the relationship between the marine environment and the survival of commercially valuable fish in the North Pacific, and how climate impacts the ecosystems of the North Pacific. Moorings are an integral part of data collection, and FOCI has been deploying moorings at numerous short- and long-term sites since 1983. PMEL-FOCI moorings produce temperature, salinity, meteorological variables, current velocities, fluorescence, nutrients and other time series parameters in the ocean environment. Studies are focused in the Bering Sea and North Pacific, and encompass large and varying dynamic systems sensitive to change at both regional and global extents.

View FOCI Stations: [Map](#) [Station List](#)



### Other Observing Systems

Select an Observing System

- [NOSA Geospatial Database Search](#)
- [Catalog of NOAA's Observing Systems \(PDF\)](#)

### About NOSA

NOAA initiated its first-ever comprehensive review of all its observing systems and their interrelationships. This activity was termed the baseline **NOAA Observing System Architecture (NOSA)**.

The baseline **NOSA** was constructed with the assistance of all observing system managers, research and operational, within NOAA.

[More about NOSA](#)

[A Spatial Portal to NOAA's Observing Systems](#) (presentation at the 2004 AGU Meeting)



# NOSA Observing Systems Database

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## NOAA Observing Systems Architecture (NOSA)

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[About Architecture](#)

[Observing System  
Inventory](#)

[Group on Earth  
Observations](#)

[Relationship to PPBES](#)

[NOAA Programs and  
Environmental Observation  
Requirements](#)

[Observation Requirements  
vs System Capabilities Tool](#)

[How is NOSA used?](#)

[Target Architecture](#)

Observing System	Acronym
<a href="#">NASA-QuikSCAT</a>	QuikSCAT
<a href="#">NESDIS-Geostationary Operational Environmental Satellite I-M</a>	GOES-I/M
<a href="#">NESDIS-Geostationary Operational Environmental Satellite NOP</a>	GOES NOP
<a href="#">NESDIS-IPO-Defense Meteorological Satellite Program</a>	DMSP
<a href="#">NESDIS-Marine Optical Buoy</a>	MOBY
<a href="#">NESDIS-National Polar-orbiting Operational Environmental Satellite System</a>	NPOESS
<a href="#">NESDIS-National Polar-orbiting Operational Environmental Satellite System Preparatory Project</a>	NPOESS-NPP
<a href="#">NESDIS-Polar Operational Environmental Satellite</a>	POES
<a href="#">NESDIS-U.S. Climate Reference Network</a>	USCRN
<a href="#">NMFS-Coral Reef Watch - Coral Reef Early Warning System</a>	CREWS
<a href="#">NMFS-Fishery Dependent - Commercial Statistics</a>	FIS
<a href="#">NMFS-Habitat Assessment</a>	Habitat
<a href="#">NMFS-Living Marine Resources</a>	LMR
<a href="#">NMFS-Marine Recreational Fisheries Statistics Survey</a>	MRFSS
<a href="#">NMFS-National Observer Program</a>	NOP
<a href="#">NMFS-Protected Resources Surveys</a>	None
<a href="#">NOS-Continuously Operating Reference Stations</a>	CORS
<a href="#">NOS-Hydrographic Surveying</a>	HYDRO
<a href="#">NOS-National Current Observation Program</a>	NCOP
<a href="#">NOS-National Status and Trends Mussel Watch Program</a>	NS&T MUSSEL
<a href="#">NOS-National Water Level Observation Network</a>	NWLON
<a href="#">NOS-Physical Oceanographic Real-Time System</a>	PORTS
<a href="#">NOS-System-Wide Monitoring Program</a>	NERR SWMP
<a href="#">NWS-Automated Remote Collector</a>	ARC
<a href="#">NWS-Automated Surface Observing Systems</a>	ASOS
<a href="#">NWS-Coastal-Marine Automated Network</a>	CMAN
<a href="#">NWS-Cooperative Observer Program</a>	COOP
<a href="#">NWS-Fischer and Porter gage</a>	FNP
<a href="#">NWS-Hydrometeorological Automated Data System</a>	HADS
<a href="#">NWS-Lightning Detection</a>	NLDN
<a href="#">NWS-Limited Automated Remote Collector</a>	LARC



# Observational Requirements Database



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## NOAA Observing Systems Architecture (NOSA)

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vs System Capabilities Tool](#)

[How is NOSA used?](#)

[Target Architecture](#)

### Requirements to Observations

Ecosystem Goal	html	.xls
Habitat	<a href="#">View</a>	<a href="#">Download</a>
Corals	<a href="#">View</a>	<a href="#">Download</a>
Coastal and Marine Resources		
Protected Species	<a href="#">View</a>	<a href="#">Download</a>
Fisheries Management		
Aquaculture	<a href="#">View</a>	<a href="#">Download</a>
Enforcement		
Ecosystem Research	<a href="#">View</a>	<a href="#">Download</a>
Ecosystem Observations	<a href="#">View</a>	<a href="#">Download</a>

Climate Goal	html	.xls
Climate Observations & Analysis	<a href="#">View</a>	<a href="#">Download</a>
Climate Forcing	<a href="#">View</a>	<a href="#">Download</a>
Climate Predictions & Projections		
Climate & Ecosystems		
Regional Decision Support		

Weather and Water Goal	html	.xls
Local Forecasts and Warnings	<a href="#">View</a>	<a href="#">Download</a>
Space Weather	<a href="#">View</a>	<a href="#">Download</a>
Hydrology	<a href="#">View</a>	<a href="#">Download</a>
Air Quality	<a href="#">View</a>	<a href="#">Download</a>
Environmental Modeling	<a href="#">View</a>	<a href="#">Download</a>
Science, Technology, and Infusion		
Coasts, Estuaries and Oceans		

Commerce and Transportation Goal	html	.xls
Marine Transportation Systems	<a href="#">View</a>	<a href="#">Download</a>
Aviation Weather	<a href="#">View</a>	<a href="#">Download</a>
Marine Weather	<a href="#">View</a>	<a href="#">Download</a>
Geodesy	<a href="#">View</a>	<a href="#">Download</a>
NOAA Emergency Response		





# CT/Marine Weather MORL



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Goal: Commerce & Transportation  
Program/Sub-Program: Marine Weather

Parameter	1 Priority	T/O	Geo Coverage	Vert Range Low	Vert Range High	Vert Range Units	Vert Res.	Vert Res. Units	Horz Res.	Horz Res. Units	Mapping Accuracy	Mapping Accuracy Units	Msmnt Range Low	Msmnt Range High	Msmnt Range Units	Msmnt Accuracy	Msmnt Accuracy Units	Msmnt Precision	Msmnt Precision Units	Sampling Interval	Sampling Interval Units	Data Latency	Data Latency Units
Air Temperature, Boundary Layer	1	T	Hemispheric	0	800	hPa	25	mb	20	km	na	na	210	320	K	1	K	1	K	1	hr	5	min
		O	tbs	tbs	tbs	tbs	tbs	tbs	tbs	km	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs
Air Temperature, Profiles	1	T	Mesoscale	0	500	hPa	500	m	10	km	2	km	210	320	K	1	K	na	na	1	hr	3	min
		O	tbs	tbs	tbs	tbs	tbs	tbs	tbs	km	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs
Cloud Imagery	1	T	Hemispheric	0	500	hPa	na	na	0.5	km	na	na	0	100	%	na	na	na	na	5	min	1	min
		O	tbs	tbs	tbs	tbs	tbs	tbs	tbs	km	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs
Visibility	1	T	Ocean Basin	0	0	na	na	na	2	km	0.5	km	0	10	km	0.5	km	0.5	km	1	hr	1	hr
		O	tbs	tbs	tbs	tbs	tbs	tbs	tbs	km	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs
Visibility	1	T	Ocean Basin	0	0	na	na	na	2	km	0.5	km	0	9.3	km	0.46	km	0.46	km	1	hr	1	hr
		O	tbs	tbs	tbs	tbs	tbs	tbs	tbs	km	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs
Ocean Wave Direction	1	T	Hemispheric	0	0	na	na	na	10	km	2.5	km	10	360	deg	10	deg (avg)	na	na	1	hr	15	min
		O	tbs	tbs	tbs	tbs	tbs	tbs	tbs	km	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs	tbs

## For Priority Categories:

"1" = Mission Critical / Cannot meet operational mission objectives without this data

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

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

[back to Requirements](#) [go to NOSA home](#)

# CORL Matrix Template & IUAOS/Climate

- Tool for your use to capture your group's *consensus, platform-independent Obs Reqs needs to meet your mission*
- Entries to consider from NOAA Climate/COA and Climate/CF
- Entries to consider from GCOS
- **Flexibility** – add columns, stratification (GEO, VR, Temporal) and/or comments to capture your group's Obs Reqs
  - Change of Attribute = new requirement
- Enables ability to interface with all other NOAA Goal/Program Obs Reqs
- Enables ability to interface with NOAA Gap, Target Arch and Investment Analyses
- **Consistency** with GCOS, IWGEO, NOAA Climate/ COA & CF and W&W/ AQ, Hydro, EMP & LFW.....