

March 17, 2008

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Chris Larsen  
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Dear Attorney Larsen,

This letter is a report of my review of the expert opinion by Brian R. Sovik (February 1, 2008) in United States vs. Menominee Tribal Enterprises, Marshall Pecore and Conrad Waniger, Cas Number 07-CV-00316, United States District Court, Eastern District of Wisconsin. In addition to Mr. Sovik's report I have also reviewed the following documents:

Report of Robert Sayer  
Maps provided by USAO:  
Bates nos. USA0010272 - USA0011572 and  
BIA Summary Maps 23-29 (Attachment C to the Initial  
Disclosures of the United States)

For your information, I have not previously testified in a court case nor have I ever been disposed for a case. My CV is attached to this document.

My comments are specifically directed to the report of Mr. Sovik but also generally apply to the report of Mr. Sayer with regards to the procedures used to transfer information from one document to another using geographic information systems technology. My opinion is that the errors that were created in such transfer could not be more than a few hundred feet per work accomplishment segment.

#### Proper Mapping Procedures

Mr. Sovik suggests that errors were introduced into the MTE compartment maps because of a "lack of mapping procedures" in transferring information about work accomplishments ("highlighted accomplishment maps") by digitizing the work accomplishment. (NOTE: Digitizing means using a hard copy map or aerial photograph and converting it to digital form for use in a GIS. The process involves clicking on a beginning point and an ending point of the line being digitized. This second point then becomes the beginning point of another line.).

This could be significant if the highlighted accomplishment maps were, in fact, digitized and the information then overlaid onto the MTE compartment maps. However, if the procedure in transferring the work accomplishment information to the MTE maps was to use the accomplishment maps as a reference for locating existing road segments in the MTE GIS database, then I do not believe any error would have been introduced. However, I have not been provided with information about which method was used to transfer the work accomplishment information to the MTE GIS database.

If the work accomplishment was actually digitized directly off the work accomplishment maps, then it is likely that errors would have been introduced as Mr. Sovik states. The result would be that the MTE work accomplishment distances would be in error.

### Limits of Source Maps

Mr. Sovik feels that the source maps (the “compartment maps”) do not contain an accurate placement of the roads because road locations were not the primary focus of the maps used to digitize them (the Continuous Forest Inventory maps and the Operations Inventory).

As I understand, the GIS map database that was used by MTE to identify work accomplishment (and then displayed on the “compartment maps”), originated from the BIA map database that was created from the United States Geological Society (USGS) topographic maps<sup>(1)</sup>. This means that the roads in the database conform to National Map Accuracy Standards which require that at least 90 percent of the horizontal points be accurate to within one-fiftieth of an inch on the map (40 feet on the ground). This, however, applies only to the roads that came from the USGS database, and many of the logging roads were not included.

My understanding is that these additional logging roads were digitized and added to the MTE GIS map database by MTE from aerial photographs – a process that is very similar to that used by the USGS to create their maps. However, if those aerial photographs had not been “rectified” (corrected for camera tilt and terrain relief errors), and if they were at a smaller scale than 1:24,000, then they would not have the same level of accuracy as the USGS GIS database. I have not been provided that information, but if rectified aerial photographs had been used, the logging roads digitized from these rectified aerial photographs would have a similar accuracy to the USGS GIS database (“40 feet on the ground”). This accuracy appears to be appropriate for calculating distances.

1. The USGS took over responsibility for mapping the country in 1879 and has been the primary civilian mapping agency of the United States ever since. The best known USGS maps are the 1:24,000-scale topographic maps, also known as 7.5-minute quadrangles. More than 55,000 7.5-minute maps were made to cover the 48 conterminous States. This is the only uniform map series that covers the entire area of the United States in considerable detail. (<http://erg.usgs.gov/isb/pubs/booklets/topo/topo.html>)

## Road Segment Modeling

This section of Mr. Sovik's analysis takes issue with the use of the BIA GIS maps to measure distances along a road segment. He identifies three situations that may cause errors in calculating the length of road segments:

- 1) the mixing of projections or shifting of vertical map datums (e.g. NAD 27 – NAD 83)

According to the Wisconsin State Cartographer's Office, the differences between the NAD 27 and the NAD 83 (1991 adjustment) datum shifts ranged "...from -14 to +1 feet in latitude and from -1 to +1 feet in longitude (NAD 83 (1991) minus NAD 83 (1986) position)" (Wisconsin Geodetic Control, Guide 2, October, 1992, p.3)

- 2) transferring the claims of fraudulent work claims from the small-scale hand drawn maps (eg. "Bucci's EX 22 map) to the larger-scale compartment maps

My understanding of the process used to transfer the claims of fraudulent work claims by BIA is that three sources of information were used to form the basis upon which road segments in the BIA GIS were identified as to the extent of brushing (partial or none):

- the Compartment Maps originally digitized and then printed by MTE (showing work accomplishment claimed on their invoices)
- the annotated "hand drawn" maps created by Mr. Congos (showing his observation of work accomplishment), and
- the text information printed about each photograph taken by Mr. Congos.

If this is the case, then the existing road segments from the BIA GIS database were only identified (ie, "clicked on") and recorded as either partially or fully brushed (as identified by Mr. Congos) – not digitized. Thus, the work accomplishment segments (the symbolized thick lines on the BIA GIS maps) would not have been digitized, but rather created by identifying existing BIA GIS road segments. This means that no errors could have been introduced because the existing roads were used to identify work accomplishments. The existing roads came from the database used by both BIA and MTE and as a result, are as accurate as the BIA and MTE GIS map database.

- 3) the implication that Marty Casselius used a large "tolerance" in recording curved road segments using the Arc/Info software. (NOTE: In a GIS map database, curved lines such as roads are recorded as a number of short, straight line segments, and thus the distance of a road is computed by summing the individual distance of each of these short, straight line segments. This means that the length of a curved road segment is more accurate the shorter the straight line segments are. The length of the short, straight line segments is called "tolerance" and is controlled by the GIS operator)

Again, I understand that the fraudulent road segments were identified from the GIS map database and not digitized; however, if they had been digitized then I believe that the distances calculated by summing the distances of the individual straight line segments would have been smaller than the actual distance along the arc. (Think of walking in a number of straight lines around a cul-de-sac rather than on the curved, curb line.)

### Map Scale

Mr. Sovik is correct in stating that map scale is a problem when combining information from two different maps drawn at two different scales (such as the BIA map showing fraudulent work at a scale of 1:126,720 and the MTE compartment maps drawn at a larger scale of 1:15,840). A point of about 1/32 inch in diameter drawn on the larger scale map (compartment map), for example, would be about 41 feet in diameter on the ground, while the same size point drawn on the BIA map would be about 330 feet in diameter on the ground. Thus, a point (say a beginning point of a work accomplishment segment) digitized from the compartment map could be anywhere within 330 feet on the ground when digitized on the BIA map.

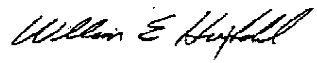
But, since the roads used by the BIA and given to the MTE as a base for their GIS came from the same source – the USGS 1:24,000 scale topographic map, they both have the same accuracy. This means that the length of a road would measure the same, regardless of the scale at which it is plotted. The difference is whether the accomplishment was recorded by digitizing a beginning point and an ending point (such as digitizing from the larger scale compartment maps) or whether the work accomplishment was recorded by identifying the road segment (such as clicking on the segment and coding it as full, partial, or no brushing.)

In summary, the majority of the arguments raised by Mr. Sovik (and Mr. Sayer) in disputing the fraudulent work calculations by the BIA are based on the procedure used in transferring the work accomplishment information from the compartment maps to the BIA map database. If the work accomplishment information had been digitized by clicking on the beginning of the work and ending of the work shown on the compartment maps to the BIA map database (ie, digitized), his arguments would have merit. However, the same argument about errors in measurements of the original work accomplishments by MTE would apply to the transfer of work accomplishment information by MTE to the compartment maps prior to invoicing. In other words, I agree with Mr. Sovik that digitizing from small scale, hand drawn maps onto a larger scale GIS database introduces error, but that error applies to both cases: the original recording of the work accomplishments (by MTE) and the subsequent recording of fraudulent work claims (by BIA).

Since I understand that the work accomplishment information was not digitized from the compartment maps, but rather used to identify which road segments in the BIA map

database had work accomplishment information, I do not believe the errors that Mr. Sovik describes were created.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "William E. Huxhold". The signature is written in a cursive style with some loops and flourishes.

William E. Huxhold, GISP

Att: Huxhold cv