

1 Executive Summary

The City of Beavercreek has been experiencing flooding and erosion issues throughout the storm infrastructure network over the years and has not undergone a citywide study since 1983 when the last master plan was developed and identified \$30 million in improvements. Woolpert was chosen to develop a new drainage master plan report to assist the City with stormwater needs. The purpose of this project was to study culverts and streams throughout the City that have been previously identified as trouble areas, are considered public streams, or are 24-inch and larger diameter culverts. Culverts smaller than 24-inch diameter are routinely addressed by City maintenance crews as part of ongoing activities with their available equipment and resources.

Woolpert met with the City to gain an understanding of known drainage issues throughout the City, which included reviewing work orders, first-hand accounts by City staff, and historical projects. These areas were used as a baseline to validate certain hydraulic modeling efforts and later overlaid with model results. All trouble areas were digitally logged in GIS and summarized by grid area in this report. Certain conveyance areas were omitted as part of the study area due to state or federal jurisdiction, including ODOT and USACE corridors, as well as the storm sewer system and privately attributed drainage concerns.

A field data collection manual was developed to inventory and inspect all culverts and streams identified to be included as part of this analysis. The field data collection manual outlined what attributes to collect and how ratings would be assigned during the condition assessment portion. All of the attributes and pictures were collected using ESRI Field Maps and stored on Woolpert's ArcGIS Online server. The study area was broken down into 20 grid areas to help identify where each culvert and stream segment is located, asset IDs were then assigned to each asset based on the grid numbering system.

There were 120 culverts inventoried and inspected as part of this study. Structurally the culverts were generally observed to be in good or fair condition, where only 13/120 (11%) received a rating of poor. Operationally the culverts did have maintenance concerns throughout, where 31/120 (26%) of the culverts received a maintenance rating of poor. There were 33/120 (28%) of culverts observed as primarily corrugated metal pipe, a distinction at the direction of the City to identify for replacement.

There were 15.12 miles of streams inventoried and inspected as part of this study. At the conclusion of the field work activities, the streams were broken up into 200 LF or less stream segments, depending on the entire inspected length, for a total of 438 stream segments. Structurally there were 44/438 (10%) stream segments to receive a rating of poor. Operationally there were 63/438 (14%) stream segments to receive a maintenance rating of poor. There were also 54/438 (12%) of stream segments that had an existing threat located within approximately 25 feet. Of the 15.12 miles of stream segments, ownership and maintenance responsibility is split with 10.72 miles considered public and 4.40 miles considered private.

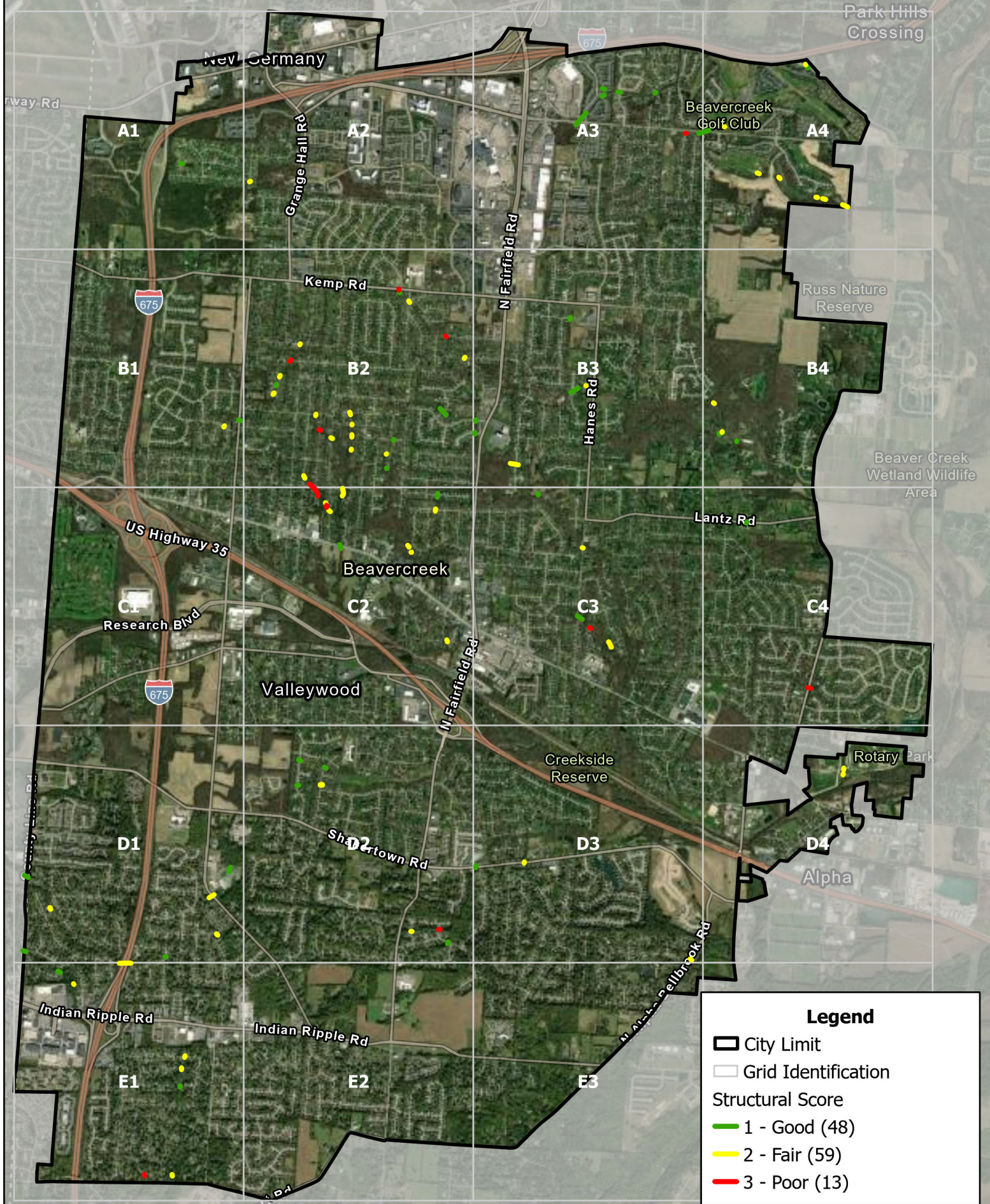
Hydrologic and hydraulic analysis included a 2D HEC-RAS model comprised of NOAA rainfall data, USGS LiDAR, NRCS soil data, USGS land use classification, and collected field data. 24-hour rainfall depths for the 2-, 10-, 25-, and 100-year recurrence intervals were used with the rainfall distribution to simulate meteorological conditions during the rain storm events after delineating drainage areas and flow paths throughout the study area. No future land use considerations were included as part of the study. The model simulation results for the desired 25-year storm event level of service guided the alternatives analysis to indicate which culverts were not meeting conveyance standards. Proposed culvert sizes in these areas were then included in a proposed model run to verify the proper increase in size. Culverts that

were found to be corrugated metal were also proposed to be replaced with RCP at the City's request, therefore lowering the Manning's value in the model and improving hydraulics conveyance.

Utilizing ODOT, City of Beavercreek, and other project resources, a cost table was developed to identify approximate costs to replace structural or hydraulic deficient culverts, maintenance of culverts, stabilize stream banks, and maintain stream banks. There were 61 culverts identified for replacement at a cost of \$10,417,558 and 31 culverts identified for maintenance at a cost of \$136,296. There were 44 stream segments identified for bank stabilization at a cost of \$3,880,945 and 63 stream segments identified for maintenance at a cost of \$524,661, both values include public and private owned areas. Additional survey and engineering will be required to fully determine the limits and types of improvements to be made.

Prioritization ratings were developed and attributed to every culvert and stream segment to help the City determine which areas should receive the most attention. Ratings were assigned on a scale of 1 (low) to 3 (high) and then averaged together. Factors included in the culvert prioritization were structural condition, maintenance condition, trouble area identification, material, hydraulic capacity, and existing pipe size. Factors included in the stream segment prioritization were structural condition, maintenance condition, trouble area identification, ownership, and existing threats. A key consideration in the stream segment project implementation will be the public vs. private ownership attribute, as the City typically prioritizes areas in public land and needs permission from private landowners. Although the City maintains a database of network assets, gaps in available records limit the ability to definitively assign responsibility for ownership and maintenance obligations. The City may need to pursue easement acquisitions to establish legal authority, secure necessary permits, and ensure appropriate use of public funds prior to starting work on privately owned and/or maintained stream segments.

Appendices for storm event inundation maps, culvert model scenario results, field data collection manual, culvert inspection grid sheets, individualized culvert cutsheets, stream inspection grid sheets, grid summary tables, and cost estimates are included at the end of the report.

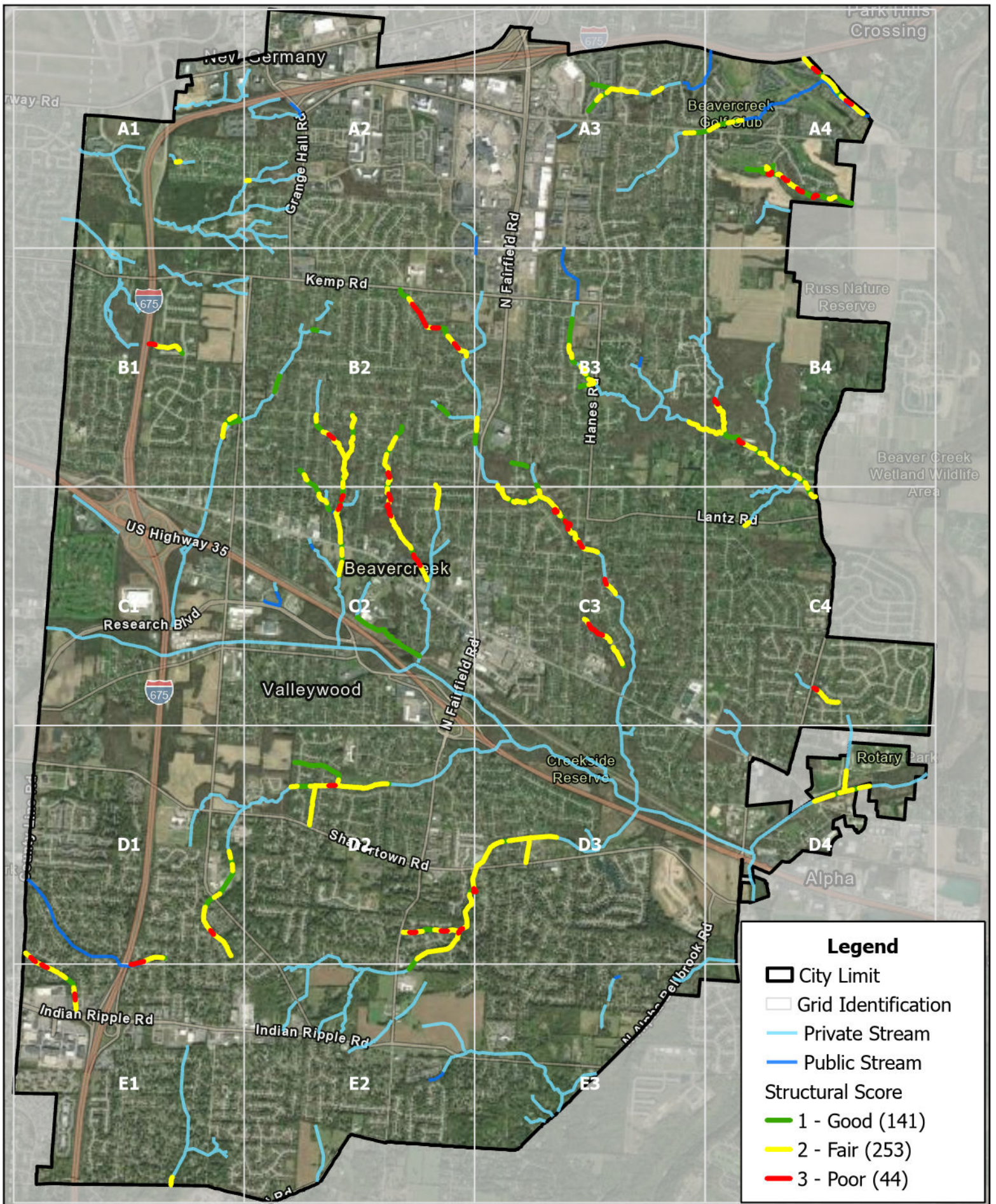


Culvert Inspections
Structural Condition Map
City of Beaver Creek, Ohio



Legend

- City Limit
- Grid Identification
- Structural Score
 - 1 - Good (48)
 - 2 - Fair (59)
 - 3 - Poor (13)



0 0.5 1 2 Miles



Stream Assessment Structural Condition Map

City of Beaver Creek, Ohio

WOOLPERT



