Validation of the GSDM Earl F. Burkholder, PS, PE, F.ASCE May 2019 – Revised February 14, 2025

This information is intended for anyone interested the Discussion and Closure of the article "Rigorous Estimation of Local Accuracy Revisited" by Soler/Han as published in the ASCE Journal of Surveying Engineering (JSE) November 2017. Hardcopy of the Discussion/Closure appears in the May 2019 issue of the JSE. The electronic version is posted by ASCE at:

https://ascelibrary.org/doi/abs/10.1061/%28ASCE%29SU.1943-5428.0000274

Summary:

- 1. A counter on the ASCE website shows how many times the "Discussion" has been downloaded.
- 2. Click on "next article" to access the "Closure." That page also has a counter on it.
- 3. Both the Discussion and the Closure pdf files can be downloaded free of charge.
- 4. Discussions and Closures published by ASCE since 1997 are now open not behind the paywall.
- 5. Each webpage contains a list of "Recommended" background articles. In this case, that history is not "short." ASCE is to be commended for including access to pertinent published articles.

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Errata:

- 1. Regretfully, previous validation "notices" contained errors of dates, numbers, and links. My apology!
- 2. A link to the September 2023 version of "validation" is <u>http://globalcogo.com/validation-A.pdf</u>.
- 3. The COGO Report Card is now called "Assessment of the U.S. National Spatial Data Infrastructure." The most recent COGO assessment was published in 2024 <u>NSDI Assessment</u>.

Chronology for free downloads:

- 1. This "validation" link has been revised several times since it was first posted in May 2019.
- 2. Initially, each download was free. The February 2021 validation link shows 860 free downloads.
- 3. At some point, ASCE began charging for the downloads and the total grew more slowly.
- 4. In January 2025, the download total was 895 and downloads were not free.
- 5. Since then, the "Discussion" can be downloaded free. The total shows a dramatic increase.

History of the spirited Discussion/Closure:

- In April 1997, local accuracy was mathematically defined (Eq. 59) in a document, "Definition and Description of a Global Spatial Data Model (GSDM)," filed with the U.S. Copyright Office, <u>http://www.globalcogo.com/gsdmdefn.pdf</u>.
- The explicit labels of "network accuracy" and "local accuracy" were included in a peer reviewed article, "Spatial Data Accuracy as Defined by the GSDM," published in Surveying & Land Information Systems (SaLIS) In March 1999, Vol. 59, No.1 – <u>http://www.globalcogo.com/accuracy.pdf</u>.

- 3. Book, "The 3-D Global Spatial Data Model: Foundation of the Spatial Data Infrastructure," published by CRC Press, 2008, contains well-documented examples of using local accuracy. Examples are included in Chapter 11, "Using Spatial Data," and in Chapter 12, "Using the GSDM."
- 4. T. Soler and D. Smith published an article, "Rigorous Estimation of Local Accuracy," in the Journal of Surveying Engineering, Aug. 2010, Vol. 136, No. 3. The Introduction in their article states that Burkholder's treatment "may be assumed conceptually correct, but it needs to be generalized."
- 5. Burkholder's Discussion of the Soler and Han 2010 article is published in the JSE, February 2012, Vol. 138, No.1. That discussion focused on Soler/Han's selection and use of rotation matrices.
- 6. Soler/Han's Closure to the Discussion of the 2010 article is published in the same JSE issue, February 2012, Vol. 138, No. 1. Soler/Han staunchly defend their results as a rigorous mathematical proof versus Burkholder's intuitive approach.
- 7. "Local Accuracies," by Soler, Han, and Smith was published in the May 2012 issue of the JSE. The "new" article references their February 2012 Closure and emphasizes using "exact equations" for computing local accuracy. There is no Discussion of this article.
- 8. "Rigorous Estimation of Local Accuracies Revisited" by Soler and Han was published on-line July 27, 2017. The hardcopy version is included in the November 2017 issue of JSE, Vol. 143, No. 4. The closing paragraph of the Introduction states, "To finally settle this issue, the authors feel obligated to revisit the subject matter and close this chapter once and for all..."
- 9. Burkholder's Discussion of the "Revisited" article by Soler and Han was published in the May 2019 issue of JSE, Vol. 145, No.2. The opening sentence reads, "The purpose of this discussion is to remind readers that the derivation of network accuracy and local accuracy as presented in Burkholder (1999 item #2 above) and subsequent publications remains valid even though the authors of the original paper call the result a mere approximation." Various points in the "revisited" article were successfully rebutted in Burkholder's "Discussion."
- 10. The Soler and Han Closure to Burkholder's Discussion of, of "Rigorous Estimation of Local Accuracies Revisited" was published in the May 2019 issue of JSE, Vol. 145, No. 2. The Closure is quite short and reads, in part, "The writers refuse to answer the arguments addressed by the discusser."

ASCE is to be commended for making copies of "Discussions" and "Closures" available without charge and for listing pertinent background articles (although a fee is charged for original articles). The issue of spatial data accuracy is critical as spatial data users worldwide embrace results of the digital revolution and place increasing reliance on AI applications involving the use of 3D digital spatial data – see http://www.tru3d.xyz.