Exhibit A
Statement of Work
AURA Contract No. 0084699-GEM00383
Design Study for ExAOC

1. Scope of Work. (a) Contractor shall perform all tasks necessary to successfully develop a conceptual design for the Extreme Adaptive Optics Coronagraph (ExAOC) which meets all of the Requirements, as set forth in more detail below (the "Work").

(b) The precise scope of the Work is defined by this document (the Statement of Work), as supplemented by the Proposal. Contractor will perform the tasks described in this Statement of Work and the tasks described in the Proposal. In the event that a description of a task given in the Proposal varies from the description of the same task given in this Statement of Work, the two descriptions shall be added together to form a combined scope of work for the task (as opposed to interpreting the differing descriptions as being contradictory and thereby making it unclear what the scope of work actually is). To the extent it is logically impossible to add two different descriptions of a single task together to form an expanded scope of work then the description given in this Statement of Work will control over the description in the Proposal.

2. Contacts. (a) The primary contacts under this Contract are as follows:

AURA: Doug Simons, Associate Director for Instrumentation (the "AURA Representative")

Contractor: Bruce Macintosh (the "Design Study Manager")

(b) Contractor has designated _____ as the Design Study Scientist

(c) The Design Study Manager and the Design Study Scientist are designated as key personnel, and cannot be changed without the consent of AURA, which consent will not be unreasonably withheld.

(d) Although regular informal communications between AURA and Contractor personnel are encouraged to explore possible ideas and gather information, all communications that might be construed as direction or permission to modify any aspect of the ExAOC requirements or design, including interfaces, must be made by means of written communications between the AURA Representative and the Design Study Manager. Both parties will explain this requirement to all staff involved in this work, and will ensure that all design/requirement modifications go through the primary contacts.

(e) Contractor recognizes that the AURA Representative is the only person with authority to provide technical direction with regard to ExAOC, and that no other person, committee or board has any authority to direct or influence any aspect of the Work. In the event that Contractor receives direction or a suggestion from any other source that it feels has merit, it will

communicate the same to the AURA Representative with its recommendations, and the AURA Representative will make a decision in consultation with the Design Study Manager.

3. Requirements.

3.1. ExAOC Requirements. Contractor shall design ExAOC so that it will meet all of the following (the "Requirements"):

(a) General Description. The ExAOC is expected to provide ~0.9-2.4 μm AO corrected coronagraphic imaging of the Gemini focal plane. The coronagraph must critically sample a near diffraction-limited PSF across the entire corrected field of view of its own AO system. Like other facility instruments it will mount on either a side-looking or the up-looking port of the instrument support structure, meet space and mass constraints, and is expected to meet the standard Gemini instrument interfaces for handling, installation, services, control, and data handling. It is expected to be used with the direct beam feed from the telescope, not ALTAIR or MCAO. The coronagraph should be delivered with pipeline processing software as part of the overall instrument package in the form of IRAF or similar routines that can be called from Gemini's existing pipeline processing system.

(b) The baseline science case for ExAOC is attached to this contract as Exhibit B.

(c) Top level design guidelines for the coronagraph include:

(1) Wavelength range: 0.9 - 2.5 μm;
(2) Field of View: minimum ~3 arcsec diameter;
(3) Spatial sampling: ~0.01 arcsec imaging option or ~0.02 arcsec for IFU option;
(4) Spectral resolution: R~100 for imaging option and R~300 for IFU option;
(5) One-shot wavelength coverage: J, H, or K;
(6) Small and well characterized image distortion to support astrometry of science targets;
(7) High intrinsic strehl to yield a contrast ratio of ~10^7 (primary to companion brightness ratio) within a 0.1-1.5 arcsec radius of the central target;
(8) Built in wavefront sensor for AO compensation;
(9) Assortment of narrow and broad band filters;
(10) Full facility class system, compatible with Gemini standard interfaces, control environment, handling equipment, etc.
(11) Pipeline data processing software included with instrument for both commissioning and science observations.

(d) The instrument should also include a polarimetry mode which takes advantage of the Gemini facility polarization unit ("GPOL"). General information and specifications for GPOL is available upon request from AURA. The design guidelines listed above are intended to focus but not completely constrain the conceptual design activities. Modifications of these guidelines based on scientific, technical, or cost considerations will be considered through the design study phase of the program.

(e) Standard requirements for Gemini facility class instruments:

(1) ExAOC shall be designed to fully comply with the latest revision of the following Gemini Interface Control Documents for facility class instruments, which Contractor shall obtain and study before beginning work on the design:

General ICDs

ICD-G0013 - Gemini Environmental Requirements
ICD-G0014 - Gemini Observatory Optomechanical Coordinate System
ICD-G0015 - Gemini Facility Handling Equipment and Procedures

Science Instrument ICDs

1.1.1/1.9 Telescope Structure, Drives, and Brakes to Science Instruments ICD
1.1.11/1.9 Telescope Control to Science Instruments ICD
1.1.13/1.9 Interlock System to Science Instruments ICD
1.4.4/1.9 M2 Control System to Science Instruments ICD
1.5.3/1.9 Instrument Support Structure to Science Instruments ICD
1.6/1.9 A&G System to Science Instruments ICD
1.7/1.9 Calibration Unit to Science Instruments ICD
1.9 Science Instruments ICD
1.9/1.10 Science Instruments to On Instrument WFS ICD
1.9/2.7 Science Instruments to Facility Handling Equipment ICD
1.9/3.1 Science Instruments to Observatory Control ICD
1.9/3.2 Science Instruments to Data Handling ICD
1.9/3.6 Science Instruments to System Services ICD
1.9/3.7 Science Instruments to Thermal Enclosures ICD
1.9/3.21 Science Instruments to Environmental Monitoring System ICD

OIWFS ICDs

1.1.11/1.10 Telescope Control to On Instrument WFS ICD
1.6/1.10 A&G System to On Instrument WFS ICD
1.9/1.10 Science Instruments to On Instrument WFS ICD
1.10 On-Instrument WFS ICD

The document “Guidelines for Designing Gemini Aspen Instrument Software” will be provided by AURA to define requirements and support estimation of the cost, time, and technical aspects of developing software for new instruments at the design study level. The software ICDs listed below are provided as reference documents and are subject to change over the duration of the design study as AURA further develops its software model for facility instrumentation. In case of a conflict between requirements, the document “Guidelines for Designing Gemini Aspen Instrument Software” takes precedence. Finally, the Technical Note TN_OS_G0045 (World Coordinates) will be provided by AURA. Though not in an ICD format,

builders are required to follow the instructions in this document to conform to Gemini's World Coordinate System.

Software:

ICD-01a - The System Command Interface
ICD-01b - The Baseline Attribute/Value Interface
ICD-01c - Baseline DHS interface
ICD-02 - System Status and Alarms Interface
ICD-03 - Bulk Data Transfer
ICD-05 - Wavefront Sensing Information Interface
ICD-06 - ICS/TCS Direct Control Interface
ICD-07a - ICS Subsystem Interfaces
ICD-09 - EPICS Time Bus Driver
ICD-10 - EPICS Synchro Bus Driver
ICD-12 - Interlock System
ICD-16 - The Parameter Definition Format

(2) ExAOC shall have a total downtime of <2% of scheduled time on the telescope, with 1% as a goal. With ExAOC otherwise functioning normally, time spent pumping, cooling, or warming the instrument prior to mounting or dismounting ExAOC on the telescope is not considered down time. Where possible, component failure shall result in gradual performance degradation. Single point failures that may result in significant downtime shall be determined and, where necessary, critical spares shall be identified.

(3) ExAOC shall be designed to mount on either side or up-looking ports on the Instrument Support Structure.

(f) Contractor shall design ExAOC so that the detailed design, fabrication, integration, testing, and delivery of all hardware, software, and documentation for the instrument can be completed for a total budget (including this Contract) of USD 14,000,000.

(1) If Contractor believes at any time the total budget is likely to exceed this amount it will immediately inform the AURA Representative in writing. The AURA Representative will then work with the appropriate entities to make a decision whether to increase the budget for ExAOC, modify the Requirements, or cancel the ExAOC program. Contractor will be consulted and involved in the decision making process, but the final decision regarding how to address potential budget overruns will be made by AURA, and Contractor will follow AURA's direction in this regard.

(g) Contractor shall design ExAOC so that it uses the designs from existing instruments (e.g. NIRI, GMOS, or GNIRS) where practical to minimize the cost and development time of the instrument. The design documentation for these instruments is available upon request from AURA.

3.2. Requirements for the Conceptual Design Study. (a) Contractor shall develop the science case for ExAOC. This will include an estimate of the ExAOC sensitivity on Gemini, so that the technical viability of different ExAOC science programs can be evaluated.

(b) Contractor shall perform design trade studies of different technical approaches to the instrument to assess cost/benefit options. This will include but not be limited to:

(1) Optical design trades between field of view and plate scale for a diffraction limited point spread function produced by the Gemini telescope from 1-2.5 μm;

(2) Wavefront sensing options, balancing trades between guide star sky coverage, sensitivity, and pick-off mechanisms while preserving the field of view of the science detector assembly;

(3) The use of either dual channel imaging for spectral differencing or an integral field unit as part of the optical assembly to help discriminate against systematic PSF errors

(4) Recommended filter complement;

(5) Baffling schemes vs. opto-mechanical layout;

(6) Assessment of manufacturing risks for key optical or mechanical components; and

(7) Trades between cooling loads, weight, and mechanical flexure in the overall assembly given the 2000 kg mass limit for the instrument.

(c) Contractor shall develop and document the conceptual optical, mechanical, electronic, and software designs of ExAOC, including the detector, its mounting, wiring, and controller. In preparing this conceptual design, Contractor will estimate the design and fabrication cost of each design element, and track the overall instrument cost as the design is prepared, so as to ensure that the conceptual design can be completed for the amount given in paragraph 3.1(f), above.

(d) Contractor shall develop and document a management plan for the remainder of the effort necessary to design, fabricate, integrate, test, and deliver ExAOC (the "Management Plan"). In preparing cost estimates for the detailed design and fabrication of ExAOC, Contractor shall make the following assumptions:

(1) AURA will not be responsible for providing any hardware for ExAOC other than the items listed in section 4.5, below.

(2) If AURA decides to proceed with ExAOC after the Conceptual Design Review, the remainder of the work will be in the form of a direct contract with AURA for the detailed design, critical design review, fabrication, integration, testing, and delivery of the instrument.

(3) Contractor will be responsible for any file format conversions of AURA provided drawings into a format usable by Contractor.

(4) Any special-purpose equipment purchased with AURA funds that is required to operate or maintain the instrument will be delivered to AURA at the completion of the work.

4. Specific Tasks and Deliverables.

4.1. Initial Operational Concept Definition Document. (a) Contractor will develop the operational concept model for the ExAOC based on the Requirements and discussions with AURA, and shall prepare an Initial Operational Concept Definition Document (Initial OCDD) which presents the science cases for which the coronagraph will be designed, relate these to the Requirements, and discuss the key functional and performance requirements that the concepts must meet.

(b) The Initial OCDD will also identify and discuss the key operational scenarios of the ExAOC instrument, especially in terms of the requirements the proposals will place on other parts of the Gemini system. These scenarios should be described in sufficient detail for a technically and scientifically skilled, but non-expert, audience to understand.

(c) A draft Initial OCDD will be prepared by Contractor and submitted to AURA for review and comment by the date specified in the Schedule. This draft Initial OCDD will have a complete table of contents, a first draft of all sections, and some sections in nearly final form to indicate the organization and level of detail of the document, but will not necessarily be complete. Contractor will promptly incorporate into the Initial OCDD all changes requested by AURA that would be necessary to make it consistent with the Requirements.

(d) Contractor will deliver the completed Initial OCDD to AURA by the date specified in the Schedule, and AURA shall promptly review it. Contractor will incorporate into the Initial OCDD all changes reasonably requested by AURA which are necessary to make it consistent with the Requirements, and shall submit the revised Initial OCDD to AURA for approval.

4.2. Initial Functional and Performance Requirements Document. (a) Contractor will develop the functional and performance requirements that the components of the ExAOC instrument will have to meet in order for the instrument to meet the requirements of the Initial OCDD and the Requirements, and will prepare an Initial Functional and Performance Requirements Document (Initial FPRD) that describes these requirements.

(b) Contractor will describe the origin of each functional and performance requirement described in the Initial FPRD, so that users of the Initial FPRD will be able to determine why each functional and performance requirement was included.

(c) The Initial FPRD must clearly state Contractor's assumptions regarding the characteristics or performance capabilities of the other parts of the Gemini system.

(d) A draft Initial FPRD will be prepared by Contractor and submitted to AURA for review and comment by the date specified in the Schedule. The draft Initial FPRD will have a complete table of contents, a first draft of all sections, and some sections in nearly final form to indicate the organization and level of detail of the document, but will not necessarily be complete. Contractor will incorporate into the Initial FPRD all changes requested by AURA that would be necessary to make it consistent with the Requirements.

(e) Contractor will deliver the complete Initial FPRD to AURA by the date specified in the Schedule, and AURA shall promptly review it. Contractor will incorporate into the Initial FPRD all changes reasonably requested by AURA which are necessary to make it consistent with the Requirements, and shall submit the revised Initial FPRD to AURA for approval.

4.3. Conceptual Design Documentation. Contractor shall prepare conceptual designs for the ExAOC which will meet all of the Requirements, and shall perform all analyses reasonably required to demonstrate that these concepts will meet all of the Requirements. The conceptual design shall be set forth in a set of documentation (the "ExAOC Conceptual Design Study Documentation") delivered to AURA by the date given in the Schedule, which shall include, but not be limited to the following materials.

4.3.1. Special Issues. Descriptions of the outcome of analysis of specific issues identified in the design study proposal, such as technology development and key cost/performance trades.

4.3.2. Science Case.

(a) A science driver summary including predicted planet detection statistics, corresponding observing time needed to complete those statistics (e.g., how many planets will be detected with 1000 hours of observations), and any non-planetary science objectives..

(b) A list of top level instrument requirements, derived from the science case.

(c) A list of science team members with descriptions of their relevant experience.

(d) A description of sample science applications with the instrument, e.g. as mini observing proposals derived from the OCDD. Also, a summary of the fall-back science if the achieved contrast ratio is 10^{-5} or 10^{-6}.

(e) A description of key risks to completing the primary science goals, e.g. due to detector limitations, target uncertainties, etc. Also an estimate of the number of false detections due to background objects.

(f) Results of simulations of the instrument's performance and/or model target properties (e.g., sky densities, brightness distributions, contrast ratios, etc.), all with the intent of quantifying, to the extent possible, the predicted instrument performance level. A description of the model's components should also be given, e.g., assumptions made about the turbulence

profile, scintillation, speckle, noise propagation in the reconstructor, pupil effects (edge, spider, and rotation), system flexure, servo delays, vibration, calibration limitations including non-common path errors, scattered light, ghosting, pupil apodization, atmospheric dispersion correction, polarization, telescope static errors, etc.

4.3.3. Design Details.

4.3.3.1. Systems Engineering.

(a) A description of priorities in balancing science vs. performance trades.

(b) Results of analyses and trade studies performed during the conceptual design.

(c) A summary of initial opto-mechanical error budgets, keying on particularly difficult or challenging tolerances, e.g. centration or tilt of optical components.

(d) A summary of the use of existing component designs (hardware or software) in the instrument as a means of reducing risk and development time.

(e) Provide the initial OCDD and FPRD, including a compliance summary between the conceptual design and the FPRD.

(f) These reports will include any recommendations for modifying the instrument requirements from those described in the RFP/Proposal and the rationale for doing so.

4.3.3.2. Optical Design.

(a) A depiction of the general layout of the optical components.

(b) A description of optical mounting schemes, e.g. approach used to mount cryogenic lenses, filters, etc.

(c) A description of key risks associated with the optical design, e.g. availability of large boules of optical material, uncertainties in cryogenic properties of optical materials, etc.

(d) A summary of expected image quality through spot diagrams and encircled energy plots at points across the instrument's entire field of view.

(e) A summary of the filters that will be provided with the instrument and coatings that will be used on all optical materials (reflective and transmissive).

(f) A description of the initial throughput and emissivity budgets for various configurations.

4.3.3.3. Mechanical Design.

(a) A schematic overview of all subassemblies in the mechanical layout:

(1) Cold bench;
(2) Filter wheels;
(3) Shutter;
(4) Cryostat;
(5) Other significant subassemblies

(b) Conceptual level designs (3D models) for the main subassemblies:

(1) Cryostat;
(2) Space Frame;
(3) Cold bench;
(4) Representative mechanisms;

(c) Description of common aspects of mechanical designs (e.g., use of feed throughs, bearings, motors, etc.)

(d) Outline of instrument integration procedure to verify that there are no significant challenges.

(e) Analysis showing there are no significant instrument handling or space envelope issues with the design as conceived.

(f) A first order analysis of the predicted thermal performance of the instrument:

(1) Cool down time and steady state operating temperature;
(2) Number and size of cold heads needed;
(3) Other important performance factors.

4.3.3.4. Electronics.

(a) An overview of the electronic systems needed to operate the instrument.

(1) Description of approach to controlling stepper motors, actuators, etc.;
(2) Estimate of the number of separate control systems the electronics design must support;
(3) A summary of the use of commercial vs. custom boards;

(b) A general layout and wiring scheme for major electronic components.

(c) A description of the initial detector subsystem design, indicating approach to meeting detector requirements using either a commercial or custom array controller (speed, noise, etc.).

(d) Discussion of grounding strategies, keying on differences between (low noise) detector electronics vs. mechanisms, communication systems, etc.

(e) Recommendation of what currently available detectors could be used in the instrument to satisfy as many of the ExAOC performance requirements as possible.

(f) Discussion of any specific detector issues that need to be addressed, e.g. detailed lab characterization and optimization, risks if new detector development is needed, etc.

(g) Description of risks and mitigation strategies with particularly challenging aspects of the electronics/detector systems.

4.3.3.5. Software.

(a) Description of the software functional requirements needed to support the science case, FPRD, and OCDD. Also a summary of how the AURA software requirements will be met with the proposed software design.

(b) Description of the hardware platform(s) planned along with the software architecture and physical layout of major instrument software components. Describe any additional hardware required.

(c) Description of the overall software design including information on existing software that may form the basis of the instrument software. Describe any external interfaces to third party products. Focus on types of communication between software components and protocols.

(d) Description of how the proposed software will operate within the Gemini environment. This should include block diagram level illustrations of major software subsystems depicting communication pathways and data flows.

(e) Description of required development platforms and tools pointing out what will need to be acquired.

(f) A summary of the algorithms and tools required for developing the software needed to process instrument data. This section should show how the proposed software works with the Gemini OLDP system. Mention already existing processing software that may be used and dependencies on third-party software or commercial products.

(g) Description of the software (including data processing software) development and delivery schedule as part of the overall description of management and cost estimates. Indicate points in the software schedule where collaborative testing between AURA and Contractor will occur.

4.3.4. Management Plan. The Conceptual Design Study Documentation shall include a separate Management Plan for the remainder of the work for ExAOC. The Management Plan shall cover all of the remaining work necessary to design, fabricate, integrate, test, and deliver ExAOC. This Management Plan shall include the following elements:

(a) Description of the development and delivery schedule for the instrument, using Gantt charts to identify all tasks, links between key tasks, milestones, etc.

(b) A Work Breakdown Structure (WBS) prepared in Microsoft Project or equivalent software detailing all of the tasks necessary to design, fabricate, integrate, and test, the instrument, with sub-tasks described down to the third level. Each WBS element should have a duration, cost, manpower required, and resources required. This information can be in a separate document keyed to the task numbers.

(c) A list describing the manpower, equipment, space, and other resources that will be needed to complete the work. This list must be based upon the WBS, and must include the estimated cost with a margin of error, the source of cost information, dates required, and any additional information about the resources availability.

(d) A procurement list describing all of the components and materials that will need to be purchased. This list must have the description of the component/material, the estimated quantity with a margin of error, the estimated price with a margin of error, a description of the source of pricing information, and the date the procurement will need to be initiated.

(e) (1) A budget, and total fixed price, and payment plan using performance based milestones, for performing the remainder of the work necessary to fully complete the baseline Instrument. This must be based on the data in the WBS, the procurement list, and the resources list, and must include an overall margin of error. The total fixed price proposed in the Management Plan for the remainder of the work to design, fabricate, and test the instrument will constitute a binding proposal by Contractor to complete the instrument for the amount proposed.

(2) This fixed price proposal shall be based on the assumption that the contract to complete the instrument would be substantially similar to the draft contract for instrument completion negotiated by the parties during the course of the Work. AURA will prepare and provide an initial draft of the completion contract to Contractor within 30 days after the Start Date and the parties will reach agreement on terms of the draft contract by no later than 30 days before the due date for the Conceptual Design Study Documentation. In the event that the parties cannot agree on the terms of the draft contract, the initial draft prepared by AURA shall be used as the basis for the fixed price proposal to complete the Instrument.

(f) Fixed price proposals for various options beyond the baseline Instrument.

(g) Any qualifications to the proposed fixed price or schedule for completing the instrument, such as proposals for cost, functional, or schedule contingencies which are believed

necessary for specific program areas. For each contingency there should be an explanation of why it is needed and a proposal for:

(1) When and how key decisions will be made regarding invoking the contingency;
(2) How much should be set aside for each cost contingency;
(3) What the fallback performance specification is for functional contingencies;
(4) The amount of time for schedule contingencies.

(h) A summary of the overall project team organization (org-chart) and description of how that team meshes within the home institution's structure. Include CVs for core team members.

(i) A description of the management techniques that will be used to ensure that Instrument is completed on schedule and on budget. This should include descriptions of the roles and responsibilities of each team member, an organization chart, and what mechanisms will be used to track schedule and budget as the work progresses.

(j) A summary of facilities available to work on the instrument (labs, shops, etc.).

(k) Description of key milestones in the development plan, e.g. availability of detectors, deformable mirrors, complex mechanisms, etc.

(l) Description of how resource loading will be managed and summarize the availability of manpower, shops, labs, etc.

(m) Description of the approach used for quality control throughout the design, fabrication, and test phases.

(n) Summary of how documentation will be managed (e.g., use of Web pages, drawing control, part procurement and tracking, etc.)

(o) Discussion, given all of the above, of key risks to schedule, performance, cost of the instrument and proposed mitigation strategies, to the extent not covered in other sections.

4.3.5. Outline of Conceptual Design Study Documentation. Contractor shall prepare an outline of the Conceptual Design Study Documentation and deliver the same to AURA for review by the date given in the Schedule. This outline shall contain enough information to allow AURA to evaluate Contractor's general design approach, the proposed individual documents and drawings to be included in the Conceptual Design Study Documentation, and the general format of the documents and drawings. Within three weeks after receiving this outline, AURA shall provide Contractor with comments and suggestions regarding the form and contents of the Conceptual Design Study Documentation.

4.4. Conceptual Design Study Review. (a) Contractor shall present the results of the conceptual design study to the review committee at the Conceptual Design Study Review, as provided in more detail below.

(b) AURA will call and conduct the Conceptual Design Study Review. AURA will select a review committee chair in consultation with Contractor and shall select the review committee members with the concurrence of the review committee chair.

(c) Five copies of the Conceptual Design Study Documentation will be delivered to AURA, and one copy each will be delivered to the review committee members, at least two weeks before the date of the Conceptual Design Study Review.

(d) The Conceptual Design Study Review will be held at the Gemini office in Hilo, Hawaii.

(e) AURA shall be responsible for all travel expenses of review committee members and up to four members of each design study team coming to Hilo for the review.

(f) Within ten working days after receipt of the review committee report, AURA and representatives of Contractor will produce a written report, based on the verbal and/or written input from the review committee, containing a list of proposed actions (the Review Actions).

(g) Within ten working days of receipt of the Review Actions, Contractor will produce a response to this report (the Review Response), that includes what actions Contractor intends to take for each issue raised in the Review Actions, when the actions will be completed, and Contractor's position as to which of the proposed actions are within the scope of the Work. For actions that are considered by Contractor to be outside the scope of the Work, Contractor will provide a cost to AURA of including the action with the Work.

(h) Within ten days of receipt of the Review Response (including the cost of work believed to be out of scope by Contractor) by AURA, AURA may direct that changes be made to the Conceptual Design Study Documentation that are required to make it consistent with the Requirements. Contractor will promptly comply with all such direction, and will complete the changes within a reasonable period of time (nominally 30 days).

(i) The Conceptual Design Study Review is advisory, and shall not relieve Contractor of any responsibility for the successful completion of the Work in conformity with the Requirements. Similarly, the Conceptual Design Study, including comments made during the review, can not waive any of the Requirements or relieve Contractor of any obligations under this Work Scope.

4.5. Gemini Furnished Items. AURA will loan the selected instrument team the following equipment for the follow-on contract for the design/fabrication phase of the work, which equipment will be returned to AURA when the instrument is delivered. It is listed here for budget planning purposes during the design study.

(a) Two cooled electronics enclosures

(b) PCI or VME Symmetricom time-bus module.

(c) Cisco 2950C-24 switch

(d) Perle Terminal Server

(e) Documentation delivered with the above components when purchased by AURA.

5. General Tasks and Responsibilities.

5.1. Progress Reports. By the fifteenth day of each month Contractor will submit written progress reports to AURA describing the technical, schedule, and financial progress of the Work as of the end of the previous month. These reports will include:

(a) information regarding the technical status of the Work;

(b) an updated schedule to consist of the most current project plan to completion. This plan will be maintained in Microsoft Project, or equivalent;

(c) a list of the major milestones with the original, previous, and current date by which they will be attained - any significant changes from the previous date will be explained, and each subsequent list will include all the explanations from previous lists;

(d) problem areas related to the Work, including potential for delays;

(e) action items for AURA and Contractor (both open and closed), and associated status; and

(f) proposed changes in key personnel.

5.2. Meetings. The fixed price for the Work include the costs of attending agreed meetings. AURA may request that Contractor present information related to the Work before additional review committees from time to time. AURA will provide at least thirty days notice of these reviews to allow for preparation of materials. AURA will use its best efforts to phase the information required for additional reviews with the Work. Unless AURA pays the additional direct costs of Contractor's attendance at additional reviews, Contractor is not bound to attend.

5.3. Access by AURA. Contractor will grant AURA personnel access at reasonable times to all places where the Work is being performed, including access to locations where Contractor's subcontractors are performing any part of the Work.

5.4. Delay. Contractor will promptly notify AURA in writing of any event which may result in a delay in performance or completion of the Work. Contractor will not be liable for delays in performance or completion of the Work that are a direct result of causes beyond its reasonable control, and not otherwise due to its willful misconduct or negligence. Contractor will, however, resume performing the Work in a manner to expedite the original schedule for completion of the Work to the extent reasonably possible promptly upon termination of the cause of such delay.

5.5. Information Transfer. AURA and Contractor shall respond to requests for information related to this Work Scope in a timely fashion. All such requests for information will specify a date by which said information is required. Each party will use its best efforts to provide the requested information by the date requested.