



# Advanced Hydrologic Prediction Service Quarterly Report 1<sup>st</sup> Quarter FY 2008



December 31, 2007

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# **Collaborative Research**

## On-going Competitive and Collaborative Research

**Theme:** Collaborative Research

**Management Lead:** Pedro J. Restrepo

**Objective:** Coordinate the evaluation and management of the collaborative grants program

### Milestones

Task	Due Date	Status
On-going competitive grants- Renewal	March 2006	Completed

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY05

- We received 27 pre-proposals for new competitive grants. There was no money in the budget to award new grants. All proposers were notified and the process terminated.
- We received progress reports from 3 of the 4 on-going competitive grants. As of today, we also hosted a seminar on the research grant from the U. of Arizona. We will be hosting seminars from the U. of Colorado, U. of Iowa and Central Florida University on Monday, February 7.
- We received a proposal for continuation of a collaborative research from Shripad Deo at CIRA. We requested a re-scope of the proposal which was received and is being evaluated

#### 2<sup>nd</sup> Quarter FY05

- All progress reports for the on-going competitive grants were received and the renewal process was complete and delivered to the Office of Grants.
- We received news of a Congressional earmark for the Red River Basin Institute. The RFA was published one week ago, and in a telephone conversation with the Institute Director (Chuck Fritz) he communicated that he was completing the proposal this afternoon (4/22)

#### 3<sup>rd</sup> Quarter FY05

- All on-going competitive grants were submitted on-time to the Grants office.
- The non-competitive Red River earmark grant was received by the proponent on-time. OHD evaluated the grant with assistance of two outside reviewers, approved and forwarded the material to the grants office on time.

#### 4<sup>th</sup> Quarter FY05

- All grants were awarded on time

#### 1<sup>st</sup> Quarter FY06

- Scheduled presentations for the Grant Principal Investigators to present their annual progress reports

#### 2<sup>nd</sup> Quarter FY06

- All four grantees gave presentations to OHD in January, and submitted progress reports.
- All grants were renewed on-time

#### 3<sup>rd</sup> Quarter FY06

- We used Water Resources Initiative funding to increase each grant by \$20 K. Additionally, we used \$80K to grant the University of Central Florida a one-year extension to adapt the model to the Pascagoula, MS river, in order to extend the area of forecasting of the LMRFC.
- We dedicated \$93K to fund 2 graduate fellowships. Both fellowships will be managed through

the NOAA-CREST program lead by the City College of New York. One of the fellowships will be hosted by a NOAA-CREST institution, and the other one will be available to any graduate program in Water Resources and Hydrology in the US.

#### **4<sup>th</sup> Quarter FY06**

- NOAA-CREST was notified of the award, which allows us to proceed to the announcement, evaluation and award of the two student fellowships.
- The four \$20K extensions to all grantees, and the \$80K extension to UCF were signed.

#### **1<sup>st</sup> Quarter FY07**

- We received 42 proposals for the June Omnibus announcement. The proposals were reviewed for compliance and found four were non-compliant. The remaining proposals are being evaluated by HSMB and external reviewers.
- The 4 on-going research projects are approaching their completion. Their third and final seminar presentation is scheduled for February 16. These projects are:
  - University of Colorado: "Improving Operational Streamflow Forecasts in the Colorado River Basin" PI Andrew Slater.
  - University of Arizona: "Parameterization and Parameter Estimation of Distributed Models for Flash Flood and River Prediction with Quantification of Uncertainty" PI Hoshin Gupta.
  - University of Iowa: "Diagnostic Verification of 6-90 Day Ensemble Streamflow Predictions for AHPS" PI Allen Bradley
  - University of Central Florida: "Tides and Waves for the National Service River Forecast System" PI Scott Hagen

#### **2<sup>nd</sup> Quarter FY07**

- Recommended one proposal for award in the Social Sciences category of the December 27 2006 Federal Register Omnibus announcement. No proposals were deemed suitable for funding in the River Regulation category.
- The 40+ proposals received in response to the June Omnibus announcement are in final review. The panel should meet on 4/20

#### **3<sup>rd</sup> Quarter FY07**

- OHD recommended 3 proposals for award under the June 2006 Omnibus announcement. We also received a proposal under the Broad Agency Announcement which we recommended for award.
- All proposals are now in the grants office. Two proposals are now finalized by the Grants office, and the remainder are in progress.

#### **4<sup>th</sup> Quarter FY07**

- All 3 grants received under the June 2006 and one grant received under the December 2006 Omnibus announcements and recommended for funding were awarded. The Grants office rejected the proposal received under the Broad Agency Announcement, by refusing to issue a waiver.

#### **1<sup>st</sup> Quarter FY08**

- The Federal Funding Opportunity Announcement was published in the Federal Register at the end of December. The deadline for the submission of proposals on probabilistic river regulation is 1/28. We expect to convene a panel during the first full week of February and to issue a recommendation to Gary shortly after that.

### **Problems Encountered/Issues**

#### **1<sup>st</sup> Quarter FY05**

- Apart from the reduced amount of funding, there have been no problems

#### **2<sup>nd</sup> Quarter FY05 – None**

**3<sup>rd</sup> Quarter FY05** - None

**4<sup>th</sup> Quarter FY05**- None

**1<sup>st</sup> Quarter FY06** - None

**2<sup>nd</sup> Quarter FY06** - None

**3<sup>rd</sup> Quarter FY06** - None

**4<sup>th</sup> Quarter FY06**

- None on our side. The award to AZ and the \$80K extension to UCF had some glitches that were resolved at the last minute.

**1<sup>st</sup> Quarter FY07** - None

**2<sup>nd</sup> Quarter FY07** – None

**3<sup>rd</sup> Quarter FY07**

- The Grants office has an issue with the indirect cost rate (ICR) of the social science proposal. The requested, and received, a clarification about the rate both from the grantee and from DoD, which reviewed and approved the ICR. The Grant specialist is now on leave, returning on 8/8. I'll pursue the question then.
- As of today, we are still waiting on a formal approval from the Grants office about the proposal received under the BAA. We had received verbal approval, but are waiting for a written approval to be attached to the file and finish up that grant.

**4<sup>th</sup> Quarter FY 07**

- The proposal received under the BAA was rejected by the Grants office. The Chief had the authority to issue a waiver, but declined to do so. We are studying whether to include it in the December 07 omnibus announcement, or whether to solicit bids for a contract.

**1<sup>st</sup> Quarter FY08** - None

## **Quantify Uncertainty (Ensembles)**

## Test, validate and comparatively verify the EPP2 GFS Subsystem

**Theme:** Quantify Uncertainty (Ensembles)

**Management Lead:** Pedro Restrepo

**Objective:** Test the prototype software, validate the science and comparatively verify the performance. The subsystem extends the forecast lead time to 14 days by the use of GFS ensemble mean forecasts of precipitation and temperature.

### Milestones

Task	Due Date	Status
Install the EPP2 GFS Subsystem at HL.	Q1	Complete
Complete functionality assessment.	Q2	Complete
Complete testing and validation.	Q3	Complete
Complete hindcasting and produce initial verification results.	FY08 Q1	Complete

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY07

- Installed the EPP2 GFS Subsystem at HL (w/ the help of Rob Hartman).
- Made test runs in real-time forecast and hindcast modes.

#### 2<sup>nd</sup> Quarter FY07

- Completed functionality testing and assessment.

#### 3<sup>rd</sup> Quarter FY07

- Data sets for the MARFC Juniata basins have been prepared.
- Identified active options available in the current version of the GFS Subsystem and their preferred settings.

#### 4<sup>th</sup> Quarter FY07

- Hindcasting of the RFC Subsystem has been completed (these hindcasts serve as reference). Hindcasting of the GFS Subsystem, however, is still in progress. The delay was necessary to accommodate enhancements in the the GFS Subsystem. The remaining task is expected to be completed by mid-Nov.

#### 1<sup>st</sup> Quarter FY08

- Hindcasting of the GFS Subsystem has been completed for 3 different options: GFS ensemble mean-driven w/o time disaggregation, GFS ensemble mean-driven w/ time disaggregation, and HPC/RFC and GFS ensemble mean-driven w/o time disaggregation.

### Problems Encountered/Issues

#### 1<sup>st</sup> Quarter FY07

- The near-real-time feed of GFS forecast via the Internet off ESRL/PSD server is not very reliable; may have to develop a new feed off NCEP.

2<sup>nd</sup> Quarter FY07 - None

3<sup>rd</sup> Quarter FY07 - None

**4<sup>th</sup> Quarter FY07**

- Because the data period of the GFS reforecast data does not match that of the HPC/RFC single-forecast data, strict comparative evaluation of the GFS ensemble mean-driven hindcasts is not possible. This is likely to add some uncertainty in the interpretation of some of the comparative evaluation results.

**1<sup>st</sup> Quarter FY08**

- Examination of the verification results indicated presence of bias in the resampled climatological ensembles. Additional work will be necessary in FY08 to remove this bias.
- Certain differences were noted in the verification results from the Ensemble Verification System (EVS) compared to its predecessor, the Ensemble Verification Program (EVP). Additional work will be necessary to confirm that the results are the same.

## Improve Ensemble Hindcaster

**Theme:** Verification

**Management Lead:** Pedro Restrepo

**Objective:**

- 1) Use the Hydrologic Ensemble Hindcaster to produce hydrologic ensemble hindcasts based on different ensemble pre-processor methodologies (including EPP2, GFS subsystem, and newly developed ensemble pre-processors)
- 2) Develop user's manual and training document for installation and operation of the prototype Hydrologic Ensemble Hindcaster
- 3) Develop additional capabilities to offer capabilities for deterministic hindcasting, basic raw model forecasting, and ensemble postprocessing and analyze the impact of input forecasts, run-time MODs, and postprocessing on flow forecasts
- 4) Coordinate the verification activities within NWS, including the support of the hydrologic verification teams to develop standardized verification strategies

### Milestones

Task	Due Date	Status
Use the prototype Hydrologic Ensemble Hindcaster to produce streamflow hindcasts from various pre-processor methodologies	FY07 – Q1	Complete
Develop a user's manual for installation and operation	FY07 – Q3	Complete
Release and support the prototype Hydrologic Ensemble Hindcaster	As necessary	In progress
Develop hindcasting capabilities for deterministic hindcasting and basic raw model forecasting	Q4	
Develop hindcasting capabilities with ensemble postprocessing	Q4	
Coordinate verification activities	As necessary	In progress

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY07

- Produced ensemble forecast verification results for various forcing inputs (including GFS subsystem hindcasts of precipitation and temperature using GFS forecasts) for AB- and CNRFCs.
- Delivered the enhanced Hydrologic Ensemble Hindcaster scripts to CNRFC.
- Developed a scientific algorithm documentation and training material, which was presented during the RFC Short-Term Ensemble Workshop in November 2006.
- Developed a description of all the verification activities and the verification focal point duties for 2007 with an estimation of work up to 2011, in order to develop a National River Forecast Verification System.

#### 2<sup>nd</sup> Quarter FY07

- Helped putting the OFS FCST NUMCOSAV enhancement request in the DR list; this enhancement is necessary for the Hydrologic Ensemble Hindcaster to produce retrospective initial conditions at the time step consistent with the forcing input fore-/hindcasts.
- Worked on developing datasets required for running the Ensemble Hindcaster with the forcing input ensembles from EPP II and for verifying the streamflow forecasts at MARFC test basins.
- Supported CNRFC for running the Ensemble Hindcaster with the hydrometeorological ensembles produced by the GFS Subsystem; helped correcting an error on date labels for the GFS Subsystem output ensembles.
- Worked on the Ensemble Hindcaster user's guide (to be completed in by April 07).
- Presented the verification of hydrologic forecasts in the NWS with results from the Ensemble

Hindcaster at the International Verification Workshop at ECMWF in Reading, UK in January 2007.

- Produced a paper entitled “Experimental hydrometeorological and hydrologic ensemble forecasts and their verification in the U.S. National Weather Service” to be published in the IAHS red books and presented at the IUGG07 conference.
- Worked on the organization of the RFC Verification workshop to be held at CBRFC in mid-August 2007: developed an agenda, contacted the speakers, developed a description of RFC verification focal points who will attend the workshop, and helped developing a survey for forecasters.

### **3<sup>rd</sup> Quarter FY07**

- Ran the EPP II hindcaster and the Hydrologic Ensemble Hindcaster using different forcing input datasets (climatology, resampled climatology, QPF-based short-term ensembles) and produced verification results for precipitation and streamflow ensembles for the 10 MARFC test basins.
- Finalized the Hydrologic Ensemble Hindcaster user’s guide.
- Worked on the organization of the RFC Verification workshop to be held at CBRFC on August 14-16 2007: finalized the agenda, had meeting with the speakers to coordinate the presentations, developed a team charter for the NWS Hydrology Forecast Verification, developed a website for the team and the workshop, reviewed the questions and the survey from the workshop participants, and developed presentations and a glossary for verification metrics.

### **4<sup>th</sup> Quarter FY 07**

- Continued to run the EPP II hindcaster using the latest EPP II methodology, the Hydrologic Ensemble Hindcaster, and the Ensemble Verification System prototype to produce verification results for precipitation and streamflow ensembles for the MARFC test basins.
- Enhanced the Ensemble Hindcaster scripts to support CNRFC hindcast work. Hydrologic hindcasts can be generated for a list of segments or forecast groups. The user’s manual has been updated using examples at CN-, AB-, and MA- RFCs. The updated scripts and users manual have been delivered to CNRFC in September 2007.
- Supported the design analysis of a hindcasting capability for XEFS.
- Conducted the RFC Verification workshop at CBRFC on August 14-16 2007. The workshop was attended by representatives from all RFCs, COMET, Central Region Headquarters, Western Region Headquarters, and one WFO. The topics covered included verification concepts and methodologies, effective strategies to communicate verification information, logistical verification, deterministic river forecast verification including the Interactive Verification Program (IVP) software and capabilities, and probabilistic river forecast verification including the Ensemble Verification System (EVS) software and capabilities. The topics were presented as lectures, software demonstrations, and hands on lab exercises. Overall, the workshop was well received with the most common feedback indicating that the workshop and training sessions need to be conducted yearly. All the workshop materials, results of software surveys, and workshop evaluation are available on the workshop website.
- Participated in the monthly meetings of the WR Hydrology Verification team to work on verification case studies at CN-, CB-, and NW- RFCs.
- Worked on the verification section for the OHD Science Plan; a first draft was presented to OHD management at the end of September 2007.
- Participated in the DMIP2 workshop on September 10-12 2007 to discuss how to verify the hydrologic simulations produced by the different models to be inter-compared.
- Worked on planning the verification activities for FY08 with the Verification System Requirements and Planning team, in coordination with the XEFS team and the RFC Archive team.

### **1<sup>st</sup> Quarter FY08**

- Supported the use of the Hydrologic Ensemble Hindcaster prototype at CNRFC for the American River basins.
- Worked on planning the verification activities for FY08 with the Verification Core Goal team, in coordination with the XEFS and RFC Archive Core Goal teams. The AHPS verification plan for

- FY08 was sent to OHD management on 11/02/2007.
- Organized monthly meetings with the NWS verification team to review the team charter, deliverables and agenda, to determine the current archiving processes and issues at the 13 RFCs, and to select verification case studies for all RFCs. Participated in the meetings with the WR verification team to review CB- and CN-RFCs case studies.
  - Participated in the NPMC monthly meetings, as well as the verification workshop in early November; OHD verification activities for both single-valued and ensemble forecast verification were presented.
  - Discussed with Matt Kelsch the verification training modules that COMET is developing.

## **Problems Encountered/Issues**

### **1<sup>st</sup> Quarter FY07**

- There has been a request for enhancing the OFS FCST NUMCOSAV function used in the Hydrologic Ensemble Hindcaster to generate retrospective initial conditions at the desired time step; no enhancement has been done so far.

### **2<sup>nd</sup> Quarter FY07**

- The requested enhancement of the OFS FCST NUMCOSAV function in the DR list is not assigned yet.

### **3<sup>rd</sup> Quarter FY07**

- The work on additional ensemble hindcasting capabilities have been delayed since a new ensemble forecasting approach based on the statistical analysis of operational deterministic forecasts, called HMOS, has been developed to support the XEFS project.
- The requested enhancement of the OFS FCST NUMCOSAV function has not been worked on yet.

### **4<sup>th</sup> Quarter FY07**

- The work on additional ensemble hindcasting capabilities have been delayed to FY08 to coordinate with the XEFS project, which includes the HMOS and post-processor components.
- The requested enhancement of the OFS FCST NUMCOSAV function is now part of the SREC list for OB9 but no resources have been allocated to it. This issue needs to be addressed before delivering the hindcasting capability to the RFCs to produce hydrologic hindcasts with the correct model states information.

### **1<sup>st</sup> Quarter FY08**

- Resources have been allocated to work on the DR18809 in 2008. The completion date for this DR needs to be determined.

## **Gridded Water Resources**

## Distributed Model - SAC-SMA Parameters

**Theme:** Gridded Water Resources

**Management Lead:** Mike Smith

**Objective:** The objective of FY08 work will be to conduct research on usage of SSURGO data and verify whether the use of the data can improve current SAC-SMA parameter estimation and further our distributed modeling. Download data for various projects. Procedures will be developed to store and process the massive data sets.

### Milestones

Task	Due Date	Status
1. Obtain high resolution SSURGO and Land Use Land Cover data for DMIP1 basins	Jan. 31, 2005	completed
2. Derive new a priori SAC-SMA parameters using high resolution data for some research basins	March 31, 2005	Completed
3. Review, understand theory of a priori parameter estimation procedure	April 30, 2005	completed
4. Streamline parameter updating (add newly derived data in current grid data sets)	Sept. 30, 2005	Completed
5. Test new parameters against those derived from STATSGO (both for lumped and distributed)	Dec. 31, 2005	In progress
6. Modify, extend theory of SAC-SMA parameter estimation (e.g. use of CN number explicitly)	Sept. 30, 2005	Completed
7. Extend areal coverage of SSURGO-based SAC parameters for more consistent evaluation	Sep. 30, 2006	Derived for DMIP 2 western basins. Derived for 25 states in SR and CBRFC
8. Evaluate performance of SSURGO-based and STATSGO based parameters on soil moisture simulation over DMIP 2 basins where data available.	FY07 Q3	In progress
9. Derive and test a priori parameters by using combination of STATSGO and Curve Number Grids	FY07 Q3	Derivation complete; testing in progress

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY05

- Task 1: Most of GIS data for DMIP1 basins are downloaded
- Task 2: Began processing of GIS data to generate SSURGO-based SAC-SMA parameters for IAHS conference

#### 2<sup>nd</sup> Quarter FY05

- Tasks 2 & 3 have been completed. Fine scale parameters have been derived for some basins in Oklahoma.

#### 3<sup>rd</sup> Quarter FY05

- Ziya Zhang, Seann Reed, and Victor Koren ran 2km x 2km scale distributed modeling tests with new parameters. Results show improvement over STATSGO based parameters.

#### 4<sup>th</sup> Quarter FY05

- New version of soil-based SAC-SMA parameters was developed that uses a high resolution CN grid in addition to soil texture. Testing of this new procedure will commence.

### **1<sup>st</sup> Quarter FY06**

- Began to process data for North Fork American River in CNRFC domain
- Developed basic time estimate to process raw data into parameters.
- OFC Dec 14 on comparison of SSURGO and STATSGO parameters for distributed model simulations. Showed improvement in cases. Gary expressed great interest in the value of these fine scale data for soil moisture simulations.

### **2<sup>nd</sup> Quarter FY06**

- Mike Smith presented paper on SSURGO and STATSGO data for distributed model simulations at the Joint Federal Interagency Modeling Conference in Reno, Nevada, April 2-6.
- Ziya Zhang's statistical analyses of the distributed modeling simulations shows that the gains by using SSURGO data for parameterization are statistically significant.
- Ziya Zhang investigated methods of automating some of the processing of the raw SSURGO data.

### **3<sup>rd</sup> Quarter FY06**

- Reviewed an available program to derive STATSGO-based SAC parameters and defined needed changes to develop the program that accounted explicitly for CN grids.
- Provide HL-RMS with Muskingum-Cunge routing option to ABRFC for their testing.
- Continued evaluation of the performance of SSURGO-based and STATSGO-based SAC parameters.

### **4<sup>th</sup> Quarter FY06 - N/A**

### **1<sup>st</sup> Quarter FY07**

- This project now leverages the work funded via the Hurricane Supplemental. Significant progress made in streamlining the process of SSURGO data downloading and processing into SAC parameters. New processes use "R" language and GRASS GIS. Validation of new procedures versus initial manual procedures shows generally good agreement.

### **2<sup>nd</sup> Quarter FY07**

- SSURGO based SAC parameters developed for 20 states in Southern Region and CBRFC domain at 1 and 4km resolutions. Initial comparisons (scatter plots and spatial variability) with STATSGO based parameters show reasonable agreement. HOSIP documents updated to agree with current status of work. Hydrologic modeling analysis of the SSURGO parameters to continue. Intermediate products such as soil porosity were also developed.
- Developed HOSIP documents for this work.

### **3<sup>rd</sup> Quarter FY07**

- Tested HL-RDHM on 16 basins using different sets of SAC parameters. Began to analyze results. Victor, Seann, Ziya, and Yu discussed use of antecedent soil moisture condition I versus II, decided condition 1 more valid. SSURGO parameters using condition 1 generated for 25 states. Yu revised his journal manuscript on SSURGO-based parameter definition per Seann's and Mike's comments. Yu completed program for filling missing values in parameter grids. Yu regenerated SSURGO parameters for entire states of OR, ID, and WY.
- Continued comparisons of SSURGO and STATSGO parameters using graphs and hydrologic simulations.

### **4<sup>th</sup> Quarter FY07**

- New parameter grids made available for DHM/RDHM users. The following five files are available from the NOAA1 server. Please see the attached Word document for instructions on obtaining these grids. The SSURGO parameters have been derived as part of the Hurricane Supplemental tasks.
  - 1) unfilled.tgz : SSURGO-NLCD based parameter grids at the 4 km resolution (25 states) and supplemental grids (see README)
  - 2) filled.tgz : SSURGO-NLCD based parameter grids at the 4 km resolution with some gaps filled via interpolation (see the README)

- 3) statsgo.tgz: STATSGO-GLCC based parameter grids at the 4 km resolution
- 4) pe\_filled.tgz: new monthly PE grids in which data at CONUS boundaries has been extended using interpolation
- 5) readme.tgz: contains documentation for all the new grids
- Ziya Zhang worked on preparing a journal paper on the analysis of these new parameter sets.
- Yu Zhang submitted paper to OHD review on the processing of SSURGO-data for the derivation of SAC model parameters.

**1<sup>st</sup> Quarter FY08**

- Ziya Zhang ran simulations using new parameter sets on 11 basins, and started results analyses for a journal paper which is under preparation.

**Problems Encountered/Issues**

**1<sup>st</sup> Quarter FY05 - None**

**2<sup>nd</sup> Quarter FY05 - None**

**3<sup>rd</sup> Quarter FY05 - None**

**4<sup>th</sup> Quarter FY05 - None**

**1<sup>st</sup> Quarter FY06**

- Ziya noted that SAC parameters derived from SSURGO data can show discontinuities at county borders.

**2<sup>nd</sup> Quarter FY06 - None**

**3<sup>rd</sup> Quarter FY06**

- Trying to automate the processing of the SSURGO is challenging due to different formats among counties.

**4<sup>th</sup> Quarter FY06**

- Delays due to 1) difficulties in process automation and 2) efforts to launch DMIP 2 western basin experiments. Also, advances in using soil moisture data for model calibration were explored; a new technique for comparing point-to-grid soil moisture estimates was developed in a related study for the economic benefits of water resources. These latter two developments will help the analysis of STATSGO (with variable CN) and SSURGO soil moisture estimates.

**1<sup>st</sup> Quarter FY07**

- Identified problem of disk storage of the SSURGO data: much space is required.

**2<sup>nd</sup> Quarter FY07**

- FY07 Q1 disk storage problem resolved by processing the SSURGO data state by state.

**3<sup>rd</sup> Quarter FY07 - None**

**4<sup>th</sup> Quarter FY07 – Work delayed due to major personnel changes:**

- Researcher Ziya Zhang suffering from major health problems; will go on extended leave in October.
- Researcher Yu Zhang left Hydrologic Modeling group to join Hydrometeorology Group. Replacement is being sought.

**1<sup>st</sup> Quarter FY08 None**

## Distributed Model - Evaluate New Parameter Approaches

**Theme:** Gridded Water Resources

**Management Lead:** Mike Smith

**Objective:** The objective will be to evaluate a parameter regionalization approach for SAC and Snow-17 using lumped calibrated parameters. Value of soil moisture data for evaluation and calibration of a priori parameters will be also analyzed.

### Milestones

Task	Due Date	Status
1. Derive relationships between lumped calibrated SNOW-17 parameters and watershed properties	Mar. 31, 2005	On schedule
1. Generate SNOW-17 parameter grids over Susquehanna River basin	Apr. 30, 2005	On schedule
2. Evaluate and calibrate derived SNOW-17 parameter grids using snow observations and streamflow	Dec. 30, 2005	On schedule
3. Evaluate a priori SAC-SMA parameters over Oklahoma mesonet using runoff and soil moisture data at different spatial scales	Sep. 30, 2005	Completed April 2005
4. Initial evaluation of possibility of using soil moisture data to calibrate a priori SAC-SMA parameters	Sep. 30, 2005	completed
5. Develop a physically-based procedure to derive <i>a priori</i> values of the most critical SNOW-17 parameters over CONUS	Mar 30, 2006	Completed for MF-max, MF-min.
6. Evaluate a priori STATSGO-based SAC parameters over selected regions (e.g., Oklahoma) by comparing to available measurement (e.g., soil moisture, runoff, evaporation)	May 31, 2006	completed
7. Perform calibration of SAC parameters, and analyze their relationships to a priori and climatologic indexes	July 31, 2006	In progress
8. Test SAC and SNOW-17 derived parameters over uncalibrated areas/basins	FY07 Q1	Snow-17 initial tests of 2 parameters nearly complete. Being done in DMIP2 western basins.
9. Evaluate soil moisture simulations over DMIP2 basins from lumped and distributed models.	Q3	Completed in Q4 for DMIP 2
10. Extend analysis and tests of a climate adjustment to a priori parameters (increase time period and basins)	Q3	In progress
11. Compare long-term climatologic variables (precipitation, evapotranspiration) to their averages over shorter test periods, and evaluate effect of their differences on the climate adjustment factors.	Q3	In progress
12. Test SAC climate adjusted parameters over uncalibrated areas/basins from lumped and distributed simulation results.	Q3	In progress
13. Investigate other sources of Snow-17 a priori parameter ranges: use energy budget model results	Q4	In progress
14. Derive and test first-cut a priori values of Snow-17 parameters SCF and UADJ	FY08 Q2	In progress

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY05

- Task 1: Similar analysis was performed for Cont-API model

- Task 4: Runoff and soil moisture data for the Oklahoma mesonet region are collected.

#### **2<sup>nd</sup> Quarter FY05**

- Task 1. Basic relationships developed.
- Task 2, 3. Completed. Fekadu Moreda and Zhengtao Cui delivered distributed model and all parameter grids to MARFC. Fekadu presented paper on this work at the conference of the International Association of Hydrologic Science (IAHS) in Brazil in April.
- Task 4. Ziya Zhang has acquired and processed fine scale soils data for the Oklahoma areas. Victor completed this task and presented work at the conference of the International Association of Hydrologic Science (IAHS) in Brazil in April.

#### **3<sup>rd</sup> Quarter FY05**

- Victor and Fekadu tested the distributed model for a multiyear period over the OK. Mesonet domain to evaluate against soil moisture estimates from the NLDAS project run by NCEP.

#### **4<sup>th</sup> Quarter FY05**

- Victor extended the analysis of Oklahoma Mesonet simulation results. Developed climate adjustment factor to modify the existing a-priori parameters. A grid of these adjustment factors was developed for CONUS. Testing with OK Mesonet soil moisture justifies again the physics of the modified SAC-SMA model. Hypothesis is that the climate index can improve a-priori parameter identification and thus simplify the calibration of distributed and other models.

#### **1<sup>st</sup> Quarter FY06**

- Developed CONUS data set of a priori parameters for Snow-17 based on Eric Andersons initial suggestions.

#### **2<sup>nd</sup> Quarter FY06**

- Ongoing work on evaluation and calibration Sacramento parameters over Oklahoma region and 20 selected river basins. Distributed and lumped approaches are used in these tests. Tests of climate adjustments are ongoing.

#### **3<sup>rd</sup> Quarter FY06**

- Published two papers (IAHS Red Book) on evaluation of a priori SAC parameters over the Oklahoma mesonet region.
- Extended analysis of a priori parameter performance over Oklahoma mesonet basins for lumped-based simulations using runoff and soil moisture measurements.
- Soil moisture measurements were incorporated into the automatic calibration process as an additional performance measure. Preliminary results suggest that the use of soil moisture data can improve a parameter estimation procedure and reliability of model parameters. They are also helpful in manual calibration to be sure that 'good results are achieved for scientifically sound reasons'.

#### **4<sup>th</sup> Quarter FY06**

- More soil moisture tests were performed at 2 New Mexico sites. These tests led to development of an approach that allowed rescaling of soil moisture states simulated using HRAP scale a priori parameters into point soil moisture states by using local soil properties (porosity and wilting point). It has potential for simulation/prediction of soil moisture at a local scale. However, wide range tests need to be performed.

#### **1<sup>st</sup> Quarter FY07**

- SAC-HT: Additional soil moisture tests conducted at the request of New Mexico State researchers (for the Economics Study of the NOAA Water Resources program). The developed approach to rescale soil moisture states simulated using HRAP-scale a priori parameters into point soil moisture states by using local soil properties was tested for 48 Oklahoma Mesonet soil measurement sites. These simulations show much higher accuracy at Mesonet sites comparing to just use of HRAP-scale a priori parameters without rescaling. This shows promise for end-

users to get site-specific soil moisture information during coarse-scale (i.e., 4km grid) executions of the SAC-HT model. End-users can obtain local soil properties from field-collected soil samples or perhaps SSURGO data would be useable.

- Snow-17: Developed CONUS estimates of MF-MAX, MF-MIN using Eric Anderson's recommended ranges modified by topographic attributes such as aspect and forest cover. Delivered estimates to CBRFC. Began testing parameters for selected areas in the Juniata River basin (MARFC).

#### **2<sup>nd</sup> Quarter FY07**

- Developed CONUS Sacramento model parameters from STATSGO data and variable NRCS Curve Number (CN). Parameters developed at 1km and 4km scale. Developed parameters for Maryland to support Baltimore Flash Flood Project with DHM-TF. Began initial evaluation of the STATSGO parameters with/without variable CN.
- Obtained calibrated SNOW-17 parameters of several basins from ED Clark (CBRFC). Started comparing these parameters with a priori Snow-17 parameters.
- Updated HOSIP documents to reflect the current status of these tasks.
- Investigators at U. New Mexico report 'promising' results using Victor's soil moisture simulations for an agricultural economics study. Draft journal paper being prepared.

#### **3<sup>rd</sup> Quarter FY07**

- Victor Koren performed analyses and prepared presentation on the use of soil moisture observations for calibration for IUGG conference in Italy, July 2007.
- Reviewed draft report from U. New Mexico: "Exploratory Case Study on the Value of Improving Soil Moisture Forecast Information for Rangeland Management" which showed the value of soil moisture data from the SAC-HT model.

#### **4<sup>th</sup> Quarter FY07**

- Victor completed analysis of using soil moisture data to aid model calibration. Victor developed paper from July IUGG conference and submitted to Journal of Hydrology for publication. Results showed that more consistent SAC model parameters can be developed when using additional data for calibration (not just basin outlet streamflow)
- Received request to provide CONUS 1/8 degree scale SAC parameters for NCEP's North American Land Data Assimilation System (NLDAS) project. This will provide more independent testing and evaluation of the soils-based parameters at a national scale.
- Began testing of a priori Snow-17 parameters in western DMIP 2 basins.
- Completed analysis of distributed model soil moisture simulations for DMIP 2. Presented results at DMIP 2 workshop September 10-12, 2007.

#### **1<sup>st</sup> Quarter FY08**

- Evaluated a priori grids of MFMAX and MFMIN over DMIP2 basins.
- Processed CONUS-wide NARRA wind data and generated monthly climatological grids. A preliminary HRAP grid of UADJ parameter was generated using these climatological grids.

### **Problems Encountered/Issues**

**1<sup>st</sup> Quarter FY05** - None

**2<sup>nd</sup> Quarter FY05** – None

**3<sup>rd</sup> Quarter FY05** – None

**4<sup>th</sup> Quarter FY05** - None

**1<sup>st</sup> Quarter FY06** – None

**2<sup>nd</sup> Quarter FY06** - None

**3<sup>rd</sup> Quarter FY06** - None

**4<sup>th</sup> Quarter FY06**

- Planned work delayed to work on SnowMIP and New Mexico soil moisture simulations to support Water Resources Economics study. However, the use of soil moisture in the auto-calibration process and a technique of relating point-to-grid soil textures from the New Mexico work will lead to better calibrated parameters to use in the analysis of a climatological adjustment.

**1<sup>st</sup> Quarter FY07**

- Delays again due to additional tests requested by the New Mexico Economics study.

**2<sup>nd</sup> Quarter FY07** - None

**3<sup>rd</sup> Quarter FY07**

- Hydro group currently managing over 30 projects; OHD prioritization needed to reduce workload.

**4<sup>th</sup> Quarter FY07**

- PE adjustment of parameters delayed due to Cold Regions workshop, DMIP 2 gridded data derivation for FY07 OHD AOP item, results analysis, preparation of OHD Science Plan, and other projects.
- Fekadu Moreda leaving Hydrologic Modeling Group to join River Mechanics group. Fekadu worked on the *a priori* estimates of the Snow-17 parameters. Replacement won't start until November 13, 2007

**1<sup>st</sup> Quarter FY08** - None

## Distributed Hydrologic Model into Operations

**Theme:** Gridded Water Resources

**Management Lead:** Jon Roe

**Objective:** Incrementally develop and nationally deliver components of distributed hydrologic modeling software within the evolving CHPS architecture.

### Milestones

Task	Due Date	Status
Expose this project to the larger NWS OSI Process in order to eventually make use of existing AWIPS capabilities for grid display and manipulation.	Q1	Complete
Adjust HOSIP Stage 1 documents and submit to OSIP.	Q1	Complete
Pass OSIP Gate 1.	Q2	Complete
Identification of first increment high-priority requirements, including requirements related to model computations, data display and manipulation, and operational considerations.	Q2	Complete
Adjust HOSIP Stage 2 documents and submit to OSIP.	Q2	Complete
Perform due diligence of a selection of existing hydrologic modeling systems used to process, display and manipulate grid-based data.	Q2	Complete
Pass OSIP Gate 2.	Q2	Complete
Pass HOSIP Gate 2	Q3	Complete
Adjust HOSIP Stage 3 documents and submit to OSIP.	Q4	Complete
Pass OSIP Gate 3.	Q1, FY06	Complete
Perform architectural design development for first increment, including database, computational, display, calibration and operational considerations.	Q1, FY06	Complete
Develop first increment prototype architecture.	Q1, FY06	Complete
Evaluate architectural design and make updates to architectural scheme and implementation.	Q1, FY06	Complete
Perform HOSIP Stage 4 development for first increment targeted for AWIPS Release OB7.	Q1 – Q3, FY06	Complete
Pass HOSIP Gate 4 for first increment	Q2, FY07	Complete
Present status update to OSIP Gate committee	Q2 FY07	Complete
Prioritize second increment of requirements for next AWIPS release OB8.2	Q2 FY07 (was Q4 FY06)	Complete
Develop architectural design for second increment of Build 1	Q1 – Q3, FY07	Complete
Perform development for second increment of Build 1 targeted for AWIPS Release OB8.2.	Q1 – Q3, FY07	Complete
Prioritize next increment of Build 1 requirements for AWIPS release OB8.3	Q4 FY07	Complete
Perform and complete development for next increment of Build 1 for AWIPS Release OB8.3.	Q1 FY08	Complete
Support AWIPS testing of software	Q2-3, FY08	Underway
Present status update to OSIP Gate committee	Q2 FY08	Not started

## Accomplishments/Actions

### 1<sup>st</sup> Quarter FY05

- WGRFC, ABRFC, and OHD agreed on a subset of high-priority functional requirements for the first increment of software development.

### 2<sup>nd</sup> Quarter FY05

- We have reviewed several existing distributed modeling systems: the USGS/USDA Object Modeling System (OMS), the NASA Land Information System, the Danish Hydraulic Institute MIKE 11 model, and the NOHRSC SNODAS modeling system. We will be working through simple experiments with the OMS and the NOHRSC system to further our understanding and to select one as the platform for our distributed modeling development.
- We have initiated an OSIP project to look at the existing AWIPS grid editing and display tools to determine if we can take advantage of them for our grids. Using existing tools will speed our development considerably.

### 3<sup>rd</sup> Quarter FY05

- We collaborated with NOHRSC in the development of a prototype distributed Sacramento model with the goal of better understanding the pluses and minuses of using the NOHRSC framework at the RFCs.
- We worked with SEC and FSL to determine the feasibility and level of effort required to update D2D and/or GFE to meet DHM's grid and spatial data display related requirements.

### 4<sup>th</sup> Quarter FY05

- We completed the analysis of a prototype DHM architecture using NOHRSC's GISRS modeling environment. Due to AWIPS constraints and differences in how NOHRSC does modeling and how DHM would be used at RFCs, we have decided to not pursue using GISRS for DHM at the RFCs.
- We started in-house development of DHM for AWIPS OB7.
- We completed, sent for review, and updated the OSIP documents to enter OSIP Gate 3 Based on the review of the documents by OCWWS, ABRFC, WGRFC, OHD, and SEC, all indications are we will get approval to commence OSIP Stage 4 in early October 2005. In fact, the OSIP Gate 3 was passed on 11 October 2005.

### 1<sup>st</sup> Quarter FY06

- We presented the proposed DHM architecture to the AWIPS design review committee. The review generated some action items, which have been addressed. We are still on track for delivery of the first increment of DHM at RFCs for AWIPS OB7.
- We worked with RFC representatives and SEC/OST to finalize the requirements for displaying output from the distributed model in D2D. SEC/OST is now making the necessary edits to D2D.

### 2<sup>nd</sup> Quarter FY06

- The DHM architecture and DHM features planned for AWIPS OB7.2 were presented to the DOH Science Steering Team (DSST). A follow-up meeting with the DSST is scheduled for mid-May to go over some of their questions and concerns.
- SEC/OST development of D2D features for DHM is back on track after contractual issues affecting the developer were resolved.
- OSIP project 05-001 "Application of the Graphical Forecast Editor in AWIPS at NWS River Forecast Centers (RFCs)", currently in OSIP Stage 3, will recommend a phased implementation of GFE at RFCs, with Phase 1 being the OB8 release of DHM. OSIP Gate 3 for project 05-001 is expected on 5/23.

### 3<sup>rd</sup> Quarter FY06

- DHM Build 1 software was delivered on time on June 6, 2006 to the AWIPS contractor for OB7.2. Corresponding D-2D changes, developed by OS&T/SEC, were also delivered on time.
- The OSIP project 05-001 "Application of the Graphical Forecast Editor in AWIPS at NWS River

Forecast Centers (RFCs)” failed its IWT pre-Gate 3 Review. A new approach will temporarily merge OSIP project 05-001 with this project (OSIP ID 04-007) to permit 05-001 Phase 1 to pass OSIP Gate 3.

- Funds from OHD/AHPS to GSD for OB8 GFE software development have now been transferred.

#### **4<sup>th</sup> Quarter FY06**

- As of September, OS&T no longer maintains a development or test system supporting an RFC localization, which is required for the end-to-end D-2D DHM capability. During this quarter, OHD created a local AWIPS development and test environment.
- Minor enhancements to the original DHM Build 1 (OB7.2) functionality are underway; these will be targeted for AWIPS OB8.1.
- Identification and re-prioritization of the next set of requirements targeted for Build 2 has begun
- The next phase of the project (DHM Build 2) is expected to “spiral” back around to OSIP Gate 3 during Q1 of FY07.

#### **1<sup>st</sup> Quarter FY07**

- The project leader for DHM in AWIPS OB8 is now Ai Vo
- OB8.1 content was completed and delivered to Raytheon for testing. Due to a compressed AWIPS schedule, OB8.1 content for DHM was limited to infrastructure improvements and bug fixes; no additional DHM requirements were implemented.
- OHD hosted a 2-day evaluation session in November with forecasters from ABRFC and WGRFC. It is now clear that the OB7.2 functionality with D-2D display of grids is too weak to be successful on its own. A joint decision was made to capitalize on ABRFC’s XDMS and HSMB’s prototype in the OB7.2 timeframe (also for OB8). OHD agreed to prepare a workshop which will provide training for RFCs and explain the plans for getting distributed modeling into operations.
- GSD will prepare and give a demonstration of GFE running in an RFC environment on January 31 2007 for the HIC conference in Kansas City. OHD will begin the DHM Build 2 requirements definition process based on information gathered at the demo.
- HOSIP Gate 4 for OB7.2 work was originally scheduled for January, but has been delayed until February due to other higher priority projects. OS&T’s OSIP analyst determined that the DHM project is only required to pass OSIP Gate 4 when all requirements for DHM Builds 1 and 2 have been met. At the present time, complete implementation is expected to occur in AWIPS OB8.3.

#### **2<sup>nd</sup> Quarter FY07**

- HOSIP Gate 4 for the OB7.2 phase of Build 1 was completed in March
- Status update presented to OSIP Gate 4 in March
- An AWIPS Requirements Review for OB8.2 content (second phase of DHM Build 1) was held at the end of February/early March
- Development is now underway for OB8.2. Several conference calls with ABRFC and WGRFC have been conducted to review design aspects for the software. Of particular concern in OB7.2 was system performance; performance has now been significantly improved for OB8.2.
- The workshop for DHM is scheduled for the week of June 4. HSMB is coordinating the effort with OCWWS.

#### **3<sup>rd</sup> Quarter FY07**

- A DHM workshop, led by HSMB, was held during Q3 FY07 as planned.
- Software development for AWIPS OB8.2 was completed on schedule and delivered to the AWIPS prime contractor, Raytheon. Raytheon will begin formal testing during Q4.
- Requirements planning for AWIPS OB8.3 began during Q3.

#### **4<sup>th</sup> Quarter FY07**

- Finalized requirements for AWIPS OB8.3 in August after several discussions with RFC personnel.
- Analysis and design for OB8.3 were completed in September.
- A Distributed Modeling Operations Concept Team was formed. Work on DHM Build 2 will be postponed pending the report of this team and subsequent teams to identify the gaps in the current capabilities in the CHPS/AWIPS II environment.

- Upcoming AWIPS Release OB9 marks the end of DHM Build 1. DHM Build 2 will be picked up when work is scheduled for CHPS/AWIPS II.

#### **1<sup>st</sup> Quarter FY08**

- AWIPS OB8.3 Pre-Integration Testing was conducted Dec. 11-13.
- AWIPS OB8.3 Integration Readiness Review was completed and all software and documentation were handed off to AWIPS in December.

### **Problems Encountered/Issues**

#### **1<sup>st</sup> Quarter FY05**

- Because some of the identified operational functional requirements are closely related to issues being addressed through software development in other parts of the NWS (e.g., developing software to display and manipulate grids), the project was promoted into the NWS's, Operational Service Improvement Process (OSIP) during the first quarter. This required adjustments to already existing HOSIP documentation which was performed in the first quarter and continues into the second quarter.
- Since this AHPS project was lightly funded for FY05, progress will be slower than seen in FY04. OHD is adding some AWIPS funding support to keep the project moving. The weak funding profile could cause milestones above to slip over time.

#### **2<sup>nd</sup> Quarter FY05**

- One of our contractors found a new (and better) job, so we have been delayed in completing our review of the modeling systems. We expect to have found a replacement by the end of April.

#### **3<sup>rd</sup> Quarter FY05**

- A more thorough review of the ARS/USGS object modeling system (OMS) led us to classify it as not mature enough for operational distributed hydrologic modeling. We will reassess it in the future.

#### **4<sup>th</sup> Quarter FY05**

- After determining NOHRSC's modeling environment (GISRS) is not useful for our purposes, we have started DHM development using the remaining alternative, which is to internally develop DHM architecture/software. We plan to use the existing research prototype and focus our efforts for AWIPS OB7 on integrating it into NWSRFS using a Java-based control structure. As documented in the OSIP documents, choosing this approach may result in reducing the number of DHM features implemented in AWIPS OB7.
- A principal OHD representative in formulating the CHPS architecture is helping to lead DHM development. Our approach for integrating DHM into NWSRFS will take advantage of the ideas being considered in the CHPS project.

#### **1<sup>st</sup> Quarter FY06**

- There is the potential for an interruption in the work being done by SEC/OST because of the transition of the AWIPS contract to Raytheon/Keane.

#### **2<sup>nd</sup> Quarter FY06**

- None

#### **3<sup>rd</sup> Quarter FY06**

- None

#### **4<sup>th</sup> Quarter FY06**

- Raytheon's implementation of changes to D-2D for DHM grid display has not gone well due to the maintenance developer's limited understanding of OHD's requirements and the D-2D subsystem. After much discussion between OHD, Raytheon, and GSD, all parties agreed that one particular major D-2D problem concerning missing cells in a gridded basin will be addressed

by Raytheon for OB7.2.

- It remains unclear what documentation is required by OSIP for DHM Build 1, if any. There is no intention to proceed to OSIP Gate 4 until all functionality has been implemented; this will take at least two DHM Builds.

#### **1<sup>st</sup> Quarter FY07**

- AHPS funding for DHM is now limited to efforts targeted towards CHPS not NWSRFS. This means resources have been reduced to one person (Ai Vo) using Base funds, with some part-time assistance from 2 other developers.

#### **2<sup>nd</sup> Quarter FY07 - None**

#### **3<sup>rd</sup> Quarter FY07**

- GSD announced to OHD that previously provided AHPS funds will only be used to develop/provide training for GFE at RFCs. It turned out that the funds were not enough for GSD to do any DHM-specific GFE software enhancements.

#### **4<sup>th</sup> Quarter FY07**

- There was insufficient developer time available to incorporate the SNOW-17 operation, the most requested enhancement, into DHM. Instead a workaround is planned for OB8.3 which will allow DHM to process input rainfall+snowmelt grids produced by the RDHM.
- Note there were no AHPS funds allocated to this project for all of FY07 and there will be none for FY08. All future work will be for AWIPS II within the context of CHPS.

#### **1<sup>st</sup> Quarter FY08**

- The decision was made in January 2008 to not include any more work on this project for AWIPS Release OB9. Resources are being diverted to the task of implementing CHPS and considering how DHM fits into that architecture.

## Snow Model - Plans for using SNODAS Output

**Theme:** Gridded Water Resources

**Management Lead:** Michael Smith

**Objective:** Develop plan and approach to use SNODAS output to generate run-time modifications to Snow-17 in operational setting.

### Milestones

Task	Due Date	Status
1. Review existing Snow-17 modifications	May 2006	completed
2. Familiarization with SNODAS processes and products	July 2006	Complete
3. Devise approach	Aug 2006	Draft plan delivered 9/06
4. Acquire data & write draft code	Sept 2006	delayed
5. Test approach.	Nov 2006	delayed

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY06

- No work this period

#### 2<sup>nd</sup> Quarter FY06

- Developed draft outline of tasks and approach (no. 3 above), gave to Eric for comment after his return to Virginia in March.

#### 3<sup>rd</sup> Quarter FY06

- Eric Anderson began in-depth planning of project; began coordinating with NOHRSC on details of data and SNODAS model outputs. Eric completed the review of run-time mods such as those with AESC.

#### 4<sup>th</sup> Quarter FY06

- Eric completed draft plan. Sent to OHD for review. Final plan will be submitted in October 2006.

#### 1<sup>st</sup> Quarter FY07

- AHPS funding of \$38K approved for HL portion of this work.

#### 2<sup>nd</sup> Quarter FY07

- The Snow Science Steering Team needs to approve this project

#### 3<sup>rd</sup> Quarter FY07

- The Snow Science Steering Team needs to approve this project. Discussions at the August Cold Regions workshop may lead to a plan or decision for this work.

#### 4<sup>th</sup> Quarter FY07

- This project was briefly discussed at the Cold Regions Hydrology (CRH) Workshop in August. No word yet on the actions to be taken from the CRH workshop.

#### 1<sup>st</sup> Quarter FY08

- Need approval from the Snow Science Steering Team prior to continuing the project

## Problems Encountered/Issues

### 1<sup>st</sup> Quarter FY06

- No work started as Eric was finishing Snow-17 coding changes and final documentation. Also, the AHPS funding amounts weren't finalized.

### 2<sup>nd</sup> Quarter FY06 - None

### 3<sup>rd</sup> Quarter FY06 - None

### 4<sup>th</sup> Quarter FY06

- Snow Science Steering Team created to provide overall direction. This project is included in the list of all OHD, NWS. NOHRSC plans for coordination. Data needed for this project is not available will have to be generated via 'Re-analysis' at NOHRSC; may be a large effort. (note: AHPS SLF Theme Team assigned this item a fairly high priority.)

### 1<sup>st</sup> Quarter FY07

- The Snow Science Steering Team needs to approve this project.

### 2<sup>nd</sup> Quarter FY07

- The Snow Science Steering Team needs to approve this project

### 3<sup>rd</sup> Quarter FY07

- The Snow Science Steering Team needs to approve this project

### 4<sup>th</sup> Quarter FY07

- The Snow Science Steering Team needs to approve this project

### 1<sup>st</sup> Quarter FY08

- Need approval from the Snow Science Steering Team prior to continuing the project

## Auto Calibration for Distributed Model

**Theme:** Gridded Water Resources

**Management Lead:** Mike Smith

**Objective:** The objectives of this work include developing tools and procedures for auto-calibrating the RDHM to generate parameters for the AWIPS DHM delivered in OB7.2. Two phases are identified for this area of research. First, initial work will focus on auto-optimization of the scalar multipliers of all the gridded parameters (SAC, Snow-17, and routing) so that all parameters are adjusted uniformly. This was done manually in DMIP 1 with good success. A prerequisite for this work is the development of sound lumped hourly parameters. Second, future funding will support work to optimize individual gridded parameters for groups of grids. FY07 work dovetails with the DMIP 2 and other projects.

### Milestones

Task	Due Date	Status
1. Modify RDHM to be called by a generic 'wrapper'	FY07 Q2	complete
2. Test initial auto calibration with OK DMIP 2 basins.	FY07 Q2	complete
3. Explore performance issues in context of DMIP 2	Q4	complete
4. Evaluate multi-time scale objective function. Evaluate need for time series component analysis to identify dominant time scales	FY07 Q2	1 <sup>st</sup> part complete; 2 <sup>nd</sup> part delayed
4. Test Rosenbrock and/or Davidon-Fletcher-Powell search algorithms	FY07 Q3	Delayed
5. Automatic calibration extended to Snow-17	FY08 Q1	Complete
6. Investigated separate procedures for elevation zones for mountainous areas.	FY08 Q4	Complete
7. Evaluate combined automatic and manual calibration strategy	Q4	Complete for non-snow basins; in progress for basins including snow

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY07

- Developed initial HL-RDHM 'wrapper' algorithm to test various minimization approaches.

#### 2<sup>nd</sup> Quarter FY07

- Simple direct search algorithm added to 'wrapper' to find best parameter scalar multipliers. This was tested for DMIP 2 with good success. Rosenbrock search algorithm is being tested now. Additionally, a promising new search algorithm developed in 2006 called Dynamically Dimensioned Search (DDS) was located and the code obtained for use free of charge. Coding advances in HL-RDHM were provided to HSEB.
- Developed HOSIP documents for this project.

#### 3<sup>rd</sup> Quarter FY07

- HL-RDHM with calibration feature presented to all RFCs at the June distributed modeling workshop at ABRFC. Training provided to workshop participants. Minor bugs corrected and continued streamlining of the procedure achieved.

#### 4<sup>th</sup> Quarter FY07

- HL-RDHM with calibration feature testing in DMIP 2 Oklahoma basins; showed good performance evidenced by comparing results to other models.
- Paper on use of simplified search algorithm and soil moisture data using multi-time scale objective function prepared.

- Hydro modeling group began Multi-step Automatic Calibration Strategy ('MACS') type calibration procedure combining manual calibration with automatic calibration in an iterative process. This used in DMIP 2.
- Presented multi-time scale objective function to DMIP 2 participants at DMIP 2 workshop; several participants want to use it.
- Field support of RFC use of calibration tool

#### **1<sup>st</sup> Quarter FY08**

- RDHM automatic calibration module was restructured (mostly dealing with parametric data and model states) that led to significant reduction in run time.
- Automatic calibration was extended to SNOW17 operation and tested for DMIP2 basins.
- Created off-line scripts to perform zone adjustment of RDHM parametric grids. This approach was tested for the Carson basin in manual calibration of SAC-SMA and SNOW17 models. Linkage to RDHM software needs to be performed for an automatic option.

### **Problems Encountered/Issues**

**1<sup>st</sup> Quarter FY07** - None

#### **2<sup>nd</sup> Quarter FY07**

- Long HL-RDHM calibration run times noticed. This was solved by adding code from the older HL-RMS to the new version HL-RDHM so that the calibration routines execute a streamlined version of the distributed model.

**3<sup>rd</sup> Quarter FY07** - None

#### **4<sup>th</sup> Quarter FY07**

- Planned activities such as testing the Rosenbrock search procedure delayed due to other projects' priority.

**1<sup>st</sup> Quarter FY08** - None

# Verification

## Improve Ensemble Verification

**Theme:** Verification

**Management Lead:** Pedro Restrepo

- Objective:**
- 1) Improve ensemble verification capabilities, by incorporating known feature requirements and ongoing feature requests from OHD scientists and the RFCs. The feature requirements will be listed and prioritized as they become known. Key feature requests include:
    - ⇒ Identification of sampling uncertainties for the ensemble verification metrics (e.g. through confidence intervals).
    - ⇒ Development of diagnostic and real-time (prognostic) verification measures
    - ⇒ Extension of the single-valued metrics within EVS, including testing for single-valued forecasts.
    - ⇒ Extension of the batch-processing options.
    - ⇒ Support for skill calculations within EVS (e.g. based on persistence and climatology).
  - 2) Develop the archiving data requirements for single-valued and ensemble forecasting through interactions with the RFCs to support the RFC Archive Core Goal Team.
  - 3) Support the prototype Ensemble Verification System (EVS) integration in the XEFS prototype with the XEFS team.
  - 4) Collaborate with COMET and other stakeholders to produce appropriate training material on ensemble verification and the EVS software specifically.

### Milestones

Task	Due Date	Status
Enhance the prototype Ensemble Verification System (EVS), develop documentation and release the prototype	FY07 - Q1	Complete
Develop diagnosis and prognostic verification measures, confidence intervals, and techniques for real-time application	FY07 - Q2	Complete
Implement the new capabilities in EVS	FY07 - Q3	Complete
Develop archiving data requirements report for current and future verification of single-valued and probabilistic forecasts	Q2	In progress
Release enhanced EVS prototype along with documentation	Q2	In progress
Support the NWS verification team with their use of EVS for exercises and RFC verification case studies	Q4	In progress
Enhance EVS to incorporate new features	Q4	In progress
Develop an experimental prototype for Real-Time Verification	Q4	In progress
Support the integration of EVS into the XEFS experimental prototype	Q4	In progress
Collaborate with COMET and other stakeholders for training material development	Q4	In progress

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY07

- Developed a Java User Interface for the Ensemble Verification System (EVS) with enhanced Fortran codes (to pair observations and forecasts and compute verification metrics) and R scripts (for graphical display).

- Developed documentation for prototype EVS and training material presented during the RFC Short-Term Ensemble Workshop in November 2006.
- Released Version 1.0 of the prototype EVS to MARFC in November 2006.
- Started to develop new prognostic verification measures.

#### **2<sup>nd</sup> Quarter FY07**

- Developed new measures and graphics for exploring historical forecast performance (diagnostic verification) and for estimating the quality of a live forecast using historical information that is tailored to that forecast (prognostic verification).
- Implemented the experimental methods for diagnostic and prognostic verification in Java (will be integrated within EVS in Q3).
- Produced the first draft of journal manuscript on the new verification measures.

#### **3<sup>rd</sup> Quarter FY07**

- Developed a new (beta) version of the Ensemble Verification System to remove dependence on legacy FORTRAN and R code and to extend the verification functionality. The new software is programmed in Java and is entirely stand-alone (i.e. it conducts file reading, pairing, calculation of metrics and plotting, all through a Graphical User Interface).
- Integrated new diagnostic verification measures developed in Q2 into EVS. It has been decided that the prognostic verification is best implemented near to the source of forecasts rather than in EVS (i.e. the RFS for streamflow, as it currently stands). This will be scoped further as XEFS progresses.
- Worked further on prognostic verification and developed ideas for operational products (to be further developed in Q4).
- Prepared for the RFC Verification Workshop in August 07.
- Begun to coordinate EVS as a prototype XEFS product.

#### **4<sup>th</sup> Quarter FY07**

- Made extensive bug fixes and improvements to EVS, and the associated documentation, prior to its official release in FY08.
- Planned AHPS verification projects for FY08, including coordination with the RFCs, XEFS, and others.
- Supported internal testing of EVS by HEP and external testing by four field offices, namely MA-AB- CN- and NC- RFCs.
- Continued to coordinate EVS as a prototype XEFS product.
- Worked further on prognostic verification, including further work on a draft manuscript illustrating the technique.
- Delivered a three-day workshop on verification of single-valued and ensemble forecasts to the field offices (verification focal points and others) at CBRFC in August 07.

#### **1<sup>st</sup> Quarter FY08**

- Made bug fixes and improvements to EVS, and the associated documentation, prior to the release of EVS 1.0 in FY08 Q2.
- Begun working on revised HOSIP documents, in preparation for Gate 3 review in FY08 Q2.
- Supported internal testing of EVS by HEP and external testing by four field offices, namely MA-AB- CN- and NC- RFCs.
- Continued to coordinate EVS as a prototype XEFS product.
- Completed first draft of prognostic verification manuscript to be reviewed and submitted in FY08 Q2.
- Begun working on the archiving data requirements for ensemble verification. A survey of existing archiving practices and issues was completed by all RFCs. This will be used in the preparation of an archiving data requirements report, to be delivered in FY08 Q2.

### **Problems Encountered/Issues**

**1<sup>st</sup> Quarter FY07 – None**

**2<sup>nd</sup> Quarter FY07**

- Development of confidence intervals has been postponed to Q3/4, in order to support a review of existing methods/codes developed by Allen Bradley.

**3<sup>rd</sup> Quarter FY07 – None**

**4<sup>th</sup> Quarter FY07**

- Work on archiving capabilities for ensemble forecasting has been postponed to the first and second quarters of FY08 to facilitate better coordination with XEFS and the RFC Archive team.

**1<sup>st</sup> Quarter FY08 - None**

# Inundation Mapping

## Real Time Inundation Map Evaluation

**Theme:** Inundation Mapping

**Management Lead:** Geoff Bonnin

**Objective:** Identify products and ways of graphically disseminating hydrologic and forecast information in a format that would help customers and managers to visualize the impact of water levels. This will aid the decision makers regarding actions to be taken to protect people and property.

### Milestones

Task	Due Date	Status
Evaluate existing map generation process	Q1-FY07	Complete
Review the RFI to determine options to generate inundation maps	Q2-FY07	RFI's reviewed.
Analyze and recommend methodology for map generation/dissemination. Write Report	Q3-FY07	Analysis complete
Write report	Q1-FY08	Complete

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY07

- The Request For Information (RFI) was published in the Federal Business Opportunities on 01/10/07. Written responses must be received by February 10, 2007. The team will continue to work. Attended a meeting with the Susquehanna River Basin Commission (SRBC) about inundation mapping. There might be a collaborative effort there. The team continues looking into the different projects to evaluate them.

#### 2<sup>nd</sup> Quarter FY07

- We received 22 RFI responses. These were evaluated by the team members. There was a combined meeting with XEFS team members to combine efforts and develop a vision. During the meeting we determined that a plan should be developed after studying the requirements needed to provide inundation maps. These maps would be provided at selected locations. In this plan a partnership between NWS and a Local Entity (LE) that might express the need for inundation maps in their area should be considered.
- This plan should identify needs, products and/or actions for NWS and the LE. The plan should present a set of options and the level of involvement from each part. It also should include initial implementation costs as well as maintenance, a MOU about exchange of information, commitments, etc. A methodology should be proposed having a vision of what is the full spectrum of products/services the NWS can provide. This will in turn tap on cost, expertise needed, resources; in general, what is necessary for this "project" to happen. After the plan is drafted, then it can be determined if the proposed end product(s) is worth the effort. The pilot projects (PPs) will be used as lessons learned.

#### 3<sup>rd</sup> Quarter FY07

- Gathered all the material to be utilized and analyzed to come up with the final recommendation.
- Requested an extension of 2 months to come up with the report (September 30, 2007).

#### 4<sup>th</sup> Quarter FY07

- The project was continued and the analysis or information was done. The report is being written and expected to be finished during 1<sup>st</sup> Quarter FY08

**1<sup>st</sup> Quarter FY08**

- Final report, “Real-time (dynamic) Inundation Mapping Evaluation (R-Time) Team Report”, completed, approved by the team, and by Gary Carter

**Problems Encountered/Issues**

**1<sup>st</sup> Quarter FY07**

- The RFI was initially published under the wrong classification.

**2<sup>nd</sup> Quarter FY07 – None**

**3<sup>rd</sup> Quarter FY07**

- Extension needed because other project had priority.

**4<sup>th</sup> Quarter FY07 - None**

**1<sup>st</sup> Quarter FY08 - None**

## Static Flood Inundation Maps Web-Page Development and Deployment

**Theme:** Graphical Dissemination of Hydrologic Information and Web Page Deployment

**Management Lead:** Victor Hom

**Objective:** Develop AHPS web page interface and Deploy available flood inundation maps

### Milestones

Task	Due Date	Status
Develop and present initial look of maps for approval	Nov. 2006	Complete
Produce prototype for review and approval	Jan. 2007	Complete
Produce first operational location in North Carolina for test, review, and comments	Apr. 2007	Complete
Produce final output for first operational location in North Carolina	Jun. 2007	Complete
Complete installation of 16 locations in North Carolina	Sep. 2007	Complete
Complete installation of 5 locations in Texas	Feb. 2008	Moved from 12/31/08
Complete installation of an additional library in North Carolina	Apr. 2008	
Complete installation of 15 locations in Southern region	Sep. 2008	
Complete additional map libraries with remainder of hurricane supplemental funds	Dec. 2008	

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY07

- Completed initial look of web page interface and map capability
- Completed prototype, on CD, of initial flood inundation map location

#### 2<sup>nd</sup> Quarter FY07

- With the departure of Tom Donaldson, Frank Richards will coordinate this task
- Orion developed a protocol to process information for the Web that will expedite production
- Watershed completed an inventory of 57 locations with available model and elevation information – 6 locations were selected for the first group of maps

#### 3<sup>rd</sup> Quarter FY07

- Goldsboro, NC, demonstration site is available on AHPS Web pages

#### 4<sup>th</sup> Quarter FY07

- Deployed 16 inundation map libraries on AHPS
- Watershed Concepts submitted 5 deliverables for NOAA to review
- Improved web interface based on feedback from NWSH staff and field offices
- Orion produced DVD to describe AHPS flood inundation mapping interface
- Published article entitled “Genesis and Evolution of NOAA’s Flood Inundation Mapping Service” for ASFPM Gilbert White Flood Forum

#### 1st Quarter FY08

- NOAA has worked out some of the inefficiencies and deficiencies, which have led to past delays. New plans and insights were gained at NWS Flood Inundation Map Meeting entitled “Lessons Learned and Process Improvements” amongst members from NOAA, USGS, Watershed Concepts, Orion, Berry Williams and Associates, and NWS offices.
- Watershed Concepts delivered ten (10) H&H map overlays for NOAA to review. NOAA now has

total receipt of fifteen (15) deliverables and remains ahead of schedule to complete the year-end target goal of 20 inundation map libraries for FY08.

- NOAA continues prospecting to build future inundation map libraries across USA for FY09 and FY10. Prospects include the Lower Colorado, Tennessee, Cumberland, Susquehanna, Delaware, and Blackstone Rivers.
- During this quarter, NOAA's out-reach activities and participation in ASFPM 2007 Flood Forum, FEMA 2007 Risk Analysis, and other inter-agency meetings, have led to stronger partnerships among FEMA, USACE, USGS, EPA, NRC, NAS, and FEMA CTPs. Partnerships will lead to better data sharing and collaborative efforts in building future map libraries.

## **Problems Encountered/Issues**

### **1<sup>st</sup> Quarter FY07**

- Schedule for North Carolina locations may be impacted by web farm consolidation process.

### **2<sup>nd</sup> Quarter FY07**

- There have been delays in identifying locations that may delay completion of the first group of locations, but final completion of the project may not be delayed

### **3<sup>rd</sup> Quarter FY07**

- Hurricane Supplemental:
  - Delays in prioritizing sites as well as slow response by FEMA to request for engineering study information may cause project to slip by ~ 90 days
  - Engineering data only available for 28 of the 55 candidate sites: will have to identify alternate sites

### **4<sup>th</sup> Quarter FY07**

- Original H&H (Hydraulics and Hydrology) studies in the Lumberton NC area was for the river reaches in the vicinity of USGS gage. To create the proper inundation map library for NWS forecast point on the Lumber River at Lumberton NC, a re-study may be required to cover the desired spatial extent. OCWWS is re-evaluating this inundation library in 1<sup>st</sup> quarter FY08.

### **1<sup>st</sup> Quarter FY08**

- NOAA and Watershed Concepts worked on several iterations of the five deliverables which was first furnished to NOAA at the end of FY07. The deliverables included assumptions concerning ponding and ineffective areas, which manifest in dangled polygons that are unconnected to the main channel. Watershed Concepts will implement tighter controls and re-allocate resources to ensure better QC/QA. Tighter controls will also be enforced to reduce oversights on the depth grids as a result of the conversion process from TIN to raster. Consequently, map inundation libraries for the initial five Texas sites will not be available until February 2008.
- NOAA re-evaluation of the map library for Lumber River in Lumberton NC indicated a re-study would be required. To ensure forward momentum and progress toward FY08 goals, NOAA has discontinued the map library for the Lumber River in Lumberton NC but will add a map library for the Tar River in Rocky Mount, NC by April 2008.

## **Inputs and Forcings**

## Radar Based Probabilistic QPE (PQPE)

**Theme:** Inputs and Forcings

**Management Lead:** David Kitzmiller

**Objective:** Improve flash flood detection through application of radar-based probabilistic quantitative precipitation estimation (PQPE) algorithms

### Milestones

Task	Due Date	Status
Develop demonstration version of radar PQPE system	Jun 30, 2005	Complete
Demonstrate real-time prototype version of PQPE system	Sep 30, 2005	Complete
Present verification statistics showing advantages of PQPE over deterministic precipitation estimates	Sep 30, 2005	Complete
Complete HOSIP SON, Conops, operational requirements for radar-based PQPE to support flash-flood monitoring and prediction	April 30, 2006	Further Delay – Q1 FY07
Complete Project Plan for radar-based PQPE	May 31, 2006	Further Delay – Q2 FY06
Design for preparation, dissemination of radar rainfall error distribution parameters for operational use	July 30, 2006	Further Delay Q1 FY07
HOSIP approval of operational design	Sep 30, 2006	Delay to Q2 FY07

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY05

- Accepted proposal for final phase of development/demonstration project from University of Iowa contractors.

#### 2<sup>nd</sup> Quarter FY05

- Initiated validation study of U. Iowa work, and derived demonstration probability products: probability of rainfall exceeding 0.1 and 0.5 inch per hour, and 50<sup>th</sup> and 75<sup>th</sup> percentile rainfall amounts derived from radar rainfall estimates.

#### 3<sup>rd</sup> Quarter FY05

- Received and began evaluation of U. Iowa mid-term report, which contains documentation on the statistical properties of 1-hour WSR-88D rainfall estimate errors
- Major findings: 1-hour radar rainfall estimates have a consistent rainrate-dependent bias component, and random errors in the estimates can be modeled as a Gaussian distribution
- Determined that statistical correction of 1-hour rainfall estimates reduces RMS errors relative to rain gauge reports, particularly for radar estimates in excess of 10 mm h<sup>-1</sup>

#### 4<sup>th</sup> Quarter FY05

- Enhanced existing real-time offline version of Multisensor Precipitation Estimator (MPE) to calculate probability that one-hour flash flood guidance amount has been exceeded, based on radar-estimated rainfall. Probabilities are shown under:  
[http://www.nws.noaa.gov/ohd/hrl/hag/ffp\\_marfc/mxprobo/mxprobo.htm](http://www.nws.noaa.gov/ohd/hrl/hag/ffp_marfc/mxprobo/mxprobo.htm)
- Obtained statistics from 2004-2005 warm seasons showing effects of rainrate-dependent bias adjustment in improving RMS error in rainfall estimates.

#### 1<sup>st</sup> Quarter FY06

- Received U. Iowa final contract report, and obtained internal and external reviews indicating the initial work is complete

- Drafted Concept of Operations and Operational Requirements

#### **2<sup>nd</sup> Quarter FY06**

- OSIP Stage I document approved (1/27/2006)

#### **3<sup>rd</sup> Quarter FY06**

- Collected conterminous U.S. data sample of radar Digital Precipitation Array and collocated 1-h rain gauge reports covering 2004-2006, for error model development
- Presented posted on error model development and applications at May AGU conference, Baltimore
- Work on HOSIP documents continuing

#### **4<sup>th</sup> Quarter FY06**

- Work on formulating an operational version of the Krajewski-Ciach model was started upon arrival of an NCEP/HPC employee on a rotational assignment (Pereira). Work involves examination of 1-h gauge/radar pairs from many WSR-88D sites.
- Results suggest the existing PQPE model is reliable for larger amounts (> 0.75 inch h-1) but it tends to underestimate probabilities of lower amounts – a modified model might be required in which an empirical table is used to estimate probabilities of smaller amounts
- Still expect completion of an operational model for 0-1h amounts by December
- Revised Concept of Operations to emphasize the development aspect of the PQPE project and how the PQPE model information will be stored and updated in AWIPS, rather than end-user applications such as FFMP

#### **1<sup>st</sup> Quarter FY07**

- Developed and presented alternatives for a radar precipitation error model at an OFC seminar in December (Pereira, Kitzmiller, Guan)

#### **2<sup>nd</sup> Quarter FY07**

- No work this quarter

#### **3<sup>rd</sup> Quarter FY07**

- Article on radar-based probabilistic QPE, “Product-Error-Driven Uncertainty Model for Probabilistic Quantitative Precipitation Estimation with NEXRAD Data” authored by Ciach, Krajewski, and Villarini, was accepted for publication in *Journal of Hydrometeorology*. The work was funded in part by OHD and AHPS, and is a peer-reviewed presentation of material in earlier contract reports.

#### **4<sup>th</sup> Quarter FY07**

- No work this quarter

#### **1<sup>st</sup> Quarter FY08**

- Article on radar-based probabilistic QPE (see 3<sup>rd</sup> quarter above) appeared. No further work this quarter.

### **Problems Encountered/Issues**

**1<sup>st</sup> Quarter FY05** - None

**2<sup>nd</sup> Quarter FY05** – None

**3<sup>rd</sup> Quarter FY05** – None

**4<sup>th</sup> Quarter FY05** – None

**1<sup>st</sup> Quarter FY06**

- Scope of work still to be determined, given funding uncertainty

**2<sup>nd</sup> Quarter FY06**

- Departure of Richard Fulton, initiator of the original project

**3<sup>rd</sup> Quarter FY06**

- Departure of Rich Fulton has affected overall progress. A rotational assignment staffer has been engaged to work on data analysis September-November 2006.

**4<sup>th</sup> Quarter FY06**

- HOSIP work limited this quarter, with only drafting work and limited internal review ongoing. Further slippage into FY07 is inevitable.

**1<sup>st</sup> Quarter FY07**

- Further work on hold pending new FTE hire in the hydrometeorology group

**2<sup>nd</sup> Quarter FY07**

- No work this quarter

**3<sup>rd</sup> Quarter FY07 - None**

**4<sup>th</sup> Quarter FY07**

- No work this quarter

**1<sup>st</sup> Quarter FY08 - None**

## Prototyping NMQ for FFMP

**Theme:** Input and Forcings

**Management Lead:** Ken Howard and Jian Zhang, NSSL; Mary Mullusky and David Kitzmiller, NWS

**Objective:** To test a high resolution Cartesian based regional multisensor QPE and QPF as input into FFMP and to facilitate a NCEP implementation of NMQ system for the national creation of QPI products and prototype dissemination to individual RFCs and weather forecast offices. The following project builds upon the FY05 NMQ to FFMP demonstration project and a FAA sponsored project for the implementation of the NMQ 3-D reflectivity mosaic code set within NCEP operational environment. Through an NCEP implementation, the full NMQ product suite can be prototyped and enhanced for potential utilization within RFC operations as well as within WFOs in FFMP.

### Milestones FY06

Task FY06	Due Date	Status
Creation of initial 'radar only' Q2 products on a Cartesian grid of 1-kilometer resolution with refreshing rate of five minutes CONUS.	March 15, 2006	Completed
Implementation of Q2 gage correction scheme using NCEP gage data feed.	May 15, 2006	Completed
Creation of and delayed preliminary real time multisensor Q2 products on a Cartesian grid of 1-kilometer resolution with refreshing rate of five minutes CONUS.	June 15, 2006	Completed
Dissemination of Q2 products on a Cartesian grid of 1-kilometer resolution updated every five minutes for CWA (Phoenix) regions for ingest into FFMP.	July 1, 2006	Q2 product creation Completed – Ingest into FFMP set for Q1 Fy07
Development and access to a web based interface for the real time verification of QPE estimates and associated uncertainties CONUS.	July 1, 2006	Completed
Performance evaluation of Q2 products in FFMP	December 1, 2007	Planned

### Milestones FY07

Task	Due Date	Status
Data exploration and coordination for the performance evaluation of NMQ/Q2 radar only products in FFMP	December 1, 2007	Q2 product creation completed in fy06 – Ingest into FFMP moved to Q2 FY08
Initial NMQ Code transfer and implementation for the creation of 3-D reflectivity mosaic products and 2-D severe weather products (HAD, VIL, etc.).	May 1, 2007	Completed
Creation of seamless 'radar only' QPE products on a Cartesian grid of 1-kilometer resolution refresh rate of five minutes CONUS at NCEP.	June 1, 2007	Pending Computing resources and requirements
Develop operational strategies for inclusion and dissemination of NMQ QPE products to WFO's and RFC's	August 1, 2007	Pending Computing resources and requirements
Configure NMQ QPE as a prototype external data source for RFC and WFOs	September 30, 2007	Completed

## Milestones FY08

Task	Due Date	Status
Customization of NMQ Q2 product real time dissemination per RFC domain	December 1, 2008	Completed
Infusion of Canadian and TDWR radar data as available into NMQ NCEP QPI grids	April 1, 2008	Planned
National prototype 2.5 minute update cycle for NMQ and QPE products	July 1, 2008	Planned
Initial development and testing of a multi sensor 'best of the science' QPE product	August 30, 2008	Planned
Development strategies and testing protocols for Dual polarization data in Q2	September 20, 2008	Planned

## Accomplishments/Actions

### 1<sup>st</sup> Quarter FY06

- Completed assessment and comparison of WDSS-II ingest, QC (NN) and 3D mosaic (merger) with NMQ application.
- Initial coding and testing of 'radar only' Q2 has been completed. CPU load tests for running initial CONUS Q2 product suite have been completed. Hardware configuration and system updates for running initial Q2 products CONUS to be complete by 2/28/06.
- Several case studies have been completed regarding the generation of VPR s and possible 'gap' corrections on 3D mosaic fields. Real time CONUS VPR correction coding is in progress.

### 2<sup>nd</sup> Quarter FY06

- The initial suite of NMQ Q2 QPE products is being generated in real time, nationally, with a five-minute update cycle at 1x1 km resolution. The initial Q2 products and national mosaic products are being disseminated using ftp and ldm protocols to collaborators and researchers at NCEP, NESDIS, RFCs, OHD, UCAR, ESL, GLERL, NCAR, Unidata and the FAA.
- A website has been established to provide 'quick looks' at the NMQ and Q2 product suites. The NMQ website forms the basis of NSSLs QPE Verification System (QVS) currently under development. The initial QVS webpage is located at [nmq.ou.edu/~qpeverif/Experimental/](http://nmq.ou.edu/~qpeverif/Experimental/). The QVS page is experimental and will continue to evolve as products and verifications tools are added.
- Hardware and software is currently being configured for the Arizona Q2 prototype system. The Southwest Q2 system will be delivered to the Salt River Project/NWS facility in early June 2006. The system will serve as the basis for generating and testing high resolution Q2 QPEs into FFMP in the southwest encompassing several CWAs. Testing is anticipated to begin 1st QR 07. However, Q2 QPEs in the southwest will be generated beginning July 1 and will be made available for use in the Arizona Flood Warning System for evaluation and verification.
- The North American Scale Remote Sensor Precipitation Estimation OSIP SON was officially posted on 3/29/06.

### 3<sup>rd</sup> Quarter FY06

- The Southwest Q2 system has successfully been deployed at the joint SRP/PHX NWS facility. The system integrates Phoenix TDWR data along with 6 WSR-88Ds in the region. High resolution Q2 products are being generated for the state of Arizona. The Southwest Q2 data is ready for inclusion in the FFMP demonstration project, which is set to begin in FY07 Q1. Currently Q2 products for Arizona are being archived and analyzed for several significant precipitation events that occurred during July 2006.
- The NMQ Q2 products continue to be generated in real time nationally with an average latency of less than 110 second from product valid time. The initial Q2 products are continually under refinement and assessment through the NMQ QPE verification system (QVS). Additional QPE

products have been added to the QVS such as the NEDSIS hydro-estimator.

- Vertical Profiles of Reflectivity (VPRs) are currently being generated for each WSR-88D with real time VPR plots on the NMQ QVS system. A gap filling technique utilizing the VPRs is currently being evaluated over the eastern 1/3 of the CONUS. Once a gap filling assessment is completed, a VPR correction will be deployed CONUS within the NMQ. Additionally, several QPE related algorithms are being developed utilizing VPRs in determining bright band height and the presence of warm rain microphysics for dynamically adjusting the Z-R relationships.
- 31 radars from Canada are being received and ingested within the NMQ system. The individual Canadian radars are being compared with adjacent WSR-88Ds using the Radar Reflectivity Calibration Tool (RRCT) to determine offsets leading to techniques for correctly combining Canadian radar with the WSR-88Ds in the NMQ 3-D Radar Mosaics and Q2 products.
- A new gauge-biasing scheme has been deployed within NMQ Q2 product suite and has been under real time performance assessment via QVS.
- A NMQ blog has been implemented for notification of NMQ and Q2 updates and system status. The NMQ Blog is viewable at [nmq.ou.edu/~qpeverif/blog/](http://nmq.ou.edu/~qpeverif/blog/)

#### **4<sup>th</sup> Quarter FY06**

- The NMQ Q2 system CPU cluster and communications servers were moved to a new National Weather Center computer room.
- The new URL for the NMQ system webpage is [www.nmq.nssl.noaa.gov](http://www.nmq.nssl.noaa.gov).
- The Stage 4 product suite has been added to the NMQ system QVS verification system. The Stage 4 products can be directly compared with Q2 products as well as HE products as well as with gauge observations.
- The NMQ Blog contains changes and enhancements to the NMQ system including documentation.
- The 31 Canadian radars have been added to the NMQ RRCT tool for evaluation leading to incorporation into the 3D mosaic and Q2 products during Fy07.

#### **1<sup>st</sup> Quarter FY07**

- Completed Fortran coding of new radar reflectivity quality control for single radar reflectivity field. The new radar QC was specifically developed for the NCEP implementation for computational efficiency and is based upon a linear heuristic rule set.
- Completed Fortran code set for NMQ radar ingest and polar to Cartesian transformation.
- Completed code set port for 3D single radar Cartesian reflectivity (SRC) product.
- Completed initial port and CPU resource testing of NMQ single radar Cartesian ingest and QC applications on NCEP mainframe.
- Completed Fortran/C++ coding of Q2 radar only QPI applications with ongoing testing currently.
- Completed and implemented additional statistical analysis tools on QPI verification system.
- Several logic changes were implemented in the polar processing SRC components towards improving the accuracy of QPI products currently being generated on the NMQ system. These changes are focused on mitigating the impacts of radar calibration offsets. For detailed info on the changes see the NMQ blog located on the NMQ homepage ([www.nmq.nssl.noaa.gov](http://www.nmq.nssl.noaa.gov)).

#### **2nd Quarter FY07**

- Initial code port to NCEP of radar quality control, single radar Cartesian transformation and 3D mosaic has been completed.
- The Q2 BAMS manuscript has undergone final review and submission.
- Scripts for the required formatting and clipping of Q2 QPI fields as input to FFMP have been completed and tested.

#### **3<sup>rd</sup> Quarter FY07**

- Completed coding and testing of automated technique for the identification of warm rain microphysics (tropical precipitation rates). The technique will augment the current Q2 pixel by pixel segregation of precipitation regimes and differential z/r assignments to include a 'tropical'

classification. The technique builds upon our VPR based applications currently running and displayable within NMQ.

- A description of the warm rain identification technique along with case studies have been completed with a formal paper on the technique submitted to the Journal of Hydrology.
- The warm rain technique is currently being implemented on NMQ for real time CONUS evaluation.
- Q2 'radar only' and 'local gauge bias' products are being formatted in XMRG and are being made available to the Arkansas-Red Basin River Forecast Center for evaluation.
- A bright band top and bottom identification (BBID) technique along with freezing level height products have been full implemented on NMQ and are currently being utilized in Q2 products. The technique is based upon VPRs in combination with RUC model analysis. A formal paper describing the VPR based BBID has been submitted to the Journal of Hydrology.

#### **4<sup>th</sup> Quarter FY07**

- The automated technique for the identification of warm rain microphysics (tropical precipitation rates) was implemented on August 12, 2007 and is currently running in real time within the NMQ/Q2 system. Evaluations are on going as to the national performance of this component. The warm rain addition completes the warm season Q2 QPI application and a paper describing the Q2 warm season technique(s) is in preparation for submission to Journal of Hydrology.
- Twenty-two (22) new dual CPU servers were added to NMQ hardware configuration. The new servers were configured for radar data ingest, QC and SRC creation with the tested capacity to process HiRes level 2 data WSR-88D in addition to 31 Canadian radars and TDWR data streams.
- The Canadian radars are being compared with the WSR-88D network and assessed for calibration and attenuation limitations. A preliminary report has been prepared and submitted to the FAA (copied provided to OHD) on quality control deficiencies associated with the Canadian radar network. Testing of new Canadian radar specific QC techniques is currently underway. The real time Q2 QPE product generation using the Canadian radar blended with the WSR-88D is planed for completion by 2<sup>nd</sup> Q FY08.
- The real time Canadian radar data stream has been added to the Radar Reflectivity Comparison Tool.
- Q2 'radar only' and 'local gauge bias' products are being formatted in XMRG HRAP and are being made available to the West Gulf River Forecast Center for evaluation in real time. Preliminary feedback is favorable towards improvements in coverage and quality of Q2 QPE products.

#### **1<sup>st</sup> Quarter FY08**

- Completed scripts and communication protocol for providing River Forecast Centers with real time Q2 products.
- Completed code and configuration changes to ingest real time high resolution 88D L2 for NMQ and Q2 products.

### **Problems Encountered/Issues**

#### **1<sup>st</sup> Quarter FY06**

- All previous NMQ hardware and facility issues have been corrected and/or resolved.
- During the process of standardizing code sets utilizing WDSS-II, it was determine that the creation of a single radar high-resolution 3-D reflectivity Cartesian grid (SRC) would improve the overall efficiency, timing and accuracy of Q2 products for infusion into FFMP. A high resolution 3-D SRC will be created in real time for each WSR-88Ds and then mosaic with subsequent product generation. The refresh rate for the SRC grids will initially be 5 minutes with a horizontal resolution of 1x1 km and 31 vertical levels.
- Transition to WDSS-II coding and operating environment for CONUS NMQ radar ingest, and radar quality control on NMQ system is on going and will be completed by March 1, 2006.

#### **2<sup>nd</sup> Quarter FY06**

- The WDSS-II Neural Net radar Quality Control (NNQC) application was found to be deficient in addressing radar QC issues associated with night 'blooms' and other artifacts. Additional cases are being assembled to facilitate further training of the NNQC application. Previously tested NMQ QC logic is being reimplementation on the NMQ system to augment the NNQC towards improving radar quality specially to address bloom occurrences.

**3<sup>rd</sup> Quarter FY06** - None

**4<sup>th</sup> Quarter FY06** - None

**1<sup>st</sup> Quarter FY07**

- Initial bench tests of radar ingest and SRC creation on the NCEP system identified potential CPU and memory allocation shortfalls. Additional testing will be conducted to ascertain memory and CPU requirements.

**2<sup>nd</sup> Quarter FY07**

- Testing of Q2 QPI fields into FFMP postponed until 3<sup>rd</sup> quarter due to a delay in the new FFMP.

**3<sup>rd</sup> Quarter FY07**

- Testing of Q2 QPI fields into FFMP postponed until 1<sup>st</sup> FY08 quarter due to a delay in the new FFMP.

**4<sup>th</sup> Quarter FY07**

- Offsets in Q2 HRAP grids for WGRFC have been resolved.
- Testing of Q2 QPI fields into FFMP postponed until possibly 2<sup>nd</sup>Q FY08 to allow time to resolve communication and ingest issues associated with FFMP advanced.
- CPU resource limitations and programmatic priorities have delayed implementation of Q2\_CST modules at NCEP. The NMQ/Q2 system at NSSL continues to provide QPI fields to RFCs and GSD until such time resources are made available. PPBS for FY10-14 includes Q2 transition to NCEP.

**1<sup>st</sup> Quarter FY08** - None

## High-Resolution Precipitation Estimator Nowcaster (HPN)

**Theme:** Inputs and Forcings

**Management Lead:** David Kitzmiller

**Objective:** Increase flash flood warning lead time through short-range prediction of heavy rainfall; HOSIP approval of MPN project and prototype implementation within operational baseline

### Milestones

Task	Due Date	Status
Create and maintain offline version of code suitable for integration with Statistical Distributed Model for flash flooding	March 31 2007	Complete
Project through HOSIP/OSIP Gate 3	Jun 30 2007	Expected Q1 FY08, on track
Training material developed	Sep 30 2007	Expected Q2 FY08

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY05

- Demonstrated ability of nowcaster system to forecast time series of precipitation rate, such as can be used in advanced distributed hydrologic models.

#### 2<sup>nd</sup> Quarter FY05

- Developed method to correct forecasted rainrate fields for artificial zero values in rainy areas, which arise due to spatially-varying motion vectors.
- Collecting verification statistics on forecast rainfall and rainrate amounts.

#### 3<sup>rd</sup> Quarter FY05

- MARFC-area real-time 0-1h rainfall and rainrate forecasts and enhanced Multisensor Precipitation Estimator (MPE) fields are available at:  
[http://www.nws.noaa.gov/ohd/hrl/hag/ffp\\_marfc/prodesc.htm](http://www.nws.noaa.gov/ohd/hrl/hag/ffp_marfc/prodesc.htm)
- Above web page is password protected
- Products include precipitation analyses, forecasts, and comparisons with real-time flash flood guidance
- Flash flood case studies were conducted to optimize adaptable parameters of forecast algorithm
- Statistics for forecast verification are being collected routinely

#### 4<sup>th</sup> Quarter FY05

- Prepared conference preprint documenting improvements offered by Nowcaster relative to simple extrapolation and persistence forecasts of rainrate
- Some Nowcaster forecast fields were sent to Hydrology Group (Seann Reed) for input to hydrologic model HL-RMS. Tests indicate the forecasts yield a realistic response in surface runoff in the hydrologic model.

#### 1<sup>st</sup> Quarter FY06

- Assisted in preparation of conference preprint documenting the utility of MPN forecasts in driving a distributed hydrologic model for small basins. Input of precipitation forecasts yielded consistently better streamflow forecasts than assuming no future precipitation or persistence of the previous hour's rainfall.
- Documentation of the verification characteristics for 0-1 hour rainfall was completed
- Concept of Operations and Operational Requirements were documented

## **2<sup>nd</sup> Quarter FY06**

- Conditional approval of OSIP Stage 2 documents (SON, Conops)
- Creating AEL and C-code from original Fortran prototype

## **3<sup>rd</sup> Quarter FY06**

- Work continues on re-coding extrapolation model from original Fortran prototype
- Routine coordination with MDL staff who maintain FFMP, to insure portability of precipitation products from MPN to FFMP

## **4<sup>th</sup> Quarter FY06**

- Work continues on re-coding extrapolation model, forecast rainfall accumulation model, and real-time verification model from original Fortran prototype to C
- Work initiated to create algorithm enunciation language (AEL) for modules as needed (extrapolation model already had documentation)

## **1<sup>st</sup> Quarter FY07**

- Draft CONOPS and ORD sent out for field review; positive comments received
- Inhouse version of MPN coded for later use in Statistical Distributed Model for flash flooding testbed
- AEL completed

## **2<sup>nd</sup> Quarter FY07**

- Transferred codes to Linux machine
- Working to finalize interface with distributed model
- Drafted science algorithm document

## **3<sup>rd</sup> Quarter FY07**

- Started regular project meetings and software developers began reviewing science documents.
- Created data interfaces to send output of offline prototype nowcaster to a distributed hydrologic model (flash flood project)
- Preparation of OSIP documents is ongoing.

## **4<sup>th</sup> Quarter FY07**

- Held an internal requirements review
- Developers reviewing prototype code and AEL
- OSIP Gate 3 documents (CONOPS, operational requirements, science algorithm document) under final internal review preparatory to gate meeting
- Journal-quality manuscript under preparation

## **1<sup>st</sup> Quarter FY08**

- Preliminary design completed for operational AWIPS software
- Continued preparing science documentation
- Started preparation of a conference preprint (for EWRI Water Resources Congress in 2008) including science documentation
- Ongoing HSMB-HSEB discussions on code transfer from prototype to operations

## **Problems Encountered/Issues**

**1<sup>st</sup> Quarter FY05** - None

**2<sup>nd</sup> Quarter FY05** – None

**3<sup>rd</sup> Quarter FY05** - None

**4<sup>th</sup> Quarter FY05** - None

**1<sup>st</sup> Quarter FY06**

- Scope of AHPS work still to be determined, given funding uncertainty

**2<sup>nd</sup> Quarter FY06**

- Departure of Richard Fulton, original project lead

**3<sup>rd</sup> Quarter FY06**

- Departure of Richard Fulton, original project lead, causing some delays.

**4<sup>th</sup> Quarter FY06**

- Departure of Richard Fulton, original project lead, causing delays in generating HOSIP documents

**1<sup>st</sup> Quarter FY07 – None**

**2<sup>nd</sup> Quarter FY07 - None**

**3<sup>rd</sup> Quarter FY07**

- Some delay in OSIP documentation

**4<sup>th</sup> Quarter FY07**

- Developers busy with OB8.3 delivery, but should be more available after early Nov.

**1<sup>st</sup> Quarter FY08 - None**

## Western Region Daily QC Integrated with MPE

**Theme:** Inputs and Forcings

**Management Lead:** Jon Roe

**Objective:** Integrate existing Western Region Mountain Mapper Daily QC (DQC) functionality and OHD Multi-Sensor Precipitation Estimator (MPE) application functionality into a single set of operational applications. A Western Region memo dated 11/18/2003 states the need for MPE to emulate Mountain Mapper in these areas:

- Provide a check based on PRISM, elevation, climate and spatial consistency.
- Estimate point precipitation based on PRISM climatology.
- Display thresholds of values like precipitation or elevation.
- Color code sites based on a statistical qualification using surrounding stations (i.e., computation of standard deviation to denote screened, bad, manual, questionable points).
- Allow user to control threshold for which questionable data is flagged.
- Filter for point data, i.e., use raw or processed data.
- Subdivide the RFC area allowing for multiple, simultaneous quality control processes.
- Add site identifier to error log.
- Generate Mean Areal Precipitation based on discontinuous basins.
- Aggregate six- and 24-hour data time steps.
- Provide the same functionality for temperature quality control.
- Provide the same functionality for freezing level quality control.

### Milestones

Task	Due Date	Status
Write HOSIP Stage 1 documents.	Q1, FY05	Complete
Pass HOSIP Gate 1.	Q1, FY05	Complete
Visit CNRFC to observe operational use of DQC.	Q2, FY05	Complete
Inventory existing DQC components.	Q4, FY05	Complete
Conduct Validation and write HOSIP Stage 2 documents.	Q4, FY05	Complete
Pass HOSIP Gate 2.	Q1, FY06	Complete
Install DQC at NWSHQ/OHD (via on site visit of Craig Peterson from WR).	Q4, FY05	Complete
Conduct Research & Analysis and write HOSIP Stage 3 documents.	Q3, FY06	Complete
Complete reverse engineering analysis of DQC.	Q3, FY06	Complete
Pass HOSIP Gate 3.	Q3, FY06	Complete
Conduct Operational Development and write HOSIP Stage 4 documents.	Q1, FY08	Complete
Pass HOSIP Gate 4.	Q2, FY08	Upcoming

### Accomplishments/Actions

### **1<sup>st</sup> Quarter FY05**

- Work did not begin until December 2004. OHD is coordinating with Kevin Werner of Western Region Headquarters. First, there is a need to better understand the existing Mountain Mapper applications and data sets in order to understand the detailed requirements. Documentation, field consultation, and the installation of Mountain Mapper at NWS Headquarters will provide the information needed to identify requirements and complete the design. As much as possible, existing code will be re-used in the integrated operations.
- We completed the HOSIP Stage 1 NID and passed HOSIP Gate 1.

### **2<sup>nd</sup> Quarter FY05**

- Minimal progress was made in the 2<sup>nd</sup> quarter. Some general design discussions were communicated between WR personnel and OHD. A visit to CNRFC by OHD staff was conducted, where we discussed and viewed demonstrations of DQC. Significant progress was made on porting the MPE FieldGeneration program from FORTRAN to C, which will help with the integration of the DQC field generation (i.e. gage-only objective analysis) methods with MPE. We have discussed the installation of DQC at OHD by CNRFC staff; it was decided to have CNRFC do this remotely, rather than via a visit from CNRFC.
- The delay is caused by the sequencing of efforts involving national QPE software; OHD is focused on completing most of the ABRFC P3 functional integration with MPE before doing serious design work on the DQC integration. We recently hired an additional contractor who is tasked with working solely on the P3-DQC-MPE applications.

### **3<sup>rd</sup> Quarter FY05**

- Minimal progress was achieved this quarter. CNRFC was assigned a user ID and password for the purposes of installing the DQC application at OHD. Initial work on installing DQC was begun. OHD staff continued general design discussions. An outline of the DQC processing was prepared by CNRFC and sent to OHD.
- P3 integration into MPE was wrapping up during Q3 which will allow more work on DQC to move forward in Q4.

### **4<sup>th</sup> Quarter FY05**

- Completed draft of the CONOPS and Project Plan for Stage 3.
- Craig Peterson visited OHD in July and installed the Daily QC software along with a canned data case.
- Daily QC code was moved to the WHFS OB7 development environment. This allowed the code to be compiled using the gcc 3.4.3 compiler and an executable to be created for testing.
- Replaced all directory references in code with .Apps\_defaults tokens.
- Completed the review the functionality of Daily QC. Began compilation of specific requirements related to the integration of Daily QC functionality into the HydroView/MPE GUI.

### **1<sup>st</sup> Quarter FY06**

- Conducted HOSIP Gate 2 Meeting. Revised CONOPS based on comments from meeting. Expect to convene a second Gate 2 Meeting and pass Gate.
- Conducted numerous internal design meetings and coordinated design issues with Craig Peterson of CBRFC
- Completed design of new MPE GUI with DailyQC options incorporated and HydroView options removed.
- Completed User Interface Document.
- Redesigned directory structure for incorporating DailyQC's 6 hour and 24 precipitation data, temperature data and freezing level data.
- Began coding to incorporate DailyQC functionality into MPE GUI.
- Continued discussions with Craig Peterson via email.

### **2<sup>nd</sup> Quarter FY06**

- Significant software development activity was completed during this quarter. The OB7.1 OHD

software was delivered in February 2006. It included the Hydroview and MPE\_editor applications as separate applications; these two applications were previously integrated in one application. Numerous design meetings were conducted during this quarter, with major software development completed for the MPE application suite to be delivered in June 2006 for AWIPS OB7.2. The data setup, pre-processor, and other utility applications and data sets were prepared for formal implementation for OB7.2. The project passed into Gate 3 in February 2006. The HOSIP documents Gate 3 were written, but after a delayed review by the AWIPS SEC staff, the documents need to be updated to discuss certain performance attributes.

### **3<sup>rd</sup> Quarter FY06**

- Major software development continued during this quarter. This culminated in the DailyQC functions delivered as part of the AWIPS OB7.2 delivery of June 6, 2006. This software was then tested on the AWIPS Pre-Integration Test platform. A few issues were identified and corrected. The software was delivered to CBRFC later in June, with installation performed in July. CBRFC will then evaluate the software operationally. Plans were made for a visit to CBRFC in August by two OHD/HSEB staff members to demonstrate and discuss the OB7.2 implementation.

### **4<sup>th</sup> Quarter FY06**

- Visited CNRFC. Evaluation was reasonable successful, but additional items (some of which are enhancements) were identified. These changes were identified and are scheduled for OB8.x. Began work on installing software at NWRFC.

### **1<sup>st</sup> Quarter FY07**

- Installed the software at NWRFC. Spent considerable time dealing with specific configuration issues related to the install. Discussed many issues with NWRFC about the different expectations they have of DailyQC as they have historically been using a different version than CBRFC used. Began defining requirements for the next pass of DailyQC feature for delivery in OB8.2. We plan to continue to work directly with the WR RFCs (CBRFC and NWRFC initially) to deliver beta versions to them for evaluation.

### **2<sup>nd</sup> Quarter FY07**

- A spreadsheet of requested changes and additions was prepared by HSEB based on feedback from WR RFCs. This was shared with NWRFC and a set of prioritized requirements was baselined. These were then assigned to AWIPS OB8.2 or OB8.3, or designated for future consideration. In April 2007, this information was shared and discussed in a conference call for which the AWIPS and national representatives were invited. WR HQ and NWRFC participated in the call. Based on the agreement from this discussion, work is continuing on the OB8.2 version of MPE/DQC.

### **3<sup>rd</sup> Quarter FY07**

- The OB82 implementation of MPE/DailyQC was delivered to Raytheon. This version included many new DailyQC features. These are summarized in a separate spreadsheet which needs to be incorporated into the HOSIP ConOps requirements tables. The spreadsheet-tracked tasks were the result of the previously mentioned conference calls and follow-up emails, which mapped out the requirements/tasks to be done for OB8.2 and OB8.3.
- The OB82 MPE was installed on the AWIPS OB82 PIT system (Pre-Integration Testing) system and was reviewed by Mark Fenbers and assorted WFO visiting forecasters.
- Preliminary work is ongoing for tasks slated for OB83.

### **4<sup>th</sup> Quarter FY07**

- Continued to work on software changes to support Daily QC operations. Considerable changes are expected to be completed for OB83 delivery in early November. A separate HSEB managed spreadsheet is being used to track the status of all the requirements.
- Conducted requirements review conference call in late August.

### **1<sup>st</sup> Quarter FY08**

- Delivered MPE with additional DailyQC features and a disaggregation feature to the AWIPS contractor for implementation in OB8.3. This delivery included associated test documents and integration handoff documents.
- Updated MPE Fieldgen and MPE Editor user's documents for OB8.2 and OB8.3.
- A full list of changes made for OB8.3 is available in a spreadsheet managed by HSEB and provided as part of the integration handoff.
- HSEB is seeking RFCs to evaluate the new features. Candidate offices include NWRFC and APRFC.

## Problems Encountered/Issues

### 1<sup>st</sup> Quarter FY05

- In order to effectively implement the integration of Mountain Mapper and MPE, detailed requirements must be identified, and the design must be formulated to address these requirements.

### 2<sup>nd</sup> Quarter FY05

- Significant design work must be completed to address the integration issues, and to account for the enhanced time resolution being proposed for the DQC functions. Currently DQC operates at a minimum of 6-hour durations. For this project, we will be supporting 1-hour durations.

### 3<sup>rd</sup> Quarter FY05

- Work on this project was very slow this period due to two main reasons.
  - First, key resources within OHD/HL needed to perform the DQC analysis and subsequent HydroView/MPE design were unexpectedly tied up most of the last several months with high priority AWIPS-directed activities including getting hydro VTEC ready for OB6 and performing the large conversion of all hydro software from using Informix to using PostgreSQL. The extent of the AWIPS activities were not only larger (in effort and on the calendar) than previously expected but the series of AWIPS releases between OB4 and OB6 were highly changeable in content from week to week.
  - Second, the labor effort expected to analyze the existing DQC functionality and to incorporate its design into HydroView/MPE was underestimated at the beginning of FY05.
- The stretch goal is still to try to get this work into AWIPS OB7.

### 4<sup>th</sup> Quarter FY05

- AWIPS OB6 activities related to the PostgreSQL upgrade continued to tie up personnel needed for this project.
- Work to update the Post Analysis application for OB6 diverted resources from this project.
- The goal remains getting Daily QC into OB7.

### 1<sup>st</sup> Quarter FY06

- Planning for staged AWIPS deployments in OB7.1 and OB7.2 required special considerations.

### 2<sup>nd</sup> Quarter FY06 – n/a

### 3<sup>rd</sup> Quarter FY06

- The CBRFC evaluation is a critical period for the DailyQC MPE implementation. Feedback from this evaluation will be integrated into updates of the MPE software suite.

### 4<sup>th</sup> Quarter FY06

- Feedback provided from CBRFC. These changes need to be scheduled and worked for incorporation into OB8.x.
- Because this is in Stage 4, but has been delivered for OB7.2, we need to update the HOSIP

requirements to account for which were considered for OB7.2 and which are scheduled for OB8.x. The build for which a requirement is scheduled is not tracked in the HOSIP requirements table.

**1<sup>st</sup> Quarter FY07**

- Still need to update requirements to account for multiple releases of the software, starting with OB7.2 and continuing through OB8.2 and OB8.3. The WR RFCs will be coordinating their individual needs into a prioritized, consensus set of requirements from which OHD development can proceed.

**2<sup>nd</sup> Quarter FY07 - None**

**3<sup>rd</sup> Quarter FY07**

- The OB82 tasks which were completed need to be inserted into an updated HOSIP document. This HOSIP project spans three AWIPS releases (OB8.1, OB8.2, OB8.3).
- The final list of tasks being worked on for OB83 must be resolved via discussions with RFC staff. The results of this information must then be used to update the HOSIP documents.

**4<sup>th</sup> Quarter FY07**

- While most of the OB83 DailyQC tasks will be completed, a few desirable components will not be completed, and it is not clear if the software will be accepted for operational use.
- The task assignments for AWIPS OB9 has been completed, as part of the SREC activities. There is no work scheduled for MPE activities, and this is a serious concern if there is a need for additional changes to support operational use of MPE/DailyQC.

**1<sup>st</sup> Quarter FY08**

- None.

## High-Resolution Precipitation Estimator (HPE)

**Theme:** Inputs and Forcings

**Management Lead:** David Kitzmiller

**Objective:** Delivery of EMPE in AWIPS OB8.3

### Milestones

Task	Due Date	Status
Obtain HOSIP/OSIP gate 3 approval	March 31, 2007	Complete
Enhanced MPE field test	July-August 2007	Ongoing
OB8.3 coding and unit testing completed	September 30, 2007	On track

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY06

- Updating enhanced MPE code to enable Nowcaster to use radar-gauge bias information in generating forecasts
- Journal article describing MPE and NEXRAD Precipitation Processing System being drafted
- Concept of Operations and Operational Requirements were drafted

#### 2<sup>nd</sup> Quarter FY06

- Conditional OSIP Gate 2 approval of SON and Conops
- Began creation of AEL and C-code based on real-time prototype
- OS&T seminar presentation on enhanced MPE and MP Nowcaster, including field representatives by Visitview (April 5)

#### 3<sup>rd</sup> Quarter FY06

- HSMB and HSEB staff now working together on code integration
- Began integration of Digital Hybrid Reflectivity product decoder in OB7.1 baseline
- HSEB and HSMB staff are refining project plan
- Routine coordination with MDL staff to insure portability of reflectivity mosaic products from EMPE into FFMP
- Planned detailed study of EMPE performance over Tar River basin, North Carolina, in collaboration with NSSL and NESDIS

#### 4<sup>th</sup> Quarter FY06

- Radar reflectivity and precipitation decoding and mosaicking functions were converted to C code and successfully run in AWIPS OB7.1 baseline
- Work initiated to create algorithm enunciation language (AEL) for modules as needed
- CONOPS and Operational Requirements reviewed by OCCWS and HSEB staff
- Options for obtaining Digital Storm-Total Precipitation (DSP) and Digital Hybrid-Scan Reflectivity (DHR) products from nonassociated radars were explored with HSEB and OS&T-SEC. We expect a final resolution on the approach during FY07 Q2.

#### 1<sup>st</sup> Quarter FY07

- Implementation into OB8.3 is on schedule
- HOSIP gate 3 meeting scheduled for February, OSIP gate 3 for March

#### 2<sup>nd</sup> Quarter FY07

- Revised Gate 3 science documentation based on HOSIP administrator's comments
- SREC design reviews carried out

- Initial real-time operation of EMPE within AWIPS
- Submitted RC for general dissemination of DHR, DSP products

### **3<sup>rd</sup> Quarter FY07**

- Demonstrated real-time operation of EMPE prototype within AWIPS, with D2D displays, for several heavy precipitation events. Data from up to 11 radars ingested and processed simultaneously.
- Passed OSIP Gate 3
- Started ATAN of operational EMPE at WFO in Salt Lake City, UT
- RC to permit routine communication of NEXRAD digital hybrid reflectivity (DHR) and digital storm-total precipitation (DSP) products was approved is under real-time testing.

### **4<sup>th</sup> Quarter FY07**

- In October 2007, OHD staff decided to rename the project High-Resolution Precipitation Estimator (HPE) because of ongoing external confusion about its relationship to MPE
- Field Tests (ATANs) at SLC, HGX, and MLB
- RC approved to increase storage for HPE
- Coding nearly completed and code review held

### **1<sup>st</sup> Quarter FY08**

- HPE operational software development was completed, and software was delivered for AWIPS OB8.3.
- Routine generation and SBN dissemination of DHR and DSP products, the necessary NEXRAD input products for HPE, was approved
- Discussed results of ATAN with WFO SLC staff; the package got a favorable reception and the staff said they'd use it in operations when available.
- Developed science documentation on ATAN results; primarily gauge/radar comparisons.
- Got results of HPE output for Tar Basin (North Carolina) precipitation intercomparison with NMQ package. The HPE performed as expected; results were consistent with MPE and Stage IV RFC-produced precipitation grids when input to hydrologic model HL-RDHM.

## **Problems Encountered/Issues**

### **1<sup>st</sup> Quarter FY06**

- Scope of work still to be determined, given funding modifications

### **2<sup>nd</sup> Quarter FY06 - None**

### **3<sup>rd</sup> Quarter FY06**

- Departure of Rich Fulton, original project lead, causing some delays.

### **4<sup>th</sup> Quarter FY06**

- Some delays in OSIP process since the group leader is still working as project lead as well

### **1<sup>st</sup> Quarter FY07 - None**

### **2<sup>nd</sup> Quarter FY07**

- We were advised by HOSIP administrators to beef up the science documentation, just prior to deadlines for gate meetings. This delayed our gate reviews into the 3<sup>rd</sup> quarter

### **3<sup>rd</sup> Quarter FY07 - None**

### **4<sup>th</sup> Quarter FY07 - None**

### **1<sup>st</sup> Quarter FY08 - None**

## Gridded Temperature Forecasts for OFS

**Theme:** Inputs and forcings

**Management Lead:** David Kitzmiller

**Objective:** Develop science background for input of gridded 3-hourly temperature forecasts to OFS/NWSRFS, supplanting current method of incorporating only maximum/minimum temperature forecasts

### Milestones

Task	Due Date	Status
Estimate optimum weights for converting max/min temps to 6-h averages in current OFS method, for CBRFC, CNRFC, AKRFC areas; present results to OHD and RFC staff	Feb 28, 2007	Complete
Test alternative methods of estimating hourly temperature from max/min values (current operational values; Schaake method)	Jun 30, 2007	Deferred; possibly not necessary
Complete concept of operations and project plan for centralized production of MOS-based gridded temperature forecasts for RFC use	Sep 30, 2007	To Q1 FY08, on track

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY07

- Initial task was undertaken for benefit of RFC operations - estimate optimum weights for converting max/min temps to 6-h averages in current OFS method, for CBRFC, CNRFC, AKRFC areas
- Results will also be applied in 2<sup>nd</sup> step, since most climatic temperature information is only on maximum and minimum values, and a daily cycle estimate must be applied to get instantaneous hourly temperatures
- Determined that these RFC areas will generally benefit by using the conversion weights derived for NWRFC, though RFC-specific weights would be best
- Collected information on availability and utility of PRISM max/min temperature grids for western U.S., Alberta, British Columbia

#### 2<sup>nd</sup> Quarter FY07

- Sent documentation on new max/min to 6-h average temperature coefficients to staff at AKRFC, CBRFC, CNRFC
- Based on positive feedback, HSEB staff implemented new coefficients as ATAN 876, on 3/22

#### 3<sup>rd</sup> Quarter FY07

- Collected more information on RFC needs for gridded temperature forecasts over Canada, and current operational capabilities for their production. There appears to be consensus from the northernmost RFC's that gridded temperature forecasts covering parts of Canada are necessary. The current MDL method for production might be suitable.
- Discussed MDL capabilities with Kathryn Hughes. The operational algorithm involves creation of 5-km temperature grids from point temperature forecasts within the CONUS. Similar point temperature forecasts are created for a set of sites in Canada.

#### 4<sup>th</sup> Quarter FY07

- In discussions with MDL staff, we identified a potential solution to the lack of gridded MOS temperature forecasts over Canada. It appears possible to cover almost all relevant RFC basins by expanding forecast coverage within the currently-operational product; by activating grid points that are presently masked.

- Prepared a draft concept of operations for circulation
- Initiated study of the behavior of operational NDFD2RFS code; located some potential problems since part of the code logic that estimates 6-h average temperatures from instantaneous values and daily maximum/minimum appears to assume a diurnal temperature cycle fixed with respect to universal time. This is a problem similar to that encountered with the max/min to 6-h conversion algorithm that was adjusted for western RFCs in an earlier stage

#### **1<sup>st</sup> Quarter FY08**

- Discussed possible modifications to NDFD2RFS code with PAL Joe Gofus, to address potential biases in 6-h average temperature output. He is now studying the code to estimate the level of effort required to modify it. We presented the proposed set of weighting factors for averaging instantaneous temperatures and max/min values to produce unbiased 6-h average temperatures.
- Discussions with RFC staff to determine the current usage of temperature forecast guidance (MOS and WFO-produced), NDFD2RFS usage, and the needs for OCONUS and Canadian temperature forecasts. It appears the most critical need for Canadian data is at NWRFC, with some additional need at NCRFC.
- Began designing a local application to use currently-operational point MOS temperature forecasts to supply grids out to day 10, to serve NWRFC needs.

### **Problems Encountered/Issues**

**1<sup>st</sup> Quarter FY07** - None

**2<sup>nd</sup> Quarter FY07** - None

**3<sup>rd</sup> Quarter FY07** - None

#### **4<sup>th</sup> Quarter FY07**

- Initial, limited RFC feedback (received in October) indicates other problems with the gridded MOS approach – lack of forecasts beyond 7 days. Point MOS temperature forecasts are available out to 10 days. Some alternatives will be investigated.

**1<sup>st</sup> Quarter FY08** - None

## Quantitative Precipitation Estimate Evaluation for CI-FLOW

**Theme:** Inputs and Forcings

**Management Leads:** David Kitzmiller, OHD and Suzanne VanCooten, NSSL/OAR

**Objective:** Evaluate significant precipitation event(s) over the Tar River basin (North Carolina) to identify an optimum set of techniques as an initial step towards a state-of-the-science NOAA multi-sensor *quantitative precipitation information* (QPI) for NWS operations. The evaluation will include an assessment of OHD, NSSL and NEDSIS QPI algorithm components towards to determining strengths as well as areas requiring collaborative research and development. Evaluations will include comparisons with independent rain gauge data, operational stage 4 products, *and impact tests on hydrologic simulations*.

### Milestones

Task	Due Date	Status
Create multisensor gridded precipitation analyses for the cool-season event 10 December 2004 – 15 January 2005	May 4, 2007	Complete
Assess the performance of various QPI components towards the overall performance of gridded precipitation estimates	June 30, 2007	Complete
Compile and document components from each QPI algorithm that, based on the assessment, would contribute towards an optimum MSQPE solution for NWS operations	June 30, 2008	Slipped to FY08 Q3 pending funding
Report on the evaluation and develop collaborative research strategy	June 30, 2008	Delayed pending additional funding

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY07

- OHD – created basic radar input to MPE and High-Resolution Precipitation (HPE, formerly EMPE) for remaining test events
- NSSL – prepared reference data sets for computing various QPI grid fields
- Limited activity due to lack of funding.

#### 2<sup>nd</sup> Quarter FY07

- NSSL- Assembled data sets of rain gauge observations collected under the radar umbrellas of KAKQ, KRDX, and KMHX for a period encompassing November 1, 2004 to February 28, 2005. NWS HADS provides the rain gauge data within the radar umbrellas but outside the Tar Basin itself.  
15 minute precipitation data from 38 USGS precipitation sites, AWOS locations  
1 Hour precipitation data from USGS, RAWS sites, North Carolina Econet, ASOS and AWOS  
24 Hour reports from NWS COOP observers
- NSSL, OHD, NCDC – Performed QA/QC on data set to document erroneous reports and questionable values
- NSSL - Coordinating FTP site and access criteria for all research partners to access one common rain gauge data set with accompanying documentation on possible erroneous values discovered from QA/QC procedures
- OHD – established necessary raingauge and radar databases for running MPE and HPE, began test runs with cool season case

#### 3<sup>rd</sup> Quarter FY07

- OHD – Created one set of MPE (4-km) and HPE (1-km) hourly gridded analyses for periods with precipitation during the December-January 2004-05 period. Carried out initial evaluation,

indicating a few suspect hourly gauge values were still in the dataset; then reran the analyses. Overall performance of the precipitation algorithms is as expected for a winter situation – most information in the precipitation grids appears to come from gauge input.

- OHD – made arrangements for running hydrologic model HL-RDHM with precipitation input
- NSSL, NCDC, OHD – agreed to rerun the MPE/HPE, and run Q2 algorithms, using ASOS gauge reports not included in the original analysis.

#### **4<sup>th</sup> Quarter FY07**

- NSSL – completed a set of radar-only and multisensor precipitation grids for the cool season case and forwarded them to other participants. Rainrate grids forwarded to NESDIS for input to ScAMPR satellite/radar algorithm
- OHD – completed a set of MPE/HPE radar-only, gauge-only, and multisensor precipitation grids, and carried out an initial analysis of their quality with respect to the reference rain gauges. It appears that the radar information in the multisensor grids adds slightly to the quality of the gauge-only analyses, possibly because the study period was dominated by stratiform rainfall with only one convective event
- Some further analysis of the OXFO rain gauge site record was carried out by OHD and NCDC – it now appears there were problems with freezing precipitation and/or gauge mechanics during part of the period, which will be dropped from the reference dataset
- Examination of the meteorological record indicated frozen precipitation over the basin during one of the storm events. Therefore the hydrologic model simulations must be run with hourly surface temperature input – a dataset from RUC and Eta model analyses and forecasts was gridded for this purpose
- AMS Hydrology Committee accepted an abstract for a paper to be presented at the upcoming Hydrology Conference (January 2008)

#### **1<sup>st</sup> Quarter FY08**

- Compared and analyzed the NMQ and HPE radar-only QPE analyses for the Dec 2004 – Jan 2005 period. It appears the NMQ handled challenging situations with unusual Z-R relationships better than did the NEXRAD PPS-based HPE. This resulted in the NMQ estimates having the smaller bias and smaller random error components. Results for both rain gauge and RDHM hydrologic model intercomparisons were consistent.
- Compiled results into a preprint for the AMS 22<sup>nd</sup> Hydrology Conference in January
- Funding to complete the analysis of warm season cases was applied for through AHPS process

### **Problems Encountered/Issues**

**1<sup>st</sup> Quarter FY07** - None

**2<sup>nd</sup> Quarter FY07** – None

**3<sup>rd</sup> Quarter FY07** - None

#### **4<sup>th</sup> Quarter FY07**

- Some delays required to track down potential problems with reports from one reference gauge, and to collect/prepare temperature input to RDHM.

#### **1<sup>st</sup> Quarter FY08**

- Some delays required to track down potential problems with reports from several rain gauge sites; must rerun multisensory analyses for the cool-season case Jan-Dec 2004-2005. Results to date are sound, however.

# **Flash Flood Services**

## National Basin Repository

**Theme:** Flash Flood Services

**Management Lead:** Ami Arthur, CIMMS and Ken Howard, NSSL

**Objective:** To create a National Basin Repository for the FFMP GIS dataset and provide data access through a web interface.

### Milestones

Task	Due Date	Status
Establishment of the National Basin Repository computer server hardware and communications infrastructure	May 1,2005	Completed
Implementation of software for web interface to FFMP GIS dataset	July 31, 2005	Completed
Creation of a seamless hydrologically-connected FFMP basin and stream dataset for the United States, including Alaska, Hawaii, Puerto Rico, and Guam.	August 30,2005	Completed
Creation of instructions for users to download data and prepare it for localization in AWIPS.	Changed to Sept. 30, 2007	Completed
Develop a kick-off training seminar to inform the regions and WFOs of the upcoming needs related to basin datasets for OB8.3, describe how to accomplish the necessary tasks, and offer continued technical support.	Feb. 5, 2008	In progress
Coordinate and facilitate the sharing of verified and additional stream names among WFOs through the establishment of a web service to host and serve verified stream name datasets.	Sept. 30, 2008	
Serve as the point-of-contact to support the WFOs in their FFMP basin dataset preparation for FFMP Advanced and WarnGen in OB8.3 to ensure that there is no interruption of service.	Sept. 30, 2008	In progress

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY05

- Notification of funding availability not received until after first QR. No activities performed during first QR.

#### 2<sup>nd</sup> Quarter FY05

- Progress has been made toward establishing hardware and communications infrastructure for the repository. The ESRI ArcIMS and Data Delivery Extension software for the web interface have been procured.
- NSSL continues to provide FFMP dataset technical support in the form of basin customization assistance and data delivery to various users.

#### 3<sup>rd</sup> Quarter FY05

- The ESRI ArcIMS and Data Delivery Extension software have been installed. A few issues with the Data Delivery Extension are being worked out with the help of ESRI Technical Support.
- Creation of a seamless hydrologically-connected basin and stream dataset for the U.S. is underway.
- NSSL continues to provide FFMP dataset technical support. This quarter, varying degrees of assistance were provided to fill 15 requests for additional data and basin customization support.

#### 4<sup>th</sup> Quarter FY05

- The Data Delivery Extension installation has been completed. Creation of the National Basin Repository website is in progress.
- The national seamless hydrologically-connected basin and stream dataset has been completed

with the exception of a few areas where re-delineation was required. Previous errors of significance in these areas are being corrected using the improved elevation data that is now available. This will further improve the accuracy of the small basin boundaries and delineated streams.

#### **1<sup>st</sup> Quarter FY06**

- The National Basin Repository website for browsing the seamless stream and basin datasets has been created. The Data Delivery Extension is being configured for these datasets to allow user downloads in addition to browsing.
- Basins in the re-delineated areas (please refer to 4<sup>th</sup> Quarter activities) have been completed and incorporated into the CONUS seamless dataset. Basins in Alaska that were outside the originally delivered radar coverage areas are near completion and will be incorporated into the Alaska seamless dataset.
- NSSL continues to provide FFMP dataset technical support. This quarter, varying degrees of assistance were provided to fill 7 requests for additional data and basin customization support.

#### **2<sup>nd</sup> Quarter FY06**

- After several unsuccessful months of attempting to work out numerous problems associated with the Linux versions of ArcIMS and DDE, the decision was made to install the Windows versions instead. A new computer was purchased, and the Windows versions of ArcIMS and DDE were installed. These are now being configured for the national basin dataset, which is planned to be online by 15 May 2006.
- The Alaska basins that were outside the originally delivered radar coverage areas have been delineated. The seamless dataset for Alaska will be completed by the end of Q3.
- NSSL continues to provide FFMP dataset technical support. This quarter, assistance was provided to 10 WFOs and the CBRFC.

#### **3<sup>rd</sup> Quarter FY06**

- The National Basin Repository website for serving FFMP GIS datasets has been completed. It is currently being reviewed by NWS Headquarters and FFMP designers. After their review and approval, the website will be opened for access by NOAA and other government agencies.
- User instructions for requesting and using data from the National Basin Repository are being drafted.
- Additional progress was made on the Alaska seamless basin and stream dataset, which will be completed and made available through the National Basin Repository by 15 August 2006.
- NSSL continues to provide FFMP dataset technical support. This quarter, assistance was provided to 12 WFOs and the ABRFC.

#### **4<sup>th</sup> Quarter FY06**

- The seamless FFMP basin and stream datasets for Alaska have been completed.
- NWS Headquarters and FFMP designers have provided feedback regarding the National Basin Repository and web interface. To the extent possible, modifications will be made to incorporate their suggestions. This will likely be an iterative process, and the draft user instructions will be updated accordingly as changes are made.
- NSSL continues to provide FFMP dataset technical support to numerous WFOs.

#### **1<sup>st</sup> Quarter FY07**

- Minor modifications were made to the web interface this quarter, and development of user instructions continued. Although improvements to the interface and instructions will be an ongoing process for some time into the future, a "final" version will be solidified during Q2 FY07.
- NSSL continues to provide FFMP dataset technical support to numerous WFOs.

#### **2<sup>nd</sup> Quarter FY07**

- To simplify the National Basin Repository data download and assimilation procedure as requested by FFMP developers, the ArcView Basin Customization Extension was updated to include new geoprocessing tools. The entire data download and assimilation procedure, including use of the newly included tools, will be tested by Bob Davis (Pittsburgh WFO) during

the next quarter. Suggestions resulting from the testing will be incorporated into the final user instructions.

- NSSL continues to provide FFMP dataset technical support.

### **3<sup>rd</sup> Quarter FY07**

- Due to other commitments, progress this quarter was limited. The data download/assimilation procedure is being tested locally and will be passed on shortly to several people outside NSSL who have volunteered to evaluate it.
- NSSL continues to supply data and provide FFMP dataset technical support upon request.

### **4<sup>th</sup> Quarter FY07**

- User instructions for the download of new FFMP shapefiles from the repository and integration with any previously customized versions of the shapefiles have been completed and posted to the repository website. For system security, website access is currently allowed through submission of an IP address. Anyone interested in accessing the repository should send their IP address to Ami.Arthur@noaa.gov.
- The eight WFOs that are participating in the FFMP Advanced Alpha test have been using the repository data and instructions during the past two weeks to prepare new basin and stream shapefiles for FFMP Advanced. We have received a few minor comments and suggestions, which we have incorporated into the instructions. NSSL will continue to maintain the repository and incorporate suggestions on the instructions to try to ensure that the task of creating the new datasets for FFMP Advanced will be as straightforward as possible for all of the WFOs.

### **1<sup>st</sup> Quarter FY08**

- During this quarter, data and support were provided to numerous WFOs who were proactive in getting started on the process of obtaining and preparing their datasets for FFMPA. This included continued assistance for the eight WFOs participating in the FFMPA Alpha Test.
- Work continued on conversion of necessary shapefile processing and customization tools for compatibility with ArcView 9.2.

## **Problems Encountered/Issues**

**1<sup>st</sup> Quarter FY05** - None

**2<sup>nd</sup> Quarter FY05** - None

**3<sup>rd</sup> Quarter FY05** - None

- Data Delivery Extension configuration issues are still being worked out.

**4<sup>th</sup> Quarter FY05**

- Delays in completing the seamless dataset were encountered due to the need for re-delineation in some areas. The re-delineation is critical for ensuring a high-quality dataset.

**1<sup>st</sup> Quarter FY06**

- Data Delivery Extension configuration issues specific to the seamless dataset are being resolved. We will enlist help from ESRI to ensure the data download capability is available as soon as possible in FY06 Q2.

**2<sup>nd</sup> Quarter FY06**

- The decision was made to halt work with the Linux versions of ArcIMS and DDE and install the Windows versions instead.

**3<sup>rd</sup> Quarter FY06** - None

**4<sup>th</sup> Quarter FY06** - None

**1<sup>st</sup> Quarter FY07** - None

**2<sup>nd</sup> Quarter FY07** - None

**3<sup>rd</sup> Quarter FY07** - None

**4<sup>th</sup> Quarter FY07** - None

**1<sup>st</sup> Quarter FY08** - None

## Flash Flood Monitoring and Prediction (FFMP)

**Theme:** Flash Flood Services

**Management Lead:** Tom Filiaggi, Stephan Smith

**Objective:** To develop a full monitoring capability for high resolution gridded QPEs for FFMP

### Milestones

Task	Due Date	Status
1. The Point Data Control GUI delivered in OB5	12//31/2004	Complete
2. Begin initial design work for gridded QPE monitoring	12/31/2004	Complete
3. Basin Layering enhancement for OB6	02/01/2005	Complete
4. Multiple Frames enhancement for OB6	02/01/2005	Complete
5. Basin Trace capability for OB6	03/31/2005	Complete
6. Provide a method to remove unwanted rain gages form FFMP consideration (OB6)	03/31/2005	Complete
7. Continue work on gridded QPE monitoring for OB7	09/31/2005	Complete
8. Prototype use of NMQ grids in FFMP	02/28/2007	Complete
9. Prototype use of EMPE grids in FFMP	04/31/2007	Complete
10. FFMP Advanced Design code check-in	05/15/2007	Complete
11. FFMP Advanced Beta Testing	09/17/2007	Ongoing

### Accomplishments/Actions

#### 2<sup>nd</sup> Quarter FY05

- Completed Basin Trace capability for OB6
- Provided a method to remove unwanted rain gages form FFMP consideration for OB6

#### 3<sup>rd</sup> Quarter FY05

- Continue development of variable gridded precip ingest.

#### 4<sup>th</sup> Quarter FY05

- Enhanced design concept.
- Communication with NSSL yielded details which allowed for certain initial streamlining.
- First step will be for a known grid type (lat/lon). Further flexibility may be added later.
- Alpha Test deadline is when AWIPS OB7 gets fielded, which is around September, 2006.

#### 1<sup>st</sup> Quarter FY06

- Established FFMP processor depict key registration. This is a step towards making grid processing more streamlined.

#### 2<sup>nd</sup> Quarter FY06

- We have combined this task with the other OB8 tasks, as they all require foundational design changes. This is being called "FFMP Advanced Design". This design has been initiated and discussions have taken place. Additional discussions, requirements reviews, and design reviews are planned.
- This task has been inserted into the OSIP process and is expected to be redirected to SREC.

#### 3<sup>rd</sup> Quarter FY06

- Many Design Approach discussions have been held with folks both in and out of group attending. Only one approach has been discussed so far. Alternative approaches have been requested of the attendees.

#### **4<sup>th</sup> Quarter FY06**

- Continued discussion regarding requirements and design of FFMP Advanced has occurred.
- New target AWIPS build is OB8.2.
- **Coding** initiated in order to flesh out technical design and requirements. Localization, configuration access, and processing has been worked to a degree.

#### **1<sup>st</sup> Quarter FY07**

- Significant progress in coding prototype.
- Design and requirements continue to be fleshed out
- Nearly functional localization (where a bulk of the work exists)

#### **2<sup>nd</sup> Quarter FY07**

- Significant progress in several areas of code and design.
- Milestones met for Requirements and Design Reviews
- Functional localization and near-functional processor.

#### **3<sup>rd</sup> Quarter FY07**

- Significant progress in several areas of code and design.
- Functional processor including Displaced Real-Time.
- Functional color display.
- Functional guidance forcing GUI.
- Nearly functional Monitor GUI.
- Can prototype and demonstrate most aspects/modules.
- Called for independent Alpha Test volunteer Forecast Offices.

#### **4<sup>th</sup> Quarter FY07**

- Very significant progress made.
- Will be able to demonstrate prototype to Mary Mullusky (OCWWS) using NMQ gridded data, approximately one week after end of FY.
- Independent Alpha Testing for FFMP Advanced will be started approximately 3 weeks after end of FY.

#### **1<sup>st</sup> Quarter FY08**

- Demonstrated NMQ data use and FFMP Advanced functionality.
- Independent Alpha Test for FFMP Advanced was begun and continued through end of Q1-08.
- All code checked in for AWIPS OB8.3 for FFMP Advanced.

### **Problems Encountered/Issues**

#### **2<sup>nd</sup> Quarter FY05**

- Gridded precip ingest (OB7): Need to ingest a **\*variable grid\***, as users will be able to define their grid when acquiring their small basins from an NSSL web page.
- There is a limit to the number of attributes that the SFAccessor class can access (AWIPS foundation, not FFMP software). This seems to be arbitrary and will affect the contents of **\*customized\*** basin shapefiles - **\*and potentially\*** the basins that are retrieved from the NSSL web page. The affect will be an inoperable FFMP

#### **3<sup>rd</sup> Quarter FY05 - None**

#### **4<sup>th</sup> Quarter FY05**

- Data transfer is still unresolved for operational deployment. For alpha testing, there is a

temporary method available.

#### **1<sup>st</sup> Quarter FY06**

- Developer tasking and re-evaluation of the FFMP big picture has led to possible issues. Some of the design issues relating to Gridded FFMP are being counted as part of a bigger re-design issue, thus if we continue to work towards the goal of “prototype for OB7”, we may be undertaking parallel development, which is a bit of a waste of resources. The next few months will shed light on the true direction of this.

#### **2<sup>nd</sup> Quarter FY06**

- Re-design will take significant effort. The prototype target is Q1FY07, which means basically January, 2007. This is not an unrealistic timeframe, but will require a good amount of work.

#### **3<sup>rd</sup> Quarter FY06**

- Progress has not been as good as expected, due to time spent on other, higher-priority items in AWIPS (ie: OB7.2 PIT). Targeting OB8.2 for this, but there is a possibility that that will not be met. We will have a better view on this as soon as we can solidify the Design Approach and begin assigning software tasks.

#### **4<sup>th</sup> Quarter FY06**

- OSIP process has yet to redirect to SREC and will require FFMP Advanced to go through Gate 3 before redirection. **\*May\*** or may not yield a schedule slip for the prototype (target Jan/Feb '07) and possible the AWIPS target of OB8.2. This remains to be seen, but hopefully the schedule will not be impacted.

#### **1<sup>st</sup> Quarter FY07**

- Not enough time in the day. Still attempting to have a functional prototype in February, but this will be challenging to complete.
- The OSIP Task still has not passed Gate 3 and thus not re-directed to SREC and likely will not before AHPS prototype deadline.

#### **2<sup>nd</sup> Quarter FY07**

- Not enough hours in the day. As prototype work continued, it was discovered that short-cuts should not be taken simply to get a ‘demonstrable’ version. It was first assumed that a ‘prototype’ did not need to be so complete, but the magnitude of what needed to be included in a prototype expanded as time went on.
- AWIPS code check-in of FFMP – Advanced Design is dependent on passing OSIP Gate 3. Passing OSIP Gate 3 is dependent on the successful completion of the prototype. Since the prototype work has slipped to the end of June, we propose pushing the AWIPS operational deployment of FFMP Advanced from OB8.2 to OB8.3. This change will provide us approximately 5 more months to complete the prototype and conduct vigorous testing including Alpha Testing. This timing will also provide improved coordination with the AWIPS OB8.3 delivery of EMPE.

#### **3<sup>rd</sup> Quarter FY07**

- Final piece (Basin Table) still needs work. First attempt was trying to make it work in existing design (for prototyping), but it may require a full re-design at this time. It is not clear which path will be most expedient.

#### **4<sup>th</sup> Quarter FY07**

- None, other than not enough hours in the day, though level of effort being put forth is very high.

#### **1<sup>st</sup> Quarter FY08**

- Noted difficulty in graph interpretation when including a QPF plot. Need feedback from operations.
- Shortcomings in FFG updates identified. We need to define additional requirements.

## Distributed Hydrologic Model with Threshold Frequencies (DHM-TF)

**Theme:** Flash Flood Services

**Management Lead:** Michael Smith

**Objective:** Continue efforts to validate DHM-TF and begin prototype testing to develop specific requirements for operational implementation.

FY05 and FY06 work showed the benefits of DHM-TF relative to current lumped-model based FFG procedures and the potential for improved lead times by ingesting forecast grids from MPN. Continued scientific validation is needed to understanding the benefits and limitations of the approach under different conditions (e.g. smaller, urban basins, and different hydrometeorological regimes with potentially lower quality forcing data).

### Milestones

Task	Due Date	Status
1) Revised HOSIP/OSIP documents given anticipated AHPS resources.	Q1	Complete
2) Completed final revisions to Journal of Hydrology article.	Q2	Complete
3) Collect data and set up model for Baltimore study area.	Q2	Complete
4) Code improvements to DHM-TF prototype.	Q2	Complete
5) Complete initial historical analysis for Baltimore study area.	Q3	Changed from Q3 to FY08 Q2; still waiting on staff to become available
6) Code features required for near real-time implementation and tighter link between distributed hydrologic model and nowcaster.	Q3	Complete
7) Present a DHM-TF case study at the distributed hydrologic modeling (DHM) workshop.	Q3	Complete
8) Compare DHM-TF and variations with gridded FFG using Baltimore and ABRFC data.	Q4	Changed from Q4 to FY08 Q2; still waiting on staff to become available
9) Further develop and evaluate the gauge-based flash flood verification; draft a conference or journal paper on this topic.	Q4	Postponed

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY07

- The HOSIP/OSIP project plans were updated based on anticipated FY06 resources.

#### 2<sup>nd</sup> Quarter FY07

- Completed publication process with the Journal of Hydrology
- Made progress on code modifications for DHM-TF prototype
- Completed 80% of the work to collect data and set up the model for Baltimore area

#### 3<sup>rd</sup> Quarter FY07

- Nearly completed module development to fully integrate DHM-TF into HL-RDHM 2.1.
- Progress on forecast mode development for HL-RDHM 2.1.
- DHM-TF presented at DHM workshop in Tulsa, OK.

#### 4<sup>th</sup> Quarter FY07

- Forecast mode and data format ingest enhancements to HL-RDHM (Task 4, Task 6)

- Cron jobs setup for 4-km prototype (Task 6)
- Collected data, setup models, and refined scripts to complete historical analysis for MD and OK basins (Tasks 5 and 8)

#### **1<sup>st</sup> Quarter FY08**

- Developed two proposals to continue work into next year. One proposal emphasizes working with Sterling on evaluating the MD prototype and testing it in their office. The other emphasizes working with NSSL and ABRFC on how to evaluate different GFFG techniques.
- Developed codes for poor person's reanalysis, which creates a bias corrected archive of 4-km, 1 hour precipitation data set that can be used to improve historical frequency calculations.

### **Problems Encountered/Issues**

#### **1<sup>st</sup> Quarter FY07 - None**

#### **2<sup>nd</sup> Quarter FY07**

- Higher than expected workloads on other projects with earlier deadlines has delayed progress. We will try to get back on schedule in Q3.

#### **3<sup>rd</sup> Quarter FY07**

- To date, about 52% of anticipated human resources have actually been available for this project. This includes initial estimates of both base-funded and contractor availability. With these resources, approximately 58% of work planned to be completed by the 3<sup>rd</sup> Quarter has been completed.

#### **4<sup>th</sup> Quarter FY07**

- Task 5 was delayed due to bias characteristics of the MARFC MPE archives that will take more time to address than originally planned.
- Tasks 5, 6, and 9 were also delayed due to lack of resources. The original schedule for this work relied not only on AHPS funds but also FTE and Hurricane Supplemental resources.
- Task 9 was over-ambitious and needs to be refined. We may be able to get help on this task in FY08 through collaborative work with NSSL.

#### **1<sup>st</sup> Quarter FY08**

- We did not have any staff available to finish all tasks planned for MD prototype, particularly analysis of results.

## Flash Flood Potential Index

**Theme:** Flash Flood Services

**Management Lead:** Greg Smith (Colorado Basin RFC)

**Objectives:** FY06 – 2<sup>nd</sup> qtr FY08:  
 - Deliver FFPI output to several NWS offices for evaluation / feedback  
 - Incorporate a dynamic soil moisture component into FFPI  
 - Evaluate best platform for FFPI should utilize (based on feedback)

FY07 – FY08 - Explore / Expand FFPI use in the generation of FFG.

FY08 - Potential for future expansion / improvements for FFPI beyond FY08.

**Milestones:**

Task	Due Date	Status
Acquire & Prepare finer resolution GIS datasets	4th qtr FY06	Completed
Update and incorporate methodology and application process	4th qtr FY06-FY07	Completed
Re-create FFPI on a national scale and document process	4th qtr FY06-FY07	Extended to 2 <sup>nd</sup> qtr FY08
Identify offices willing to evaluate product	3 <sup>rd</sup> qtr FY06	Completed
Deliver-Test static product – obtain / incorporate feedback	4 <sup>th</sup> FY06-1 <sup>st</sup> qtr FY08	Extended to 2 <sup>nd</sup> qtr FY08
Incorporate a dynamic soil moisture component (ext to FY08)	4 <sup>th</sup> qtr FY06-FY07	Extended to FY08
Acquire FF Event Data / Verify FFPI Output (ongoing – ext to FY07)	4 <sup>th</sup> qtr FY06-FY08	On Schedule-extended to FY08
Define a method to incorporate FFPI in FFG generation (ext to FY07)	4th qtr FY06-FY07	Completed
Peer Review of FFPI Methodology / Application	FY06-FY07	Completed (& Ongoing)
Re-define future CONOPS based on testing / evaluation	FY07 – 2 <sup>nd</sup> qtr FY08	On Schedule-extended to FY08
Implement re-defined CONOPS & Improvements/Updates	FY08 & beyond	On Schedule

**Accomplishments/Actions**

**1<sup>st</sup> Quarter FY06**

- Obtained MRLC 30 meter resolution land-use dataset for conterminous U.S.
- Obtained national forest density dataset.
- Converted and merged approximately 25-30% of MRLC data required for application
- Visited PHX WFO (CBRFC funded) to implement initial FFPI for testing/feedback.

**2<sup>nd</sup> Quarter FY06**

- Continued to merge MRLC datasets required for application
- Acquired national DEM dataset required for application
- Identified several offices willing to test/evaluate product

**3<sup>rd</sup> Quarter FY06**

- Identified scale & methodology issues and addressing these.
- Completed FFPI for LAX office (western region test office)
- Set list of alpha test stations for initial FFPI testing
- Continued to manipulate national datasets for use in FFPI procedure

**4<sup>th</sup> Quarter FY06**

- Converted all available MRLC datasets for use in FFPI procedure.

- Developed initial implementation plan for Alpha test sites.
- Continue to manipulate remaining datasets for utilization in FFPI process.
- Continued to manipulate national datasets for use in FFPI procedure.

#### **1<sup>st</sup> Quarter FY07**

- Re-sampled datasets to FFPI grid-cell resolution for alpha test site regions.
- Loaded alpha test site geographic boundaries and clipped datasets to match.
- Met with USFS remote sensing center to verify proper application of wildfire burn data.
- Developing a process with USFS for obtaining wildfire burn data for FFPI application.
- Obtained numerous wildfire burn area datasets for FFPI application.
- Continued to manipulate national datasets for use in FFPI procedure.

#### **2<sup>nd</sup> Quarter FY07**

- Completed creating FFPI for RNK test sites (working on delivery methods).
- All Data acquired for conterminous test sites, ABQ/SGF near completion
- Started review of GRASS GIS and GFS as working environments for FFPI
- Developed FFPI-FFG methods for the CNRFC

#### **3<sup>rd</sup> Quarter FY07**

- Completed FFPI for ABQ (have not yet delivered)
- Developed a checklist for evaluation FFPI performance at test sites
- Identified possible soil moisture components for application to FFPI
- Incorporated FFPI into FFG development at CNRFC
- Visited Las Vegas office and delivered FFPI

#### **4<sup>th</sup> Quarter FY07**

- Modified methodology for incorporating slope data layer into FFPI
- Tested Arc-IMS as an option for delivery of product to FFPI
- Continued to develop final FFPI for CONUS and SJU sites. These are nearly complete.

#### **1<sup>st</sup> Quarter FY08**

- Completed FFPI for SGF.
- Incorporated finer resolution DEM data for SGF, ABQ, and RNK sites.

### **Problems Encountered/Issues**

#### **1<sup>st</sup> Quarter FY06**

- Some slowdown encountered do to lack of available software licenses
- Some slowdowns do to processing power required, storage requirements for finer resolution data sets.
- Timetable subject to RFC operational responsibilities (minimal impact to date)
- Acquiring timely wildfire burn severity data from the forest service is still challenging. WRH has conducted meetings aimed at accelerating this process and I've been involved in those. Unfortunately this process isn't under NOAA's control.

#### **2<sup>nd</sup> Quarter FY06**

- RFC workload / operational responsibilities have had a significant impact on 2<sup>nd</sup> (and 3<sup>rd</sup>) quarter development. Most of these tasks will slip at least 1 qtr. Still hopeful to accomplish many 4<sup>th</sup> qtr tasks on time.

#### **3<sup>rd</sup> Quarter FY06**

- RFC workload / operational responsibilities continued to impact development. Less impact is anticipated during the 4<sup>th</sup> qtr and early FY07. Some tasks and product delivery will slip into the first half of FY07.

**4<sup>th</sup> Quarter FY06**

- RFC operational responsibilities occasionally impact development, otherwise no major issues.

**1<sup>st</sup> Quarter FY07**

- RFC operational responsibilities occasionally impact development, otherwise no major issues.

**2<sup>nd</sup> Quarter FY07**

- RFC operational responsibilities occasionally impact development, otherwise no major issues.

**3<sup>rd</sup> Quarter FY07**

- No real problems but RFC responsibilities occasionally impact development and delivery schedule.

**4<sup>th</sup> Quarter FY07**

- No real issues, RFC operational responsibilities and associated travel for training have pushed delivery into early FY08.

**1<sup>st</sup> Quarter FY08**

- Minor problems encountered with some FFMP Basin Files. Currently trying to re-acquire some FFMP basins.
- No other real issues, RFC operational and basin focal point responsibilities occasionally impact development activities.

## ABRFC Gridded Flash Flood Guidance

**Theme:** Flash Flood Services

**Management Lead:** Billy Olsen, John Schmidt, ABRFC

**Objective:** Research, develop, implement, and evaluate the Arkansas-Red Basin River Forecast Center (ABRFC) methodology for gridded flash flood guidance.

### Milestones

Task	Due Date	Status
Experimental FFG becomes operational FFG at ABRFC for 1, 3, and 6-Hour FFG products.	August 2006	Completed
Additional FFG products (2 Hour)	August 2007	No longer required
Presentation of work to-date at professional meetings is expected 2-4 times	Throughout FY07	Completed
Project Completion- GFFG operational on experimental basis at 4-5 WFOs in 3-4 different RFCs.	December 2007	Completed

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY07

- Presented Gridded Flash Flood Guidance project at Oklahoma Water 2006.

#### 2<sup>nd</sup> Quarter FY07

- Presented Gridded Flash Flood Guidance project at AMS Conference 01/07 in San Antonio.
- Presented Gridded Flash Flood Guidance project at the COMET FF Hydrology and QPE Workshop in 03/07.
- Presented Gridded Flash Flood Guidance project at the ABRFC-Tulsa District Corps Coordination Workshop in 03/07.
- Completed work so that LMRFC has GFFG operational on an experimental basis as of 03/07.
- The Research Distributed Hydrologic Model (RDHM) is up and running at SERFC as of 03/07.
- Completed several local surveys of low-water crossings to finalize a procedure for WFOs to customize / modify their threshR values where bankfull flows are not appropriate.
- Completed v1.0 of a ThreshR value field survey customization gui for RFC and WFO laptops.
- Purchased laptop, external 500Gb drive and survey equipment.
- Paperwork submitted for purchase order for ESRI ArcGis9.2 and Spatial Analyst.
- Field trips scheduled for WFOs SGF, OUN and AMA for April to do low water crossing surveys.

#### 3<sup>rd</sup> Quarter FY07

- GFFG will be operational at LMRFC in August 2007.
- GIS data set work for SERFC and WGRFC nearing completion. GFFG installation expected for August 2007 at SERFC and September 2007 at WGRFC.
- Conducted preliminary GFFG discussions with OHRFC and MBRFC. GFFG installation expected for Q1 FY 08 at OHRFC and MBRFC.
- Completed approximately 16 surveys of low water crossings and flash-flood prone locations in the Texas Panhandle, southcentral Oklahoma, northeastern Oklahoma and southwestern Missouri.
- Presented GFFG at SERFC Service Hydrologist Workshop in April, 2007.
- Presented GFFG at COMET Advanced Hydrologic Sciences Course in May, 2007.

- Presented GFFG at SRHQ in May, 2007.
- Presented GFFG at National Hydrologic Warning Council Conference in June, 2007.
- Research Distributed Model up and running at WGRFC.
- OHD delivers first “alpha” version of RDMS\_disagg which allows for the ingest of daily xmrgrs of data (including PE) and disaggregates to a user-defined time step in June, 2007.
- Acquired national 30m NED DEM from NSSL.

#### **4<sup>th</sup> Quarter FY07**

- GFFG is operational at LMRFC.
- Experimental GFFG is running at SERFC and WGRFC. WFO evaluations are underway.
- Conducted a training seminar and field exercise for several RFCs and WFOs at Blacksburg, Va. in late August. Set up website with pertinent information from the seminar - [http://lucretia.srh.noaa.gov/abrfc/outreach/blueridge\\_gffg.php](http://lucretia.srh.noaa.gov/abrfc/outreach/blueridge_gffg.php). Attendees learned technical details about GFFG and participated in field surveying exercises to collect pertinent data for customizing threshold runoff at low-water crossings.
- Presented GFFG at SERFC Service Hydrologist Workshop in April, 2007.
- Completed a few surveys of low water crossings and flash-flood prone locations.
- Continued with technical work such as processing new DEM data, making GFFG-related applications more portable for other RFCs, analyzing field data and etc.

#### **1<sup>st</sup> Quarter FY08**

- ABRFC Gridded Flash Flood Guidance Project is officially completed with four RFCs running operationally or experimentally for numerous WFOs.
- ABRFC has development work for four additional RFCs east of the Rocky Mountains under various stages of completion and will continue to assist implementation for these RFCs in an unofficial manner not supported by funding from this project.

### **Problems Encountered/Issues**

#### **1<sup>st</sup> Quarter FY07**

- No word on funding approval for this project until Feb. 5, 2007. This has delayed the scheduled first quarter tasks of acquiring hardware and software. This presumably will also delay the completion of OHD’s task to “develop a distributed model capacity to incorporate variable daily PE and determine hourly values”. It was originally scheduled to be completed by March, 2007.

#### **2<sup>nd</sup> Quarter FY07**

- No word on progress OHD’s task to “develop a distributed model capacity to incorporate variable daily PE and determine hourly values”.

#### **3<sup>rd</sup> Quarter FY07**

- Prolonged, significant flood event in ABRFC’s area delays GFFG project by about 2 months.

#### **4<sup>th</sup> Quarter FY07 - None.**

#### **1<sup>st</sup> Quarter FY08 – None.**

## DamBreak Tools

**Theme:** Flash Flood Services

**Management Lead:** Geoff Bonnin

**Objective:** Replace the existing tools for simplified dam break with a set of computations that would allow the forecasters at the River Forecast Centers and Weather forecast Offices to generate peak discharges and corresponding water levels due to a dam break situation.

### Milestones

Task	Due Date	Status
No activity in this project.	FY07 Q1	
Form a team to define the procedure for Quality Control of the data and draft a work plan.	FY07 Q2	SON submitted and gate 1 approved.
Write HOSIP documentation and initiate the Quality Control of the data based on pre-defined plan and priorities.	FY07 Q3	Delayed
Continue the QC and define data base. Select the software to replace SMPDBK.	FY07 Q4	Delayed

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY07

- We have been reviewing the SMPDBK and the tools available for dam break as part of the evaluation of hydraulic models. We also are getting feedback about using LMRFC's Rules of Thumb as the interim tool.

#### 2<sup>nd</sup> Quarter FY07

- The SON was sent to HOSIP and Gate 1 was approved. We are working on the project plan to define the work and start the process. Coordinating with COMET for their training module in basic hydraulic concepts.

#### 3<sup>rd</sup> Quarter FY07

- None

#### 4<sup>th</sup> Quarter FY07

- None

#### 1<sup>st</sup> Quarter FY08

- HSMB Hydraulics Group began investigating the use of HEC-RAS as a dam break tool and collecting information to develop a more complete project plan.

### Problems Encountered/Issues

#### 1<sup>st</sup> Quarter FY07

- HSMB, Hydraulics Group does not have enough staff to start the project.

#### 2<sup>nd</sup> Quarter FY 07

- HSMB, Hydraulics Group does not have enough staff to start the project.

#### 3<sup>rd</sup> Quarter FY07

- HSMB, Hydraulics Group does not have enough staff to start the project.

**4<sup>th</sup> Quarter FY 07**

- HSMB, Hydraulics Group does not have enough staff to start the project.

**1<sup>st</sup> Quarter FY08**

- Tasks proposed to the 2008 AHPS Flash Flood Theme team may not get funding. Therefore, we are putting most HSMB Hydraulics group resources on other projects in FY08 Q1 until resources are identified.

## **Routing (Hydraulics)**

## NWSRFS Reservoir Tools Enhancements

**Theme:** Routing (Hydraulics)

**Management Lead:** Jon Roe

**Objective:** To enhance existing NWSRFS models to aid with modeling reservoirs.

### Milestones

Task	Due Date	Status
Add <i>potential</i> requirements to the existing HOSIP Concept of Operations document.	Q2, FY06	Completed
Submit project to AWIPS SREC to be considered for inclusion in Release OB8.3.	Q2, FY06	Completed
HSD surveys RFC for potential requirements, validity and priorities.	Q2, FY06	Completed
AHPS FY 2006 SAE Theme Team confirms requirement priorities in from the RFCs.	Q3, FY06	Completed
Create Statement of Objectives (SOO) to contract the work.	Q3, FY06	Completed
Review Statement of Work (SOW) from contractor.	Q4, FY06	Completed
Update HOSIP documents for HOSIP Gate 2 as needed.	Q1, FY07	Completed
Update HOSIP documents for Gate 3 as needed.	Q2, FY07	Completed
Pass HOSIP Gates 2 and 3.	Q2, FY07	Completed
Pass HOSIP Gate 3.	Q3, FY07	Completed
Begin Operational Development.	Q3, FY07	Completed
Complete Operational Development.	Q1, FY08	Completed
Deliver software and documentation to AWIPS for release OB8.3	Q1, FY08	Completed
Support AWIPS Testing	Q2-3, FY08	Underway
AWIPS OB8.3 System Validation Review (Deployment decision)	Q3, FY08	Scheduled

### Accomplishments/Actions

#### 2<sup>nd</sup> Quarter FY06

- HOSIP Gate 3 for Phase 1 identified the POWERGEN function as a potential Phase 2 requirement.
- Added potential Phase 2 requirements to the existing HOSIP Concept of Operations document.
- Submitted project through OSIP to the AWIPS SREC to be considered for inclusion in the OB8.3 release.
- OCWWS/HSD conducted a survey of the RFCs to consider the potential enhancements outlined by the AHPS FY 2006 Software Architecture Enhancements (SAE) Theme Team together with suggestions from a 2004 workshop on streamflow regulation accounting tools and methods.

#### 3<sup>rd</sup> Quarter FY06

- We received responses from the SAE theme team concerning the priorities of the Phase 2 requirements.
- We issued a Statement of Objectives for Phase 2 identifying five functions to be implemented if funds permit.

#### 4<sup>th</sup> Quarter FY06

- We revised the Phase 2 activities to concentrate on two enhancements: a multi-valued time series lookup operation and utilizing standard NWSRFS static rating curves in Res-J.

- We accepted a Statement of Work from the contractor for the revised Phase 2 activities.

#### **1<sup>st</sup> Quarter FY07**

- HOSIP Concept of Operations and Project Plan were finally ready for HOSIP Gate 2 on January 17, 2007.

#### **2<sup>nd</sup> Quarter FY07**

- Passed HOSIP Gate 2 on March 2.
- Saud Amer arrived as the new contractor on-site liaison.

#### **3<sup>rd</sup> Quarter FY07**

- Received conditional approval of HOSIP Gate 3 on April 18, 2007.
- Conducted a combined Kickoff and Requirements Review for AWIPS SREC representatives on June 19, 2007.
- Draft design document, test plan and test procedures were submitted by RTi and are under review.

#### **4<sup>th</sup> Quarter FY07**

- Testing of the prototype software was completed at MBRFC.
- Conducted a combined Design and Test Plan Review for AWIPS SREC representatives on Sept. 25, 2007.

#### **1<sup>st</sup> Quarter FY08**

- HOSIP Gate 4 was passed.
- AWIPS OB8.3 Pre-Integration Testing was conducted Dec. 11-13.
- AWIPS OB8.3 Integration Readiness Review was completed and all software and documentation were handed off to AWIPS in December.

### **Problems Encountered/Issues**

#### **2<sup>nd</sup> Quarter FY06**

- Most attention has been focused on completing Phase 1.
- Jon Roe has been slow in convening the AHPS FY 2006 SAE Theme Team to get the final say on Phase 2 tool priorities – expected to occur in Q3 of FY 2006.

#### **3<sup>rd</sup> Quarter FY06 - None**

#### **4<sup>th</sup> Quarter FY06**

- The funds expected to be available forced a reduction in the number of enhancements planned for Phase 2.

#### **1<sup>st</sup> Quarter FY07**

- Personnel absences delayed completion of the HOSIP Gate 2 documents.
- Completing the HOSIP internal review of the Gate 2 Documents took longer than expected.

#### **2<sup>nd</sup> Quarter FY07**

- The completion of the Stage 3 activities took longer than the contractor expected.
- Continued changes to the format and expected content of the Gate 3 documents delayed the submission of the documents.

#### **3<sup>rd</sup> Quarter FY07 - None**

#### **4<sup>th</sup> Quarter FY07**

- The completion of the development activities was delayed pending the HOSIP Gate 4 Review. However, the development and testing are essentially complete and the application will be ready for the AWIPS OB8.3 release.

**1<sup>st</sup> Quarter FY08**

- None

# Hydraulic Models

## Physically-based Modifications to the Sacramento Model

**Theme:** Hydrologic Models

**Management Lead:** Mike Smith

**Objective:** The objectives of this work are to investigate further modifications to the Sacramento model. These include: investigate/modify SAC model to run over cascading planar elements; better treatment of vegetation, perhaps from the NCEP LSM model; treatment of old water/new water in runoff process; treatment of re-infiltration of runoff, etc.

### Milestones

Task	Due Date	Status
5. Evaluate need for adding vegetation component to Sac Model. This could include: 1) Evaluate NOAA LSM treatment of vegetation in context of DMIP 2 in OK and Western basins. 2) Evaluate benefit of better PE estimates versus adding vegetation component (i.e. collaborate with Martha Anderson of Beltsville, ARS; get NCEP's PE estimates, evaluate NASA Marshal PE).	FY07 Q4	Done via DMIP 2
6. Identify basins with clear evidence of channel re-infiltration. Coordinate with Dave Goodrich of ARS for this; set up RDHM runs for analysis	FY07 Q4	Delayed
7. Modify RDHM to test approach if necessary.		
8. Evaluate need for treatment of Mean residence times and old/new water as per seminar by Jeff McDonnell.	FY07 Q4	Delayed
9. Evaluate new NASA PE time series to assess value for hydrologic simulations.	Not defined	In progress

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY07

- Initiated new project for physically-based modifications to the Sacramento Model

#### 2<sup>nd</sup> Quarter FY07

- Time estimates developed for potential modifications to SAC-SMA. Identified NCEP actual PE values as possible path. Evaluation of Blue River in Oklahoma for channel re-infiltration not conclusive. McDonnell commented during the seminar on 'old water' that this concept is probably most geared towards hillslope runoff processes.

#### 3<sup>rd</sup> Quarter FY07

- Identified Blue River in Oklahoma as one that has channel losses from karst formations. Contacted Dr. Todd Halihan, a hydrogeologist from Oklahoma State University who is very familiar with the Blue River and springs and karst formations. Requested any data for this basin.

#### 4<sup>th</sup> Quarter FY07

- Provided Guidance to NASA researchers on Joint OHD/NASA project for PE estimates. This work will test the combination of MODIS satellite-derived cloud mask information with ASOS ceilometer data to derive a replacement for the manual sky cover observations required for SYNTRAN. Initial interim results look promising.
- Obtained many papers etc from Dr. Todd Halihan on the hydrogeology of the Blue River basin. Sent one presentation to ABRFC for their use. Hopefully, these will provide useful data.
- Some DMIP 2 participants used the NARR data for evaporation; must evaluate these results

#### 1<sup>st</sup> Quarter FY08

- Shane Sheldon began analysis to compare the impacts of several different PE sources on

simulations in the Blue River.

### **Problems Encountered/Issues**

**1<sup>st</sup> Quarter FY07** - None

**2<sup>nd</sup> Quarter FY07**

- Hydro group is currently managing 38 major tasks...need prioritization and final budget resolution before moving ahead with new projects.

**3<sup>rd</sup> Quarter FY07**

- Hydro group is currently managing 38 major tasks...need prioritization and final budget resolution before moving ahead with new projects.

**4<sup>th</sup> Quarter FY07** - None

**1<sup>st</sup> Quarter FY08**

-

## Calibration - Complete IDMA Study

**Theme:** Hydrologic Models

**Management Lead:** Mike Smith

**Objective:** The objective of FY05 work will be to conduct a scientific study to evaluate the impacts of not performing (historical) data quality control procedures on during hydrologic model calibration. FY05 work will complement the initial results from Eric Anderson presented at the 2004 DOH/RDM workshop. The FY05 results will be posted on the HL Calibration web site and will also be submitted to a journal for publication.

### Milestones

Task	Due Date	Status
10. Complete Eric Anderson's initial evaluation and put on HL web site	Jan. 27, 2005	Complete
11. Develop literature review to establish how NWS procedures fit into the published literature of accepted practices.	12/31/2004	Complete
12. Develop outline of journal paper.	12/31/2004	Complete
8. Obtain data for additional analyses	5/31/2005	Complete
9. Calibrate basin with uncorrected/corrected data	5/15/06	delayed
10. Analyze calibration results	6/1/2006	delayed
11. Submit paper to OHD –Review and peer-reviewed journal for potential publication.	7/1/2006	delayed

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY05

- Determined that the NWS double mass analysis procedures fit well into the body of existing quality control procedures for historical data. Climate-change researchers regularly use such procedures and stress their importance.
- Eric Anderson's initial work shows that biases can result from not corrected data for man-made inconsistencies.

#### 2<sup>nd</sup> Quarter FY05

- Given problem described in Q1 above, found study basin with hourly discharge data and a nearby station with a documented station move.
- Found more studies in the literature on the effects of calibration data on model calibration.
- Discussed with Seann Reed a strategy to test the effects of calibration data quality on model forecasts.

#### 3<sup>rd</sup> Quarter FY05

- Found another peer-reviewed journal article to support the need for the analysis.
- Began hourly calibration of ELDO2 using MAP time series with and without the consistency correction.

#### 4<sup>th</sup> Quarter FY05

- Used data from the current IDMA study to help evaluate the MPE-Reanalysis data to be used for DMIP 2.

#### 1<sup>st</sup> Quarter FY06

- Will continue calibration of the basin in conjunction with calibration of basins for DMIP 2

#### 2<sup>nd</sup> Quarter FY06

- Work resumed after the lumped calibrations for DMIP 2 begun.
- Found journal papers confirming the test approach and need for such investigations (Journal of Hydrology, Vol. 320, pages 62-86).

### **3<sup>rd</sup> Quarter FY06**

- Began to revisit this project with calibration of DMIP 2 basins.

### **4<sup>th</sup> Quarter FY06**

- N/A

### **1<sup>st</sup> Quarter FY07**

- Calibrated ELDO2 test basin for DMIP 2 with MAPX data and sent to Eric Anderson for review. These parameters will help evaluate the parameters derived via calibration with raingauge data. Studied paper on calibration with MAPX and raingauge data as a surrogate to this problem (Calibration of a rainfall-runoff model using radar and raingauge data, Adv. In Geosciences, 2005)

### **2<sup>nd</sup> Quarter FY07**

- Updated the HOSIP documents to reflect the current status of this project.

### **3<sup>rd</sup> Quarter FY07**

- N/A

### **4<sup>th</sup> Quarter FY07**

- N/A

### **1<sup>st</sup> Quarter FY08**

- N/A

## **Problems Encountered/Issues**

### **1<sup>st</sup> Quarter FY05**

- Discovered that it is difficult to calibrate a basin using mean daily flow given minor changes in the MAP time series (caused by lack of consistency corrections). Proposed solution is to use hourly computations and data.

### **2<sup>nd</sup> Quarter FY05 - None**

### **3<sup>rd</sup> Quarter FY05 – None**

### **4<sup>th</sup> Quarter FY05**

- Work delayed as Mike was assigned to lead River Mechanics Group as well as Hydrology group. George Smith ok'd the delay.
- Work delayed to focus on 1) DMIP 2 cost estimates for funding from Water Resources Program (No AHPS funding for DMIP 2 granted), 2) DMIP 2 precipitation forcing problem: MPE Reanalysis data found to be lacking and needed more analysis.

### **1<sup>st</sup> Quarter FY06**

- Will continue calibration of the basin in conjunction with calibration of basins for DMIP 2.

### **2<sup>nd</sup> Quarter FY06 - None**

### **3<sup>rd</sup> Quarter FY06**

- Task put on 'back burner' due to crush of other projects.

### **4<sup>th</sup> Quarter FY06**

- Task delayed in order to launch DMIP 2 western basin experiments. Will continue this task when calibrating the DMIP 2 basins.

**1<sup>st</sup> Quarter FY07**

- Task delayed due to tasks with higher priority

**2<sup>nd</sup> Quarter FY07**

- Task delayed due to tasks with higher priority

**3<sup>rd</sup> Quarter FY07**

- Task delayed due to tasks with higher priority

**4<sup>th</sup> Quarter FY07**

- Task delayed due to tasks with higher priority

**1<sup>st</sup> Quarter FY08**

- Task delayed due to tasks with higher priority

## Calibration - Re-Implement the Interactive Calibration Program and Enhance

**Theme:** Hydrologic Models

**Management Lead:** Jon Roe

**Objective:** Re-Implement the Interactive Calibration Program (ICP) from the new set of functional requirements generated from an FY04 contract task. Originally, a follow on task to improve the functionality by implementing enhancements identified by the Theme Team, was expected. However, any such enhancements will be done in the CHPS environment rather than NWSRFS.

### Milestones

Task	Due Date	Status
Write HOSIP Stage 1 documents.	Q3, FY05	Complete
Pass HOSIP Gate 1.	Q4, FY05	Complete
Write Statement Of Objectives (SOO) for contractor tasking.	Q3, FY05	Complete
Review Statement Of Work (SOW) from contractor.	Q4, FY05	Complete
Add requirements for enhanced functionality to the HOSIP Concept of Operations document.	Q2, FY06	Complete
Submit project through OSIP to AWIPS SREC to be included in AWIPS OB8.x release.	Q2, FY06	Complete
Contractor writes HOSIP Stage 2 and 3 documents.	Q3, FY06	Complete
Pass HOSIP Gates 2 & 3 for Re-implementation.	Q3, FY06	Complete
Contractor begins Operational Development for Re-implementation	Q4, FY06	Complete
Contractor completes Re-implementation of ICP software and all required documentation and testing	Q1, FY08	Complete (completed 10/12/07)
Software and documentation are delivered to AWIPS	Q1, FY08	Complete
Support AWIPS testing of software	Q2-3, FY08	Underway
AWIPS System Validation Review (OB8.3 deployment decision)	Q3, FY08	Scheduled
Write SOO for contractor tasking for enhancements.	N/A	Cancelled
Review contractor's SOW for enhancements.	N/A	Cancelled

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY05

- We completed project identification, budgeting, and planning.

#### 2<sup>nd</sup> Quarter FY05

- We started writing the HOSIP Stage 1 documentation.

#### 3<sup>rd</sup> Quarter FY05

- HOSIP Stage 1 NID and SON were completed.
- SOO was completed and forwarded to Contracts for final processing.

#### 4<sup>th</sup> Quarter FY05

- HOSIP Gate 1 was passed
- Technical proposal submitted by Contractor was accepted by OHD
- The task for RTi was awarded very late in Q4

### **1<sup>st</sup> Quarter FY06**

- We completed CONOPS and Project Plan
- HOSIP Gate 2 was passed

### **2<sup>nd</sup> Quarter FY06**

- The contractor completed the Stage 3 research and submitted the Research Report.
- The contractor is creating the HOSIP material for Gate 3, now expected in Q3, FY06
- Both the Re-implementation project and the enhancements from the AHPS Theme Team were submitted through OSIP to the AWIPS SREC for potential inclusion in AWIPS OB8.x releases.

### **3<sup>rd</sup> Quarter FY06**

- HOSIP Gate 3 was passed.
- OHD and RTi agreed to a contract for HOSIP Stage 4 (operational development).

### **4<sup>th</sup> Quarter FY06**

- The contractor held a kickoff meeting for the operational development phase in early August.
- The contractor has delivered revised Concept of Operations and decomposed technical requirements documents.
- The contractor has delivered a draft design document.

### **1<sup>st</sup> Quarter FY07**

- As planned, the contractor delivered several prototypes with increasing functionality, which were reviewed by OHD and RFC personnel.

### **2<sup>nd</sup> Quarter FY07**

- The contractor delivered a release candidate with all the required functionality. HSEB, HSMB and three RFCs: NERFC, NWRFC and WGRFC are currently testing this software.

### **3<sup>rd</sup> Quarter FY07**

- The contractor updated the release candidate based on reviewer comments, submitted a revised version which was being tested at the sites listed above. The major performance problems have been resolved and corrections are now mostly addressing usability concerns. The development is on target for inclusion in AWIPS OB8.3.

### **4<sup>th</sup> Quarter FY07**

- At the end of the period, the Contractor was completing final changes to the software and documentation.
- A HOSIP Gate 4 review was scheduled for 10/10/08.

### **1<sup>st</sup> Quarter FY08**

- HOSIP Gate 4 was passed.
- AWIPS OB8.3 Pre-Integration Testing was conducted Dec. 11-13.
- AWIPS OB8.3 Integration Readiness Review was completed and all software and documentation were handed off to AWIPS in December.

## **Problems Encountered/Issues**

### **1<sup>st</sup> Quarter FY05**

- We will be having an off-site contractor work on this project. The extent of the implementation to be completed with this work will depend upon the contractor's response to our Statement of Objectives (SOO). It is not clear at this point whether the allowed budget will cover complete re-implementation of the ICP by the contractor. This potential shortfall may be exacerbated by having to retrofit early HOSIP documents during this funded item.
- This project has essentially completed the technical work necessary to pass HOSIP Gates 1, 2, and 3 but the work was performed in FY04 (pre-HOSIP) by an outside contractor culminating in

a complete functional requirements document. Now, the current task will have to fill in the required HOSIP deliverables and formally pass the Gates to get completed.

**2<sup>nd</sup> Quarter FY05**

- We have moved the expected date for passing HOSIP gate 1 to the third quarter.

**3<sup>rd</sup> Quarter FY05**

- Due to Edwin Welles' departure from OHD we have moved the expected date for passing HOSIP Gate 1 to the fourth quarter.

**4<sup>th</sup> Quarter FY05**

- We experienced a delay because the Contractor's first technical proposal was unacceptable to OHD and had to be re-written and re-submitted. The second proposal was acceptable, but Contracts was unable to award the task until the end of Q4.
- Due dates for HOSIP Stage 2 and 3 documents, and HOSIP Gates 2 and 3, have been moved to Q2, FY06 to match the Contractor's SOW schedule. Follow-on activities have been adjusted accordingly but are subject to negotiation under Phase 2 of the contract task.

**1<sup>st</sup> Quarter FY06**

- We completed HOSIP Gate 2 CONOPS and Project Plan documents. HOSIP Gate 2 (January 18<sup>th</sup>, 2006) review went well with minor changes in CONOPS and Project Plan.

**2<sup>nd</sup> Quarter FY06**

- Progress in Stage 3 has been slower than expected.
- The contractor has not yet submitted a separate SOW for the operational development phase (HOSIP Stage 4) for the re-implementation. All schedule milestones for the HOSIP Stage 4 work and implementation into AWIPS are TBD, pending the contract being established.
- The funds allocated in FY05 will not be sufficient to complete the operational development, so FY06 funds will be used.
- Separate SOOs and SOWs will eventually be created for the enhancements.

**3<sup>rd</sup> Quarter FY06**

- HOSIP Stage 3, Applied Research & Analysis, took quite a bit longer than originally intended.

**4<sup>th</sup> Quarter FY06**

- None

**1<sup>st</sup> Quarter FY07**

- Reports from several reviewers have raised concerns about slowness in the prototypes. The development contractor is investigating ways to improve performance.

**2<sup>nd</sup> Quarter FY07**

- The performance of the application is still a concern and the contractor is continuing to investigate and try to improve it.

**3<sup>rd</sup> Quarter FY07**

- None

**4<sup>th</sup> Quarter FY07**

- The contractor is resolving several additional problems which have been identified in the final rounds of testing.

**1<sup>st</sup> Quarter FY08**

- None

## Frozen Ground Algorithm SAC-SMA Enhancement

**Theme:** Hydrologic Models

**Management Lead:** Jon Roe

**Objective:** Deliver enhanced Frozen Ground Algorithm as part of the AWIPS national baseline, using OHD's evolving CHPS architecture

### Milestones

Task	Due Date	Status
Modify HOSIP documents and submit to OSIP for Gate 1	Q2, FY06	Completed
Pass OSIP Gate 1	Q2, FY06	Completed
Modify HOSIP documents and submit to OSIP for Gate 2	Q2, FY06	Completed
Pass OSIP Gate 2	Q2, FY06	Completed 3/21/06
Modify HOSIP documents and submit to HOSIP for Gate 3	Q3, FY07	Completed
Pass HOSIP Gate 3	Q3, FY07	Completed
AWIPS Requirements Review	Canceled	Canceled
AWIPS User Interface Review	Canceled	Canceled
AWIPS Design Review	Canceled	Canceled
AWIPS Test Plan/Procedures Review	Canceled	Canceled
Check-in software for Pre-Software Integration Testing (PIT)	Canceled	Canceled
Test software during PIT	Canceled	Canceled
AWIPS Integration Readiness Review	Canceled	Canceled

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY06

- Project on hold waiting for appropriate internal OHD resources. The project is in HOSIP stage 3.
- Decision made to use OHD internal resources vs as a contracted-out effort.

#### 2<sup>nd</sup> Quarter FY06

- In accordance with new AWIPS rules, this project was entered into OSIP in order to be eligible for AWIPS OB8 SREC consideration (OSIP project number 06-018).
- OSIP Gate 2 was held on 3/21/06. Project was unconditionally approved and redirected to AWIPS SREC for prioritization.
- HOSIP Gate 3 documents submitted for review on 1/30/06. Re-write requested. Waiting for Gate 3 to be rescheduled.

#### 3<sup>rd</sup> Quarter FY06

- This project assigned to AWIPS Release OB8.3 by the AWIPS SREC in May.

#### 4<sup>th</sup> Quarter FY06

- No HSEB resources were available during this quarter. This should not jeopardize the ability to incorporate the algorithm in the lumped model for the AWIPS OB8.3 release.

#### 1<sup>st</sup> Quarter FY07

- Direct work on enhancing the lumped NWSRFS model was deferred in favor of implementing the enhancements first in the CHPS FEWS pilot system. This decision will allow the developer to become very familiar with implementing the enhancements. The timing of the CHPS FEWS pilot and the AWIPS OB8.3 release will allow OHD developers to incorporate the frozen ground enhancements in both projects in a more efficient manner than working on both projects in parallel. The project milestones were updated to reflect this new plan.

#### **2<sup>nd</sup> Quarter FY07**

- Planning and review and revision of the documents for HOSIP Gate 3 began.

#### **3<sup>rd</sup> Quarter FY07**

- The project received conditional approval of HOSIP Gate 3 on June 27, 2007. Analysis and detailed design work has begun.

#### **4<sup>th</sup> Quarter FY07**

- After detailed analysis and discussions with several RFCs concerning what constituted the minimal useful functionality, we decided to retarget this project for AWIPS Release OB9. This will allow the completion of all the operational components in one release.
- Development of the calibration mode is proceeding and we plan to provide prototype software to NCRFC and OHRFC before the end of the calendar year.

#### **1<sup>st</sup> Quarter FY08**

- Provided a prototype implementation of SAC-HT enhancement for calibration mode (ICP and MCP3 executables) to NCRFC and OHRFC for evaluation.
- Began design and development of the enhancements for forecast and ESP modes.

### **Problems Encountered/Issues**

#### **1<sup>st</sup> Quarter FY06**

- Project resumption suffering from lack of appropriate internal OHD resources.

#### **2<sup>nd</sup> Quarter FY06**

- OHD project funding uncertainties coupled with lack of appropriate internal OHD resources continues to delay forward movement toward HOSIP/OSIP Gate 3.

#### **3<sup>rd</sup> Quarter FY06**

- No progress this quarter due to AWIPS OB7.2 pressure on OHD resources. AWIPS KAP activities in 4<sup>th</sup> Quarter FY06 are also expected to significantly limit OHD's ability to provide HOSIP Gate 3 support. OHD should be able to free up some resources in 1<sup>st</sup> Quarter FY07.
- Issues must be resolved between the development of the prototype against today's NWSRFS versus CHPS modernizations.
- Issues must be resolved between the development of the prototype for the lumped model versus the need for the algorithm in both the lumped model and the distributed model.

#### **4<sup>th</sup> Quarter FY06**

- Completion of HOSIP Gate 3 was not accomplished due to unresolved science issues which delayed completion of HOSIP Gate 3, as well as a lack of HSEB resources.

#### **1<sup>st</sup> Quarter FY07**

- Resources were still not available to work directly on this project, but a plan for addressing this project is described in the accomplishments above.

#### **2<sup>nd</sup> Quarter FY 07**

- Completion of work on the CHPS FEWS pilot took longer than planned but we have finally resumed work on this project.

**3<sup>rd</sup> Quarter FY07**

- There is a question concerning whether there are sufficient resources available to complete all requirements within the OB8.3 development schedule. We are revisiting the requirement priorities to ensure that all essential requirements are addressed with the resources available.

**4<sup>th</sup> Quarter FY07**

- Lack of available developers caused the project to be delayed to the AWIPS OB9 Release.

**1<sup>st</sup> Quarter FY08**

- In mid-January, after consulting with the RFCs, HSEB made the decision to cease development work on this project for the NWSRFS environment for AWIPS Release OB9 and devote the resources to developing the SAC-HT functionality as part of CHPS.

## **Software Refresh**

## Community Hydrologic Prediction System (CHPS)

**Theme:** Software Refresh

**Management Lead:** Jon Roe

**Objective:** Provide an improved software infrastructure for operational use at RFCs, as a replacement for the existing NWSRFS, and which will meet the future forecasting needs of all RFCs.

### Milestones

Task	Due Date	Status
1. Implement a minimally capable working demonstration ("pilot") at one RFC of a modernized river forecast using WL   Delft's Flood Early Warning System (FEWS)	Q1, FY08	Complete
2. Extend the FEWS pilot to cover more basins at the pilot RFC	Q1, FY08	Complete
3. Implement the FEWS pilot at other RFCs	Q4, FY08	Complete
4. Identify features required to make the FEWS pilot more useful in RFC operations	Q3, FY08	Ongoing
5. Develop new and/or expand some of the following features for the FEWS pilot. Examples: i. evaluate and design calibration tools (potentially port ICP into FEWS environment) ii. evaluate and design verification tools (migrate legacy if needed) iii. evaluate and design Ensembles hindcaster, pre-processor, V&V iv. evaluate and design a distributed modeling capability that will accommodate future extensions such as a snow model, new frozen ground model, probabilistic distributed modeling v. research a grid editor for FEWS vi. evaluate and design OHD's new Frozen Ground model (lumped) vii. identify additional services as needed (e.g., Index Velocity Ratings)	Q4, FY08	Ongoing
6. AWIPS II migration: design a solution for the FEWS pilot which operates in an AWIPS II environment (ADE)	Q1 FY08 (was Q4, FY07)	Complete

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY07

- Key minimum requirements for demo system were defined. RFCs/basins were selected for the pilot. Draft versions of the HOSIP Concept of Operations (CONOPS) and Plan documents, co-developed by RTi and Delft, were delivered. HOSIP Gate 2/Gate 3 (combined) is expected to be held in January.
- The original plan for the pilot was to demonstrate functionality at one RFC. The CAT members agreed that there would be greater value using 2 RFCs rather than one. This means that Task 3 (Implement the FEWS pilot at other RFCs) has effectively begun.
- For risk reduction purposes, OHD also fired up a small team of developers to implement the new Heat Transfer version of the SAC-SMA/Frozen Ground model as part of the pilot demonstration. Work on this sub-project has begun.
- OHD installed the first version (0.0) of ADE locally, and began investigation of its capabilities and features. Several OHD developers, including the CHPS SOA expert, will attend ADE training in January 2007.

## **2<sup>nd</sup> Quarter FY07**

- The CHPS FEWS Pilot project successfully passed HOSIP Gates 1 and 2 in January.
- In February OHD delivered a re-engineered Java version of OHD's new SAC-SMA Heat Transfer (HT) model, with associated adapter source code, to Delft for inclusion in the pilot.
- Delft began the installation and set-up of FEWS at NCRFC and NWRFC in March. A demonstration of the pilot system running at NWRFC is planned for April.
- OHD initiated a new task in March with Apex Digital Systems to conduct an assessment of the FEWS pilot system. The task will begin with the demo at NWRFC in April and is expected to run for 6 months. Apex will work with the pilot RFCs to develop a set of success criteria, and to evaluate the pilot system against those criteria. The assessment will provide information required in order for the CAT and OHD management to make the final decision concerning FEWS for CHPS.
- Jon Roe and Chris Dietz began a series of discussions with Raytheon in March to address the nature of an interface between AWIPS II and CHPS (FEWS). Raytheon expects to begin analysis of the FEWS pilot system in July with a view to identifying future work for OHD and Delft.
- OHD's SOA expert, Sudha Rangan, attended AWIPS Development Environment (ADE) training in January. This places her in the key position of having familiarity with both FEWS and AWIPS II, and will provide OHD with a means to assess Raytheon's proposal.

## **3<sup>rd</sup> Quarter FY07**

- Installation of the CHPS FEWS Pilot system at NWRFC and NCRFC occurred this quarter; Delft demonstrated the system in Portland, OR during the week of April 15.
- Beyond the success of the demonstration, CAT members recognized immediately that additional functionality is required for the Pilot system to be viable, and for the Pilot evaluation to be meaningful. In response to this, HSEB initiated a contract task with Delft through RTi to implement the following:
  - Installation of the Pilot at ABRFC
  - Develop a MODs-like capability (the "what-if scenarios" are inadequate for operations)
  - Configure all Pilot sites as client-servers, not standalone as now
  - Provide additional segment definitions for the Santiam River for NWRFC
  - Provide more in-depth training to all Pilot sitesHSEB expects Delft to begin work on these additional tasks in Q4.
- OHD began implementation of the lumped SNOW-17 model for the FEWS Pilot. Completion is targeted for Q4.
- Apex distributed an early version of the Pilot evaluation criteria document to the CAT; however in the absence of the additional functionality described above, the CAT members suggested that the evaluation effort be postponed until all functionality is complete.
- HSEB completed negotiations with Raytheon to define the interface between AWIPS II and CHPS. Raytheon is expected to begin the task in Q4.
- After a series of discussions with HSMB and HEC, HSEB submitted the necessary paperwork to begin the task of incorporating the USACE HEC River Analysis System (HEC-RAS) into CHPS. Apex will conduct the analysis; OHD expects HEC to do most, if not all, of the software development.
- In May the Experimental Ensemble Forecast System (XEFS) Design and Gap Analysis Team, led by DJ Seo (HSMB) and Rob Hartman (CNRFC) presented to the Director of OHD, Gary Carter, a report entitled "The Experimental Ensemble Forecast System (XEFS) Design and Gap Analysis: Report of the XEFS Design and Gap Analysis Team", dated May 11, 2007. Following acceptance of the report's recommendations, Gary Carter assigned Execution Management responsibility to HSEB, and created an Oversight Group (Rob Hartman, DJ Seo, Mary Mullusky, Chris Dietz). The XEFS will be implemented using the CHPS software architecture. An implementation plan will be prepared during Q4.

## **4<sup>th</sup> Quarter FY07**

- Conducted a kick-off meeting for the CHPS FEWS Pilot Enhancements project on August 15. Demonstration and workshop is now planned for the week of December 17 2007 at NCRFC.
- Conducted a design review for the proposed MODs-like capability in the Pilot system.

Discussions resulted in some changes identified for the Sac-SMA Pilot implementation, to be completed by Q1 FY08.

- Delivered SNOW-17 software to Delft for inclusion in the Pilot system.
- Pilot configurations and set-up for ABRFC have begun.
- Began changes to Pilot version of Sac-SMA to accommodate PE time series needed for the Illinois River at ABRFC; completion scheduled for Q1 FY08.
- Delft met with Raytheon in Omaha, NE at the end of September to discuss the question of an interface between Delft-FEWS AWIPS II. OHD expects to receive a proposal for review in early November.
- During the week of July 9, Delft led an installation at CNRFC bringing all collaborative components for the Res-Sim project together in one place for the first time; i.e., Delft-FEWS configured for CNRFC, an early Linux version of the ResSim from HEC, and a modified version of NWSRFS from Apex. The installation revealed some missing functionality needed for NWSRFS, which HSEB provided at short notice, and which was delivered to CNRFC during August.
- Delft sent a hydrologist to CNRFC during the week of September 17 to troubleshoot an outstanding ResSim issue on-site. The cause of the problem turned out to be configuration and environment, not software.
- Acceptance testing at CNRFC for the ResSim project has been delayed until mid-November.
- OHD and HEC finalized the Memorandum Of Agreement (MOA) that will enable us to work jointly on the HEC-RAS project. Funds for Phase 1 (the analysis & design phase) were transferred to HEC at the very end of Q4 FY07.
- HSEB (RSIS) completed the Experimental Ensemble Forecast System (XEFS) High Level Analysis & Design document. The Analysis & Design document will be shared with the XEFS Oversight Group for review, followed by the XEFS Implementation team.
- HSEB has now begun an XEFS Implementation Plan associated with the draft Analysis & Design. The plan is required for FY08 funding proposals. The XEFS Implementation project will be addressed by the Core Goal Planning Team for Forecast Uncertainty (i.e., Ensembles).

#### **1<sup>st</sup> Quarter FY08**

- For more detailed information, please visit the CHPS news and activities page on the Web at: <http://www.nws.noaa.gov/oh/hrl/chps/news.html>.
- Apex Digital Systems and Dr. Michael Piasecki from Drexel University submitted to OHD a HydroXC proposal for the FY08 Hydrology budget that would build upon work completed in previous fiscal years, and help make the HydroXC work successful and self-sustaining.
- At a workshop hosted by the CNRFC in Chanhassen, MN during the week of December 17, Delft Hydraulics (now Deltares) presented and demonstrated the final version of the CHPS FEWS Pilot system to a group of HICs and RFC hydrologists.
- Based on the CHPS FEWS Pilot system, the CHPS Acceleration Team (CAT) is now satisfied that FEWS is a comprehensive platform which can be adapted to meet the current operational needs of NWS RFCs (i.e., is a suitable foundation for an NWSRFS replacement); and additionally has the potential to meet future needs of CHPS as a whole. The CAT delivered a final recommendation report to Gary Carter summarizing their findings. The NOAA Hydrology Program Manager accepted the findings and endorsed the implementation of FEWS for CHPS.
- Raytheon concluded their analysis of CHPS (FEWS), and delivered a proposal to OHD at the end of October for an approach to the CHPS-AWIPS II interface.
- Acceptance testing of the new ResSim at CNRFC occurred during November. An adequately functional version of ResSim was installed, along with OHD's/Apex's enhanced version of NWSRFS.
- Phase 1 of the HEC-RAS into CHPS project began with a kick-off conference call in December where a proposed project schedule was discussed.
- On October 19 HSEB submitted a "High Level Analysis and Design" document to the XEFS Implementation Team for review.
- In December HSEB held a meeting to address feedback received on the XEFS document. However the discussion prompted a re-think of the implementation strategy, which will now be based on Delft-FEWS in light of the CAT recommendation for CHPS.

## **Problems Encountered/Issues**

**1<sup>st</sup> Quarter FY07** - None

**2<sup>nd</sup> Quarter FY07** - None

**3<sup>rd</sup> Quarter FY07**

- The Pilot Evaluation task has been postponed until after the next set of Pilot enhancements have been deployed. This delays the key decision concerning adoption of FEWS for CHPS until FY08 Q2.

**4<sup>th</sup> Quarter FY07**

- The extension of AWIPS OB8 and OB9 activities caused a 2 month delay to the start of the XEFS project. Originally expected to begin on September 1, the project will now begin on November 1.

**1<sup>st</sup> Quarter FY08**

- An outstanding issue concerning ResSim's ability to execute a warm start in the manner expected by RFC forecasters was never resolved. As the necessary changes to ResSim would be extensive, CNRFC agreed that their plan to move forward with ResSim in their operations could proceed with minor impact. The USACE HEC will submit a proposal to the YCWA to make the necessary design and code changes to ResSim. This HEC activity will delay Phase 2, which is expected to add processing of ensemble forecasts in ResSim.

## **Dissemination (Web Pages)**

## AHPS Web Page Activities

**Core Goal:** Generate and disseminate information to and for our users

**Management Lead:** Donna Page

**Objective:** Provide a standard look and feel for the presentation of AHPS hydrologic and forecast information on the World Wide Web by all NWS weather offices. Also, complete the implementation of a single national database that aggregates information on hydrologic observation and service locations used by WFOs and RFCs (National Rivers Location Data Base - NRLDB).

### Milestones

Task	Due Date	Status
1. Phase VI development and testing	Delayed to FY08 Q3	In progress
2. Phase VI deployment	FY08 Q4?	Depends on web consolidation
3. Phase VII definition	FY07 Q4	Delayed to FY08 Q3
4. Phase VII development	FY09 Q1	Not started

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY07

- Delivered and supported implementation of core Phase IV deliverables on regional web-farms
- Modified AHPS CMS to resolve potential river database loops. Solution will be implemented with Phase V
- Developed inundation prototype for OCWWS/OHD

#### 2<sup>nd</sup> Quarter FY07

- Finalized inundation prototype look and functionality
- Deployed inundation prototype for NOAA/NWS review
- Integrated AJAX into national precipitation development pages and AHPS HSA pages
- Developed KMZ output for river observation and forecast data

#### 3<sup>rd</sup> Quarter FY07

- Delivered Phase V to Regions for review
- Implemented first flood inundation site in NC
- Phase VI development underway

#### 4<sup>th</sup> Quarter FY07

- Several new inundation web interface features added to code set
- Implemented 16 additional inundation locations in NC
- AHPS CMS modified to fully manage inundation configuration options
- NRLDB version 2.0 delivered to OCWWS for review/testing
- Phase VI development continues

### **1<sup>st</sup> Quarter FY08**

- Provided 5 Texas inundation locations for review by Government on AHPS staging server.
- Worked on new inundation water-depth process to merge Triangulated Irregular Network (TIN) and Digital Elevation Model (DEM) datasets for Texas and North Carolina locations.
- Finished beta version of new hydrograph generation software for future consolidated web-farms. Waiting to test on AHPS backend blade servers.
- Started process of documenting NRLDB tables to move to AHPS-CMS database for web operations.

## **Problems Encountered/Issues**

### **1<sup>st</sup> Quarter FY07**

- Continued issues with missing products in HQ product database. NWS OCIO is aware of the ongoing issue
- Found issue where WFO users could create a river database loop in the AHPS CMS
- Continued to have intermittent SQL update issues with the cluster database at CRH. Will establish a development cluster database to determine a long-term solution

### **2<sup>nd</sup> Quarter FY07**

- Continued to have occasional issues with missing products in HQ product database. NWS OCIO is aware of the ongoing issue. Additionally OCIO implemented a new database population process, which did not meet hydrologic text product requirements. OHD worked with OCIO developer to resolve issues.

### **3<sup>rd</sup> Quarter FY07**

- Continued issues with missing products in HQ product database. NWS OCIO is aware of the ongoing issue
- Unable to obtain required web consolidation documentation from OCIO for AHPS Phase VI development architecture planning

### **4<sup>th</sup> Quarter FY07**

- Delays in web consolidation data/file synchronization adversely affect AHPS Phase VI development
- Delays in obtaining necessary web consolidation documentation from OCIO adversely affect AHPS Phase VI development architecture planning
- Continued issues with missing products in HQ product database. NWS OCIO is aware of the ongoing issue

### **1<sup>st</sup> Quarter FY08**

- Delays in web consolidation hardware implementation adversely affecting AHPS Phase VI
- Delays in web consolidation data/file synchronization adversely affecting AHPS Phase VI development
- Delays in obtaining necessary web consolidation documentation from OCIO adversely affecting AHPS Phase VI development architecture planning
- Continued issues with missing products in HQ product database. NWS OCIO is aware of the ongoing issue
- New text product issue caused missing NWS products for all AHPS pages. NWS OCIO is aware of issue and has indicated that they will address their PHP code.

## **New Service Locations**

## Snow Water Equivalent Data

**Management Lead:** Larry Rundquist, APRFC

**Objective:** Acquire high quality, high resolution airborne gamma radiation snow water equivalent for flight lines in Alaska; this should improve accuracy and lead time of hydrologic forecasts by providing high quality input to forecast operations in data sparse areas

### Milestones

Task	Due Date	Status
Ingest 07 flight line data into archive database	5/07	Done
Compare period of record for flight line data (2003-2007) with nearby snow course sites to see if data are consistent	8/07	Done
Attempt to use flight line data in Snow updating system if data are sufficiently consistent and correlated with long-term snow course sites	FY08	Under evaluation

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY07

- Activities are on target

#### 2<sup>nd</sup> Quarter FY07

- Activities are on target... coordinated timing and priorities of flight lines with NOHRSC.

#### 3<sup>rd</sup> Quarter FY07

- Flight lines were slightly abbreviated due to conflict on use of aircraft. Data collected have been evaluated against the appropriate basins

#### 4<sup>th</sup> Quarter FY07

- Initial evaluation of flight line data against snow course completed. More detailed study in FY08 should evaluate direct correlation. Conclusion of initial evaluation recommends that data continue to be collected to maintain utility of records and allow more rigorous application of data in model update.

#### 1<sup>st</sup> Quarter FY08

- Activities are on target... coordinated timing of FY08 flight lines with NOHRSC.

### Problems Encountered/Issues

1<sup>st</sup> Quarter FY07 - None

2<sup>nd</sup> Quarter FY07 - None

3<sup>rd</sup> Quarter FY07 - None

4<sup>th</sup> Quarter FY07 - None

1<sup>st</sup> Quarter FY08 - None

## AHPS Implementation APRFC

**Management Lead:** Scott Lindsey, APRFC

**Objective:** Implement probabilistic hydrologic forecast for basins in the Alaska/Pacific Forecast Center's (APRFC) area of responsibility.

### Milestones

Task	Forecast Points Planned	Due Date	Actual to Date 1 <sup>st</sup> Qtr FY08	Variance
Identify 7 potential basins for new calibrations		1 <sup>st</sup> Qtr	Complete	
Calibrate 7 new basins for non-AHPS implementation	7	3 <sup>rd</sup> Qtr	0	
Implement 7 new forecast points (non-AHPS)	7	3 <sup>rd</sup> Qtr	0	
Identify 8 locations for AHPS implementation for FY08		1 <sup>st</sup> Qtr	Complete	
Recalibrate and prepare historical time series for 8 existing non-AHPS basins to utilize new data sources and improve forecast performance	8	4 <sup>th</sup> Qtr	5	
Implement 8 new AHPS points	8	4 <sup>th</sup> Qtr	0	
<b>Total</b>	<b>8</b>		<b>0</b>	<b>0</b>

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY08

- Identified 8 new AHPS points that will be implemented this fiscal year.
- Performed recalibrations and extended historical times series for 5 of these basins.
- Identified 7 new basins to calibrate. Began data collection and analysis.
- Identified additional previously calibrated basins (non-AHPS points) that have not performed well. Began calibration process to add new data sources and improve model parameters.

### Problems Encountered/Issues

1<sup>st</sup> Quarter FY08 - None

## AHPS Implementation for NCRFC

**Management Lead:** Dan Luna, HIC/NCRFC

**Objective:** Implement probabilistic hydrologic forecasts for basins in the North Central River Forecast Center's (NCRFC) area of responsibility. For FY08 there will not be any new service locations implemented.

### Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date (1 <sup>st</sup> Qtr FY08)	Variance
Awaiting MO river flows.	0		0	
New, unplanned forecast points	0		1	+1
<b>Total</b>	<b>0</b>		<b>0</b>	<b>+1</b>

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY08

- Added a new forecast point per WFO request, Rifle River near Sterling

### Problems Encountered/Issues

1<sup>st</sup> Quarter FY08 - none

## AHPS Implementation for MBRFC

**Management Lead:** Steve Predmore, HIC

**Objective:** Implement probabilistic forecasts for basins in the Missouri Basin River Forecast Center's (MBRFC) area of responsibility. For FY08 this includes the Elkhorn river Basin, the Marais Des Cygnes Basin, the South Platte down to Kersey, CO., and the Milk river Basin above Havre, MT.

### Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date (1 <sup>st</sup> FY08)	Variance
Elkhorn	9	4 <sup>th</sup> Qtr	0	0
Marais Des Cygnes	12	4 <sup>th</sup> Qtr	0	0
Remaining Milk River	7	2 <sup>nd</sup> Qtr	0	0
South Platte River down to Kersey	16	4 <sup>th</sup> Qtr	0	0
Carryover from FY07	25		25	0
New, unplanned forecast points	0		1	+1
<b>Total</b>	<b>69</b>		<b>26</b>	<b>+1</b>

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY08

- Added a new forecast point per WFO request, Niobrara River at Sparks, NE (SPNK1)

### Problems Encountered/Issues

1<sup>st</sup> Quarter FY08 - none

## AHPS Implementation for MARFC

**Management Lead:** Peter Ahnert (HIC/MARFC), Joe Ostrowski (DOH)

**Objective:** Implement probabilistic hydrologic forecasts for basins in the Middle Atlantic River Forecast Center's (MARFC) area of responsibility. MARFC implemented basic AHPS for existing forecast points in the entire MARFC area of responsibility by the end of FY 2006.

### Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date (1st Qtr FY08)	Variance
MARFC Service Area	0	-----	0	0
<b>Total</b>	<b>0</b>	<b>FY08</b>	<b>0</b>	<b>0</b>

### Accomplishments/Actions

#### 1st Quarter FY08

- MARFC has completed basic AHPS implementation for its entire service area.
- Per communication with the Norfolk Division of the US Army Corps of Engineers (USACOE), MARFC is now generating a companion table for the 30-day inflow exceedance probability chart for Gathright Dam in the headwaters of the James River Basin in Virginia. Due to the low flows in the James Basin, the USACOE is looking more closely at the range of expected inflows to Gathright Dam.
- MARFC has undertaken a project in cooperation with the New York City, Department of Environmental Protection (NYC DEP) to develop probabilistic forecast pool elevations using currently produced probabilistic inflow hydrographs. No results to report at this time as project just got underway.
- **MARFC Gridded Flash Flood Guidance (FFG) Project Update:**
  - Independently varying gridded FFG methodology expanded to approximately 65% of HSA LWX, with 100% completion in the metropolitan Washington/Baltimore corridor.
  - Implementation efforts have been temporarily directed to MARFC's southern border within the WFO RNK and AKQ service areas. SERFC plans to implement ABRFC's FFG methodology, and it was felt that RNK and AKQ would benefit from having both new methodologies in place for operational assessment. The gridded FFG information provided to RNK has been converted over to the prototype FFG system.
  - Made significant progress on the data collection phase of project to refine the precision of gridded threshold runoff across MARFC's service area. Approximately 80 basins in PA, MD, DE, NJ, and VA were visited and bankfull measurements made, primarily by contracted summer employees, accompanied in some cases by a MARFC staff member. All measurements have been documented with photographs and field notes, and analysis of the data is progressing.

### Problems Encountered/Issues

1st Quarter FY08 – None

## AHPS Implementation for NERFC

**Management Lead:** David Vallee (HIC/NERFC), Robert Shedd (DOH)

**Objective:** Implement probabilistic hydrologic forecasts for basins in the Northeast River Forecast Center's (NERFC) area of responsibility. The NERFC goal is to have AHPS implementation for long-term forecasts for the entire NERFC area of responsibility by the end of FY 2009.

### Milestones

Implementation Area	Forecast Points Planned	Due Date FY08	Actual to Date (1st Qtr FY08)	Variance
Connecticut River	4	2 <sup>nd</sup> Qtr.	0	0
Maine	2	4 <sup>th</sup> Qtr.	0	0
Southern New England	3	4 <sup>th</sup> Qtr.	3 (1 <sup>st</sup> Qtr FY08)	0
<b>Total</b>	<b>9</b>	<b>FY08</b>	<b>3</b>	<b>0</b>

### Accomplishments/Actions

#### 1st Quarter FY08

- NERFC has implemented three (3) new AHPS forecast locations on rivers in Southern New England.
- Implementation of four locations in the Connecticut River Basin (originally scheduled for implementation in FY 07) was delayed due to NWSRFS software problems. These problems have been fixed in OB8.1.1 which contains an updated version of the Reservoir Operation (RES-J). OB8.1.1 software is now installed at NERFC, and the forecasts are now running in test mode in NWSRFS with assistance from RTi. This should allow for implementation of these locations over the next few months.
- The contract from FY07 funds with RTi is now in place for continued work in the Connecticut/Housatonic River Basins. NERFC has begun work with RTi on the calibrations. RTi visited NERFC (per task order) in December to coordinate the calibration efforts.
- NERFC and RTi held a meeting with First Light Power who operates power plants on the Housatonic River. The meeting was positive, and an agreement was reached to enhance data exchange from First Light to the NWS. This will provide more real time access to a number of platforms that NERFC does not receive reliable data from, including both precipitation and stage data. This should enhance the AHPS calibration/implementation efforts on the Housatonic river.
- NERFC plans to start working on market research phase of the FY08 task in January, to ensure they are ready as soon as possible.
- In-house calibration continues for locations in Southern New England and Maine.

### Problems Encountered/Issues

1st Quarter FY08 – None

## AHPS Implementation for OHRFC

**Management Lead:** Craig Hunter (HIC/OHRFC), Tom Adams (DOH)

**Objective** Implement probabilistic hydrologic forecasts for basins in the Ohio River Forecast Center's (OHRFC) area of responsibility. The OHRFC implemented basic AHPS for all existing long-term forecast points in the OHRFC area of responsibility by the end of FY 2006.

### Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date (1 <sup>st</sup> Qtr FY08)	Variance
Ohio River Basin	0	---	0	0
<b>Total</b>	<b>0</b>	<b>FY08</b>	<b>0</b>	<b>0</b>

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY08

- OHRFC has completed basic AHPS implementation for its entire service area.
- OHRFC is continuing with re-calibration activity in selected basins in parts of the Kentucky and Muskingum basins. Re-calibration in the Little Wabash is complete. Additionally, OHRFC is working on re-calibration of the Great Lakes (Lake Erie) drainage basins using one-hour time steps.
- Work on the Community Ohio River HEC-RAS model continues as a cooperative project with the Ohio R. & Great Lakes Div. of the USACE and the USGS.
- Implementation of the Advanced Research (ARW) version of the Weather Research and Forecasting (WRF) model on the OHRFC Linux cluster is progressing.
- OHRFC is working cooperatively with the NERFC and NCEP to implement a Short Range Ensemble Forecasting (SREF)-based approach to short lead-time probabilistic hydrologic forecasting.

### Problems Encountered/Issues

1<sup>st</sup> Quarter FY08 – None

## AHPS Implementation for ABRFC

**Management Lead:** Billy Olsen, HIC

**Objective:** Implement probabilistic forecasts for basins in the Arkansas-Red Basin River Forecast Center's (ABRFC) area of responsibility. For FY08, this would include implementation of basic service for 51 AHPS forecast locations in the following ABRFC forecast groups: Washita Basin, Lower Arkansas River-Kerr to Pine Bluff, Denison Inflow and Lower Red – Arthur City to Fulton. No contract assistance is requested this year.

### Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date (1 <sup>st</sup> Qtr FY08)	Variance
Washita Basin	11	1 <sup>st</sup> Qtr	11	0
Lower Arkansas River - Kerr to Pine Bluff	1	1 <sup>st</sup> Qtr	1	0
Denison Inflow	22	4 <sup>th</sup> Qtr	0	0
Lower Red – Arthur City to Fulton	17	4 <sup>th</sup> Qtr	0	0
<b>Total</b>	<b>51</b>		<b>12</b>	<b>0</b>

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY08

- ABRFC staff members Greg Stanley and Mike Pierce traveled to the RTi offices during the week of December 10 to review contract progress to date. The project is on schedule and all is in order otherwise.
- Local implementation work has begun on the DENINF forecast group for ESP. Fourteen basins have been set up in ICP and initially calibrated for long-term probabilistic forecasting.

### Problems Encountered/Issues

#### 1<sup>st</sup> Quarter FY08

- None

## AHPS Implementation for LMRFC

**Management Lead:** Dave Reed, HIC

**Objective:** Implement probabilistic hydrologic forecasts for basins in the Lower Mississippi River Forecast Center's (LMRFC) area of responsibility. For FY08 this includes the Pearl and Pascagoula basins

**Milestones:**

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 1 <sup>st</sup> Qtr FY08	Variance
Upper Pearl, MS	6	Q1	6	0
Lower Pearl Basin, MS/LA	6	Q2		
Lower Pearl Basin, LA	3	Q3		
Pascagoula Basin, MS	4	Q3		
Pascagoula Basin, MS/AL	9	Q4		
<b>Total</b>	<b>28</b>		<b>6</b>	<b>0</b>

**Accomplishments/Actions**

**1<sup>st</sup> Quarter FY08**

- November 13, coordination call held with RTi on FY07 calibration progress and activities. LMRFC provided an updated set of FY07 calibration shapefiles to RTi, at their request
- December 24, received all preliminary FY07 calibration decks from RTi for LMRFC review.
- Implemented 6 new AHPS sites for the Upper Pearl Basin during December at: GDHM6, KSCM6, OFAM6, RATM6, JSNM6, and JACM6.
- Provided a brief overview of AHPS activities for the USACE, USGS, and TVA during our annual meetings with these Agencies.
- Completed 7 historical MAPs for the Gulf basins in Mississippi. This completes all MAPS for basins east of the Mississippi River. A total of 10 historical MAPs were completed for the White Basin in AR.
- Two in-house basin calibrations were completed this Quarter:
  - Yazoo Basin: YZOM6
  - Wolf Basin: ROST1
- No AHPS outreach/training activities were scheduled during the Quarter.
- LMRFC continues support of AHPS activities with in-house calibration effort for the west Tennessee, Yazoo, and Pearl Basins.

**Problems Encountered/Issues**

**1<sup>st</sup> Quarter FY08 – None**

## AHPS Implementation for SERFC

**Management Lead:** John Feldt, HIC

**Objective** Implement probabilistic hydrologic forecasts for basins in the Southeast River Forecast Center's (SERFC) area of responsibility. For FY08 this would complete AHPS sites in portions of Georgia, South Carolina, and north Florida.

### Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date (1st Qtr FY08)	Variance
Altamaha	7	1 <sup>st</sup> Qtr	8	+1
	1	2 <sup>nd</sup> Qtr		
Santee	1	2nd Qtr		
Apalachicola	5	2 <sup>nd</sup> Qtr		
	6	3 <sup>rd</sup> Qtr		
	6	4 <sup>th</sup> Qtr		
<b>Total</b>	<b>26</b>	<b>FY08</b>	<b>8</b>	<b>+1</b>

### Accomplishments/Actions

#### 1st Quarter FY08

- Although they are not planned AHPS sites, because of the extreme drought in the Southeast, ESP was developed for Lake Sidney Lanier on the Chattahoochee River (CMMG1) and Lake Allatoona on the Etowah River (CVLG1). Information from the output was disseminated to various federal, state, and local users.
- Because of the extreme drought that has plagued the Southeast, the Savannah District of the Corps of Engineers invited SERFC to participate with them in several public Town Hall meetings. AHPS ESP graphics were shown to help quantify the magnitude of the drought, along with CPC seasonal outlooks. On November 13-14, Todd Hamill participated in Augusta, GA and Anderson, SC, and on December 6, John Feldt participated in Savannah, GA.

### Problems Encountered/Issues

1st Quarter FY08 – None

## AHPS Implementation for WGRFC

**Management Lead:** Thomas Donaldson, WGRFC

**Objective:** Implementation of probabilistic hydrologic forecasts for basin in the West Gulf River Forecast Center's area of responsibility. For FY08 this includes the Brazos River Basin..

### Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date (1 <sup>st</sup> Qtr FY08)	Variance
Upper Brazos Forecast Group	29	4th Qtr		
Lower Brazos forecast Group	44	4th Qtr		
<b>Total</b>	<b>73</b>		<b>0</b>	<b>0</b>

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY08

- Assimilated and provided to RTi the following datasets in support of RES-J and headwater calibration for the Brazos River system:
  - Current fs5files
  - ESRI shapefiles of forecast points and basins
  - Historical reservoir inflow, release, and elevation time series
  - Reservoir Regulation Documents
  - Historical mean daily and instantaneous flow time series
  - Historical mean areal precipitation time series
  
- Began process to compute historical MAPs for Brazos River system.
  
- Constructed historical reservoir timeseries for three Brazos River Authority Reservoirs, and built preliminary RES-J models for these BRA reservoirs.

### Problems Encountered/Issues

#### 1<sup>st</sup> Quarter FY08

- None

## AHPS Implementation for CBRFC

**Management Lead:** Michelle Schmidt, HIC/CBRFC

**Objective:** Implement probabilistic hydrologic forecasts in the Colorado Basin River Forecast Center's (CBRFC) area of responsibility.

### Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 1 <sup>st</sup> Qtr FY08	Variance
<b>Total</b>	<b>0</b>		<b>0</b>	<b>0</b>

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY08

- N/A

### Problems Encountered/Issues

#### 1<sup>st</sup> Quarter FY08

- Implementation for regulated points is delayed until delivery of new software.

## AHPS Implementation CNRFC

**Management Lead:** Robert Hartman, HIC/CNRFC

**Objective:** Implement probabilistic hydrologic forecasts in the California-Nevada River Forecast Center's (CNRFC) area of responsibility.

### Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 1 <sup>st</sup> Qtr FY08	Variance
<b>Total</b>	0		0	0

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY08

- N/A

### Problems Encountered/Issues

#### 1<sup>st</sup> Quarter FY07

- Implementation for regulated points is delayed until delivery of new software.

## AHPS Implementation for NWRFC

**Management Lead:** Harold Opitz, HIC/NWRFC

**Objective:** Implement probabilistic forecasts for basins in the Northwest River Forecast Center's (NWRFC) area of responsibility.

### Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 1 <sup>st</sup> Qtr FY08	Variance
<b>Total</b>	<b>0</b>		<b>0</b>	<b>0</b>

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY07

- N/A

### Problems Encountered/Issues

#### 1<sup>st</sup> Quarter FY08

- Implementation for regulated points is delayed until delivery of new software.

# Training

## Hydrologic Science Training - COMET

**Theme:** Training

**Management Lead:** Jeff Zimmerman

**Objective:** Develop training and education materials to facilitate the implementation of new science and technologies into hydrologic operations.

### Milestones

Task	Due Date	Status
Conduct Flash Flood Hydrology/QPE Workshop	2 <sup>nd</sup> Q	On-going
Conduct Advanced Hydrologic Science Residence Course	4 <sup>th</sup> Q	On-going
Deliver Dambreak Distance Learning Module	2 <sup>nd</sup> Q FY	To be delivered 2 <sup>nd</sup> Q FY 08
Deliver Verification Distance Learning Module	2 <sup>nd</sup> Q FY	To be delivered 2 <sup>nd</sup> Q FY 2008
Deliver Distributed Hydrologic Model Distance Learning Module	1 <sup>st</sup> /2 <sup>nd</sup> Q FY	To be delivered 1 <sup>st</sup> /2 <sup>nd</sup> Q FY 2008
Deliver Precipitation Processing Inputs Distance Learning Module		
Deliver Verification Distance Learning Module		

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY08

- Continued development work on Dambreak, Verification, and Distributed Hydrologic Model training modules. These modules were funded as part of the FY 07 NSTEP process.
- Conducted initial conference calls on FY 08 funded modules
- Initiated preparation activities for Flash Flood Hydrology/QPE Workshop to be held in February 2008

### Problems Encountered/Issues

#### 1<sup>st</sup> Quarter FY08

- None

# Outreach

## FY08 Hydrology Program Outreach Work Plan

**Theme:** Hydrologic Services Outreach

**Management Lead:** Tom Graziano, Larry Wenzel, Regional Hydrologic Services Program Representatives

**Objectives:** Accomplish outreach with national, regional, and local partners and customers with emphasis on locations where AHPS or water resource services are being or will soon be implemented. Develop clear and consistent outreach materials for use by national, regional, and local personnel.

### Milestones

Tasks	Org	Cost (\$1000)	Due Date	Status
Flood Inundation Mapping Coordination Mtg (Tauton, MA)	OCWWS	6.0	Q1	Completed
COE Flood Plain Management Services and Planning Assistance to States Programs Workshop (Napa, CA, Dec 2007)	OCWWS	4.0	Q1	Completed
FEMA Risk Analysis Division Mtg (Philadelphia, PA)	OCWWS	0.5	Q1	Completed
Flood Inundation Mapping Coordination Mtg (FTW, TX)	OCWWS	4.5	Q2	
Flood Mapping Promotional Event: (Raleigh, NC, March 2008)	OCWWS	4.0	Q2	
National Hurricane Conference –Travel (Mar 2008)	OCWWS	1.5	Q2	
Interdepartmental Hurricane Conference - Travel	OCWWS	1.5	Q2	
Flood Inundation Mapping Coordination Mtg (TBD)	OCWWS	5.0	Q3	
ASFPM: (Reno, NV, May 2008) - includes booth costs and 3 attendees	OCWWS	8.0	Q3	
FEMA National Flood Conference: 2 attendees (Chicago, IL, May 2008)	OCWWS	4.0	Q3	
AHPS Users Guide: 100,000 copies (July 2008)	OCWWS	5.0	Q4	
NSC Congress and Exposition (Anaheim, CA, Sept 22-24)	OCWWS	10.0	Q4	
<b>Sub Total</b>		<b>54.0</b>		
Participate in quarterly Delaware River Basin Flood Advisory Committee Meetings and review AHPS deployment and operations in the Delaware River Basin. (MARFC, HSD, PHI, BGM); Location: Trenton, NJ	ER	.5	Q1	Completed
Participate in Mississippi River Drainage Tri-Agency (NWS, USACE, USGS) Coordination Meeting. (OHRFC); Location: Tunica, MS	ER	.7	Q1	Completed
Flood Inundation Mapping Coordination Meeting at FEMA Region One Headquarters. (HSD); Location: Boston, MA	ER	.5	Q1	Completed
Flood Inundation Mapping Coordination Meeting to review enhanced partnered AHPS services in North Carolina. (HSD, RAH, ILM); Location: Raleigh, NC	ER	.5	Q1	Completed
Participate in U.S. Army Corps of Engineer Water Management Briefing to review AHPS services in South Carolina. (SERFC); Location: TBD	ER	.4	Q1	Completed
Participate in the Tri-Agency USGS-NWS-USACE New England Science Strategy Meeting. (NERFC, WFOs); Location: Hanover, NH	ER	2.0	Q1	Completed
Participate in RFC-WFO partnered workshop in the Oswego River Basin to review new AHPS deployment. (NERFC, BGM); Location: Onondaga County, NY	ER	1.0	Q1	Completed
Participate in semi-annual New York City Water Supply Meetings and review AHPS deployment and operations in the NYC water supply system. (NERFC, HSD, ALY, BGM); Location: Grahamsville, NY	ER	.6	Q2	
Participate in the NOAA in the Carolinas / Coastal and Inland Flooding Observation and Warning Project Coordinate Meeting. (SERFC) Location: TBD	ER	.8	Q2	

Participate in quarterly Delaware River Basin Flood Advisory Committee Meetings and review AHPS deployment and operations in the Delaware River Basin. (MARFC, HSD, PHI, BGM); Location: Trenton, NJ	ER	.5	Q2	
Co-sponsor and participate in WMO Sponsored-Saint John River Hydrology Committee Meeting. Co-located with the Eastern Snow Conference. Share AHPS development and deployment activities in northern New England. (NERFC, HSD, CAR, BTV, GYX); Location: Hanover, NH	ER	3.0	Q2	
State Hurricane Conference Support to review AHPS product suites and review inland flooding hydrologic services. (SERFC); Location: NC & SC	ER	1.8	Q3	
Participate in Ohio River Drainage Tri-Agency Coordination Meeting (OHRFC); Location: Urbana, IL	ER	.7	Q3	
<b>Sub Total</b>		<b>13.0</b>		
FEMA Flood Map modernization scoping meetings Audience – local/county/FEMA officials (or corporate technical partners)	SR	4.0	Q4	
LA State Flood Plain Managers Conference - Presentation on NWS Flood Inundation Mapping Efforts; Audience - Flood Plain Managers in LA	SR	.5	Q3	
MS State Flood Plain Managers Conference - Presentation on NWS Flood Inundation Mapping Efforts Audience - Flood Plain Managers in MS	SR	.5	Q3	
Mississippi Water Resources Conference (MWRC) - Paper/presentation on NWS Flood Inundation Mapping Efforts Audience - Water resources managers in MS	SR	.5	Q3	
RFC/WFO AHPS Workshop for Mobile District COE - Brief on AHPS products and services	SR	.4	Q3	
RFC/WFO AHPS Workshop- Mississippi Valley Division/ Vicksburg District/Pearl River Valley Water Supply District - AHPS products and services Audience - Water Resources managers at the COE and PRVWSD	SR	1.2	Q3	
RFC/WFO AHPS Workshop; Audience - WFO SHV high-end users/customers of AHPS products	SR	1.2	Q4	
RFC/WFO Outreach on the use of AHPS Products and Services to Support Drought Management.	SR	1.7	Q4	
Support to Hurricane Program - The SERFC plays a lead role in the hurricane program. 70% or more of inland-moving tropical systems affect the SERFC's area. This request would fund attendance at key hurricane conferences to share information about AHPS products and services.	SR	3.0	Q3	
<b>Sub Total</b>		<b>\$13.0K</b>		
NWS Hydrology WAS* IS Societal Impacts Workshop (Location TBD)	CR	5.0	Q4	
WFO/RFC AHPS Workshop MBRFC	CR	3.0	Q4	
WFO/RFC AHPS Workshop NCRFC	CR	3.0	Q4	
Sub-regional Hydrology Partners/Stakeholders Workshop (Location TBD)	CR	2.0	Q4	
<b>Sub Total</b>		<b>\$13.0K</b>		
Development of a "Hands-on" Watershed Model – Phoenix, MT WFO	WR	1.0	Q4	
Host Montana Hydrology Conference - Theme AHPS and Water Supply Services – Helena, MT WFO	WR	6.0	Q2	
In coordination with the CNRFC Produce Southern California AHPS Hydrology, Drought and Water Resource Services Brochure – San Diego, CA	WR	2.0	Q2	
In coordination with the NWRFC produce AHPS, Water Supply and Flash Flood Brochure for the state of OR and WA	WR	2.0	Q4	
In coordination with the CBRFC Produce an Arizona-wide Brochure detailing AHPS Hydrology and Flash Flood Services in the state	WR	2.0	Q3	

	<b>Sub Total</b>		<b>\$13.0K</b>		
	<b>Total</b>		<b>\$106K*</b>		
CFI Group Biennial Hydrologic Services CSI Survey	OCWWS & Regions	36.0	Q4		
	<b>Grand Total</b>		<b>\$142.0K</b>		

**\*Total combined FY08 OCWWS and Regions Outreach costs equivalent to FY07**

**Accomplishments/Actions**

**1<sup>st</sup> Quarter FY08**

- All planned activities have been completed for the quarter

**Problems Encountered/Issues**

**1<sup>st</sup> Quarter FY08**

- 1<sup>st</sup> Quarter activities were funded by local money and will make a cost adjustment once AHPS money is released.

# **Program Management**

## Program Management

**Theme:** Program Management

**Management Lead:** Donna Page

**Objective:** Provide national program management; coordinate and track AHPS budgets and project plans; manage AHPS contracts; and foster Agency, Departmental, and Legislative Interface.

### Milestones

Tasks/Subtask FY07 Milestones	Responsible	FY07 Quarter Completion Date
AHPS Planning/ Execution/ Reporting <ul style="list-style-type: none"> <li>• Quad Charts</li> <li>• E-CPIC Updates</li> <li>• Earned Value Reports</li> <li>• Quarterly Status Reports</li> </ul>	OHD/Regions OHD OHD OHD	Monthly Quarterly Monthly Monthly
NOAA PPBES Hydrology Program Support <ul style="list-style-type: none"> <li>• Program Operating Plan</li> <li>• Quad Charts</li> <li>• Quarterly Program Review</li> </ul>	OHD OHD OHD	3 <sup>rd</sup> Quarterly Quarterly
Agency/ Department/ Legislative Interfaces <ul style="list-style-type: none"> <li>• Budget Fact Sheet</li> <li>• Prepare and submit Budget Request</li> <li>• Prepare Briefings and Support OMB/Congressional Meetings</li> <li>• Prepare Response to Pass Back</li> <li>• Prepare Response to Budget Hearing Questions</li> <li>• Program Assessment Rating Tool Progress</li> </ul>	OHD OHD OHD OHD OHD OHD	1 <sup>st</sup> 2 <sup>nd</sup> 3 <sup>rd</sup> 3 <sup>rd</sup> 4 <sup>th</sup> Quarterly
HOSIP Process Improvement and Document Development <ul style="list-style-type: none"> <li>• Instructions</li> <li>• Guidance &amp; Standards</li> <li>• Performance Statistics</li> <li>• Quality Control Reports</li> <li>• Gate Status Reports</li> <li>• Validation &amp; Recommendation Reports</li> <li>• HOSIP Documents</li> </ul>	OHD OHD OHD OHD OHD OHD OHD	Quarterly Quarterly Quarterly Quarterly Quarterly Quarterly Quarterly

### Accomplishments/Actions

#### 1<sup>st</sup> Quarter FY08

- All milestones are on schedule – all scheduled reports completed

### Problems Encountered/Issues

1<sup>st</sup> Quarter FY08 - none