Smithsonian
National Air and Space Museum

Exhibit Maintenance Plan – Final Report

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1. Overview of Project

1.1 Charter and Team Validation

During the Exhibit Maintenance Plan (EMP) charter development, a problem statement was established to identify the perceived maintenance issue at the National Air and Space Museum (NASM).

Problem Statement:
NASM currently has a reactive rather than proactive approach to exhibit maintenance. Multiple organizations are involved, resulting in gaps or uncertainty in maintenance responsibilities. In the past, funding for maintenance of exhibits has been associated with initial exhibit donor funding and is often the first activity cut or reduced when exhibits run over budget. While a maintenance line-item was placed in the Federal budget in FY13, a lack of coordinated planning and requirements development has resulted in inadequately maintained NASM exhibits, which negatively impacts the visitor experience.

EMP Charter Available on the V Drive HERE

Following the sign off of the Team Charter and Action Plan on January 5, 2017, the Exhibit Maintenance Team Co-Chairs and Project Manager reached out to maintenance provider and stakeholder groups to request department representation. In February, team members were established, a schedule was compiled, and an action plan was drafted. All foundation team information was provided to the full Exhibit Maintenance Team (EMT) at a kickoff meeting on March 8, 2017.

Maintenance Team Members:

Co-Sponsors: Rick Flansburg, Francisco Torres
Co-Chairs: David Cremer, Jim Evans
Beatrice Mowry, Exhibits Design
Alex Van Ness, Exhibits Technology
Ryan Doyle, Office of Facilities Management and Reliability (OFMR)
Denise Upson, OFMR
Rick Fary, OFMR
Malcolm Collum, Conservation
Ashlee Prevette, Project Management

Maintenance Stakeholders:

Marcy Borger, Collections Processing Unit (CPU)
Anne McCombs, Preservation and Restoration Unit (PRU)
Matthew Horton, Education and Public Engagement (left NASM September 2017)
Alan Smith, Security
Rose Soldano, Visitor Services
Larry Burke, Curators
Jim David, Curators

1.2 Current Conditions Report

To establish the Museum's current conditions for maintenance, the Co-Chairs and Project Manager held individual department meetings with all maintenance team members and stakeholders. To guide the conversation, an input questionnaire was distributed to all team members ahead of their scheduled meeting. Questions included information on current responsibilities in maintaining exhibits spaces, assessment and tracking of maintenance requirements, current resources in annual budget and staffing for maintenance, maintenance best practices, and an overall assessment of the department's current condition and maintenance practices.

Through the individual department meetings, further information on standard operating procedures and other key maintenance functions was gleaned from the members and stakeholders. The team members and stakeholders reviewed and validated a chart of current responsible units for various maintenance work areas.

As established in the charter, the Current Conditions Report included the following information:

Determine current responsibilities of each organization (any gaps and/or overlaps), frequency of assessments, annual budget expended (and staff time) dedicated to maintenance, obvious shortcomings to include visitor comments, electronic interactives regularly down for maintenance, maintenance requirements dismissed due to lack of funding or staff, etc. Identify best practices.

The full EMT reviewed a draft of the Current Conditions Report and provided input. The final Current Conditions Report was circulated on May 5, 2017.

Current Conditions Report available on the V Drive HERE

1.3 Interim Recommendations + Draft Final Report

Using the findings of the Current Conditions Report as a framework, the EMT conducted focused meetings on maintenance areas that required further analysis.

Through a coordinated effort with the EMT, a document of Interim Recommendations and Draft Final Report was circulated on July 31, 2017. In addition to interim recommendations, the report highlighted corrective actions for organization gaps and was intended to set up the framework for this final report.

Following submittal of the interim recommendations a refined outline of final report table of contents was provided to the Co-Sponsors.

Interim Recommendations available on the V Drive HERE

1.4 Final Report

Per the team charter, the task of the EMT for this final report is to:

Provide a final report and recommended implementation plan. The EMP will include implementation recommendations for the Revitalization period so as to ensure current exhibits are adequately maintained. For Post-Revitalization, to ensure adequate maintenance assessments, funding, and procedures to maintain new exhibits – both during National Mall Building (NMB) renovations and after.

1.4.1 Final Report Executive Summary

Since its charter in January 2017, the EMT has endeavored to evaluate current conditions for maintenance, develop interim recommendations to address organizational gaps, and establish an implementation plan for a more proactive approach to exhibit maintenance. As a result of this integrated process, the EMT recommends that the following actions be implemented:

- Utilize SKYNET to develop an Exhibits Maintenance directory with links to maintenance providers, work generation systems and status updates (i.e. exhibits removed/down for repair, major component repairs/maintenance actions, etc.)
- Establish a centralized tracking system capable of displaying real-time status of exhibits maintenance actions
- Submit an FY2020 Smithsonian budget request to fund maintenance federally; utilize budget estimate included in this document that outlines requirements for proactive maintenance
- Realign maintenance providers as outlined in the recommended conditions by work area chart below; major recommendations include utilizing a contract cleaner for high artifact cleaning at the NMB and service contracts for exhibit case refurbishment and relamping/repair of track lighting at UHC

2. Areas of Responsibility

2.1 Current Conditions + Recommended Updates

As submitted in the current conditions report, the current responsible units are listed below by maintenance area. Recommended updates to responsibilities are highlighted in light blue below.

Area	NMB	UHC
Gallery	**Current Responsible Unit**	**Current Responsible Unit**
Artifact Cleaning (High)	Artifact Cleaning Crew Cleaning Contractor (Recommended)	Artifact Cleaning Contractor (CSI)
Artifact Cleaning (Low)	Artifact Cleaning Crew and Volunteers	Artifact Cleaning Volunteer
Artifact Specialized Cleaning/Repair	Conservation/Preservation and Restoration Unit	Conservation/Preservation and Restoration Unit
AV Repairs /Maintenance	Exhibits Technologies	UHC based Information Technologies Exhibit Technologies (Recommended)
Ceiling Tiles	OFMR	N/A
Emergency Exit Signage/Lighting	OFMR	OFMR

Exhibit Component Cleaning	Artifact Cleaning Crew	GAP Cleaning Contractor (Recommended)
Exhibit Component Repairs /Maintenance	Exhibits Production	Exhibits Production
Exhibit Lighting - Lamp Replacement	Exhibits Technologies	Exhibits Production Contract (Recommended)
Exhibit Case Lighting - Repairs/Lamps	Exhibits Technologies	Exhibits Technologies Contract (Recommended)
Exhibit Wall Repair/Painting	Exhibits Production	N/A
Floor Surface Cleaning	OFMR	OFMR (Contractor-Meridian)
Floor Surface Repair/Replacement	OFMR (via cost reimbursement)	OFMR
Gallery Emergency Exit Door Surface	OFMR	OFMR
Gallery Notification Speaker System	Exhibits Technologies	N/A
Gallery Work Lights	OFMR	N/A
Common Areas (Corridors, Atrium Galleries)		
Balcony Label Cleaning	Artifact Cleaning Crew	GAP Cleaning Contractor (Recommended)
Bench Placement/Cleaning	OFMR	OFMR (Contractor -Meridian)
Bench Repairs	OFMR	OFMR
Ceiling Tiles	OFMR	Office of Facilities Management
Donation Box Cleaning	GAP Artifact Cleaning Crew (Recommended)	GAP Cleaning Contractor (Recommended)
Donation Box Repairs	Exhibits Production	Exhibits Production
Education/Event Signage	Education Department	Education Department
Emergency Exit Signage/Lighting	OFMR	OFMR
Entrance Door/ Window Cleaning	OFMR	OFMR (Contractor-Meridian)

Floor Surface Cleaning	OFMR	OFMR (Contractor-Meridian)
Floor Surface Repair/Replacement	OFMR (via cost reimbursement)	OFMR (via cost reimbursement)
Gallery Signage Cleaning	GAP	GAP
	Cleaning Contractor (Recommended)	Cleaning Contractor (Recommended)
Notification Speaker System	Exhibits Technologies	UHC based Information Technologies
Overhead Lighting	Artifact Cleaning Crew	OFMR
Railing Cleaning	OFMR	OFMR (Contractor-Meridian)
SE Signage/Kiosk/Displays	Smithsonain Enterprises	OFMR
Stairwell/Elevator Cleaning	OFMR	OFMR (Contractor-Meridian)
Stanchion Movement	OFMR	OFMR
Task Lighting (Exhibit, Banner, etc.)	Exhibits Technologies	Exhibits Production
		Contract (Recommended)
Trash/Recycling Bin Placement	OFMR	OFMR
Wall Repair/Painting	OFMR	OFMR
Welcome Center/Video Wall Cleaning	OFMR	OFMR (Contractor-Meridian)

3.0 Maintenance Focus Areas

3.1 Gallery Areas (NASM Identified Responsibilities)

3.1.1 High Artifact Cleaning

NMB

The Artifact Cleaning Crew (Conservation Unit) focuses on the cleaning artifacts that are displayed outside of exhibit cases and primarily the large and suspended objects. The crew is comprised of four NASM Exhibit Specialists and a supervisor. The artifact cleaning crew staff are expected to operate one-person lifts, boom lifts, and scissor lift to reach exhibit components and objects. Proper cleaning regimen, condition reporting, and hazards are outlined in their SOP (MPP-0000). All staff work from a NMB Cleaning Schedule (document) to ensure the cyclical cleaning and staff assignment to objects within the building. This Cleaning Schedule is based on a Cleaning Frequency Sheet. The artifact cleaning staff has also implemented a weekly team cleaning of a single gallery, one day per week. The priority is often prompted by upcoming special events or photography of specific artifacts. The current annual budget for this effort is $5,000.

Challenge: Operating Hours and Staffing

The identified gaps include staffing and ancillary duties that detract from the unit's primary focus directly attributing to a compromised cleaning frequency. The narrow window of opportunity for

much of this work to take place before the museum opening is also a contributing factor. High artifact cleaning involves the time-consuming movement and placement of lift equipment to reach the object. There has been a significant reduction in staff over the years mostly through lack of succession planning and funding. Adequate coverage will continue to be an issue as most staff in this department are eligible for retirement. While artifact cleaning is the unit's primary focus, other duties include the cleaning of exhibit components as well as most aerial and forklift operations for non-cleaning activities. Artifact cleaning staff are often diverted for lift operator support for various groups (OFMR/ET/Exhibits) as well as performing the high-bay light replacement. Close examination of the Cleaning Frequency Sheet exhibits shortfalls between the Required Frequency and the Current Frequency, which is directly attributed to an under-staffed workforce.

Recommendation:

We recommend that a contract cleaning arrangement of high artifacts similar to what is utilized at the UHC be implemented. A further consideration would be that this work takes place off-hours as employed by other facilities. This would leave subsequent cleaning of lower artifacts and exhibit components by the NASM Artifact Cleaning Crew during their next shift. Succession planning for those available for retirement is of importance to ensure we are maintaining critical skillsets as staff turnover occurs. Training in this field is accomplished through on the job experience with the guidance of knowledgeable staff further necessitating advance succession planning. These efforts should be pursued by the responsible provider for inclusion into the next budget cycle.

Budget Impact:

A budget request would be required. Quotation from a suitable vendor would be requirement for accurate pricing. As a point of reference, the contract for similar work at the UHC is $210,000.

Challenge: Electronic Tracking of Cleaning

An additional gap is in regards to the electronic tracking of object cleaning frequency or condition reporting. The current means for scheduling and tracking has inherent accuracy issues as well as no centralized record of scheduled cleaning or object discrepancies. The Volunteer Cleaning Program currently utilizes an acceptable means of electronically tracking cleaning efforts with guidance by the Preservation and Restoration Unit (PRU) as described below. While their system (Blast) may not be deemed appropriate, the establishment of a system that is used by all artifact-cleaning crews would provide the most benefit and ease of use.

Recommendation:

It is recommended that an appropriate system, similar to Blast but acceptable by the IT Department, be investigated and put in place for use by all cleaning staff, volunteers, and contractors. This is a critical element to the successful delegation, scheduling and record keeping as proven by systems currently in place. While this effort will require development time for an appropriate system, it is recommended that this is given high priority given its proven effectiveness. This would require a team effort by the effected providers in determining the best method and software. A goal of 6-9 months should be considered.

Post-Transformation:

Considerations would be the updating of the artifact cleaning lists and frequencies. The appropriate department in advance of gallery opening should determine these. Development of an electronic tracking system for cleaning efforts should be established in time to bring new Transformation gallery objects online. Review of proposed HSD gallery layouts should be considered in determining access points to the objects and any foreseen trouble spots.

UHC

Large and suspended artifacts are cleaned quarterly by a staff of three contracted service providers from Conservation Solutions and monitored by the NASM artifact cleaning staff supervisor and Contracting Officer Technical Representative (COTR). The requirement for more frequent cleaning at the UHC and the limited staff resources prompted the contract cleaning service. The frequency of cleaning and any object discrepancies are tracked via the contractors tracking system. The results are then provided to the COTR as well as the Preservation and Restoration Unit (PRU) for any repairs. This effort certainly illustrates a best practices approach and should be considered where outlined. An annual budget of approximately $210,000 is dedicated for the cleaning contract.

3.1.2 Low Artifact Cleaning

NMB

The Artifact Cleaning Crew with the assistance of a small team of three volunteers support the cleaning 67 ground-level artifacts. The use of volunteers for "safe" tasks supporting artifact-cleaning efforts was implemented to fill a growing requirement since permanent artifact cleaning staff positions were not being backfilled. This program had been in place at the UHC and had proven successful. PRU staff assisted with establishing the volunteer program at the NMB and work is performed similarly to the UHC. Artifacts inside cases are cleaned as requirement and in conjunction with representatives from the Conservation Unit and Collections Processing Unit. The procedure for the access and cleaning of artifacts inside of cases is outlined in SOP MPP-000001. The current annual budget for this effort is included in NMB High Artifact Cleaning.

Challenge:

As with the High Artifact Cleaning, low artifacts are not receiving the appropriate scheduled cleaning due to staffing conditions and a much smaller volunteer force than the UHC.

Recommendation:

As recommended above for implementation of high artifact cleaning with contract cleaners, the low artifacts would receive the recommended cleaning frequency by the Artifact Cleaning Crew and volunteer members. Objects that lend themselves to cleaning after museum opening should be identified. Implementation of an appropriate electronic cleaning schedule would prove useful in this area as well. Timeframe of this recommendation is directly related to the NMB high-cleaning and electronic tracking suggestions above.

Post-Transformation:

Considerations would be the updating of the artifact cleaning lists and frequencies. The appropriate department in advance of gallery opening should determine these.

UHC

A team of 15 artifact cleaning volunteers clean 206 ground-level objects. The volunteer cleaning program was originally established at the UHC by the Preservation and Restoration Unit (PRU). A combination of Conservation and CPU provides the necessary oversight of the volunteer cleaning crews at the UHC. Volunteer cleaning is limited to objects that can be reached from the floor or step ladder. Objects requiring the use of lifts for cleaning are cleaned by contractors (UHC) or NASM Conservation Unit staff from the NMB. Artifacts are cleaned based upon a priority list, but scheduled every 3-4 months. Volunteers always work in groups of two or more. Volunteers utilize a modified Microsoft Access database program (BLAST) to track maintenance actions and condition assessments. BLAST can track cyclic cleaning schedules and captures findings which are reviewed by PRU in a report generated through the program. An email notification is sent when each artifact is cleaned, and if there are follow-up actions required, corrective action is tracked in the artifact report. A volunteer enters information from BLAST into TMS. As with the NMB, artifacts inside cases are cleaned as requirement and in conjunction with a Conservation Unit staff member. The current budget for volunteer cleaning at the UHC is provided through the PRU operating budget at $2,000 annually.

Challenge: Lack of Staff Workforce

While the program has proven quite effective, it has the inherent risk in that it is volunteer base with no secure future workforce. NASM staff well outside their Position Description also monitor it. NASM currently has a vacancy for the TMS Administrator position. In the interim, a PRU staff member is spending approximately 5 hours per week managing the process.

Recommendation:

While continued volunteer support may be successful well into the future, it would be advisable to solicit and forecast any budgetary adjustment. Should this effort require the use of a cleaning contractor, an extension to the current high-level cleaning contract could be possible. This effort would be a lower priority in that volunteer commitment seems to be holding. It should be determined by the appropriate unit if the vacancy for the TMS administrator should be requested based on this and other TMS workload deficiencies by the responsible unit. Heavy TMS usage during Revitalization/Transformation may also require improved TMS administration.

Budget Impact:

An estimated amount for contract cleaning of low-artifacts to be solicited. Potential pay for TMS Administrator position.

3.1.3 Artifact Specialized Cleaning and Repairs

NMB/UHC

Once an object is conserved and on display, the artifact is considered stable and typically does not require routine conservation. There is an informal process for monitoring, and on-demand conservation of artifacts is provided as requirement. Specialized cleaning of fragile artifacts is performed by Conservation Unit staff. The requirement for CPU support is typically triggered as a result of an exhibit maintenance requirement or issue with an object on display and is requested via an online system on the NASM Intranet. Accessing and coordination of artifact cleaning within cases is done in accordance with MPP-000001 "Accessing Artifact Cases" SOP. While there is no dedicated budget for gallery maintenance actions, requirements are absorbed as part of the regular operating budgets.

Challenge: Electronic Reporting Not Utilized

One gap consideration is if notification from the staff is not using any electronic cleaning and reporting system. This is the primary source of information to CPU for subsequent specialized cleaning or repair. It is an additional reason for all artifact-cleaning crews to be utilizing such a system as suggested above.

Recommendation:

It is recommended that an appropriate system, similar to Blast but acceptable by the IT Department, be investigated and put in place for use by all cleaning staff, volunteers, and contractors. As indicated above this is a high priority item.

3.1.4 Artifact Loan Rotations, Rotation of Sensitive Artifacts, Case Access

NMB/UHC

At both locations, CPU provides the primary role in this coordination. They handle small objects and are responsible for providing Collections support for accessing artifacts in exhibit cases. CPU staff requirements to be present if an exhibit case requirements to be opened, if something gets disassociated (broken) from an object and if an object requirements to be relocated. CPU and Registration provide some preventative maintenance of fragile artifacts, such as changing pages or artifact loan change outs.

3.1.5 Loan Manager

NMB/UHC

Artifact Loans are the responsibility of Registrar Unit. Installation, removal, and rotation of loaned objects are tracked by this unit. Access to the cases is supported by CPU and Exhibits Production.

Loans for the most part occur on a standard timetable and have a predictable packing and shipping cost as well as a due date. Prior to Transformation, all costs associated with Loans were absorbed thru various accounts.

Going into the Transformation project, all galleries that have loans rotations have submitted a budget thru their respective galleries. After Transformation has ended, we would recommend, as a best practice, that a centralized pool of trust money be maintained so that the return packing and shipping costs are covered. NASM is required, as a borrower and artifact steward, to provide the highest level of care appropriate to the artifact and having an established budget from which to draw these funds would make for a much smoother process.

3.1.6 Audio, Video and Computer Interactives

NMB

Audio, video and computer interactives at the NMB are maintained by the Exhibits Technologies staff. It is comprised of six full-time A/V and IT Technicians and three part-time weekend Technicians. They perform daily assessments of A/V equipment and interactives while bringing exhibits online before the Museum opens and turning systems off at the end of the day. More in-depth walkthroughs are conducted monthly to aid longer-term procurement planning. ET utilizes Mean Time Between Failure (MTBF) statistical analysis and modeling as a predictive method for anticipating when items will likely fail. The annual budget for this effort is on a rotational equipment replacement cycle and has ranged from $90,000 – 800,000 annually.

Challenge: Request System

One identified gap is the request of ET services. Currently, they are placed via a cumbersome system with no availability for tracking or assignments. It has been indicated that this is not an effective system.

Recommendation:

Planning and coordination are now taking place on switching the request system over to what has recently been developed by the Exhibits Department. This coordinated effort will allow for the request, assignment and notification of all Exhibits and IT related efforts within one system. Launching of this is expected the first quarter of fiscal 2018.

Challenge: Missing Content

An additional gap is that some video monitors on the floor do not have the content in place, leaving a blank screen for an extended period. Additionally, some computer interactives have outdated software that will no longer be supported by the SI network, requiring them to be completely rebuilt when they fail.

Recommendation:

An acceptable downtime should be established for any interactive and provisions should be made to remove from the floor if that time is exceeded. The provider can make determinations and move forward on any instances where this is encountered. It is also recommended that new video screens are not installed until the content is available.

Post-Transformation:

Considerations would be the utilization of standardized equipment being used throughout all galleries. This is currently a request in the design phase of Transformation thus allowing for stocking of equipment should a failure take place. Design considerations are also in development to allow a graphic panel to be exchanged with a monitor for any downtime periods. All the projectors will be LASER or LASER phosphor and therefore, no lamps to change and the light engines life expectancy is ten years.

3.1.7 Mechanical Interactives

NMB

Mechanical interactives at the NMB are maintained by the Exhibits Technologies staff. They currently have one Mechanical Technical staff member to support all interactives within the museum. Mechanical interactives by nature are high wear – high maintenance exhibits components. While some parts are off the shelf, many are custom made requiring extensive fabrication time. Often during the repair process, modifications are requirement to correct a default in the design leading to the breakdown. The current annual budget for this effort is $50,000.

Challenge: Personnel

The main deficiency is not having enough experienced museum mechanical interactive personnel to address the amount of wear and tear on the aging mechanical interactives, many of which have been in place for 20-40 years. Two key mechanical interactive development and maintenance staff positions have not been backfilled. It is difficult for current personnel to stay on top of maintenance issues in highly interactive galleries such as How Things Fly.

Recommendation:
It is recommended that these positions be considered for maintenance staff deficiencies. The number of interactives throughout the museum and the wear they receive warrant near-term action. The Education and Public Engagement (EPE) team is also researching the potential of having contract support specifically for the How Things Fly gallery. This effort will have to be balanced against hiring full time staff.

Budget Impact:
Develop cost analysis of hiring two mechanical interactive staff members or IDIQ contract coverage for interactive repair.

Post-Transformation:
During the planning of the Transformation galleries, proactive measures will be pursued concerning the maintenance of the mechanical interactives. Pertinent information on each interactive will be requested from the interactive designer and fabricator. This will include parts lists, fabrication drawings and electronic files for 3D printed components, allowing for more accessible information aiding in a more expedited repair. The commonality in parts where achievable has been requested to allow stocking of parts. It is also suggested that any high wear parts be identified by the fabricator for lifespan determination and parts stocking efforts. A recommendation for on-site maintenance staff is advised to include specific technical expertise that is required for interactives relying on custom electronics and moving mechanical parts and had training in some technical field, and past field experience diagnosing and repairing equipment.

3.1.8 Media Wall at NMB

Cleaning

OFMR cleans the Media wall on a daily basis. In accordance with the Collective Bargaining Agreement, BSW's are limited to cleaning to a height of eight feet.

Repairs

Exhibits Technologies oversees any issues or required repairs. The fabrication was performed by an outside contractor and would again be necessary for any extensive repairs. This item is currently under a maintenance contract.

Maintenance

Both Exhibits Technologies and Web & New Media have hardware and software maintenance contracts for the media wall. The Planar 5 year hardware maintenance contract cost $28,000.14 and the Avitecture 5 year service support agreement cost $22,000. Both contract should run through June 2021. The Bluecadet software maintenance contract cost has been requested of the COTR.

3.1.9 Media Content

NMB/UHC

Education and Public Engagement (EPE) provide digital and media content maintenance in conjunction with ET and the Curators. Reorganization of EPE departments is in the advanced planning stages and will potentially address gaps in content maintenance. Currently, within EPE, the Interactive Media and Outreach Department planned to create and update individual video for interactive and media content when not contracted out.

Challenge: Staffing

Due to the infrequency of updating content, maintenance is addressed on a case by case basis, and there is not currently a formalized process for requesting video or media assistance Currently, Digital Experiences is at capacity maintaining the NASM website and does not have the staffing to maintain or update flash-based interactives. The current staff focus and budget are geared towards Transformation requirements. In the interim, any current requirements for interactives would requirement to be assessed on a case-by-case basis by NASM staff (i.e., EPE, ET, and Curators) to determine whether the interactive can be fixed/updated or if it requirements to be removed.

3.1.10 Exhibit Components (Cases, Graphic Panels, Gallery Signage)

NMB (Cleaning)

The Artifact Cleaning Crew is responsible for the cleaning of exhibit components as per SOP (MPP-0000). Proper cleaning regimen, incident reporting, and safety are outlined in this document. As with artifact cleaning, all staff work from a NMB Cleaning Schedule (document) to ensure the cyclical cleaning and staff assignment to objects. When an exhibit component requires a more involved cleaning beyond the use of approved cleaning products, Exhibits Production is notified, and the condition is corrected. This applies to scuffs or staining conditions on exhibit elements. Budgeted expenses are included in other Artifact Cleaning Crew tasks noted above.

Challenge: Staffing

As with the artifact cleaning, exhibit components are not receiving the appropriate scheduled cleaning due to staffing conditions.

Recommendation:

As recommended above for High Artifact Cleaning with contract cleaners. Through offset in the cleaning of high-artifacts, exhibit components would receive the recommended cleaning frequency by the Artifact Cleaning Crew. Consideration should be to establish a more electronic-based scheduling system similar to the artifact-cleaning regime. This would allow for more accurate assignment and acknowledgment of work performed.

Post-Transformation:

During Transformation gallery development and fabrication, information including approved cleaning methods should be consolidated and provided for subsequent use. The estimated overall glass surface area in the 9 galleries of external glass surface of display cases at approximately 17,000sf. Many of these cases will be ten feet tall requiring access to these higher areas. Specialist high-level cleaning will be also required in all galleries alongside conservation housekeeping for hanging objects.

UHC (Cleaning)

Fashion Concepts (Meridian) provides general cleaning and exhibit maintenance support at the UHC under a service contract monitored by the OFMR Assistant Building Manager and COTR. Typically, two contract staff are assigned to exhibit cases and graphic panels with work being performed during evening hours. This is not including tops/areas above seven feet. This is considered the threshold for high cleaning and shall be carried out by others. Budgeted expenses are included in the OFMR service contract.

Challenge: High Area Attention

Cleaning performed in high areas exhibits a persistent gap.

Recommendation:

In 2016, a contract cleaner was hired for cleaning tops of cases and high-bay areas. It is recommended that a high cleaning frequency recommendation is developed for scheduled cleaning and an IDIQ be put in place.

Budget Impact:

Cost of high-cleaning contract at a determined frequency. Based on past contract efforts a $30,000 price would be a fair indicator for future requests.

NMB/UHC (Repair)

Exhibits Production maintains and repairs static exhibit components within the gallery spaces. This includes cases, graphics, structures and wall surfaces. Exhibits Production has a staff of nine, with two dedicated full-time to exhibit maintenance as scheduling allows. Exhibit structures and elements are repaired/replaced as damage occurs. Cyclic replacement of exhibit structures typically coincides with the requirement to renew/replace the gallery. Individual exhibit items do not tend to have a life expectancy. Planning for elements near high wear areas (structures containing interactives, video displays, etc.) is typically factored as having a shorter lifespan. There are times when a maintenance item will require a drawing, electronic file, or specification to give Exhibits Production guidance to complete the repair. The Exhibits Design Department provides this type of support, which typically averages about 15-20 staff hours per month. Maintenance requirements are captured and tracked through completion via the monthly facility walkthrough spreadsheet and Exhibit Service Request electronic form. Most maintenance actions required of Exhibits Production are low cost, labor-intensive repairs. Any delays in addressing maintenance requirements are primarily due to workload. Staff hours are often diverted to a higher priority or time-sensitive assignments, such as a new gallery with a specific deadline. The current annual budget of $51,000 is dedicated to exhibit maintenance, which includes both fabrication and graphics supplies.

Challenge: Requirement Identification

Current deficiencies include the timely identification of a maintenance requirement and submittal for a corrective action to take place.

Recommendation:

A recently implemented Exhibit Request system has been used for maintenance requests that are subsequently assigned, tracked and acknowledgment of completion sent to the requestor. Additional measures should be explored for inspections that are more frequent. These could include weekly department focused gallery walkthroughs. Another opportunity is the utilization of other departments as they interact with these areas on a daily basis. This daily interaction with these elements is an ideal first line of defense for discovering any deficiencies. Training of these staff members on making appropriate exhibits request through the already established request system. It is recommended that this effort of utilizing existing staff monitoring these areas and the training of staff to submit a request be implemented immediately.

Challenge: Project Funding

Occasionally damage takes place to high-dollar components. This will become an increasing factor, as high-end glass cases are included in the new galleries during Transformation. Currently, there is no dedicated budget resource for these items, and their cost is absorbed in the EP budget. As with most exhibit damage, these instances are spontaneous and cannot be predicted. They can, however, be budgeted for.

Recommendation:

It is recommended that a dedicated maintenance fund is requested for such requirements. These requirements could include carpet, acrylic vitrines, and glass cases. Review of past requirements for current budget requests and anticipate Transformation acquisitions should be used to develop future request amounts.

Budget Impact:

An annual line item request for large ticket maintenance item repair or replacement. A recommendation for current gallery items and conditions would be $200K annually.

Challenge: Maintenance Task Priority

Exhibit damage is a recurring maintenance effort which is not predictable. Once the identification of a requirement takes place, it is added to a list of other repairs. No definitive determination for priority items is considered.

Recommendation:

It is recommended that assignment of priority to these tasks takes place. This would initially include the development of a priority assignment document based on factors such as safety and levels of visual impact. It would also include an acceptable completion time to be monitored for effectiveness and accountability. The priority can then be assigned through the existing Exhibits Request System when the task is assigned. This is a recommendation that can take place immediately by the provider.

Post-Transformation: Within the design of Transformation galleries are many high-dollar glass exhibit cases. The estimated cost for case replacement should be provided for budgeting at an appropriate time before them coming online.

3.1.11 Environmental Controls for Cases

NMB/UHC

Case environments are monitored by the Conservation Unit. Occasional access to the cases is supported by CPU and Exhibits Production. Exhibits Technologies and Information Technologies support the installation and monitoring of the equipment.

3.1.12 Gallery Signage (Wayfinding, Maps)

NMB (Cleaning)

Low-level signage is cleaned by OFMR.

Challenge: High Area Attention

One gap is in the cleaning of directional signage with much of it at a high level. There is currently no assigned schedule or responsibility to this effort. The artifact cleaning crew now

steps in on an as-requirement basis if accumulation levels are sighted as beyond acceptable levels.

Recommendation:
It is recommended that a cleaning schedule is developed, tracked and assigned to a provider. It may be deemed that scheduled high cleaning of these areas may be provided by a contractor on a determined basis.

UHC (Cleaning)
Fashion Concepts (Meridian) provides general cleaning of low-level signage.

Challenge: High Area Attention
As with the NMB, there is a deficiency in the cleaning of higher signage. The high cleaning contract mentioned above would have been the only instance of this cleaning taking place.

Recommendation:
It is recommended that a cleaning schedule for these items be determined and included in a similar but more frequent contract cleaning of high items.

NMB/UHC (Repair)
Exhibits Production provides repairs and upgrades at both locations. The requirement for a repair is sighted and processed similarly to exhibit components. Frequent updates take place to directory and museum maps in conjunction with information provided by the Exhibits Design Department.

3.1.13 Welcome Center

NMB (Cleaning)
OFMR cleans the Welcome Center and Security desks at the NMB. (Frequency)

UHC (Cleaning)
Fashion Concepts (Meridian) cleans the Welcome Center and tour desk.

NMB/UHC (Repair)
Exhibits Production provided any maintenance requirements beyond cleaning.

3.1.14 Exhibit Electrical and Lighting

NMB (Electrical)
Exhibit Technologies maintains exhibit electrical systems as approved by Smithsonian Facilities.

NMB (Lamp Replacement)
Exhibit Technologies monitors and replaces all lamps within gallery spaces. They also replace track lighting along the corridors used to light banners and signage. The Artifact Cleaning Crew has been replacing high-bay exhibit lighting. The current annual budget for this effort is $50,000.

Challenge: Staffing
The Artifact Cleaning Crew took on high-bay lighting when they had more staff. This has become one of the additional duties that have been assigned to the Artifact Cleaning Crew that detracts from their primary mission of artifact cleaning. OFMR has in the past supported the museum and installed customer provided lights through quoted OT work.

Recommendation:

It is recommended that the task of high bay lighting replacement be removed from the Artifact Cleaning Crew's responsibilities. A determination will have to be made as to assignment to this task to another NASM department or place under a contract effort.

Post-Transformation:

LED and the state of the art control systems being specified for the upgrade to the gallery lighting will be installed with training for the NASM team as they continue to be educated in the systems employed. This is the optimum approach to the maintenance of the exhibit lighting as well as ensuring the system runs efficiently. Lighting maintenance may involve re-lamping luminaires, cleaning luminaires and room surfaces, troubleshooting and replacing defective parts, and re-aiming directional lamps and luminaires. It may also include periodically inspecting and reprogramming or recalibrating controls

UHC (Lamp Replacement/Repair)

Barrier and track lighting at the UHC was originally maintained by a contracted facilities company. It was considered building lighting. When the contract was not renewed, personnel from Special Events stepped in for coverage. After a loss of staffing, Exhibits Production was tasked to replace any low-level lighting and has been purchasing stock bulbs from its maintenance budget. This effort was requested due to a lack of any other resources. Exhibits Production has recently included an annual budget line item of $3,000 for this effort. Following a barrier lighting safety issue that required the complete removal of all barrier lighting, a lighting study was conducted at the facility. The results of the lighting study are available HERE and the related cost estimate information is available HERE.

Challenge: Staffing

Staffing needs to be determined for this effort. It is beyond the scope of Exhibits Production.

Recommendation:

A responsible provider needs to be determined. They should develop a plan and submittal for contract support of this effort at the UHC. The amount of work required does not require full time staffing.

Budget Impact:

The cost of a service contract will have to be determined. For estimation, a cost for required replacement/repair should be at least $35,000 annually.

UHC (Exhibit Case Lighting and Repair)

Exhibits Technology staff assigned to the NMB provide repair support as required.

Challenge: Staffing

There are currently no staff members located at the UHC for this effort. While Exhibit Technologies has sent support from the NMB, the ability to do so is on a limited basis. Repairs for these items are specialized as they require work on lighting, security and environmental controls. When lighting elements inside of cases have to be replaced, a representative from CPU must be present.

Recommendation:
It is recommended that a service contract be prepared for repair of these cases. All have outdated lighting, are failing and require upgrades to LED fixtures. Proximity sensors and environments systems are having similar issues due to age.

Budget Impact:
The cost of a service contract will have to be determined. For estimation, a cost for required upgrades and repairs should be at least $500,000.

3.1.15 Exhibit Walls

NMB (Cleaning)
Exhibit walls at the NMB are cleaned on an as-requirement basis by the Artifact Cleaning Crew.

NMB (Repair)
Painting and wall repairs in exhibit gallery spaces may be performed by OFMR staff but will be considered reimbursable by NASM. This work may also be performed by NASM staff or contractor.

3.1.16 Exhibit Flooring

NMB (Cleaning)
OFMR cleans all flooring outside of artifact containing areas. Cleaning inside of artifact containing areas is performed by the Artifact Cleaning Crew.

Challenge:
Carpet used throughout some galleries has reached a threshold where vacuuming is not effective.

Recommendation:
It is recommended that each gallery be placed on a deep-cleaning cycle at an interval that is deemed appropriate by the provider. This effort would be most effective in the East End galleries with a longer lifespan. A funding source will have to be determined and secured which could set the timeframe on implementation.

Budget Impact:
An annual budget request for contract cleaning services would be required at an amount to be determined by the provider.

Post-Transformation:
The change from carpet to a sealed surface material in Transformation galleries is considered advantageous in respect to cleaning. Dust mitigation will be helped as well. The estimated exposed floor surface in the nine galleries are a total of 43,800 sf. The applied floor finish in all galleries is currently specified as Forbo Marmoleum type flooring. Review of product cleaning for new galleries can refer to 'Forbo Floor care – Marmoleum' cleaning and maintenance advice sheet for details on regular cleaning and periodic maintenance:

http://www.forbo.com/flooring/en-uk/installation-floorcare/linoleum/pozv0i#panel_28

UHC (Cleaning)

Fashion Concepts (Meridian) Clean areas behind barriers with dust mops but do not clean under artifacts. Mechanical cleaning equipment is kept one foot away from all barriers and cases. Any cleaning of floors under artifacts is only taking place during subsequent cleanup after an object is cleaned by the volunteer artifact cleaning crewmember.

Challenge:

A determined gap is that there is no scheduled assignment to cleaning the floor areas directly below an object.

Recommendation:

It is recommended that this area is considered for scheduled assignment in coordination with the low-artifact cleaning taking place.

NMB (Repair)

OFMR staff is trained to install and repair only carpet squares. They will not perform roll goods carpet work. All new carpet in exhibit galleries spaces that is produced as roll goods will only be installed by the contractor. All work related to flooring performed by OFMR in exhibit related areas will be considered reimbursable. If new flooring is required in an exhibit space and the work is conducted by OFMR, the materials will be carpet squares and reimbursable. Other flooring materials will be installed and repaired by a contractor, managed by the assigned COTR and paid for by NASM.

Challenge:

Floor coverings and transition strips repair protocol is lacking. Any issues tend to be a patch and repair arrangement by any staff requested to do so.

Recommendation:

Since most flooring materials are outside the scope of work for both NASM and OFMR staff, a qualified contractor should be available via an IDIQ. An appropriate lead requirements to be determined and assigned to oversee these efforts.

Budget Impact:

An estimated annual request should be prepared and submitted for funding.

Post-Transformation:

Flooring materials other than carpet are being specified for gallery areas. Wear issues related to carpet will be averted. New flooring materials and their recommended cleaning should be reviewed by OFMR.

UHC (Repair)

Repair of flooring is the responsibility of OFMR.

3.1.17 Donation Boxes

NMB (Cleaning)

Currently, there is no assigned responsible unit for the cleaning of donation boxes. Given their location on the floor in public spaces, it is recommended that OFMR be requested to include in their daily routine.

UHC (Cleaning)
Fashion Concepts (Meridian) provides general cleaning of the donation boxes at the UHC.

NMB/UHC (Repairs)
Exhibits Production is responsible for repairs. The current donation boxes were purchased. Any recent repairs have only involved lock replacement. Exhibits Production reviewed repair procedures with the vendor.

3.1.18 Lift Maintenance/Replacement

NMB/UHC
Aerial lifts at both locations and forklifts at UHC/Garber are maintained by the Artifact Cleaning Crew Supervisor. This includes COTR assignment for all maintenance contracts. The maintenance of NASM lift equipment is conducted with an annual budget of $30,500.

Challenge:
Some lifts are reaching the end of their life cycle.

Recommendation:
Our recommendation is the development or update of an existing inventory and life cycle document with current replacement dates and replacement value. This document can also track maintenance requirements to assist in determining equipment reaching a value in repair. A request for funding should be placed by the provider to begin the replacement cycle. A lift has been identified in past review efforts. This effort can and should begin immediately to enter the funding cycle.

Budget Impact:
Estimated cost for replacement options of the 60' lift is $106,000.

3.2 Facility Areas (Public, Staff, and Non-Exhibit Spaces)

At the NMB location, OFMR is responsible for general cleaning in galleries and common areas. With a staff of approximately fifteen Building Service Workers (BSW), OFMR performs facility cleaning related tasks, while routine maintenance and repairs are performed by the Craft Shop with a staff of skilled tradesmen assigned to the East Mall Zone. BSW staff work from a cleaning schedule checklist to monitor work areas and task completion.

A gap in facility cleaning staffing because of overlaps in existing shift schedules was identified and assessed during FY 2017. OFMR is in negotiations with union to adjust the second shift work schedule from 11:30am – 7:30pm to 3:00pm – 11:30pm to increase the cleaning time available while the Museum is closed to the public. Currently, there is a three-hour schedule overlap between the first and second BSW shifts occurring during public hours, resulting in only a two-hour period available for cleaning while the Museum closed for the evening (less during periods of extended operating hours). The adjusted schedule is expected to be implemented by the mid-FY 2018 and will significantly increase the time available to clean the Museum.

At the UHC location, Fashion Concepts (Meridian) provides general cleaning and exhibit maintenance support under a service contract monitored by the OFMR Assistant Building Manager and Contracting Officer's Technical Representative (COTR). With an average staff of eight personnel, Meridian performs

the majority of cleaning functions in the evenings, with a shift beginning after normal business hours at 5:30pm. A smaller day shift staff begins at 08:00am and performs general spot cleaning and restocking throughout normal operating hours.

3.2.1 Entrance Doors and Exterior Windows

NMB (Cleaning)

OFMR cleans all building curtain wall glass and exterior windows reachable from ground level without the use of ladders or lifts. OFMR will typically seeks the expertise of a service contractor to clean glass above this height.

UHC (Cleaning)

Meridian is required to sweep and damp mop inside entrance area floors to remove all dirt, dust, spills, stains, and standing water. The contractor cleans entrance and walk-off mats located at the building entrance. The exterior of the building shall be free of gum, salt, deicer or other debris to a distance of 10 feet. The contractor is responsible to clean first floor interior and exterior glass surfaces, frames, sills and trim.

OFMR has developed a scope of work and project package for exterior window cleaning at both NASM Museum locations. The project package is with Smithsonian Institutions' Office of Contracting (OCON) for review/award with work expected to occur in October 2017. At the NMB, the contractor shall clean exterior window surfaces/frames, including glass entrance doors, balcony glass doors, and windows from the first through third floors. At the UHC, the contractor shall clean all exterior window surfaces on the main entrance level and interior window surfaces of the Observations Tower. It is anticipated that contracted window cleaning will occur on a biennial basis, pending availability and allocation of funding.

NMB/UHC (Repair)

OFMR is responsible for executing repairs to entrance door and exterior windows at both museum locations. The East Mall Zone Craft Shop typically accomplishes routine repairs with the OFMR Central Shop or specialty contractor supporting major/complex repairs.

NMB/UHC (Replacement)

Replacement of exterior doors and windows at both museum locations is typically accomplished via task order on preexisting IDIQ contracts to expedite the required action.

3.2.2 Floor Surfaces

NMB (Cleaning)

OFMR BSW staff clean all flooring located in public and nonpublic spaces with the exception of flooring located behind exhibit barriers. The artifact cleaning staff cleans areas behind exhibit barriers. Although cleaning schedules are tailored for each day, common areas are vacuumed daily, galleries three times per week and after special events. Carpets are spot cleaned daily and deep cleaned quarterly or more often as requirement.

UHC (Cleaning)

Meridian dust-mops or sweeps all hard floor surfaces daily and vacuums carpeted areas in staff and support spaces. Meridian steam clean carpets and strips, seals, and wax/finishes hard flooring surfaces at least four times per year. Terrazzo floors are polished and sealed twice annually.

NMB (Repair)

OFMR Craft Shop staff is trained to install and repair only carpet squares. They do not routinely perform roll goods carpet repair work. All new carpet in exhibit galleries spaces that is produced as roll goods will only be installed by contractor. All work related to flooring performed by OFMR in exhibit related spaces will be considered reimbursable by the Museum.

UHC (Repair)

OFMR Craft Shop staff or contractor would make any necessary repairs depending on the type of flooring surface and scope/breadth of repair required.

NMB (Replacement)

If new flooring is required in an exhibit space and the work is performed by OFMR, the materials will be carpet squares and reimbursable. Other flooring materials are typically installed by contractor, managed by the assigned COTR and funded by NASM. Replacement of flooring in non-exhibit areas is funded through capital improvement projects.

UHC (Replacement)

The majority of the floor surfaces in the public areas are either polished concrete or terrazzo requiring limited maintenance and no cyclic replacement planned. Replacement of tiled or carpeted areas are accomplished via OFMR staff or separate contract.

3.2.3 Facility Walls (Non-Exhibit Walls)

Painting

Painting of public areas at both museum location will be performed by OFMR staff or via contract funded by Smithsonian Facilities.

Repair

Wall repairs at both museum locations will be performed by OFMR staff or via contract funded by Smithsonian Facilities. It is assumed that all original wall joints at the NMB contain asbestos materials and repairs are handled in accordance with established ACM protocols. Wall repairs in exhibit gallery spaces may be performed by OFMR staff but will be considered reimbursable by NASM.

Replacement

Replacement of existing or construction of new walls at both museum locations will be performed by OFMR staff or via contract. Wall construction in exhibit gallery spaces may be performed by OFMR staff but will be considered reimbursable by NASM.

3.2.4 Ceiling Tiles

Repair/Replacement

Repair or replacement of ceiling tiles at both museum locations are accomplished by OFMR staff. Coordination with OPS, Collections, Curators, and Exhibits staff is required when repairing or replacing ceiling tiles in proximity to hanging artifacts or exhibits.

3.2.5 Building Lighting

Repair/Replacement

OFMR is responsible for maintenance, repair, and replacement of non-exhibit building lighting. High-bay lighting responsibilities are currently split between OFMR (procurement) and the Artifact Cleaning Crew

(installation). Exhibits Technologies develops and maintains automated lighting control schedules for facility cleaning/maintenance and for special events.

3.2.6 Public Space Seating (Benches)

NMB (Cleaning)

OFMR cleans existing fixed and mobile seating located in the museum public spaces, to include galleries.

UHC (Cleaning)

Meridian cleans all seating located in the museum public spaces, to include benches integrated into the exhibit barrier system.

NMB/UHC (Repairs)

OFMR maintains/repairs existing seating located in the public spaces at both museum locations, to include galleries. Repairs to seating integrated into the exhibit barrier system at the UHC are accomplished by Exhibit Production staff.

NMB/UHC (Replacement)

Replacement of public space seating is coordinated by NASM Exhibits and typically funded by the museum.

3.2.7 Balcony Rails and Signage

NMB (Cleaning)

OFMR BSW staff clean all non-exhibit related rails and signage below the height of eight feet, with the exception of way finding and entrance door graphics. Brass and glass railings are spot cleaned daily and cleaned thoroughly on a rolling schedule or more frequently as required.

UHC (Cleaning)

Meridian cleans all non-exhibit rails and signage below ladder height with a nonabrasive cleaner/polish. All surfaces shall be free of streaks, stains, spots, smudges, and other obvious soil. All horizontal surfaces must be dusted or cleaned to eliminate dust collection.

NMB/UHC (Repair/Replacement)

OFMR is responsible for repair/replacement of non-exhibit balcony rails at both museum locations, with either in-house staff or separate contract. Signage repair/replacement (including non-exhibit signage) is coordinated by NASM Exhibits and accomplished by Exhibits Production staff or via separate contract.

3.2.8 Stairwells, Elevators, Escalators

NMB (Cleaning)

OFMR provides surface cleaning of stairwells, elevators, and escalators. Vertical transportation clean-downs and maintenance are via contract with Elcon. Smithsonian Facilities Systems Engineering Division (SED) provided the COTR to manage the contract actions. SED coordinates the annual escalator clean-down schedule for all SI units.

Challenge: Escalator Clean-down Schedule

While the annual clean-down schedule for the NMB was adjusted in FY 2017 from the peak visitation period of June/July/August to March/April/May, each escalator is removed from service

for a period of one week (Monday-Friday). Removing one of the four main escalators from service during open hours greatly affects accessibility and overall visitor experience.

> **Recommendation:**
> We recommend that Smithsonian Facilities (SED) assess the ability to contract for and accomplish routine/scheduled escalator maintenance during off-hours when the museums are closed to the public.

UHC (Cleaning)

Meridian cleans stairwells and elevators, there are no escalators at the UHC. The contractor shall clean elevator cabs walls, interior hand rails, operation switch panels, doors, and threshold plates. The contractor shall sweep and damp mop elevator hard floors and vacuum door tracks. No more than one elevator shall be placed out of service at a time for routine cleaning.

NMB/UHC (Repair)

Repairs to vertical transportation assets are centrally funded by Smithsonian Facilities and are accomplished via contract with Elcon at both museum locations. SED provides the COTR to manage the contract actions.

NMB/UHC (Replacement)

Replacement of stairwells, elevators, and escalators are capital improvement projects. The current scope of work for the Revitalization of the NMB project includes the reconfiguration of multiple stairs, replacement/addition of two gallery elevators, and replacement of the lower lobby escalators to improve egress, code-compliance, and overall visitor experience.

3.2.9 Emergency Equipment

Emergency Exit Doors

OFMR is responsible for maintaining the physical door components and related hardware. OPS staff is responsible for electronic security installation/maintenance and performs weekly door and lock inspections along with monthly inspections of fire extinguishers throughout both NASM facilities.

Emergency Notification System (Public Address System)

Smithsonian Facilities owns, OPS staff operate and maintain the emergency notification systems at both museum locations. Exhibit Technologies manages the building PA announcements and schedules. They also maintain the equipment. The Office of Emergency Management and NASM Safety provide guidance and support for establishing/executing emergency notification and response protocols. NASM Exhibits Technology and Information Technology staff periodically provide programming support as required.

Emergency Lighting

OFMR Craft Shop staff is responsible to maintain the emergency lighting systems and associated components at both museum locations. Work includes, but is not limited to, installation, maintenance, and replacement of emergency exit door lights, overhead emergency lighting fixtures, and egress signage.

3.2.10 Utilities (Electrical/Plumbing)

Maintenance/repairs

Smithsonian Facilities is responsible for all maintenance and repairs of utilities at both museum locations. Maintenance/repairs actions are typically handled by in-house Craft Shop, USRO, or Central Shop personnel.

Challenge: Maintenance and Repair of Legacy Systems

The Revitalization of the NMB is planned to begin in FY 2018 and continue for ~6-7 years. The scope of work includes all new mechanical systems, replacing existing utilities/systems as phased construction progresses. Until construction is complete, there will be a requirement for portions of various legacy systems to be operational.

Recommendation:

Assess whether near and mid-term maintenance tasks could/should be deferred based on upcoming projects and (Revitalization / Transformation).

New installation/replacement

The NMB Revitalization project scope of work includes replacing the existing normal and emergency power distribution and branch circuit systems. In addition, the majority of the domestic water distribution system will be replaced and storm water will be collected and stored in underground cisterns for toilet and urinal flushing, building humidification system, the cooling tower, and irrigation system.

3.2.11 HVAC (Environmental Controls)

Maintenance/repairs

Smithsonian Facilities is responsible for all maintenance and repairs of HVAC systems and associated environmental controls at both museum locations.

New installation/replacement

The NMB Revitalization project scope of work includes complete HVAC replacement. Planned work includes chilled water plant, maintenance of the GSA chilled water system with new equipment to improve performance as well as provision of a supplemental water-cooled chiller plant optimized to improve overall energy efficiency. In addition, a new boiler plant and high performance VAV system, including all new air handling units will be provided.

To address a cooling capacity shortfall at the UHC, a major upgrade to the chiller plant was completed in FY 2017 new cooler towers placed into service. The construction of the Dulles Collection Center Storage Module includes dedicated HVAC and environmental control systems to service the new facility.

3.2.12 Trash and Recycling

NMB (Bin placement/disposal)

OFMR BSW staff are responsible for placement and disposal of trash and recycling bins throughout the entire facility, including exterior receptacles. Trash/recycle bins are monitored and emptied throughout the day, while BSW staff continually police trash and debris in public areas. OFMR manages the recycling program.

UHC (Bin placement/disposal)

Meridian is responsible for placement and disposal of trash and recycling bins throughout the entire facility, including exterior receptacles. Meridian monitors and empties trash and recycling receptacles throughout the day, including receptacles located in the parking lot. The contractor manages the recycling of mixed paper, cardboard, plastic, aluminum, and glass.

3.2.13 Support Equipment

OFMR maintains material handling equipment (forklifts) at the NMB and their own facilities support equipment at UHC.

3.3 Smithsonian Enterprises (Theaters, Store, McDonald's)

Smithsonian Enterprises currently maintains their own equipment and marketing areas. They utilize their own staff or contractors for repairs or maintenance, or request OFMR services via the Work Management Center.

4.0 Organizational Gaps

4.1 Areas for Improvement in Maintenance

Currently there is no centralized system for tracking maintenance actions.

Reporting of scheduled artifact cleaning performed (i.e. BLAST or similar system, not being utilized by all departments).

In addition to the monthly facility walkthrough by maintenance providers, re-establish quarterly stakeholder walkthroughs (joint effort Conservation / Curators).

Establish lighting support presence at the UHC (i.e. exhibit and case lighting / video monitors).

Anticipated retirements and the uncertainty about backfilling those positions or potentially contracting out specific work elements.

Artifact cleaning staff pulled for lift operator support - provides lift operator support for various groups (OFMR/ET/Exhibits) and performs high light replacement. Allowing some of these ancillary duties to be reassigned would allow the cleaning staff to spend more time on cleaning.

Staffing for maintenance of environmental controls for exhibit cases.

4.2 Challenge Areas

Multiple means and methods for initiating and tracking work tickets

a. Exhibits Production/Design: Exhibit Service Request
b. Exhibits Technology: HEAT
c. Collections: CPU Service Request
d. OFMR: CMMS (SF-Help)

Staffing

a. OFMR Building Manager position vacant for nearly a year
b. No lighting support assigned (UHC)
c. Two Exhibits Technology mechanical interactives positions not backfilled (NMB)

d. Artifact cleaning was formally under BMD (prior to OFMR) with a staff of 11, currently under NASM Collections with a staff of five with most eligible for retirement

Delineation between various units cleaning

a. Height restrictions in cleaning efforts leaves "grey zone"
b. Public floor to artifact boundary gap (i.e. one foot perimeter that may not be being cleaned)
c. Gap may occur when an exhibit component requires a more involved cleaning (e.g. some graphic panels throughout the museum reach a point where standard cleaning products are not effective)
d. NMB Artifact cleaning crew does not have a well-established method for reporting cleaning/ providing condition reports, no official record of how frequently artifacts are cleaned

Standardized system for identification and monitoring of exhibit components

a. No ID system for gallery components/cases for identification of requirements
b. No remote access for monitoring environmental conditions in artifact cases

5.0 Best Practices

5.1 Current Practices at NASM Recommended to Continue

Recurring facility walkthroughs and inspections

The most structured (current) assessment is the monthly facility walkthroughs of both Museum locations, conducted by the Facilities Liaison with representatives from maintenance providers and stakeholders. Deficiencies are identified, assigned to the appropriate maintenance provider, and required maintenance actions are updated after each walkthrough and tracked through completion. A status update is provided at the end of each month to NASM leadership for awareness of completed and pending maintenance actions.

Another means of assessment comes in the form of independent facility walkthroughs by Visitor Services conducted on a weekly basis at the NMB and bi-weekly at the UHC. Summarized results of the walkthroughs are provided via email to the various maintenance providers and stakeholders. Although lacking a formal tracking/feedback system, these walkthroughs are a valuable source of information from individuals on the museum floor daily. Visitor Services also receives feedback from guests on maintenance issues that typically focus on common areas rather than galleries.

Exhibit Technologies performs daily start-up and shut-down walkthroughs of interactives and lighting along with periodic walkthroughs throughout the day.

Artifact and Exhibit Cleaning

Volunteer artifact cleaning program, where volunteers perform artifact cleaning and minor exhibit maintenance functions at both NASM locations as part of the Artifact Care and Inspection Program. The volunteer program at the UHC was established by the Collections staff and is currently managed by Anne McCombs as an unofficial collateral assignment. At the NMB, the volunteer program is managed by Jeff Franklin and augments the artifact cleaning crew. Conservation staff provide training for the artifact cleaning volunteers.

Gallery "team cleaning" has been initiated by the artifact cleaning staff at the NMB to provide a more holistic, top-down level of cleaning verses the daily routine level of cleaning. Currently, team

cleaning is performed one day per week, with individual staff working in their assigned galleries the remainder of the week.

Exhibit Service Request System

A centralized system established by the Exhibits Design Department for requesting, tracking and assigning tasks.

5.2 Recommended Practices for Consideration

Re-establish recurring Exhibit status meeting to coordinate near and long-term actions occurring in galleries and common spaces.

Succession planning for maintaining critical skillsets as staff turnover occurs or consider contracting for infrequent, specialized repairs and maintenance.

Coordination of high and low cleaning for effectiveness (Conservation/OFMR).

Stakeholder representatives identified for each gallery space "team". Establish overall "responsible individual" for coordinating required actions in each gallery or space.

Exhibit reference documents (for every galley) containing comprehensive maintenance information (i.e. paint colors, flooring, case numbering, etc.).

Selecting Exhibit components that are more durable, less susceptible to damage, and easily repaired.

Design process for mechanical interactives to be able to replace individual portions of the unit most susceptible to wear/component failure.

5.3 Practices of Other Museums To Be Considered at NASM

Preparedness and Response in Collections Emergencies (PRICE).

PRICE is a pan-Institutional body that serves as the Smithsonian's collections emergency support team. Formally established in 2016, the purpose of PRICE is twofold: to advise and provide subject-matter expertise, consultation, and assistance to NCP, Smithsonian collecting units, and Smithsonian senior management; and, when activated, to provide collections support, response, and recovery as requested by NCP, as part of the Smithsonian's Emergency Operations Center (EOC).

Pre-staged Collections Emergency Management Supplies:

In order to provide a more immediate response to emergencies affecting Collections, the NASM Collections Processing Unit staff has developed collections emergency management response kits to be pre-staged at both Museum locations during FY 2018. At the NMB, a kit will be located on the first floor in the Milestones Gallery 108 storage closet to quickly respond to emergencies affecting display and storage areas, while a second kit will be located on the second floor in the Temporary Exhibit Gallery 211 storage room. At the UHC, there will be a quick response kit located on the first floor of the main display hangar in room 109.07 (near the Enola Gay) to allow staff to respond quickly to emergencies affecting public display areas while a second (larger) kit will be located in room 118.24 near the loading dock, to treat higher volumes of Collections.

The estimated cost to establish two tailored response kits for each Museum location was $6,500. The three smaller kits have been assembled will be in place by the end of Q1 2018. The larger kit for the UHC will cost about $3,000 and should be funded in FY 2018.

The contents of the various response kits support the rapid and safe recovery of artifacts exposed to water and other hazards. Numerous materials double for artifact support while drying and for triage after recovery. Supplies range from tarps, plastic sheeting, blotter paper for recovery and drying to artifact tags, plastic bags, notepads, and pencils necessary to document the response for reference in the days ahead. Kits contain varying amount of Personal Protective Equipment (PPE), flashlights, batteries, knives, scissors, and other small items that are helpful to have grouped together for an expeditious response. The intent is that these kits would support base building response from OFMR and that item such as squeegees, brooms, and mops would be available from these departments if necessary. All containers selected are blue or yellow in color as a visual identifier for recovery teams. Units are mobile and contents specifically curated for the unique requirements of each location.

6.0 Recommended Standards of Service

6.1 Exhibit Component Cleaning

Standard

Exhibit components and their condition have a direct visitor impact. There should be minimal dust accumulation in visible areas. Dust accumulations in non-visible location should be cleaned on a regular basis to mitigate migration of it into visible areas. Daily cleaning of visitor interaction with glass and acrylic cases should be accomplished.

Requirement

The exhibit components are to be cleaned on a predetermined schedule similar to artifacts. Results should be continually monitored, and adjustments to cleaning frequency made where required. Fingerprints on glass and acrylic cases required daily cleaning and periodic cleaning during the day for highly attended objects. Any observable case or exhibit component damage should be entered into the Exhibits Request System for requirement repairs.

6.2 Exhibit Component Repair

Standard

Exhibit components are to be kept in a safe and presentable manner. Proactively monitoring is required to identify any damages incurred. A system and workflow to expedite repairs should be in place. Priority assignment to address safety concerns and visual prominence.

Requirement

The repair of damaged exhibit components should be accomplished in an acceptable amount of time. The first requirement is the early identification of damage. Building walkthroughs have been a great first step. Training of staff who have daily interactions with exhibit components with currently utilized Exhibits Request systems should be implemented. The second requirement is timely repair of the damage. Acceptable repair times for individual components should be developed and assigned a priority rating. This rating should be based on safety concerns and visual prominence. Considerations to Design involvement on the repair and material availability may be factors. Turnaround times are to be monitored for evaluation.

6.3 Interactives and Audio Visual Experiences

Standard

Downtime of interactives should be minimal and is currently specified at one week. If an extended amount of time is required for a repair, the interactive should be removed from the floor.

Requirement

An acceptable downtime for interactives should be adhered to. The moment an interactive is down, it should be immediately placarded. Based on an initial assessment it can be determined how quickly the repair can be accomplished. If an extended amount of time is required, the component should be removed from the floor for service. In older galleries removal of these components can be difficult. In newer Transformation galleries, modularity in design will allow for this more easily. Monitor housings will have the ability to be switched over to a graphic element. Any interactive with additional long-term requirements including content availability should be removed or installation of hardware delayed. It is recommended that each interactive be identified and a course of action be developed for both short and long-term repair scenarios.

6.4 High and Low Artifact Cleaning

Standard

The museum's collection is its cornerstone. The condition in which they are presented requires attention to their cleanliness and overall appearance. Proper cleaning also increases the long-term stability of the object.

Requirement

Artifacts are to be cleaned on a predetermined schedule. This schedule should be electronically based allowing for both schedule adjustments and tracking of accomplished cleaning. Results should be continually monitored, and adjustments to cleaning frequency made where required. When issues are encountered with the object, the Preservation and Restoration Units should be notified along with the Collections Processing Unit and Registration. PRU and the Conservation Unit are the predominate responders if the record needs to be altered to reflect a part that has broken off.

6.5 Facility Components

Standard

Public areas and components within them are to be kept at a suitable level of cleanliness and appearance. The visitor experience is directly affected either positively or negatively by the environment they are in.

Requirement

Facility components are to be cleaned on a predetermined schedule. Results should be continually monitored, and adjustments to cleaning frequency made where required. Any damage encountered should involve the contact of responsible providers for repairs. Components that require contractor attention, such as floor surface damage, should have required procurement actions in place.

6.6 Requirements for Works in Progress

Standard

Any maintenance work taking place on the museum floor requires attention to public safety and limited impact on visitor experience.

Requirement

Work taking place on the museum floor should be accomplished promptly. Estimated repair time, materials and required staff should all be predetermined and in place before work commences. Efforts requiring more than one day should consider additional impacts. Before any maintenance effort, coordination with any museum events should be considered. This is especially advisable for any work requiring an extended amount of time. Any work performed on the museum floor during museum hours should be cordoned off in a safe and presentable manner. Stanchions or screening should be appropriately selected for the job. Adequate safe distances between the work performed, and the public is to be maintained. Large efforts may require the input of the safety coordinator and notice to any affected departments. The work area should be placarded as a "Work in Progress" area. When work is completed all support materials and equipment should be removed, and the area cleaned.

7.0 Recommendations for Proactive Maintenance System

7.1 During Revitalization

A primary goal of the Museum during Revitalization is to sustain a professional public institution, which excels in presenting engaging, educational exhibitions, innovative programs and quality guest experience.

There will be unique and challenging maintenance requirements associated with keeping the NMB open and accessible to the public during the estimated 6-7 year phased construction period. While the NMB building envelop and mechanical systems are undergoing Revitalization, all of the Exhibition Galleries and public amenities spaces are simultaneously being transformed. There will be significant periods of time where both legacy and newly installed systems/equipment must work seamlessly together (or complement one another) to meet the requirements of the museum.

Close coordination between maintenance providers, stakeholders, and the Revitalization and Transformation project teams will be critical to ensure that portions of the Museum accessible to the public represent the best possible guest experience.

7.2 Post-Transformation

7.2.1 Prioritized Recommendations

Throughout this document, the EMT has provided recommendations for exhibit maintenance post-Transformation. While a proactive maintenance system will utilize as many of these recommendations as is feasible, the EMT's top priorities in this area include:

- Development of an electronic tracking system for artifact cleaning efforts
- Utilization of standardized interactive equipment and exhibit components throughout all galleries

- On-site maintenance staff to include specific technical expertise that is required for interactives relying on custom electronics and moving mechanical parts
- Retention of current plan to install hard surface flooring rather than carpet
- Provide budget for on-site storage or quick ordering capability of gallery replacement parts (case components, graphic panel materials, etc.)

7.2.2 Recommendations from Haley Sharpe Design

Haley Sharpe Design, contract exhibit designer for the west end of the NMB, has provided maintenance recommendations for the new galleries below.

General Overview

Cleaning is essential to museums and galleries, not only in terms of enhancing the visitor experience, but also to reduce potential damage to objects and artifacts, and to send a positive message to donors, stakeholders and supporters.

The estimated overall glass surface area in the nine (west-end) galleries is 2,000 SF, external glass surface of display cases at approximately 17,000 SF with the additional 17,000 SF of internal glass surface. Specialist high-level cleaning will be also required in all galleries alongside conservation housekeeping for hanging objects.

The estimated exposed floor surface area in the nine (west-end) galleries is 43,800 SF. The applied floor finish in all galleries is currently specified as Forbo Marmoleum type flooring. For complete care instructions please refer to 'Forbo Floor care – Marmoleum' cleaning and maintenance sheet which details regular cleaning and periodic maintenance recommendations.

Throughout all galleries preventive maintenance should be best practice, including but not exhaustive of monitoring effectiveness of environmental controls, periodic inspections, electrical testing, regularly carrying out checks in display cases (gaskets, fans etc.), repairing and replacing damaged parts asap, checking load limit when changing display.

Media Hardware

Projectors: From an AV perspective, the projectors will have no lamps to change and the light engines life expectancy is ten years. The prime maintenance task for the projectors, to be carried out by a trained AV technician or engineer, is cleaning the filters on all projectors. All vents in all the kiosk housings should be checked (minimum) every three months for dust congregation and ensured they are clean and clear to provide maximum ventilation to the screens housed inside.

Server room: The server room should be always kept very clean and dust free. A visual inspection of all air intakes should be carried out on a regular basis to ensure they remain clean and obstruction free.

Repairs and equipment failure: In case of equipment failure, the technicians are required to diagnose the faulty item and report accordingly. Within the first twelve months it is expected they would report to the vendor to arrange repair or replacement, after that period an in-house arrangement may be considered. Majority of the equipment will have more than a twelve-month manufacturer's warranty, typically two and in some cases three years. Therefore, in the

event of failure during this period contacting the applicable manufacturer to arrange repair/replacement is recommended.

Beside the daily inspections and checks the show control system will report any hardware failing to run. With regards to computers, it is recommended that members of the NASM AV team available on site are capable of and trained to rebuild a computer and therefore have the skill to diagnose and fix any issues arising.

Media updates: Further to previous discussions in charrettes relating to out of hours visits and the requirement for updating media it is expected that the NASM AV team have a full understanding of the proposed AV systems and how these can be adapted for the intended use. This will not necessarily involve displacement of equipment or leads; the flexibility requirements to be programmed in and operated via the Content Management System.

The team is expected to have knowledge of how to load media onto all the different media replay platforms used for both media updates and any alternate use. The "tools" to enable this will be included in the design and all necessary software and hardware will be included in the system specifications.

Events: In case of a major number of events to support, additional staff may be need to be trained in the use of live sound and video systems.

Exhibit Lighting

General: NASM team currently maintains "state of the art technologies" with mechanical interactives in museum exhibits, they provide technical support for outreach programs, and manage networked building lighting and communication systems. They also have knowledge of collections care and preservation issues as they relate to exhibit design, lighting. LED and the state of the art control systems being specified for the upgrade to the gallery lighting will be installed with training for the NASM team as they continue to be educated in the systems employed. This is the optimum approach to the maintenance of the exhibit lighting as well as ensuring the system runs efficiently.

As lighting technology changes, maintenance is changing with it, though the fundamentals remain the same: re-lamping, cleaning and troubleshooting. LED lighting significantly reduces maintenance, while advanced lighting controls are providing new tools that facilitate it. The key to maintaining LED lighting and control installations is to understand the technology and proactively monitor the systems.

LED lighting installations may benefit from other sensible maintenance practices such as luminaire cleaning and re-aiming. LED luminaires generally do not require spot re-lamping, therefore maintenance personnel must make an effort to ensure cleaning occurs, particularly in this Museum Environment where dirt accumulation can reduce light output. Additionally, as displays move, directional lighting must be re-aimed. For NASM this cleaning should occur once a year.

A growing maintenance area in LED lighting is controls, which are becoming increasingly automatic and sophisticated. Changes to the space, how the space is used, etc., may result in

the controls falling out of sync. Periodic inspections, including functional testing of a sampling of control points, will reveal deficiencies that can be corrected by reorienting or moving sensors and recalibration. Maintenance ensures lighting systems perform as intended over the long term.

Lighting Design: Proper lighting can enhance the ambience and add experience within a space, as well as protect the integrity of sensitive artifacts and graphic materials. Lighting design is governed by the allowable light levels for artifacts: NASM Conservation Exhibit Design Guidelines

Lighting Maintenance: Each day before the museum opens the Exhibit Technologies staff walk through the galleries to ensure that the lighting, overhead and case lighting are functional. An overall lighting preset will be activated to ensure that the team can see that each luminaire is working. They also perform walkthroughs throughout the day to monitor operation and condition. Each evening after the museum closes, they walk through the galleries to ensure that all lighting and power are set for the cleaning or after-hour event lighting.

All light sources must be maintained; as lighting controls become more sophisticated, they also must be maintained. Responsible lighting design should include maintenance to preserve design integrity. Lighting maintenance may involve re-lamping luminaires, cleaning luminaires and room surfaces, troubleshooting and replacing defective parts, and re-aiming directional lamps and luminaires. It may also include periodically inspecting and reprogramming or recalibrating controls.

Reliability issues: LEDs are a long-life light source, which is a major benefit. Manufacturers have come a long way in their understanding of how drive current, temperature and other factors affect performance. As a result, today's well-designed and properly operated LED products are generally reliable and long-lasting.

According to the Department of Energy, within five years, the technological development of LED sources will result in service life reaching a theoretical limit of about 50,000 hours for LED lamps and 100,000 hours for LED luminaires. In the average building, 100,000 hours of life translates to 35 years of service. What's more, aside from infancy failures, well-designed luminaires typically provide light with a very long lead-time between failures.

RTI International discovered driver electronics and other components are likely to fail before the light source, a reversal of what is accustomed to with traditional lighting, which is the lamp failing before the ballast. The research institute published a study about it in 2013.

Product replacement: After LED products are installed, infancy failures may occur and would be covered by warranty. Should a product fail after the warranty expires, replacement products must be purchased unless spares are available in attic stock. The look and shape of LED luminaires are not standardized, and product cycles are compressing to as little as one to two years, resulting in new generations. This presents the risk that the manufacturer may no longer be in business or that the product may no longer be available or have a different light output or form factor.

Mechanical and Physical Interactives

The maintenance plan will be very dependent upon the final design of the exhibits and will have to be reviewed on individual basis once development is complete.

A good interactive will endure a large amount of use from a wide range of audience. It is essential to keep maintenance and servicing up to date with regular checks and logging of faults to identify issues and improve the performance of any interactive. Through regular maintenance inspections, servicing and replacement of minor parts, the life span of exhibits can be increased and downtime kept to a minimum.

7.2.2 Training/Contract Requirements for New Technology

In terms of exhibit maintenance skillsets and available specialty tools/equipment, while having highly trained technicians with years of experience across multiple fields is desirable, this may not be possible/practical. In-house core maintenance staff should include specific technical expertise required for interactives relying on custom electronics and moving mechanical parts and training in some technical field, and past field experience diagnosing and repairing equipment.

More and more companies are relying on outsourcing (using temporary employees) or specialty contractors to supplement their in-house workforce. Temporary or contract employees can cover temporary skill shortages or gaps and provide relief during peak work periods. Contracted labor is often ideal for specific, self-contained projects and can serve as an ongoing supplement to core museum staff.

7.3 Work Induction, Tracking, Notification

A centralized work induction, tracking and notification system with a “dash board” function has been identified a follow-on action for assessment in FY 2018.

7.4 Key Contacts

An emergency contact sheet was created to serve as a quick reference guide for urgent/critical collections and exhibits maintenance issues.

Exhibit Maintenance Emergency Contact Sheet

Department	Contact Person	Contact Info	Example of Issue
Exhibits Technology	Alex Van Ness A/V - Group ET - Group	O: (202) 633-2308 C: (202) 498-4020 VanNessA@si.edu NASM-AVSUPPORT@si.edu NASM-ET@si.edu	- Interactive screen out - Mechanical interactive broken - Lighting - PA - Audio
Exhibits Production	Dave Cremer Production Group	O: (301) 238-1665 C: (202) 498-4302 CremerD@si.edu NASM-ExhibitProduction@si.edu	- Graphic panel damaged - Exhibit case/component damaged

Collections	Liz Garcia Malcolm Collum	O: (703) 572-4126 C: 202-557-0410 GarciaE@si.edu O: (703)-572-4361 CollumM@si.edu	- Exhibit case damaged - Leak on artifact - Artifact damaged - Artifact alarm activation
Artifact Cleaning Crew	Jeff Franklin	O: (202) 633-2458 FranklinJB@si.edu	- Artifact/case dirty - Lift parked in way
OFMR	Ryan Doyle SF Help Desk	O: (202) 633-3227 C: (202) 359-8283 DoyleR@si.edu O: (202) 633-1560 SF-Help@si.edu	- Building leak - Utility outage - Carpet tear - Building Lighting

7.5 Building Information Modeling (BIM)

The NMB Revitalization Project was selected as a pilot project to inform the development of the Smithsonian's BIM standards for design development and information management.

The models are to be developed in a manner that will support on-going operations and management of the building and its systems, including an inventory of facility items and recommendations for servicing based on the specified design use and not solely on the standard manufacturer's recommendations. The models will include asset information for all facility system equipment based on the SI asset template. It is anticipated that BIM models will be created for each exhibition to integrate with the building BIM model.

8.0 Staffing Requirements by Responsible Organization

Based on information contributed by maintenance providers, current and projected staffing requirements are indicated below.

Responsible Organization	Current Staffing	FY20 Projected Staffing Requirement
Conservation/Artifact Cleaning Crew	5 FTEs 3 NMB Volunteers 15 NMB Volunteers	Recommend shift to contract support for high cleaning, increase in volunteer cleaning crew, retaining 5 FTEs for all low cleaning
Exhibit Production	10 FTEs	Recommended increase in staffing by 1 NTE/FTE for total of 11 FTEs
Exhibits Technology	8 FTEs 1 contractor 3 PTEs	Recommended increase in staffing by 2 to support projected increase in mechanical interactives at NMB.

9.0 Budgetary Requirements

Based on the information provided to the EMT, below is an outline of current annual budget and FY2020 projected budget by maintenance area. The increase of an estimated $1,303,500 in requirements is due to further refining requirements, acknowledging gaps at UHC, and recommended addition of contract support in required areas. If the high end of computer interactives maintenance is assumed ($800k), the delta is reduced to $503,500.

Maintenance Area	Current Annual Budget	FY20 Projected Budget
High Artifact Cleaning	$5,000 supplies (NMB) $210,000 contract (UHC)	$300,000 NMB $300,000 UHC Estimated based on current contract cost + estimation of NMB scope + escalation
Low Artifact Cleaning	$2,000 supplies (UHC volunteers) Cost included in high artifact cleaning above (NMB)	$10,000 estimated for both locations
Artifact Specialized Cleaning and Repairs	Absorbed in regular operating budget	Absorbed in regular operating budget
Artifact Loan Rotations, Rotation of Sensitive Artifacts	Absorbed in regular operating budget	Recommend establishing annual funding, to be further established as Transformation loan list is confirmed
Computer Interactives	$90,000 – $800,000 (NMB)* Depends on equipment replacement cycle	$150,000 (NMB) $10,000 (UHC) Estimated based on current NMB design, age of UHC interactives
Mechanical Interactives	$50,000 (NMB)	$100,000 (NMB) $10,000 (UHC) Estimated based on current NMB design, potential addition of UHC interactives
Media Wall Maintenance Contract	$50,000 for 5 years (hardware)	Current hardware maintenance contract runs through June 2021
Media Content	$0	$10,000 (NMB/UHC) This estimate should be further refined as NMB interactives are further developed
Exhibit Components Repair (Cases, Graphics Panels, Gallery Signage)	$51,000 (NMB/UHC combined)	$200,000 (NMB/UHC combined) Estimated based on proactive strategy proposed in this document + escalation
Environmental Controls for Cases	$0	$50,000 (NMB/UHC) Estimated based on current NMB design, age of UHC cases
Gallery Signage (Wayfinding, Maps)	Budget carried under Exhibit Components line	Budget carried under Exhibit Components line
Welcome Center	Budget carried under Exhibit Components line	Budget carried under Exhibit Components line

Exhibit Electrical and Lighting	$50,000 (NMB) $3,000 (UHC)	$60,000 (NMB) $535,000 (UHC) Estimated based on proactive strategy proposed in this document + escalation, UHC estimate is for cost of service contractor for lamp replacement/repair ($35k) + cost for service contract for required upgrades and repairs for exhibit case lighting($500k)
Exhibit Walls	Budget carried under Exhibit Components line	Budget carried under Exhibit Components line
Exhibit Flooring	Budget carried under Exhibit Components line	Budget carried under Exhibit Components line
Donation Boxes	Budget carried under Exhibit Components line	Budget carried under Exhibit Components line
Aerial Lifts	$30,500 maintenance contract (NMB/UHC)	$35,000 maintenance contract (NMB/UHC) Estimated based on current scope + escalation Replacement cost for 60' lift $106,000 (may be requirement earlier than FY20, not included in total below) Recommend line item of $75,000 for purchase of replacement lift every 3 years or major repairs annually
Facility Areas (Corridors, Non-Exhibit Areas)	Covered under OFMR annual funding	Covered under OFMR annual funding
Total	**$541,500** *for purposes of this total, low end budget of $90k calculated for computer interactives	**$1,845,000**
Additional Consideration for Replacement of Barrier Lighting at UHC (Referenced in Section 3.1.14)		$5,790,308

9.1 Budget Requirements by Responsible Organization

Based on the table above, the budget requirements by responsible organization is summarized below. Totals do not include staff costs.

Responsible Organization	Current Annual Budget	FY20 Projected Budget
Conservation/Artifact Cleaning Crew	$247,500	$770,000
Exhibit Production	$51,000	$200,000
Exhibits Technology	$243,000	$865,000
TBD – Media Content	$0	$10,000
TOTAL	**$541,500**	**$1,845,000**

9.2 Capital Investments Requirement for Maintenance

Purchase or replacement of maintenance related equipment should be evaluated by the EMT on a rolling basis. Currently, the most pressing requirement is for a replacement 60' aerial lift at the NMB. Estimated cost for replacement is $106,000.

10.0 Implementation Plan

10.1 SKYNET page

In order to provide NASM-wide visibility/accessibility to maintenance tools, resources, and reference documents, a dedicated maintenance page to be established on SKYNET by the end of Q2 2018.

Develop Exhibits Maintenance directory on NASM SKYNET with links to maintenance providers, work generation systems, and status updates (i.e. exhibits removed/down for repair, major component repairs/maintenance actions, etc.).

10.2 Work Induction System

Identify requirements (desired functionality) of a centralized tracking system capable of displaying real-time status of exhibits maintenance actions. Develop system requirements and capabilities as an action item to be complete by the end of Q4 2018. As a baseline, the system should support the following (minimum) capabilities:

Verify that an issue has been identified and entered into the "system"

Provide date identified, maintenance provider assigned and estimate to complete

Notification to service providers and stakeholders for awareness and coordination of support requirements or supplementary work

Dashboard to see status of maintenance actions

11.0 Exhibits Maintenance Team Look Ahead

11.1 Outbrief to Leadership

Following the final report submittal on September 29, 2017, the EMT will work with the sponsors on distributing the report to NASM leadership. The Team can schedule an in-person briefing, if required.

11.2 Team Members Post-Final Report

The EMT recommends that the post-final report team is comprised of the Co-Chairs and the Maintenance Team outlined in the team charter to include the Associate Director of Exhibits; the Associate Director for Collections, Artifacts, and Logistics; Facilities Liaison; Supervisory Exhibits Production Specialist; Supervisory Visual Information Specialist; Supervisory Exhibits Technology Specialist; Office of Facilities Management and Reliability Leadership Representative; and Conservation Unit Representative. The EMT recommends retaining a Project Manager to manage the scope, schedule, and budget of this ongoing effort.

This team would be charged with meeting quarterly to provide a summary of maintenance assessments, actions, and problem areas for continued improvement.

The EMT recommends that at least annually, the team provides the maintenance stakeholders with an update on maintenance efforts. As designated in the charter, maintenance stakeholders include representatives from Collections Processing Unit, Preservation and Restoration Unit, Education and Public Engagement (formerly Education and Digital Experiences), Security, Visitor Services, and the Curatorial departments.

The EMT recommends that the maintenance stakeholders remain their respective department's conduit to provide maintenance concerns to the EMT.

11.3 Team Requirements Post-Final Report

11.3.1 Quarterly Summary for Continued Improvement

As noted in the charter, following the final report submittal, the EMT will provide a summary of maintenance assessments, actions, and problem areas for continued improvement.

Based on availability of team members, quarterly meetings shall be held on the following schedule:

Quarter	Meeting Held By
1st	31 December
2nd	31 March*
3rd	30 June
4th	30 September

*Meeting to be held in enough time to accommodate for annual budget call deadline in March

At the close of each fiscal year, the EMT will provide a summary report of maintenance assessments, actions, and problem areas to the maintenance stakeholders and NASM leadership, as outlined below.

11.4 Leadership Accountability

Following submittal of the final report to the Co-Sponsors and subsequently determined dissemination to current NASM leadership, the Co-Chairs and Project Manager will work with the Co-Sponsors to outline an appropriate delegation of NASM leadership to include in quarterly outputs from the EMT. The target date for confirming the delegation and outputs is 2nd quarter FY18, following the anticipated start date of the new NASM director in January 2018.

11.5 FY2020 Budget Submittal

In order to be considered for central Smithsonian exhibit maintenance funds, the NASM EMT will provide maintenance funding requirements through the proper NASM channels ahead of the March 2018 request.

11.5.1 Budget Request Schedule Milestones

Schedule milestones for submitting this request in a timely manner are outlined below:

Milestone	Required Date*
Final report submitted to Co-Sponsors and NASM leadership	September 29, 2017
EMT and NASM leadership refine any budgetary requirements outlined in final report	November 30, 2017
EMT 1st quarter meeting held, any budgetary requirements updates submitted through EMT	December 31, 2017
EMT finalizes maintenance budgetary requirements	February 2, 2018
EMT submits maintenance funding requirements through required NASM channels	February 16, 2018
NASM budget request submitted to SI leadership	March 2018, exact date unknown

*Dates may be updated, dependent upon SI leadership budget submittal requirements

11.5.2 Maintenance Budget Submittal

Below is a snapshot of a previous year's Smithsonian budget request by an individual unit. The EMT will format our line item request for exhibit maintenance to align with this example and submit through appropriate NASM channels.

An example addition for exhibit maintenance to this request is "Proactive exhibit maintenance is a crucial part of the proper management of NASM, to ensure the continuous and safe presentation of our exhibits to our guests."

as highly pathogenic avian influenza, require additional staffing to respond to new requirements and maintain a viable collection.

Furthermore, the National Zoo must strategically augment staffing with a select number of well-trained animal care professionals and veterinarians — staff who are essential for ensuring that the Zoo successfully achieves its vital mission of saving species. Specifically, the requested funding will support one veterinarian, three animal keepers, and one support position. Additional details are provided in the NZP unit narrative in this budget submission.

MISSION ENABLING

Category	FY 2017 Program Increase ($000s)	FY 2017 FTEs Increase
MISSION ENABLING		
• Facilities Maintenance	+14,500	+23
• Facilities Operations	+15,640	+51
• IT Infrastructure	+2,050	+0
• Management Operations	+1,770	+8
Total Increase	**+$33,960**	**+82**

Facilities Maintenance — Base: ($73,877,000); FY 2017 Increase: (+$14,500,000, +23 FTEs)

For FY 2017, the Smithsonian requests an increase of $14.5 million and 23 FTEs to enable its maintenance program to continue the work of stabilizing and standardizing the overall condition of Institution facilities. The increase will fund high-priority needs, including support to complete funding of facilities and security operations for the National Museum of African American History and Culture (NMAAHC). The long-term, well-documented goal is to maintain Smithsonian facilities at the Leadership in Educational Facilities, or APPA, top rating of Level 1. Progress toward that goal has been made in recent years. With the resources requested in the FY 2017 budget, the Smithsonian will operate at a solid APPA maintenance rating of Level 3 (out of 5), "Managed Care." This increase provides a minimal level of preventive maintenance and building system reliability to ensure that proper environmental conditions are maintained for collections and that public expectations are met.