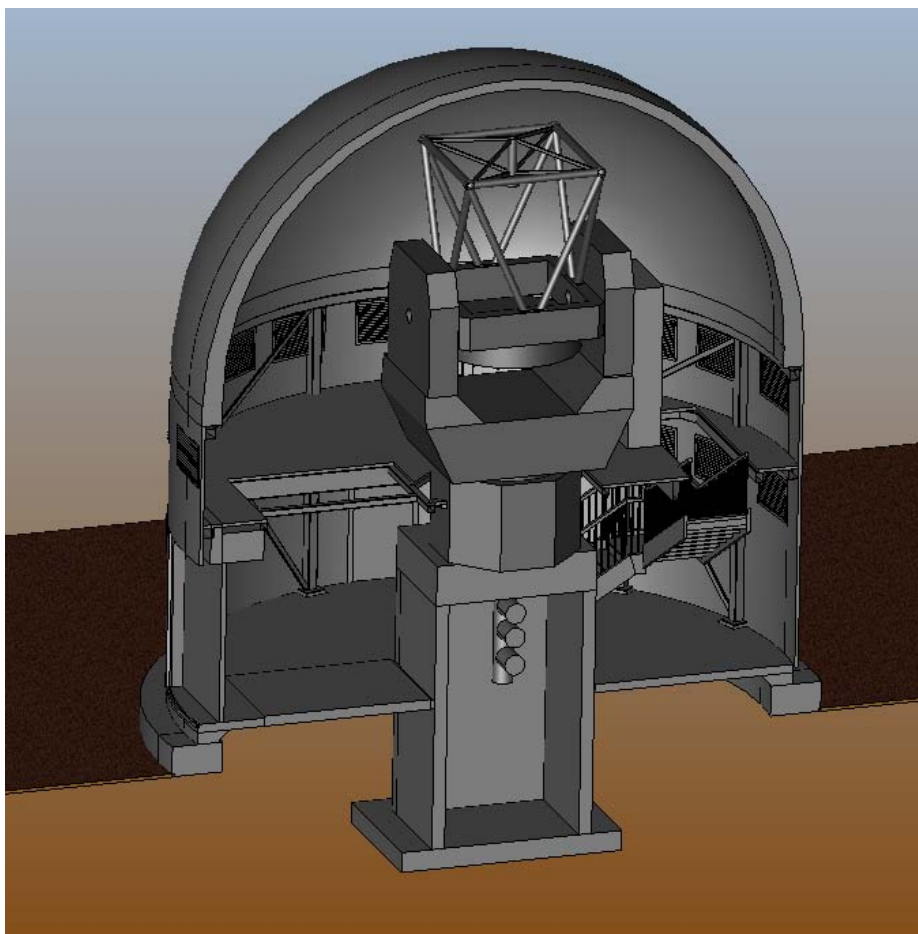




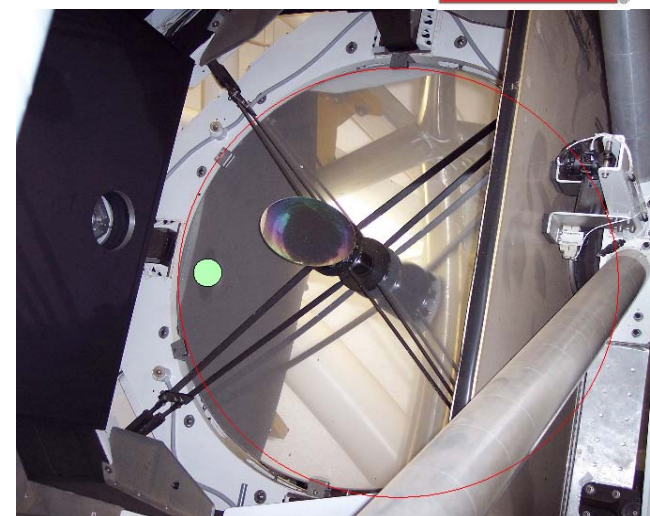
The *Kenneth J. Johnston* NPOI: Plans for the 1.8-meter Array



**P.D. Shankland, Director NOFS; M.E. DiVittorio, Chief Engineer NOFS
D.J. Hutter, Director NPOI
+ Lowell Team + NRL Team + Past players**



U.S. Naval Observatory



Upper: Current 5" Siderostat Beam compared to full use of 1.8m aperture.

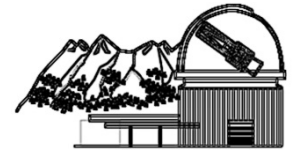
Expected optical mag limit to V~9.5

Precise Time & Astrometry





“How We Got Here”



- 2006 First Official Indication Keck Outriggers May Be Available
- 2006 Discussions with CARA/NASA Initiated
- 2007 Papers– Array defined
- 2008 Preliminary Engineering Plan Developed
- 2009 CARA Officially Offers Gift of Four 1.8m Telescopes to Naval Observatory
- 2009 USNO Visits Australia; Disposed Surplus
- 2009 6.02x10²³ Navy/CARA/NASA/EOS Lawyers later...



- 2010 U.S. Navy Officially Accepts Ownership of Telescopes, Transfer to NOFS (UNSECNAV Robert O. Work)



- 2011 Initiated Final Engineering Plan; JMAPS...
- 2012 Facility Engineering Plan Complete.
- 2012 USFS Approved; WBS/GANTT/Strawman Contracts/FISC Review
- 2012 Bulk Funded to \$10.5M/18.3M, failed in 3Q (Navy Fuel Shortage)



- 2013 Back on Table – POM for FYDP starting FY15
- 2014 Funded to \$8.5M in FY15, in POM for 10M more; Moving some left?
- 2015+ Install Cont'd – Telescope Plan, 4th Scope Plan, Integration (NRL 1.4m etc)

U.S. Naval Observatory

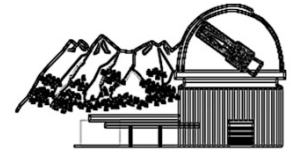
Precise Time & Astrometry





\$18.3M OMN/OPN/RDTE Install

Current FY14-16 POM Plan



FY14 UNK/TBD – Possible partial Slide from FY15 into FY14

FY15 (\$3.1M RD TEN) **** UPDATE IN FOLLOWING SLIDE***

In Core- \$2.2M civil works construction (RD TEN)

In Core- \$0.9M structures & electrical (RD TEN) In Core

OMN= Operational “Maintenance”;
1 year in FYDP
Oceanographer of the Navy

FY16 (\$0.9M RD TEN)

In Core - \$0.9M structures & electrical (RD TEN)

In Core - FY16 (\$2.3M RD TEN)

RD TEN=R&D; 2 years per...
Office of Naval Research

Above Core - \$0.2M structures & electrical (RD TEN)

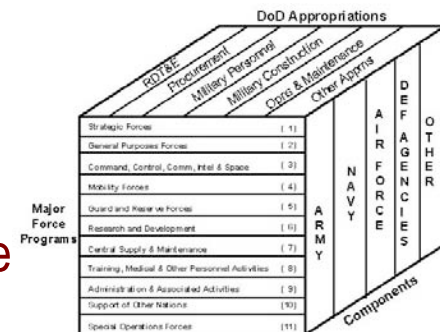
Above Core - \$0.6M COTS domes (RD TEN)

Above Core - \$0.6M new telescope control system (RD TEN)

Above Core - \$0.6M telescope installation (RD TEN)

Above Core - \$0.3M feed system upgrade (RD TEN) Above Core

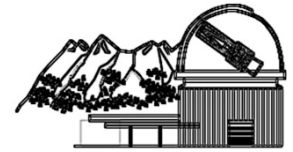
OPN=Operational Procurement
3 yrs





\$18.3M OMN/OPN/RDTEN Install

Current FY17-19 POM Plan



FY17 (\$2.0M RDTEN / \$3.4M OPN)

Above Core - \$0.2M feed system upgrade (RDTEN)

Above Core - \$0.4M Cterm metrology (RDTEN)

Above Core - \$0.5M IR beam combiners & fringe tracking prototypes (RDTEN)

Above Core - \$0.9M final array integration & test (RDTEN)

Above Core - \$2.0M AO system (OPN)

Above Core - \$1.4M IR beam combiners & fringe tracking systems (OPN) Above Core

FY18 (\$1.0M RDTEN / \$1.0M OPN)

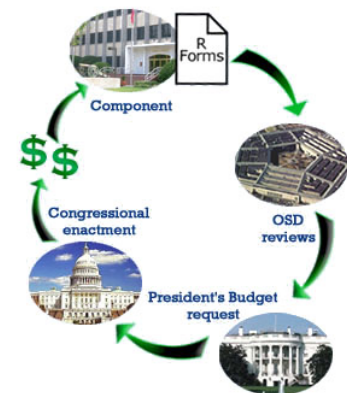
In Core - \$1.0M final array integration & test (RDTEN)

In Core - \$1.0M Upgrade lab & control building facilities (OPN)

In Core - FY18 (\$0.5M OPN / \$2.5M OMN)

Above Core-\$0.5M Upgrade lab & control building facilities (OPN)

Above Core-\$2.5M 1.8m array ops & maintenance (OMN)



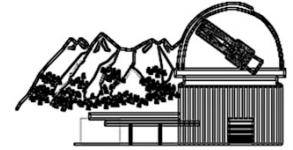
FY19 (\$2.5M OMN)

In Core - \$2.5M 1.8m array ops & maintenance (OMN) ... \$19.2M in sum





From Pentagon's Program Budget Information System (PBIS)



on 14 March 2013...

“The Oceanographer of the Navy had three issues LOCKED in PBIS this morning for the Presidential FY15 and FYDP Budget for SECDEF”

....and for NPOI:

16201 - Navy Precision Optical Interferometer, *plus-up \$8.5M* across FYDP

Notable for Fiscal Climate & SECDEF Hagel approach to Sequestration;

UPSHOT:

***Four Domes and
Infrastructure First
@ FY15 (FY14?)***

Then Telescopes...



U.S. Naval Observatory

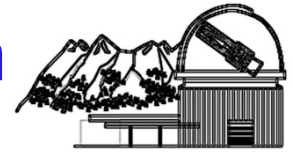
Precise Time & Astrometry





Contracted Facility Engineering Team

...to "Shovel Ready"



Project Coordination: Loven Contracting

Civil Engineering: Civil Design Engineering (CDE)

Structural Engineering: Tor Engineering

Electrical Engineering: Tor Engineering



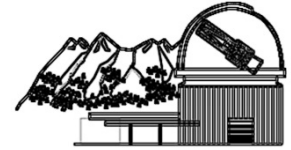
U.S. Naval Observatory

Precise Time & Astrometry





NPOI 1.8 m Facility Engineering Plan: Construction Ready Drawings



Civil: including all grading, drainage, road and fence realignment, light pipe locations and orientations, and locations of all excavations and pours.

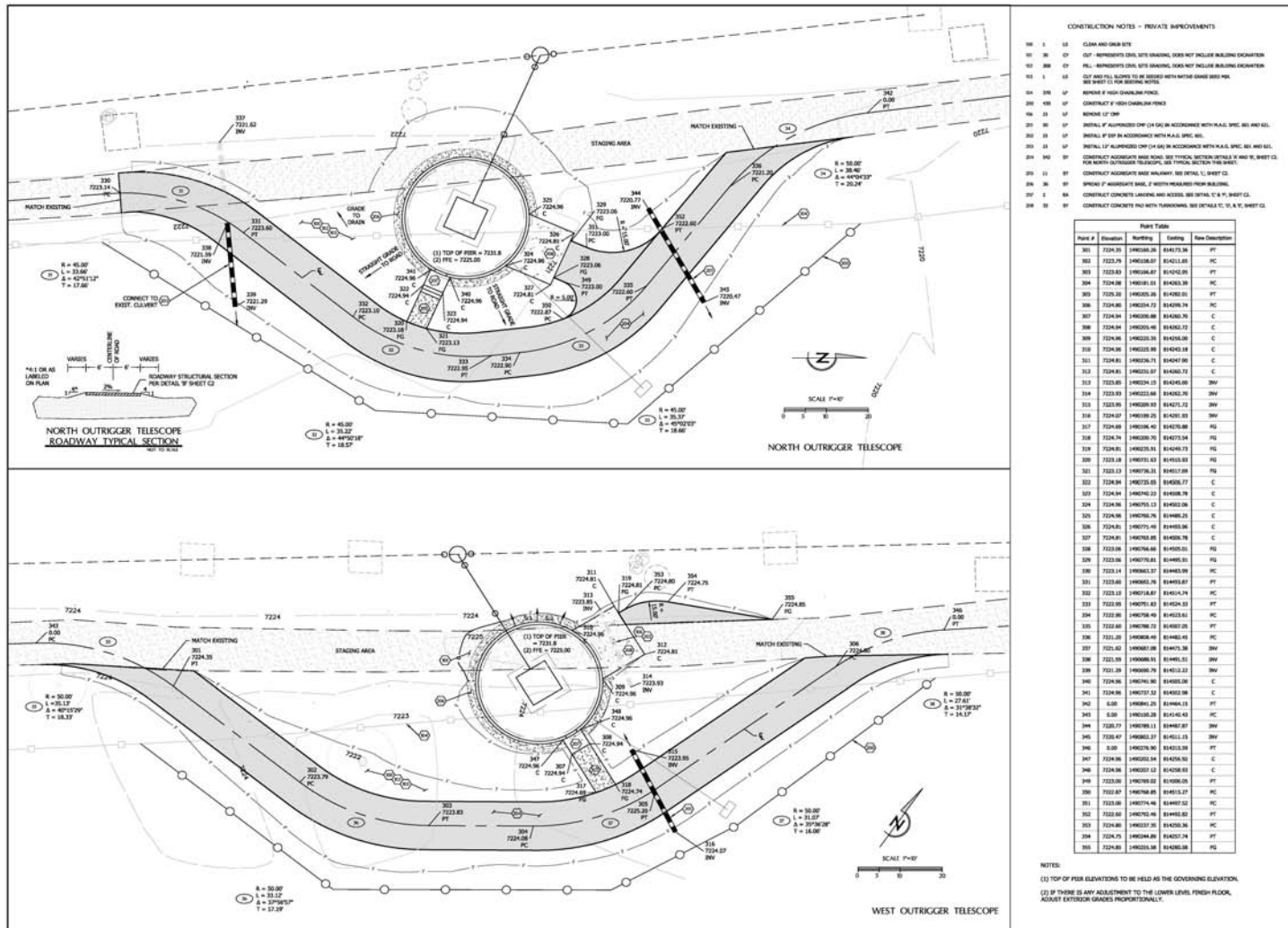
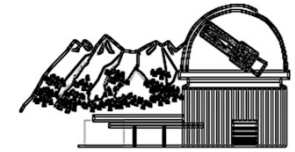
Structural: including foundation details, building structural and finish details, doors, dome, piers, flooring, stairs, decking, and ventilation louvers.

Electrical: including power feeds, disconnects, grounding, transformers, TVSS, lighting, receptacles, and special power allocation for cooling.





Civil Plan: Grading, Roads, Drainage (North and West)



CIVIL DESIGN & ENGINEERING, INC.
 P.O. BOX 30836
 FLAGSTAFF, ARIZONA 86003-0836
 PHONE (928) 522-9287

**NORTH AND CENTER OUTRIGGER TELESCOPES
 GRADING AND DRAINAGE
 PHOTOGRAPHIC OPTICAL INTERFEROMETER
 ANDERSON MESA
 FLAGSTAFF, ARIZONA**

**PRELIMINARY
 NOT FOR
 CONSTRUCTION**

1:400 SCALE
 1" = 400'-0" (VERTICAL)
 1" = 400'-0" (HORIZONTAL)

PROJECT: LONCH FLAG
 SHEET: 10-033
 DRAWN BY: JMM
 CHECKED BY: JMM
 DATE: 04/24/07
 SCALE: 1:400

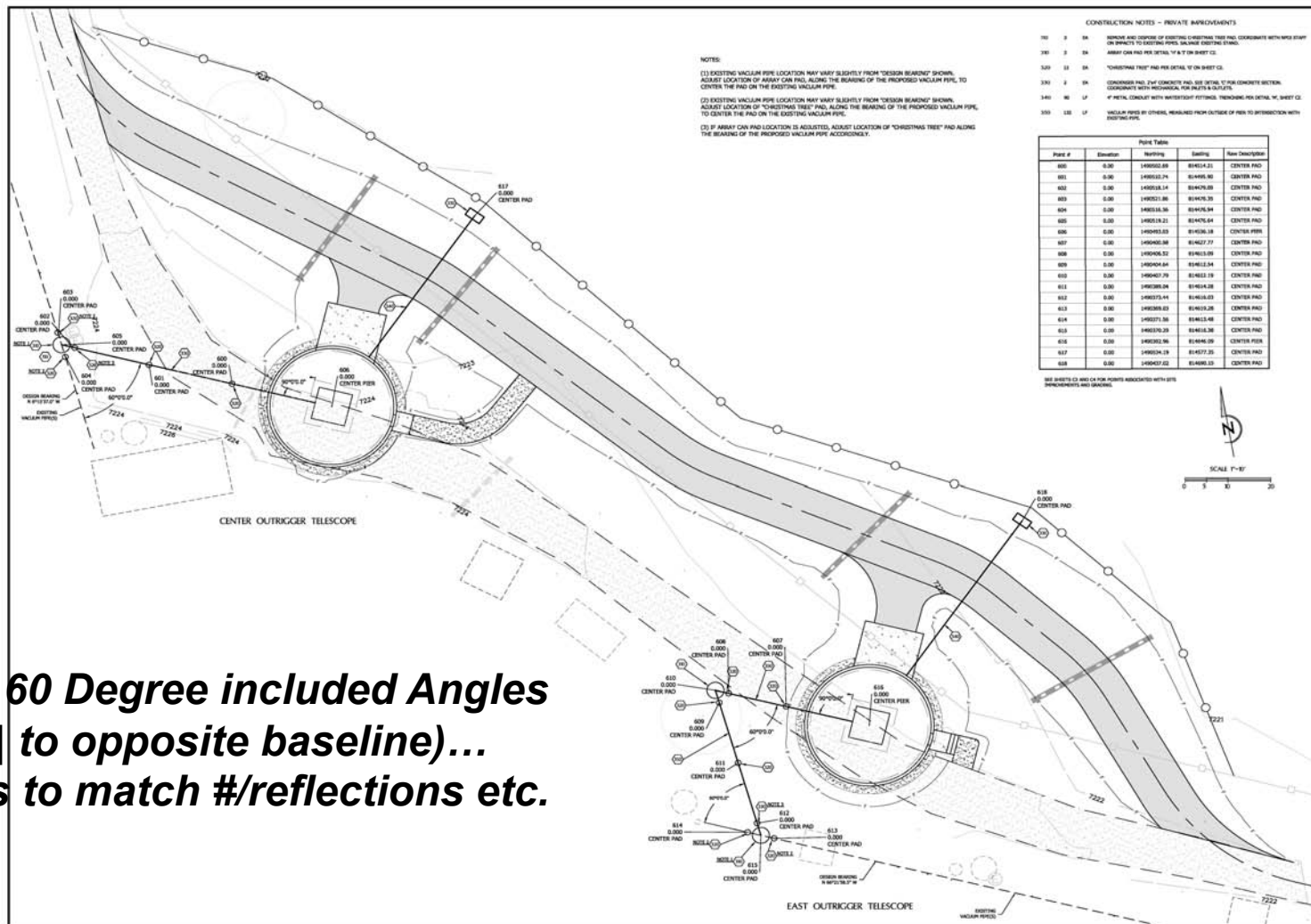
DATE: _____
 BY: _____

DATE: _____
 BY: _____





Civil Locations: Pipes and Pads (Center and East)



**Note 60 Degree included Angles
(|| to opposite baseline)...
Turns to match #/reflections etc.**

CIVIL DESIGN & ENGINEERING, INC.
P.O. BOX 30836
FLAGSTAFF, ARIZONA 86003-0836
PHONE (928) 522-9287

NORTH AND CENTER OUTRIGGER TELESCOPES
PIPES AND PADS INFORMATION
NAVAL PROTOTYPE OPTICAL INTERFEROMETER
ANDERSON, MESA
FLAGSTAFF, ARIZONA

PRELIMINARY
NOT FOR
CONSTRUCTION



PROJECT: LINDS-FLAG
SHEET # 3-013
DRAWING DATE: 08/24/10
C.D. (PWS) 0-1032090
DRAWN BY: KK
CHECKED BY: CS
DATE: 08/24/10
SCALE: 1"

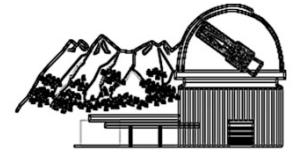
DATE: _____
DATE: _____
DATE: _____
DATE: _____
DATE: _____
DATE: _____
DATE: _____
DATE: _____





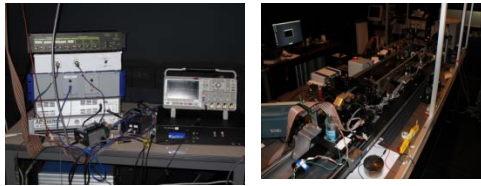
Engineering Work Done/Underway

(much AES / NRL Eng / USNO Eng / Lowell Eng)



1- Implement NOW, in advance

- Sid Control systems upgrades (AES)
- Replacing VME-based control systems (AES)
- New Fast Delay Line (FDL) controller prototype
- New Fringe Engine
- Long Delay Lines (LDL's)



2- Control Sys, IW 1.8m Upgrades:

- Modified NPOI siderostat controller using existing telescope motors and encoders (AZ Embedded Systems)
- Existing Motors and Encoders, New Motor Drivers
- Vision Back End (NSF-covered)

U.S. Naval Observatory

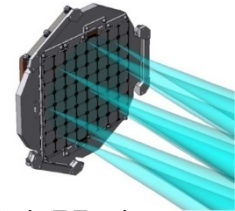
3- Vacuum Feed Pipe Installation/ Integration Acquisition:

- 5 array center cans
- 24 light pipe support stands
- 12 lengths of pipe (6m)
- 9 flats/mounts
- M7 vacuum can and window (new)

(detail next Slide)

4- Adaptive Optics:

- Test bed system built in-house (ICW USNA; in test on NOFS 1.55m)
- NGS



5- Telescope Installation:

- Reviewed proposals from "3rd party" engineering consultants for installation and commissioning

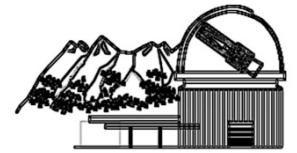


Precise Time & Astrometry





.... Assured Future... (Considering!)



U.S. Naval Observatory

Precise Time & Astrometry

