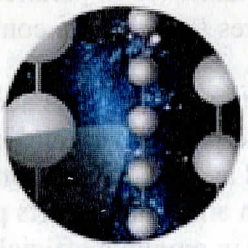

IceCube Startup Project
Quarterly Report

November 1, 2002 – January 31, 2003

Submittal Date: February 28, 2003

Robert J. Paulos, IceCube Project Manager
University of Wisconsin - Madison

This report is submitted in accordance with the reporting requirements set forth in the IceCube Startup Project Cooperative Agreement, number OPP-0236449.

Foreword

This quarterly report is submitted under Cooperative Agreement Number OPP-0236449, and covers the three-month period beginning November 1, 2002 and concluding on January 31, 2003.

Collaboration agreements being established in parallel with the project start up are nearly completed, and operating procedures / precedents continue to mature.

While every effort has been made to present status accurately, the cost data contained in this document should be considered preliminary and is subject to restatement following internal review. The funds labeled as "actual" are compiled from financial records at the University of Wisconsin - Madison and from reports provided by our subawardees. Accounting differences may result in amounts officially recorded at individual institutions being different from those collected in this summary document.

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Executive Summary

Project Manager's Assessment

IceCube is continuing to develop into a mature project governed by sound project management and engineering practices. We remain on target to achieve year-1 objectives within cost and schedule baselines.

The year-1 critical path is through the Enhanced Hot Water Drill (EHWD) system and specifically through the Mobile Drilling Structures (MDS) this quarter. The tasks of procurement and outfitting are on schedule. MDS costs are coming in approximately 10 percent higher than planned due to scope changes related to heater efficiency changes and modifications to better accommodate safety regulations. Looking at future activity, the next major hurdle will be the IV&T activity in late spring and summer. The IV&T plan will be available for comment and discussion in March.

Actual spending for quarter-2 totaled $2,212,498. Planned spending was $2,248,266.

Preliminary requirements for the Digital Optical Module (DOM) main PC board and the DOM hub have been completed and submitted for review to the project office. The first of two prototype DOM main PC boards have been fabricated and assembled. Testing and delivery to UW is scheduled for February.

IceTop tank testing at Port Wilmington is being performed in a refrigerated warehouse that simulates the South Pole temperature environment. Two freezing methods are being tested. Results of these tests will be used to determine further tests that will be conducted in-situ next season.

The Enhanced Hot Water Drill remains on schedule for delivery to Port Hueneme in August of this year. The mobile drilling structure (MDS) vendor has completed modifications and shipped the first MDS for outfitting at the UW Physical Sciences Lab.

Previous inconsistencies between our budget and schedule baselines have been reconciled, and monthly reporting of technical progress is now enriched with supporting cost and schedule information and good progress is apparent. Our earned value pilot activity, the Enhanced Hot Water Drill development, has migrated to OpenPlan and Cobra as its schedule and financial management tools. Earned value reports for the EHWD are generated monthly and reviewed by project management. Key project office personnel are undergoing training on these software applications in preparation for project-wide implementation next year.

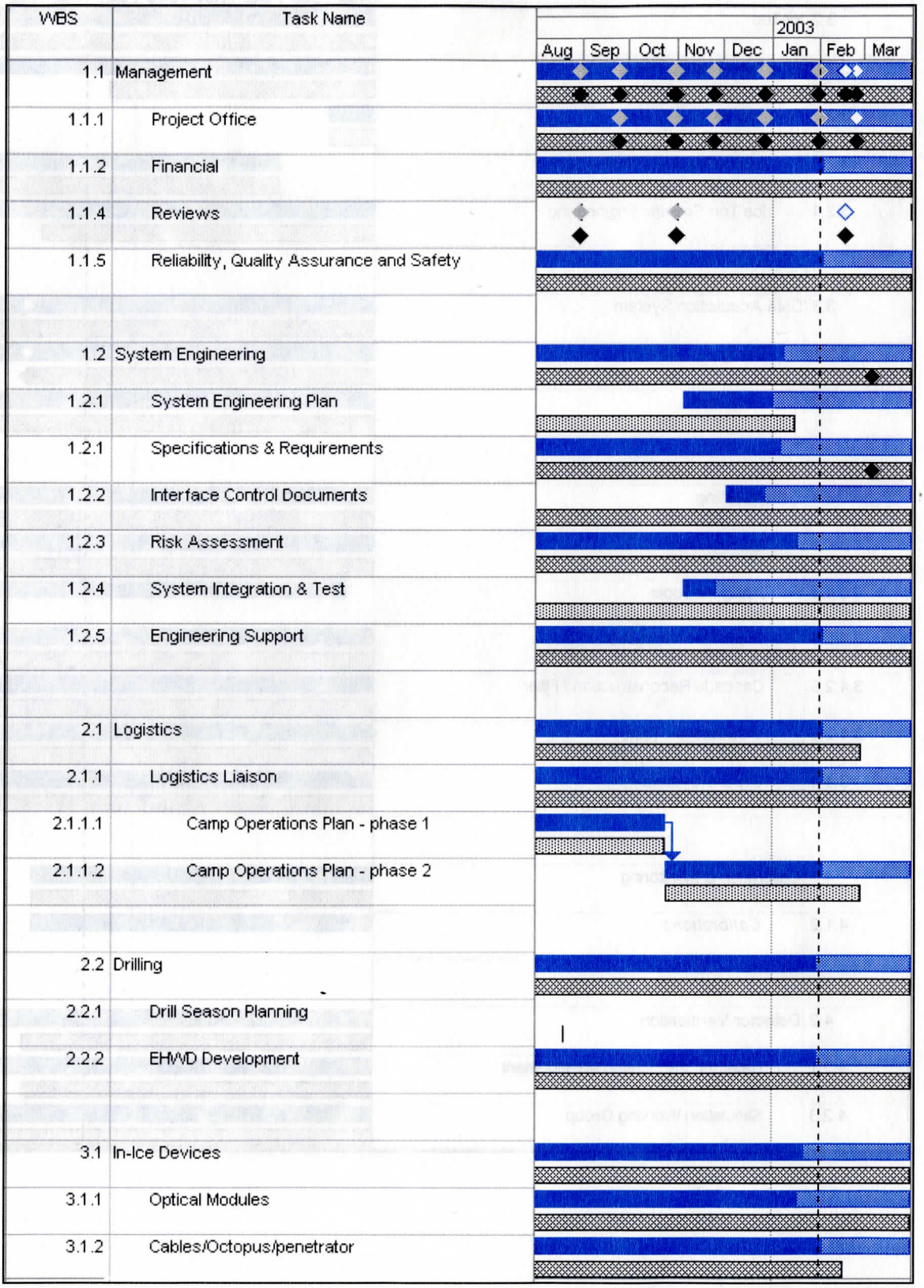
The project is developing and finalizing subaward agreements. Our partners who did not have finalized agreements proceeded with much of their planned work in good faith. As funds began flowing to cover their costs, our partners hired additional staff members. The delayed work is not significant to the overall schedule.

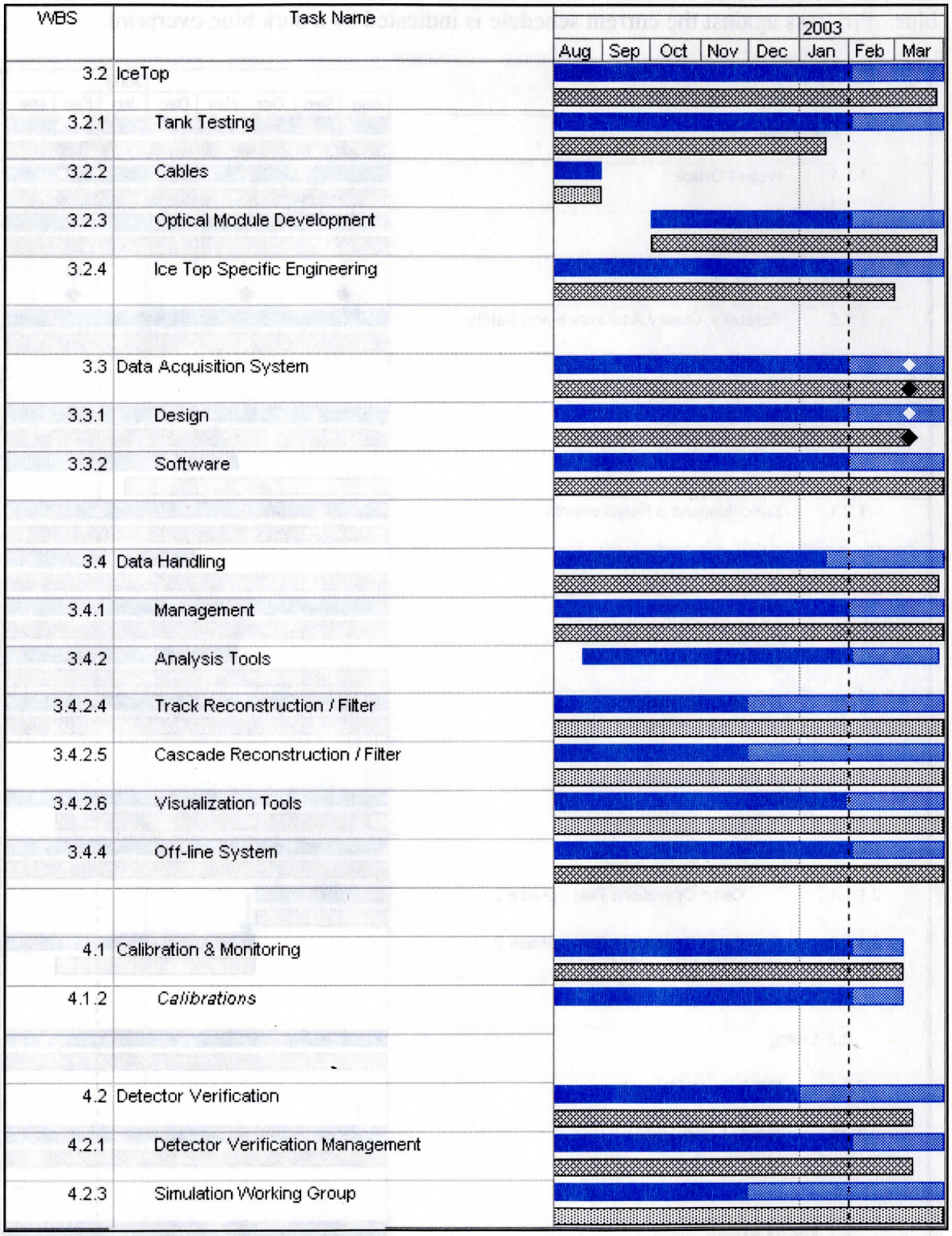
Major project accomplishments during this period include the following:

- An interim Project Director (Jay Gallagher) has been assigned as the IceCube project until the position is permanently filled.
- WBS structural differences between the cost and schedule baselines have been resolved and all tasks identified by either baseline have been combined in a unified Microsoft Project Plan.
- Major procurements in the project management and drilling activities have been re-phased to coincide with the current schedule and to reflect the dates when costs will be realized rather than when the funds will be committed.
- The Project Manager, in conjunction with Level 2 managers, have established Year 2 objectives. Top-level deliverables, budgets, and schedules to support these objectives are being developed.
- A template has been developed for use by level 3 managers in generating monthly technical status update reports.
- The start-up year schedule and budget for the Enhanced Hot Water Drill were ported from MS Project/Excel to Cobra and Open Plan. Sample reports have been generated from the software and reviewed by the management team.
- Eleven US institutions will receive IceCube subawards. Five subawards have been signed and three are in formal iteration between the UW and the collaborating institutions. The remaining three, which contain only travel funds, are being drafted.
- Eleven of the 12 hazard analyses have been released. The remaining hazard analysis for Operations (planned for completion in 12/02) is on hold pending definition of the process flow for drilling and deployment operations at the South Pole. This will not adversely impact any other schedule elements.
- Significant progress was made in introducing Systems Engineering leadership and coordination to ongoing technical activities. This cultural shift towards comprehensive and deliberate analysis of requirements and associated formal verification is a critical step in the maturation of IceCube project management.
- An internal Systems Requirements Review is scheduled for mid-February 2003.
- A carbon monoxide sensor, fuel leak sensor, and DGH module (used to relay sensor signals to the control system) have successfully passed cold storage tests.
- RPSC submitted its purchasing request for generators to the NSF in December. The selected vendor is National Electrical Systems, Inc.
- The Rodriguez Well System (RWS) MDS design and analysis has been approved. An approval to proceed with construction was given on January 17th.
- Bens has been selected as the Whitco Heater distributor. An order has been placed for a high efficiency prototype heater.
- The PreHeater System (PHS) MDS construction is approaching completion. Delivery to PSL is expected in early February.

- A general TOS tower design has been approved. The design is modularized to break down onto three shipping platforms made from the lower work platform.
- An order was placed in December for an autobanding machine to bind the supply hose and the drill support cable together as they enter the hole. The machine was received during the first week of January.
- A draft IV&T Safety Inspection Plan has been developed. It will ensure all safety measures required by the hazard analyses and the system design are in place.
- The data acquisition system Test Main Board layout has been fabricated and is under test.
- Electronics parts manufacturers qualified by NASA, DoD, and international agencies for high-reliability applications have been identified. These will be considered preferred manufacturers for data acquisition system parts.
- The Nucleus operating system release for use on DOM Main Board was received, installed and tested on the development system at LBNL.
- C-programming style specifications and documentation tools for generating DOM Main Board C-code were evaluated and accepted.
- The Data Systems work breakdown structure (WBS 4) was revised and coordinated with WBS 4 & 5 level 2 and level 3 leads.
- A draft of the Detector Verification plan was completed.

The following schedule chart shows the baseline in black and the current schedule in blue. Progress against the current schedule is indicated by a dark blue overprint.




WBS
Task Name
2003
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
3.2 IceTop
3.2.1 Tank Testing
3.2.2 Cables
3.2.3 Optical Module Development
3.2.4 Ice Top Specific Engineering
3.3 Data Acquisition System
3.3.1 Design
3.3.2 Software
3.4 Data Handling
3.4.1 Management
3.4.2 Analysis Tools
3.4.2.4 Track Reconstruction / Filter
3.4.2.5 Cascade Reconstruction / Filter
3.4.2.6 Visualization Tools
3.4.4 Off-line System
4.1 Calibration & Monitoring
4.1.2 Calibrations
4.2 Detector Verification
4.2.1 Detector Verification Management
4.2.3 Simulation Working Group

Significant variations from the current schedule:

None of the schedule variance shown above impacts the project's ability to meet first year objectives. Increased technical risk has been introduced, however, by the delayed implementation of a strong systems engineering process. This risk is being mitigated as the recently hired System Engineer completes planned activities.

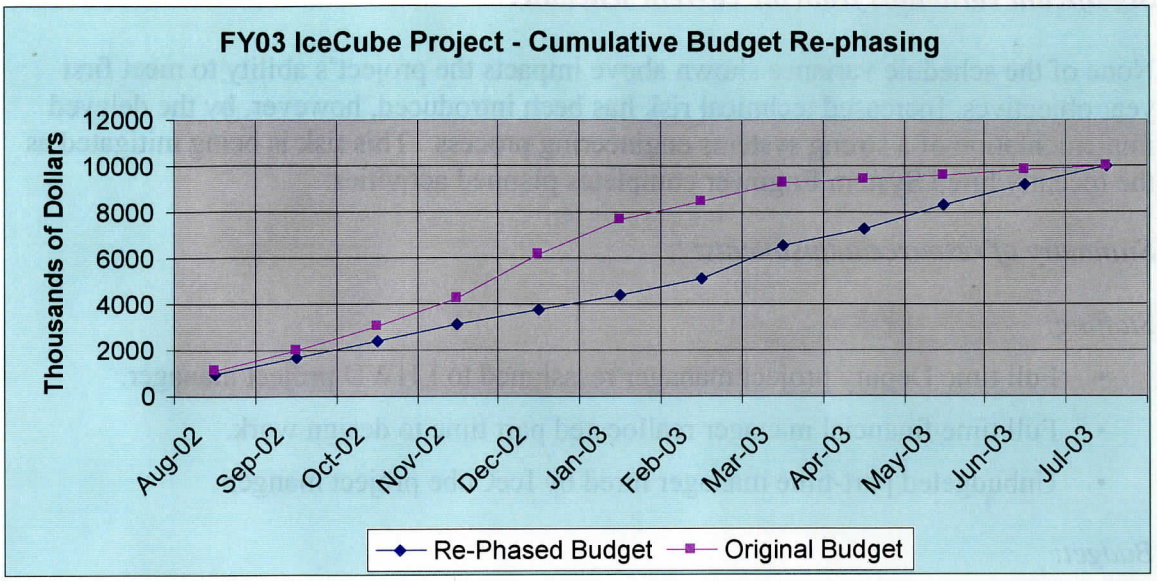
Summary of resource adjustments:

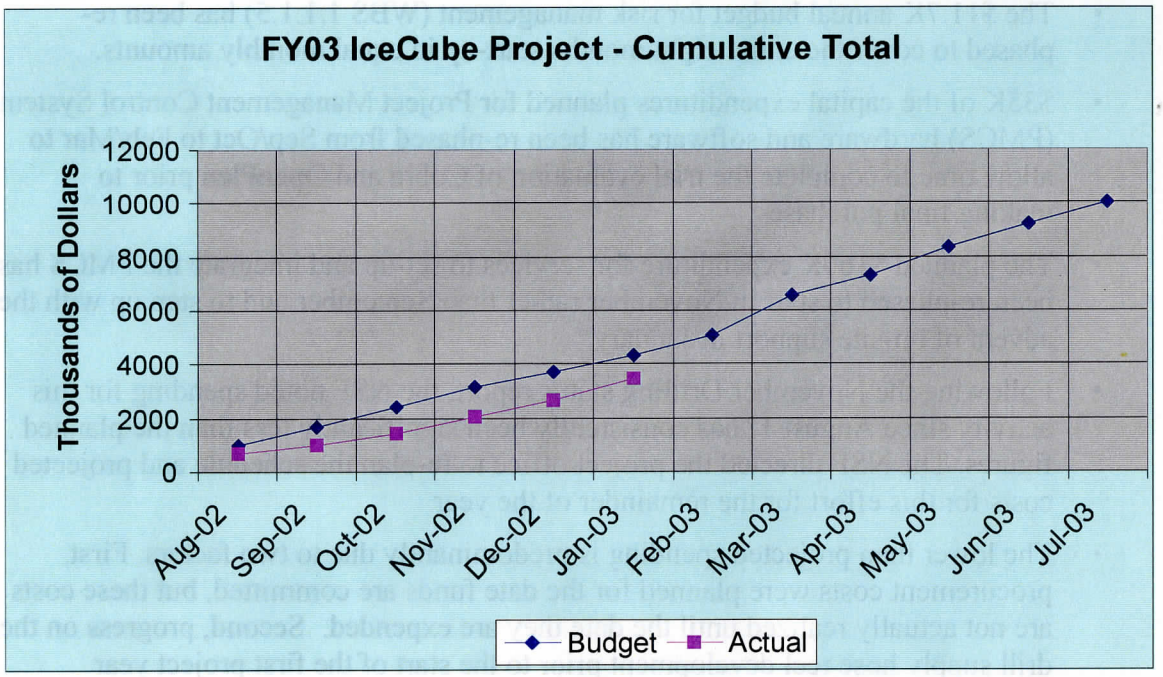
Staffing:

- Full time Deputy project manager reassigned to EHWD project manager.
- Full time financial manager reallocated part time to design work.
- Unbudgeted part-time manager hired by IceCube project manger.

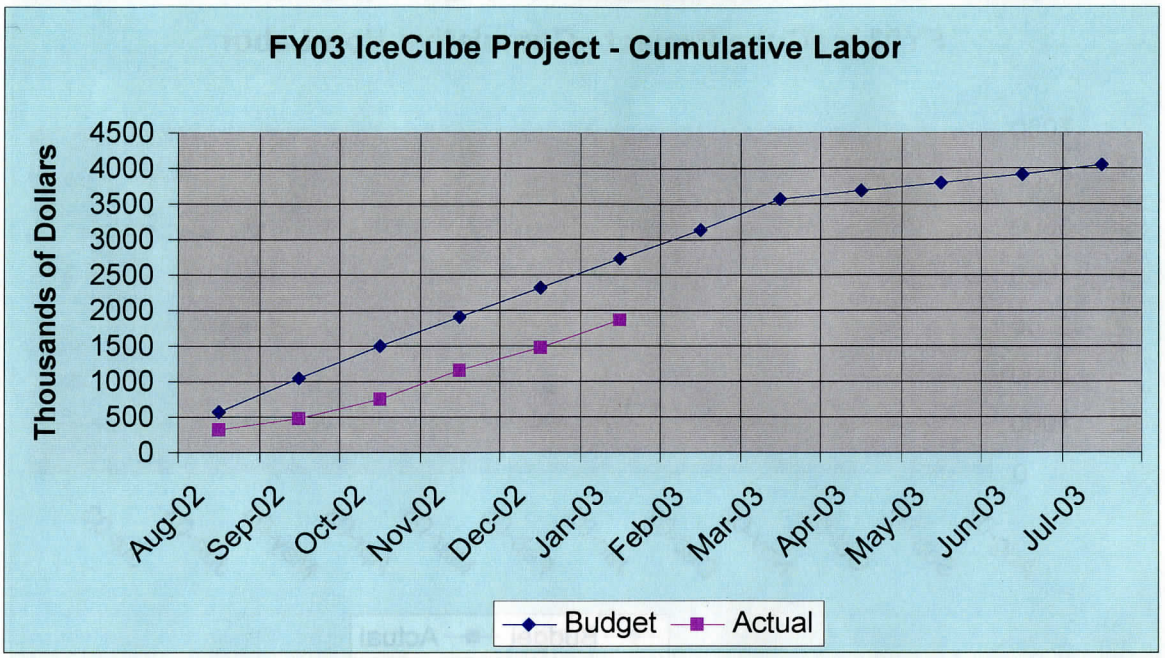
Budget:

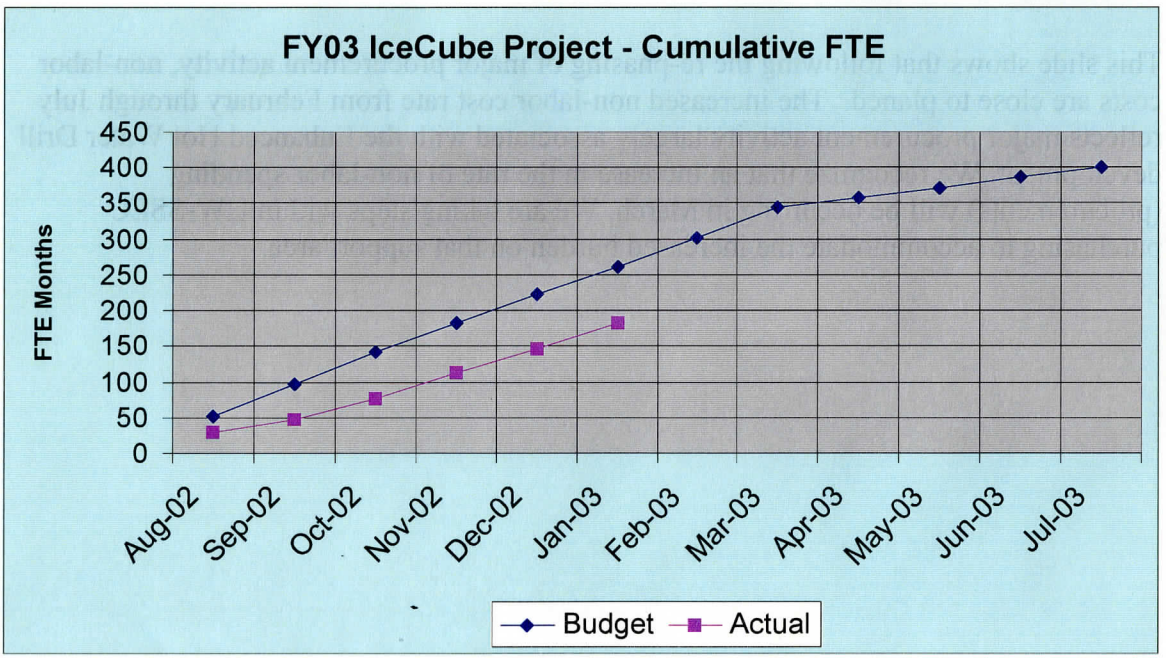
- The $11.7K annual budget for risk management (WBS 1.1.1.5) has been re-phased to cover the entire eight months start-up in equal monthly amounts.
- $35K of the capital expenditures planned for Project Management Control System (PMCS) hardware and software has been re-phased from Sep/Oct to Feb/Mar to allow time to complete the trial evaluation of Cobra and OpenPlan prior to making final purchases.
- The planned $160K expenditure for services to set-up and integrate the PMCS has been re-phased to start in November rather than September and to step up with the advent of on-site support in January.
- Following the November Drilling status report, the NSF noted spending for this activity since August 1st has consistently been significantly less than the planned figures. The NSF directed the project office to re-plan the schedule and projected costs for this effort for the remainder of the year.
- The lower than projected spending is predominantly due to two factors. First, procurement costs were planned for the date funds are committed, but these costs are not actually realized until the date they are expended. Second, progress on the drill supply hose reel development prior to the start of the first project year funding exceeded expectations.
- The following graph shows both the initial and the re-phased budget for the current project year for the entire project. From this point forward, actual costs will be compared to the re-phased budget.



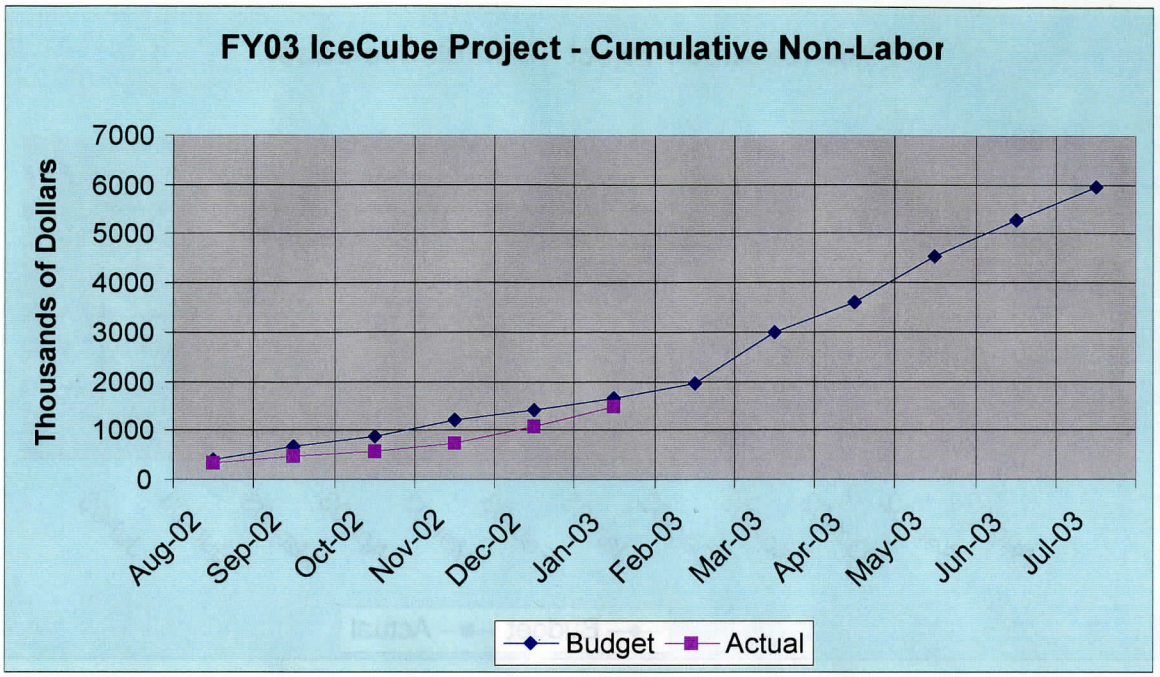


Following the re-phasing of major procurements, the project remains about $1M below the projected spending level. This is essentially due to slower than anticipated staffing ramp up, and is indicative of the fact that first year performance is somewhat behind schedule.





These slides show that the total cost variance is a reflection of labor cost variance resulting from slow staffing ramp up.



This slide shows that following the re-phasing of major procurement activity, non-labor costs are close to planed. The increased non-labor cost rate from February through July reflects major procurement activity largely associated with the Enhanced Hot Water Drill development. We recognize that an increase in the rate of non-labor spending (procurements) will be occurring in March. We are taking steps within UW-SSEC purchasing to accommodate the increased burden on that support area.

Section I - Status by WBS Element

The following pages in this section provide visibility into the project at Level 3 of the WBS, and are intended to provide a concise overview of the work accomplished as well as a comparison of progress to plan.

Routine task management identifies and resolves issues on a continuing basis. In situations where an issue may result in a programmatic impact, it has been flagged for additional visibility and documented in Section II of this report.

Information related to tasks that are not currently funded will be found in Section III.

1.1 Management

Summary of technical accomplishments:

1.1.1 Project Management

Planning: An interim Project Director (Jay Gallagher) has been assigned to the Ice Cube project until the position is permanently filled. WBS structural differences between the cost and schedule baselines have been resolved, and all tasks identified by either baseline have been combined in a unified Microsoft Project Plan. The Project Manager, in conjunction with Level 2 managers, has established year 2 Objectives. High level deliverables, budgets, and schedules to support these objectives are being developed. The Year-2 proposal will be completed in early March.

Subsystem Management: The primary subsystem of concern for Project Year-1 is the Enhanced Hot Water Drill development. The Ice Cube Deputy Project Manager has been assigned full time to manage this critical subsystem development, and costs for this effort are being charged to the Drill task rather than to this project management task.

Reserve Management: While there was little reserve at the beginning of the project year, analysis of the impact of slow staffing ramp up and reconciliation of the cost and schedule baselines have identified a relatively small amount of financial resources which are unlikely to be spent where planned during this project year. The work represented by these funds will still need to be completed next year, and the project office plans to carry unexpended funds forward into next year for that purpose.

Progress Reports: A template has been developed for use by level 3 managers in generating monthly technical status update reports. The template has been used for two months and is likely to remain fairly close to its current form. Additionally, requirements and formats for monthly cost reports have been included in the sub-agreements between the UW-Madison and its domestic collaboration partners. Efforts to automate both the technical and financial reporting process began in January. Weekly technical status teleconferences continue to be useful for exchanging technical status information in near real-time.

Risk Management: This general task is part of the on-going and continuous efforts of the Project Manager. The budget, originally allocated to the first five months of the project-year, has been re-phased to span the entire startup phase. Specific accomplishments include completion and review of a draft quality plan, implementation of formal system engineering and project control processes, and completion of several technical hazard analyses.

Project Tracking: The start up year schedule and budget for the Enhanced Hot Water Drill development have been ported to test versions of Cobra and Open Plan. Sample reports have been generated from the test software and reviewed by the management team. Additional formal training in both programs has been scheduled for key management personnel. Meanwhile, cost and FTE source data for current Microsoft Project management graphs have been expanded to include data reported monthly by LBNL directly to the Project Office.

MOUs and Subcontracts: Eleven US institutions will receive an IceCube Subaward. Five Institutions have signed Subawards, three are in formal iteration between the UW and the collaborating Institutions, and the remaining three, which contain only travel funds, are in draft form. Draft MOUs are in place with the non-US institutions. Due to the uncertainty of FY04 funding, we did not pursue MOUs with our international collaborators.

1.1.2 Financial Management:

This task, plus three associated sub-tasks were added to the schedule to be consistent with the budget baseline. This work has been proceeding on schedule with costs charged to Project Management. These efforts are now being charged to Financial Management, as intended. Since all charges from both 1.1.2 and 1.1.1 role up to the same level 3 activity, no effort will be made to adjust costs between the level 4 tasks.

1.1.4 Reviews:

The yearly review reflected in the baseline budget has been added to the schedule. The review was held in October as planned. Additionally, an internal requirements review event reflected in the cost baseline has been scheduled to occur in February. Collaboration meetings reflected in the budget and held as planned have also been reflected in the schedule.

1.1.5 Reliability, Quality Assurance, and Safety:

Eleven of the 12 hazard analyses have been released. The remaining HA for Operations (planned for completion in 12/02) required definition of the process flow for drilling and deployment operations at the South Pole to fully understand the potential safety issues. This effort required specific additional staff resources, some of which were only intermittently available during the quarter. It appears unlikely at this point that the hazard analysis will be completed and approved prior to the second quarter of 2003. This will not adversely impact any other schedule elements.

The first code waiver request was submitted to NSF November 26, 2002 regarding the interior height of the MDS's not meeting OSHA requirements for headroom. Harry Mahar concurred with the waiver as long as obstructions are not hung in the egress pathways of the MDS's. No official sign-off on the waiver has been received from NSF.

The draft IceCube Quality Plan is under review by members of the Project Office and has been reviewed by staff from LBNL.

The draft IceCube Document Management Process has undergone preliminary review and will undergo final review upon completion of the Quality Plan.

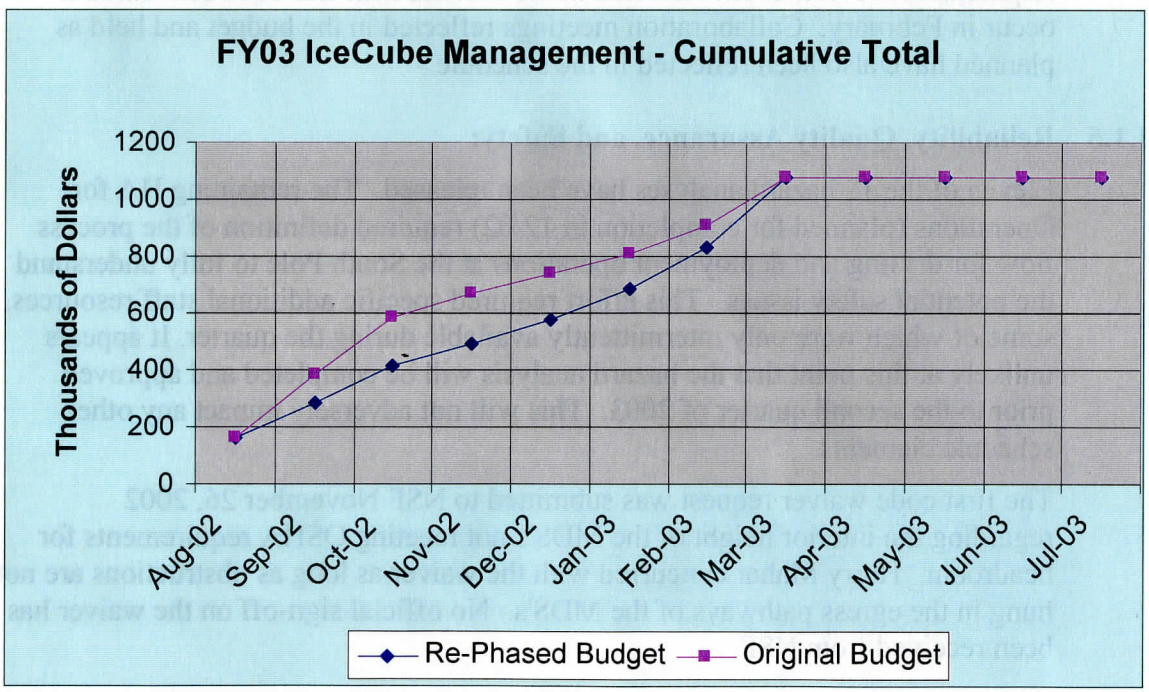
Summary of resource adjustments:

Staffing:

- Full time Deputy project manager reassigned to EHWD project manager.
- Full time financial manager reallocated part time to design work.
- Unbudgeted part-time manager hired by IceCube project manger.

Budget:

- The $11.7K annual budget for risk management (WBS 1.1.1.5) has been re-phased to cover the entire eight months of the start-up phase (in equal monthly amounts).
- $35K of the capital expenditures planned for Project Management Control System (PMCS) hardware and software has been re-phased from Sep/Oct to Feb/Mar to allow time to complete the trial evaluation of Cobra and OpenPlan prior to making final purchases.
- The planned $160K expenditure for services to set-up and integrate the PMCS has been re-phased to start in November rather than September and to step up with the advent of on-site support in January.



Variance Analysis:

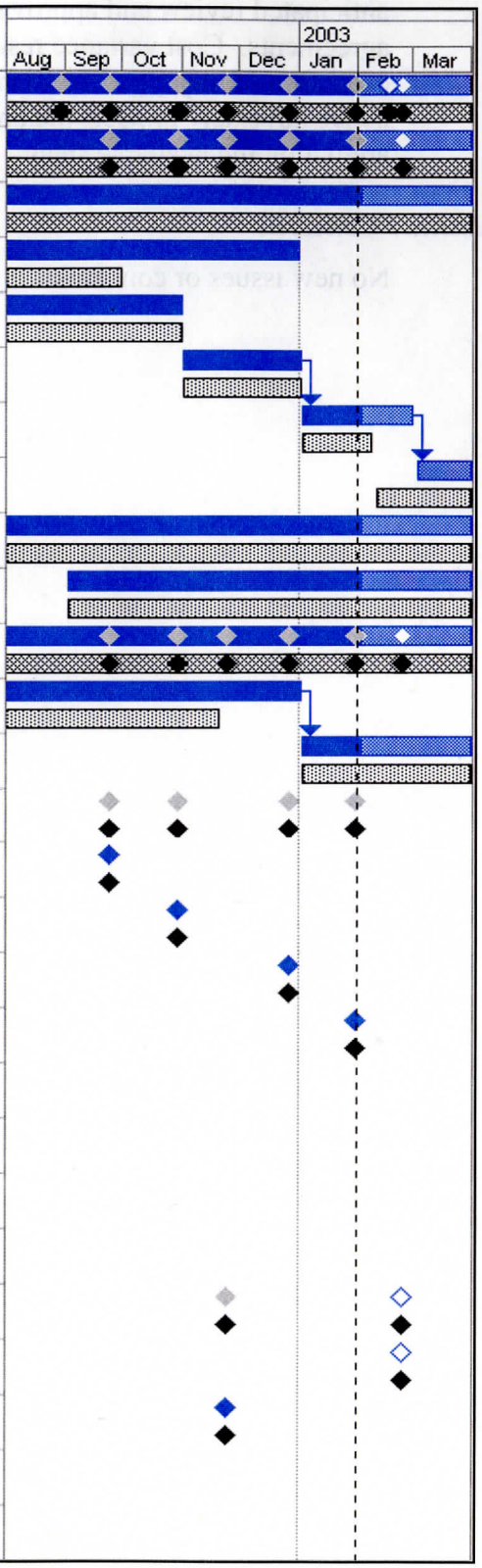
Schedule variance is the result of slow project start up, and slower than anticipated review and approval of formal documentation and inter-collaboration agreements. Cost variance resulted from inconsistencies between planning and execution of major procurements. None of the cost or schedule variance indicated above adversely impacts the project schedule or total cost. All schedule revisions are within the available slack.

Issues / Concerns

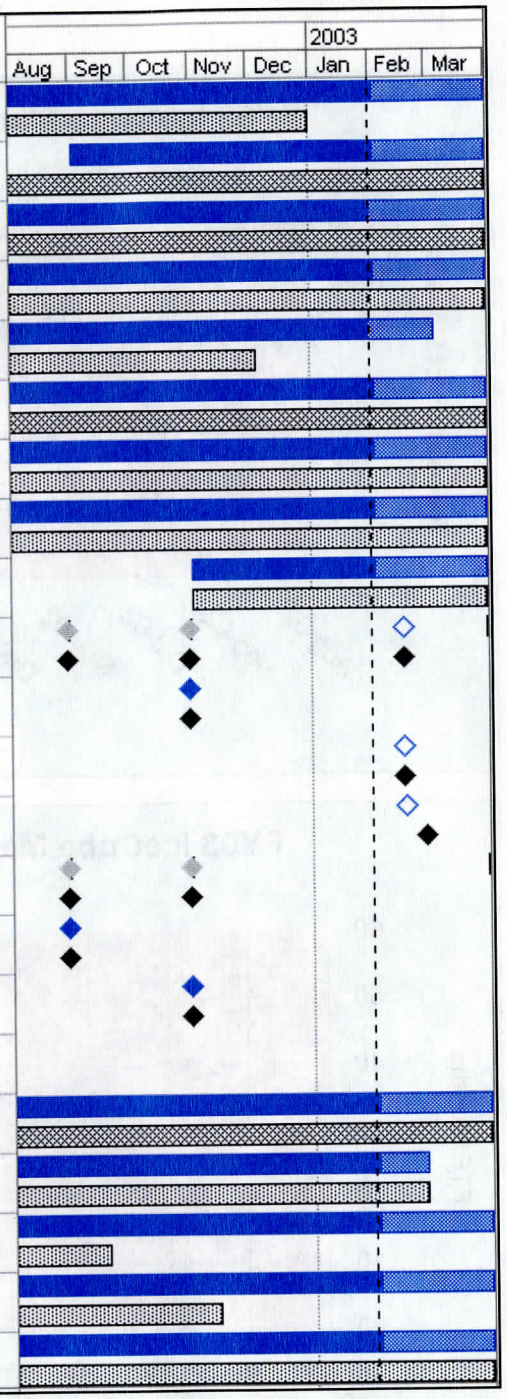
No new issues or concerns.

The following schedule chart shows the baseline in black and the current schedule in blue. Progress against the current schedule is indicated by a dark blue overprint.

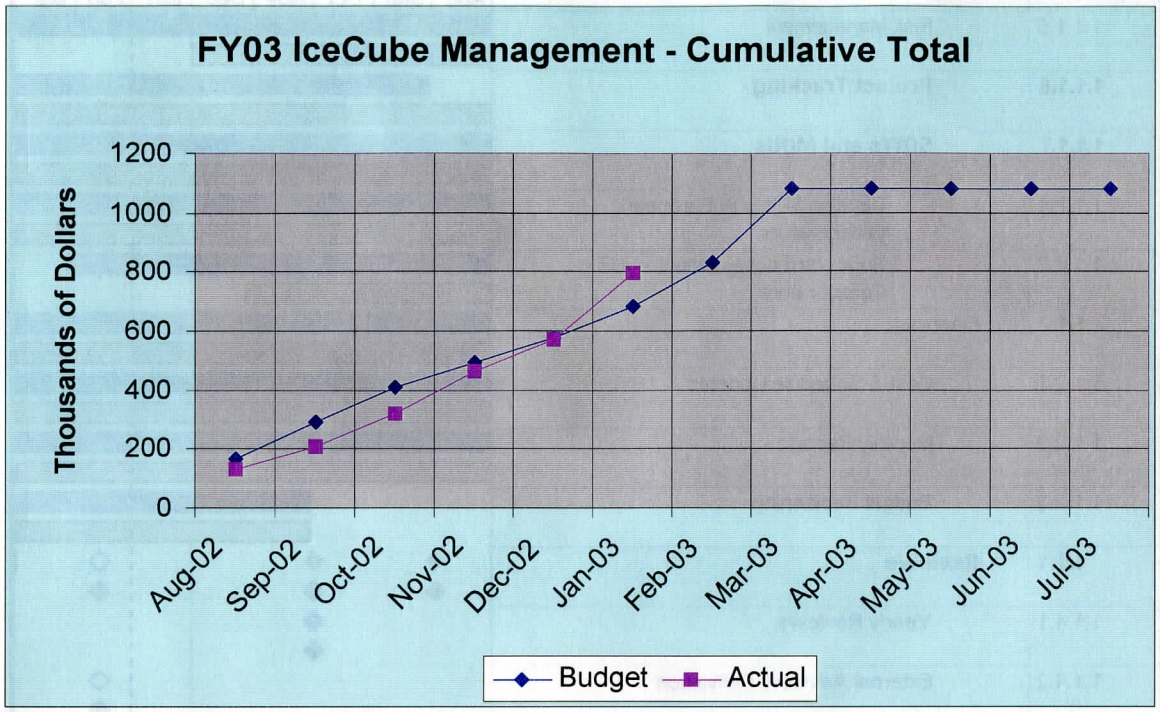
WBS	Task Name
1.1	**Management**
1.1.1	**Project Office**
1.1.1.1	**Project Planning**
1.1.1.1.1	Appoint Project Director
1.1.1.1.2	Reconcile year-1 bdgt and schedule baselines
1.1.1.1.3	Establish Year-2 Objectives
1.1.1.1.4	Prepare Year-2 Proposal
1.1.1.1.5	Prepare Detailed Year-2 PEP
1.1.1.2	Subsystem Management
1.1.1.3	Reserve Management
1.1.1.4	**Progress Reports**
1.1.1.4.1	Setup Collaboration Reporting System
1.1.1.4.2	Standardize and automate reporting and analysis
1.1.1.4.3	**Monthly Progress Report**
1.1.1.4.3.1	Sep
1.1.1.4.3.2	Oct
1.1.1.4.3.3	Dec
1.1.1.4.3.4	Jan
1.1.1.4.3.5	Mar
1.1.1.4.3.6	Apr
1.1.1.4.3.7	Jun
1.1.1.4.3.8	Jul
1.1.1.4.4	**Quarterly Progress Report**
1.1.1.4.4.1	Feb
1.1.1.4.4.2	Nov
1.1.1.4.4.3	May
1.1.1.4.5	Annual Report

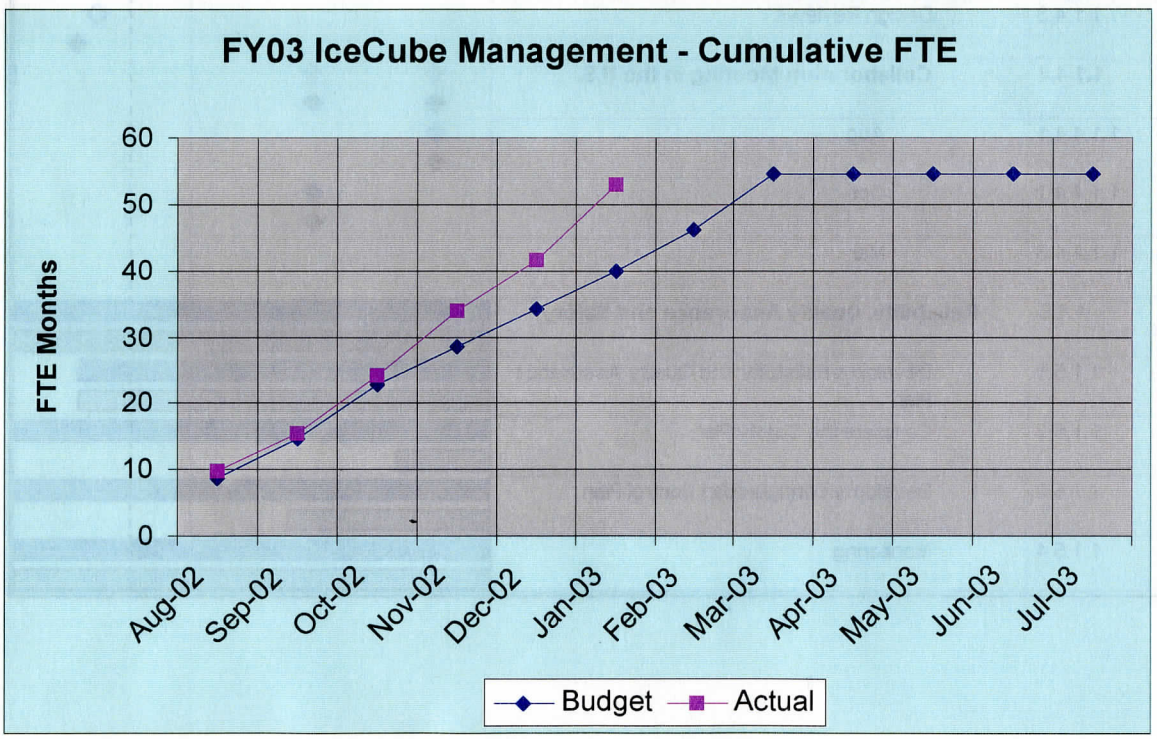


WBS	Task Name
1.1.1.5	Risk Management
1.1.1.6	**Project Tracking**
1.1.1.7	**SOWs and MOUs**
1.1.1.7.1	Develop MOUs w/European Collaborators
1.1.1.7.2	Subaward development w/US Collaborators
1.1.2	Financial
1.1.2.1	Cost & Schedule Updates
1.1.2.2	Monthly Reports
1.1.2.3	Budget Replanning
1.1.4	**Reviews**
1.1.4.1	Yearly Reviews
1.1.4.2	External Advisory Committee
1.1.4.3	Design Reviews
1.1.4.4	**Collaboration Meeting in the U.S.**
1.1.4.4.1	Aug
1.1.4.4.2	Oct
1.1.4.4.3	Mar
1.1.5	**Reliability, Quality Assurance and Safety**
1.1.5.1	Develop a Reliability and Quality Assurance Plan
1.1.5.2	Complete the Safety Plan
1.1.5.3	Develop a Configuration Control Plan
1.1.5.4	Monitoring



Level 3 Summary Charts





1.2 Systems Engineering

Summary of technical accomplishments:

Significant progress was made in a number of areas during the quarter. Key among these is the introduction of Systems Engineering input and coordination to ongoing project activities. While not reflected in specific milestone events, the cultural shift towards comprehensive and deliberate analysis of requirements and associated formal verification is a critical success factor for the project. More tangible measures of progress include analysis of system environments and architecture in support of the in-work Systems Engineering Management Plan (SEMP) and Engineering Requirements Document (ERD), as well as coordination of DAQ / Data Handling software requirements.

1.2.1 Specifications and Requirements

The Draft Software Requirements Document has been completed, as has most of the documentation of the engineering prototype DOM configuration. The System Engineering Management Plan (SEMP) and Engineering Requirements Document (ERD) are both in active development. A System Requirements Review meeting has been schedule for mid-February to accelerate the collection of relevant data for these two documents, as well as to introduce System Engineering methods to the project at large.

1.2.2 Interface Control Documents

Data acquisition / data handling interface documentation has begun in earnest, and significant progress has been made on defining and controlling interfaces internal to the engineering prototype DOMs.

1.2.3 Risk Assessment

Ongoing effort in risk assessment continues in several areas, notably definition of environments, establishment of "physics of failure" reliability parameters, and assessment of total data bandwidth requirements.

1.2.4 System Integration & Test

Preliminary planning for the engineering prototype DOM testing cycle has been supported, as have requirements for the Dark Freezer.

1.2.5 Engineering Support

Level of effort activity continues in each of these areas as required.

Summary of resource adjustments:

No significant resource adjustments during this reporting quarter.

Variance Analysis:

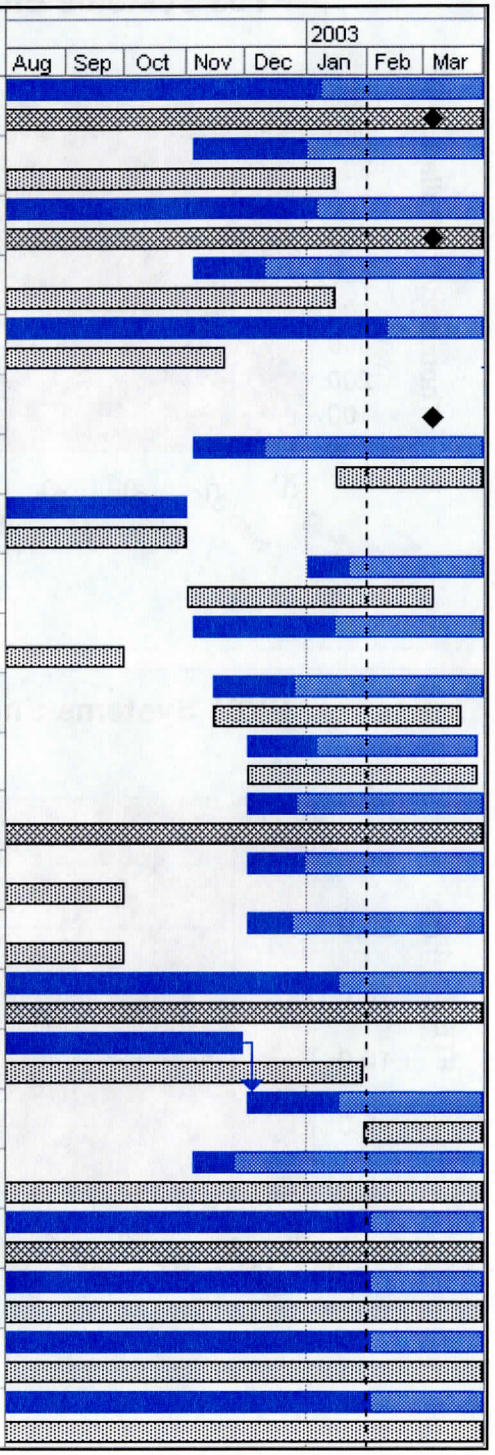
Schedule variance is the result of slow project start up. (A full time System Engineer did not come on board until November.) Cost variance is due, in part, to slow staffing ramp up, but is dominated by the non-labor variance resulting from deferred commitment of project financial reserves. None of the cost or schedule revisions indicated above adversely impact overall project schedule or total cost. Increased technical risk has been introduced, however, by the delayed implementation of a strong systems engineering process. This risk is being mitigated as the recently hired System Engineer completes planned activities.

Issues / Concerns

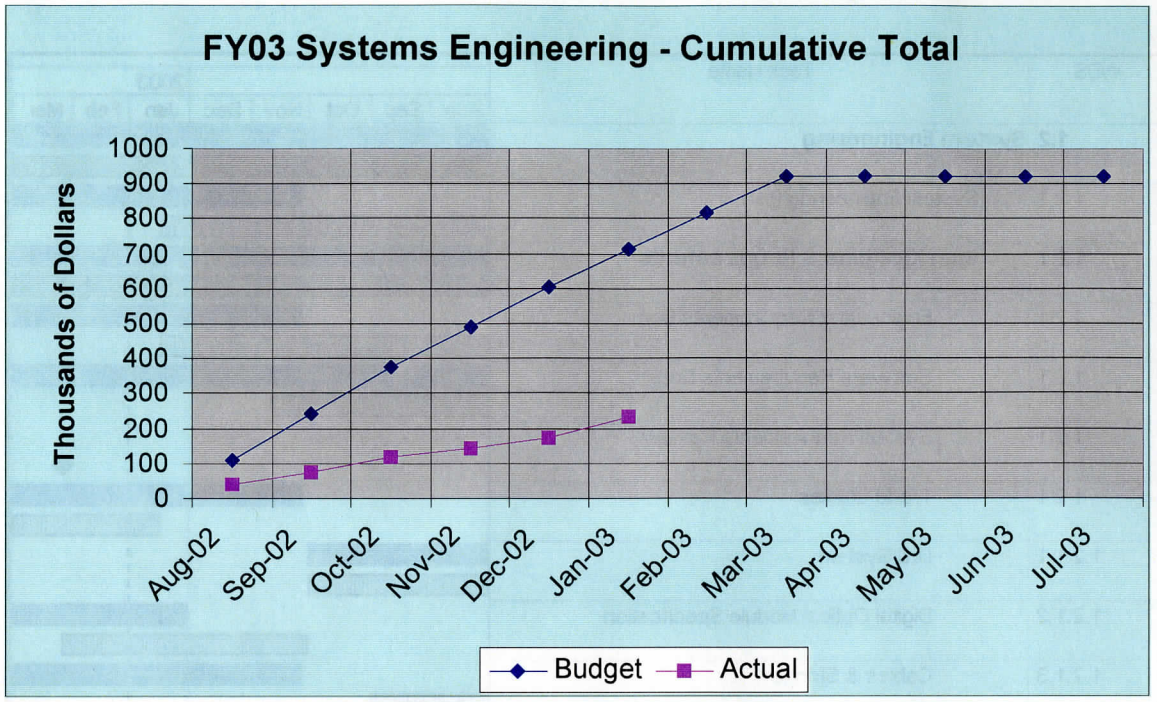
No new issues or concerns. The previously identified action regarding delayed start of System Engineering activities remains open.

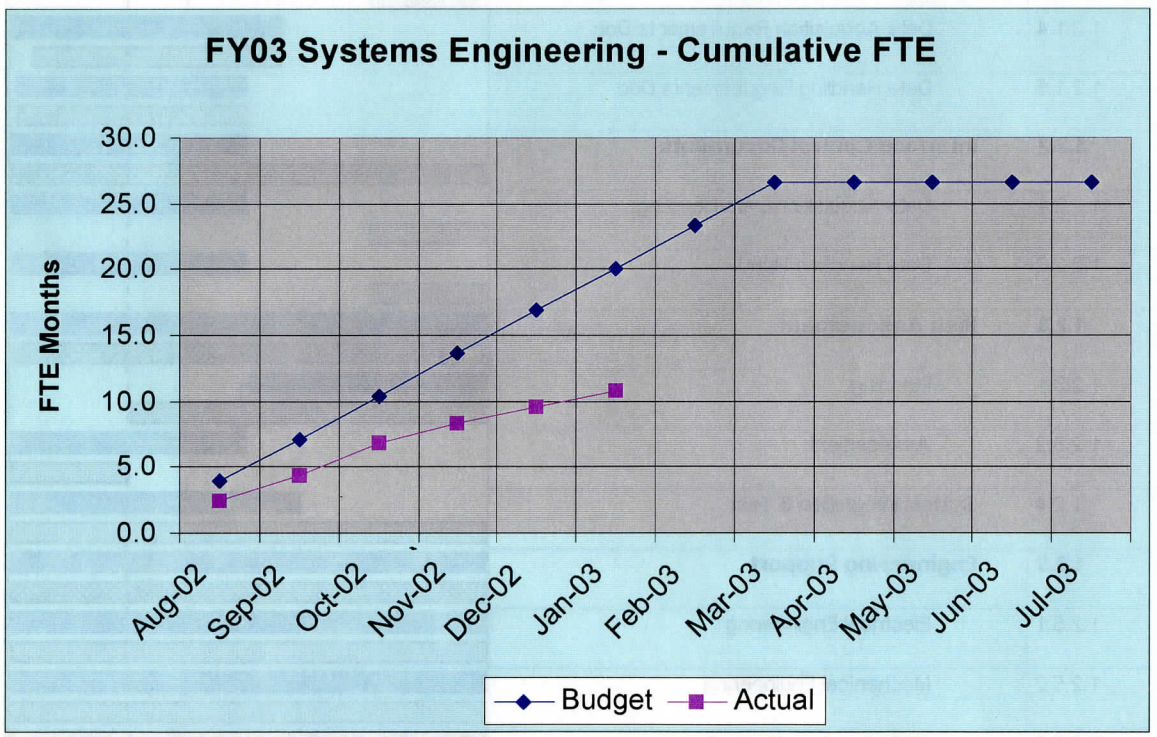
The following schedule chart shows the baseline in black and the current schedule in blue. Progress against the current schedule is indicated by a dark blue overprint.

WBS	Task Name
1.2	**System Engineering**
1.2.1	System Engineering Plan
1.2.1	**Specifications & Requirements**
1.2.1	Engineering Requirements Doc
1.2.1	Software Requirements Doc
1.2.1	System Requirements Review
1.2.1	Trade Studies
1.2.1.1	Drill System
1.2.1.2	Digital Optical Module Specifcation
1.2.1.3	Cables & Strings
1.2.1.4	Data Acquisition Requirements Doc
1.2.1.5	Data Handling Requirements Doc
1.2.2	**Interface Control Documents**
1.2.2.1	Data Acquisition/Data Handling
1.2.2.2	Data Handlling/Uplink
1.2.3	**Risk Assessment**
1.2.3.1	Planning
1.2.3.2	Assessment
1.2.4	System Integration & Test
1.2.5	**Engineering Support**
1.2.5.1	Electrical Engineering
1.2.5.2	Mechanical Engineering
1.2.5.3	Software Development



Level 3 Summary Charts





2.1 Logistics

Summary of technical accomplishments:

This is a relatively low level planning activity for this year which is dependent upon a clear funding profile and related plans for deploying IceCube to the pole. Preliminary work has been accomplished related to the detector array lay out and drilling plans for FY04-FY06 have been clarified.

The project office is in the process of recruiting a Logistics Manager in anticipation of Project Year 2 funding. It is expected that this person will be hired in March.

Summary of resource adjustments:

No significant resource adjustments during this reporting quarter.

Variance Analysis:

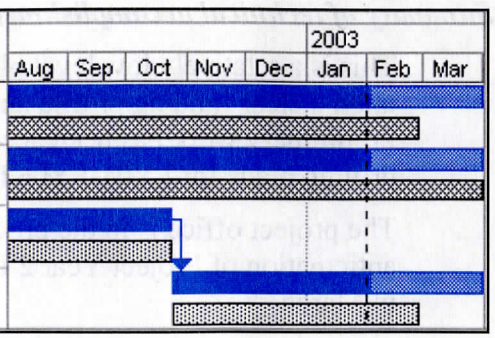
No significant variance during this reporting quarter.

Issues / Concerns

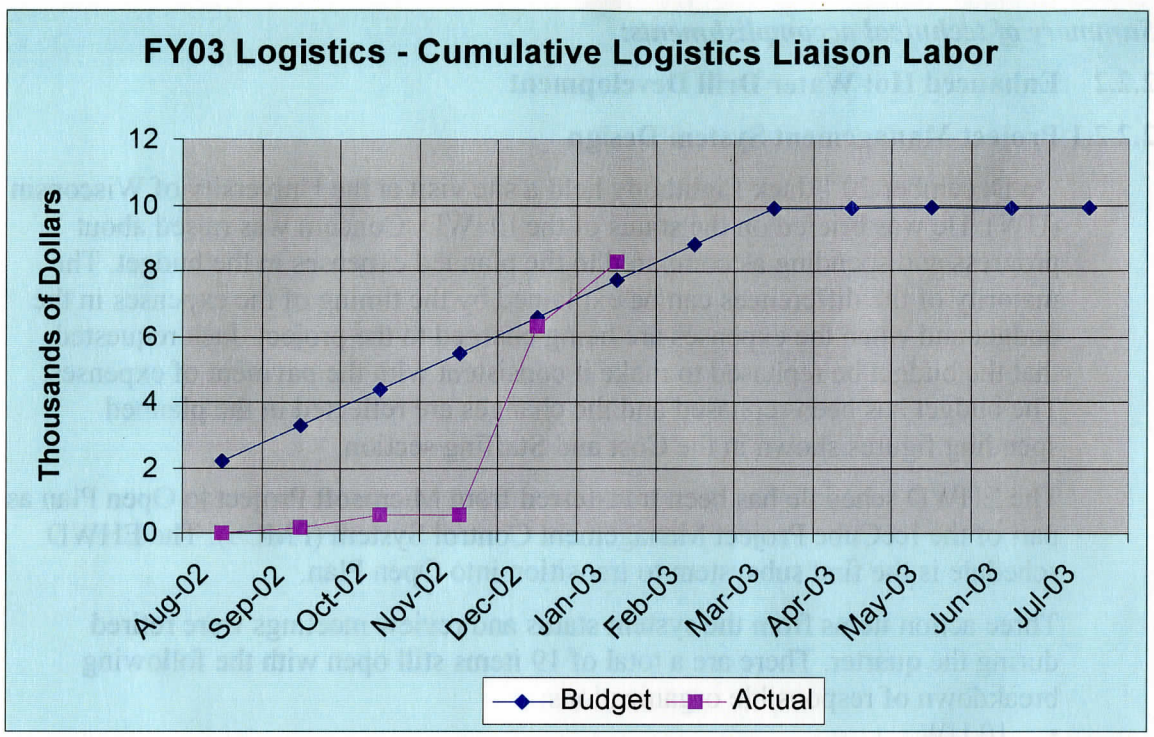
No new issues or concerns. The previously identified action regarding availability of logistics source data remains open.

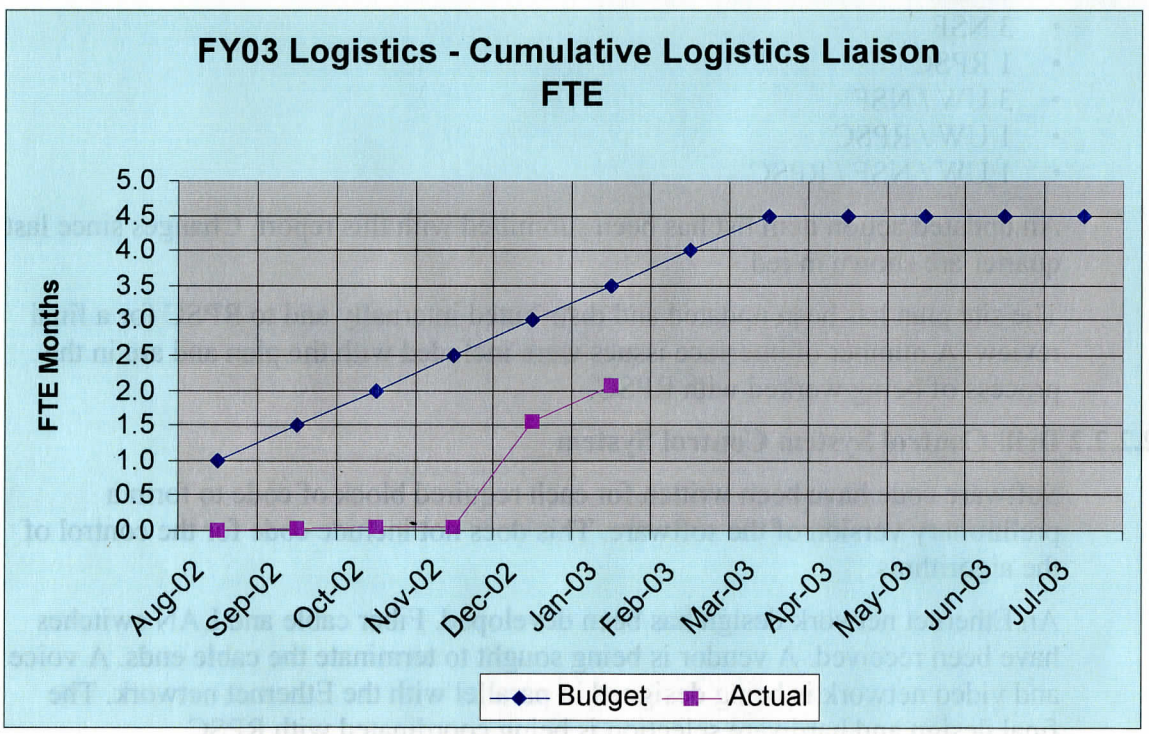
The following schedule chart shows the baseline in black and the current schedule in blue. Progress against the current schedule is indicated by a dark blue overprint.

WBS	Task Name
2.1	**Logistics**
2.1.1	Logistics Liaison
2.1.1.1	Camp Operations Plan - phase 1
2.1.1.2	Camp Operations Plan - phase 2



Level 3 Summary Charts





2.2 Drilling

Summary of technical accomplishments:

2.2.2 Enhanced Hot Water Drill Development

2.2.2.1 Project Management System Design

On December 20th, Jack Lightbody held a site visit at the University of Wisconsin (UW). He was briefed on the status of the EHWD. Concern was raised about progress and spending as compared to the planned expenses in the budget. The majority of the differences can be explained by the timing of the expenses in the budget and when the expenses are being charged to the project. Jack requested that the budget be rephased to make it consistent with the payment of expenses. The budget has been rephased and the changes are reflected in the planned spending figures shown in the Cost and Staffing section.

The EHWD schedule has been transferred from Microsoft Project to Open Plan as part of the IceCube Project Management Control System (PMCS). The EHWD schedule is the first subsystem to transition into Open Plan.

Three action items from the system status and review meetings were retired during the quarter. There are a total of 19 items still open with the following breakdown of responsible organizations:

- 10 UW
- 3 NSF
- 1 RPSC
- 3 UW / NSF
- 1 UW / RPSC
- 1 UW / NSF / RPSC

An updated action item list has been submitted with this report. Changes since last quarter are shown in red.

The site plan has been updated and distributed internally and to RPSC for a final review. A number of interface issues were included with the plan and are in the process of being worked with RPSC.

2.2.2.2 Drill Control System Control System

Software code have been written for each required block of code to form a preliminary version of the software. This does not include code for the control of the algorithms.

An Ethernet network design has been developed. Fiber cable and LAN switches have been received. A vendor is being sought to terminate the cable ends. A voice and video network is being designed in parallel with the Ethernet network. The final design and hardware selection is being coordinated with RPSC.

The sensor selection is divided into four categories: flow, pressure, temperature, and environmental. A decision between a venturi or turbine flow meter should be final by the end of February. A style of pressure sensor has passed cold storage

testing. Alternative simpler gauges are being considered. The same temperature sensor used on AMANDA will be used, but perhaps in a smaller package. Two environmental sensors have passed cold storage testing and the remaining two are currently going through testing. The DGH I/O modules have passed cold storage temperature testing.

A bidding process will soon be opened for an e-stop network cable. Locations for e-stops throughout the system have been identified. They are detailed on the site plan. E-stop contactor panels have been designed for the HPP and PHS.

A rebid was required for the system computers. The initial bid responses did meet the size constraint. The requirement was reviewed and relaxed. The new bids are due the first week of March. In the meantime, desktop computers are being utilized for control system design.

The design and analysis of the DCC was approved at the end of January and fabrication started immediately after. The DDC should be complete by March 10th.

2.2.2.3 Power Distribution System

A review of the generator RFP responses was held December 10th and 11th at RPSC. The EHWD electrical and systems engineer participated in the review. National Electrical Systems, Inc. was selected as the generator vendor. RPSC submitted its purchasing request to the NSF and the contract was awarded to NESI on January 27th. A kick-off meeting was held February 6th at NESI. The current estimate of delivery to UW is June 27th. RPSC will be working with NESI to improve the delivery.

UNICO was awarded the system motor drive contract. An initial order was placed in December for the Drill Supply Hose Reel (DSHR) drum, DSHR level wind, and the high pressure pump drives. They are scheduled to arrive the week of February 24th. An order for all of the remaining drives was placed in January and the drives are expected by March 18th.

The DSHR drum motor has arrived. The return water hose reel and the high pressure pump motors are schedule to arrive in late February / early March. A motor order for drill head support cable winch drum, the drill head support cable winch level wind, the DSHR level wind, and the deployment winch should be placed by the end of February.

2.2.2.4 Plumbing System

The painting of the DSHR is complete. It has been disassembled into the drum and support frame and moved outside of the PSL high bay. A few tasks remain to be completed. These include the installation of a brake, the design and fabrication of an enclosure, installing a DSHR panic cable, and installing plumbing hardware on the inlet side. These tasks will be completed prior to the start of testing.

The Rodriguez Well Reel was transported from the ICDS warehouse to the PSL machine shop. The plumbing and the drum are being redesigned to accommodate two hoses. In addition, the condition of the drive train and bearings are being inspected.

The High Pressure Pump (HPP) MDS was inspected at Sea Box during the last week of January and was shipped and received at PSL during the first week of February. It is in the process of being outfitted.

Fabrication of the Rodriguez Well System MDS began in mid-January. It is scheduled to be complete by February 28th.

The Seasonal Equipment Workshop design and analysis has been approved. Its construction is scheduled to start once the PreHeater System (PHS) ships out of the shop.

The design for the water tanks has changed significantly in the last quarter. Working with Sea Box, the design has changed to utilize the roof of the MDS as a cover. The roof will be modified to provide access doors for loading snow and pumps into the tank. A layout drawing will be completed during the next quarter.

The high pressure pumps were received the first week of February and will be installed in the HPP once the high pressure pump motors arrive. An order for the RWS and PHS heater pumps was placed in February. They are due to arrive in early April. While this does not compromise the schedule, the vendor will be contacted to inquire about an earlier delivery.

IVG reports that they are in full production on the drill supply hose. The first shipment is on schedule to leave the first week of April. The rest of the order will ship out at the end of the month. The smaller diameter hoses (3/4 and 1-1/2 inch) are on order and will arrive during the first week of March.

2.2.2.5 Heating System

Fabrication and inspection of the PHS was completed on February 13th. Due to the weather, its delivery was delayed. It was received on February 21st.

The design and analysis of the Main Heating Plants (MHP) has been completed. Sea Box is developing a cost estimate for the changes since the proposal. Once a final approval is given, construction of the first MHP can start as soon as the RWS ships out.

A prototype large heater was ordered and tested at Whitco during the third week of February. The prototyped heater showed marked improvement over the nominal 77% efficiency used in our fuel usage model. Efficiency levels as high as 95% were measured. While efficiencies as the pole may not be as good (due to the oxygen limit), this is a significant improvement that will result in reduced fuel costs and a reduced burden on the logistics system. However, the cost of the more efficient heater doubled in the price of the heater from ~$4k to ~$8k. The increased cost in equipment will more than pay for itself, but it does present a financial burden to the first year budget. The higher efficiency heater also

increased the weight of the heater by 50% which will result in higher MDS costs to provide structural support.

While testing the prototype large heater, a prototype small heater was quickly fabricated and tested. The results of the tests should provide for a slightly more efficient design, improving the efficiency by perhaps as much as 5% without a significant increase in weight.

2.2.2.6 Tower Operations Site

The detail design and analysis of the Tower Operations Site (TOS) tower is nearly complete. Detail drawings of the base platform are complete and have been submitted to the PSL machine shop. Material has been ordered to begin construction. A review of the analysis has suggested a change to the orientation and position of a few of the beams in the tower. This will be communicated with Bit7, the drawings updated, and the remaining tower drawings delivered to PSL.

The left and right half TOS MDS drawings have been revised and provided to Sea Box to start their design and analysis.

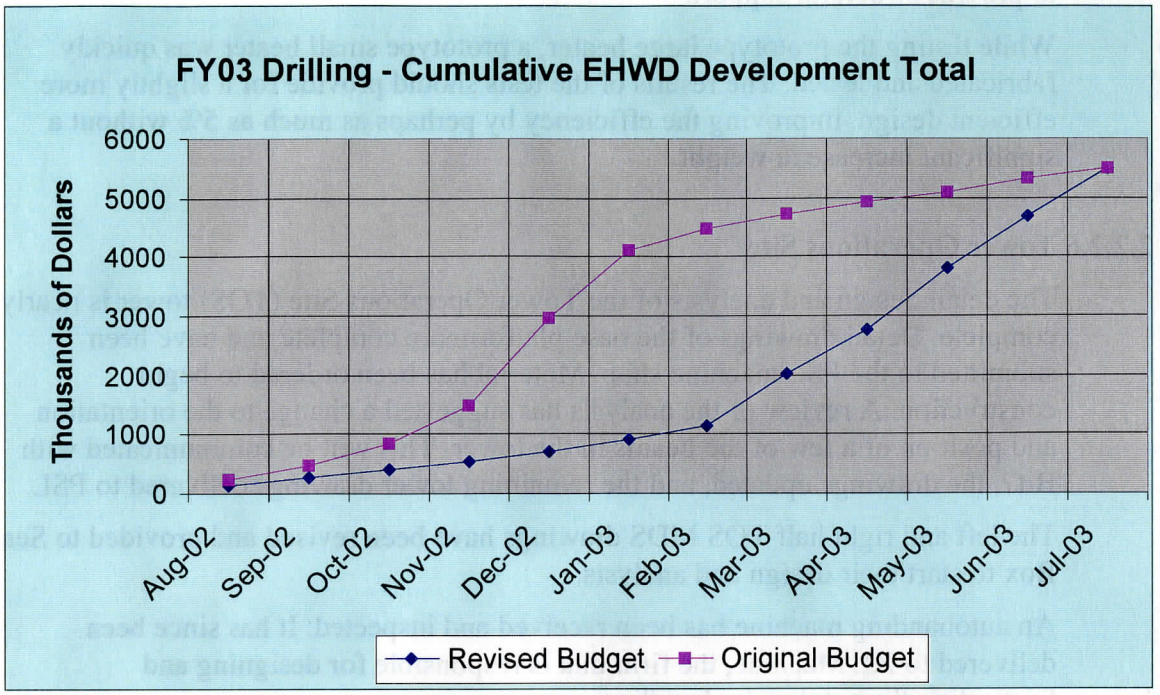
An autobanding machine has been received and inspected. It has since been delivered to XL Machine, the firm that is responsible for designing and fabricating the autobander handling

Summary of resource adjustments:

Following the November Drilling status report, the NSF noted spending for this activity since August 1st has consistently been significantly less than the planned figures. The NSF directed the project office to re-plan the schedule and projected costs for this effort for the remainder of the year.

This is predominantly due to two factors. First, is the difference in timing between when expenses are planned and when they actually are paid. Second, the greater than anticipated drill supply hose reel development prior to the start of the first project year funding. The following graph shows both the initial and the re-phased budget for the current project year. From this point forward, actual costs will be compared to the re-phased budget.

The total cost of this activity for this year is unchanged by the re-phasing of anticipated expenditures. To the degree that this re-phasing adjusts when procurement costs are anticipated from the date funds are committed to the date funds are expended, there is no schedule impact. To the degree that this re-phasing represents schedule slip, the impact is increased schedule risk. At this point, there is very little schedule flexibility remaining, however we are still on a schedule to fully meet this years objectives.



Variance Analysis:

The current projected System ready to ship date is August 15th. This date represents when the last piece of equipment is packed and ready to ship. As equipment and mobile drilling structures are packed, they will leave for Port Hueneme. All equipment is due at Port Hueneme by August 31st. The fabrication and delivery of the MDS's is driving the schedule.

At this point, there is very little schedule flexibility remaining, however we are still on a schedule to fully meet this years objectives. The following variations from schedule are manageable without impact to this year's objectives.

Issues / Concerns

No new issues or concerns. The previously identified action remains open.

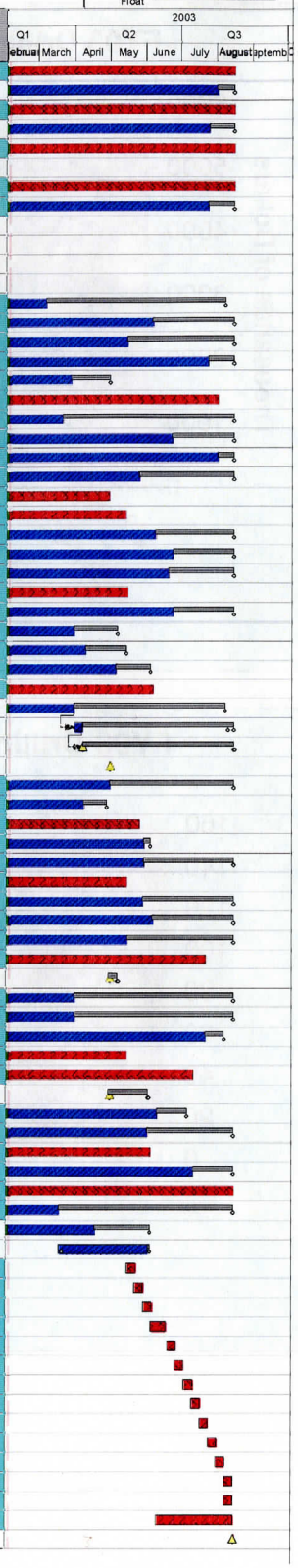
Project: EHWD Restore
Time Now: 02/03/03
Start: 02/18/02
Finish: 08/15/03
Run: 02/17/03

SSEC

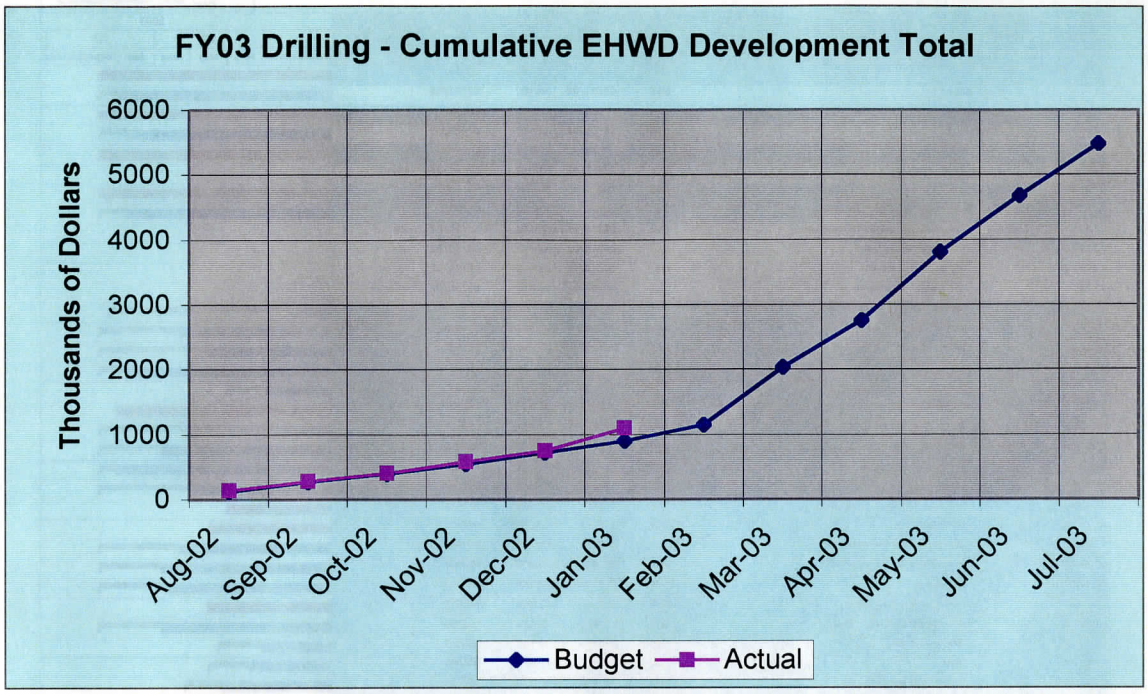
EHWD SKD - v02/16/03

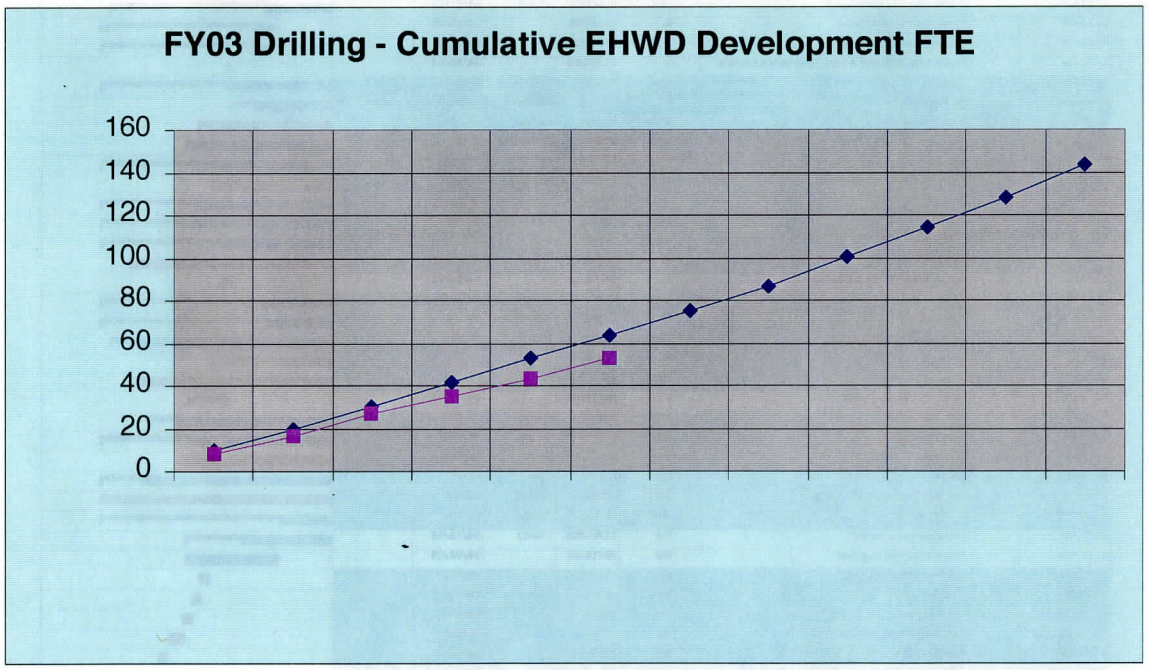
Planned
Critical
Late Dates
Milestone
Progress
Summary
Float

WBS	Activity Desc.	Duration	Early Start	Actual Start	Early Finish	Actual Finish
0	EHWD SKD	420d	01/07/02	01/07/02	08/15/03	
0.1	Project Support	280d	**08/01/02**	08/01/02	**07/31/03**	
0.2	Implementation	420d	01/07/02	01/07/02	08/15/03	
0.2.1	Logistics	280d	**08/01/02**	08/01/02	**07/25/03**	
0.2.2	Drilling	420d	01/07/02	01/07/02	08/15/03	
0.2.2.1	Drill Season Planning	0	**07/31/02**	07/31/02	**07/31/02**	07/31/02
0.2.2.2	EHWD Drill System	420d	01/07/02	01/07/02	08/15/03	
0.2.2.2.1	Project Management and Administration	374d	02/18/02	02/18/02	07/24/03	
0.2.2.2.1.1	Complete responses to CDR comments	170d	**02/18/02**	02/18/02	**10/11/02**	10/11/02
0.2.2.2.1.2	NSF EHWD Status Update	0	**06/19/02**	06/19/02	**06/19/02**	06/19/02
0.2.2.2.1.3	NSF/IceCube Cooperative Agreement	41d	**06/19/02**	06/19/02	**08/14/02**	08/14/02
0.2.2.2.1.4	NSF EHWD Design Review	2d	**09/04/02**	09/04/02	**09/05/02**	09/05/02
0.2.2.2.1.5	Staffing	245d	04/01/02	04/01/02	03/07/03	
0.2.2.2.1.6	Project Plans	265d	06/03/02	06/03/02	06/06/03	
0.2.2.2.1.7	Safety	325d	02/18/02	02/18/02	05/16/03	
0.2.2.2.1.8	EHWD System Plans and Procedures	359d	03/11/02	03/11/02	07/24/03	
0.2.2.2.1.9	System Related Design Tasks	235d	05/06/02	05/06/02	03/28/03	
0.2.2.2.2	Drill Control System	410d	01/07/02	01/07/02	08/01/03	
0.2.2.2.2.1	Control System Architecture	170d	07/29/02	07/29/02	03/21/03	
0.2.2.2.2.2	Control System Software	235d	07/29/02	07/29/02	06/23/03	
0.2.2.2.2.3	Control System Hardware	360d	02/18/02	02/18/02	08/01/03	
0.2.2.2.2.4	DCC Furnace	160d	10/15/02	10/15/02	05/26/03	
0.2.2.2.2.5	MDS Sled, Tow Bar, & Lifting Sling	70d	01/23/03	01/23/03	04/30/03	
0.2.2.2.2.6	DCC MDS	353d	01/07/02	01/07/02	05/14/03	
0.2.2.2.2.7	Voice & Video Communication Systems	121d	12/23/02	12/23/02	06/09/03	
0.2.2.2.3	Electrical Power Distribution System	362d	02/18/02	02/18/02	06/24/03	
0.2.2.2.3.1	Generator System	222d	08/15/02	08/15/02	06/20/03	
0.2.2.2.3.2	General Electrical Equipment	325d	02/18/02	02/18/02	05/16/03	
0.2.2.2.3.3	Contactors and Contactor Panels	181d	10/15/02	10/15/02	06/24/03	
0.2.2.2.3.4	Motors and Drives	160d	08/19/02	08/19/02	03/31/03	
0.2.2.2.3.5	UPSs	104d	11/18/02	11/18/02	04/10/03	
0.2.2.2.3.6	Electric Cable and Connectors	146d	10/15/02	10/15/02	05/06/03	
0.2.2.2.4	Hose/Plumbing System	370d	01/07/02	01/07/02	06/06/03	
0.2.2.2.4.01	Complete plumbing system layout	135d	**07/23/02**	07/23/02	**03/31/03**	
0.2.2.2.4.02	Review plumbing system layout	5d	**04/01/03**		**04/07/03**	
0.2.2.2.4.03	Approved plumbing system layout	0	**04/07/03**		**04/07/03**	
0.2.2.2.4.04	Receive RWS, SEW, HPP, & Water Tanks Sleds & Tow Bars	0	**04/30/03**		**04/30/03**	
0.2.2.2.4.05	Pumps	143d	10/15/02	10/15/02	05/01/03	
0.2.2.2.4.06	Rod Well Hose Reel	92d	12/02/02	12/02/02	04/08/03	
0.2.2.2.4.07	Rod Well System MDS (RWS)	361d	01/07/02	01/07/02	05/26/03	
0.2.2.2.4.08	Seasonal Equipment Workshop MDS (SEW)	365d	01/07/02	01/07/02	05/30/03	
0.2.2.2.4.09	Water Tanks	365d	01/07/02	01/07/02	05/30/03	
0.2.2.2.4.10	High Pressure Pump MDS (HPP)	354d	01/07/02	01/07/02	05/15/03	
0.2.2.2.4.11	Hose	324d	03/04/02	03/04/02	05/29/03	
0.2.2.2.4.12	Hose Reel	340d	02/18/02	02/18/02	06/06/03	
0.2.2.2.4.13	Fuel System	95d	01/06/03	01/06/03	05/16/03	
0.2.2.2.5	Heating System	402d	01/07/02	01/07/02	07/22/03	
0.2.2.2.5.1	Receive PHS & MHP Sleds & Tow Bars	0	**04/30/03**		**04/30/03**	
0.2.2.2.5.2	Heaters	181d	07/23/02	07/23/02	04/01/03	
0.2.2.2.5.3	Pre-Heat System Pumps	121d	10/15/02	10/15/02	04/01/03	
0.2.2.2.5.4	Main Heating Plant MDS (MHP)	402d	01/07/02	01/07/02	07/22/03	
0.2.2.2.5.5	Pre-Heat System MDS (PHS)	354d	01/07/02	01/07/02	05/15/03	
0.2.2.2.6	Tower Operations Site	395d	01/07/02	01/07/02	07/11/03	
0.2.2.2.6.1	Receive TOS Sleds & Tow Bars	0	**04/30/03**		**04/30/03**	
0.2.2.2.6.2	Tower Operations	372d	01/07/02	01/07/02	06/11/03	
0.2.2.2.6.3	Return Water System	185d	10/15/02	10/15/02	06/02/03	
0.2.2.2.6.4	Drill Head	339d	02/18/02	02/18/02	06/05/03	
0.2.2.2.6.5	Firn Drill	365d	02/18/02	02/18/02	07/11/03	
0.2.2.2.7	System Integration, Verification and Test	275d	07/29/02	07/29/02	08/15/03	
0.2.2.2.7.01	System Test Plan	167d	07/29/02	07/29/02	03/18/03	
0.2.2.2.7.02	Identify and secure test site	75d	**11/04/02**	11/04/02	**04/18/03**	
0.2.2.2.7.03	Procure system test equipment	55d	**03/19/03**		**06/03/03**	
0.2.2.2.7.04	High Pressure Pump System	6d	05/16/03		05/23/03	
0.2.2.2.7.05	PreHeater System	6d	05/23/03		05/30/03	
0.2.2.2.7.06	Main Hose Reel	6d	05/30/03		06/06/03	
0.2.2.2.7.07	Assemble drill camp at test site	10d	06/06/03		06/19/03	
0.2.2.2.7.08	Rodriguez Well System	6d	06/20/03		06/27/03	
0.2.2.2.7.09	Drill Head Support Cable Winch	6d	06/27/03		07/04/03	
0.2.2.2.7.10	Main Heating Plant 1	6d	07/04/03		07/11/03	
0.2.2.2.7.11	Tower Operations Structure & Tower	6d	07/11/03		07/18/03	
0.2.2.2.7.12	Mechanical Systems Test	6d	07/18/03		07/25/03	
0.2.2.2.7.13	Flow System Test	6d	07/25/03		08/01/03	
0.2.2.2.7.14	Main Heating Plant 2	6d	08/01/03		08/08/03	
0.2.2.2.7.15	Main Heating Plant 3	6d	08/08/03		08/15/03	
0.2.2.2.7.16	Main Heating Plant 4	6d	08/08/03		08/15/03	
0.2.2.2.7.17	Package and Crate System for Shipment	48d	06/11/03		08/15/03	
0.2.2.2.7.18	EHWD System Ready to Ship	0	**08/15/03**		**08/15/03**	



Level 3 Summary Charts





3.2 Ice Top

Summary of technical accomplishments:

3.2.1 Tanks

Operate 2 full-scale test tanks are being evaluated in a commercial freezer at the Port of Wilmington. One tank is to test a top-down freezing method, the other a bottom-up approach. Tests are to be completed by the first week of March.

3.2.2 Cables

No activity: cables for tests were purchased in previous quarter.

3.2.3 Optical Modules

No activity: OMs for test were obtained from UW in previous quarter. We will be using AMANDA OMs for the test.

3.2.4 Ice Top Specific Engineering

A major accomplishment this quarter is successful implementation of a modified version of the Auger tank simulation programs applied to the test tanks. This will enable us to make comparison between data taken in the test tanks under various conditions with expectations. The purpose is to understand the response of ice Cherenkov tanks to cosmic-ray signals which will be background for neutrino events in IceCube.

Summary of resource adjustments:

No significant resource adjustments during this reporting quarter.

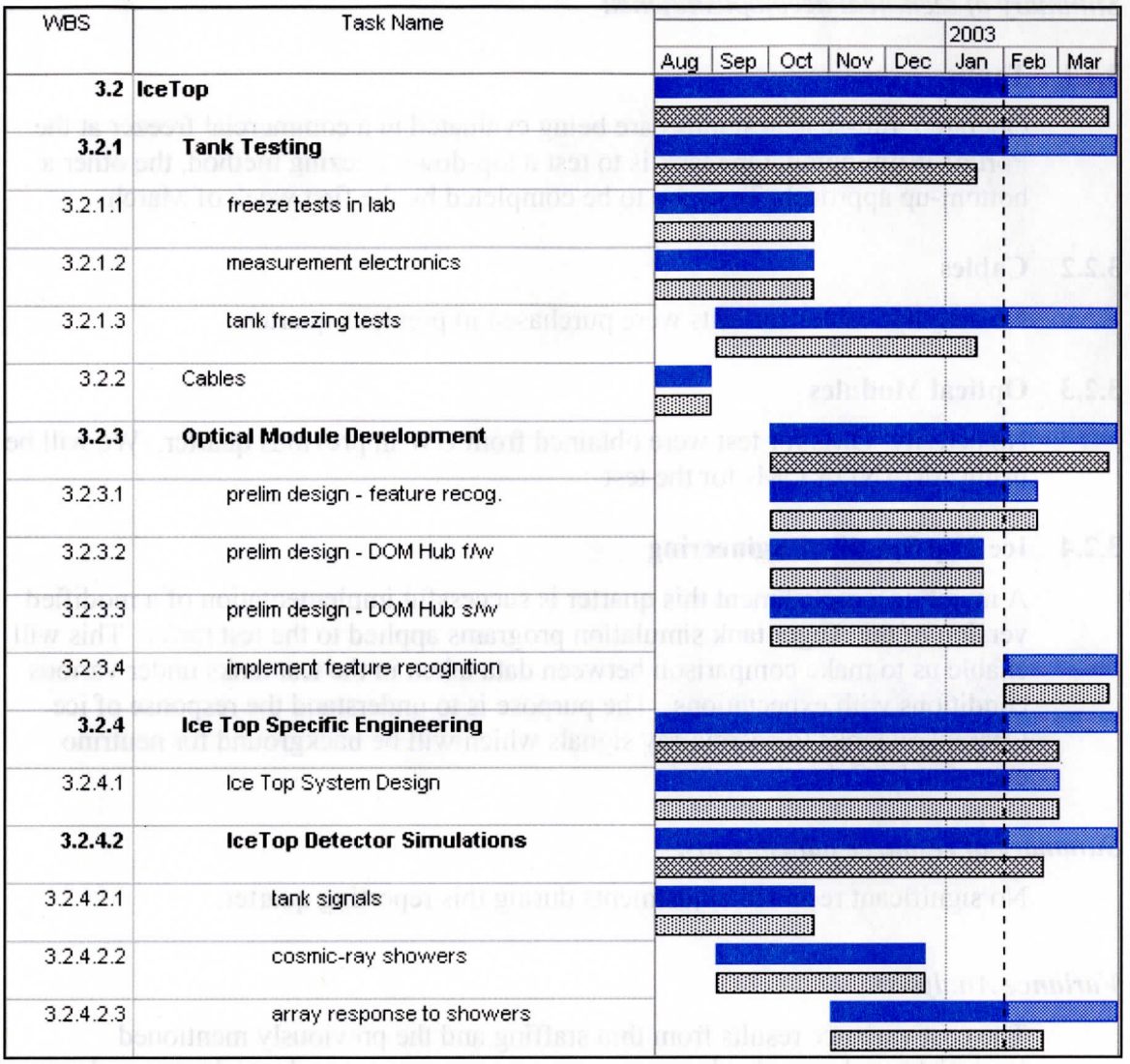
Variance Analysis:

The cost variance results from thin staffing and the previously mentioned inconsistency between when procurement expenses were planned versus when they are realized.

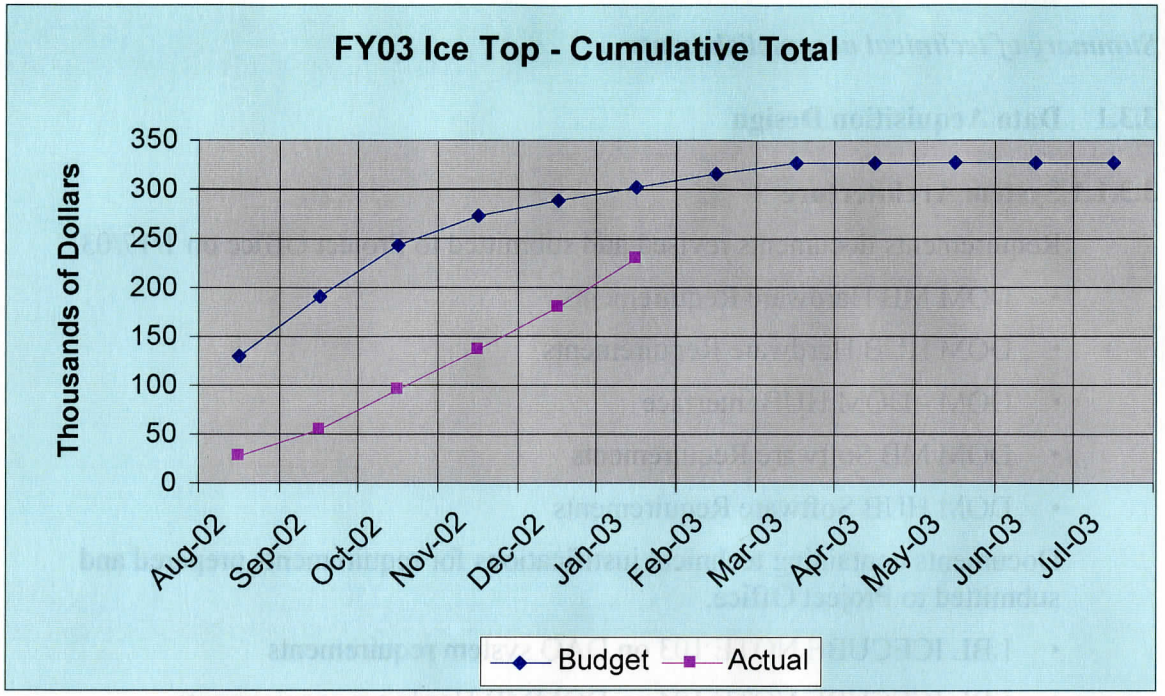
Issues / Concerns

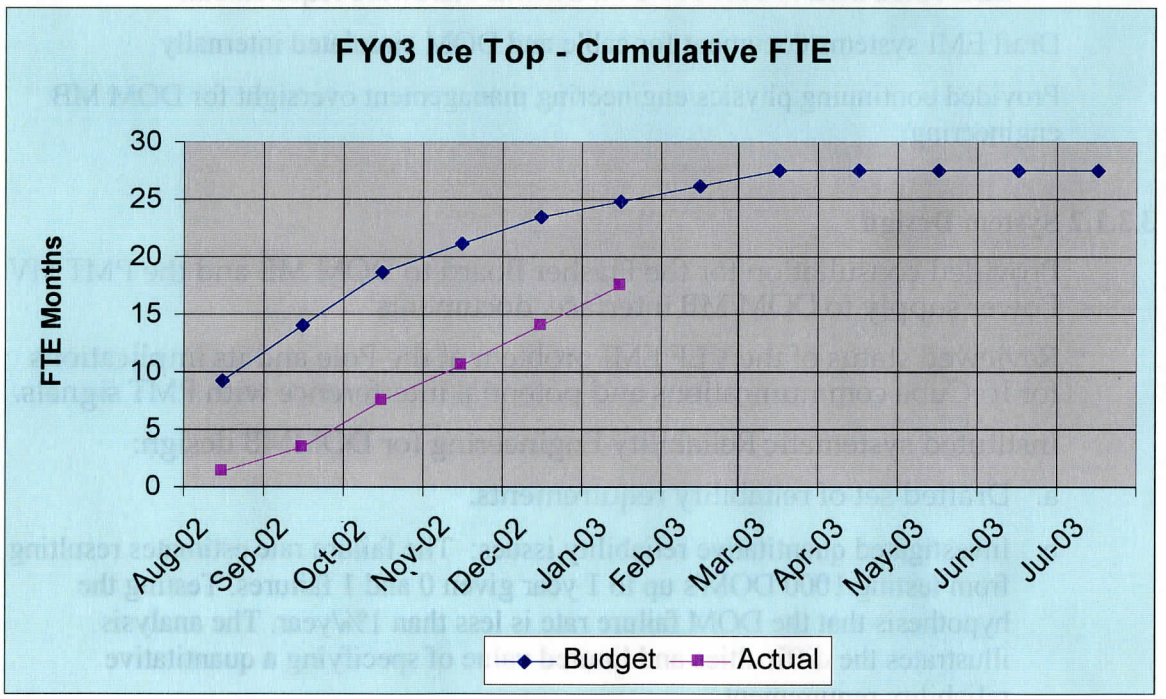
No new issues or concerns.

The following schedule chart shows the baseline in black and the current schedule in blue. Progress against the current schedule is indicated by a dark blue overprint.



Level 3 Summary Charts





3.3 Data Acquisition

Summary of technical accomplishments:

3.3.1 Data Acquisition Design

3.3.1.1 System Architecture

Requirements documents revised and submitted to Project Office on 1/17/03.

- DOM MB Hardware Requirements
- DOM HUB Hardware Requirements
- DOM - DOM HUB interface
- DOM MB Software Requirements
- DOM HUB Software Requirements

Documents containing technical justifications for requirements prepared and submitted to Project Office.

- LBL ICECUBE NOTE 103 on DAQ system requirements
- LBL ICECUBE NOTE 104 on DOMMB Hardware requirements

Draft EMI systems document for cable and DOM circulated internally

Provided continuing physics/engineering management oversight for DOM MB engineering.

3.3.1.2 System Design

Provided consultation for the Flasher Board to DOM MB and the PMT HV Power supply to DOM MB interface documents.

Reviewed status of the VLF EMI problem at the Pole and its implications for IceCube communications and potential interference with PMT signals.

Instituted systematic Reliability Engineering for DOMMB design:

a. Drafted set of reliability requirements.

b. Investigated quantitative reliability issues: The failure rate estimates resulting from testing 1000 DOM's up to 1 year given 0 and 1 failures. Testing the hypothesis that the DOM failure rate is less than 1%/year. The analysis illustrates the difficulties and limited value of specifying a quantitative reliability requirement.

c. Identified electronics parts manufacturers qualified by NASA, DoD, and international agencies for hi-reliability applications.

d. Purchased RAC's Automated Databook and installed it on a PC. It contains failure rates by generic component type and specific data by part number for many commercial and high reliability parts.

3.3.1.3 Main PCB Design

Test version of Main Board hardware and firmware:

a. Test Board schematics finalized
b. Layout completed
c. Internal review of design performed
d. Parts ordered and received
e. Fabricated and loaded boards received
f. Engineering testing started
g. Continuing modifications for design enhancement to the DOM MB schematics are underway
h. Continuing evaluations of components.
i. DOM CPLD API drafted
j. Firmware coding started.

ATWD tester design:

a. Designed schematic for four FPGA configuration options
b. Designed voltage/current sources, waveform sources, power consumption measurement, high frequency switch
c. Schematics corrected and completed.
d. Completed power supply design.
e. Completed mechanical design.
f. Ordered components for two boards.
g. Started layout of 12-layer ATWD tester board.

3.3.1.4 DOM HUB Engineering & Prototyping

DOM / HUB cable interface schematic finalized, based on test measurements made at DESY Zeuthen.

Wrote first version of software API, as basis for the Linux driver development by John Jacobsen

DOR schematic received final improvements, was checked and finalized.

Component placement documented and sent to the PCB designer.

Placement optimized at the PCB design lab (in Germany) during three interactive sessions.

New FPGA design software (Quartus) installed and tested.

Raw PLD design created.

The PCB design has been reviewed and corrected in several iterations.

DOR board layout completed at PCB design lab in Germany.

Master/Slave PCI Bus interface has been designed, simulated and time-analyzed.

The PLD, which is needed to load/reload the FPGA from FLASH, has been completely designed and simulated.

3.3.2 Data Acquisition Software

Provided supervision of design and coding activities for the DAQ software.

Continued coding and testing of DOM software simulation environment.

Continued work on software development environment for DOM MB C-code.

Prepared presentation for DOM test software meeting to be held in Madison in early Jan. '03

DOM MB software:

a. Received Nucleus operating system release for use on DOM MB. Installed and tested software on development system at LBNL.

b. Began transferring existing DOM MB application from existing String 18 development environment to the new IceCube BDF environment.

c. Redesigned directory layout for source and include code and debugged new BDF tools for use with C source code programs.

d. Evaluated and accepted C programming style specification and documentation tools for use with DOM MB C code.

e. Defined and implemented Hardware Access Library (HAL) program used by DOM MB application for accessing all DOM MB hardware and PLD controlled functions.

DOM HUB software:

a. Continued design of core DOM Hub architecture.

b. Began implementing concrete classes for the DOM Hub server.

c. Continued planning the interface to the Linux kernel driver that sits between the DOM Hub and the DOR Card.

d. Worked with U. Wisconsin on the interaction between the String Processor component and the DOM Hub.

Simple Test Framework (STF)

a. Completed design and test of Simple Test Framework executing in simulation mode on Linux processor.
b. Integrated STF test generation software into common IceCube development environment (BDF).
c. Coded and tested STF software executing on Altera Excalibur development board.
d. Coordinated development of STF production hardware tests with project staff at UW. These plans included mechanisms for automating test results in IceCube database, use of STF as part of documented instrumentation test plan, and use at UW during initial post-March DOM MB integration and testing.

The Linux driver:

e. In preparation for the arrival of DOM Hub hardware, expanded the existing prototype control functions and communications interfaces into a full kernel module device driver capable of various simulation modes.
f. Ran and reported benchmarks on the simulation driver. Established that the requirements for data throughput were consistent with the existing driver implementation.
g. Developed and refined Perl and Java interfaces to the driver.
h. Assisted with systems administration details on driver test bed computers.
i. Continued to expand documentation of the driver under development.

Summary of resource adjustments:

No significant resource adjustments during this reporting quarter.

Variance Analysis:

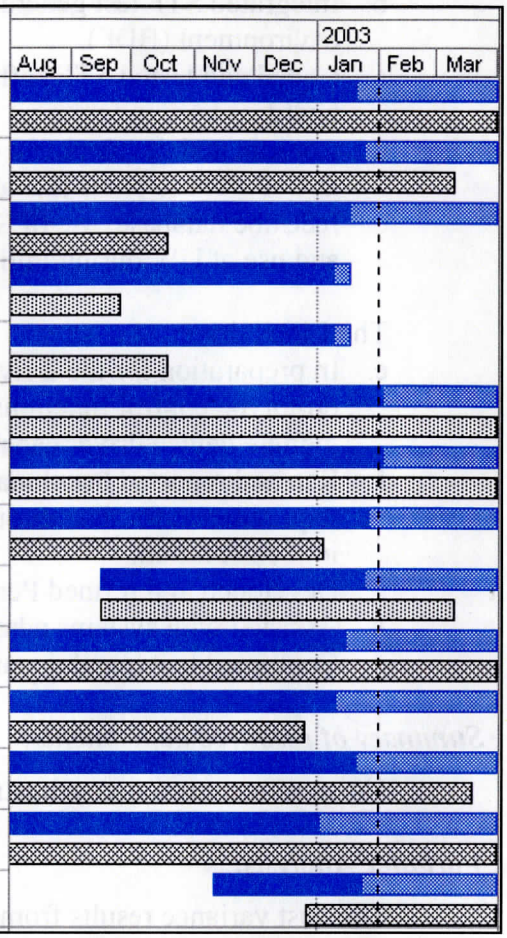
The cost variance results from thin staffing and the previously mentioned inconsistency between when procurement expenses were planned versus when they are realized.

Issues / Concerns

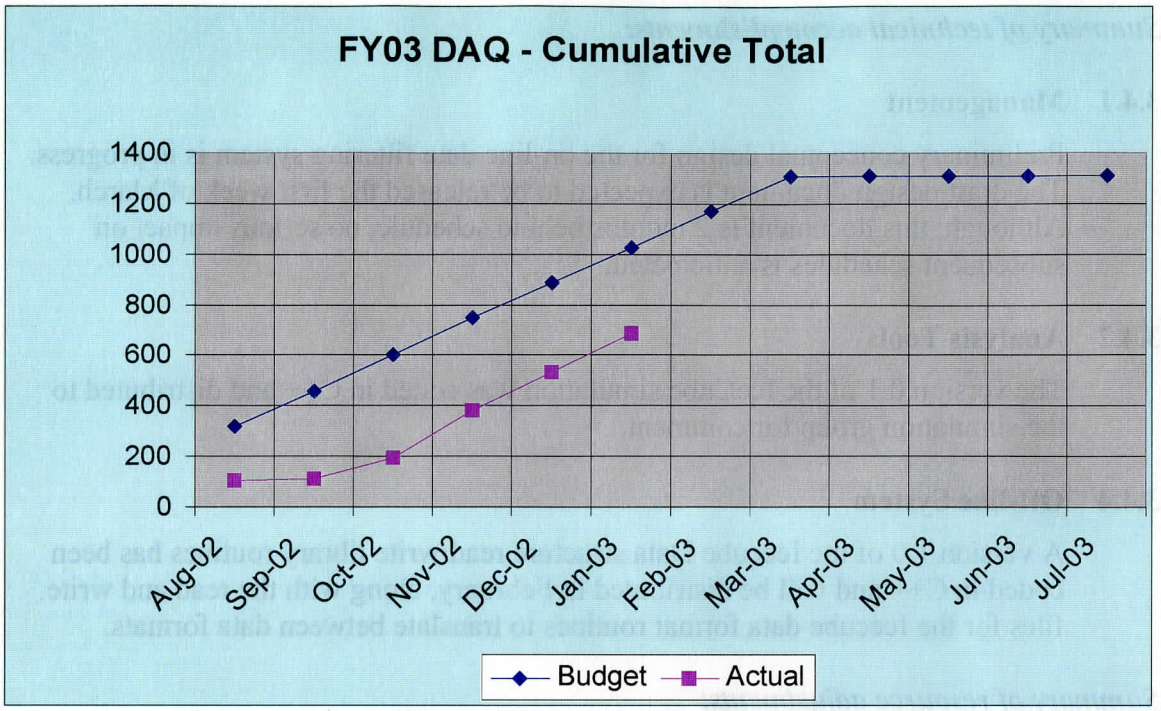
No new issues or concerns.

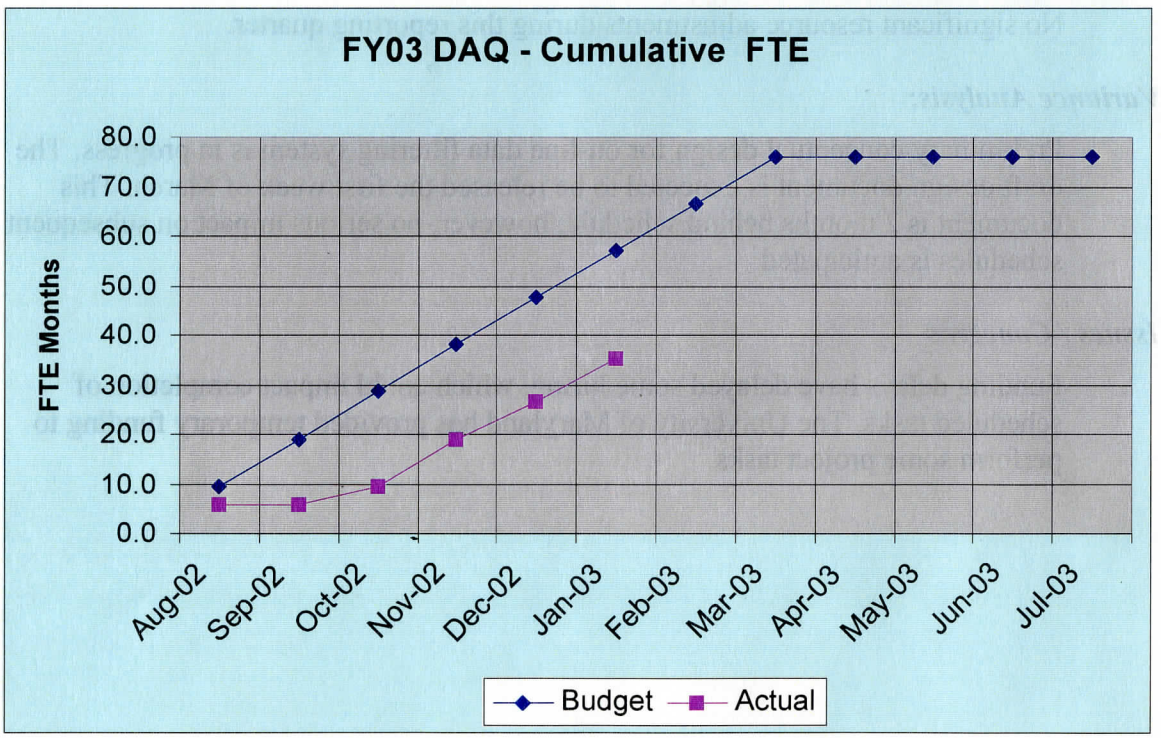
The following schedule chart shows the baseline in black and the current schedule in blue. Progress against the current schedule is indicated by a dark blue overprint.

WBS	Task Name
3.3	**Data Acquisition System**
3.3.1	**Design**
3.3.1.1	**System Architecture**
3.3.1.1.1	DOM Main PCB Requirements document
3.3.1.1.2	Hub Requirements document
3.3.1.1.3	DOM MB Engineering Oversight
3.3.1.2	System Design
3.3.1.3	**Main PCB Design**
3.3.1.4	DOMHub Engineering and Prototyping
3.3.2	**Software**
3.3.2.1	**Software Architecture**
3.3.2.1.1	**DOM Hub Software**
3.3.2.1.2	**DOM Software**
3.3.2.1.8	**Hardware Test Software Framework**



Level 3 Summary Charts





3.4 Data Handling

Summary of technical accomplishments:

3.4.1 Management

Preliminary conceptual design for the on-line data filtering system is in progress. The draft design document is expected to be released the first week of March. Although, this document is 2 months behind schedule, no serious impact on subsequent schedules is anticipated.

3.4.2 Analysis Tools

The version 0.1 of the IceCube simulation was coded in C++ and distributed to the simulation group for comment.

3.4.4 Off-line System

A version 1.0 of the Icecube Data structure read/write library routines has been coded in C++ and will be distributed in February, along with the read and write files for the Icecube data format routines to translate between data formats.

Summary of resource adjustments:

No significant resource adjustments during this reporting quarter.

Variance Analysis:

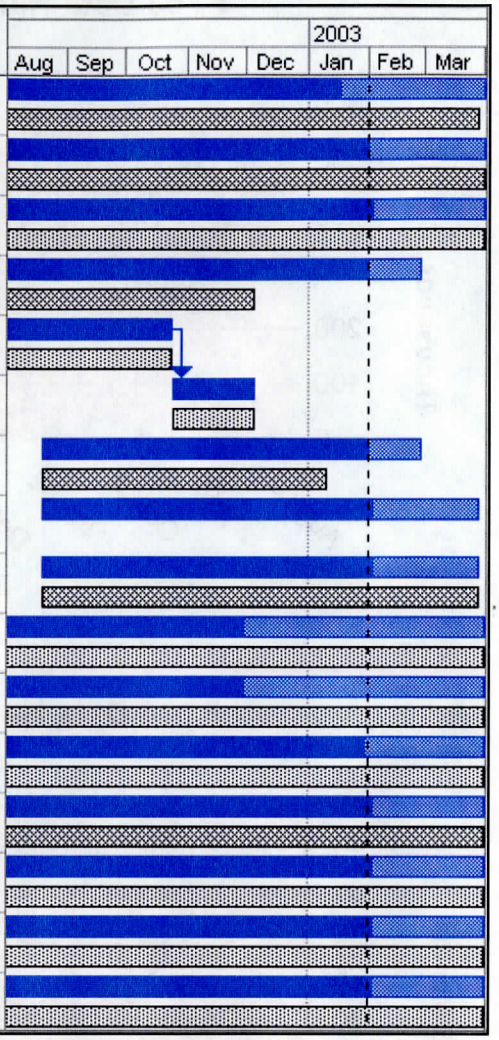
Preliminary conceptual design for on-line data filtering system is in progress. The draft design document is expected to be released the first week of March. This document is 2 months behind schedule; however, no serious impact on subsequent schedules is anticipated.

Issues / Concerns

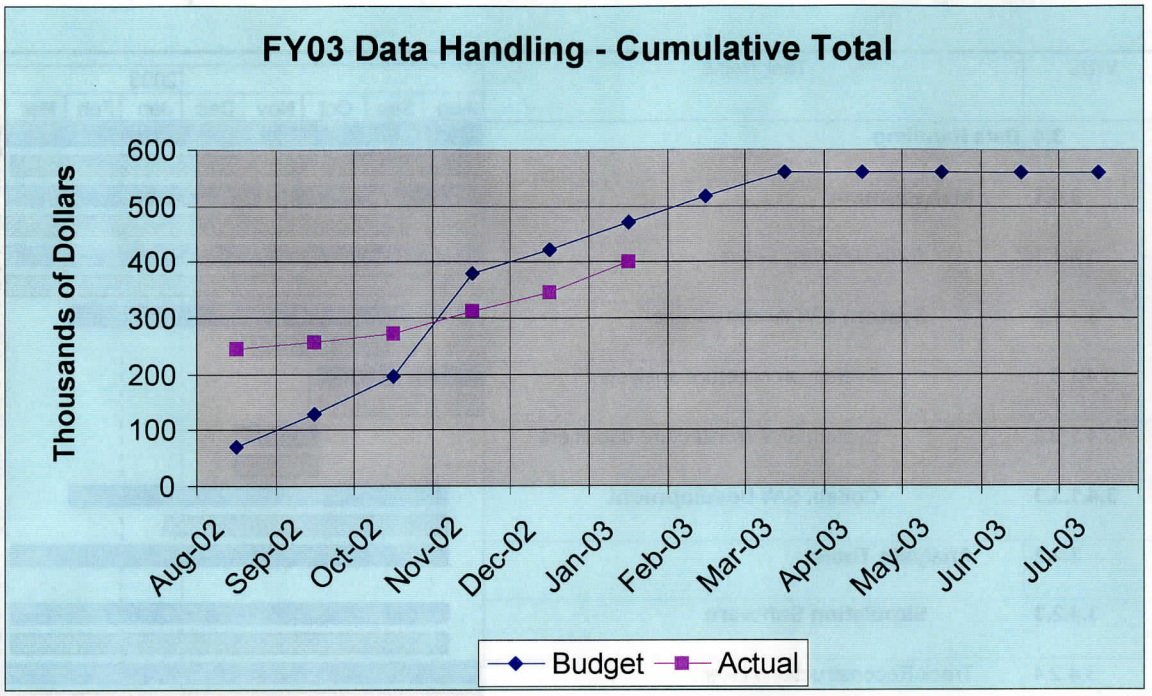
Funding delays have delayed some hiring, which could impact completion of scheduled tasks. The University of Maryland has provided temporary funding to perform some project tasks.

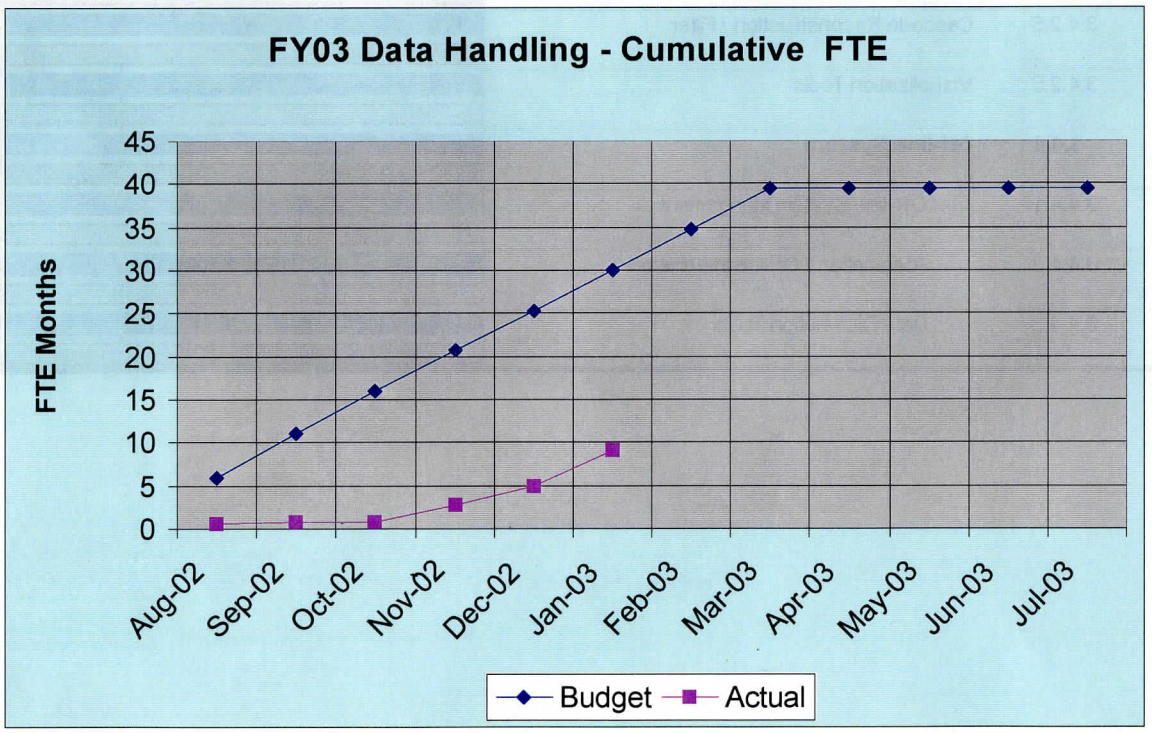
The following schedule chart shows the baseline in black and the current schedule in blue. Progress against the current schedule is indicated by a dark blue overprint.

WBS	Task Name
3.4	**Data Handling**
3.4.1	**Management**
3.4.1.1	*Data Handling Leader*
3.4.1.3	**System S/W Architecture**
3.4.1.3.1	System architecture analysis
3.4.1.3.2	System S/W architecture document
3.4.1.3.3	**Collab. S/W Development**
3.4.2	**Analysis Tools**
3.4.2.3	**Simulation Software**
3.4.2.4	Track Reconstruction / Filter
3.4.2.5	Cascade Reconstruction / Filter
3.4.2.6	Visualization Tools
3.4.4	**Off-line System**
3.4.4.1	Off-line System Mangement
3.4.4.2	Automation / Offline Integration
3.4.4.3	Data Distribution Tools



Level 3 Summary Charts





4.1 Calibration and Monitoring

Summary of technical accomplishments:

This is a relatively low level planning activity for this year, which is somewhat dependent upon final system specifications and design. Preliminary work has been accomplished related to flasher board design, geometry and ice properties.

Summary of resource adjustments:

No significant resource adjustments during this reporting quarter.

Variance Analysis:

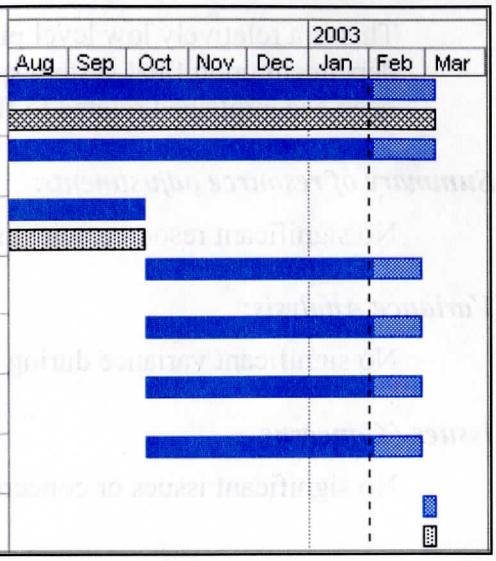
No significant variance during this reporting quarter.

Issues / Concerns

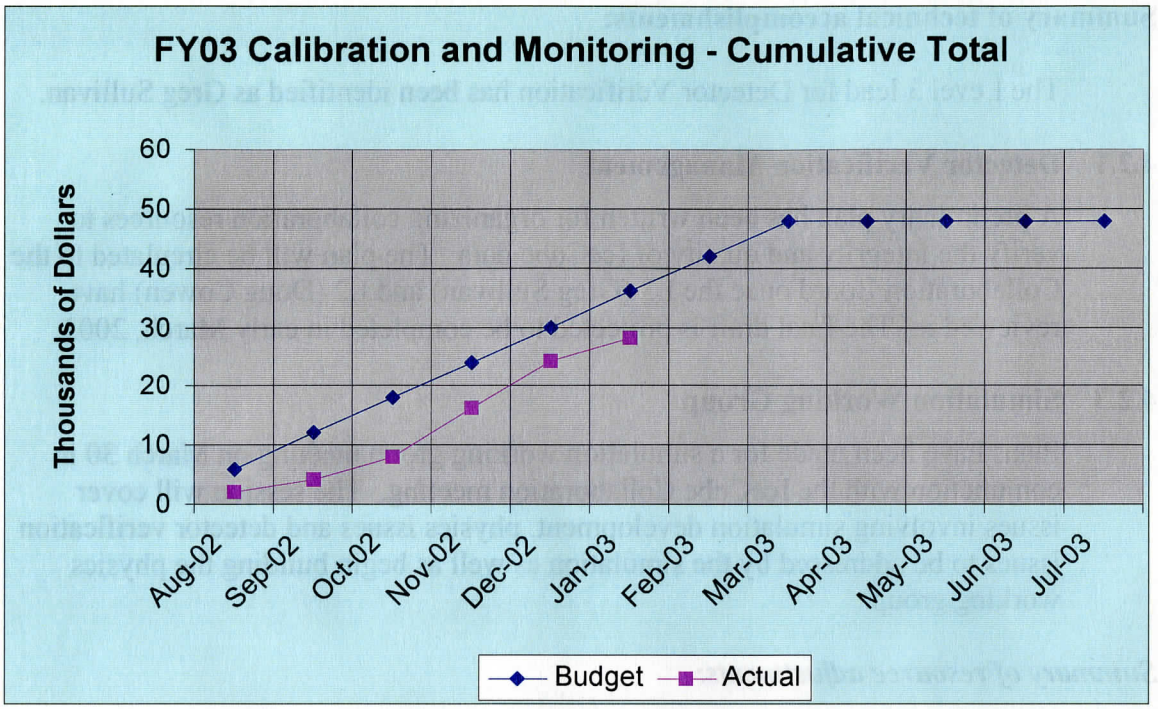
No significant issues or concerns.

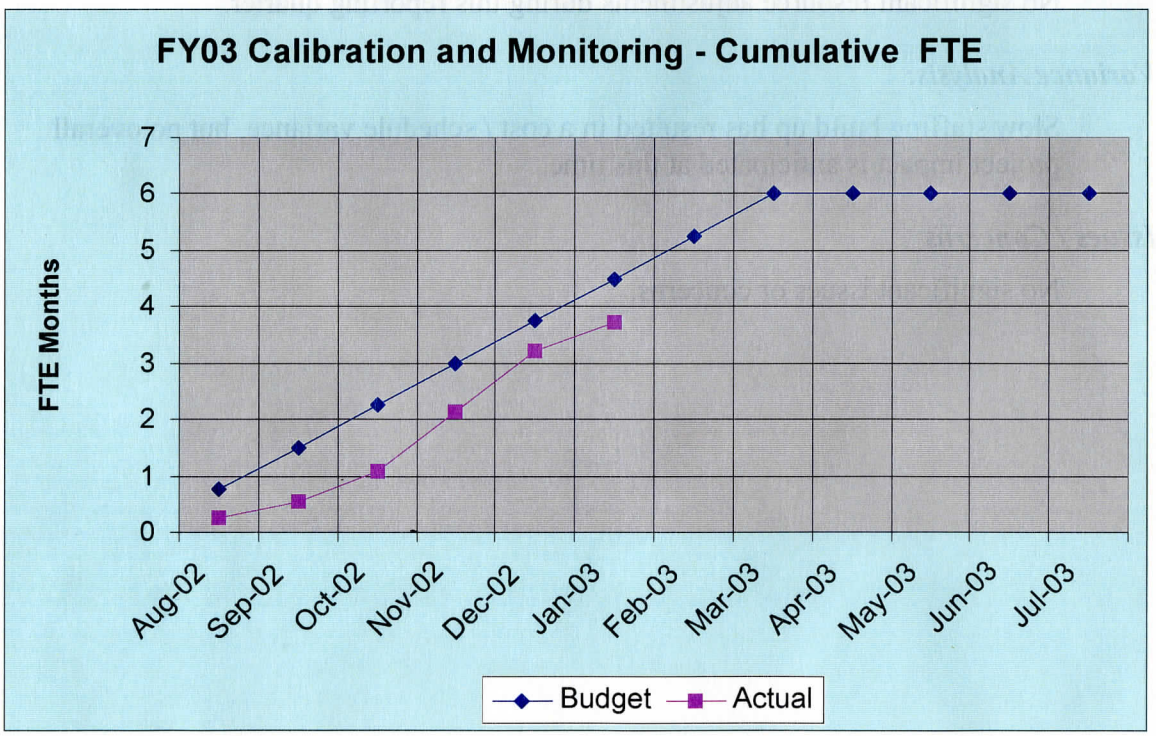
The following schedule chart shows the baseline in black and the current schedule in blue. Progress against the current schedule is indicated by a dark blue overprint.

WBS	Task Name
4.1	**Calibration & Monitoring**
4.1.2	*Calibrations*
4.1.2	define calibrations working group
4.1.2.1	*PMT Gain*
4.1.2.2	*Timing*
4.1.2.3	*Geometry*
4.1.2.4	*Ice Properties*
4.1.2	Finalize Calibration Plan



Level 3 Summary Charts





4.2 Detector Verification

Summary of technical accomplishments:

The Level 3 lead for Detector Verification has been identified as Greg Sullivan.

4.2.1 Detector Verification Management

A preliminary plan has been written for organizing collaboration resources to verify the integrity and quality of IceCube data. The plan will be circulated to the Collaboration Board once the L3 (Greg Sullivan) and L2 (Doug Cowen) have reviewed it. The final draft is projected to be completed in early March, 2003.

4.2.3 Simulation Working Group

Plans have been made for a simulation working group meeting on March 30 in conjunction with the IceCube Collaboration meeting. The session will cover issues involving simulation development, physics issues and detector verification issues to be addressed by the simulation as well as begin building the physics working group.

Summary of resource adjustments:

No significant resource adjustments during this reporting quarter.

Variance Analysis:

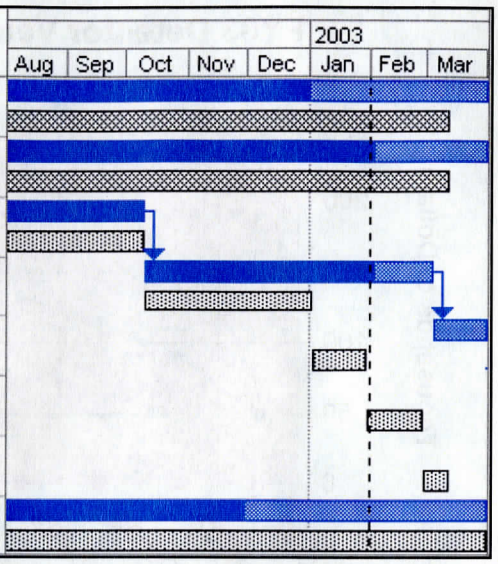
Slow staffing build up has resulted in a cost / schedule variance, but no overall project impact is anticipated at this time.

Issues / Concerns

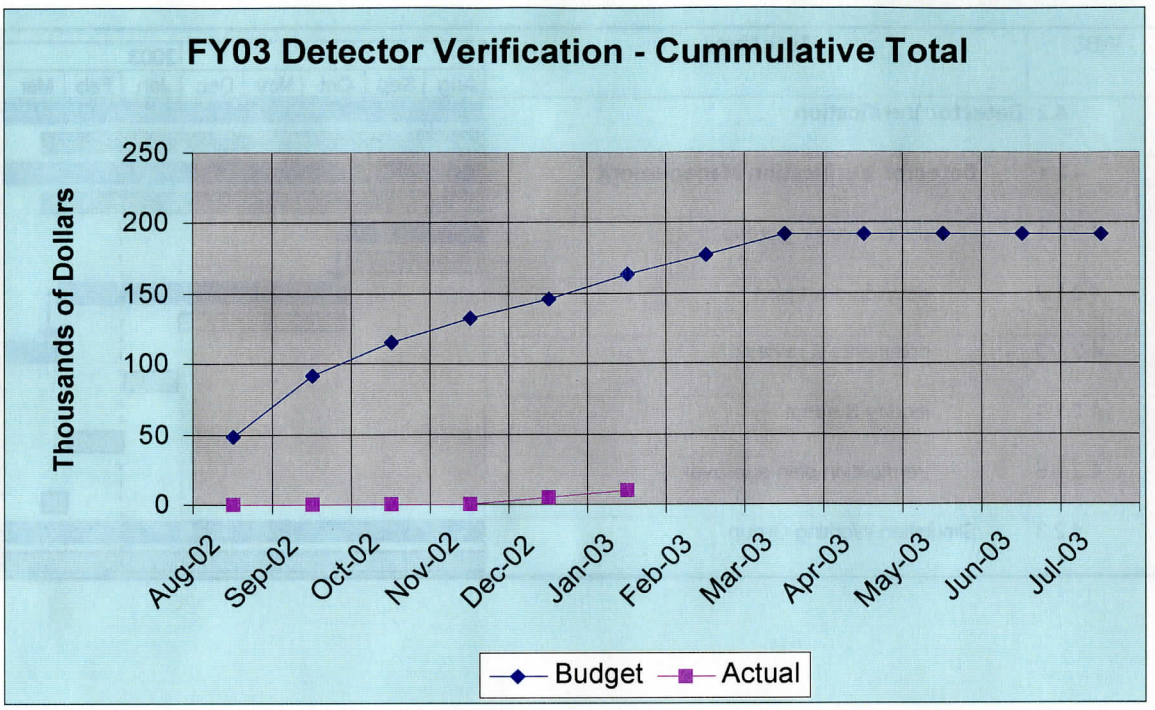
No significant issues or concerns.

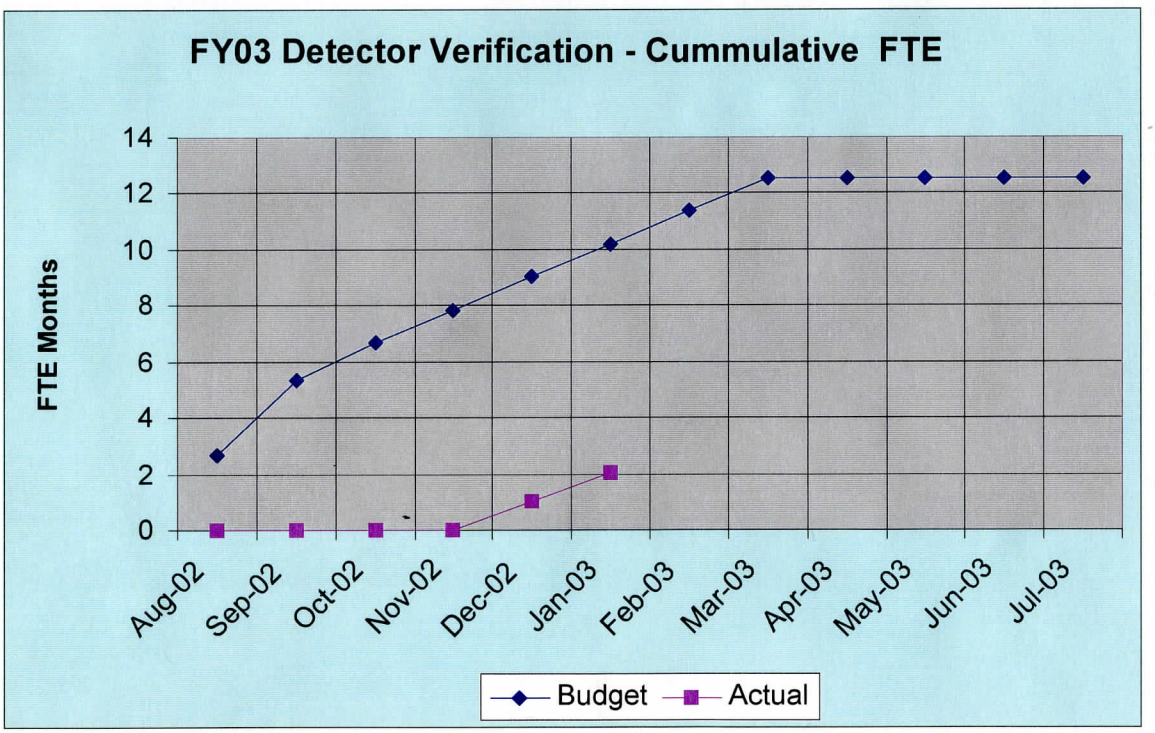
The following schedule chart shows the baseline in black and the current schedule in blue. Progress against the current schedule is indicated by a dark blue overprint.

WBS	Task Name
4.2	**Detector Verification**
4.2.1	**Detector Verification Management**
4.2.1.1	define working group
4.2.1.2	develop draft plan
4.2.1.3	comments & review
4.2.1.4	modify & adapt
4.2.1.5	verification plan approval
4.2.3	Simulation Working Group



Level 3 Summary Charts





Section II - Current or Anticipated Problem Areas

A management system has been implemented to collect, address, status and report problem areas that could result in current or future impact to the success of the IceCube project.

This report section contains:

1) A one page narrative summary of the overall project status;
2) A table that collects impact and status information for each item being reported;
3) Individual information sheets that provide detailed information regarding the description, impact, root cause, corrective action, responsibility, closure date and status of action items.

Items are labeled "New", "Open", or "Closed" as appropriate to reflect their status.

New	Item first introduced during the current reporting period.
Open	Previously reported item that has not yet been completely addressed.
Closed	Concerns have been addressed and the item no longer requires special attention.

Each item has also been ranked based on potential severity of impact to the project. The following categories have been defined:

Major	Failure to correct will prevent the project from achieving key cost, schedule, and /or technical performance. Items in this category will receive the highest possible level of management attention.
Moderate	Items whose impact may be significant, but for which recovery opportunities are available. Items in this category will receive high levels of management attention and corrective action plans will be closely monitored.
Minor	These items will have limited overall project impact but still require timely and effective corrective action plans. Management attention will be focused on containment and rapid closure.

Summary of Current or Anticipated Problem Areas
November 1, 2002 - January 31, 2003

At this time there are no Major problem areas identified, and only a small number of Moderate and Minor items. As frequently occurs during the start up period of any large project, these are primarily schedule delays attributable to staffing build up.

Corrective action plans are in place to deal with all currently identified problem areas, and sufficient lead-time exists to anticipate full recovery without adverse impact to the overall project.

Tracking Log

Item	Title	Impact	Status
1	Delayed Completion of Hazard Analyses and Reschedule of Final Safety Design Review	Moderate	Closed
2	Delayed Start of Systems Engineering Management Plan and Related Documents	Moderate	Open
3	Availability of Logistics Source Data Needed to Estimate Transportation Weights and Volume (Cubes)	Minor	Open
4	Delays in Completion of Specific EHWD Subsystem Specifications and Related Procurement Activities	Moderate	Open
5	Delays in Development of DAQ / DOM / DOM Hub Software	Moderate	Closed
6	Delayed Completion of Deployment Operations Hazard Analysis	Moderate	New
7	Delayed Completion of Drilling Operations Hazard Analysis	Moderate	New

Item: **1**

Reference: **Quarterly Report, Nov 27, 2002, Topic #1**

Title: **Delayed Completion of Hazard Analyses and Reschedule of Final Safety Design Review**

Status: **Closed**

Impact: **Moderate**

Related WBS: **1.1 Management**

Item Description / Impact Summary:

Hazard Analyses – All hazard analyses were scheduled for completion by 11/11/02. The 3 remaining hazard analyses (power distribution, fuel system, operations) will not be completed in that timeframe. They will be rescheduled for completion. The rescheduling of these activities is not expected to affect any other critical deliverables.

Final Safety Design Review – The Final Safety Design Review was scheduled for completion by 12/16/02. This schedule does not allow us time to complete tasks that should be reviewed during that design review (i.e., addressing action items from the first review, making a final decision on the type of anti-freeze, completing the fire suppression plan).

Root Cause:

Hazard Analyses – The remaining three hazard analyses were delayed to allow additional time to better define the subsystems they were addressing.

Final Safety Design Review – The schedule for the Final Safety Design Review was premature and did not allow sufficient time to address important safety issues that need to be discussed at that review.

Corrective Action:

- **Hazard Analyses** – The hazard analyses are rescheduled for completion by 1/15/03. The Operations Hazard Analysis is scheduled last since it reviews issues that may arise through use of the system and are not linked to a specific subsystem.
- **Final Safety Design Review** – The Final Safety Design Review is being rescheduled to 3/31/03.

Responsibility:

Tom Demke; QA & Safety Manager - IceCube; UW – Madison

Closure Date:

Hazard Analysis: 1/15/03, Safety Design Review: 3/31/03 - Hazard analysis rescheduled for 1/15/03 completion, Final Safety Design Review rescheduled for 3/31/03.

Status of Actions:

The final safety design review is on track for completion by 3/31/03.

The hazard analyses for Anti-freeze and water tanks, and the Power Distribution System have been signed and released. The remaining HA (Operations) required definition of the process flow for drilling and deployment operations at the South Pole to fully understand the potential safety issues. This effort required specific additional staff resources, some of which were only intermittently available during the quarter. It appears unlikely at this point that the hazard analysis will be completed and approved prior to the second quarter of 2003. Also, it was determined that since drilling and deployment are separate operations staffed by different organizations, the Operations HA should be split into two HA's (one for drilling and one for deployment) and action items for their completion established under the appropriate level-3 leads.

This action item is closed and two new actions will be opened to track the remaining hazard analyses (see items 6 & 7).

Item: **2**

Reference: **Quarterly Report, Nov 27, 2002, Topic #2**

Title: **Delayed Start of Systems Engineering Management Plan and Related Documents.**

Status: **Open**

Impact: **Moderate**

Related WBS: **1.2 Systems Engineering**

Item Description / Impact Summary:

WBS 1.2 System Engineering tasks scheduled for start on 8/1/02 have been delayed until 11/04/02. This has resulted in delayed start of the Systems Engineering Management Plan, important revisions to the Draft Engineering Requirements Document, and other key systems related effort.

Current period impact has been to require individual element leaders to informally anticipate and address system level requirements. This leads to the possibility that portions of the lower level requirements documents now underway will need to be adjusted or refined. If uncorrected, this condition will introduce technical risk into the overall system design and delay the design review process.

Root Cause:

Delayed documentation start results from delays in staffing the IceCube Systems Engineering Level 2 Manager position.

Corrective Action:

An experienced and highly qualified individual has been identified to lead the Systems Engineering effort, and will begin work on 11/04/02. This individual will be responsible for establishing and executing a corrective action plan based on accelerated development of the delayed documents. At this time we believe it is possible to achieve the planned completion dates as well as support the balance of system engineering responsibilities without incurring unplanned costs or unrecoverable technical impact.

Responsibility:

Randall C. Iliff, IceCube System Engineering; University of Wisconsin - Madison

Closure Date:

Position staffing to be accomplished on 11/4/02

Accelerated development as required to preserve 3/5/03 Design Review schedule.

Status of Actions:

Position staffing accomplished as planned on 11/4/02

All available project documentation has been reviewed, and the critical System Engineering Management Plan (SEMP) and Engineering Requirements Document (ERD) products are in process. A System Requirements Review meeting is planned for February, with follow-up during the collaboration meeting at the end of March.

As of January 31, 2003, the SEMP and ERD schedules remain challenging, and this action should be continued as OPEN into the next reporting period.

Item: 3

Reference: Quarterly Report, Nov 27, 2002, Topic #3

Title: Availability of Logistics Source Data Needed to Estimate Transportation Weights and Volume (Cubes)

Status: Open

Impact: Minor

Related WBS: 2.1 Logistics, 2.3 Deployment

Item Description / Impact Summary:

Pending completion of the overall design effort, all weight and volume estimates will be subject to significant change. Deployment concepts and schedule are also subject to significant iteration at this stage of the project. The long lead time needed to coordinate cargo flights, availability of handling equipment, storage facilities, and personnel support make it necessary to identify requirements as early as possible in the project life cycle.

Root Cause:

Serial dependency between system design progress and the ability to prepare high confidence logistics requirements.

Corrective Action:

While it is not possible to alter the serial dependency noted above, actions have been identified to minimize any delay associated with communication of the information at the earliest possible time, and also to store the data in an easily updated format. Near term coordination with RPSC to identify the availability of handling equipment at the South Pole will also reduce uncertainty.

Responsibility:

Bob Morse, University of Wisconsin - Madison

Closure Date:

Revise closure date to April 15, 2003.

Status of Actions:

Specific logistics requirements to meet the FY-04 season deployments will be developed in concert with RPSC during meetings to take place on March 5, 2003 and about March 18-19, 2003.

A specific logistics plan (NSF-SIP document) will be presented to the NSF on about April 15, 2003. At this meeting all cargo weights, volume, ROS (required on station), and descriptions will be presented. Deployment concepts and schedules also developed during the March meetings with RPSC will be presented. We are planning on developing the RSP (Research Support Plan) with

the NSF during the April meeting, so that all parties may proceed with a clear vision of what is required.

This action remains open.

Item: **4**

Reference: **Quarterly Report, Nov 27, 2002, Topic #4**

Title: **Delays in Completion of Certain EHWD Subsystem Specifications and Related Procurement Activities**

Status: **Open**

Impact: **Moderate**

Related WBS: **2.2 Drilling**

Item Description / Impact Summary:

Schedule issues for specification, design and procurement of certain elements of the Enhanced Hot Water Drill have been identified as follows:

- **E-stop** – The current plan is to have the e-stop system design complete and contactor panels fabricated for outfitting the first MDS in January. The progress to date is five weeks behind schedule.
- **Sensors Specification** – Specification and selection of system sensors is two weeks behind schedule.
- **Generators** – The generator Request For Purchase (RFP) release was approximately six weeks later than expected. It is possible that the generator may not be at the Physical Sciences Lab (PSL) for the start of testing (IV&T). The RFP requests delivery of the generator by April 30th, which would fully support IV&T.
- **Feeder Cable** – The feeder cable selection has proceeded essentially as planned; however, the delivery time may have doubled from initial estimates of six to twelve weeks. This may present a problem for IV&T.
- **Drill Hose Delivery** – IVG (drill hose supplier) is quoting a thirty-week drill hose delivery. This was an unexpected increase of ten to twelve weeks. With the order placed 11/1/02, the drill hose will arrive at PSL the last week of May, approximately one month into IV&T.
- **Water Tank** – The schedule for the detail design work of the Water Tank cover and catwalk is two weeks behind schedule.

Root Cause:

- **E-stop** – This is a resource issue, where the same engineer was working on numerous elements of the electrical system.
- **Sensors Specification** – This was a resource issue, where the same engineer was working on numerous elements of the electrical system.
- **Generators** – The amount of time required to define the generator RFP with RPSC was underestimated.
- **Feeder Cable** – The supplier presented us with a large, unanticipated increase in the delivery time.
- **Drill Hose Delivery** – The supplier presented us with a large, unanticipated increase in the delivery time.
- **Water Tank** – This is a resource issue. The design work for the tanks is in series with the detail work on all the MDSs. The Water Tanks are being designed last.

Corrective Action:

- **E-stop** – The design has been made a priority for an engineer to accelerate its development. Its progress will be closely monitored over the next few weeks. If the development continues to lag, a contingency plan has been prepared. During outfitting, the e-stop push buttons will be installed and wired to the utility closets. Space will be provided for the e-stop contactor panel and it will be installed later prior to the start of subsystem testing.
- **Sensors Specification** – Bit7, a local engineering firm, has been contracted to complete the sensor specification and selection. This work includes defining the specifications for all sensors, identifying sensors to meet the specs, developing procurement documents, and preparing sensor test plans. The work should be complete by the third week of December. This should allow time to order sensors for installation in the MDSs. Sensor testing will be conducted in parallel.
- **Generators** – Based on RPSC's experience, they feel a December 20th award date provides sufficient time to support an April 30th delivery date. If the generator fails to arrive by the start of IV&T, alternative power sources have been identified. A generator may be rented from a local distributor or line power may be available. More will be known about the delivery once the proposals have been received.
- **Feeder Cable** – Engineering is actively working with power cable representatives to finalize a cable / connector design that will meet our needs. Once the design is finalized, a firmer estimate of the lead-time will be known. In the meantime, options are being weighed to provide schedule relief. These may include some parallel testing of the cable and connector while it is being produced or finding an alternative cable to support IV&T activities while the cable is on order.
- **Drill Hose Delivery** – IVG is sensitive to our delivery needs and plans to work with us to improve delivery to the end of April. The first step towards improving delivery was the expedited wire transfer of funds to place the coupling order. IVG is planning to review their testing plans to see if some tests can be done in parallel. If it appears the hose will not arrive until late May, the test plan will be reviewed to accommodate the late arrival of the drill hose.
- **Water Tank** – To improve the progress, a draftsman has been hired temporarily to assist in the MDS detail layouts. He is expected to remain hired for two to three months. Another option being considered is to have Sea Box do the detail layout of the cover and catwalk. This decision will be made based on its status when Sea Box begins their design and analysis of the Water Tanks.

Responsibility:

Mark Mulligan; Project Manager-EHWD; University of Wisconsin - Madison

Closure Date:

Immediate initiation of corrective actions, follow up activities over the next few months as noted above.

Status of Actions:

- **E-stop** – In the last quarter, the e-stop system design has been a priority for an engineer at the Physical Sciences Lab (PSL) and significant progress has been made. The contactor panels may not be available until late February or early March. The panels may not be available for electrical outfitting of first few MDS's. The e-stop buttons will be installed and wired to the utility closet. Once the contactor panels are complete, they will be installed. This will not delay the start of IV&T activities. ***This action is closed.***
- **Sensor Specification** – Bit7 is continuing to make progress finalizing the specification and selection of sensors. During November, they dedicated an additional engineer to this task from their Illinois office. A test plan has been developed to test the sensors ability to survive the cold storage extremes. It has been used to evaluate sensors not rated to –112° F storage. The final specifications for all sensors are complete. The sensor and module installation into the MDS will not be done by the electrical contractor but by technicians from Space Science and PSL. This provides additional schedule flexibility. The installation of all the sensors is scheduled to be complete by early May in time to support the start of IV&T. ***This action is closed.***
- **Generators** – The generator and power distribution delivery schedule is being worked with vendors and alternative sources of power to support IV&T are being researched. ***This action remains open.***
- **Feeder Cable** – Specifications for the electrical cable and connector have been finalized. Two vendors with suitable cables were identified and a bid was released. While preparing a bid response, one vendor determined that they could not meet the cable requirements. The other vendor, USA Wire & Cable, submitted a bid. Their cable is constructed per the Insulated Cable Engineers Association (ICEA) standard S-95-658; however, that standard does not address the TPE insulation and jacket. For that, UL Standard 62 is referenced. Since the cable is not completely covered by one standard, its suitability is being evaluated. In parallel with that, other vendors are being contacted for a suitable cable. Currently, the vendors include Americable and Anixter. It is not clear what potential schedule impact this will have. It will depend on the lead time for the cable. ***This action remains open.***
- **Drill Supply Hose Delivery** – IVG reports that their current projected delivery date for the hose is now April 30th. This is one month earlier than was planned at the time of the order and soon enough to support IV&T activities. The hose progress will continued to be monitored through regular contact with IVG. ***This action is closed.***
- **Water Tank** – The additional draftsman has been focused on mobile drilling structure installation drawings. This has freed other resources to focus on the mobile drilling structure design drawings. In preliminary design discussions with Sea Box, the conceptual layout of the water tank has changed to incorporate a cover. The cover will be integral to the container to provide structural integrity for

supporting the water loads. Sea Box will be responsible for designing the cover as part of the water tank. The addition of resources and reallocation of responsibilities allows the water tanks to be complete in time to fully support IV&T. ***This action is closed.***

Item: **5**

Reference: **Quarterly Report, Nov 27, 2002, Topic #5**

Title: **Delays in Development of DAQ / DOM / DOM Hub Software**

Status: **Closed**

Impact: **Moderate**

Related WBS: **3.3 Data Acquisition**

Item Description / Impact Summary:

DOM software top-level design completion has slipped from a scheduled date of 10/16/02 to a projected completion date of mid January 2003. DOM Hub software top-level design has slipped from a scheduled date of 10/16/02 to a projected completion date of 12/25/02. Lesser delays are associated with the mid-level and low-level design.

Unless these delays are recovered, software will not be available to support integration testing of the DOM and DOM Hub components scheduled for March and April of 2003.

Root Cause:

Resource availability.

Corrective Action:

Additional resources have been identified and committed to the software development task, and an accelerated development schedule established to recover in time to avoid delays to the March 2003 delivery of DOM main boards.

Responsibility:

Dave Nygren, LBNL DAQ Level 3 Manager

Closure Date:

Corrective action has already taken place, will monitor activity described above and close by January 31, 2003.

Status of Actions:

An experienced embedded software engineer was hired in October to work on IceCube DAQ. Additionally, the effort associated with this task will be less than originally projected due to the unexpected availability of industrial grade, open source software for performing bootstrap and flash memory management functions. These two factors have enabled us to make up most of the DOM Main Board-related schedule lost due to delayed staffing rampup.

An additional full time software engineer was hired in October to work solely on DOM Hub application software. Initial design of this application took longer than anticipated, but implementation has now begun. An additional software engineer (John Jacobsen) has been hired to concentrate on the Linux system driver used to communicate between the DOM Hub application and the DESY developed PCI communications interface. John developed and maintained the Linux driver used with the previous generation DESY-developed ISA communications interface. John's comprehensive knowledge of the existing DOM communications design and prior working relationship with both LBNL and DESY should shorten the time required to develop and debug the communications driver software. The schedule for this work remains aggressive and we will continue to monitor progress closely.

This action is closed.

Item: 6

Reference: Quarterly Report, Nov 27, 2002, Topic #1

Title: Delayed Completion of Deployment Operations Hazard Analysis

Status: New

Impact: Moderate

Related WBS: 2.3 Deployment

Item Description / Impact Summary:

The Operations Hazard Analysis was split into two hazard analyses, Deployment Operations and Drilling Operations (see item 1). It appears unlikely that the Deployment Operations Hazard Analysis will be completed and approved prior to the second quarter of 2003.

Root Cause:

The Deployment Operations HA required definition of the process flow for deployment operations at the South Pole to fully understand the potential safety issues. This effort required specific additional staff resources, some of which were only intermittently available during the quarter.

Corrective Action:

An action item for the completion of the Deployment Operations HA will be established under the appropriate level-3 lead. The due date is established as 8/31/03 to allow predecessor activities to be completed prior to the hazard analysis. This delay will not adversely impact any other schedule elements.

Responsibility:

Tom Demke; QA & Safety Manager - IceCube; University of Wisconsin – Madison

Closure Date:

8/31/03

Item: 7

Reference: **Quarterly Report, Nov 27, 2002, Topic #1**

Title: **Delayed Completion of Drilling Operations Hazard Analysis**

Status: **New**

Impact: **Moderate**

Related WBS: **2.2 Drilling**

Item Description / Impact Summary:

The Operations Hazard Analysis was split into two hazard analyses, Deployment Operations and Drilling Operations (see item 1). It appears unlikely that the Drilling Operations Hazard Analysis will be completed and approved prior to the second quarter of 2003.

Root Cause:

The Drilling Operations HA required definition of the process flow for drilling operations at the South Pole to fully understand the potential safety issues. This effort required specific additional staff resources, some of which were only intermittently available during the quarter.

Corrective Action:

An action item for the completion of the Drilling Operations HA will be established under the appropriate level-3 lead. The due date is established as 4/30/03 to allow predecessor activities to be completed prior to the hazard analysis. This delay will not adversely impact any other schedule elements.

Responsibility:

Tom Demke; QA & Safety Manager - IceCube; University of Wisconsin - Madison

Closure Date:

4/30/03

Section III – Additional Management Information

Changes to Key Personnel:

We are pleased to report the addition of Jay Gallagher to the IceCube team as Interim Project Director.

VITAE & RECENT BIBLIOGRAPHY---JOHN S. GALLAGHER, III

EDUCATION:

B.A. (magna cum laude), Princeton University, 1969.
M.S., University of Wisconsin - Madison, 1971.
Ph.D., University of Wisconsin - Madison, 1972.

PROFESSIONAL EXPERIENCE:

Current Position: 1991- : Professor of Astronomy, University of Wisconsin - Madison.
Former Positions: 1988--1992: Adjunct Professor of Physics and Astronomy, Northern Arizona University (non-tenured).
1989--1991: Vice President, Associated Universities for Research in Astronomy, Inc. (non-tenured administrative).
1986--1989: Director, Lowell Observatory (non-tenured; research & administration).
1984--1986: Astronomer, Kitt Peak National Observatory, National Optical Astronomy Observatories.
1982--1984: Professor of Astronomy, University of Illinois at Urbana-Champaign.
1977--1982: Associate Professor of Astronomy, University of Illinois at Urbana-Champaign
1974--1977: Assistant Professor of Astronomy, University of Minnesota-Twin Cities
1972--1974: Research Associate and Visiting Assistant Professor of Physics, University of Nebraska - Lincoln.

PROFESSIONAL SOCIETIES:

Fellow, American Association for the Advancement of Science
American Astronomical Society; Astronomical
Society of the Pacific
International Astronomical Union
Sigma Xi

SELECTED RECENT PROFESSIONAL SERVICES:

NSF National Optical Astronomy Observatories review panel; chair 2002-
Chair, NSF review panel for operation of the National Optical Astronomy Observatories 2000-2001.
Maximum Aperture Telescope Workshop Chair, Madison 1998, Hyannis 1999 (Project to design future ground-based telescopes that are 3-10 times larger than the 10-m diameter Keck Telescopes)
International Reviewer, astrophysics graduate programs, CAPES Foundation, Brazil 1999
International Gemini 8-m Telescopes Project, Board of Directors 1997- 2001 , Chair 2000-2001; (Gemini is a collaboration involving the US, UK, Canada, Australia, Argentina, Brazil and Chile to operate two high performance astronomical telescopes.)
Board of Editors, *Astronomy* magazine (Waukesha, WI) (Outreach activity)
National Science Foundation site review panelist, Center for Astrophysical Research in Antarctica, Chicago, 1996 NASA Long Term Space Astrophysics Review Panel 1996
NASA Space Science Advisory Committee 1994-1996
National Astronomy & Ionosphere Center (Arecibo) Visiting Committee 1994-1996, Chair 1996
Wide Field Planetary Camera 2 Investigation Definition Team 1991-99 (Team that built the WFPC2 for the Hubble Space Telescope.)

UNIVERSITY SERVICE—WISCONSIN:

Antarctic Astronomy and Astrophysics Research Institute, Director 1999-2003.
Chair, College of Letters &Science Review Committee for the Department of Physics 1998-99
Graduate Fellowship Committee 1998-01
WIYN Telescope Board, UW-Madison member 1997- 00
Dean's Committee on Physical Sciences Laboratory 1997-98
Chair, Department of Astronomy 1995-98.

Progress on Unfunded Efforts:

1.3 Education and Public Outreach

Summary of Work Accomplished

Since it began operating, the IERC has established an organizational infrastructure, including an advisory committee, and accomplished many tasks. IERC has been within budget and on schedule with respect to its plans.

Primary among these accomplishments are:

designed and implemented the IceCube web site, featuring Education and Outreach as a major component http://icecube.wisc.edu);
offered and evaluated the Astronomy in the Ice summer course, taught through UW-River Falls to 15 teachers in summer 2002, (see http://icecube.wisc.edu/astronomy-in-ice/)
developed and produced IceCube brochure, with versions in English and Spanish, AMANDA/IceCube bookmark, and IceCube logo.
provided the Exploratorium with resources on AMANDA for their Origins Project
established a collaboration with the UW Space Place outreach center and began IceCube outreach initiatives through Space Place.
arranged for Francis Halzen to present at UW-Madison Roundtable (10/16/02), and are developing video-based on-line version for broad distribution
arranged for English and other language versions of DESY-produced "AMANDA Animations" short film (available from IceCube website)
participated in the NRC-sponsored Neutrino and Subterranean Science Workshop
planning for new Science in the Ice summer course to be offered in summer 2003 through UW-River Falls to some 30 teachers, including teachers from the four districts involved in the NSF-funded System-wide Change for All Learners and Educators Math Science (SCALE) Partnership project, plus teachers involved with the NSF-funded Teachers Exploring the Arctic and Antarctic program, and teachers linked to collaboration institutions Clark Atlanta and Atlanta University and Southern University.
participation in SCALE Immersion Team, developing science units focused on cutting edge science for use by thousands of SCALE teachers (in LA, Denver, Providence, Madison) and teachers elsewhere in the world
planning for Polar Summer Science Institute to be held in conjunction with Yerkes Observatory and the Aurora University in summer 2004.

Changes in key personnel

The IERC staff for Year 1 consisted of a director, an outreach specialist and web master (August 1 – December 31, 2002) and as of January 2003 consists of two co-directors, an outreach specialist and web master (January 1 - July 30, 2003).

The shift from a single director to a "co-director for planning and administration" and a "co-director for learning and teaching" was initiated by the current director, Dr. Susan Millar, partly due to her belief that it is important for the IERC leadership to include a person with a doctorate in physics and extensive knowledge of physics education. The new co-director is Jim Madsen, UW-River Falls Professor of Physics, IceCube scientist, director of the Astronomy in the Ice course, and of the planned Science in the Ice course.

2.3 Deployment

No planned activity in year one.

3.1 In-Ice Devices

(Major effort is underway in this area, and a detailed summary will be found starting on the next page.)

4.3 AMANDA / IceCube Integration

No planned activity in year one.

3.1 In-Ice Devices

Summary of technical accomplishments:

This activity was provided little funding from the NSF in the first project year, however significant effort is being expended to ensure we are ready for full project funding beginning in FY03. The UW is pre-funding this effort in good faith, with the expectation that costs will be reimbursed by the NSF when full funding is approved.

3.1.1 Optical Modules

Layout and Design: DOM design integration is on track through this reporting period. Three-dimensional solid drawings have been created to test the design ideas. The drawings include models of the Brantner SeaCon penetrator, and the Benthos glass enclosure, as well as the steel cable and harness components that provide support to the DOM.

Drawings both solid and two-dimensional have been created for the top and bottom half of the Mu Metal shield. The two dimensional drawings have been sent to Europe for prototype fabrication.

The design concept for mounting the internal DOM components started with the PMT selection and creation of the collar. Several photo-multipliers were physically modeled before the Hamamatsu 10" PMTs as the best choice for mechanical compatibility with the space inside the glass sphere. The PMT collar design is completed and has been released for build. Prototypes are expected by the end of February. The DOM design allows each of the circuit boards to be built with a "donut" shape rather than a "horseshoe: shape. This provides for additional board space as compared with the Amanda design.

The default selection for the High Voltage is the ISEG base. To date a complete specification document has been written for the High Voltage base. Two competing designs are in progress. Both ISEG and EMCO are on task to build components to produce the PMT high voltage.

Dark Freezer Lab: Construction of the dark freezer lab is scheduled to begin March 3 and be completed March 17. The OM Gel for 24 DOMs is here at PSL, and shipping containers with correct foam will be delivered by the end of March. Shipping foam mold is no longer required; foam is water jet cut not molded

Flasher Boards: The responsibility for development of the flasher board has been transferred from LBNL to PSL/UW.

Physical requirements for the flasher boards were examined by Kurt Woschnagg (UC-Berkeley) and Albrecht Karle (UW), and a draft requirements document created. One Flasher Board per OM will be required

Significant changes included:

(a) Higher maximum pulse intensity than the LBNL design.
(b) Wide dynamic range for the intensity (six decades)
(c) Multiple operating modes (wide low intensity mode, narrow high intensity mode, etc.)
(d) Extensible electrical and logical interface to incorporate future experimental devices

The electrical and logical interface definitions have been developed and are being incorporated into a formal engineering requirements document by the UW team. A formal approval of this interface document as well as the functional requirements document is expected shortly.

The pulser hardware development is being carried out at the Physical Sciences Laboratory. The facility include a chest-size freezer modified for light-tightness, a 10-inch Hamamatsu Photonics PMT, optics (pinholes and neutral density filters for intensity calibration), high-speed oscilloscopes (LeCroy, Techtronics), and an arbitrary signal generator.

The CPLD incorporates Dallas 1-Wire bus master and a Serial Peripheral Interface bus master to communicate with the flasher modules, and maps all the Flasher Board functions in a six-bit address space for the DOM Main Board to access. The firmware development is well under way.

We have assembled a single circuit module with a production-quality circuit board, which is ready for a full evaluation with a CPLD firmware, and are preparing a Flasher Development Board (FDB) that will allow automated testing of the flasher modules with a PC interface driven through the CPLD circuits.

We plan to calibrate the intensity of each flasher module before integration into the Flasher Control Board. A programmable memory device (PROM) is already in place in the present design, and a CPLD firmware for the PROM operation is nearly complete. An uninitiated task, however, is to develop the calibration protocols and relevant production process flow.

3.1.2 Cables/Octopus/Penetrator

A 2.5 km test cable capable of testing the operation of a full string of 60 OMs has been ordered. Octopus wires were ordered, from JDR cable systems (Houston), and 24 penetrators were ordered from Seacon-Brantner.

The design and procurement of the main cable and string hardware has proven more complicated than anticipated. It is unlikely the final cables and connectors will be available for prototype construction. It will be possible to work around this delay by using non-production materials for the purpose of prototype manufacture and testing.

Definition of the suite of special devices is nearly complete and the resulting slip ring connector requirements have been established. This subtask is not critical to prototype manufacture and test. The schedule lag will not impact critical year-one objectives.

Summary of resource adjustments:

No significant resource adjustments during this reporting quarter.

Issues / Concerns

Characterization of the short, intense LED pulses in our approach involves a precise attenuation of the pulse, followed by a well-calibrated PMT measurement. This is a non-trivial task. Our best estimate for the total light output of six LEDs fired simultaneously is 5×10^8 photoelectrons per pulse, which is within a 50% of the rather aggressive target. We have learned, however, that lowering the temperature from room temperature down to –43 °C reduces the pulse intensity by as much as a factor of eight. Thus, we are roughly a factor of 20 short of the targeted goal for maximum light output. The possible impact of this shortcoming, if it is surmountable, is being investigated by the IceCube physicists.

A fully functional flasher board is no longer projected to be delivered by early March. We are creating an interim flasher board with a fully functioning interface that communicates with the DOM Main Board to mitigate the impact of this delay.

Variance Analysis:

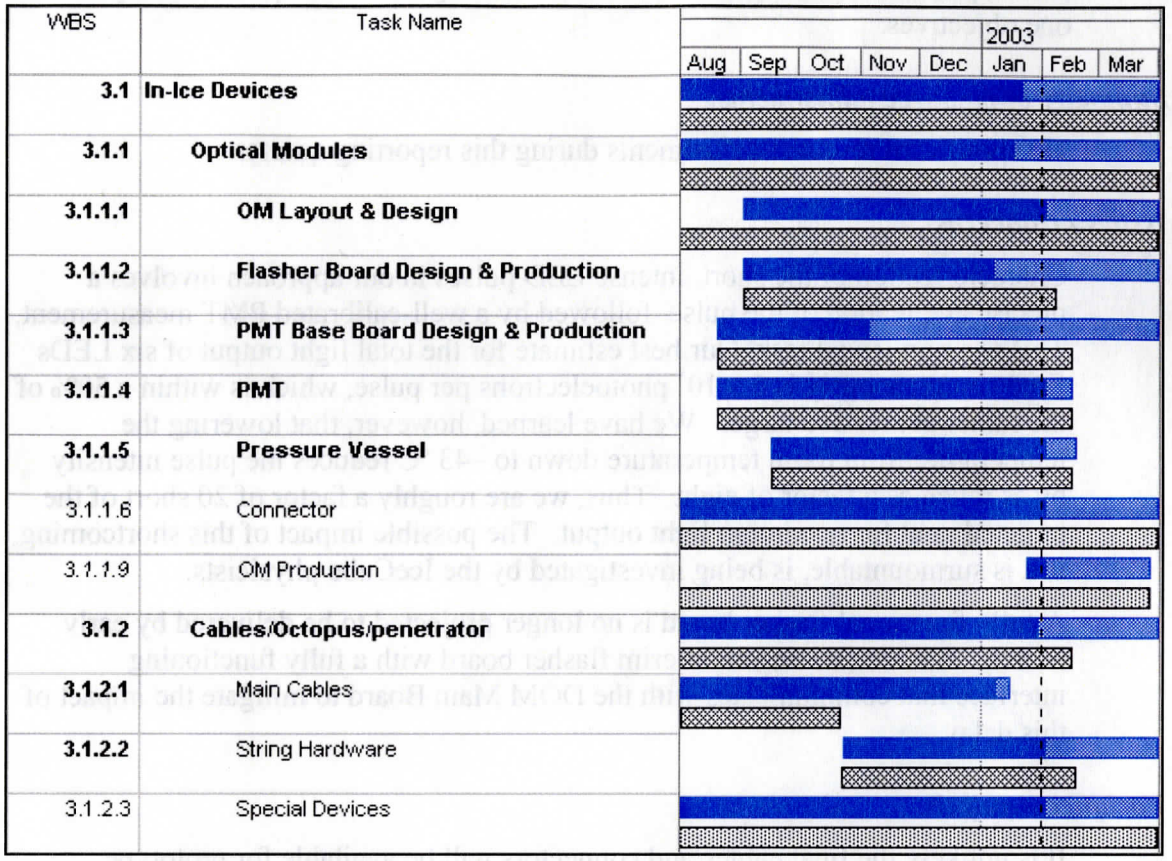
It is unlikely the final cables and connectors will be available for prototype construction. It will be possible to work around this delay by using non-production materials for the purpose of prototype manufacture and testing.

A fully functional flasher board is no longer projected to be delivered by early March. We are creating an interim flasher board with a fully functioning interface that communicates with the DOM Main Board to mitigate the impact of this delay.

The "Special Device" subtask is not critical to prototype manufacture and test. This schedule lag will not impact critical year-one objectives.

The cost variance results from thin staffing and the previously mentioned inconsistency between when procurement expenses were planned versus when they are realized.

The following schedule chart shows the baseline in black and the current schedule in blue. Progress against the current schedule is indicated by a dark blue overprint.



Level 3 Summary Charts (includes $74.2K NSF funding and $1,289.6K UW funding)