

GMD Final Report to OAR Management re: the 2013 Global Monitoring Division Reviewers' Findings and Recommendations and GMD's Response

[Comments on Actions taken in Blue]

27 July 2015

Revised 10 August 2016

We greatly appreciate the thoughtful comments provided by the Review Panel, and the time they spent in carrying out this review of NOAA's (National Oceanic and Atmospheric Administration) Global Monitoring Division (GMD).

This document responds to issues raised by the reviewers or provides additional information where warranted by the reviewers' comments. In the first section below, we have responded to general comments offered in the written review report. The second section responds to specific points made by the reviewers within the topic areas of the review. Excerpts from the Review Report are shown in italics.

General Comments

We appreciate the positive comments offered by the reviewers concerning the quality, relevance, and performance of atmospheric chemistry, aerosol, and solar radiation research at ESRL. It is good to hear this diverse panel underscore the quality, relevance, essential nature, and value of our data sets and research to assessments and scientists worldwide. We agree that these data and research are essential to the success of international science and are dedicated to maintaining quality and keeping the systems operational under all budget scenarios.

Actions: To sustain the continuity and quality of GMD's data sets, we are aggressively pursuing several options. We actively seek extramural funds from other agencies and we are beginning to charge full cost recovery on services at the observatories. *[We have instituted an on-going effort, phasing in charges according to individual agreements at all observatories.]* We also have recently engaged the Office of Marine and Aviation Operations (OMAO) for a larger effort by NOAA Corps in providing staff at our observatories, increasing their staffing in GMD and the length of their tours of duty. *[This has been completed for a third officer; we continue to seek a fourth.]* Though each of these efforts is helpful, none of them is a sufficient amount of funding to provide to adequately upkeep and maintain our sites, nor to cover the plethora of publications our highly productive staff generates from these data. What may be more effective is our effort to secure additional funds through a proposed increase of base funds in the President's budget requests. Although we received a modest increase in base funding beginning in FY2014, fragments of what is needed remain. These were kept in NOAA's request for FY2015 and FY2016 to no avail and we understand these items will again appear in the President's FY2017 request. We will continue to work closely with the

Office of Oceanic and Atmospheric Research (OAR) and NOAA leadership to ensure that GMD has appropriate funding for its critical work.

Specific Comments on the Topic Areas

Finding #1: *The NOAA GMD Mission is on target, well aligned with the needs of many stakeholders and supporting the activities of other science and regulatory agencies (state, national, and international). The lab is an environmentally strategic asset of the US that has been carefully optimized to conduct highly successful science in the areas of Climate Forcing, Ozone and Ozone-depleting substances and Air Quality.*

Recommendation #1: *The science GMD carries out to support other science and regulatory agencies (state, national, and international) should be expanded rather than contracted to accomplish NOAA's mission.*

Response: GMD's mission is essentially unchanged since its inception and that is consistent for an organization designed to provide long-term monitoring to address multi-decadal concerns. GMD's scientific publications, data, and products have become increasingly relevant to other agencies through the US Global Climate Research Program (USGCRP), particularly the Environmental Protection Agency. In addition to their scientific contribution, GMD's ozone observations inform policies on stratospheric ozone and air quality; greenhouse gas observations inform policies on energy development; aerosols and radiation inform policies on energy development and overall air quality.

Actions: GMD will continue to maintain all networks, expand its product base, interact with other agencies to enhance observing systems, inform assessments, build outreach, and publish manuscripts, analyses, and data products in a timely manner. Our Global CO₂ Record and our Annual Greenhouse Gas Index have now been officially adopted as National Climate Indicators. They both also are used routinely in EPA Annual Reports, as are all of our data on ozone depleting gases along with the Ozone Depleting Gas Index. Our studies of oil and gas field emissions of methane are also now used by EPA to evaluate their methane emission inventories and our findings on ozone have influenced recent air quality policy decisions by EPA and we continue our contributions to the ozone assessments that inform the parties to the Montreal Protocol. Internationally, we continue to maintain strong ties with the World Meteorological Organization (WMO) through participation in its Global Atmospheric Watch Programme (GAW) serving on or leading its scientific advisory groups and experts groups, WMO Commission for Atmospheric Sciences (the guiding body for GAW and the World Weather Research Programme), the Baseline Surface Radiation Network, the Federated Aerosol Network, the Global Climate Observing System (GCOS) Atmospheric Observation Panel for Climate, the USGCRP Carbon Cycle Interagency Working Group and Scientific Steering Groups, US Group on Earth Observations (GEO), and the international GEO-Carbon Programme. [\[GMD continues to leverage its skills and capabilities among these organizations, being key players in the GEO-Carbon Strategy, the emerging WMO Integrated Greenhouse Gas Information System, and the emerging GEO-Carbon Flagship. GMD leads much of the work at the biennial Greenhouse Gas Measurement Techniques meetings where measurement guidelines are evaluated. GMD provides leadership of the Baseline Surface Radiation Network, two WMO Scientific Advisory Groups, and participation on a third. We continue to update of products, re-establish lost sites with infused funds, participation in](#)

WMO, GCOS, GEO events, commissions, panels worldwide, maintain involvement in USGCRP, work to establish Nat'l Climate Indicators, and build capacity through WMO, CEOS, GEO and national partners.]

Overall, we are looking at ways to brand GMD's observing systems for what they are – “Reference Networks for Atmospheric Composition and Radiative Forcing”. As reference networks, they have become the core of any global observing system of these variables – other instruments, sites, or systems must yield results that are consistent with GMD's. GMD's observing systems for greenhouse and ozone-depleting gases, ozone, aerosols, and radiation are “reference” networks for several reasons: (1) they are supported internally by world recognized standards, calibration gases, and approaches; (2) their high quality and comprehensive coverage make them particularly useful for comparisons by other observing systems; (3) GMD maintains rigorous, transparent quality control procedures that provide the glue for incorporating outside measurements; (4) products such as GlobalView and CarbonTracker are used universally to initialize and validate climate models; and (5) satellite retrievals similarly use GMD's records for initialization and validation. We are exploring having this “branding” as reference networks for several other of our networks in the near future. A “beta” version for greenhouse gases is currently posted at <http://www.esrl.noaa.gov/gmd/ccgg/about.html> .

Finding #2: *The combination of GMD activities and priorities, with a mixture of operations, science and technology is an essential element of its successful approach to carrying out its mission.*

Recommendation #2: *All three components of GMD work, operations, scientific analysis and technological development, are required for its mission and must be sustained.*

Response: Our understanding of this finding is that, although much of what we do to ensure the continuity of our observations can be considered operational, it is essential that research and observations be tightly linked under the same roof. This is needed because of the high accuracy and precision of data required, the low concentration levels measured, and the sophistication of the instrumentation. We have maintained this tight linkage since the inception of GMD's predecessor organization (Geophysical Monitoring for Climate Change – GMCC), but especially since 1984, when a review panel for GMCC made it clear to OAR and NOAA leadership that the importance of these observations, the quality needed for them to be of scientific value, and the dependence of the broader community on the observations required an infusion of research scientists within the organization if it is to succeed. The recommendation was acted upon within the following few years and improved the value and impact of what are now GMD's data, products, and research.

Action: GMD will continue to pursue a careful balance between top quality scientists and skilled technicians to ensure the continuity, quality, and relevance of these data. As we work to replace our aging workforce, we will ensure that highly-capable individuals are attracted to oversee and maintain our observing systems. To a great extent such an attraction already exists because of the relevance and quality of GMD data, the

opportunity to work in a pool of innovative scientists, and our engagement with national and international partners. We will enhance this with opportunities for succession and leadership development by fostering even closer coordination among our scientists and technicians, by continuing to give mid-level scientists leadership opportunities, and by encouraging retiring senior federal staff to continue part-time in non-federal positions to provide continuity and mentoring for the new generation of leaders. [We have hired two technicians and Group Chief as federal employees and several scientists and technicians as CIRES Associates with new funds. Several federal employees have retired and we are working on filling positions. We have developed succession plans for all research groups.]

Finding #3: *GMD “leveraging” of activities done by others is extensive and integral to the scientific mission of GMD and is often an appropriate and required strategy. Although national and international partnerships partially compensate for limited NOAA resources, the continued US leadership role in monitoring and scientific assessments is at risk due to declining budgets!*

Recommendation #3: *NOAA must put additional resources into all aspects of GMD operations, scientific analysis and innovation.*

Response: This is a critical issue that GMD has long-recognized. For Fiscal Years 2011-2017, NOAA, with considerable push from GMD, OAR, CPO, and even OSTP, has had requests in the President’s Budget for amounts ranging from \$5.7M to \$12.7M augmentation to GMD, mainly through CPO. The requested funds in the FY 2011-2013 budgets were not appropriated by Congress. In FY2014, \$3.5M of the \$5.7M request was granted by Congress. This brings us back to 2003 levels in real dollars, which helps, but is still not enough to meet current demand and requirements. Also, with a complete design and cost estimates fully laid out, we have had requests to the NOAA Chief Administrative Officer for funds for a new building at Pt. Barrow for about a decade, getting high in the rankings in many years, but not high enough to compete for the limited, available resources.

Action: For FY2015, GMD has worked closely with OAR Leadership, NOAA Headquarters, and NOAA Office of Program Planning and Integration to request \$3M additional funding for NOAA’s Atmospheric Baseline Observatories, mainly for operational support. This is now in the FY2015 President’s Budget Request. The amount is not sufficient for maintaining our unique reference networks at a level to ensure global leadership, but it will at least prevent our observatories from falling further into disrepair. OMB saw fit to add two additional requests for FY2015 that harbor significant increases for GMD observing networks. One is a request for \$4.5M, of which \$1.0M is targeted at GMD activities regarding the North American Carbon Program. That is intended to recover most of the remaining FY2014 request. The second request was for \$8M for North American carbon research, calling for largely expanded monitoring of CO2 and methane from GMD’s aircraft and tall tower networks, supported by enhanced measurement of C-14 in CO2, other isotopes in CO2 and methane, and chemical tracers for attributing emissions. Along with OAR and NOAA HQ, we will meet with key committee staff and members of Congress on several occasions this year as the budget is developed. It is essential not just to GMD, but to NOAA, OAR, and the world scientific

community that these funds become available. In addition, we will work closely with OAR and NOAA and continue to push for funding for a new Barrow facility at the earliest possible chance. [We continue to push for more resources supporting NOAA's long-term observing systems, adding, once again, a request for funds to construct a new building at Barrow, Alaska (BRW)].

Finding #4: *The scientific capacity of GMD is at risk due to a disproportionately senior workforce, including possible near-term retirements of some of its pre-eminent leadership, and little succession planning for major programs. Most junior and some mid-career scientists with leadership potential in GMD are employed through CIRES, with limited opportunity to advance.*

Recommendation #4: *Recruitment of new talent and conversion of suitable CIRES staff to NOAA positions are imperative for keeping projects strong.*

Response: GMD has an urgent need to open up NOAA positions if it is to succeed in maintaining leadership within the organization. GMD and OAR agree to continue to push for these positions.

Action: GMD is working with OAR HQ to fill eight NOAA positions this calendar year. These include four scientists, an administrative officer, a budget analyst and two technicians. [GMD has hired two technicians, an Administrative Officer, and two scientists as federal employees. Several CIRES technicians and scientists have also been hired. We are still waiting on two scientists, one technician, and two administrative positions and are preparing a list for further conversions.] See also discussion of personnel hiring and succession planning in response to recommendation 2.

Finding #5: *The GMD observatories are national treasures and strategically located to support their highest priority national and international measurement programs. However, their current number is barely sufficient and NOAA cannot respond to emerging environmental problems with new stations.*

Recommendation #5: *NOAA should ensure the continued support for the observatory system.*

Response: This is one of several needs for GMD funding, as noted above in our response to Finding and Recommendation #3. These are (1) additional funds for the current atmospheric baseline observatories to accommodate rapidly rising costs and previous budget cuts; (2) support to strengthen and upgrade GMD's reference networks for atmospheric composition and radiative forcing with up-to-date equipment; and (3) facilities support to replace the greatly aged main building at Pt. Barrow, AK.

Action: The additional funding received in FY2014 has taken some pressure off of GMD's observing system infrastructure, but significant gaps remain. As we noted in our response to Finding and Recommendation #3, OAR's request for funding for GMD's Atmospheric Baseline Observatories has appeared in the President's budget for FY2015,

FY2016, and likely FY2017. Other portions of the President's Budget request that support GMD will greatly benefit the overall observing systems that are intricately linked to and support the observatories. These additions will allow NOAA to maintain its leadership position in providing reliable, long term information on global atmospheric composition. [In addition to on-going requests for funds for the ABOs, GMD has solidified its relationship with NOAA Corps, increasing number of NOAA Corps Officers supporting ABOs from 2 to 3. We have also hired additional staff (CIRES) to support and staff observatories.]
