

Metropolitan Sewer District of Greater Cincinnati

# **10142910 LUDLOW RUN SUSTAINABLE SOURCE CONTROL**

Data Review Technical Memorandum

Planning Phase

**FINAL**

December 11, 2020



## CONTENTS

|     |                                      |   |
|-----|--------------------------------------|---|
| 1   | Introduction .....                   | 2 |
| 2   | Data Organization.....               | 2 |
| 3   | Collection System .....              | 3 |
| 3.1 | CAGIS Shapefiles.....                | 3 |
| 3.2 | CSO Regulator Information .....      | 3 |
| 3.3 | Sewer Drawings .....                 | 4 |
| 3.4 | Stormwater Data.....                 | 4 |
| 3.5 | CCTV Records .....                   | 4 |
| 3.6 | Asset Management Data .....          | 4 |
| 3.7 | Historical Studies and Reports ..... | 5 |
| 3.8 | Site Visit.....                      | 6 |
| 4   | Model Data .....                     | 6 |
| 4.1 | Collection System Model.....         | 6 |
| 4.2 | Flow Meter Data .....                | 6 |
| 4.3 | Rainfall Data .....                  | 7 |
| 4.4 | CSO Monitoring Data .....            | 7 |
| 5   | Recommendations.....                 | 8 |
| 5.1 | GSAM and CCTV Data .....             | 8 |

## APPENDICES

- APPENDIX A Data and Information Request Log
- APPENDIX B GIS Shapefile Inventory
- APPENDIX C MSDGC Comment and Response Form

## 1 INTRODUCTION

The Ludlow Run Sustainable Control project includes planning, design and construction phase services for a Wet Weather Improvement Plan (WWIP) project (or projects) to reduce the volume of the combined sewer overflows in the Ludlow Run watershed (CSO's 151, 109, 110,111,112, 162 and 024). The project will also address asset management needs within the Ludlow Run watershed.

The Ludlow Run sub-watershed, located in King's Run watershed, includes portions of Cincinnati neighborhoods: Northside, College Hill, Winton Hills, and Winton Place. CSO 024, referred to as the Ludlow Run Regulator is located on the west bank of Mill Creek at the three-way intersection of Spring Grove Avenue, Dooley Bypass, and Dane Avenue. Six CSOs are nested within CSO 024 sub-watershed. Listed from north to south within the sub-watershed, CSOs 151, 109,110, 111, 112, and 162 overflow into Ludlow Run, which then enters the combined sewer system and contributes to overflow at CSO 024.

It is the objective of this planning portion of the project to develop a watershed plan to address the CSOs in the Ludlow Run sub-watershed. An alternatives evaluation and Business Case Evaluation (BCE) will be developed to evaluate alternates to address the following:

1. Combined sewer overflow volume reduction in the nested CSOs and at CSO 024.
2. Asset management needs within the Ludlow Run sub-watershed.

The execution of the overall scope of work for the planning effort will inform MSDGC to make decisions on proceeding with asset management and capital projects in the Ludlow Run project area.

The scope for the Ludlow Run Sustainable Source Control project includes many tasks ranging from model review to alternatives analyses to a final BCE. Data review requirements outlined in the scope of this project include both collection system assets and model data. It is paramount that the Project Team acquires the data necessary to thoroughly develop each of the proposed tasks and communicate the data inventoried and reviewed to all team members in an organized method.

All of the data that has been received has been provided by the Metropolitan Sewer District of Greater Cincinnati (MSDGC). Some of it had been provided during the proposal stage and some of it has been provided after the notice to proceed. To facilitate initial data collection, Arcadis developed a Data Request/Inventory Log to track the requests, including when they were made and when the information was received. The Data and Information Request Log is contained in Appendix A. In addition to this, some data requests and Requests for Information (RFI) have occurred during initial meetings and progress meetings and have been noted below.

## 2 DATA ORGANIZATION

The Data regarding this project relates to either the Collection System or the Model. The data is further broken down into the following categories:

### Collection System

- CAGIS Shapefiles
- CSO Regulator Information

- Sewer Drawings
- Stormwater Data
- CCTV Records
- Asset Management Data
- Historical Studies and Reports

#### Model

- Collection System Model
- Flow Meter Data
- Rainfall Data
- CSO Monitoring Data

## 3 COLLECTION SYSTEM

Ludlow Run Sewershed data was provided by MSDGC to support Task 3 model review and future tasks for development of the BCE. This data included CAGIS shapefiles, drawings, CCTV records, asset management data and historical studies and reports. Each of these items are discussed separately within this section.

### 3.1 CAGIS Shapefiles

The most current CAGIS (Cincinnati Area Geographical Information System) shapefiles were provided by Hamilton County CAGIS and included sewer infrastructure within the Ludlow Run Sewershed and orthographic photos, aerial photos and contour data. Appendix B includes a listing of CAGIS shapefiles provided. The listing in Appendix B also includes shapefiles provided by MSDGC that cover MSD assets including sewers, sewer laterals, flow monitoring locations, etc.

### 3.2 CSO Regulator Information

There are 7 combined sewer overflows within the Ludlow Run Sewershed. Six of the CSOs are nested and include CSOs 109, 110, 111, 112, 151 and 162. CSO 024 is the largest within the Sewershed and it discharges to the Mill Creek. Data provided on the CSOs included the following:

1. *CSO Site Reports – Developed by RD Zande*
  - Site Reports for CSOs 109, 110, 112, 151, 162 and 024
  - Site Report for CSO 111 was not included because the setup of CSO 111 was changed since completion of RD Zande Report
2. *CSO Regulator Drawings*
  - CSO 024 Drawings 1966

- Drawings not provided for remaining CSOs

### 3. CSO Overflow Elevations

- CSO site elevations survey and review completed by RJN Group
- Files included for CSOs 109, 110, 111, 112, 151, 162 and 024

## 3.3 Sewer Drawings

Record drawings in the Ludlow Run Sewershed were requested and the following as built drawings and record drawings were provided:

- Rockford Woods As-built Final Survey data – July 2001
- Thompson Heights As-built Final Survey data – May 2002
- Aster Place As-built Final Survey data – August 2013
- Ludlow Run Relief Sewer Drawings – No date of first issue indicated, drawing revision dates as old as October 1988 and as recent at June 1997 are indicated on the drawings.
- Cedar Avenue Replacement As-built Drawings – construction drawings by Wilson and Associates, as-built data performed in November 2000.
- 50-scale sewer record drawings for the project area within Ludlow Run Sewershed.

## 3.4 Stormwater Data

City of Cincinnati Stormwater NPDES Small MS4 General Permit 2019 Annual Report submitted by MSDGC March 9, 2020. City of Cincinnati Stormwater Management Plan NPDES/MS4 Permit and Program updated February 2020.

## 3.5 CCTV Records

Initially, Closed Circuit Television (CCTV) video files were provided by MSDGC through web links included in an excel spreadsheet; however, the links were not accessible. Arcadis met with MSDGC to discuss asset management processes. After this meeting, MSDGC provided Arcadis with an updated GSAM geodatabase that included live web links to the CCTV reports for those segments that had them. Arcadis will review the updated data and request the corresponding videos files, as needed. Arcadis will use this data in conjunction with other asset data received to provide a recommendation of additional CCTV locations within the Ludlow Run Sewershed, as required.

## 3.6 Asset Management Data

MSDGC records their asset management data within their GIS information. MSDGC provided Arcadis with their GIS for Strategic Asset Management (GSAM) data in the form of a GIS Shapefile. The GSAM shapefile includes fields which indicate each pipes probability of structural failure (1 to 5) and criticality or consequence of failure (1 to 5). It also includes a structural bin score that is utilized when identifying projects for the capital improvements program. Arcadis met with MSDGC to discuss the GSAM methodology and the details of the shapefile that is maintained for their assets. MSDGC is currently

performing revisions and updates to their asset management process and Arcadis plans to follow-up with MSDGC during the project for updates to processes and data.

There are approximately 415 pipe segments within the Ludlow project boundary that include GSAM data for a total of about 64,800 LF of sewer pipe. An initial review of the GSAM data indicates that approximately 9,700 LF of sewer pipe contain a structural probability of failure score (S\_Prob) of greater than or equal to 4. Table 1 provides an initial estimated breakdown by pipe size of those pipe with a 4 or 5 structural probability score (S\_Prob).

**Table 1. Ludlow Run Sewershed Pipes with Structural Probability of Failure Score 4 and 5**

| Pipe Size (in)       | S_Prob = 4<br>Pipe Length (ft) | S_Prob = 5<br>Pipe Length (ft) | Total Pipe Length (ft) |
|----------------------|--------------------------------|--------------------------------|------------------------|
| 8                    | 762                            | 674                            | 1436                   |
| 10                   | 1081                           | 849                            | 1931                   |
| 12                   | 2057                           | 1018                           | 3074                   |
| 15                   | 363                            |                                | 363                    |
| 18                   | 583                            | 270                            | 853                    |
| 20                   | 205                            | 157                            | 362                    |
| 21                   | 51                             |                                | 51                     |
| 22                   | 314                            |                                | 314                    |
| 24                   | 256                            | 325                            | 581                    |
| 27                   | 186                            |                                | 186                    |
| 36                   | 113                            |                                | 113                    |
| 120 x 144 SemiCircle | 240                            |                                | 240                    |
| <b>Total</b>         | <b>6664</b>                    | <b>3294</b>                    | <b>9957</b>            |

Arcadis will utilize the GSAM data to perform the condition assessment analysis which will inform the strategies and alternatives during Task 5 BCE Planning of this project.

### 3.7 Historical Studies and Reports

The following is a list of all the Report and Studies that we have received.

1. Ludlow Run Watershed CSO 024 Strategic Separation Planning Alternatives Analysis – Prepared by AMEC Environment and Infrastructure dated November 2012
2. Ludlow Run Watershed CSO 024 Strategic Separation BCE – Prepared by AMEC Environment and Infrastructure dated April 25, 2012 (BCE not finalized and signed off by MSDGC)
3. Geotechnical Soil Boring Data for the Auxiliary Mill Creek Interceptor Section #3 – Work performed by H.C. Nutting Company dated Summer 1959.
4. Ludlow Run Bundle Project Charter – prepared by MSDGC and dated June 5, 2019.

5. Geotechnical Soil Boring Data for the Ludlow Run Relief Sewer – Work performed by ATEC Associates Inc and dated July 1992.

### 3.8 Site Visit

As a result of our project site visit that occurred on September 8, 2020, there were some additional data items that were requested. As indicated from the Data Request Log in Appendix A, these items were received:

- CSO Regulator Maintenance data – How often are they maintained, what is the typical maintenance required
- Historical Flooding Data – there were residential accounts of significant surface flooding. Arcadis will work MSDGC as needed to investigate these accounts and understand the impact of surface flooding within the project area.
- Developer submittal drawings and approval documents for the Rockford Subdivision.

A brief summary of the site visit findings including site photos was provided to MSDGC as a reference during the project.

## 4 MODEL DATA

Ludlow Run sewershed collection system model data was provided by MSDGC to support Task 3 Collection System Model Review and future tasks including alternative analysis and the BCE development. This data includes the collection system model, flow data, rainfall data and CSO monitoring data. A more detailed review of these items will be provided under a separate document for Task 3 called the Model Review Technical Memorandum. This data will inform on the decision as to whether further flow monitoring will be required for Task 4 Model Update and Calibration.

### 4.1 Collection System Model

The collection system model is an EPA SWMM 5 model. The provided input file is the Mill Creek Bridge model. It mainly represents existing conditions plus bridge projects in Mill Creek. Bridge projects are included even though they may not be constructed yet. The modeling group has established the Bridge model for the basis of planning efforts. This model will serve as the starting base model for this project and it is named:

*MC-Bridge-2020-0825\_TypYr.inp*

A detailed model review will be completed as scoped in Task 3 with a draft and final Model Review Technical Memorandum. This review will determine whether the current model can be used for planning efforts or if additional flow monitoring and calibration will be required.

### 4.2 Flow Meter Data

Five-minute edited time series data for flow, level and velocity were obtained for 25 flow meters of interest in the Ludlow Run Sewershed. This monitoring data will be used to complete model versus observed comparisons during Task 3 Collection System Model Review and help to inform if additional monitoring

and calibration will be required as part of the scope of this project. The following table provides a list of the monitors received.

**Table 2. Ludlow Run Flow Monitoring Data**

| Flow Monitor ID | Current Status | Data Type Received  |
|-----------------|----------------|---|
| AMCI-29703025   | Current        | Real-time ops interceptor meter, Flow                     |
| AMCI-32608013   | Current        | Real-time ops interceptor meter, Level Only               |
| MC-KR-007       | Removed        | 05/2008 – 11/2011   |
| MC-KR-008       | Removed        | 05/2008 – 11/2011   |
| MC-KR-009       | Removed        | 05/2008 – 11/2011   |
| MC-KR-010       | Current        | Real-time ops, Level Only, Install 05/2016                |
| MC-KR-011       | Removed        | 05/2008 – 11/2011   |
| MC-KR-012       | Removed        | 05/2008 – 11/2011   |
| MC-KR-017       | Removed        | 03/2010 – 05/2011   |
| MC-KR-018       | Removed        | 03/2010 – 05/2011   |
| MC-KR-019       | Removed        | 03/2010 – 05/2011   |
| MC-KR-025       | Current        | Real-time ops, Flow, Install 09/2011                      |
| MC-KR-033       | Removed        | Project Meter, Davey Ave Sewer Project, 08/2017 – 08/2018 |
| MC-KR-034       | Removed        | Project Meter, Davey Ave Sewer Project, 08/2017 – 08/2018 |
| MC-KR-035       | Removed        | Project Meter, Davey Ave Sewer Project, 08/2017 – 08/2018 |
| MC-KR-036       | Removed        | Project Meter, Davey Ave Sewer Project, 08/2017 – 08/2018 |
| MC-KR-037       | Removed        | Project Meter, Davey Ave Sewer Project, 08/2017 – 08/2018 |
| MC-KR-038       | Removed        | Project Meter, Davey Ave Sewer Project, 08/2017 – 08/2018 |

### 4.3 Rainfall Data

Rainfall data was provided based on MSDGC watersheds. The data provided is a mix of Radar rainfall data and MSDGC rain gauge data that together creates a continuous distributed rainfall dataset. The entire dataset was provided from 2003 through first quarter or March 2020. For the Ludlow Run model review, mixed rainfall dataset for the Watershed (WS) covering the Ludlow Run sewershed is Watershed WS235.

### 4.4 CSO Monitoring Data

Telemetry data for the level sensors at each of the monitored CSOs was provided for the past two years from approximately January 2016 through April 2018. When the monitored level exceeds the overflow level, this generally indicates an active CSO bypass. MSDGC uses telemetry monitoring data to generate



their monthly Electronic Discharge Monitoring Reports (eDMR), which report the number of CSO activations to EPA.

To date, Arcadis has not received CSO monitoring data prior to 2018. Initial review of the raw CSO level data indicates a portion of data recorded in 2017, then a large gap in data until it resumes again in late summer August 2018. Arcadis will review the history of the monitoring at these locations and will work with MSDGC to determine if additional data is available at these locations for the periods not provided in the initial dataset.

**Table 3. Ludlow Run CSO Monitoring Data Received**

| CSO Monitor ID | Current Status | Data Type Received                         |
|----------------|----------------|--|
| CSO-024        | Current        | Level Only, CSO monitor, 08/2018 – 06/2019 |
| CSO-109        | Current        | Level Only, CSO monitor, 08/2018 – 06/2019 |
| CSO-110        | Current        | Level Only, CSO monitor, 08/2018 – 06/2019 |
| CSO-111        | Current        | Level Only, CSO monitor, 08/2018 – 06/2019 |
| CSO-112        | Current        | Level Only, CSO monitor, 08/2018 – 06/2019 |
| CSO-151        | Current        | Level Only, CSO monitor, 08/2018 – 06/2019 |
| CSO-162        | Current        | Level Only, CSO monitor, 08/2018 – 06/2019 |

## 5 RECOMMENDATIONS

Based on our review of the data provided, we provide the following recommendations for further analysis as we move forward with the Ludlow Run project:

### 5.1 GSAM and CCTV Data

Current data provided by MSDGC includes the GSAM geodatabase which includes an extensive amount of data. Arcadis met with MSDGC to discuss the GSAM methodology and the details of the shapefile that is maintained for their assets. MSDGC is currently performing revisions and updates to their asset management process and Arcadis plans to follow-up with MSDGC during the project for updates to processes and data.

The GSAM geodatabase includes links to access CCTV report data for those pipe segments that have been investigated. Arcadis will utilize these reports in parallel with the asset risk scoring to develop strategies and alternatives during Task 5 BCE Planning of this project. Corresponding videos files for the CCTV reports will be requested during Task 5, as needed. Recommendations for additional CCTV activities in the project area will also be evaluated during Task 5.

# APPENDIX A

## Data and Information Request Log



APPENDIX A

**LUDLOW RUN SUSTAINABLE SOURCE CONTROL  
PROJECT NO. 10142910  
DATA AND INFORMATION REQUEST LOG**

LOG DATE: 12/11/2020

| Item | Data and Information Type   | Format             | Name                                | Date Requested  | Date Received              |
|------|---|--------------------|-------------------------------------|-----------------|----------------------------|
| 1    | Ludlow Run CSO Maps   | PDF                | RFQ 2019-009                        | Included in RFQ |                            |
| 2    | Flow Monitoring Data including Interceptor  | XLS, CSV           | D. Moughton                         | 8/12/2020       | 9/1/2020                   |
| 3    | Rain Gauge and Radar Data   | TXT                | D. Moughton                         | 8/12/2020       | 9/1/2020                   |
| 4    | Current SWMM Model  | Model file         | D. Moughton                         | 8/12/2020       | 9/1/2020                   |
| 5    | Overflow Monitoring Data for all Ludlow Run CSOs  | XLS                | D. Moughton                         | 8/12/2020       | 9/1/2020                   |
| 6    | <b>Watershed Operations - FM logs, CSO diversion sketches, recent survey measurement, etc.</b>                                      | <b>Various</b>     | <b>D. Moughton</b>                  |                 |                            |
| 6a   | CSO Site Reports for the following CSOs: 024, 109,110,112,151,162   | TIF                |                                     |                 | 7/24/2020                  |
| 6b   | CSO Regulator Drawings for CSO 024 (1966)   | TIF                |                                     |                 | 7/24/2020                  |
| 6c   | CSO Overflow Elevations for CSO 024,109,110,111,112,151,162   | PDF                |                                     |                 | 8/10/2020                  |
| 7    | Updated CAGIS Shapefiles for the Ludlow Run Watershed (See "Sheet2" for details)  | Shapefiles         | J. Weidner                          |                 | 7/24/2020                  |
| 8    | Trouble Calls GIS Shapefile- (Field_Investigation.Shp)  | Shapefiles         | J. Weidner                          |                 | 7/24/2020                  |
| 9    | GSAM data for Ludlow Run Watershed  | Shapefiles         | J. Weidner                          |                 | 7/24/2020                  |
| 10   | CCTV video for Ludlow Run Watershed   | PDF                | E. Mamacos<br>J. Weidner            |                 | To be revisited in Task 5  |
| 11   | <b>Record drawings from projects within Ludlow Run Watershed within the past 10 years since the last model update was performed</b> | <b>PDF</b>         | <b>E. Mamacos</b>                   |                 |                            |
| 11a  | Rockford Woods As Built Survey  | TIF                |                                     |                 | 7/24/2020                  |
| 11b  | Thompson Heights As Built Survey  | TIF                |                                     |                 | 7/24/2020                  |
| 11c  | Aster Place As Built Survey   | TIF                |                                     |                 | 7/24/2020                  |
| 11d  | Ludlow Run Relief Sewer Drawings  | TIF                |                                     |                 | 7/24/2020                  |
| 11e  | Cedar Avenue Sewer Replacement Drawings   | TIF                |                                     |                 | 7/24/2020                  |
| 12   | OUPS Site Plans from Duke Electric and Gas; Sprint Fiber Optics; Cincinnati Bell  | PDF, tif           | E. Mamacos                          |                 | To be completed by Arcadis |
| 13   | OUPS Site Plans for GCWW and other Utilities not listed above. CAGIS may also have water lines.                                     | PDF;<br>Shapefiles | E. Mamacos/<br>J. Weidner           |                 | To be completed by Arcadis |
| 14   | 50-scale drawings of the Ludlow Run basin located on server- Sewer Tap Records, Underground Records (City of Cincinnati)            | TIF                | E. Mamacos                          |                 | 7/24/2020                  |
| 15   | Available reports or plans defining future land use within the Ludlow Run basin   | PDF                | E. Mamacos/<br>Development Services |                 | 11/17/2020                 |
| 16   | Development/redevelopment requests within the Ludlow Run basin  | PDF                | E. Mamacos/<br>Development Services |                 | 11/17/2020                 |
| 17   | When alignments are verified, existing MSD easement documentation may requested for specific parcels/alignments.                    | PDF                | J. Bechtold                         |                 | To be revisited in Task 5  |

**APPENDIX A**

**LUDLOW RUN SUSTAINABLE SOURCE CONTROL  
PROJECT NO. 10142910  
DATA AND INFORMATION REQUEST LOG**

**LOG DATE: 12/11/2020**

| <b>Item</b> | <b>Data and Information Type</b>  | <b>Format</b> | <b>Name</b>  | <b>Date Requested</b> | <b>Date Received</b>                               |
|-------------|---|---------------|--------------|-----------------------|--|
| 18          | Current Storm Water Management Program (SWMP) for City of Cincinnati (required by NPDES Phase II permit)- Updated Feb 2020              | PDF           | E. Mamacos   |                       | 7/30/2020  |
| 19          | Most Recent Small MS4 Annual Report for City of Cincinnati (required by NPDES Phase II permit)- For year 2019; submitted in March 2020. | PDF           | E. Mamacos   |                       | 7/30/2020  |
| 20          | GSAM Literature on Methodology  |               | R. Schneider | 9/16/2020             | 11/17/2020   |
| 21          | Continuous Distributed Rainfall Mixed Data by radar pixel   |               | B. Gamble    | 9/16/2020             | Not preferred Dataset, no longer required          |
| 22          | CCTV Shapefile, if available  |               | E. Mamacos   | 9/16/2020             | Referenced in GSAM Shapefile provided on 12/9/2020 |
| 23          | Rockford Subdivision Development Information  |               | E. Mamacos   | 9/16/2020             | 11/17/2020   |
| 24          | Flow Monitoring Site Installation Sheets  |               | D. Moughton  | 10/27/2020            | 11/17/2020   |
| 25          | Flow Monitoring Maintenance Logs  |               | D. Moughton  | 10/27/2020            | 11/17/2020   |
| 26          |   |               |              |                       |  |
| 27          |   |               |              |                       |  |
| 28          |   |               |              |                       |  |

**Current Document Inventory**

|          |   |            |                   |    |                      |
|----------|---|------------|-------------------|----|----------------------|
| <b>1</b> | <b>Historical Studies- Ludlow- CSO 24</b>                               |            | --                | -- | --                   |
| 1a       | Modeling Files- (2011)  | Model      | --                | -- | (Prior Project work) |
| 1b       | Shapefile- CSO24- Existing Conditions_Catchments                        | Shapefile  | --                | -- | (Prior Project work) |
| 1c       | CSO 24- BCE Reports Draft (2011) and Final Report (2012)                | Word       | --                | -- | (Prior Project work) |
| 1d       | Model Setup Presentation, Ludlow Project Boundary maps                  | PDF        | --                | -- | (Prior Project work) |
| <b>2</b> | <b>LMCPR Analysis of Ludlow</b>   |            | --                | -- | --                   |
| 2a       | Cost estimate analysis and update                                       | Excel      | --                | -- | (Prior Project work) |
| 2b       | Ludlow Revisions (Model Files)  | RTP files  | --                | -- | (Prior Project work) |
| 2c       | LMCPR Approval letter- 2013   | PDF        | --                | -- | (Prior Project work) |
| 2d       | WWIP (November 2009)  | PDF        | --                | -- | (Prior Project work) |
| <b>3</b> | <b>Historical Studies and Reports completed in the Ludlow Run basin</b> | <b>PDF</b> | <b>E. Mamacos</b> |    |                      |
| 3a       | LR Alternative Analysis (November 2012)                                 | PDF        |                   |    | 7/24/2020            |
| 3b       | CSO 24 BCE Report- Final (2012)   | Word       |                   |    | 7/24/2020            |
| 3c       | Auxillary Mill Creek Interceptor Section 3 (1959)                       | PDF        |                   |    | 7/24/2020            |
| 3d       | Ludlow Run Relief Sewer   | PDF        |                   |    | 7/24/2020            |
| 3e       | Ludlow Run Bundle - Project Charter                                     | PDF        |                   |    | 7/24/2020            |

Grey shading - Received

# APPENDIX B

## GIS Shapefile Inventory



**APPENDIX B**

**LUDLOW RUN SUSTAINABLE SOURCE CONTROL  
PROJECT NO. 10142910  
GIS SHAPEFILE INVENTORY**

**GIS Data Received-**

|           | <b>Name of File</b>   | <b>Type</b> | <b>Source</b> | <b>Date Received</b> |
|-----------|---|-------------|---------------|----------------------|
| <b>1</b>  | MSD_Soil_Borings  | Shapefile   | MSDGC         | 7/24/2020            |
| <b>2</b>  | MSD_Sewer_Manholes  | Shapefile   | MSDGC         | 7/24/2020            |
| <b>3</b>  | MSD_Pumpsta   | Shapefile   | MSDGC         | 7/24/2020            |
| <b>4</b>  | MSD_CSO   | Shapefile   | MSDGC         | 7/24/2020            |
| <b>5</b>  | field_investigation (trouble calls field- "DESCRIPTIO")                   | Shapefile   | MSDGC         | 7/24/2020            |
| <b>6</b>  | Cinti_Storm_Apps  | Shapefile   | MSDGC         | 7/24/2020            |
| <b>7</b>  | MSD_TV_Taps   | Shapefile   | MSDGC         | 7/24/2020            |
| <b>8</b>  | MSD_Sewer_Lines   | Shapefile   | MSDGC         | 7/24/2020            |
| <b>9</b>  | MSD_Sewer_Laterals  | Shapefile   | MSDGC         | 7/24/2020            |
| <b>10</b> | GSAM  | Shapefile   | MSDGC         | 7/24/2020            |
| <b>11</b> | Cinti_Storm_Sewers  | Shapefile   | MSDGC         | 7/24/2020            |
| <b>12</b> | Storm_Detention   | Shapefile   | MSDGC         | 7/24/2020            |
| <b>13</b> | MSD_CIP   | Shapefile   | MSDGC         | 7/24/2020            |
| <b>14</b> | mon_perm  | Shapefile   | MSDGC         | 7/24/2020            |
| <b>15</b> | Streetcl  | Shapefile   | MSDGC         | 7/28/2020            |
| <b>16</b> | Orthophotos- 2017, 2019   |             | CAGIS         | 7/28/2020            |
| <b>17</b> | Historic Aerial Photos (1990,1977,1975,68,62,56,50,38,32)                 |             | CAGIS         | 7/28/2020            |
| <b>18</b> | <b>CAGIS_CPD_Files.</b>   | GDB         | CAGIS         | 7/28/2020            |
| a         | CPD_Response_Areas  | GDB         | CAGIS         | 7/28/2020            |
| b         | Addresses   | GDB         | CAGIS         | 7/28/2020            |
| c         | Streetcl  | GDB         | CAGIS         | 7/28/2020            |
| <b>19</b> | <b>CAGIS_Locators- Address Locator, Composite_Locator, Street_Locator</b> | Locators    | CAGIS         | 7/28/2020            |
| <b>20</b> | <b>CAGIS_Open_Data_Summer_Quarter_2020</b>                                |             | CAGIS         | 7/28/2020            |
| a         | addresses   | Shapefile   | CAGIS         | 7/28/2020            |
| b         | auditor_book_page   | Shapefile   | CAGIS         | 7/28/2020            |
| c         | buildings   | Shapefile   | CAGIS         | 7/28/2020            |
| d         | cincinnati_benchmarks   | Shapefile   | CAGIS         | 7/28/2020            |
| e         | cincinnati_community_council_neighborhood                                 | Shapefile   | CAGIS         | 7/28/2020            |
| f         | Cincinnati_Statistical_Neighborhood_Approximations                        | Shapefile   | CAGIS         | 7/28/2020            |
| g         | civilbnd  | Shapefile   | CAGIS         | 7/28/2020            |
| h         | condo_units   | Shapefile   | CAGIS         | 7/28/2020            |
| i         | condo_areas   | Shapefile   | CAGIS         | 7/28/2020            |
| j         | dote_walls  | Shapefile   | CAGIS         | 7/28/2020            |
| k         | driveways   | Shapefile   | CAGIS         | 7/28/2020            |
| l         | fences  | Shapefile   | CAGIS         | 7/28/2020            |
| m         | hamco_benchmarks  | Shapefile   | CAGIS         | 7/28/2020            |
| n         | hcpd_rural_zoning   | Shapefile   | CAGIS         | 7/28/2020            |
| o         | monument  | Shapefile   | CAGIS         | 7/28/2020            |
| p         | parcels   | Shapefile   | CAGIS         | 7/28/2020            |
| q         | parks_greenpaces  | Shapefile   | CAGIS         | 7/28/2020            |

APPENDIX B

**LUDLOW RUN SUSTAINABLE SOURCE CONTROL  
PROJECT NO. 10142910  
GIS SHAPEFILE INVENTORY**

|           | <b>Name of File</b>            | <b>Type</b> | <b>Source</b> | <b>Date Received</b> |
|-----------|--------------------------------|-------------|---------------|----------------------|
| r         | parparnt                       | Shapefile   | CAGIS         | 7/28/2020            |
| s         | polling_Locations              | Shapefile   | CAGIS         | 7/28/2020            |
| t         | railroad                       | Shapefile   | CAGIS         | 7/28/2020            |
| u         | RightOfWays_Easements          | Shapefile   | CAGIS         | 7/28/2020            |
| v         | road_pavement                  | Shapefile   | CAGIS         | 7/28/2020            |
| w         | sidewalks                      | Shapefile   | CAGIS         | 7/28/2020            |
| x         | Street_centerlines             | Shapefile   | CAGIS         | 7/28/2020            |
| y         | subdivisions                   | Shapefile   | CAGIS         | 7/28/2020            |
| z         | voter_precincts                | Shapefile   | CAGIS         | 7/28/2020            |
| aa        | zoningCincinnati               | Shapefile   | CAGIS         | 7/28/2020            |
| <b>21</b> | <b>CagisOpenDataYearly2020</b> |             | CAGIS         | 7/28/2020            |
| a         | cenbgr2010                     | Shapefile   | CAGIS         | 7/28/2020            |
| b         | cenblk2010                     | Shapefile   | CAGIS         | 7/28/2020            |
| c         | centra2010                     | Shapefile   | CAGIS         | 7/28/2020            |
| d         | Flood_FEMA_Zones               | Shapefile   | CAGIS         | 7/28/2020            |
| f         | Rivers_Lakes_ponds             | Shapefile   | CAGIS         | 7/28/2020            |
| g         | Section_Corners                | Shapefile   | CAGIS         | 7/28/2020            |
| h         | sectline                       | Shapefile   | CAGIS         | 7/28/2020            |
| i         | streams                        | Shapefile   | CAGIS         | 7/28/2020            |
| j         | tgrplaces                      | Shapefile   | CAGIS         | 7/28/2020            |
| <b>22</b> | Contour2011                    | Shapefile   | CAGIS         | 7/28/2020            |
| <b>23</b> | topography                     | GDB         | CAGIS         | 7/28/2020            |
| <b>24</b> | HAM_CONTOUR_2017               |             | CAGIS         | 7/28/2020            |
| <b>25</b> | GSAM_Selection                 | GDB         | MSDGC         | 12/9/2020            |

# APPENDIX C

MSDGC Comment and Response Form







**Comment & Response Form**

**10142910**

**Ludlow Run Sustainable Source Control**

All comments will be coordinated and responded to by the Project Manager.

Return Comments To: **Erwin Mamacos**

Comments Due: **9/30/2020**

| MSDGC REVIEW COMMENTS                      |     |               |   | PROJECT MANAGER/DESIGN TEAM RESPONSE   |   |      |
|--|-----|---------------|---|--|---|------|
| Document: Data Review Technical Memorandum |     |               |   | Response Codes: (Design Team Response required at each major milestone 30%/60%/90%/100%)<br>A – Accept Comment, B – No Action, C – More Information Needed |   |      |
| Initials                                   | No. | Sheet/Doc No. | Comment   | Initials   | Response/Action /Date   | Code |
| JB   | 1.  | General       | Will this project address surface flooding south of Spring Lawn Ave.? And in the vicinity of 4609 Crawford Ave.?  | Arcadis  | The primary objective of the project is to reduce overflow volume from CSOs in the Ludlow Run Watershed to meet ROV in Consent Decree. The project will also identify asset management needs by evaluating pipe segments in critical condition. MSD has statutory limitations on its ability to use sanitary sewer ratepayer funds to solve stormwater problems and therefore it is expected that this project may not address all stormwater or flooding concerns. | B    |
| JB   | 2.  | General       | ARCADIS did not mention MSDGC's previous discussions with residents. Several residents requested they be apprised of progress and investigations on this project. | Arcadis  | The MSDGC Project Manager is engaged with the community and is keeping them apprised of progress on this project.   | B    |

**LEGEND**

| Initials | Name          | Role      | Initials | Name             | Role         |
|----------|---------------|-----------|----------|------------------|--------------|
| ECM      | Erwin Mamacos | EM-PM     |          |                  | EM-PM        |
| JB       | John Barton   | WO        | Arcadis  | Arcadis US, Inc. | Consultant   |
|          |               | WWC/WWT   |          |                  | {Consultant} |
|          |               | {WWC/WWT} |          |                  | {EM-ROW}     |
|          |               | {WWC/WWT} |          |                  | {EM-Planner} |
|          |               | EM-QC     |          |                  |              |
|          |               | EM-QA     |          |                  |              |

| MSDGC REVIEW COMMENTS                      |     |               |   | PROJECT MANAGER/DESIGN TEAM RESPONSE   |   |      |
|--|-----|---------------|---|--|---|------|
| Document: Data Review Technical Memorandum |     |               |   | Response Codes: (Design Team Response required at each major milestone 30%/60%/90%/100%)<br>A – Accept Comment, B – No Action, C – More Information Needed |   |      |
| Initials                                   | No. | Sheet/Doc No. | Comment   | Initials   | Response/Action /Date   | Code |
| ECM  | 3.  | Page 3        | <p><i>“OUPS Sites Plans from Duke, Sprint, Cincinnati Bell, GCWW and other utilities as required by project planning locations.”</i></p> <p>MSD requested on 7/23/2020 via eBuilder that Arcadis requests OUPS for this project. Level of effort should not be significant as this can be performed by a technician or a junior engineer.</p> | Arcadis  | Arcadis will perform the OUPS request for this project, the Data Request Log will be updated accordingly. | A    |
| ECM  | 4.  | Section 4.5   | MSD WWC is currently gathering CCTV reports within the Ludlow Run watershed. CCTV reports will be provided shortly.   | Arcadis  | Added to the Data Request Log and has been tracked accordingly.   | A    |
| ECM  | 5.  | Section 4.6   | GSAM literature may have to be updated. MSD WWC will provide the literature once ready.   | Arcadis  | Added to the Data Request Log and has been tracked accordingly.   | A    |
| ECM  | 6.  | Section 5.3   | Mixed rainfall data based on radar pixels will be requested from WO.  | Arcadis  | Rainfall based on watershed will be used on this project, not pixel data. Retracted request.              | A    |
| ECM  | 7.  | Section 6.3   | CSO regulator maintenance data will be requested from WWC.  | Arcadis  | Added to the Data Request Log and has been tracked accordingly.   | A    |
| ECM  | 8.  | Section 6.3   | Developer submittal drawings and approval documents for the Rockford Subdivision will be requested from MSD Development Services.   | Arcadis  | Added to the Data Request Log and has been tracked accordingly.   | A    |
| ECM  | 9.  | General       | Please update data request log based on new data requests.  | Arcadis  | The data request log has been updated and provided as an appendix to the Technical Memorandum             | A    |

**LEGEND**

| Initials | Name          | Role      | Initials | Name             | Role         |
|----------|---------------|-----------|----------|------------------|--------------|
| ECM      | Erwin Mamacos | EM-PM     |          |                  | EM-PM        |
| JB       | John Barton   | WO        | Arcadis  | Arcadis US, Inc. | Consultant   |
|          |               | WWC/WWT   |          |                  | {Consultant} |
|          |               | {WWC/WWT} |          |                  | {EM-ROW}     |
|          |               | {WWC/WWT} |          |                  | {EM-Planner} |
|          |               | EM-QC     |          |                  |              |
|          |               | EM-QA     |          |                  |              |

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A decorative graphic consisting of three thin orange lines. One line is horizontal, extending across the width of the page. Two other lines are diagonal, starting from the bottom left and extending towards the top right, crossing the horizontal line.