STEA
WIP Report

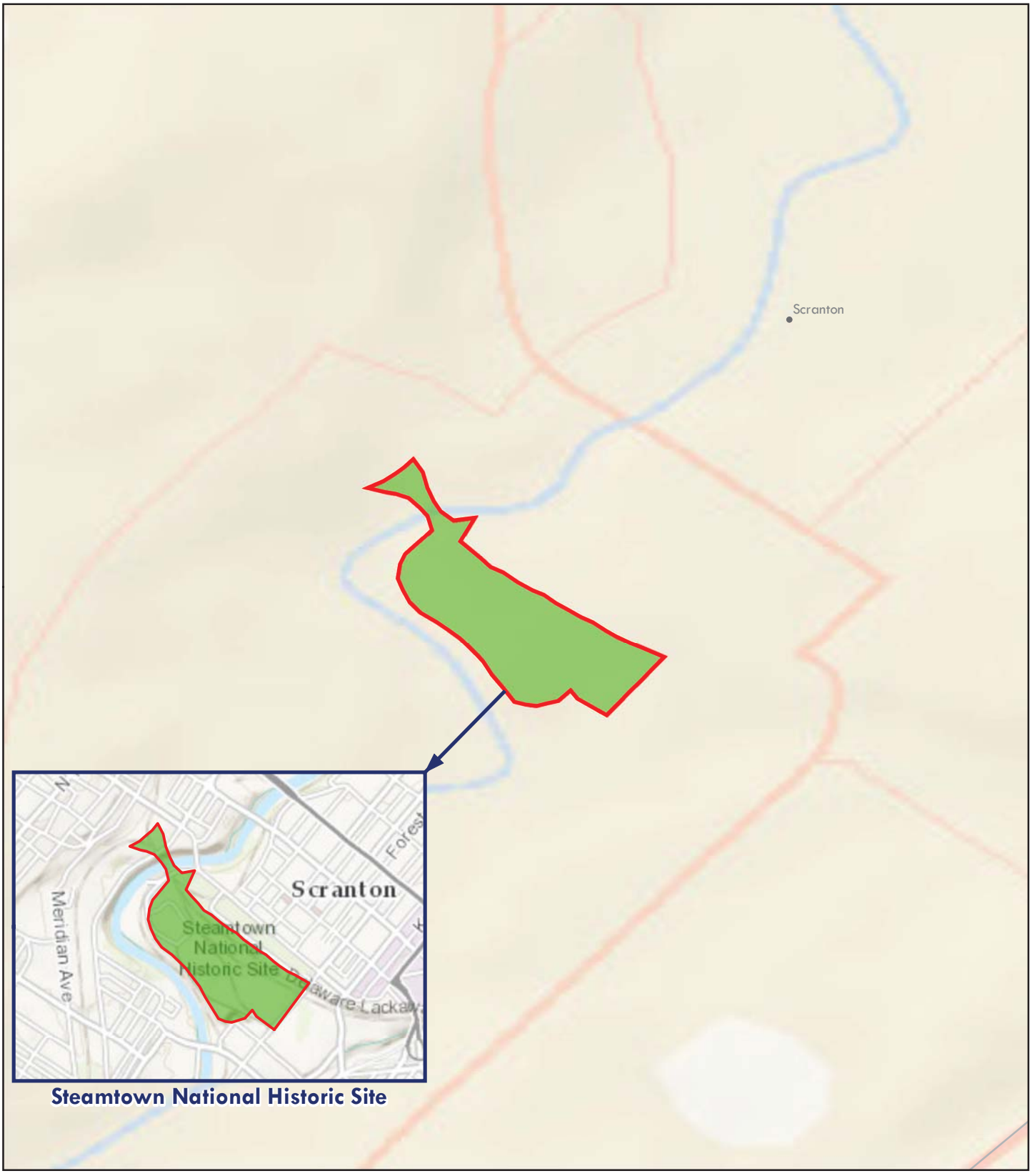
NPS Retaining Wall Inventory Program
Steamtown National Historic Site

Federal Lands Highway
Road Inventory Program

Prepared By:
Federal Highway Administration
Eastern Federal Lands Highway Division
Road Inventory Program (RIP)

Data Collection Date: October 2008
Report Date: November 2015

Steamtown National Historic Site
in
New York



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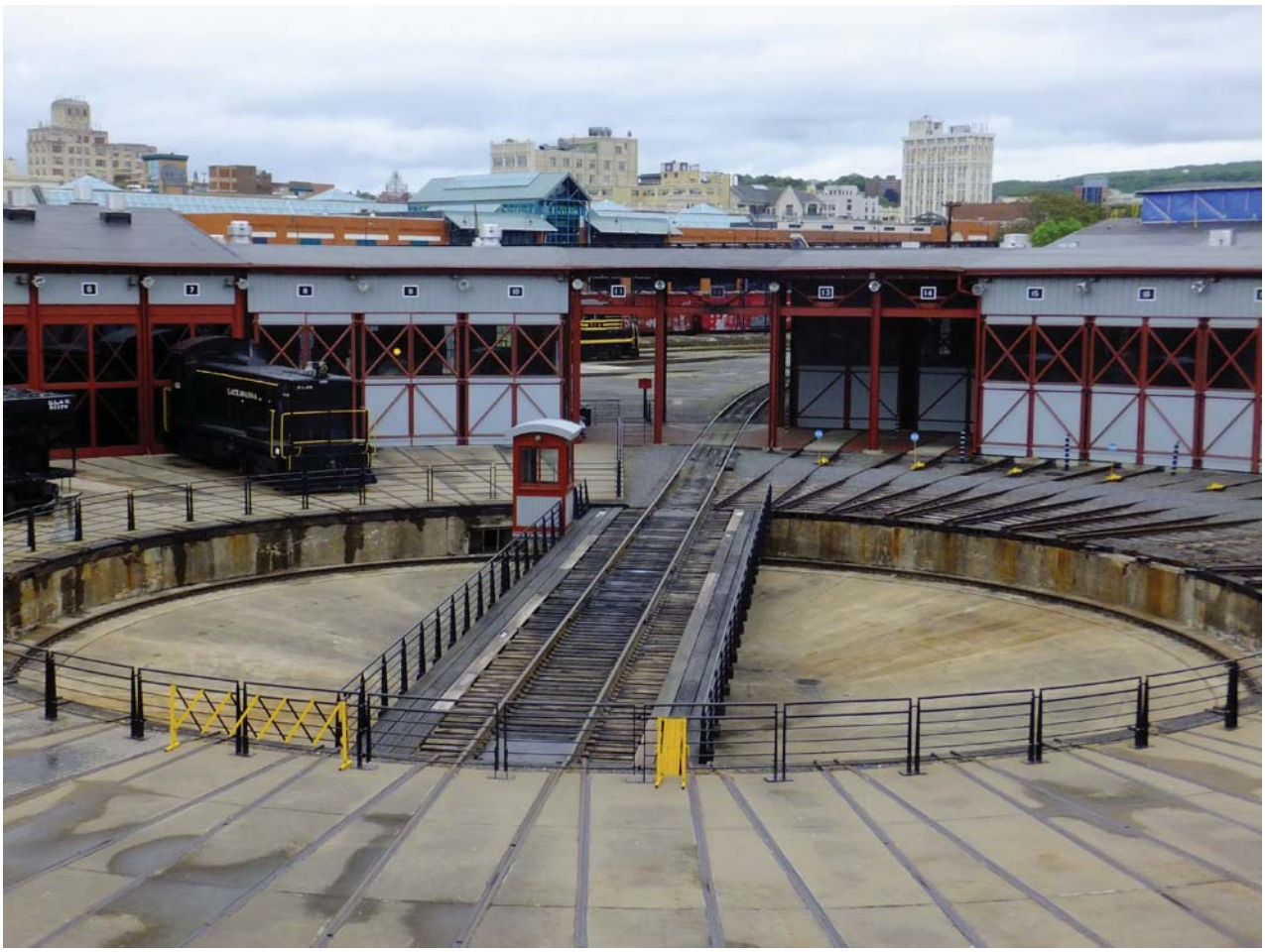

Steamtown National Historic Site

Federal Lands Highway
Road Inventory Program

Introduction

The Federal Lands Highway Division (FLH) of the Federal Highway Administration (FHWA), in partnership with the National Park Service (NPS), has conducted a retaining wall inventory and condition assessment as part of the NPS Retaining Wall Inventory Program (WIP). This inventory provides information to the NPS Facility Management Software System (FMSS) regarding such things as type, size and location of retaining structures, as well as the condition of these facilities and consequences of failure. In addition, when wall and/or adjacent element deficiencies are identified, repair recommendations and estimated costs are also provided, suitable for use as FMSS work orders.

The main intent of this effort is to determine the backlog of needs associated with retaining wall assets – equipment features ascribed to the "parent" roadway asset. Inventory and condition assessments (pavement only) for the roads themselves are conducted under the NPS Road Inventory Program (RIP). Prior to development of the WIP, the vast majority of retaining walls were not accounted for in FMSS. Based on WIP inventory work to date, NPS wall assets are valued at well over $400M. A second and equally important intent of this effort is to inform and improve project selection, prioritization, and development activities and processes at NPS regions/parks, FLH Division offices and the NPS Denver Service Center.

In support of WIP, a comprehensive procedures manual (available at the following link: http://www.cflhd.gov/programs/techDevelopment/geotech/WIP/) was developed to document the data collection and management process, wall attribute and element definitions, and team member responsibilities for conducting retaining wall inventories and condition assessments. This manual was used for nearly 3,500 wall assessments initially conducted between 2007 and 2008 within 34 national parks. WIP is supported by several key components described in the procedures manual, including a comprehensive training program for field inspectors, an Oracle-based database for long-term data management, unique data collection forms, a supporting field guide, and a wall repair/replace cost estimate guide.

Ultimately, condition assessments for retaining wall structures are expressed as deferred maintenance costs, which are then divided by current year replacement costs to arrive at a "Facility Condition Index" (FCI). Coupling this condition prioritization index with an "Asset Priority Index" (API), which measures the feature's importance to the mission of the park, capital asset investments are made more efficiently. This approach appropriately focuses maintenance and construction priorities on value, rather than solely on cost. Wall inventory condition and cost data are transferred from the WIP database to FMSS, the primary asset documentation, management and planning platform maintained at each park. In addition, wall data are also provided to the Road Inventory Program to update equipment assets associated with the parent roadway asset.

Initial inventories were conducted based on RIP Cycle 3 data, but future planning has ensured updates to WIP will occur simultaneously with RIP. For long-term data management purposes, the WIP database will be linked to the larger, parent RIP database and be updated under the responsibility of the RIP Database Administrator.

This report is organized in a tiered approach from the broad park overview perspective (Tier 1) to a route overview perspective (Tier 2), then down to the details of each wall (Tier 3). Tier 1 presents park wall location maps and an overall park-specific summary narrative of the results of the wall inventory program. Tier 2 presents route overview maps with associated wall summary information. Tier 3 presents individual wall information in a three-page detailed format, including a photograph of each wall. Appendix A provides a condensed summary of wall inventory definitions and assessment categories to assist in reading this report.

Park Retaining Wall Location Maps

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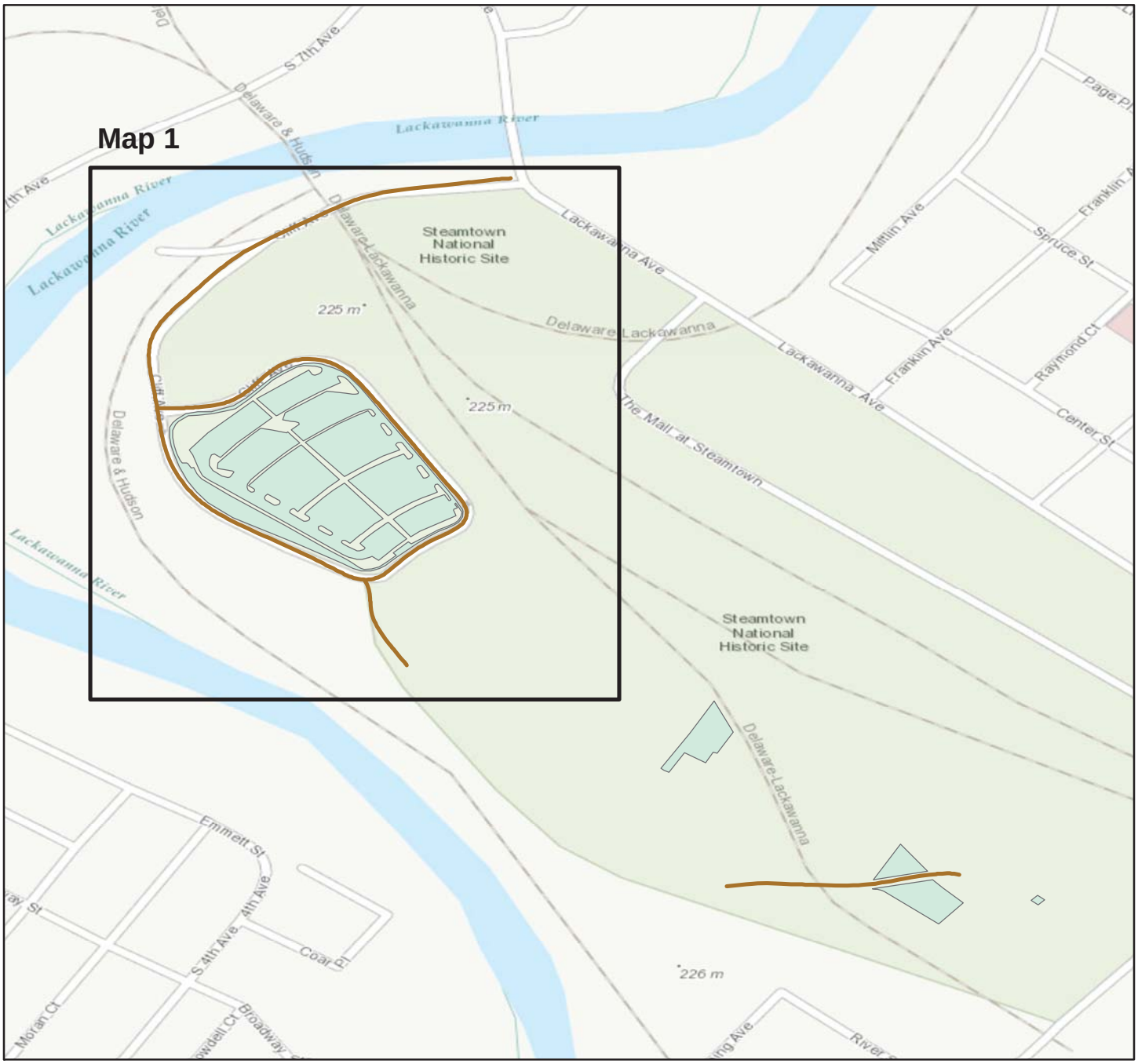
WALL LOCATION MAP

Key Map



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RIP Collected Routes

Miles

0 0.05 0.1

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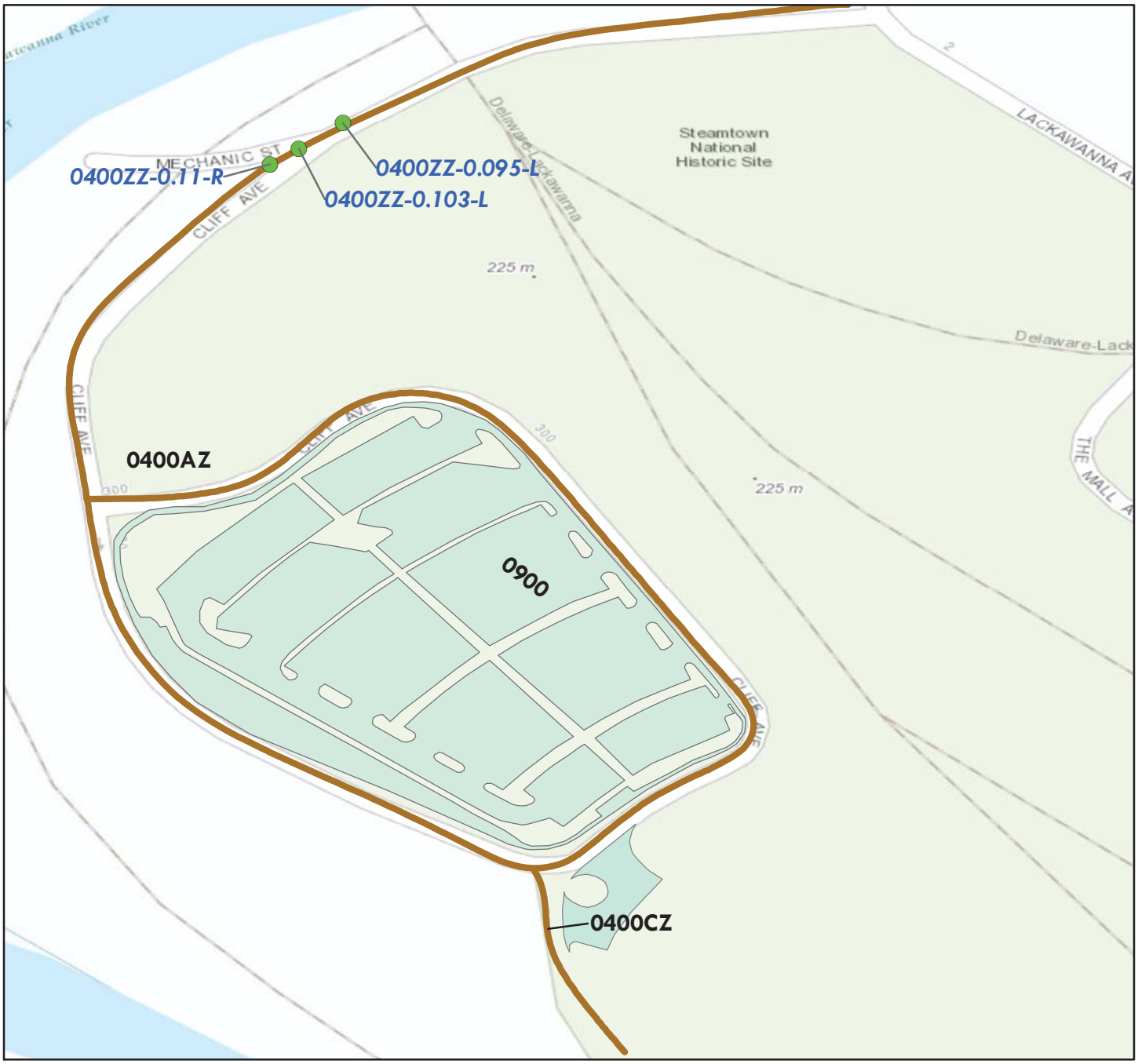
WALL LOCATION MAP

Map 1



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- Wall Locations
- RIP Collected Routes
- RIP Collected Parking

Miles

0 0.05 0.1

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Tier 1
Park Retaining Wall Overview

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Parkwide Summary: Steamtown National Historic Site

Initial retaining wall inspections were conducted at Steamtown National Historic Site in 2008, and encompassed all known retaining wall structures associated with Park roadways - including structure's retaining cuts and fills, as well as qualifying headwalls at culverts. For the purposes of the assessment, walls must be a minimum of 4 feet in maximum height of retained earth and greater than 6 feet in maximum height for culvert headwalls. This does not include the height of parapet or guardwall above a retaining wall.

All paved roadways and parking areas listed in the RIP Route Identification Report were inspected for walls. Occasionally, unpaved routes not in RIP were inventoried due to their future programmatic addition at the park, which was a decision made on site specific to each park.

The following tables provide an overview of the findings of this inspection and assessment effort. In all, 6 walls were inventoried on the routes listed below.

Table 1: Number of Walls by Route

Route Number	Route Name	No. of Walls
0400ZZ	MAIN ENTRANCE ROADS	3
0700	UNKNOWN ROUTE	1
0701	UNKNOWN ROUTE	1
0702	UNKNOWN ROUTE	1

The following table shows the number of walls broken out by seven possible categories of basic wall function.

Table 2: Number of Walls by Wall Function

Wall Function	No. of Walls
CW - Cut Wall	2
FW - Fill Wall	4

The following table shows the primary wall types that were inventoried and assessed. There are 24 possible primary wall types, which are summarized in Appendix A.

Table 3: Number of Walls by Primary Wall Type

Primary Wall Type	No. of Walls
BC, Bin - Concrete	1
CC, Crib - Concrete	1
CL, Cantilever - Concrete	4

The following table shows the number of walls by one of six categories of recommended action along with associated 2007 costs and the number of walls that are in each recommended action category. The majority of walls have a recommendation of *No Action* or *Monitor*; work orders were created for all other recommended actions.

Table 4: Number of Walls by Recommended Action and Associated 2007 Cost

Recommended Action	2007 Repair Costs*	No. of Walls
No Action	$0	1
Monitor	$0	0
Maintenance	$3,500	2
Repair Elements	$62,800	3
Replace Elements	$0	0
Replace Wall	$0	0
Totals	**$66,300**	**6**

*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

The following table categorizes the number of walls that fall into one of ten cost ranges, based on the prepared work orders. The locations, work descriptions, and cost of the recommended repairs for these walls are listed by individual wall in Tier 3 of this report.

Table 5: Number of Walls Grouped by Associated 2007 Cost

Cost Range*	No. of Walls
$0	1
$1 - $25,000	4
$25,001 - $50,000	1
$50,001 - $100,000	0
$100,001 - $250,000	0
$250,001 - $500,000	0
$500,001 - $1,000,000	0
$1,000,001 - $2,000,000	0
$2,000,001 - $3,000,000	0
$3,000,001 - $4,000,000	0
Total Number of Walls	**6**

*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Routine inspection and performing the noted maintenance will greatly aid in the continued performance of all walls at Steamtown National Historic Site. Work orders for walls needing maintenance generally included items such as replacing missing stones, replacing mortar, filling voids at the top or bottom of fill walls, and clearing vegetation.

Work orders for walls needing localized element repairs generally included items such as adding riprap protection to the wall foundation, replacing missing sections of dry stone walls, replacing culverts, grouting voids in walls, and patching/restoring roadway pavement. While decaying mortor generally does not threaten wall stability in the near term, grout repair will extend the life of these walls.

Work orders for walls needing major repairs (replace elements or replace wall) generally include items such as foundation repair or replacement, fill voids, repair roadway shoulder, replace or extend retaining wall in either height or length, rebuild failed segments of walls, repair elements across 50% or more of the wall, remove and recompact backfill material, add scour protection (typically with riprap, concrete, or rock fill), and remove/reset culvert headwalls. Due to the large unit items associated with major repairs, recommendations vary by specific wall and are presented in Tier 3 of this report.

WIP identified 55 critically deficient walls nationally based on wall ratings less than 49 (poor/critical overall condition). The following table presents the walls in Steamtown National Historic Site that are on this list and have been elevated to the Park Regional Coordinators in a Regional Park Summary Memorandum. Generally, these are walls with major repair element recommendations that may be a priority for repair work in your park.

Table 6: Number of Walls by Route

Wall Identification	Failure Consequence(1)	Wall Rating(2)	Recommended Action(3)	2007 Repair Costs(4)
No critically deficient walls.				

Notes: 1) Low consequence of failure and/or no recommended action may indicate repairs are not needed.
2) Wall ratings listed range from 0-49 (Poor/Critical).
3) Information was prepared for project planning purposes only. Actual repair work order scopes and actual costs will need to be evaluated based on current pay item unit prices for specific locations.
4) 2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Tier 2
Route Retaining Wall Overview

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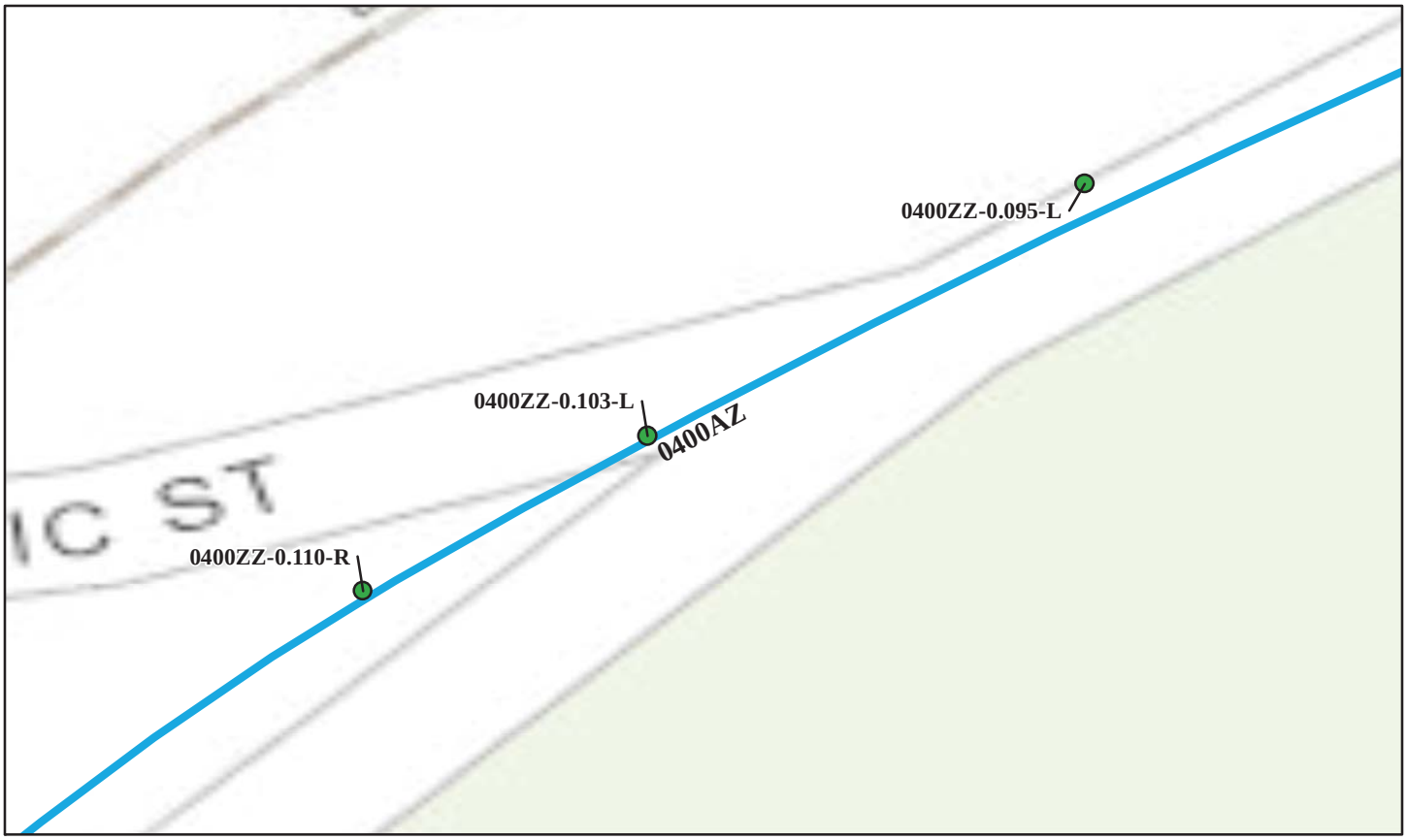
ROUTE 0400ZZ: MAIN ENTRANCE ROADS



Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)	Fair (50 - 69)	Good to Excellent (70 - 100)	No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
STEA-0400ZZ-0.095-L 10/7/2008	576	68	Crib - Concrete	Cut Wall	86	$0.00
STEA-0400ZZ-0.103-L 10/7/2008	5,530	279	Cantilever - Concrete	Cut Wall	74	$1,300.00
STEA-0400ZZ-0.110-R 10/7/2008	3,760	280	Bin - Concrete	Fill Wall	77	$2,200.00

*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

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ROUTE 0700: UNKNOWN ROUTE

Wall location is unknown.

Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)	Fair (50 - 69)	Good to Excellent (70 - 100)	No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
STEA-0700-0.000-R 10/7/2008	2,769	231	Cantilever - Concrete	Fill Wall	64	$12,000.00

*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

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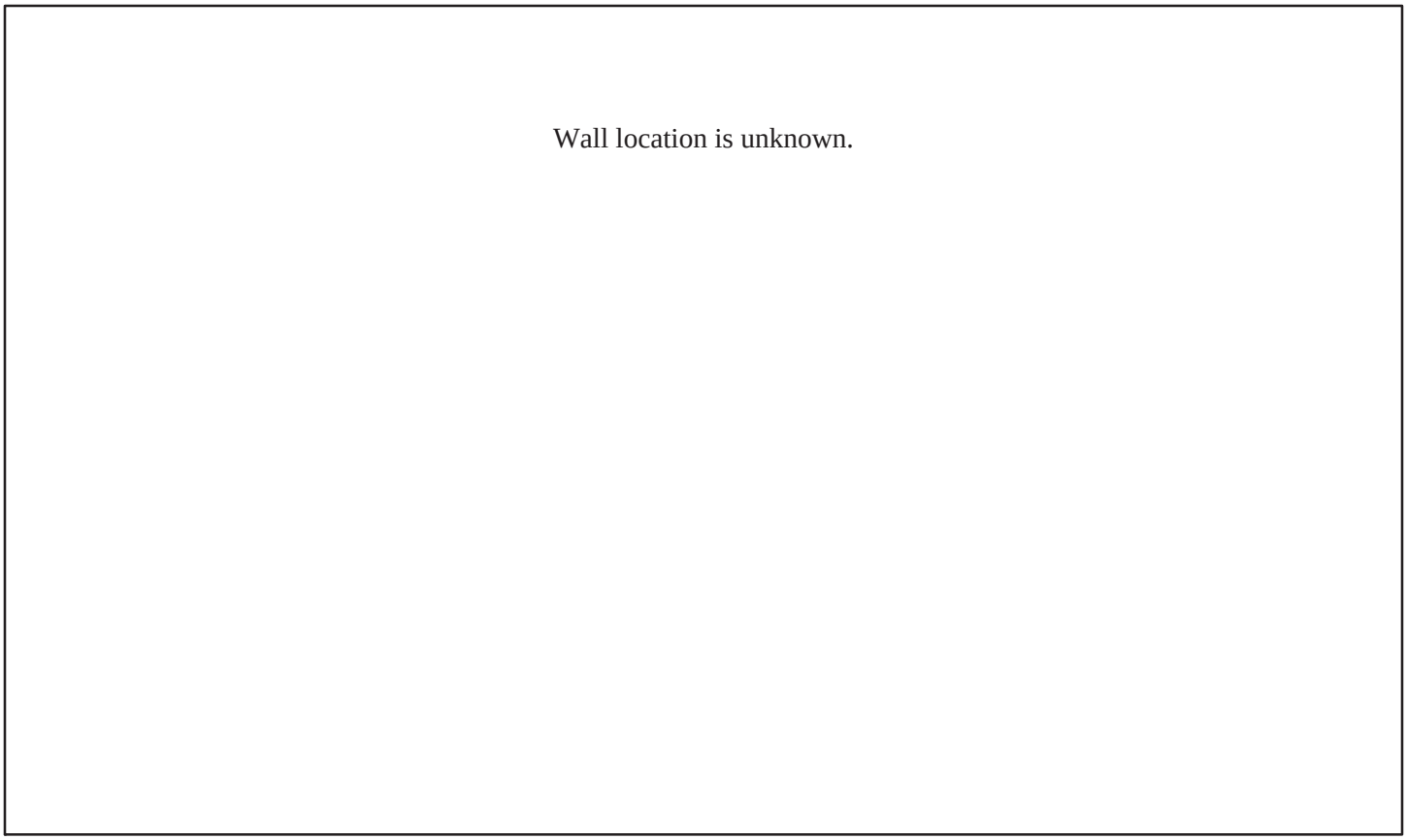
ROUTE 0701: UNKNOWN ROUTE



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Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)	Fair (50 - 69)	Good to Excellent (70 - 100)	No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
STEA-0701-0.000-R 10/7/2008	11,634	439	Cantilever - Concrete	Fill Wall	60	$45,200.00

*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

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ROUTE 0702: UNKNOWN ROUTE

Wall location is unknown.

Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Retaining Wall Condition Legend – Wall Condition Rating

Critical / Poor (0 - 49)	Fair (50 - 69)	Good to Excellent (70 - 100)	No Data

Wall ID Inspection Date:	Wall Area (Sq. Ft.)	Wall Length (Ft.)	Wall Type	Wall Function	Overall Rating	Repair Cost
STEA-0702-0.000-R 10/7/2008	2,288	88	Cantilever - Concrete	Fill Wall	67	$5,600.00

*2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Tier 3
Retaining Wall Details

Steamtown National Historic Site

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Wall ID:	**STEA-0400ZZ-0.095-L**		
Route Name:	MAIN ENTRANCE ROADS		
Inspection Date:	October 07, 2008	**Approximate Year Built:**	1994
***Wall Rating:**	86	**Maintenance Action:**	No Action

Wall Description

Wall Function:	Cut Wall	**Primary Wall Type:**	Crib - Concrete
Surface Treatment:		**Secondary Wall Type:**	
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	4 x 4x 8, aggregate-filled, large modular block wall on inboard side of Cliff Ave. adjacent to large cantilever concrete/stone masonry wall. 0.000 milepoint start is used to differentiate RRR1 walls on Cliff Ave.		

Wall Measurements

Wall Length (ft.):	68	**Face Area (sq.):**	576
Average Wall Height (ft.):	8	**Face Angle (deg.):**	80
Maximum Wall Height (ft.):	9	**Vertical Offset (ft.):**	0

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No signs of global distress or settlement. Excellent wall condition.	9
WALL FOUNDATION MATERIAL 8.00	Firm ground showing no signs of settlement, erosion or soft areas.	9
BIN OR CRIB 8.00	Concrete modular crib block is in very good condition, with no significant cracking. No signs of block displacement.	8
DOWNSLOPE 0.50	Roadway - no distress.	8
LATERAL SLOPE 0.50	Cantilever wall at one end, stable grassy slope at other end.	8
ROAD/SIDEWALK/SHOULDER 0.50	No signs of wall-related distress.	8
UPSLOPE 0.50	Gentle grassy slope showing no signs of slumping or erosion.	8
WALL DRAINS 1.00	No wall drains - drains through block joints, though no signs of staining or fines transport.	7

Repair Recommendations

Failure Consequence:	MODERATE
Recommendation Narrative:	None
Repair Cost:	$0

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Steamtown National Historic Site

ROUTE 0400ZZ: MAIN ENTRANCE ROADS

Retaining Wall Condition Photos

STEA_0400ZZ_0.095_L_1.jpg

STEA_0400ZZ_0.095_L_2.jpg

Wall ID:	**STEA-0400ZZ-0.103-L**		
Route Name:	MAIN ENTRANCE ROADS		
Inspection Date:	October 07, 2008	**Approximate Year Built:**	Unknown
***Wall Rating:**	74	**Maintenance Action:**	Maintenance

Wall Description

Wall Function:	Cut Wall	**Primary Wall Type:**	Cantilever - Concrete
Surface Treatment:		**Secondary Wall Type:**	Gravity - Mortared Stone
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	Cantilever concrete wall with 36 ft-wide mortared stone masonry/18 ft non-mortared stone masonry segment. GM is newly reconstructed followimg recent failure. 0.013 wall start MP is based on adjacent concrete bin wall start 0.000 MP.		

Wall Measurements

Wall Length (ft.):	279	**Face Area (sq.):**	5530
Average Wall Height (ft.):	19	**Face Angle (deg.):**	90
Maximum Wall Height (ft.):	28	**Vertical Offset (ft.):**	2

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No evidence of significant global distress or wall settlement. Recent wall failure in dry-laid section, replaced with mortared stone, indicates possible structural weakness in current dry-laid section (though no failure apparent). Cracking at the lower	7
WALL FOUNDATION MATERIAL 8.00	Stiff, firm foundation soils, showing no signs of settlement or soft areas.	8
CONCRETE 8.00	Cantilever concrete is in very good condition with only minor cracking observed. Wall start end (downhill) has developing cracking at corner of wall. Minor evidence of water staining along wall face.	6
MORTAR 8.00	New mortar, durable, hard, intact, with no signs of significant shrinkage.	8
STONE MASONRY 8.00	Hard, durable, intact rock with minor to no significant weathering.	8
CURB/BERM/DITCH 0.50	Concrete curb shows no signs of global wall deformation or bearing failure.	8
DOWNSLOPE 0.50	Short, gentle grassy toe slope showing no signs of wall-related distress.	8
ROAD/SIDEWALK/SHOULDER 0.50	Roadway below wall shows no signs of wall-related distress.	8
TRAFFIC BARRIER/FENCE 0.50	Wrought iron decorative fencing is in good shape, though poorly attached at top of wall. No signs of wall-related distress.	8

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Evaluate tree impacts at top of wall and clear back from wall face 6-8 ft. Mortar patch developing cracks in cantilever wall at downhill corner. Tree removal (tree cutting, cleanup, haulage, equipment time lumped under labor hours): 20 hrs @ $55/hr
Repair Cost:	$1,300

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Steamtown National Historic Site

ROUTE 0400ZZ: MAIN ENTRANCE ROADS

Retaining Wall Condition Photos

Condition photos are not available for STEA-0400ZZ-0.103-L.

Wall ID:	**STEA-0400ZZ-0.110-R**		
Route Name:	MAIN ENTRANCE ROADS		
Inspection Date:	October 07, 2008	**Approximate Year Built:**	1994
***Wall Rating:**	77	**Maintenance Action:**	Maintenance

Wall Description

Wall Function:	Fill Wall	**Primary Wall Type:**	Bin - Concrete
Surface Treatment:		**Secondary Wall Type:**	
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	Aggregate-filled 8 x 4 x 4 large modular concrete block. Outboard fill wall below Cliff Ave at Mechanic St. Wall is along outboard side of west entrance, supporting the roadway above the rail line.		

Wall Measurements

Wall Length (ft.):	280	**Face Area (sq.):**	3760
Average Wall Height (ft.):	13	**Face Angle (deg.):**	80
Maximum Wall Height (ft.):	24	**Vertical Offset (ft.):**	-1

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
PERFORMANCE 8.00	No global instability or settlement deformation. Vegetation could be a future problem.	6
WALL FOUNDATION MATERIAL 8.00	Firm, stiff soils. No signs of erosion or localized settlement. No soft areas evident.	9
BIN OR CRIB 8.00	Very good condition. No significant signs of cracking or weathering. No missing blocks. Joints are still tight, with no signs of significant block displacement.	8
LATERAL SLOPE 0.50	Well-vegetated lateral slopes with no indication of slumping or erosion.	8
ROAD/SIDEWALK/SHOULDER 0.50	Roadway shows no wall-related signs of distress.	8
UPSLOPE 0.50	Well-vegetated gentle upslpoe. No signs of slumping or significant erosion.	8
CURB/BERM/DITCH 0.50	Concrete curb shows no signs of wall settlement or deofrmation.	9
DOWNSLOPE 0.50	Flat ground adjacent to rail line. No wall-related distress observed.	9
TRAFFIC BARRIER/FENCE 0.50	K-rail at top of wall is in excellent condition, showing no signs of wall settlement of deformation.	9

Repair Recommendations

Failure Consequence:	HIGH
Recommendation Narrative:	Remove large brush and trees from toe and face of wall, and within 6-8 ft of the top of the wall face. 40 hours general labor @ $55/hr = $2,200
Repair Cost:	$2,200

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Steamtown National Historic Site

ROUTE 0400ZZ: MAIN ENTRANCE ROADS

Retaining Wall Condition Photos

STEA_0400ZZ_0.110_R_1.jpg

STEA_0400ZZ_0.110_R_2.jpg

Wall ID:	**STEA-0700-0.000-R**		
Route Name:	5 UDUe MUnwe 5 ok		
Inspection Date:	e s07, 2n843988i	**Approximate Year Built:**	5 bf bt Cb
***Wall Rating:**	rr mn	**Maintenance Action:**	w, Pvc2rk K,G, bOS

Wall Description

Wall Function:	FckkMvKK	**Primary Wall Type:**	RvbOdK,d, 2ngRt bs2, Q
Surface Treatment:		**Secondary Wall Type:**	z 2vdcOngp 2lna0b,
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	RvbOdK,d, 2nst bs2, QnCvKKubQu2vKK0n7WKKcbunt Wbhv0t bF7vS, G, bOHSWPPt 2cbunGvcbQbvbs, nv2, vnPv2fcbuyp 2lgKvchn S0b, nGvSt b2lnS, uG, b0, TcSSnt brt 0, 2nSch, rt .n72chu, nHt bSch, 2, hrt b, nCvKK0WvcO3nCc0qnbQ2d, bcbunCvKKt Cb, hn71n t 0, 2Sy		

Wall Measurements

Wall Length (ft.):	r9/ En	**Face Area (sq.):**	r94r l n
Average Wall Height (ft.):	rEEn	**Face Angle (deg.):**	ri An
Maximum Wall Height (ft.):	r9i n	**Vertical Offset (ft.):**	r8

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
NkwFe w 6URk ri y88	Ut nScubSrt .nuK7vKubSO7cKOrt 2nS, 0K,G, bQma0WsOW2vKhcSO2, SSn0nst bs2, QnS, s0t bn2, $W2cbun 2, Pvc2n0nGc0uvQnst bQcbWhrh, Q,2t 2v0t by	rr n
M6 j j nFe 5 Up 6 o0e Un 6 okw06 j ri y88	aO7K,nt Wbhv0t bnGvQ2vKSnSqt Ccbunbt nScubSrt .nS, 0K,G, b0t 2n, 2t Sct by	ri n
Re URwk ok ri y88	Rt bs2, QnSW2vs, nSnu0uqKknC, v0, 2, hnvbhns2vsf, h3nCc0qnSW7SO9bQvKSPvKKcbunvbhn, TPt S, hn vuu2, uvQymN2t Kc0sns2vsf cbu3nCc0qnC, v0, 2, hnvbhn vcKbunGt 2092nPv09qy	nAn
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p e MUaj e Nk nEy88	a ch, CvKKnvbhn2t vhCv1ynUt nScubcc svb0ScubSrt .nCvKKg2, KvQhnhcSO2, SSy	n4n

Repair Recommendations

Failure Consequence:	I 0z I
Recommendation Narrative:	w, Pvc2nst bs2, QnCvKKuvs, nvbhnsvPynRK,vbnvbhnP2, Pnh, Q2ct 2vQhnst bs2, Qnvscbu=nEA8nSS.0B nxEAHSS.0Mnx939A8ynEA8n SS.0t .nst bs2, Qn2, Pvc2nB nxr AHSS.0Mnx134A8
Repair Cost:	xE93888

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Steamtown National Historic Site

ROUTE 0700: UNKNOWN ROUTE

Retaining Wall Condition Photos

Condition photos are not available for STEA-0700-0.000-R.

Wall ID:	**STEA-0701-0.000-R**		
Route Name:	5 UDUe MUnwe 5 ok		
Inspection Date:	e s0 7, 2n843988i	**Approximate Year Built:**	5 bf bt Cb
***Wall Rating:**	rr 8n	**Maintenance Action:**	w, Pvc2rk K,G, bOS

Wall Description

Wall Function:	FcKKMvKK	**Primary Wall Type:**	RvbOK,d, 2rgrRt bs2, O
Surface Treatment:		**Secondary Wall Type:**	
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	ovKKst bs2, Ornsvb0K,d, 2rCvKKSWPPt 20bun2vcKKb, yrDbt CbnvSr0, nz 2, v0rMvKKt .rRqcbvyma, s0t bnbSP, sQhrnSnvK bun vK,1rt . .rMvSqcbu0 bra0y		

Wall Measurements

Wall Length (ft.):	m/l n	**Face Area (sq.):**	rEEr / mn
Average Wall Height (ft.):	r9r n	**Face Angle (deg.):**	rl 8n
Maximum Wall Height (ft.):	r9i n	**Vertical Offset (ft.):**	r8

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
NkwFe w 6URk ri y88	Utn,dch, bs, rt .nuK 7vKbSO7cKOrt 2rS, 0K,G, bOrqt C, d, 23rSW7SObOvKSO2WsO92vKC, v0, 2cbun vbhrst bs2, OrnSPvKKbunv0t cbOSnvbhnvK bun0, rn9Prt .n0, rCvK,v	nAn
M6 j j nFe 5 Up 6 o0e Un 6 okw06 j ri y88	Fc2Grnt W9hv0t brnSt cbSyrUtn,dch, bs, rt .rhc . , 2, bOvK,S, 0K,G, bOvK bun0, rCvK,t 2n, 2t h, hn .t W9hv0t brnS, s0t bSy	ri n
Re URwk ok ri y88	j t svK9, hrnS, d, 2, rnSPvKKbunvbhrns2vsf cbu3rCcOqrGcSScbun vscbunvbhrnsvPrnS, s0t bSymR2vsf cbun 0q2t Wiqt W9n0St KvOhrnSPvKKbu3rPv20sWK2Krnv0t cbOSymk dch, bs, rt .rh2vcbvu, rnSSWySn st bO2c7W0bun0rnst bs2, Orh, O2t 2v0t bymaW7SO9bOvK9 . . K 2, Ss, bs, rn0 2t Wiqrnqt 2c)t bOv	nAn
p e MUaj e Nk rn8yA8	6 K,1n2t vhCv1yrUt rCvK,2, KvOhrnhcSO2, SSy	ri n
j 6 okw6 j ra j e Nk rn8yA8	MvKKO2GcbvOSnv0t 0q, 2rCvK,SymUt rKvO2vK,SK P, rnhcSO2, SSy	ri n
we 6 p Fa0p k M6 j DFaI e 5 j p k w rn8yA8	Utn,Scubs rt .rCvK,2, KvOhrnhcSO2, SSy	ri n
M6 j j np w6 0Ua rEy88	Utn,CvKKh2vcbSrdcSc7K,yp 2vcbvu, rnSrt ssW2cbunv0t cbOS3nvbhrnst bO2c7W0bun0rnst bs2, OrnSPvKKbun v0t0q, S, rnK svOt bSy	rnn
ow6 FF0RrnL6 ww0k wHFk URk rEy88	p , st 2v0cd, rnC2t Wiqr0n2t bn, bs, nv0t0 Prt .rnCvKKcSrh, Ovsq, hrnbnv2, vSrt .rh, O2t 2v0cbunst bs2, Oy	nAn
5 Naj e Nk rEy88	FKv0u2t W9hrnCcOqrbWG, 2t WSrO2, , Snu2t Ccburb, v2r0 Pn, hu, rt .rCvK,Symot PrnSK P, rnSrd, 2lrnSO7K,ym Ut GrSW2, nv7t W0S, 0K,G, b0v7, qcbhrnCvKKvs, y	nAn

Repair Recommendations

Failure Consequence:	I 0z I
Recommendation Narrative:	w, Pvc2rst bs2, Onvsc bunv0t cbOSnvbhnvK bun0 Prt .rCvK,Symw, S, 0t, bsc buyuw, Gt d, rO2, , Sr0 rnC cOqcbrn gi n0t .r0, r0 Prt .n CvK,SymRt bs2, OrnsK,vbc bu3rh, Gt KO2t bnvbhrnP2, P=mj WGPrnSWGrnVrnxEA3888yrNvO9qE2, .t 2Grnst bs2, O=nvPP2t Tyri 88rnS. 0B n x/ AESSn0dVrnx9i 3888y
Repair Cost:	xmA3988

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Steamtown National Historic Site

ROUTE 0701: UNKNOWN ROUTE

Retaining Wall Condition Photos

Condition photos are not available for STEA-0701-0.000-R.

Wall ID:	**STEA-0702-0.000-R**		
Route Name:	5 UDUe MUnwe 5 ok		
Inspection Date:	e s0 7, 2n843988i	**Approximate Year Built:**	5 bf bt Cb
***Wall Rating:**	rr 4n	**Maintenance Action:**	w, Pvc2rk K,G, bOS

Wall Description

Wall Function:	FckkMvKK	**Primary Wall Type:**	RvbOK,d, 2rgRt bs2, O
Surface Treatment:		**Secondary Wall Type:**	
Secondary Surface Treatment:		**Architectural Facing:**	
General Description:	Rt bs2, Onsvb0K,d, 2nCvKk2, Ovdcbun2vdKKb, nv2, vynMvKkuSn2, ., 22, hn0nvSnOq, nz 2, v0MvKkt .nRqdbvynoqcSn6, sOt bnuSn vKbunMvSqdbu0bnaOy		

Wall Measurements

Wall Length (ft.):	ni i n	**Face Area (sq.):**	r99i i n
Average Wall Height (ft.):	r9r n	**Face Angle (deg.):**	rl 8n
Maximum Wall Height (ft.):	r9i n	**Vertical Offset (ft.):**	r8

Assessed Elements

Element (Weighting Factor)	Narrative	Condition Rating (0 - 10)
NkwFe w 6URk ri y88	MvKkSqt CSnbt rnSubc csvb0uK 7vKkhcSO2, SSnt 2rS, O0K,G, bOnqt C, d, 2nst bs2, OnuSn 2vsOY2, hnvbhn C, vOq, 2, hnCcOqnSubSnt .rnS, , Pvu, nOq2t WiqnOq, nCvKkvs, ngrPt SSc7K,n2, , g2, KcOhnhvGvu, y	rr n
M6 j j nFe 5 Up 6 o0e Un 6 okw06 j ri y88	Ut nSubSnt .rnS, O0K,G, bOt 2nC, OnSt .0v2, Sym6 PP, v2Sn0n7, nc2GrnSt dKnvcOqnSWO7K,n7, v2dbun svPvscOy	ri n
Re URwk ok ri y88	Rt bs2, OnuSnq, vdcKnC, vOq, 2, h3nCcOqnP2t Kc csns2vsf cbu3nSt G, nSPvKkbuynk . .K2, Ss, bs, nuSn dcSc7K,nvKbunGvb1ns2vsf SymN2, dct WSnvs, nPvO9qrIGt 2O2nuSnSPvKkbunbnPKvs, Sym6 uu2, uvOnuSn , TPt S, hnvOnvn, CnKcsvOt bSy	rr n
p e MUaj e Nk n8yA8	aO7K,nScn, CvKcnvbhn2t vhCv1y	ri n
j 6 okw6 j naj e Nk n8yA8	MvKkv7WSnvK,1nS, uG, bOt .nRqdbvnMvKkvbhn2vck72chu, y	ri n
we 6 p Fa0p k M6 j DFaI e 5 j p kw n8yA8	a cn, CvKcnvbhn2t vhCv1nSqt Cnbt nScubc csvb0nScubSnt .nCvKk2, KcOhnhcSO2, SSy	ri n
o w6 FF0RnL6 ww0k wHFk URk n8yA8	Rqvdbnkbf n, bs, nvO0Pnt .nCvKkSqt CSnbt nScubSnt .nCvKk2, KcOhnhcSO2, SSy	ri n
5 Naj e Nk n8yA8	FKvOu2t W0h3nQt WiqnW0f bt CbnS, O0K,G, bO7, qdbhnCvKkvs, y	ri n
(kz k o6 o0e U nEy88	o2, , SnvO0Pnt .nCvKkGv1n7, nst bO2c7WObun0nCvKks2vsf cbuynUt n2t OSn, TPt S, hnvOCvKkvs, y	rr n

Repair Recommendations

Failure Consequence:	I 0z I
Recommendation Narrative:	w, Gt d, nO2, , SnOnCcOqdbnr gi nOt .nCvKkvs, nvO0Pnt .nCvKkynNvOqrnSPvKk,hnst bs2, Oynro 2, , n2, Gt dvKkn98nq2SnB nxAAfq2n VnxE3E88ynRt bs2, OnsK,vbcbunvbhnGdbt 2nPvO9qrCt 2f=nE88nS.0B nx/ AfS8.0Bnx/ 3A88yn cSsyn, $WdPG, bOnvbhnK7t 2=n KWGPnsWGnVnxE3888
Repair Cost:	xA3r88

2007 cost estimate (ASTM Class D), preliminary for comparison to other repair costs only.

Steamtown National Historic Site

ROUTE 0702: UNKNOWN ROUTE

Retaining Wall Condition Photos

Condition photos are not available for STEA-0702-0.000-R.

Appendix A
Summary of WIP Definitions

Steamtown National Historic Site

Federal Lands Highway
Road Inventory Program

Appendix A

Summary of WIP Definitions and Assessment Categories

Wall Naming Convention

Unique "Wall Identification" names were assigned to the retaining walls that were inventoried. The Wall Identification includes the Park Name, the RIP Route Number (e.g., **0013**), the beginning milepoint of a wall (e.g., **0.622**) and the side of the road the wall is located on (e.g., **L**.) relative to the primary direction of travel (direction of increasing mileposts). Thus, a typical wall identified would have the following format: **YOSE-0013-0.622-L.**

For roadways not in RIP, park-supplied route numbers were used or the convention RRR#. Similarly, for parking areas not in RIP, the park-supplied parking area number or the convention PPP# was used. Also for parking areas, walls are numbered in ascending order as they are encountered when traveling counterclockwise around the parking area (most common direction of traffic flow). Parking area walls are designated P1, P2, P3, etc. as new walls are encountered.

- NPS Retaining Wall Inventory Program Field Guide (WIFG)-

Retaining Wall Acceptance Criteria

*All classes of paved roadways and parking areas included in the RIP Route Investigation Report and/or identified by park staff.
*Walls must reside within the constructed roadway/parking area prism.
*Maximum wall height, including only that portion actively retaining soil and/or rock, must be ≥ 4 ft. (>6ft for culvert headwalls).
*Consider known/verifiable wall embedment in determining maximum retaining wall height. Include fully buried retaining structures.
*Walls have an internal wall face angle ≥ 45˚ (≥ 1H:1V face slope ratio).
*Include all walls where the intent is to support/protect the travelway, and where failure would require replacement with a retaining wall.

Definitions

Design Criteria	Measure of how well current design criteria are satisfied: **None** - Does not meet any known standards. **Non-AASHTO** - Does not meet AASHTO, but is consistent with other structures of its type/period with good performance. **AASHTO** - Apparently meets current AASHTO Geometric, Design, Materials, and Construction Standards.
Consequence of Failure	**Low** - No loss of roadway, no to low public risk, no impact to traffic during wall repair/replacement **Moderate**- Hourly to short-term closure of roadway, low-to-moderate public risk, multiple alternate routes available **High**- Seasonal to long-term loss of roadway, substantial loss-of-life risk, no alternate routes available
Action	Select from: **No Action, Monitor, Maintenance, Repair Elements, Replace Elements,** and **Replace Wall**
Weighting Factor	Weighting Factor to be applied to the Condition Rating (CR). When indicated on the Condition Assessment Input Form: WF=**0.5** for CR=8-10; WF=**1.0** for CR=4-7; and WF=**5** for CR=1-3.
Data Reliability	Estimate of how well observed conditions represent wall performance, and if additional investigations may be warranted. **1-Poor** Conditions cannot be sufficiently observed to rate element(s), warranting additional investigations to better define element performance and/or to determine the cause(s) or poor performance. **2-Good** Observed conditions are sufficient to rate the conditions of wall element(s); however, additional investigations would be useful to better understand element performance. **3-Very Good** Observed conditions clearly describe wall performance. Additional investigations are not needed.

Wall Function Codes

[**FW**] Fill Wall	[**BW**] Bridge Wall	[**SW**] Switchback Wall
[**CW**] Cut Wall	[**HW**] Head Wall	[**SP**] Slope Protection **[FL]** Flood Wall

Wall Type Codes

[**AH**] Anchor, Tieback H-Pile	[**CC**] Crib, Concrete	[**MG**] MSE, Geosynthetic Wrapped Face
[**AM**] Anchor, Micropile	[**CM**] Crib, Metal	[**MP**] MSE, Precast Panel
[**AS**] Anchor, Tieback Sheet Pile	[**CT**] Crib, Timber	[**MS**] MSE, Segmental Block
[**BC**] Bin, Concrete	[**GB**] Gravity, Concrete Block/ Brick	[**MW**] MSE, Welded Wire Face
[**BM**] Bin, Metal	[**GC**] Gravity, Mass Concrete	[**SN**] Soil Nail
[**CL**] Cantilever, Concrete	[**GD**] Gravity, Dry Stone	[**TP**] Tangent/ Secant Pile
[**CP**] Cantilever, Soldier Pile	[**GG**] Gravity, Gabion	[**OT**] Other, User Defined
[**CS**] Cantilever, Sheet Pile	[**GM**] Gravity, Mortared Stone	[**NO**] None

Architectural Facing Type Codes

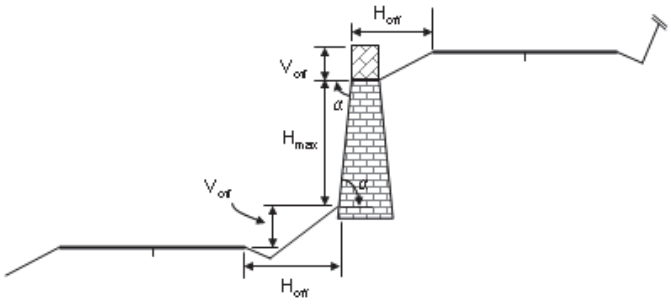
[**BV**] Brick Veneer	[**PF**] Planted Face	[**SS**] Simulated Stone
[**CO**] Cementitious Overlay	[**SC**] Sculpted Shotcrete	[**SV**] Stone Veneer
[**FF**] Fractured Fin Concrete	[**SH**] Shotcrete (nozzle finish)	[**TI**] Timber
[**FL**] Formlined Concrete	[**SM**] Steel/Metal	[**OT**] Other, User Defined
[**PC**] Plain Concrete (float finish or light texture)	[**SO**] Stone	[**NO**] None

Surface Treatment Codes

[**BG**] Bush Gun (tool-textured concrete)	[**PS**] Preservative	[**WS**] Weathering Steel
[**CA**] Color Additive	[**SE**] Silane Sealer	[**OT**] Other, User Defined
[**GL**] Galvanized	[**ST**] Stain	[**NO**] None
[**PA**] Painted	[**TR**] Tar Coated	

Condition Ratings	
Condition Ratings apply to all Primary and Secondary Wall Elements, and are intended to assist in consistently defining element **severity**, **extent**, and **repair/replace urgency** of wall element distresses.	
9-10 (Excellent)	-Any defects are minor and are within normal range for *newly constructed or fabricated* elements. -Defects may include those typically caused from fabrication or construction.
7-8 (Good)	-Low-to-moderate extent of low severity distress. -Distress present does not significantly compromise the element function, nor is there significantly severe distress to major structural components of an element.
5-6 (Fair)	-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/elevated risk of element failure in the near term.
3-4 (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 and road closure is not necessary.
1-2 (Critical)	-Medium-to-high extent of high severity distress. -Element is no longer serving intended function. Element performance threatening overall stability of the wall at the time of inspection.

Wall Performance Condition Ratings		
Performance	Evaluation of overall wall performance as indicated by observations not necessarily captured by observed distresses for specific elements, including global wall distresses (rotation, settlement, translation, displacement, etc.) and/or evidence of prior repairs that may further indicate component problems.	**Good to Excellent** - No observation of distresses not already captured by individual element condition assessment. No combination of element distresses indicating unseen problems or creating significant performance problems. No history of remediation or repair to wall or adjacent elements.
		Fair - Some observed global distress is not associated with specific elements. Some observation of element distress combinations that indicate wall component problems. Minor work on primary elements or major work on secondary elements has occurred improving overall wall function.
		Poor to Critical - Global wall rotation, settlement, and/or overturning is readily apparent. Combined element distresses clearly indicate serious stability problems with components or global wall stability. Major repairs have occurred to wall structural elements, though functionality has not improved significantly.



H_{max}	Maximum exposed wall height, ft
V_{off}	Average vertical distance from pavement to cut wall toe or groundline at top of fill wall (+ above/ - below roadway), ft
H_{off}	Horizontal distance to wall face from edge of roadway, ft
α	Wall face angle measured from the horizontal, degrees
L	Maximum earth retaining length of the wall (excluding guardwalls). Wall length is the actual length of the structure, not simply the projected length along the roadway, ft