Section 6
Additional Tools for Visual Mitigation

Effective visual mitigation of oil and gas facilities requires in-depth analysis from locations where the improvements are the most visually sensitive. To analyze and formulate proper mitigation solutions before construction of facilities, accurate and detailed digital information needs to be gathered and created. The more accurate the digital information, the more exact and reliable the visual impact analysis and the greater the ability to develop effective mitigation solutions.

Data requirements

Projection information requirements, including datum and units, must be decided prior to data collection. Either NAD 1983 Stateplane Colorado South_FIPS_0503 [Feet]) *or* UTM NAD 1983 or 1927, Zone 13 provide real-world projection information for use in GIS, CAD, and other modeling software.

Survey data should also be collected in real-world coordinates and CAD data should be generated in the chosen projection from the start. When CAD data is initially drawn in a layout without a projection assigned, accuracy is lost when the data is referenced and aligned into the correct location at a later date.

CAD data requirements

CAD data must be created in a real-world coordinate system. The projection needs to be assigned before the information is generated; CAD information cannot be accurately "rubber-sheeted" into a real world coordinate system after the information has been generated.

GIS data requirements

GIS data should be created in the agreed-upon projection. If created in a different projection, the GIS data needs to be re-projected into the project datum for analysis. Appropriate meta-data needs to be included following FGDC (Federal Geographic Data) standards.

Data types for analysis

Multiple data types are required to accurately model and evaluate proposed oil and gas improvements. Information representing the following will be needed for effective evaluation and generation of proposed visual mitigation practices:

- **Locations for all proposed facilities, roads, pads, and other features that would be part of the finished construction.** This includes cut-and-fill slope calculations for all grading and the associated construction requirements, such as additional fill or surplus cut, as determined by an on-site survey using accurately located, real-world coordinates.
- **Details regarding the visual appearance and functional requirements of all proposed facilities, roads, well pads, and other additional features.** This includes the façade information for structures and facilities, type and frequency of vehicular access to the site, and the functional setback requirement for equipment. This information should be provided in a written format with diagrams or imagery to provide further explanation.
- **Locations from which the view of the proposed improvement would be the most visually sensitive.** Views may be static from a single point or dynamic as the viewer travels along a road. Key observation point information should be provided in a georeferenced CAD file or in a GIS format file.

- **Terrain information representing the landscape that would be seen from key observation points.** Terrain information should include the landforms between the viewer and the improvements, as well as the landforms adjacent to and behind the improvements. All terrain in the subject viewshed should be represented. This information should be obtained by LIDAR (Light Detection and Ranging), an airborne system that uses pulses of laser light striking the surfaces of the earth and measuring the time of pulse return. This data is well-suited for making accurate digital elevation models. In addition, the data is geo-referenced from inception which means it can be used directly in GIS.
- **Terrain data representing all proposed modifications to existing contours.** This data would include existing, construction, and reclamation contours. The information should be provided in a geo-referenced CAD file.
- **Orthophotography of the viewshed area**. Digital imagery created through orthophotography has distortion from the camera angle and topography removed, thus equalizing the distances represented on the image. In order to be useful and accurate, these image files must also include real-world projection files.
- **Surrounding conditions information** such as parcel boundaries and ownership, locations and outlines of surrounding landcovers (with specific vegetation types and zones), existing structures, bodies of water, protected species habitats, utilities, public roads, and any other pertinent information that would be important for an accurate visual mitigation analysis. This information should be provided in a GIS-compatible format. Providing accurate data for visual mitigation analysis.

Terrain data inaccuracies

Inaccuracies and discrepancies in basic information will lead to visual mitigation solutions that are less than ideal. The visual mitigation analysis and solutions will only be as accurate as the information from which the analysis is run.

Common problems associated with terrain information include the following:

- CAD information for site surveys is often created without using real-world coordinates. “Rubber-sheeting” the data into place leads to inaccurate horizontal and vertical location. The site survey information should always be generated in a CAD file or GIS-compatible file that uses real-world coordinates.
- Cut and-fill calculations for lengthy improvements, such as access roads, are often generated from a centerline over the contour information of a USGS quad. The USGS contour data generated from 30 meter DEMS is too general to develop an accurate representation of the terrain information. Cut-and-fill calculations should be generated from the surveyed alignment of the road width over survey or LIDAR-flown terrain data.

- The area specifically associated with the proposed improvements is surveyed with a one-foot contour interval and then laid over generally available contour information with a 30-foot or greater contour interval. This creates a huge jump along the edge of the contour information where the accurate information meets the less-accurate contour interval. All proposed site information, including the areas that will be disturbed for construction, should be generated from a geo-referenced onsite survey. All additional terrain data should be obtained by LIDAR.

There are multiple ways to analyze and evaluate the data described above. The following are proven, recommended programs and methods.

Autodesk Map, AutoCAD Land Desktop

CAD, or Computer-Aided Design, is used to evaluate and edit the proposed contour information and develop the layout and orientation of the proposed site and facilities. A Map extension to a CAD program is used for exporting the information as shape files to be opened in a GIS program. Example Software: Autodesk Map, AutoCAD Land Desktop

GIS

GIS, Geographic Information System, is an information system used to manage, edit, and analyze spatial data, generate maps, and look at the terrain data in 3D. It is a very efficient tool for analyzing the distance and elevation differences between the proposed improvements and locations with the most visual sensitivity, assisting the user in development of effective visual mitigation strategies specific to each site. GIS is an important tool for analyzing the large areas of terrain often associated with visual mitigation. Example software: ArcMap.

Modeling programs

GIS spatial data is exported into a landscape modeling program for further analysis. Using the terrain and other spatial data from GIS, the modeling program applies attributes that simulate the characteristics of the adjacent landscape and the proposed improvements, such as vertical vegetation or structures. Modeling programs are used to simulate visual mitigation strategies in a real-world setting, providing the opportunity to evaluate their effectiveness before implementation. Example Software: Visual Nature Studio 2.

Photo editing programs

Photo editing programs are used to generate photo simulations to represent the views from specified critical observation areas. GIS points can be taken in the field to designate where images are being taken from. These points can be imported into the modeling programs and cameras set exactly on those points to generate the views in the model from the point. The model image can then be compared to the photo and a simulation can be created in the photo editing program. Example Software: Adobe PhotoShop, PhotoImpact, Digital Image Suite.