Appendix 4-B

Digital Elevation Model (DEM) Datasets

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A 10-meter resolution DEM dataset with Nebraska statewide coverage is distributed through multiple channels, including the USGS and the NDNR (http://dnr.nebraska.gov/data/elevation-data). This dataset was developed by manually digitizing and tagging 10 or 20-foot interval topographic contour lines on 7.5-minute USGS quadrangular maps. These contours were interpolated using GIS processes to create the tiled rasters that are distributed via the web sources listed above. The unit of elevation used in these datasets is feet relative to the NGVD 1929. For the COHYST2010 project, the DEM raster tiles covering the model area were mosaicked together using GIS to yield a single dataset referred to in the remainder of this appendix as "the COHYST DEM" or just "the DEM".

While these datasets were subject to review and quality control checks by the NDNR and USGS commensurate with the requirements of a level 2 DEM, the manual nature of the process allowed opportunity for human error. Because the DEM was used as the means for assigning boundary condition, grid cell, and, in many cases, water level target elevations, checks were made throughout the development of models and supporting datasets to ensure consistency between DEM-derived elevations and values from independent survey measurements. In areas without LIDAR coverage (the majority of the COHYST2010 model area at the outset of the project), on-ground point survey points or benchmarks were the only viable independent dataset to use for this purpose.

Observation well locations and elevations, a dataset reviewed and developed in tandem with other groundwater model components, were used as the primary point dataset of reference for checking DEM accuracy. The reported elevations at observation well locations in the model area were compared with the DEM value for that location. In cases where the difference in DEM and reported elevations was greater than 20 feet, the location was flagged for further detailed review. In all but one instance throughout the model domain, this difference was attributed to a reporting error associated with the observation well. This attribution was assisted using 174 surveyed elevations made at observation wells by NDNR survey staff in 1998. In these cases, the DEM elevation was consistent with the original USGS contours and, if available, the manually surveyed well elevations.

In the one instance of inconsistency, however, the DEM values in the vicinity of USGS observation well 413539101274101 (http://nwis.waterdata.usgs.gov/usa/nwis/gwlevels/?site_no=413539101274101) were found to be in error relative to the topographic contours in the Buck Tail quadrangular map (in the northwest portion of the COHYST model area) and the surveyed well elevation. The location of this quadrangle relative to the COHYST2010 model area is shown in figure 4B-1 below. Further investigation revealed that two contour line segments (highlighted segments A and B in figure 4B-2 below) had been incorrectly tagged as 3560 feet. The values of contiguous contours, the benchmark elevations published as part of the USGS topographic map, and the surveyed elevation at the observation well (green dot on figure 4B-1) indicated an assignment of 3520 feet was more accurate for both contours. This correction was made to the digitized contour lines and interpolated using GIS processes to a new Bucktail quadrangle raster, which was in turn patched into the COHYST model area 10-meter DEM mosaic.

Because the checks and corrections described here could only be done where independent data was available, this quality control process does not guarantee comprehensive accuracy of elevation across

the model area DEM. While uncertainties are a part of any DEM*, the general concordance of independently surveyed point elevations with gridded DEM values in the model domain was sufficient to indicate the corrected DEM could be relied up on to represent elevation values at the scale of half mile by half mile grid cells.

The revised DEM dataset is an ASCII raster consisting of two data files described in table 4B-1 below.

Table 4B-1 Revised 10-m DEM Data Files

File Name	Description
COHYST2010_10mDEMascii_v2.txt	ASCII text file containing array of elevation values in feet, each value representing a regular 10-meter square grid cell
COHYST2010_10mDEMascii_v2.prj	Projection file for viewing raster in an GIS (Nebraska State Plane NAD83)

* For a more detailed discussion of this topic, the reader is directed to any number of scientific analyses (like http://proceedings.esri.com/library/userconf/proc99/proceed/papers/pap262/p262.htm) and guidelines http://nationalmap.gov/standards/demstds.html on DEMs.

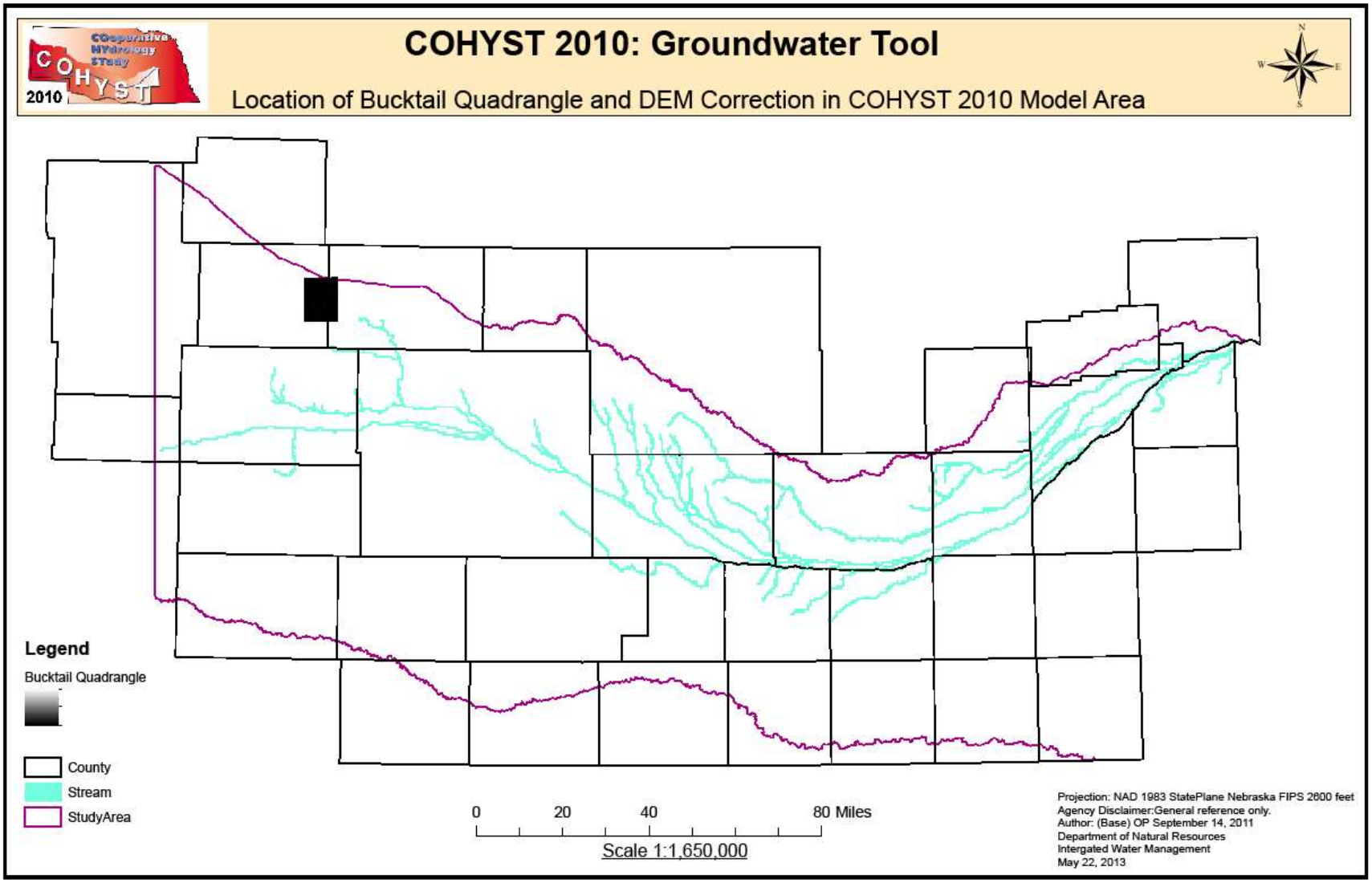

Figure 4B-1 – Location of Bucktail Quadrangle (black rectangle) within the COHYST2010 model area.

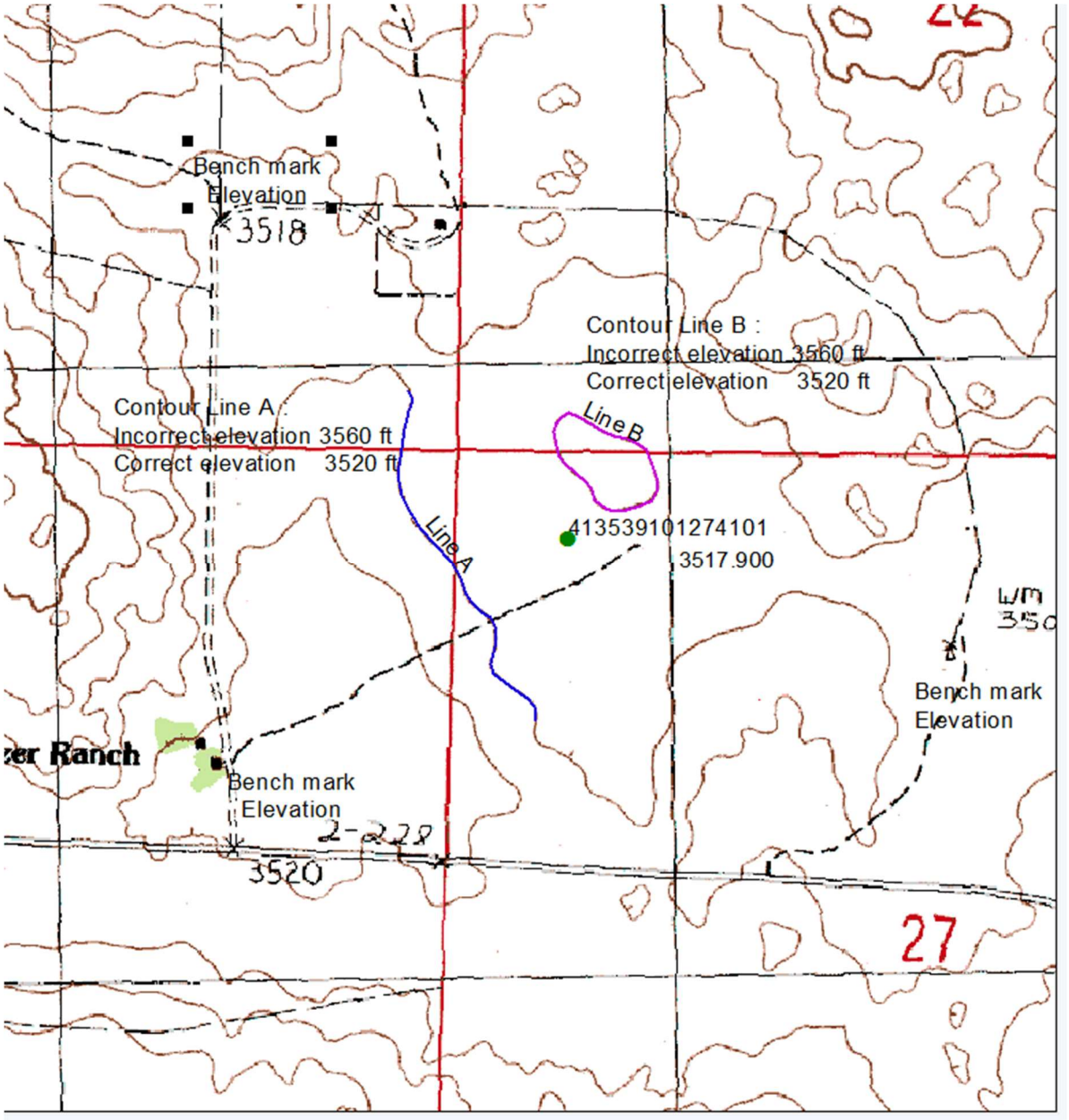

Figure 4B-2 – Portion of Bucktail quadrangle topographic map (1:24,000) in the northwest portion of the model area. The green dot represents the location of a USGS observation well and highlighted lines A and B indicate locations of erroneous contour tags that were the basis for the original 10-meter DEM.