



## 2016 & 2017 RETAINING WALL AND LANDSLIDE REPORT



City of Cincinnati

Department of Transportation and Engineering

Division of Engineering

Structures and Geotechnical Section

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## SECTION 1 WALL REPORT

### INTRODUCTION

Retaining walls are an essential part of Cincinnati's transportation network, protecting roadways, sidewalks and stairways from landslides and hillside slippage. Timely maintenance is important for the safety and welfare of the traveling public. The Department of Transportation and Engineering (DOT E) is the city agency responsible for inspecting, maintaining and improving the transportation system within the City of Cincinnati. The Wall Stabilization & Landslide Correction Program is the specific program within DOT E charged with the responsibility of maintaining the retaining walls within this transportation system and stabilizing landslides within the public right-of-way.

### RETAINING WALL DATABASE AND INSPECTION

Essentially every retaining wall within or adjacent to the right-of-way has been inventoried and is included in the Retaining Wall Database (RWD). There are a total of 7,217 retaining walls having a length of approximately 170 miles included in the RWD. DOT E is responsible for maintaining 1,530 walls having an approximate length of 50.2 miles of retaining walls.

Wall Owner	Number	Length-Feet	Length-Miles
Transportation And Engineering	1530	265,052	50.20
Other Departments	213	41,511	7.86
Maintenance Agreements	100	9,494	1.80
Unknown	40	7,638	1.45
Hamilton County	14	5,107	0.97
ODOT	192	54,664	10.35
Private	5128	513,112	97.18
<b>TOTALS:</b>	<b>7,217</b>	<b>896,578</b>	<b>169.81</b>

The Retaining Wall Database (RWD) formerly known as WITS (Wall Inventory Tracking System) was created in 1991. The RWD was upgraded to a geodata system in 2015 and is now directly accessed through ArcGIS. A web supported viewing and reporting system of the retaining walls contained in the RWD is included in DOT E's Asset Management Portal.

DOT E personnel inspect DOT E walls and walls owned and maintained by other city departments. The city is divided into six inspection districts (Inspection District Map Section 5 of report). Each district is inspected once every six years. In addition to the individual inspection district, all walls that are rated poor or critical condition are inspected yearly. Other inspections are performed if a wall is damaged in an automobile accident or if a complaint is received. All newly constructed, replaced or repaired walls are inventoried and inspected.

The objectives of the inspections are to:

1. Locate and determine the extent of any weakness or damage so that appropriate corrective actions can be taken to ensure public safety.
2. Provide a current information database on the condition of City owned retaining walls within Cincinnati so that maintenance, repair, and replacement projects can be scheduled efficiently.

The goal of the Retaining Wall Program is to preserve the structural integrity of all walls maintained by DOTE. DOTE established the following performance measures to track progress towards accomplishing this objective.

1. DOTE personnel will annually inspect all City walls (excluding flood walls) in one inspection district and all walls that are rated 3 (Poor) or 4 (Critical) condition. DOTE personnel will also inspect new, replaced, repaired, and damaged walls. They will maintain an inventory of all walls that are in or near public streets within the City of Cincinnati and annually submit a report summarizing the condition of City owned walls.
2. Within the limits of available funding, retaining wall personnel will develop and manage a wall maintenance, repair, and replacement work program so as to maintain a Satisfactory Structural Rating for 80% or more of the walls maintained by DOTE.

DOTE personnel inspected a total of 282 walls having a total length of 8.26 miles in the 2016 inspection district. These walls were in the communities of:

1. Mt. Auburn
2. Clifton, University Heights
3. Camp Washington
4. University Heights
5. Corryville
6. Clifton
7. Winton Place
8. Winton Hills

In 2017, DOTE personnel inspected a total of 316 walls having a total length of 9.88 miles in fourteen (14) communities.

1. Walnut Hills
2. Evanston
3. Paddock Hills
4. East Walnut Hills
5. Oakley
6. Madisonville
7. Pleasant Ridge
8. Kennedy Heights
9. Hartwell

- 10. Carthage
- 11. Roselawn
- 12. Bond Hill
- 13. North Avondale
- 14. Avondale

Section 4 of the report summarizes the results of the inspections done in 2016 and 2017.

**RETAINING WALL CONDITION SUMMARY**

Tables and graphs summarizing the condition of DOTE walls and other city maintained walls are shown in Section 2 of this report. The rating of each wall is based on the structural wall rating which ranges from Excellent (0) to Critical (4). The structural condition ratings are defined in Section 2 of this report. Ninety-nine (99) of the 1,530 (6.5%) walls maintained by DOTE have a Structural Rating of Poor (3). Ten (10) walls, 0.654% of DOTE walls have a Structural Rating of Critical (4). Tables of all DOTE walls and other maintained wall with a Poor (3) or Critical (4) condition rating are also listed in Section Two (2)

A list of the priority and estimated costs to replace or repair DOTE walls is shown in Section 3 of this report. The lists identifies whether the cost to replace/repair is a capital or maintenance expense. The estimated costs are conceptual and are primarily based on the inspection reports and photographs. They are only intended to establish basic funding needs and are not considered engineer’s estimates. The priority for replacement/repair is based on the walls’ effect on public safety, performance, the area it supports, further deterioration if not repaired, and degree of consequences if left unrepaired. A summary of the list is shown below.

**WALL REPAIR PRIORITY AND ESTIMATED FUNDING SUMMARY**

Capital Cost

High Priority (14 walls)	\$3,200,000
Medium Priority (10 walls)	\$549,000
<u>Low Priority (37 walls)</u>	<u>\$2,667,400</u>
TOTAL (51 walls)	\$6,416,400

Maintenance Costs

High Priority	\$41,000
Medium Priority	\$205,000
<u>Low Priority</u>	<u>\$100,000</u>
TOTAL	\$346,000

The total estimated maintenance and capital construction cost to replace/repair the walls to bring all walls to a condition of Satisfactory or better is \$6,762,400. This estimated conceptual cost does not account for costs associated with design, construction management, real estate or costs associated with inflation.

## **FUNDING**

In 1987, the Smale Commission which studied Cincinnati's infrastructure put an emphasis on the need to stabilize a backlog of landslides and the need for the repair and replacement of retaining walls throughout the city. Annual Capital funding for the Wall Stabilization and Landslide Correction Program which began in 1989 has substantially declined over the years from a high point of \$1.84 million in 1995 to a low \$550,000 in Fiscal Year (FY) 2016.

Neither DOTE or Public Services receive funding specifically for the maintenance of retaining walls. Maintenance Funds which were at an annual level of \$500,000 between 1989 and 1992 and \$200,000 between 1993 and 1995 have been completely eliminated since 1996. Retaining wall repairs must be funded from the same Capital funds used for landslide stabilization projects. The majority of the salaries of DOTE personnel within the program are funded directly from the program. Construction management and inspection services are also funded from the program.

Four-hundred-and-eighty-nine thousand (\$489,000) is currently (July 31, 2018) available in the Wall Stabilization and Landslide Correction Program. The total projected funding over the six year period from 2018 to 2023 is \$3,622,336. The estimated conceptual construction cost to repair or replace structurally deficient retaining walls is on the order of \$6.7 million. The estimated construction cost to stabilize landslides which are or may significantly impact the roads is estimated at approximately \$2.5 million.

The Wall Stabilization & Landslide Correction Six Year Plan included in Section 3 of the report demonstrates that the current level of funding is not sufficient to adequately address the maintenance and replacement of existing retaining walls and the stabilization of landslides which impact the roads. The program is highly dependent on securing outside funding. Repairs to the Cummins Street retaining wall repair project alone are estimated at \$2.3 to \$2.6 million. Outside funding of at least \$2.8 million is necessary to complete the high priority capital projects and the high priority maintenance repairs listed on the Wall Repair Priority & Estimated Funding Table in Section 3. The six year plan only addresses three of the eight landslide locations even with obtaining \$2.8 million in outside funding. The plan therefore must be dynamic and revised if outside funding becomes available or is not obtained or if circumstances, such as prolonged rainfall, cause a change in priorities.

Retaining walls and landslide locations will continually be inspected and evaluated. The program will prioritize allocated funding to address the most critical locations given the constraints of the budget.

## **CAPITAL IMPROVEMENT PROJECTS 2016 – 2018**

The city has completed over seventy-three (73) major landslide stabilization projects and forty-four (44) major retaining wall projects since the establishment of the Retaining Wall and Landslide Stabilization in 1989. Landslide stabilization projects are given priority over retaining wall replacement and repair projects due to the greater potential for road closures and infrastructure damage if the landslide is not stabilized. The program has been successful leveraging funds from outside sources such as SCIP

### **Hillside Avenue at Tyler Street** (Riverside)\_ (2016) - Construction cost - \$461,445

The landslides at the intersection of Hillside Avenue and Tyler were repaired in 2016. A pier wall was constructed to stabilize the landslide on the west side of the intersection and a fill buttress was constructed to stabilize the landslide on the east side of the intersection. This work was completed in June 2107. Fifty percent of the construction cost was funded from the State of Ohio Capital Improvement Program (SCIP).



Newly paved surface of Hillside Avenue looking east towards Tyler Street. Roadway stabilized with a drilled pier retaining on the downhill side of the guardrail.

**Colerain Avenue Bus Stop Barrier Walls** (Mt. Airy) (2016) - Construction cost - \$15,000

The bus stops bump-outs along the southbound side of Colerain Avenue are constructed on top of a drilled pier retaining wall and include vehicle barriers. Two of the bus stops were heavily damaged in vehicle crashes and required reconstruction. DOTE worked with the Department of Public Services to reconstruct the two damaged areas.



Damaged bus stop opposite Tranquility Lane.



Repaired bus stop opposite Tranquility Lane.



**McHenry Avenue Sidewalk Replacement** (East Westwood) (2017) – Construction cost - \$23,512

A heavily used section of sidewalk had been sinking due to slow hillside movement (creep). The area was re-graded with lightweight fill and the sidewalk was replaced to City standards, including ADA requirements. This work was funded jointly by the Wall Stabilization and Landslide fund and the Sidewalk Maintenance Program of DOTE.



**Beekman Street** (North Fairmont) (2017) - Construction cost - \$174,000

A section of the retaining wall supporting Beekman Street in South Fairmont failed in March 2017, closing one lane of the north bound roadway. DOTE applied for and received Ohio Public Works Commission Emergency Funding to cover 80% of the repair cost for this project.

The wall was repaired using soil nails and a shotcrete facing. Once a series of critical utility issues were resolved, the Contactor completed the stabilization work in 2 weeks.



**Riverside Drive Landslide Stabilization** – (East End) (2017-2018) Exploration  
\$400,000

The initial subsurface and geotechnical investigations of the Riverside Drive Landslide Stabilization Project were funded from the Retaining Wall Stabilization and Landslide Correction Program. The subsurface investigations included the installation of thirty-four inclinometers. The monitoring and evaluation of the inclinometers readings were and continue to be performed by personnel in and funded by the program.

DOTe geotechnical staff were and are extensively involved in the investigation, analyses and selection of options to mitigate potential damage including the evaluation of the design, contractor selection and monitoring during construction. DOTe will be responsible for the inspection, monitoring and maintenance of the 2,340 ft length of retaining wall. Construction of the retaining wall was funded by Greater Cincinnati Water Works to reduce the level of threat of hillside movement disrupting utilities to an acceptable level.



East end of Area 1 Retaining Wall

**Kirby Avenue** – (Mt. Airy) (2018) Construction cost - \$142,000

The rain event which caused the February 2018 Flood in southern Ohio resulted in a failure of roadway on Kirby Avenue that required the southbound road to be closed. The failure was the result of concentrated surface runoff directly onto an unstable slope due to a clogged inlet. DOTE designed an emergency repair and initiated emergency procurement procedures while concurrently applying for funding relief from FHWA. A drilled pier wall approximately 120 feet in length was installed to close the gap between two existing pier walls and the roadway was completely reopened less than 2 months later. DOTE anticipates being reimbursed by FHWA for this work.



Closure of inbound lane on Kirby Avenue



Drilling Piers on Kirby Avenue

**Berkshire Lane, Camargo Road, Kirby Avenue** (2018)

Berkshire Lane, Camargo Road and another section of Kirby Avenue are other locations, although not directly related to the 2018 February Flood Event, which required stabilization due to stream erosion and concentrated surface runoff directly onto a slope. These three locations were stabilized with rip-rap and grouted rip-rap at an approximate total construction cost of \$60,000.



Grouted Rip-Rap at Camargo Road



Rip-Rap placed on Kirby Avenue.

**TROD Repairs (2016-2018)**

In addition to the repair of the Colerain Avenue TROD made the following wall repairs in Calendar Years 2016 through July of 2018.

<b>TROD RETAINING WALL REPAIRS 2016-2018</b>			
<b>Wall #</b>	<b>Street</b>	<b>Condition</b>	<b>Repair</b>
201-016	River Road	deteriorated, cracks	chip and patch
252-016	Hoadly Court	loose and missing stones	mortar stone
284-004	Baltimore Ave	insufficient grout at posts	grout posts
289-083A	Elberon Ave	automobile accident	straighten blocks
294-062	Beekman Street	deteriorated barrier	install guardrail
299-011A	Hamilton Ave	automobile accident	replace block and cap
329-001	Straight Street	deteriorated, cracked	chip and patch
329-006	Central Parkway	deteriorated, cracked	chip and patch
330-057	Peete St at Vine	delaminated face	chip and patch
330-090B	Goethe Street	slope movement	grade above wall
330-170	East Clifton at Vine	delaminated face	chip and patch
335-143B	Riverside Drive	automobile accident	replace railing
409-051	Columbia Parkway	deteriorated columns	chip and patch
409-094	Missouri Avenue	failed modular wall	replace wall



Seventy-two feet of railing needed to be replaced on the Riverside Drive Retaining Wall (Wall #335-143B) due to an automobile accident on December 27, 2016.

## **LANDSLIDE DEBRIS REMOVAL 2016 - 2018**

Landslide debris which slid or threatened to slide onto the roadway was removed at five locations. Two of the locations were on Columbia Parkway. The other three locations were on Elberon Avenue, Sunset Avenue and on Martin Drive north of its intersection with Hill Street.

Debris needed to be removed from the Columbia Parkway locations on several occasions because of the limited reach of the excavation equipment to entirely remove the slide mass from the slope at one time. Removal of the debris was not practical until the debris moved further down slope within reach of the equipment.

Removal of slide debris which affect the roadways is funded through Public Services budget under the direction of DOTE.



The landslide on Martin Drive occurred on February 25<sup>th</sup>, 2018. This landslide and the need to remove additional debris from Columbia Parkway approximately 1,100 feet east of Kemper Lane occurred after a significant storm event.

<b>LANDSLIDE DEBRIS REMOVAL 2016-2018</b>	
<b>Date</b>	<b>Location</b>
02/03/2016	Columbia Parkway, 700 ft. west of Taft
02/04/2016	Columbia Parkway, 700 ft. west of Taft
02/05/2016	Columbia Parkway, 700 ft. west of Taft
02/24/2016	Columbia Parkway, 700 ft. west of Taft
03/01/2016	Columbia Parkway, 1,100 ft. east of Kemper
03/02/2016	Columbia Parkway, 1,100 ft. east of Kemper
05/11/2017	Columbia Parkway, 1,100 ft. east of Kemper
02/25/2018	Columbia Parkway, 1,100 ft. east of Kemper
02/26/2018	Columbia Parkway, 1,100 ft. east of Kemper
03/30/2017	Sunset Avenue
06/15/2017	Sunset Avenue
03/12/2018	Sunset Avenue
04/24/2018	Elberon Avenue, West of Mt. Hope
04/25/2018	Elberon Avenue, West of Mt. Hope
02/25/2018	Martin Drive, 250 ft. north of Hill St.

The Sunset Avenue debris removal location is at the toe of the landslide which impacted the access drive to the Eagle Watch Apartments at 1868 Sunset Avenue. The property owner constructed a soldier pile retaining wall to stabilize the access drive. The right-of-way is mid-slope between the curb of Sunset Ave. Movement of the hillside below the soldier pile wall continues to occur (See Sunset Avenue Retaining Wall page #).

In addition to the debris locations listed above, TROD on several occasions removed minor amounts of debris from the curb gutter on Elberon Avenue and from the base of the Columbia Parkway retaining wall.



## 2019 CAPITAL IMPROVEMENT PROJECTS

The major Capital Improvement Project scheduled for construction in CY 2019 is the Columbia Parkway Retaining Wall Restoration Project. Other projects in the design phase are dependent on the success of receiving funding from outside sources such as SCIP.

### **Columbia Parkway Retaining Wall Restoration** (Riverside)

The Riverside Drive Landslide originates along the downhill side of the existing pier wall which supports Columbia Parkway. The existing pier wall is a continuous wall consisting of a series of thirty, thirty-six and forty-two inch diameter piers all installed at a center to center spacing of seven feet. Concrete lagging was constructed behind and between the piers and extends eight feet below the top of the piers. The lagging retains the soil between the piers. The piers are embedded ten (10) to seventeen (17) feet into the bedrock and effectively separate and protect the Parkway from the landslide. The Riverside Drive Landslide, however, caused the ground surface in front of the piers to drop several feet below the bottom of the existing concrete lagging. The project consists of the construction of cast in place panels to retain the soil exposed between the existing piers and below the existing lagging to prevent the eventual loss of granular backfill from behind the existing panels. State of Ohio Capital Improvement Program (SCIP) funding has been approved by the Ohio Public Works Commission (OPWC). The funding is at a 50% local match. Municipal Road Funds from Hamilton County have also been obtained for project funding.



**Grandin Road Wall Extension** (Mt. Lookout) – Estimated construction cost – \$350,000 - \$400,000

A portion of Grandin Road between the driveways for the NIOSH facilities and opposite Tuscany Place is being subjected to slope movement. The most significant movement has undermined guardrail and has damaged a paved drainage channel in the roadway shoulder. The movement begins at the west end of a pier wall that was constructed in 1995 and continues for 230 feet.



Limited funding will more than likely restrict the extent of the repair of Grandin Road to the section where the guardrail is being undermined (above) leaving the section shown below unsupported.



**Sunset Avenue Retaining Wall** (West Price Hill) – Estimated construction cost – \$150,000 - \$250,000

The toe of the landslide that occurs below the private driveway accessing the Eagle Watch Apartments has slid in to the roadway along Sunset Avenue. The initial movement resulted in damage to the concrete storm ditch and resulted in the concrete from the ditch sticking into the roadway. Department of Public Services promptly removed the concrete debris from the roadway and has had to remove additional soil from the advancing slide on several occasions. Limited funding prevents the immediate construction of the wall. Plans are being prepared in case additional movement absolutely necessitates construction of a wall. Construction of a retaining wall along the toe of the slope would not only prevent further movement into the travel lane but also allow for the reestablishment of the concrete drainage ditch.



**Peete Street Retaining Wall Reconstruction** (Mt. Auburn)- Estimated construction cost – \$300,000 - \$400,000 (Minimum 2% City funding with the remaining funds paid by the Homeowners through an assessment.)

A series of privately owned mortared limestone retaining walls along Peete Street have been failing since 2015. These walls were built in the late 1800's when the lots that front along Mulberry Street were developed. A continuous stretch of 10 private walls have failed or are failing, prompting the Department of Buildings and Inspections to issue repair orders to the Mulberry Street Homeowners. At the request of the Homeowners, City Council passed a motion in June 2017 requesting that the City Administration begin the process of designing and constructing a public retaining wall to maintain the right-of-way and assess the Homeowners the project cost. Requests for Proposals (RFP) were requested in February 2018. The cost of the wall presented in the proposals was higher than expected. At the homeowner's request, a second request for RFP's was made in July of 2018. Three RFP's were submitted and are being reviewed by the Selection Committee.



Looking east down Peete Street. Public Services cleared the retaining wall debris from the roadway and stockpiled the stone against the slope to support it. Photo taken on March 3, 2016.

**Hamilton Avenue Segmental Wall Repair** (Northside)- Estimated construction cost  
– \$35,000 - \$50,000

A segmental retaining wall constructed in 2009 as part of the Hamilton Avenue Roadway Improvement Project has been repeatedly struck in vehicle crashes. The wall was repaired on several occasions only to be struck again. DOTE applied for State of Ohio funding for safety upgrades to the roadway. The wall will be reconstructed as part of the project once improvements are made to improve drainage and the pavement surface to eliminate or at least reduce the number of crashes that have destroyed the wall.



**Cummins Street Wall Repair** – (North Fairmont) (2020) Estimated construction cost \$2.6 Million

The Cummins Street Retaining Wall Project was described in the 2015 Retaining Wall Condition Report and is repeated in this wall report. DOTE will submit a SCIP Application for the repair of the retaining wall which supports Cummins Street in 2018 (SCIP Round 33) for construction in 2020. An application to SCIP in 2016 nearly made the cut of funded projects. The Beekman Street Wall Project (2017 page ##) is immediately adjacent to the Cummins Street Wall.

The existing retaining wall on Cummins Street was constructed in the 1930's. The retaining wall has a length of 1,810 feet and a maximum height of eighteen feet. The roadway of Cummins Street is two through lanes and one parking lane on the opposite side of the wall. The total width of the roadway is 30 feet.

The existing wall is in fair condition, the coping which is attached to the wall and the concrete railing which is attached to the coping is in a failed to critical condition. Sections of the railing have deteriorated, exposing reinforcing steel. Sections of the railing which appear visually sound crumble within a grasp of the hand. Guardrail sections have been bolted to the pilasters throughout the years to temporarily repair the railing.

The project requires removal of disintegrated concrete down to sound concrete and replacement of concrete removed. Soundings revealed approximately 2,000 square feet of unsound concrete. Joints between the panels need to be reconstructed and the entire wall will need to be sealed. The repairs to the retaining wall are essential in order to avoid complete replacement of the retaining structure. The existing concrete railing and coping needs to be replaced with a Texas Style railing by doweling into the existing retaining wall. The installation of the new concrete railing will require the removal and replacement of the curb.



Southern portion of Cummins Street retaining wall from below.



Disintegration of railing exposing steel reinforcement most likely due to salt spray.



Sections of concrete railing replaced with guardrail sections bolted to pilasters on Cummins Street.

## **SIGNIFICANT FUTURE PROJECTS UPDATE**

An update of future projects described in the 2015 Retaining Wall Condition Report is presented below.

### **Art Museum Drive** (Mt. Adams) - Estimated construction cost - \$625,000

Application for SCIP assistance for the repair of Art Museum Drive was submitted in 2016. The project was not funded. Previous SCIP Applications were also submitted in 2008 and 2009.

Hillside movement affects Art Museum Drive for a distance of approximately 500 feet from its intersection with Eden Park Drive. Separation of the sidewalk from the curb, separation of the curb from the roadway and tension cracks within the pavement continues to occur. Sections of the cable guardrail system are in need of repair.

Thirteen-hundred feet of cable guardrail on Eden Park Drive was replaced with steel-backed timber guardrail in 2017. The section of replaced railing was between Fulton Avenue and Martin Drive.

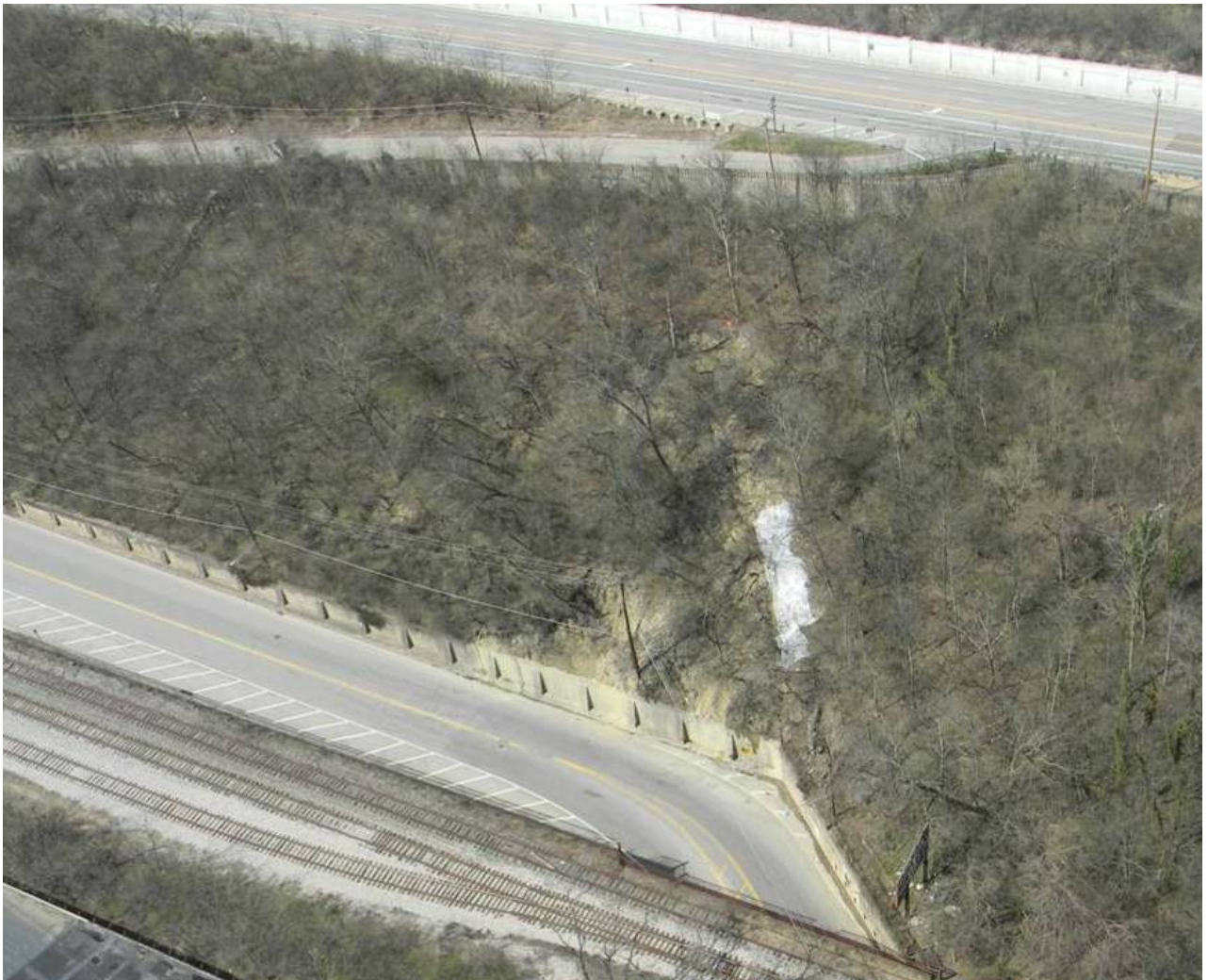


Patchwork to fill gaps due to hillside movement between curb and pavement.



**Riverside Drive** (East End) Estimated construction cost \$350,000

As described in the 2015 Wall Report, a landslide occurs above the existing retaining wall on the north side of Riverside Drive, US Truck Route 50, immediately west of the Rookwood Railroad Overpass. It extends up the hillside to immediately below Kemper Lane and Columbia Parkway US Route 50. The slide area covers nearly 1.5 acres of hillside. Riverside Drive, US Truck Rt. 50 is one lane in each direction through the Rookwood Overpass. The road curves as it goes under the overpass. Significant movement has not occurred since the spring seasonal rains of 2011. Riverside Drive is routinely inspected following periods of heavy rainfall.



Aerial view of landslide on Riverside Drive west of the Rookwood Overpass. The property above the wall is owned by the Park Board. Note extent of headscarp. Plastic sheet left behind after test pits were dug in 2011 to prevent water from seeping along scarp line into the slide mass. Plastic has since deteriorated and no longer exists.

**Dorchester Avenue Wall Repair** (Mt. Auburn) – Estimated construction cost – \$100,000 - \$150,000

The sidewalk on Dorchester Avenue remains closed due to the collapsed wall. The collapsed wall served as the foundation wall of a private building on Sycamore and was a privately owned wall. DOTE has prepared designs to either temporarily or permanently repair the wall, but logistical and legal issues have prevented this work from proceeding. It was also decided that since the exposed face is stable bedrock that the project could be postponed with the possibility that future redevelopment of the parcel will restore support of the rock cut. Protection of the rock face however remains on the list of potential projects.



## SECTION 2

# Retaining Wall Rating Summary

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List of Walls in Poor (3) and Critical (4) Condition

## Structural Condition Rating Definitions

### 0 to 1 Excellent

No-to-very-low extent of very low distress. Defects are minor, are within the normal range for *newly constructed or fabricated* elements, and may include those resulting from fabrication or construction. Ratings of 0-1 are only given to elements with very minor to no distress whatsoever –conditions typically seen only shortly after wall construction or substantial wall repairs.

### 1 to 2 Good

Low-to-moderate extent of low severity distress. Distress does not significantly compromise the element's function, nor is there significant severe distress to major structural components. Ratings of 1 to 2 indicate highly functioning wall elements that are only beginning to show the first signs of distress or weathering.

### 2 to 3 Satisfactory

High extent of low severity distress and/or low-to-medium extent of medium to high severity distress. Distress present does not compromise element function, but lack of treatment may lead to impaired function and/or elevated risk of element failure in the long term. Ratings of 2 to 3 indicate functioning wall elements with specific distresses that need to be mitigated to avoid significant repairs or element replacement in the longer term.

### 3 to 4 Poor

Medium-to-high extent of medium-to-high severity distress. Distress present threatens element function, and strength is obviously compromised and/or structural analysis is warranted. The element condition does not pose an immediate threat to wall stability. A rating of 3 to 4 indicates marginally functioning, severely distressed wall elements in jeopardy of failing without element repair or in need of repair to prevent further deterioration at an accelerated rate.

### 4 Critical

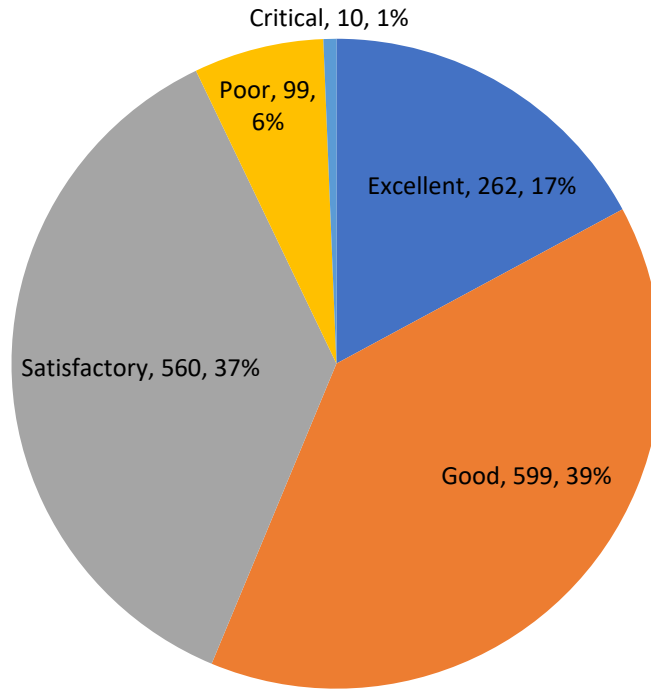
Medium-to-high extent of high severity distress. Element is no longer serving intended function. Element performance is threatening overall stability of the wall at the time of inspection. In practice, a rating of 4 indicates a wall that is no longer functioning as intended, and is in danger of failing.

**2017 Stuctural Rating Summary for Walls Maintained by DOTE**

RATING	COUNT	PERCENT by COUNT	LENGTH (FEET)	PERCENT by LENGTH	AREA (SQ. FEET)	PERCENT by AREA
Excellent	262	17.12%	46,157	17.35%	310,134	15.58%
Good	599	39.15%	105,446	39.51%	830,632	40.21%
Satisfactory	560	36.60%	91,929	34.35%	727,806	36.36%
Poor	99	6.47%	20,451	7.72%	142,322	7.04%
Critical	10	0.65%	1,646	0.62%	11,970	0.59%
TOTALS	1,530	100%	265,052	100%	2,022,864	100%

50.2 Miles

**2017 DOTE Maintained Walls**

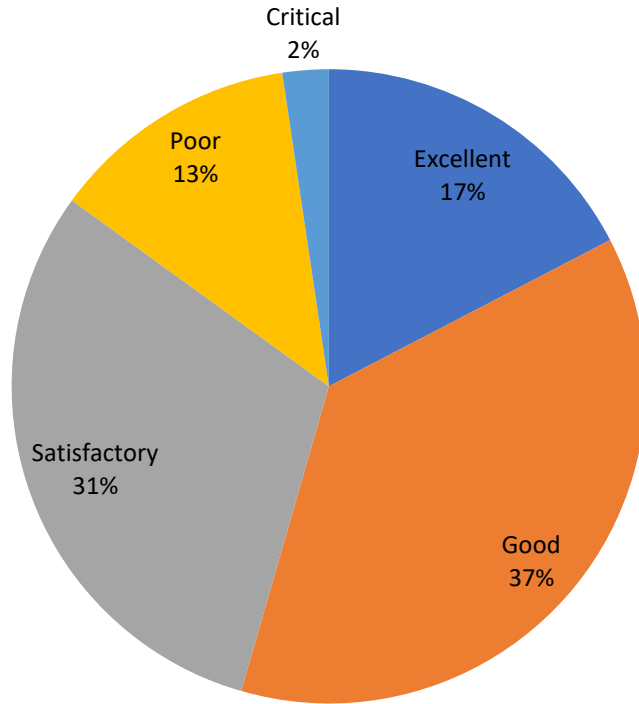


**2017 Stuctural Rating Summary for City Walls NOT MAINTAINED by DOTE**

RATING	COUNT	PERCENT BY COUNT	LENGTH (FEET)	PERCENT by LENGTH	AREA (SQ. FEET)	PERCENT by AREA
Excellent	37	17.37%	5,373	12.94%	47,115	16.11%
Good	79	37.09%	15,254	36.75%	111,610	38.17%
Satisfactory	65	30.52%	16,133	38.86%	112,265	38.40%
Poor	27	12.68%	4,315	10.39%	19,450	6.65%
Critical	5	2.35%	436	1.05%	1,950	0.67%
<b>TOTALS</b>	<b>213</b>	<b>100%</b>	<b>41,511</b>	<b>100%</b>	<b>292,390</b>	<b>100%</b>

7.86 Miles

**2017 Other City (Non DOTE) Maintained Walls**



### DOTE Maintained Wall with Structural Rating of 3 (Poor Condition) to 4 (Critical Condition)

<u>Wall ID</u>	<u>Side</u>	<u>House Numbers</u>	<u>Street Name</u>	<u>Wall Length</u>	<u>Height (Max)</u>	<u>Wall Type</u>
153-009	E	6308 to 6308	Gracely Drive	50	4.1	Toe, Concrete
201-003D	S	4101 to 4101	Hillside Avenue	465	5	Pier, Cantilever
201-019	N	4294 to 4302	River Road	227	5	Cantilever, Concrete
201-025	S	4311 to 4315	Hillside Avenue	257	2.5	Pier, Cantilever
241-009	W	821 to 881	Nebraska Avenue	431	7.3	Cantilever, Concrete
248-011A	N	986 to 996	Dehli Avenue	198	4	Toe, Concrete
248-011B	N	998 to 1004	Delhi Avenue	276	9	Toe, Concrete
249-014	E	916 to 932	Olive Avenue	94	2.6	Gravity, Concrete
250-059	N	3818 to 3820	Latham Avenue	115	9	Gravity, Dry Stone
251-028	S	2475 to 2481	Queen City Avenue	220	3	Precast Modular
251-029	W	4340 to 4344	Guerley Road	155	4.4	Precast Modular
251-030B	S	2523 to 2547	Queen City Avenue	357	5.6	Precast Modular
251-034	S	1999 to 1999	Sunset Lane	15	5	Gravity, Mortared Stone
252-021	N	2726 to 2729	Ruberg Avenue	49	3.7	Gravity, Concrete
281-002	W	4929 to 4929	Kirby Avenue	132	5.5	Gravity, Dry Stone
284-002A	E	2094 to 2156	Baltimore Avenue	433	12	Cantilever, Concrete
284-002B	E	2078 to 2092	Baltimore Avenue	433	11.5	Cantilever, Concrete
284-010B	S	3584 to 3588	Mchenry Avenue	130	6	Gravity, Concrete
285-021B	E	2004 to 2022	Baltimore Avenue	365	7.8	Gravity, Concrete
285-022	W	2035 to 2047	Baltimore Avenue	255	8.1	Gravity, Concrete
285-037	W	2079 to 2087	Baltimore Avenue	132	2.3	Cantilever, Concrete
286-043C	N	1758 to 1760	Harrison Avenue	430	5	Gravity, Mortared Stone
286-088	S	1681 to 1681	Harrison Avenue	32	3.3	Gravity, Concrete
286-090	W	2301 to 2301	Merton Street	35	6	Gravity, Dry Stone
286-193D	S	0 to 0	Queen City By-Pass	161	6	Pier, Cantilever
287-001	W	1327 to 1403	Bowman Avenue	149	10.3	Gravity, Dry Stone
287-022	E	1254 to 1256	Grand Avenue	60	6	Toe, Concrete
287-053	S	2633 to 2641	Ring Place	165	1.9	Gravity, Concrete
287-055	S	2801 to 2801	Lehman Road	39	2.8	Precast Modular
287-081	W	1939 to 1965	Grand Avenue	452	6.8	Mechanically Stabilized
288-022	E	2370 to 2398	Wilder Avenue	436	23.5	Gravity, Concrete
288-039	N	2311 to 2327	Wilder Avenue	249	9.4	Gravity, Concrete
288-045	E	2490 to 2490	Warsaw Avenue	71	1	Pier, Cantilever
288-055	W	2515 to 2515	Glenway Avenue	24	11	Gravity, Concrete
288-080	S	2511 to 2513	Warsaw Avenue	58	4	Gravity, Concrete
288-095	E	1000 to 1006	Kingston Place	67	7.7	Gravity, Concrete
288-107A	N	2630 to 2698	Maryland Avenue	378	7.3	Gravity, Dry Stone
289-072	S	2711 to 2743	River Road	516	13	Mechanically Stabilized
293-058	W	0 to 0	Fitzpatrick Street	50	1	Gravity, Mortared Stone
294-052	W	0 to 0	Fargo Alley	200	9	Gravity, Mortared Stone
294-062A	E	0 to 0	Cummins Street	450	18	Cantilever, Concrete
294-062B	E	2528 to 2550	Cummins Street	440	5	Cantilever, Concrete
294-062C	E	2552 to 2622	Cummins Street	440	9	Cantilever, Concrete
294-085	S	0 to 0	Queen City Alley	25	2.3	Gravity, Concrete

**DOTE Maintained Wall with Structural Rating of 3 (Poor Condition) to 4 (Critical Condition)**

<u>Wall ID</u>	<u>Side</u>	<u>House Numbers</u>	<u>Street Name</u>	<u>Wall Length</u>	<u>Height (Max)</u>	<u>Wall Type</u>
295-029	S	1647 to 1729	Baltimore Avenue	633	10.5	Precast Modular
295-102	N	1630 to 1648	Baltimore Avenue	155	4	Pier, Cantilever
298-013	W	4615 to 4627	Cresap Avenue	136	3.8	Gravity, Concrete
298-095	W	0 to 0	Coppice Lane	201	6	Pier, Cantilever
299-003	E	4800 to 4800	Hamilton Avenue	308	4.5	Precast Modular
299-008	W	0 to 0	Hamilton Avenue	375	2.5	Cantilever, Concrete
299-009	W	0 to 0	Hamilton Avenue	586	3.5	Pier, Cantilever
299-010	W	0 to 0	Hamilton Avenue	100	1.5	Cantilever, Concrete
299-011B	E	0 to 0	Hamilton Avenue	401	2.5	Precast Modular
326-028	W	0 to 0	Clifton Avenue	115	1	Precast Modular
329-015B	N	512 to 590	Straight Street	245	10.5	Gravity, Dry Stone
329-059	N	244 to 248	Warner Street	87	5.5	Gravity, Concrete
329-081	E	0 to 0	Renner Place	144	4	Gravity, Concrete
329-126A	N	700 to 730	Mcmillan Street, West	380	14.1	Gravity, Concrete
329-126B	N	680 to 700	Mcmillan Street, West	152	6	Gravity, Concrete
329-132	W	0 to 0	Hukill Alley	30	1.5	Cantilever, Concrete
329-155	S	317 to 317	Klotter Avenue	12	3.6	Gravity, Mortared Stone
330-052	S	2134 to 2135	Ohio Avenue	80	7.2	Gravity, Concrete
330-053A	N	2122 to 2146	Central Avenue	350	13.5	Cantilever, Concrete
330-053B	N	2148 to 2172	Central Avenue	350	13.5	Cantilever, Concrete
330-063	W	0 to 0	East Alley	198	12.5	Gravity, Mortared Stone
330-065	W	0 to 0	East Alley	102	16	Gravity, Mortared Stone
330-069	W	0 to 0	East Alley	114	11	Gravity, Mortared Stone
330-154	W	0 to 0	Elysian Place	100	9	Gravity, Dry Stone
335-217	S	325 to 353	Baum Street	255	20	Gravity, Dry Stone
336-078	S	135 to 145	Dorchester Avenue	91	17	Gravity, Mortared Stone
336-142	S	0 to 0	Ringgold Street Steps	60	1.3	Gravity, Concrete
336-163	W	2027 to 2029	Eleanor Place	41	4.5	Gravity, Mortared Stone
336-199	S	0 to 0	Seitz Street	13	3.5	Gravity, Mortared Stone
336-307	S	121 to 125	Dorchester Avenue	62	12	Gravity, Mortared Stone
337-112	N	144 to 150	Glencoe Place	130	10.5	Cantilever, Concrete
337-192	N	0 to 0	Mcgregor Avenue	100	6	Gravity, Concrete
337-242	W	0 to 0	Presley Alley	150	4	Gravity, Mortared Stone
338-035	E	3400 to 3408	Wilson Avenue	158	6.7	Gravity, Concrete
338-079	W	0 to 0	Alameda Place	97	5.5	Gravity, Concrete
339-065	S	511 to 517	Forest Avenue	84	1	Toe, Concrete
339-088	S	34 to 62	Forest Avenue	397	4.4	Toe, Concrete
339-091	N	0 to 0	Rockdale Avenue	170	13	Cantilever, Concrete
368-001	W	1015 to 1019	Dana Avenue	159	5.7	Toe, Concrete
371-054	E	0 to 0	Kemper Lane	235	6.2	Gravity, Mortared Stone
371-055	E	0 to 0	Kemper Lane	321	13	Cantilever, Concrete
371-056	E	0 to 0	Kemper Lane	390	14.5	Cantilever, Concrete
371-073	S	0 to 0	Columbia Parkway	29	9	Pier, Tiedback
375-060	S	0 to 0	Elmhurst Avenue	56	12	Gravity, Mortared Stone



**DOTE Maintained Wall with Structural Rating of 3 (Poor Condition) to 4 (Critical Condition)**

<u>Wall ID</u>	<u>Side</u>	<u>House Numbers</u>	<u>Street Name</u>	<u>Wall Length</u>	<u>Height (Max)</u>	<u>Wall Type</u>
375-091	S	0 to 0	Columbia Parkway	336	0.5	Pier, Cantilever
375-092	S	0 to 0	Columbia Parkway	29	0.5	Pier, Cantilever
375-093	S	0 to 0	Columbia Parkway	182	0.5	Pier, Cantilever
375-095	S	0 to 0	Columbia Parkway	28	8	Pier, Cantilever
376-020	S	1845 to 1845	Duck Creek Road	35	1	Toe, Concrete
376-066	S	2021 to 2021	Duck Creek Road	108	1.6	Toe, Concrete
376-097	N	3550 to 3550	Holly Lane (Private)	64	6	Cantilever, Concrete
422-052	N	0 to 0	Columbia Parkway	190	7.5	Gravity, Mortared Stone
422-057	W	4540 to 4598	Columbia Parkway	430	10	Toe, Concrete
452-001B	E	5766 to 5774	Kennedy Avenue	318	4.7	Gravity, Dry Stone
460-002A	S	0 to 0	Salem Road	86	8	Gravity, Block

Total Wall Length: 19,874.00

**DOTE Maintained Wall with Structural Rating of 4 (Critical Condition)**

<u>Wall ID</u>	<u>Side</u>	<u>House Numbers</u>	<u>Street Name</u>	<u>Wall Length</u>	<u>Height (Max)</u>	<u>Wall Type</u>
244-006A	S	3645 to 3645	Hillside Avenue	55	3	Gravity, Mortared Stone
244-006B	S	3645 to 3645	Hillside Avenue	41	3	Gravity, Dry Stone
244-008	S	3645 to 3645	Hillside Avenue	60	2.5	Gravity, Mortared Stone
286-086	W	2497 to 2499	Seegar Avenue	30	5	Gravity, Dry Stone
287-005	E	1300 to 1302	Lockwood Avenue	70	11.5	Gravity, Mortared Stone
288-107B	N	0 to 0	Maryland Avenue	183	7.5	Gravity, Dry Stone
294-062D	E	2624 to 2660	Cummins Street	480	15	Cantilever, Concrete
299-011A	E	0 to 0	Hamilton Avenue	397	2.5	Precast Modular
329-133A	W	0 to 0	East Alley	310	10.5	Gravity, Mortared Stone
423-104	W	647 to 647	Delta Avenue	20	2	Gravity, Concrete

Total Wall Length: 1,646.00

**City owned Walls Not Maintained by DOTE  
with Structural Rating of 3 (Poor Condition) to 4 (Critical Condition)**

<u>Wall ID</u>	<u>Side</u>	<u>House Numbers</u>	<u>Street Name</u>	<u>Wall Length</u>	<u>Height (Max)</u>	<u>Wall Type</u>
244-068	N	3762 to 3762	Hillside Avenue	36	1.5	Toe, Concrete
283-001	W	0 to 0	Todd Avenue	45	6.5	Tee- Wall
286-150	N	1710 to 1710	Harrison Avenue	13	4	Gravity, Concrete
289-028	S	0 to 0	Pavillion Drive	339	4.8	Pier, Cantilever
297-099	N	4123 to 4125	Virginia Avenue	46	3	Gravity, Mortared Stone
327-003	N	500 to 502	Mcalpin Avenue	288	6	Gravity, Mortared Stone
327-015	N	328 to 328	Mcalpin Avenue	234	2	Gravity, Concrete
330-237	S	6 to 12	Hust Alley	90	12	Cantilever, Concrete
331-026	S	0 to 0	Clark Street	133	2	Cantilever, Concrete
335-211	W	1301 to 1301	Sycamore Street	316	3	Tee- Wall
335-349	N	0 to 0	Celestial Street Steps	150	4	Gravity, Mortared Stone
335-354	E	0 to 0	Riverside Drive	20	2	Gravity, Concrete
336-162	W	0 to 0	Eleanor Place	72	6.5	Gravity, Mortared Stone
336-268	E	1799 to 1799	Art Museum Drive	648	3.5	Gravity, Concrete
336-309	E	0 to 0	Gilbert Avenue	580	3.5	Gravity, Dry Stone
336-376	E	2044 to 2056	Gilbert Avenue	164	3.5	Gravity, Dry Stone
337-055	E	2520 to 2520	Euclid Avenue	33	2.8	Gravity, Mortared Stone
337-311	E	2600 to 2600	Van Street Parking Lot	60	5	Toe, Concrete
339-077	S	0 to 0	Forest Avenue	187	4	Gravity, Mortared Stone
339-078	S	0 to 0	Forest Avenue	90	4	Gravity, Mortared Stone
339-079	S	0 to 0	Forest Avenue	131	3	Gravity, Mortared Stone
368-029	S	897 to 897	Clinton Springs Avenue	90	1.5	Gravity, Mortared Stone
371-088	E	0 to 0	Martin Drive	233	2.2	Gravity, Mortared Stone
372-008	N	0 to 0	Columbia Parkway	120	9	Gravity, Mortared Stone
375-155	N	2342 to 2352	Gladstone Av (Private)	180	9	Gravity, Dry Stone
409-068	N	2998 to 2998	Riverside Drive	8	2	Gravity, Brick
409-069	N	3000 to 3000	Riverside Drive	9	2	Gravity, Brick

Total Wall Length: 4315.00

**City owned Walls Not Maintained by DOTE  
with Structural Rating of 3 (Poor Condition) to 4 (Critical Condition)**

<u>Wall ID</u>	<u>Side</u>	<u>House Numbers</u>	<u>Street Name</u>	<u>Wall Length</u>	<u>Height (Max)</u>	<u>Wall Type</u>
281-023	W	5083 to 5087	Colerain Avenue	128	2	Gravity, Mortared Stone
288-130	W	611 to 615	Maryland Avenue	108	7.3	Gravity, Mortared Stone
330-152A	E	0 to 0	Elysian Place	36	7	Gravity, Mortared Stone
335-269	S	0 to 0	Bolivar Alley	40	5	Gravity, Mortared Stone
375-118	S	2425 to 2445	Riverside Drive	124	3	Gravity, Mortared Stone

Total Wall Length: 436.00

## SECTION 3

# Wall Repair Priority and Estimated Funding

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Priority and Estimated Funding – Landslide  
Stabilization Projects

**WALL REPAIR PRIORITY & ESTIMATED FUNDING**

Wall #	Street	Length	Area	Type	Comments	Priority	Fund	Estimate	
251-029	Guerley Rd	155	600	PM	replace cap with CIP Cap	HIGH	capital	\$15,000	
285-022	Baltimore Av	255	1050	CC	repair deteriorated cap & railing	HIGH	capital	\$30,000	
286-037	Esmonde St	97	500	T	replace rotten railroad ties with modular wall	HIGH	capital	\$75,000	
286-088	Harrison Av	32	160	CC	replace delaminated wall cap & railing	HIGH	capital	\$15,000	
288-022	Wilder Av	436	9500	CC	deteriorated & cracked chip and patch	HIGH	capital	\$85,000	
288-039	Wilder Av	249	2400	CC	chip and patch delaminations	HIGH	capital	\$35,000	
294-062A	Cummins St	450	5500	CC	delaminated cap & railing, new CIP barrier	HIGH	capital	\$552,500	
294-062B	Cummins St	440	1600	CC	delaminated cap & railing, new CIP barrier	HIGH	capital	\$552,500	
294-062C	Cummins St	440	3000	CC	delaminated cap & railing, new CIP barrier	HIGH	capital	\$552,500	
294-062D	Cummins St	480	5000	CC	delaminated cap & railing, new CIP barrier	HIGH	capital	\$552,500	
337-081B	Maplewood Av	79	400	G5	replace wall with modular wall	HIGH	Capital	\$60,000	
371-050A	Riverside Dr	460	5200	G2	deteriorated cap, replace and mortar	HIGH	capital	\$225,000	
371-050B	Riverside Dr	460	4400	G2	deteriorated cap, replace and mortar	HIGH	capital	\$225,000	
371-050C	Riverside Dr	460	2500	G2	deteriorated cap, replace and mortar	HIGH	capital	\$225,000	
						<b>14 WALLS</b>	<b>HIGH</b>	<b>capital</b>	<b>\$3,200,000</b>
241-009	Nebraska Av	431	2260	CC	deteriorated, cracks , chip and patch	MED	capital	\$40,000	
285-037	Baltimore Av	132	320	CC	replace wall cap & railing	MED	capital	\$30,000	
329-126A	McMillan St	380	2200	CC	broken end & railing, patch and replace	MED	capital	\$76,000	
329-126B	McMillan St	152	1200	CC	broken cap, chip and patch	MED	capital	\$31,000	
329-129	Vine St	179	950	G5	patch/repair wall cap	MED	capital	\$150,000	
329-133B	East Alley	190	2600	G2	reset tilted wall cap; reanchor rail post	MED	capital	\$10,000	
330-036	Central Pkwy	492	1700	CC	tilted, deteriorated cap	MED	capital	\$40,000	
337-047	McMillan St	110	500	G5	underpin wall	MED	capital	\$60,000	
330-053B	Central Av	350	3700	CC	broken cap & spalled face, chip and patch	MED	capital	\$74,000	
371-074	Col. Pkwy	90	1400	CC	delaminated face, chip, patch and repaint	MED	capital	\$38,000	
						<b>10 WALLS</b>	<b>MED</b>	<b>capital</b>	<b>\$549,000</b>
244-006A	Hillside Av	55	150	G2	deteriorated, replace with modular	LOW	capital	\$22,000	
244-006B	Hillside Av	41	120	G2	deteriorated, replace with modular	LOW	capital	\$16,400	
244-008	Hillside Av	60	120	G2	moved and settled, replace with modular	LOW	capital	\$24,000	
244-019	Fithian St	80	450	G2	bulged, replace with modular	LOW	capital	\$32,000	
244-026	Baurichter St	105	450	CC	cracked, leaning, replace with modular	LOW	capital	\$28,000	
248-011A	Delhi Av	198	750	CC	delaminated toewalk, chip and patch toe	LOW	capital	\$10,000	
248-011B	Delhi Av	276	2500	CC	delaminated toewalk, chip and patch toe	LOW	capital	\$10,000	
249-014	Olive Av	94	280	CC	leaning, replace with concrete	LOW	capital	\$10,000	
250-059	Latham Av	50	850	G2	stones missing, replace with modular	LOW	capital	\$15,000	
251-028	Queen City Av	220	800	PM	wrecked & salt damage, replace with modular	LOW	capital	\$40,000	
251-030B	Queen City Av	357	1900	PM	wrecked & salt damage, replace with modular	LOW	capital	\$85,000	
251-034	Sunset Ln	15	70	G2	tilted wall & eroded area, replace with modular	LOW	capital	\$12,000	
253-002	McHenry Av	146	720	CC	replace leaning panel	LOW	capital	\$5,000	
286-008	Saffin St	165	450	G2	deteriorated wall & steps, rebuild existing	LOW	capital	\$30,000	
286-090	Merton St	35	100	G2	moved and settled, repair existing stone	LOW	capital	\$15,000	
286-150	Harrison Av	13	65	CC	replace wall w/ modular	LOW	capital	\$10,000	
287-001	Bowman Av	149	1500	G2	broken cap & steps, replace cap mortar stone	LOW	capital	\$28,000	
287-005	Lockwood Av	70	900	G2	cracked corner, repair stone replace cap	LOW	capital	\$35,000	
287-022	Grand Av	60	325	TC	Toe removed, check tilt, will need replaced	LOW	capital	\$40,000	
288-080	Warsaw	20	350	CC	leaning, replace with CIP	LOW	capital	\$18,000	
288-107A	Maryland Av	378	2700	G2	deteriorated & bulged, rebuild stone	LOW	capital	\$300,000	
288-107B	Maryland Av	183	1300	G2	deteriorated & bulged, rebuild stone	LOW	capital	\$150,000	
294-052	Fargo Al	200	1350	G2	bulge, broken end & cap, rebuild stone	LOW	capital	\$30,000	
329-015B	Straight St	245	2400	G2	bulged & tilted, replace	LOW	capital	\$280,000	
329-133A	East Alley	310	3000	G2	bulge fell, rebuild stone in sections	LOW	capital	\$40,000	
330-063	East Alley	198	2400	G2	bulged, rebuild stone in sections	LOW	capital	\$40,000	
330-065	East Alley	102	1800	G2	bulged, rebuild stone in sections	LOW	capital	\$40,000	
330-069	East Alley	114	1500	G2	bulged, rebuild stone in sections	LOW	capital	\$40,000	
335-110	St Gregory Pl	196	650	CC	delaminated upper part, repair cap	LOW	capital	\$20,000	
336-307	Dorchester St	62	750	G2	deteriorated cap, replace with modular	LOW	capital	\$35,000	
337-048	Eucliden Alley	130	1100	TC	replace tilted panel	LOW	capital	\$6,000	
337-242	Presley Al	150	700	G2	bulged and moved, rebuild stone , railing	LOW	capital	\$40,000	
339-091	Rockdale Av	170	1600	CC	deteriorated concrete, replace with CIP	LOW	capital	\$150,000	
370-125	Wm H Taft Rd	32	125	G2	bulged under sidewalk, replace cap	LOW	capital	\$10,000	
371-054	Kemper Ln	235	1300	G2	cap partially missing, replace wall	LOW	capital	\$235,000	
371-055	Kemper Ln	321	3600	CC	top delaminated, replace wall	LOW	capital	\$321,000	
371-056	Kemper Ln	390	3400	CC	moved, replace wall	LOW	capital	\$390,000	
423-104	Delta Av	20	40	CC	damaged wall, replace with modula4r	LOW	capital	\$25,000	
452-001A	Kennedy Av	318	1900	G2	bulged, rebuild existing	LOW	capital	\$15,000	
452-001B	Kennedy Av	318	1900	G2	bulged & moved, rebuild existing	LOW	capital	\$15,000	
						<b>37 WALLS</b>	<b>LOW</b>	<b>capital</b>	<b>\$2,667,400</b>
294-011	Beekman St	307	5600	G2	repair stone barrier	HIGH	maint.	\$4,000	
296-028	Blue Rock Av	296	1500	G5	replace missing blocks	HIGH	maint.	\$2,500	
330-029	Central Pkwy	129	1550	G5	reset railing.	HIGH	maint.	\$1,000	
330-149	Rice St	180	900	CC	replace section of deformed rock catchment fence.	HIGH	maint.	\$5,000	
335-062	Carney St	36	280	TC	replace missing section of railing.	HIGH	maint.	\$500	
336-266	Eden Park Dr	523	2200	G5	Replace cracked/delaminated wall panels.	High	maint.	\$3,000	
340-001	Clinton Springs Av	137	950	CC	Repair railing	HIGH	maint.	\$1,000	
367-006	Paddock Rd	361	1700	TC	Repair Toewalk/sidewalk (cracked, holed).	HIGH	maint.	\$4,000	
368-001	Dana Av	159	850	CC	delaminated toewalk, repair	HIGH	maint.	\$5,000	
371-047	Riverside Dr	146	1200	G2	Reset GR, remove big tree from top of wall	HIGH	maint.	\$2,000	
372-007	Col. Pkwy	225	1350	G2	broken cap, mortar and patch	HIGH	maint.	\$3,000	
409-050	Col. Pkwy	460	5900	CC	deteriorated end, chip and patch	HIGH	maint.	\$5,000	
422-049A	Col. Pkwy	345	4500	CP	Cut down trees growing through wall.	HIGH	maint.	\$2,500	
422-049B	Col. Pkwy	345	4500	CP	Cut down trees growing through wall.	HIGH	maint.	\$2,500	
						<b>14 WALLS</b>	<b>HIGH</b>	<b>maint.</b>	<b>\$41,000</b>
284-002A	Baltimore Av	433	4500	CC	patch holes	MED	maint.	\$4,000	
284-002B	Baltimore Av	433	3700	CC	chip and patch delaminations	MED	maint.	\$5,000	
284-010A	McHenry Av	62	525	CC	patch holes	MED	maint.	\$2,000	
284-010B	McHenry Av	130	670	CC	chip and patch delaminations	MED	maint.	\$3,000	
285-016	Sutter Av	500	5400	MSE	replace stolen fence	MED	maint.	\$5,000	
285-040	Bickel Av	65	800	CC	patch holes	MED	maint.	\$1,000	



**WALL REPAIR PRIORITY & ESTIMATED FUNDING**

Wall #	Street	Length	Area	Type	Comments	Priority	Fund	Estimate
336-002	Bunker Alley	32	175	CC	replace railing	LOW	maint.	\$1,500
336-067	Boal St	42	275	CC	patch over exposed rebar.	LOW	maint.	\$500
336-142	Ringgold St	60	80	G5	patch spall/delaminated area(1); patch void/hole in side of curbswall	LOW	maint.	\$500
336-195	Mulberry St	31	80	G5	patch exposed rebar at corner	LOW	maint.	\$500
336-238	Reading Rd	468	1050	TC	unclog weep holes, patch corner	LOW	maint.	\$1,000
336-257	Dorsey St	475	5000	PC	repair top tube rail where seperation has occurred.	LOW	maint.	\$1,000
336-304	Main St	31	60	CC	patch 2 areas of spalled concrete at bottom of fence post	LOW	maint.	\$500
336-345	Mulberry St	25	75	G3	remove shrub growing in wall, fill gap with stone	LOW	maint.	\$500
336-376	Cogswell Alley	75	0	G2	Reset bulge in wall.	LOW	maint.	\$1,000
337-055	Euclid Av	33	120	G2	some loose stones on top course need re mortaring	LOW	maint.	\$500
337-192	McGregor Av	100	500	CC	crumbled foundation/ abandon, regrade if necessary	LOW	maint.	\$3,000
337-214	Wellington Pl	58	450	G2	replace 1 missing stone, regROUT 1 loose stone.	LOW	maint.	\$100
337-281	Van St	72	200	TC	Grout railing post	LOW	maint.	\$100
338-035	Wilson Av.	158	1000	G5	chip and patch delaminations	LOW	maint.	\$5,000
338-102	MLK Dr	226	1100	CC	repair/replace bent railing section	LOW	maint.	\$1,000
339-065	Forest Av	84	100	CC	tilted panel, replace w/ curb wall	LOW	maint.	\$10,000
339-077	Forest Av	187	950	G2	replace missing stone	LOW	maint.	\$5,000
339-088	Forest Av	397	1700	CC	broken toewalk, repair	LOW	maint.	\$5,000
368-029	Mitchell Av	38	0	G2	loose stones need remortaring/restacking.	LOW	maint.	\$2,000
371-022	St Paul Dr	310	75	G2	Repair 10' of loose top course toward E end.	LOW	maint.	\$500
371-049	Riverside Dr	505	900	TC	Remove metal edge from curb.	LOW	maint.	\$500
375-112	Wold Av	54	150	G2	Re mortar loose stones.	LOW	maint.	\$500
375-143	Grandin Rd	135	0	G5	Patch wall cap where crushed. 2 locations	LOW	maint.	\$1,000
376-016	Duck Creek Rd	90	200	CC	Close 1' gap in wall	LOW	maint.	\$1,000
381-003	Losantiville Av	226	1600	CC	Prevent backfill (pebbles) from coming out of weep holes @ E.	LOW	maint.	\$500
409-037	Walworth Av	385	5700	CC	Patch 2 holes in wall.	LOW	maint.	\$3,000
422-053	Col. Pkwy	490	3200	G2	Remortar loose stones.	LOW	maint.	\$1,000
422-057	Col. Pkwy	430	4000	CC	toewalk broken & heaved, chip and patch	LOW	maint.	\$5,000
335-056	Jerome St	100	800	G5	patch crack at joint in wall	LOW	maint.	\$500
						<b>48 WALLS</b>	<b>LOW</b>	<b>\$100,000</b>

**Total Capital & Maintenance Costs**

**\$6,762,400**

**WALL REPAIR PRIORITY AND ESTIMATED FUNDING SUMMARY**

**Capital Cost**

High Priority (14 walls)	\$3,200,000
Medium Priortiy (10 walls)	\$549,000
<u>Low Priority (37 walls)</u>	<u>\$2,667,400</u>
<b>TOTAL (51 walls)</b>	<b>\$6,416,400</b>

**Maintenance Costs**

High Priority	\$41,000
Medium Priortiy	\$205,000
<u>Low Priority</u>	<u>\$100,000</u>
<b>TOTAL</b>	<b>\$346,000</b>

**WALL TYPE KEY**

CC	Cantilever, Concrete	LS	Landslide
CM	Ccrib, Metal	LT	Landscaping Timber
CP	Crib, Pre-Cast Concrete	MS	Mechanically Stabilized
CT	Crib, Tiedback	OT	Other, See Comments
CW	Crib, Wood Timbers	PC	Pier, Cantilever
FW	Floodwall	PM	Precast Modular
G1	Gravity, Dry Stone	PT	Pier, Tiedback
G2	Gravity, Mortared Stone	RB	Rock Fall Barrier
G3	Gravity, Block	RE	Reinforced Earth
G4	Gravity, Brice	SE	Slope Easement
G5	Gravity, Concrete	ST	Settlement
GB	Gabion	TC	Toe, Concrete
HC	H-Pile, Cantilever	TD	Turned Down
HM	Hillside Movement	TW	Tee-Wall
HT	H-Pile, Tiedback		

### Landslide Correction Projects & Estimated Funding

LOCATION	PRIORITY	EST.
Grandin Road Pier Wall Extension	HIGH	\$400,000
Sunset Avenue Retaining Wall	MED	\$250,000
Berkshire Lane Pier Wall	MED	\$300,000
Dorchester Rock Cut Stabilization	MED	\$100,000
Tusculum Avenue	MED	\$250,000
Riverside Drive @ Rookwood Overpass	MED	\$350,000
Art Museum Drive Retaining Wall	LOW	\$625,000
Hillside Avenue @ Henrietta Avenue	LOW	\$300,000

**TOTAL COST      \$2,575,000**

## Wall Stabilization & Landslide Correction 2018 through 2023

*Program Expenses*

Carry-Over <sup>1</sup>	New <sup>2</sup>	Projects by Calendar Year Contract Awarded	Estimated Total Cost	Projected Funding <sup>3</sup>					Estimated Remaining Funds
				Wall Fund Portion		Outside Funding Portion <sup>4</sup>			
Wall Funds	Wall Funds			Amount	%	Amount	%	Secured	
\$489,000		<b>2018</b>							
		Wall Inspection & Program Management	\$20,000	\$ 20,000	100%	\$ -	0%	N/A	
		Project Design & Management	\$150,000	\$ 150,000	100%	\$ -	0%	N/A	
		TROD and Contract Maintenance Work	\$80,000	\$ 80,000	100%	\$ -	0%	N/A	
		Peete Street Retaining Wall	\$400,000	\$ 8,000	2%		98%	No	
		<b>Total Expenses</b>		<b>\$ 258,000</b>					<b>\$231,000</b>
\$231,000	\$705,000	<b>2019</b>							
		Wall Inspection & Program Management	\$60,000	\$60,000	100%	\$ -	0%	N/A	
		Project Design & Management	\$275,000	\$275,000	100%	\$ -	0%	N/A	
		TROD and Contract Maintenance Work	\$50,000	\$50,000	100%	\$ -	0%	N/A	
		Columbia Parkway Pier Wall Restoration	\$700,000	\$ 350,000	50%	\$ 350,000	50%	Yes	
		Grandin Road (Limited Repair)	\$125,000	\$ 125,000		\$ -	0%	N/A	
		<b>Total Expenses</b>		<b>\$ 860,000</b>					<b>\$76,000</b>
\$76,000	\$573,000	<b>2020</b>							
		Wall Inspection & Program Management	\$60,000	\$60,000	100%	\$ -	0%	N/A	
		Project Design & Management	\$275,000	\$275,000	100%	\$ -	0%	N/A	
		TROD and Contract Maintenance Work	\$0	\$ -	100%	\$ -	0%	N/A	
		Cummins Street Retaining Wall	\$2,600,000	\$ 286,000	11%	\$2,314,000	89%	No	
		<b>Total Expenses</b>		<b>\$ 621,000</b>					<b>\$28,000</b>
\$28,000	\$611,992	<b>2021</b>							
		Wall Inspection & Program Management	\$60,000	\$60,000	100%	\$ -	0%	N/A	
		Project Design & Management	\$275,000	\$275,000	100%	\$ -	0%	N/A	
		TROD and Contract Maintenance Work	\$100,000	\$ 100,000	100%	\$ -	0%	N/A	
		Berkshire Lane Pier Wall	\$300,000	\$ 75,000	100%	\$ -	0%	N/A	
		<b>Total Expenses</b>		<b>\$ 510,000</b>					<b>\$129,992</b>
\$129,992	\$630,652	<b>2022</b>							
		Wall Inspection & Program Management	\$60,000	\$60,000	100%	\$ -	0%	N/A	
		Project Design & Management	\$275,000	\$275,000	100%	\$ -	0%	N/A	
		Sunset Avenue Retaining Wall	\$250,000	\$ 250,000	100%	\$ -	0%	N/A	
		TROD and Contract Maintenance Work	\$50,000	\$ 50,000	100%	\$ -	0%	N/A	
		<b>Total Expenses</b>		<b>\$ 635,000</b>					<b>\$125,644</b>
\$125,644	\$611,992	<b>2023</b>							
		Wall Inspection & Program Management	\$50,000	\$60,000	100%	\$ -	0%	N/A	
		Project Design & Management	\$300,000	\$275,000	100%	\$ -	0%	N/A	
		TROD and Contract Maintenance Work	\$50,000	\$ 50,000	100%	\$ -	0%	N/A	
		Esmonde Street Retaining Wall	\$75,000	\$ 75,000	100%	\$ -	0%	N/A	
		Riverside Drive	\$675,000	\$ 135,000	10%	\$ 540,000	80%	N/A	
		Wilder Avenue Retaining Walls	\$120,000	\$ 120,000	100%	\$ -	0%	N/A	
		<b>Total Expenses</b>		<b>\$ 715,000</b>					<b>\$22,636</b>

- 1 - End of previous calendar year (i.e. Dec 31) with exception of 2018 which is balance on July 31, 2018
- 2 - Budget amount for fiscal year applied at beginning of calendar year
- 3 - Additional leveraged funds will be pursued and will be used to supplement local funds as secured.
- 4 - Outside funding is considered any funding other than that from the Wall and Landslide Program



SECTION 4

**2016 & 2017  
Retaining Wall  
Inspection  
Summaries**

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# Retaining Wall Inspection Criteria

## DIVISIONS (# of items in each Division)

- Structural (12 items)
- Drainage (5 items)
- Cosmetic (4 items)
- Miscellaneous (5 items)

### Each Item Rated

0 = No Problems

1 = Minor Problems

2 = Moderate Problems

3 = Severe Problems

4 = Critical Problems

N/A = Not Applicable

Each Division – Given an Average Rating (Sum of Individual Items in Division / # of Items rated)

## OVERALL WALL RATING (General Condition)

Sum of the average of the total number of items in the four Divisions (Structural, Drainage, Cosmetic, Misc.) Excludes any N/ Ratings Example:

Overall Wall Rating = 35 (Sum of Ratings for Items) / 15 (Number of Items) = 2.3 (Rating)

**TOTAL AVERAGES OF WALLS INSPECTED IN 2016 CYCLE**

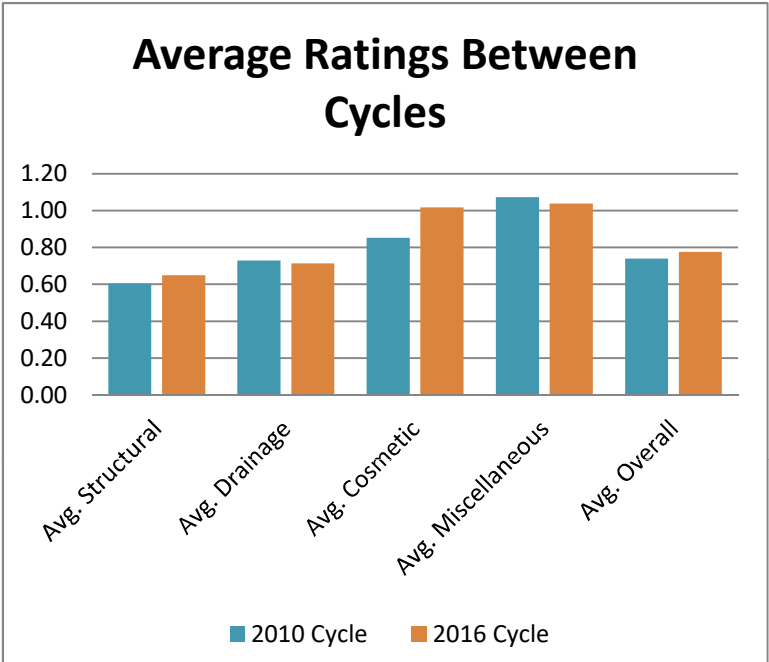
<b><u>2016 INSPECTION CYCLE</u></b>								
Maintence	Wall Count	Total Length (Lin. Ft.)	Total Exposed Area (Sq. Ft.)	Avg. Structural	Avg. Drainage	Avg. Cosmetic	Avg. Misc.	Avg. Overall
Agreement	1	36.00	150.00	1.56	2.33	1.00	2.67	1.84
Community Development Dept	10	1,110.00	4,250.00	0.42	0.22	1.15	0.96	0.58
General Services Department	4	1,121.00	8,600.00	0.56	0.63	0.88	0.96	0.65
Health Department	2	303.00	825.00	0.15	0.25	0.75	0.34	0.26
Park Board Recreation Department	14	3,081.00	18,230.00	0.69	0.75	0.96	0.80	0.76
	9	767.00	2,010.00	0.74	0.78	0.94	0.78	0.77
Transportation And Engineering	231	37,178.00	260,692.00	0.50	0.76	0.96	1.12	0.71
Water Department	1	12.00	70.00	0.56	0.00	1.50	0.67	0.63
<b>2016 TOTALS:</b>	<b>272</b>	<b>43,608.00</b>	<b>294,827.00</b>	<b>0.65</b>	<b>0.71</b>	<b>1.02</b>	<b>1.04</b>	<b>0.78</b>
		<b>8.26 Miles</b>						

<b><u>2010 INSPECTION CYCLE</u></b>								
Maintence	Wall Count	Total Length (Lin. Ft.)	Total Exposed Area (Sq. Ft.)	Avg. Structural	Avg. Drainage	Avg. Cosmetic	Avg. Misc.	Avg. Overall
Agreement	1	36.00	150.00	1.56	2.33	1.00	2.67	1.84
Community Development Dept	12	1,292.00	6,050.00	0.47	0.21	1.21	1.19	0.66
General Services Department	4	1,121.00	8,600.00	0.56	0.63	0.88	1.02	0.67
Health Department	2	303.00	825.00	0.15	0.25	0.75	0.34	0.27
Park Board Recreation Department	18	3,618.00	22,030.00	0.65	0.82	1.02	0.73	0.74
	9	767.00	2,010.00	0.72	0.78	0.94	0.78	0.75
Transportation And Engineering	232	35,011.00	272,516.00	0.51	0.82	1.02	1.18	0.74
Water Department	1	12.00	70.00	0.22	0.00	0.00	0.67	0.25
<b>2010 TOTALS:</b>	<b>279</b>	<b>42,160.00</b>	<b>312,251.00</b>	<b>0.60</b>	<b>0.73</b>	<b>0.85</b>	<b>1.07</b>	<b>0.74</b>
		<b>7.98 Miles</b>						

**TOTAL AVERAGES OF WALLS INSPECTED IN 2016 CYCLE**

	City Maintened Owned Walls			
	0-1	1-2	2-3	3-4
Avg. Structural	242	30	0	0
<i>Avg. Structural</i>	<i>253</i>	<i>26</i>	<i>0</i>	<i>0</i>
Avg. Drainage	206	58	8	0
<i>Avg. Drainage</i>	<i>205</i>	<i>66</i>	<i>8</i>	<i>0</i>
Avg. Cosmetic	199	64	9	0
<i>Avg. Cosmetic</i>	<i>202</i>	<i>64</i>	<i>13</i>	<i>0</i>
Avg. Miscellaneous	157	88	27	0
<i>Avg. Miscellaneous</i>	<i>146</i>	<i>106</i>	<i>27</i>	<i>0</i>
Avg. Overall	211	61	0	0
<i>Avg. Overall</i>	<i>213</i>	<i>66</i>	<i>0</i>	<i>0</i>

*2010 Averages are Italicized*



## Transportation and Engineering Maintained Walls - Changes from 2010 to 2016

Wall No	Com Description	Street	Wall Height	Wall Length	Wall Type	Avg Struct '10	Avg Struct '16
294-070	Clifton, University Heights	Rush Street	3.5	30	Gravity, Concrete	0.56	0.67
295-013	Camp Washington	Meeker Street	1	30	Gravity, Concrete	0.11	0.22
325-004	Winton Place	Derby Avenue	3.6	155	Toe, Concrete	0.55	0.64
328-003B	Camp Washington	Central Parkway	6.5	335	Cantilever, Concrete	0.90	1.00
328-028	Clifton, University Heights	Probasco Street	9.1	141	Cantilever, Concrete	0.17	0.25
328-089	Camp Washington	Central Parkway	17	224	Cantilever, Concrete	0.40	0.50
328-116	Clifton, University Heights	Dixmyth Avenue	6	174	Pier, Cantilever	0.00	0.10
329-001	Clifton, University Heights	Central Parkway	8.3	120	Gravity, Concrete	0.70	0.80
329-015B	University Heights	Straight Street	10.5	245	Gravity, Dry Stone	1.90	2.00
329-039	Clifton, University Heights	Conklin Street	10	201	Gravity, Concrete	0.60	0.70
329-059	Clifton, University Heights	Warner Street	5.5	87	Gravity, Concrete	0.70	0.80
329-081	Clifton, University Heights	Renner Place	4	144	Gravity, Concrete	1.09	1.55
329-143	Clifton, University Heights	Schorr Alley	6	225	Gravity, Mortared Stone	1.22	1.33
329-155	Clifton, University Heights	Klotter Avenue	3.6	12	Gravity, Mortared Stone	0.00	1.40
329-240	Clifton, University Heights	Hukill Alley	2.6	100	Gravity, Concrete	0.00	0.09
329-241	Clifton, University Heights	Hukill Alley	2.5	158	Gravity, Concrete	1.22	1.33
329-247	Clifton, University Heights	Clemmer Avenue Steps	5	48	Gravity, Block	0.78	0.89
329-261	University Heights	Tafel Street	2.1	57	Gravity, Block	0.89	1.11
330-084	Mt. Auburn	Wendell Alley, North	28	65	Gravity, Mortared Stone	0.33	0.44
330-154	Clifton, University Heights	Elysian Place	9	100	Gravity, Dry Stone	1.67	1.78
336-078	Mt. Auburn	Dorchester Avenue	17	91	Gravity, Mortared Stone	0.67	0.89
336-140	Mt. Auburn	Southern Avenue	3.5	129	Cantilever, Concrete	0.09	0.20
336-142	Mt. Auburn	Ringgold Street Steps	1.3	60	Gravity, Concrete	1.00	1.22
336-149	Mt. Auburn	Sycamore Street	15.5	192	Gravity, Concrete	0.70	0.90
336-163	Mt. Auburn	Eleanor Place	4.5	41	Gravity, Mortared Stone	0.86	1.14
336-193	Mt. Auburn	Sycamore Street	9.5	177	Gravity, Mortared Stone	0.80	0.90
336-199	Mt. Auburn	Seitz Street	3.5	13	Gravity, Mortared Stone	0.00	1.11
336-275	Mt. Auburn	Main Street Steps	16	215	Gravity, Mortared Stone	0.50	0.40
336-307	Mt. Auburn	Dorchester Avenue	12	62	Gravity, Mortared Stone	1.44	1.67
336-323	Mt. Auburn	Hiram Street Steps	2.5	20	Gravity, Dry Stone	1.00	1.11
336-398	Mt. Auburn	Liberty Hill	1.5	60	Gravity, Concrete	0.90	0.10
337-047	Mt. Auburn	Mcmillan Street, East	4	110	Gravity, Concrete	1.18	1.27
337-081B	Mt. Auburn	Maplewood Avenue	4.4	79	Gravity, Concrete	0.70	0.90
337-112	Mt. Auburn	Glencoe Place	10.5	130	Cantilever, Concrete	0.73	0.82
337-193	Corryville	William Howard Taft Rd	5.5	20	Cantilever, Concrete	0.10	0.20
338-026	Clifton	Ruther Avenue	5	148	Pier, Cantilever	0.00	0.09
340-008	Clifton	Mitchell Avenue, West	3	275	Toe, Concrete	0.73	0.10
341-004	Winton Place	Orient Avenue	2	90	Precast Modular	0.30	0.20
342-001	Winton Hills	Este Avenue	7	38	Toe, Concrete	0.40	0.40
344-001	Winton Hills	Center Hill Avenue	8.4	330	Cantilever, Concrete	0.30	0.40

**TOTAL AVERAGES OF WALLS INSPECTED IN 2017 CYCLE**

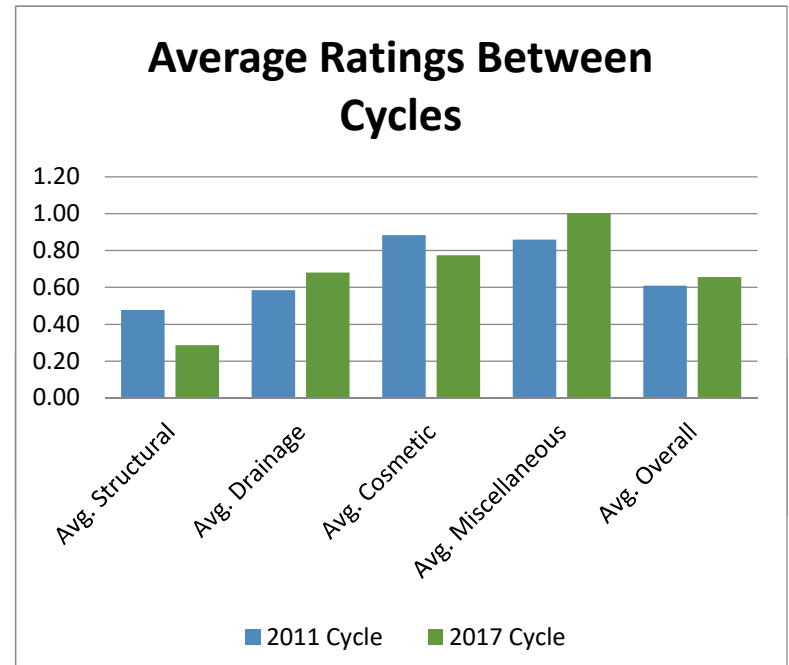
<b><u>2017 INSPECTION CYCLE</u></b>								
Maintence	Wall Count	Total Length (Lin. Ft.)	Total Exposed Area (Sq. Ft.)	Avg. Structural	Avg. Drainage	Ave. Cosmetic	Avg. Misc.	Avg. Overall
Community Development Dept	1	50.00	300.00	0.00	1.50	1.00	2.33	1.41
General Services Department	1	116.00	2,400.00	0.00	0.00	0.00	0.00	0.00
Park Board	46	11,424.00	66,060.00	0.61	0.72	0.80	0.88	0.69
Recreation Department	4	592.00	2,765.00	0.35	0.50	1.25	0.77	0.55
Transportation And Engineering	264	39,972.00	283,831.00	0.47	0.68	0.82	1.03	0.63
<b>2017 TOTALS:</b>	<b>316</b>	<b>52,154.00</b> <b>9.88 Miles</b>	<b>355,356.00</b>	<b>0.29</b>	<b>0.68</b>	<b>0.77</b>	<b>1.00</b>	<b>0.66</b>

<b><u>2011 INSPECTION CYCLE</u></b>								
Maintence	Wall Count	Total Length (Lin. Ft.)	Total Exposed Area (Sq. Ft.)	Avg. Structural	Avg. Drainage	Ave. Cosmetic	Avg. Misc.	Avg. Overall
Park Board	48	12,034.00	69,130.00	0.60	0.72	0.76	0.84	0.68
Recreation Department	6	744.00	3,265.00	0.33	0.33	1.00	0.63	0.47
Transportation And Engineering	267	38,618	290,719.00	0.50	0.71	0.89	1.11	0.68
<b>2011 TOTALS:</b>	<b>321</b>	<b>51,396.00</b> <b>9.73 Miles</b>	<b>363,114.00</b>	<b>0.48</b>	<b>0.59</b>	<b>0.88</b>	<b>0.86</b>	<b>0.61</b>

**TOTAL AVERAGES OF WALLS INSPECTED IN 2017 CYCLE**

	Transportation & Engineering Owned Walls			
	0-1	1-2	2-3	3-4
Avg. Structural	249	14	1	0
<i>Avg. Structural</i>	<i>249</i>	<i>18</i>	<i>0</i>	<i>0</i>
Avg. Drainage	205	49	6	0
<i>Avg. Drainage</i>	<i>209</i>	<i>52</i>	<i>6</i>	<i>0</i>
Avg. Cosmetic	215	42	3	0
<i>Avg. Cosmetic</i>	<i>216</i>	<i>45</i>	<i>6</i>	<i>0</i>
Avg. Miscellaneous	159	79	17	5
<i>Avg. Miscellaneous</i>	<i>155</i>	<i>87</i>	<i>19</i>	<i>2</i>
Avg. Overall	226	38	0	0
<i>Avg. Overall</i>	<i>226</i>	<i>41</i>	<i>0</i>	<i>0</i>

*2011 Averages are Italicized*



## Transportation and Engineering Maintained Walls - Changes from 2011 to 2017

Wall No	Community	Street	Wall Height	Wall Length	Wall Type	Avg Struct '11	Avg Struct '17
332-051	CBD - Riverfront	Rosa Parks Street	2	144	H-Pile, Tiedback	0.00	0.09
336-259	Walnut Hills	Iowa Street	8	69	Gravity, Concrete	0.73	0.45
337-176	Walnut Hills	William Howard Taft Rd.	4	183	Toe, Concrete	1.18	1.27
337-186	Walnut Hills	Burbank Street	6	90	H-Pile, Cantilever	0.73	0.82
337-192	Walnut Hills	Mcgregor Avenue	6	100	Gravity, Concrete	1.83	2.00
337-241	Walnut Hills	Presley Alley	7	112	Gravity, Mortared Stone	1.00	1.11
338-035	Avondale	Wilson Avenue	6.7	158	Gravity, Concrete	0.60	0.80
338-036	Avondale	Wilson Avenue	6.7	150	Gravity, Concrete	0.60	0.70
338-066	Avondale	Hickory Street	3.5	70	Toe, Concrete	0.45	0.27
338-072	Avondale	Hickory Street	3	53	Gravity, Concrete	0.70	0.80
338-079	Avondale	Alameda Place	5.5	97	Gravity, Concrete	1.00	1.20
339-048	Avondale	Lossing Street	3.5	84	Gravity, Concrete	0.00	0.10
339-049	Avondale	Lossing Street	7.5	137	Cantilever, Concrete	0.90	1.00
339-091	Avondale	Rockdale Avenue	13	170	Cantilever, Concrete	1.10	1.10
339-103	Avondale	Vine Street	1.8	55	Gravity, Concrete	0.40	0.60
364-016	Carthage	Longview Street	1.5	17	Gravity, Concrete	0.22	0.33
365-013A	Bond Hill	Towanda Terrace	9.5	26	Gravity, Mortared Stone	0.45	0.36
367-006	Paddock Hills	Paddock Road	7	361	Toe, Concrete	0.64	0.73
367-013	North Avondale	Clinton Springs Avenue	7.4	330	Cantilever, Concrete	1.36	0.36
369-020	Walnut Hills	Victory Parkway	7.6	184	Cantilever, Concrete	0.30	0.20
369-097	Walnut Hills	Martin L King Jr Dr, E	7.6	488	Cantilever, Concrete	0.40	0.50
370-079	Walnut Hills	Martin L King Jr Dr, E	2.4	20	Toe, Concrete	0.20	0.30
370-090	Evanston	Neilson Place	2	40	Gravity, Concrete	0.80	0.90
370-106	East Walnut Hills	Salutaris Avenue	3	90	Gravity, Mortared Stone	0.91	3.00
370-118	East Walnut Hills	William Howard Taft Rd.	3.7	116	Toe, Concrete	0.45	0.55
370-119	East Walnut Hills	William Howard Taft Rd.	2.8	128	Toe, Concrete	0.18	0.27
370-120	East Walnut Hills	William Howard Taft Rd.	5	125	Toe, Concrete	0.73	0.82
370-125	East Walnut Hills	William Howard Taft Rd.	4.3	32	Gravity, Mortared Stone	1.44	0.45
371-058	East Walnut Hills	Edgecliff Point	4	33	Gravity, Mortared Stone	1.18	0.55
371-101	Walnut Hills	Alpine Place	34	84	Gravity, Dry Stone	0.56	0.67
372-007	Walnut Hills	Columbia Parkway	7.6	225	Gravity, Mortared Stone	0.60	0.50
375-038	East Walnut Hills	William Howard Taft Rd.	2.2	22	Toe, Concrete	0.10	0.00
375-060	Evanston	Elmhurst Avenue	12	56	Gravity, Mortared Stone	1.36	1.40
375-067	East Walnut Hills	William Howard Taft Rd.	3	150	Toe, Concrete	0.82	0.55
375-097	East Walnut Hills	Columbia Parkway	2.7	85	Cantilever, Concrete	0.18	0.27
375-132	East Walnut Hills	Collins Avenue	4	8	Gravity, Mortared Stone	0.22	0.44
376-020	Evanston	Duck Creek Road	1	35	Toe, Concrete	0.45	0.64
376-066	Evanston	Duck Creek Road	1.6	108	Toe, Concrete	0.64	0.73
379-002	Paddock Hills	Tennessee Avenue	15.5	71	Cantilever, Concrete	0.40	0.50
382-012	Hartwell	Anthony Wayne Avenue	2.5	120	Cantilever, Concrete	0.10	0.30
403-005	Bond Hill	Seymour Avenue	6	48	Toe, Concrete	0.64	0.73
425-016	Oakley	Madison Road	16.5	215	Cantilever, Concrete	0.40	0.60
425-030	Oakley	Oak Lane	3	40	Gravity, Mortared Stone	0.89	0.75
426-006	Oakley	Vandercar Way	4	345	Cantilever, Concrete	0.40	0.70
428-007	Pleasant Ridge	Ridge Avenue	4	71	Cantilever, Concrete	0.09	0.00



## Transportation and Engineering Maintained Walls - Changes from 2011 to 2017

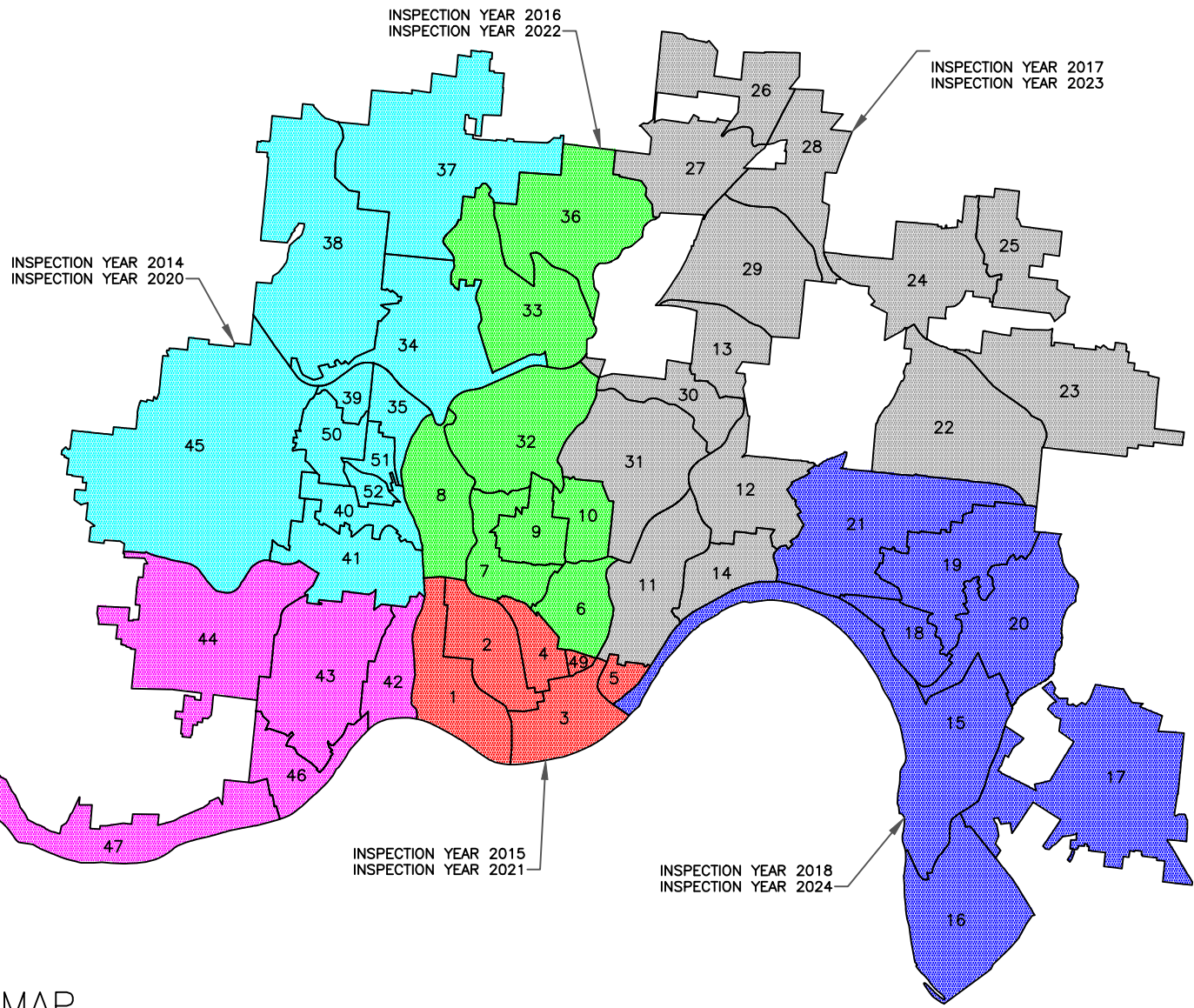
Wall No	Community	Street	Wall Height	Wall Length	Wall Type	Avg Struct '11	Avg Struct '17
450-007	Kenndey Heights	Crestview Avenue	3.5	43	Other, See Comments	0.11	0.33
452-001A	Kenndey Heights	Kennedy Avenue	4.2	305	Gravity, Dry Stone	1.33	1.22
452-001B	Kenndey Heights	Kennedy Avenue	4.7	318	Gravity, Dry Stone	1.67	1.78
452-015	Kenndey Heights	Davenant Avenue	2.5	15	Gravity, Mortared Stone	0.78	0.67
454-006	Madisonville	Erie Avenue	3.5	217	Toe, Concrete	0.91	0.55
454-020	Madisonville	Dunning Place	2.8	46	Cantilever, Concrete	0.70	0.80

SECTION 5

# Inspection District Map

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COMMUNITIES			
1	Queensgate	27	Carthage
2	West End	28	Roselawn
3	CBD - Riverfront	29	Bond Hill
4	Over The Rhine	30	North Avondale
5	Mt. Adams	31	Avondale
6	Mt. Auburn	32	Clifton
7	Clifton, University Heights	33	Winton Place
8	Camp Washington	34	Northside
9	University Heights	35	South Comminsville
10	Corryville	36	Winton Hills
11	Walnut Hills	37	College Hill
12	Evanston	38	Mt. Airy
13	Paddock Hills	39	Fay Apartments
14	East Walnut Hills	40	North Fairmont
15	East End	41	South Fairmont
16	California	42	Lower Price Hill
17	Mt. Washington	43	East Price Hill
18	Columbia-Tusculum	44	West Price Hill
19	Mt. Lookout	45	Westwood
20	Linwood	46	Sedamsville
21	Hyde Park	47	Riverside
22	Oakley	48	Saylor Park
23	Madisonville	49	Pendleton
24	Pleasant Ridge	50	East Westwood
25	Kenndey Heights	51	Millvale
26	Hartwell	52	English Woods



INSPECTION CYCLE MAP

SECTION 6

# Retaining Wall Inspection Form

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# RETAINING WALL INSPECTIONS



Wall Number: \_\_\_\_\_  
 Street: \_\_\_\_\_

DIVISION		RATING	COMMENTS
<b>Structure</b>			
1	Cracking-----		
2	Bulging-----		
3	Sliding-----		
4	Tilt-----		
5	Settlement-----		
6	Delamination-----		
7	Joints-----		
8	Wall Cap-----		
9	Stone/Block-----		
10	Footing-----		
11	Landslide Damage-----		
12	Tree Damage-----		
			Average Structural Condition
<b>Drainage</b>			
13	Backdrains-----		
14	Weep Holes-----		
15	Ditch Behind Wall-----		
16	Erosion-----		
17	Leakage-----		
			Average Drainage Condition
<b>Cosmetic</b>			
18	Discoloration-----		
19	Graffiti-----		
20	Gunite-----		
21	Paint/Miracoat-----		
			Average Cosmetic Condition
<b>Miscellaneous</b>			
22	Brush/Undergrowth-----		
23	Railing/Fence-----		
24	Curb-----		
25	Sidewalk/Roadway-----		
26	Steps-----		
			Average Miscellaneous Condition
<b>General Condition</b>			
27	Overall Wall Rating		

Community No.: \_\_\_\_\_ Community: **#N/A**

Inspected By: \_\_\_\_\_ Inspection Date: \_\_\_\_\_  
 Last Overall Wall Rating: \_\_\_\_\_ Change in Rating: \_\_\_\_\_  
 Last Inspection Date: \_\_\_\_\_ ("+" = getting better / "-" = getting worse)

# RETAINING WALL INSPECTION FORM

The technician/inspector uses this form in the field to write down inspection data. A form is filled out for each wall that is inspected. As of 01/01/2011 only DOTE and other City department walls are inspected on an annual basis. Inspect walls that have Maintenance Code letters B, D, F, G, H, M, R, S, T, & W. At the top of the form, the technician/inspector fills out data that pertains to the community number that the wall is located in, the retaining wall number, the street the wall is located on, who inspected the wall and the date the wall was inspected.

The rest of the retaining wall inventory form is divided into five divisions and these are: Structural, Drainage, Cosmetic, Miscellaneous and General Condition. The Structural, Drainage, Cosmetic and Miscellaneous Divisions have various categories and each category is assigned a sequential number. There are 25 categories in all. Each category is rated from 0 to 4 and the rating system is shown below.

- 0 = No Problems
- 1 = Minor Problems
- 2 = Moderate Problems
- 3 = Severe Problems
- 4 = Critical Problems
- NA = Category Not Graded  
Because It Is Non-Applicable

Each division has three columns, one for category, one for rating and one for comments. The technician/inspector carefully examines the wall for each category, rates the category by consulting the attached guide and enters pertinent comments that relate to the category.

Each division has an average rating box at the bottom of the rating column. The average rating is the sum of all the ratings in that division. An NA rating is not included in the average rating. An example is shown below.

## COSMETIC DIVISION

CATEGORY	RATING	COMMENTS
18. DISCOLORATION.....	2	rust from fence
19. GRAFFITI.....	3	patches from graffiti cover-up
20. GUNITE.....	NA	there is no gunite
21. PAINT/MIRACOAT.....	1	private paint job
TOTAL SUM OF CATERGORIES	6	

Sum of Ratings (6) divided by (Number of Categories (3)) = 2.0 Average Rating.

The General Condition Division has one line to list the overall wall rating. This is sum of all rated categories divided by the number of rated categories. Do not include NA categories. The computer inspection form includes a large Additional Comment box. Use this comment box to input information about repairs required including measurements and amounts.

## STRUCTURAL DIVISION

The Structural Division is the most important because the categories impact the stability of the wall. The inspector should carefully inspect these categories, especially cracking, bulging, sliding, tilt, settlement and delaminations. Severe or critical problems in these categories should be addressed ASAP. Technician should maintain a spreadsheet of walls with severe and critical problems to coordinate maintenance with engineers, Public Service Department and contractors.

### 1. CRACKING

0 = None

1 = Minor; hairline

2 = Moderate; partial penetration, width < 1/8"

3 = Severe; deep cracks, width 1/8" or more, exposed rebar

4. = Critical: full or partial wall failure

Suggested Comments: numbers, locations, sizes, direction, causes and previous repairs

### 2. BULGING

0 = None

1 = Minor; pushed out 3" or less

2 = Moderate; pushed out 3" to -6"

3 = Severe; pushed out more than 6"

4 = Critical; wall failure due to collapsed bulge

Suggested Comments: numbers, locations, pushed out measurements, settlement above bulge, causes and previous repairs

### 3. SLIDING

0 = None

1 = Minor; offset 3" or less at joint

2 = Moderate; offset 3" to -6" at joint

3 = Severe; offset more than 6" at joint

4 = Critical; wall failure due to sliding

Suggested Comments: number, locations, offset measurements, damage to property supported by wall, causes and previous repairs

### 4. TILT

0 = None

1 = Minor; less than 1" per foot

2 = Moderate; 1" to 2" per foot

3 = Severe; more than 2" per foot

4 = Critical; wall failure due to tilting

Suggested Comments; numbers, location, tilt measurements, damage to property supported by wall, causes and previous repairs

## 5. SETTLEMENT

- 0 = None
- 1 = Minor; less than 3"
- 2 = Moderate; 3"+ to 6"
- 3 = Severe; more than 6"
- 4 = Critical; wall failure due to settlement

Suggested Comments: numbers, locations, measurements, causes and previous repairs

## 6. DELAMINATIONS

- 0 = None
- 1 = Light; sporadic small areas
- 2 = Moderate; sporadic medium areas
- 3 = Severe; exposed rebar
- 4 = Critical; wall failure due to delaminations

Suggested Comments: numbers, locations, sizes, causes and previous repairs

## 7. JOINTS

- 0 = None
- 1 = Minor; joint material missing or deteriorated
- 2 = Moderate; broken and less than 2" wide
- 3 = Severe; broken and 2" to 4" wide
- 4 = Critical; broken and wider than 4"

Suggested Comments: numbers, location, measurements, causes and previous repairs

## 8. WALL CAP

- 0 = None
- 1 = Minor; small cracks
- 2 = Moderate; cracks & delaminations
- 3 = Severe; cracks & delaminations with exposed rebar
- 4 = Critical; large sections of cap deteriorated or missing

Suggested Comments: numbers, location, measurements, causes and previous repairs

## 9. STONE OR BLOCK

- 0 = None
- 1 = Minor; isolated missing and or loose units
- 2 = Moderate; small areas of missing and loose units
- 3 = Severe; large areas of missing and loose units
- 4 = Critical; very large areas of missing and loose units

Suggested Comments: numbers, locations, measurements, causes and previous repairs

## 10. FOOTING

- 0 = None
- 1 = Minor; cracked



- 2 = Moderate; cracked and spalled
- 3 = Severe; cracked, spalled and broken
- 4 = Critical; cracked, spalled, broken and exposed rebar

Suggested Comments: numbers, locations, measurements, causes, previous repairs and for footers underground and unable to inspect write NA

#### 11. LANDSLIDE DAMAGE

- 0 = None
- 1 = Minor; debris overtopping wall, but no damage to wall
- 2 = Moderate; minor damage to wall
- 3 = Severe; damage to wall requires repairs
- 4 = Critical; wall failure caused by landslide

Suggested Comments: locations, causes, property effected and previous repairs

#### 12. TREE DAMAGE

- 0 = None
- 1 = Minor; light damage
- 2 = Moderate; cracking and movement
- 3 = Severe; damage to wall requires repairs
- 4 = Critical; wall failure caused by trees

Suggested Comments: numbers, location, damage and previous repairs

### DRAINAGE DIVISION

#### 13. UNDERDRAINS AND BACKDRAINS

- 0 = None
- 1 = Minor; pipe leaking onto sidewalk or roadway
- 2 = Moderate; partial blockage
- 3 = Severe: full blockage
- 4 = Critical: collapsed pipe

Suggested Comments: inspect outlet after heavy rain, inform Stormwater of problem, most pipes are underground and cannot be inspected, therefore the most common comment is NA

#### 14. WEEP HOLES

- 0 = None
- 1 = Minor; some holes clogged and or buried
- 2 = Moderate; 1/3 of holes are clogged and or buried
- 3 = Severe; 2/3 of holes are clogged and or buried
- 4 = Critical; all holes are clogged and or buried

Suggested Comments: numbers, holes are weeping, roots in hole and debris in hole

## 15. DITCHES AND TRENCHES

- 0 = None
- 1 = Minor; ditch partially blocked
- 2 = Moderate; ditch fully blocked and or slightly settled
- 3 = Severe; ditch settled enough to impede flow of water
- 4 = Critical; ditch damaged and non-functional

Suggested Comments: clean ditch and or inlet, measurements, and inform Stormwater

## 16. EROSION

- 0 = None
- 1 = Minor; light overtopping or one end eroded
- 2 = Moderate; moderate overtopping and or both ends eroded
- 3 = Severe; heavy overtopping and erosion at ends which requires cleanup or slight undermining of wall
- 4 = Critical; wall undermined by erosion

Suggested Comments: description of erosion, causes and previous repairs

## 17. SEEPAGE

- 0 = None
- 1 = Minor; slight seepage through joints and or cracks
- 2 = Moderate; moderate seepage through joints and or cracks
- 3 = Severe; heavy seepage through joints and or cracks
- 4 = Critical; constant flow of water through joints and or cracks

Suggested Comments: numbers, locations, water ponding, slick surfaces, algae, possible spring or broken sewer pipe behind wall

## COSMETIC DIVISION

## 18. DISCOLORATION

- 0 = None
- 1 = Minor; 25% or less
- 2 = Moderate; 25%+ to 50%
- 3 = Severe; 50%+ to 75%
- 4 = Critical; more than 75%

Suggested Comments: types, locations and causes

## 19. GRAFFITI

- 0 = None
- 1 = Minor; patches from previous cover-up
- 2 = Moderate; small amounts
- 3 = Severe; large amounts
- 4 = Critical; ugly surface due to repeated graffiti & cover-ups

Suggested Comments: notify graffiti removal and or notify Police gang unit

20. GUNITE

- 0 = None
- 1 = Minor; sporadic flaking
- 2 = Moderate; small portions fallen
- 3 = Severe; large amounts fallen
- 4 = Critical; mostly gone and non-functioning

Suggested Comments: numbers, locations and causes

21. PAINT OR MIRACOAT

- 0 = None
- 1 = Minor; sporadic flaking
- 2 = Moderate; small portions missing
- 3 = Severe; large portions missing
- 4 = Critical; mostly missing

Suggested Comments: numbers, location and causes

MISCELLANEOUS

22. BRUSH OR OVERGROWTH

- 0 = None
- 1 = Minor; landscaping
- 2 = Moderate; over hanging wall
- 3 = Severe; over hanging and in front of wall
- 4 = Critical; wall completely overgrown, inaccessible

SUGGESTED COMMENTS: location and notify Public Services

23. RAILING OR GUARDRAIL

- 0 = None
- 1 = Minor; light damage or rusted
- 2 = Moderate; moderate damage
- 3 = Severe; heavy damage or rusted through, requires repairs
- 4 = Critical; mostly wrecked and or missing, requires replacement

Suggested Comments: location, amount, notify Public Services and research Police Report

24. CURB

- 0 = None
- 1 = Minor; light deterioration or damage
- 2 = Moderate; moderate deterioration or damage
- 3 = Severe; heavy deterioration or damage, requires repairs
- 4 = Critical; mostly deteriorated, damaged or missing, requires replacement

Suggested Comments: location, amount, causes and notify proper agency

## 25. ROADWAY OR SIDEWALK

- 0 = None
- 1 = Minor; light cracking and or settlement
- 2 = Moderate; moderate cracking and or settlement
- 3 = Severe; heavy deterioration, requires repairs
- 4 = Critical; unusable, requires replacement

Suggested Comments: location, amount, causes and notify proper agency

## 26. STEPS

- 0 = None
- 1 = Minor; light deterioration
- 2 = Moderate; moderate deterioration
- 3 = Severe; heavy deterioration, requires repairs
- 4 = Critical; unusable, requires replacement

Suggested Comments: location, amount, causes and notify proper agency

## GENERAL CONDITION

## 27. OVERALL WALL RATING

- 0 = Excellent Condition: No Problem
- 1 = Good Condition: Minor Movement, Cracking, settlement and Discoloration
- 2 = Fair Condition: Wall stable but Need Minor Repairs
- 3 = Poor Condition: Excessive deterioration, Major Rehab Work Required
- 4 = Wall Failure: Immediate Replacement Required

Suggested Comments: location, amount, causes and notify proper agency