SECTION C
DESCRIPTION/SPECIFICATIONS/AND WORK STATEMENT

1. **BACKGROUND**

Building on the highly visual world we have come to expect in everyday life, education, entertainment, and recreation, the National Park Service recognizes the added value of new media maps in publications, information kiosks, videos, exhibits, portable electronic devices, and online. Digitally-generated terrain models give visitors an overview of the park and the opportunity to "touch" the landscape—an important accessibility consideration. Our mission is to provide access information and safety data while enhancing a park story. This can be done through a combination of highly accurate, stimulating, and innovative map depictions of terrain, geological phenomena, pre-history scenes, a battle plan, or by extending a visual invitation that encourages park visitors to explore a particular trail on foot. Such an interpretive device also offers a realistic visual experience to less agile visitors who are just as eager to experience a park's story, but from their vantage point. With the advent of computer graphics programs, combined with cartographic databases that are expanding daily, the possibilities for enhancing park interpretation methods also increases.

2. **PURPOSE**

The purpose of this contract is make use of the latest technology to provide new media map products and digitally-generated terrain models to enrich the experience of visitors while at a park, on the Web, and via portable electronic devices and other emerging technology. The National Park Services (NPS) requires the following products and services.

NEW MEDIA MAPPING SERVICES

This category includes an array of map products, of which three-dimensional (3D) maps are the most commonly used by the NPS at the present time. The following describes the types of new media maps sought.

3D maps: Sometimes called panoramas or birds-eye views, these digitally rendered views show landscapes (and 3D objects on the landscape) from an oblique angle. They are presented on flat two-dimensional surfaces, such as paper. Typical uses include printed publications, wayside exhibits at trailheads, museum exhibits, and digital displays.

Flythrough animations: As if in a low-flying aircraft, flythrough animations take the viewer on a virtual journey over a landscape created from Digital Elevation Model (DEM) data, draped imagery, and 3D buildings in a scene that can contain a horizon and clouds. Producing flythrough animations requires 3D software. Typical uses would include movies shown in visitor centers or introductory screens on digital kiosks.

Animated maps: This product shows a sequence of events or information on a base map presented on a computer display. Animated maps can use both 2D and 3D maps as bases. Typical uses for animated maps would include showing continental drift on a world map, the advance and retreat of glaciers, and battlefield troop movements.

Interactive maps: Delivered dynamically on the Web and on electronic devices, interactive maps provide graphically rich tools and layered information that engages the reader. Virtual navigation and information retrieval are key uses.

DIGITAL TERRAIN MODELS

Created from a variety of solid materials, such as high-density foam or resin compounds, these models show a scaled representation of the landscape in three dimensions. They derive from Digital Elevation Model (DEM) data that a Computer Numerically Controlled (CNC) router reads to carve the terrain. Digital data for landscape textures, map labels and lines can be added to the surface of the routed model. Digitally-generated terrain models are usually at least several square feet in size and displayed either horizontally or vertically. When made from durable materials, they are touchable by the public.

3. SCOPE OF WORK

Independently, and not as an agent of the Government, the contractor shall furnish all labor, materials, facilities, and miscellaneous services to provide the National Park Service with new media maps and digitally-generated terrain models. The contractor shall also prepare preliminary data to be used by the National Park Service for in-house production or by third-party contractors.

NPS new media maps must combine accurate geo-data and exceptional graphical presentation. The default output from Geographic Information System (GIS) and many Computer Assisted Drawing (CAD) applications do not meet National Park Service presentation requirements. Conversely, the most aesthetic output from graphical applications that is not derived from geo-data also does not meet National Park Service geographical accuracy requirements.

Because NPS maps cater to the lay audiences from diverse backgrounds—the citizens of the United States and millions of people from abroad—it is essential that they convey complex geographic concepts and spatial relationships in a clear and understandable manner. To ensure accessibility for the widest possible audience, the design of new media maps and digitally-generated terrain models shall incorporate universal design principles and conform to NPS Accessibility Standards, Attachment O.

In addition to having a keen eye for design and the ability to present visual information effectively, the contractor must be broadly familiar with U.S. geography—physical, cultural, and historical geography, geomorphology, ecoregions, and land use are themes common on NPS maps.

All new media mapping shall be cross-platform accessible on Macintosh System 10.0 or higher and Windows XP or higher. The contractor shall use common data formats for map creation, unless otherwise specified in individual task orders. The software used for production will vary depending on the use to which the new media map will be put. Vector artwork shall be delivered in Adobe Illustrator CS2 or higher format. Final raster images shall be delivered in Adobe Photoshop CS2 format or higher. Preliminary raster images for evaluation shall be delivered as high-quality JPEGs. Apple QuickTime format shall be used for map Flythrough animations and 360-degree panoramic scenes.

Presently, the NPS is flexible about the software applications and data formats used for the creation of new media maps and digitally-generated terrain models. The NPS is in the process of adopting Department of the Interior Enterprise Application software standards. The contractor will be notified of any new standards and procedures to be utilized to provide deliverables under this contract according to the most current standards.

At a minimum, however, contractors must posses expertise with the software that the NPS presently uses, including Bryce 5.5, Natural Scene Designer 4.0, Google Sketchup Pro 5.0, Zoomifyer, and Macromedia (now owned by Adobe) Flash Professional 8.0 and Director. Software upgrades may be required over the course of the contract. Programs, formats, upgrades, and/or specialized fonts will be specified in individual task orders.

The National Park Services recognizes that new media map and digitally-generated terrain model technologies are evolving rapidly and that other software applications, data formats, and production solutions might become available that are better suited to National Park Service mapping needs. The National Park Service encourages the contractor to propose alternative solutions as they become available. These will be evaluated on a case-by-case basis for incorporation into the National Park Service new media map and digitally-generated terrain model program.

Specifically, the following work is required:

A. **3D Maps**:

The contractor shall use 3D software of their choice for rendering 3D maps, unless otherwise specified in individual task orders. When finished, the contractor shall provide the National Park Service with the final 3D map rendering in Adobe Photoshop format, the 3D software scene file(s) used to create the 3D map, and associated preliminary base data including DEMs, geo-imagery, vector map linework, and 3D models and pictures.

(1) 3D map development shall be completed in two preliminary stages; each shall be submitted sequentially to the Contracting Officer's Representative (COR) for review and approval before starting production on the final map.

(a) Stage 1: A low-resolution 3D map showing basic scene parameters, including the format, layout, viewing direction, camera elevation, vertical exaggeration, and field of view. Terrain shall be shown in light neutral gray with an overlay of lines depicting roads, boundaries, and drainages; the sky and horizon, if included in the scene, shall not contain clouds and atmospheric haze; and water surfaces shall be shown as flat blue. The file shall be delivered to the COR in jpeg format.

(b) Stage 2: A low-resolution 3D map, based on the scene parameters approved in Stage 1, showing final colors and textures; waves and reflections on water surfaces; and, sky and atmospheric special effects. The file shall be delivered to the COR in jpeg format.

(2) Production of the Final Map: After Stage 2 is reviewed and approved by the COR, the contractor shall prepare the final high-resolution 3D map, making any requested revisions or changes.

Requirements for final 3D map preparation shall include but are not limited to:

(a) All 3D scenes shall be rendered in at 300 dpi unless otherwise specified in individual task orders. Normal or higher anti-aliasing shall be used in rendering. Rendered file sizes, on occasion, will be up to 15,000 pixels wide and may require several days of continual computer processing to render.

(b) Rendering 3D scenes without cast shadows or colored illumination, other than white, unless specified in individual task orders.

(c) For greater flexibility, developing 3D map(s), not as a single monolithic file, but as multiple component files rendered separately and composited in Adobe Photoshop as layers and layer masks. The layer elements for compositing in Adobe Photoshop, depending on the project will be specified in individual task orders.

(d) Rendering linework depicted on final 3D scenes separately from the rest of the scene, but with identical 3D scene parameters. The rendered linework shall be composited directly, with final scenes in Adobe Photoshop, or serve as a template for redrawing linework in Adobe Illustrator. When traced from a template, linework shall then be used as either a vector overlay or rasterized for compositing with the final scene file in Photoshop as specified by the individual task order.

(e) Delivery of final 3D scenes in Adobe Photoshop format in RGB, CMYK, or grayscale color modes as specified in individual task orders. Color adjustments shall be placed on editable non-permanent adjustment layers. Unsharp masking shall not be applied.

(f) Making post-rendering edits to 3D scene files in Adobe Photoshop to remove visible seams between DEM tiles and repetitious wave patterns, adding breaking surf to shorelines, substituting skies from one scene file to another, adding free-standing clouds and cloud shadows, and other artistic embellishments as specified in individual task orders.

(g) Drawing 2D vector representations of buildings, vegetation, and other objects in Adobe Illustrator CS2 as an overlay surprinting raster images of 3D landscapes. The 3D landscapes shall be in Adobe Photoshop format placed within the Adobe Illustrator file as linked artwork. Vector elements shall be placed on multiple layers to facilitate editing.

(h) Creating typography, legends, north arrows and scales (where appropriate), and auxiliary vector linework in Adobe Illustrator CS2.

(i) Type font specification is limited and specific to insure graphic consistency from one map to the next and with other elements that may comprise the brochure or exhibit panel. The contractor shall acquire licenses for Adobe Type Library Frutiger light, light italic, roman, roman italic, bold, bold italic, black, black italic, and ultra black. Required type will be specified in individual task orders. If National Park Service Rawlinson fonts are specified, the Government will furnish the contractor with a proprietary set of fonts for exclusive use on the individual task order.

(ii) Typography placement shall be on multiple layers as defined by the National Park Service. Type positioning will be guided by legibility, layout, and will be a result of coordination with the designated COR for the individual task order.

(3) The contractor shall be responsible for preparing four types of preliminary base data to be used for the production of 3D maps. These data are Digital Elevation Models (DEMs); geo-imagery, aerial photographs and satellite images; vector map linework; and objects (buildings, landscaping, and other human-made features). Base data preparation shall place equal emphasis on accuracy and graphic quality.

When required to access base data, the contractor shall first determine if that information is available from a National Park Service source, a United States Geological Survey (USGS) source, or other non-proprietary source. Base data once compiled, edited, and approved for National Park Service projects shall, if possible, be unencumbered by one-time use fees, copyrights, or other licensing agreements. If proprietary base data must be used, the contractor shall notify the COR, in writing. The Government will negotiate the licensing terms and pay all fees.

Specific instructions for preparing base data follow:

(a) **Digital Elevation Models (DEMs):**

The contractor shall have the capacity to obtain and use Digital Elevation Models (DEMs) and related varieties of elevation data in the following file formats: ArcInfo ASCII DEM, AutoCAD Digital Exchange Format (DXF), USGS Spatial Data Transfer Standard (SDTS) DEM, USGS ASCII DEM (Optional or “Native” format), raw data (binary and ASCII format), Portable Gray Map (PGM), GTOPO30, and Digital Terrain Elevation Data (DTED). The contractor shall have the ability to import these data into 3D applications, including Bryce 5.5, without downsampling the

resolution for quadratic file sizes up to 4,096 x 4,096 height (pixel) samples. Larger DEMs shall only be downsampled with the permission of the COR.

DEM preparation and services shall include, but are not limited to:

(i) Maintaining all of the elevation values included in the original DEM source file at full 16-bit vertical resolution.

(ii) Merging multiple DEMs across adjacent Universal Transverse Mercator (UTM) zones as a single seamless file.

(iii) Editing defective DEM data to remove gaps and elevation differences between mismatched adjacent DEMs, applying smoothing filters to ameliorate the effects of systematic banding, terracing, and other visible artifacts, and making manual edits to remove spikes and holes.

(iv) On occasion, manipulating the projection plane of DEMs to produce spherical or convex surfaces for depicting over-the-horizon views and panoramas with curved horizons. Modifications to the projection plane of DEMs shall be made at 16-bit vertical resolution.

(v) Performing manipulations to alter the surface morphology of DEMs. These manipulations include, but are not limited to, selective vertical exaggeration, resolution bumping, Boolean rendering, drainage etching, and geomorphological special effects for showing erosion, orogenesis, glaciation, or other processes specified in individual task orders.

(b) **Geo-Imagery for 3D Maps:**

The contractor shall obtain, manipulate, and provide digital geo-imagery to be used as "draped" images and bump-map textures on their associated DEMs. Digital geo-imagery techniques and services shall include, but are not limited to:

(i) Cropping and registering aerial photographs, Digital Orthophoto Quadrangles (DOQs), satellite images, rasterized vector map linework, and Digital Raster Graphics (DRGs) to DEMs. Registration between geo-imagery and DEMs shall be within one pixel tolerance.

(ii) Compositing multiple smaller geo-images into seamless larger images, correcting for differences in color and tonal balance, texture, and contrast.

(iii) Colorizing grayscale aerial photographs, DOQs, and satellite images to RGB or CMYK color modes as specified in individual task orders. The contractor shall be responsible for adjusting false color satellite images to appear as natural ecosystems. Occasionally the contractor shall be required to remove clouds, cast shadows, and other unwanted features embedded in geo-imagery.

(iv) Enhancing geo-imagery in Adobe Photoshop with other cartographic and graphic elements. This includes, but is not limited to, the following procedures: Using DEM masks to create artificial snowlines on mountains; using DEM masks to add lowland green tints; applying noise and embossment filters to add textures representing woodlands; merging rasterized vector roads, drainages, boundaries, and area fills with geo-images; and, creating and enhancing bump-map textures. Geo-images and bump-map textures shall have a resolution at least twice that of the DEMs they are to be draped upon, unless otherwise specified. For example, a DEM containing 4,096 x 4,096 height samples shall be draped with a geo-image measuring at least 8,192 x 8,192 pixels.

(v) Preparing manipulated geo-images in Adobe Photoshop format as unflattened files with each class of data placed on a separate layer. Color and tonal adjustments shall be made with editable adjustment layers. For large-format special projects, layered file sizes may approach one gigabyte, although smaller flattened images shall be used for actual 3D draping.

(c) **Vector Linework for 3D Maps:**

The contractor shall obtain and prepare vector map linework. In most cases, these data shall be rasterized in Adobe Photoshop and combined directly with geo-imagery or used for producing 3D linework templates to be used as an intermediate production step.

(i) Map linework shall be derived, whenever possible, from USGS Digital Line Graph (DLG); National Park Service GIS sources, ArcInfo and MapInfo formats; Digital Chart of the World (DCW); the USGS 1:2,000,000-scale digital national atlas; and other digital public domain sources. On occasion, the contractor shall be required to digitize lines from paper maps.

(ii) All map linework shall be prepared as layered Adobe Illustrator CS2 files, or higher. Generalization, Bezier smoothing, shall not be used with imported geo-data linework, unless otherwise specified in individual task orders.

(iii) Map linework, drainages, boundaries, roads, trails, etc., shall be initially rasterized in Adobe Photoshop CS2. After the initial rasterization, these data can be opened and saved in later Adobe Photoshop versions safely. The color, width, style, and resolution of the rasterized map linework will be specified in individual task orders.

(iv) Map linework merged with geo-imagery shall be rasterized at the same dimension, resolution, and color mode as the geo-imagery on separate Adobe Photoshop layers.

(d) **Objects for 3D Maps:**

The contractor shall provide custom-designed objects for insertion into 3D scenes as 3D object files and 2D images. Objects shall be used primarily for large-scale site mapping and shall often include such items as buildings, walls, fences, ruins, bridges, rocks, trees, and human figures, as specified in individual task orders.

(i) The contractor can use the 3D modeling software and file format of their choice for creating exporting 3D objects (with final colors and textures intact).

(ii) Alternatively, as specified in individual task orders, the contractor shall provide the National Park Service with 2D raster images of objects such as trees and human figures. Images of objects shall contain a transparency mask for silhouetting the primary subject from unwanted background areas. The dots-per-inch (dpi) resolution of images shall be, at minimum, equivalent to the final rendered resolution of the 3D scene into which it will be inserted. Pictures shall be delivered in RGB Adobe Photoshop format.

B. **Flythrough Animations and Animated Maps and Interactive Maps:**

The contractor shall provide all labor, materials, and services necessary to create Flythrough animations and animated maps as follows:

(1) In general, flythrough animations shall be created to inform audiences about a landscape rather than entertain them with a thrilling flight. High elevation flights at slow speeds with a minimum of sharp turns, banking, and camera panning are preferred.

(2) The contractor shall prepare flythrough animations for a variety of purposes ranging from low-bandwidth web animations to high definition theater presentations. The frame rate, frame size (width x height in pixels), and data compression/decompression (CODEC) will be specified in task orders for each job.

(3) The contractor shall deliver flythrough animations in Apple QuickTime 7.0 format or higher with maximum quality and without compression unless otherwise specified in individual task orders.

(4) Prior to rendering final flythrough animations the contractor will provide preliminary animations that are thumbnail-sized (formatted as a smaller version of the final) and at low frame rates.

(5) On occasion the contractor may be asked to provide special effects on flythrough animations, including a cross fade at the start or end of a flythrough with video footage of an actual landscape; creating realistic scenes with atmospheric haze, clouds, and water reflections; and, modifying textures that appear on the landscape surface during the course of the flythrough.

(6) The primary software for creating animated maps in vector format shall be Macromedia Flash 8 or Director. The contractor must receive approval from the NPS to use other software—such as those based on Scalable Vector Graphics (SVG) format—for creating vector map animations

(7) Raster animated maps may be created with any software application provided that approval is granted by the NPS.

(8) Because NPS interactive maps will be used by diverse audiences, the contractor shall prepare them with intuitive and easy-to-use graphical user interfaces (GUIs).

(9) NPS interactive maps shall have an elegant and refined look eschewing the overwrought and cartoon-like graphics that often characterize this genre. Gimmicky and gratuitous interactive features shall be avoided in favor of those that bring enhanced value and understanding to the map.

(10) The construction of interactive maps shall take into account the method of delivery (Web, kiosk, CD-ROM, etc.) to ensure that the maps load quickly and the GUI is responsive.

(11) The New Media Map contractor shall prepare map bases and other preliminary data for use by NPS exhibit and audiovisual contractors. Individual task orders will specify how to coordinate these projects.

C. **Digital Terrain Models:**

The contractor shall provide all labor, materials, and services necessary to create, ship, and install computer-generated and digitally-generated terrain models for the indoor and outdoor exhibits as follows:

(1) Models shall be prepared from DEMs with the maximum number of height postings possible for a carving a detailed model with a Computer Numerically Controlled (CNC) router.

(2) All necessary measures shall be taken to assure that the carved model does not exhibit artifacts, such as parallel grooves, contour terraces, and edge-matching seams between merged DEM tiles.

(3) Where water bodies exist on the model, if necessary, the DEM shall be manipulated, so that the water surface appears as a flat surface on the routed model.

(4) The contractor shall propose the amount of vertical exaggeration needed on final models and provide the NPS with visualizations for review. If necessary, vertical exaggeration shall be reduced to prevent mountains from spiking upwards and to prevent draped type and lines from blurring.

(5) The contractor shall provide a sample 1’ x 1’ section of the proposed final model for NPS review and approval before producing the final. The NPS shall select the area on the model that the 1’ x 1’ sample will show.

(6) Images draped onto the model shall be in perfect registration with the DEM below. The DEM or draped image shall be manipulated if necessary to keep drainages in narrow valley bottoms.

(7) In addition to topographic shading, land cover, aerial photographs and satellite images, draped images shall contain roads, trails, text labels, north arrow, scales, and other map elements as requested by individual task order.

(8) Draped images shall be prepared at the highest resolution possible for the model making process to maximize detail and legibility.

(9) If a subcontractor is used for fabricating the final model, the primary contractor shall provide them with digital files (a DEM and image for draping in the appropriate formats) and an inkjet printout to be used as a proof for color matching.

(10) The contractor shall treat all final models with a clear protective coating that minimizes glare.

(11) Depending on the park, visitors may or may not be allowed to touch the exhibited model. Models intended for occasional touching by visitors shall be constructed for extra durability from the highest density foam available and with extra protective coatings applied to the surface.

(12) To make models that will be routinely touched by visitors, the contractor shall provide physical models routed from foam to subcontractors for casting with weather-resistant materials such as bronze, plaster, and epoxy resin.

(13) Touchable terrain models shall follow Architectural Barriers Act Accessibility Standards (ABAAS). Touchable exhibits positioned horizontally (on a table or platform) should be placed no higher than 30" from the floor. In addition, if the exhibit is approachable only on one side, it should be no deeper than 24”. Touchable exhibits positioned on a vertical surface (such as a wall) shall be no lower than 15” above the finished floor and no higher than 48” above the finished floor. (ABAAS 308.3.1)

(14) Fabricate attractive, sturdy, display tables custom fitted to the size and shape of the final model.

(15) Provide for the shipping of the final tactile model and table to a park or other facility.

(16) If required by the individual task order, install the model and table at a park or other facility.

(17) Create models with raised tactile surfaces and lettering and Braille for use by people with visual impairments.

(18) Create portable models via vacuum forming, embossing, or other technologies with raised tactile surfaces that are lightweight and portable.

D. **File Delivery:**

The contractor shall provide the preliminary and final new media map files in digital format only. Files (under 7 megabytes) can be submitted as email attachments, files larger then 7 megabytes can be submitted via FTP (hosted by the contractor), or on optical media (CD-ROM and DVD-ROM). The exception to this is digitally-generated terrain models and their tables that require shipping by traditional means.

4. ADVANCE UNDERSTANDING

The National Park Service retains ownership of the compilation data, and all digital components used to generate all production-ready files.

5. PERFORMANCE

All work to be performed under this contract, will be directed by the Government through the issuance of individual task orders in accordance with the procedures outlined in Section G. In no event will the Government be responsible for any work performed by the contractor that was not undertaken pursuant to a duly executed task order signed by the Contracting Officer.

6. ACCESSIBILITY

All work performed under this contract shall be in accordance with Attachment J, *Draft* Programmatic Accessibility Standards for National Park Service Interpretive Media, dated November 2006. These standards are in the process of being finalized. Once finalized, the contract will be modified to add the final version.