AMENDMENT 005

Asset Management Plan
WMATA Parking Garages
Volume 1 of 3
February 2015
Walker Restoration Consultants

DISCLOSURE STATEMENT:

All data and information provided on this report is for <u>informational purposes only</u> as it may report conditions using standards greater than industry standards.

Washington Metropolitan Area Transit Authority (WMATA) makes no representations as to accuracy, completeness, currentness, suitability, or validity of any information contained within this report and will not be liable for any errors, omissions, or obsolescence in this information or any losses, injuries, or damages arising from its content or use. All information is provided on an as-is basis.

Proposers shall ensure their proposal submission details the standards that will be used for maintenance and capital repairs of the facilities. The proposer's maintenance standards shall ensure all parking assets are returned to WMATA at the conclusion of the Concession Agreement with no less than either 10 years remaining usable life or the same remaining usable life of the asset at the outset of the agreement, whichever is less.

PROJECT NO. 14-3944.04

ASSET MANAGEMENT PLAN

WASHINGTON AREA METROPOLITAN TRANSIT AUTHORITY PARKING GARAGES

Prepared for:
Metro

FEBRUARY, 2015
VOLUME 1 OF 3

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EXECUTIVE SUMMARY

We have reviewed the Washington Area Metropolitan Transit Authority – ("Metro") parking garages to prepare this Asset Management Plan ("AMP"). These 28 garages contain nearly 40,000 parking spaces and at approximately $25,000/space would cost $1,000,000,000 to replace. The 10 year repair budget of $73,226,000 is 7% or 0.7% per year of the replacement cost. While the total cost is large, this is primarily due to the total system size. The following is a summary of the garages and our recommendations included in the AMP:

Table 1: Garage Information Executive Summary

LOCATION	SPACES	AGE*	CONDITION	10-YEAR BUDGET	ANNUAL COST PER SPACE
Addison Road	1268	34	FAIR	$ 1,054,000	$ 83
Anacostia	1105	23	FAIR	$ 1,625,000	$ 147
College Park	1340	16	GOOD	$ 1,837,000	$ 137
Dunn Loring	2009	1	GOOD	$ 990,000	$ 49
Franconia Springfield Expansion	1054	11	GOOD	$ 1,240,000	$ 118
Franconia Springfield Original	3856	17	FAIR	$ 5,166,000	$ 134
Glenmont East	1781	16	FAIR	$ 5,108,000	$ 287
Glenmont West	1216	3	GOOD	$ 812,000	$ 67
Grosvenor	1482	10	FAIR	$ 2,404,000	$ 162
Huntington III	1451	6	GOOD	$ 1,113,000	$ 77
Huntington North	1281	23	FAIR	$ 1,439,000	$ 112
Huntington South	885	31	POOR	$ 20,653,000	$ 2,334
Largo North	1075	10	FAIR	$ 1,107,000	$ 103
Largo South	1125	10	FAIR	$ 1,182,000	$ 105
Minnesota Ave	516	5	GOOD	$ 567,000	$ 110
New Carrolton	1817	9	GOOD	$ 2,222,000	$ 122
Prince George's Plaza	1068	21	FAIR	$ 3,325,000	$ 311
Rhode Island	223	3	GOOD	$ 337,000	$ 151
Shady Grove North	2140	11	GOOD	$ 3,180,000	$ 149
Shady Grove South	1310	25	FAIR	$ 1,594,000	$ 122
Southern Avenue	1980	14	POOR	$ 3,073,000	$ 155
Suitland	1890	14	FAIR	$ 1,505,000	$ 80
Twinbrook West	426	1	GOOD	$ 466,000	$ 109
Vienna North	1871	24	FAIR	$ 2,282,000	$ 122
Vienna South	2174	14	FAIR	$ 2,451,000	$ 113
West Falls Church	1225	10	GOOD	$ 710,000	$ 58
Wheaton	977	24	FAIR	$ 1,325,000	$ 136
White Flint	1270	9	FAIR	$ 4,459,000	$ 351
TOTAL	**39,815**			**$ 73,226,000**	
AVERAGE					**$ 184**

*Age as of December 2014

In an effort to manage the cash flow impact, we have spread the work out over ten years according to priority. Based on our observations, we recommend Metro budget the following expenditure to extend the service life of the garages to provide the lowest total cost of ownership.

Table 2: Recommended Total Annual Garage Expenditures

PHASE	YEAR	TOTAL	AMOUNT/ SPACE*	AMOUNT/ SQ. FOOT*+
1.	2016	**$2,437,000**	$61	$0.19
2.	2017	**$20,653,000**	$519	$1.60
3.	2018	**$14,220,000**	$357	$1.10
4.	2019	**$10,540,000**	$265	$0.82
5.	2020	**$8,680,000**	$218	$0.67
6.	2021	**$5,774,000**	$145	$0.45
7.	2022	**$3,537,000**	$89	$0.27
8.	2023	**$2,443,000**	$61	$0.19
9.	2024	**$4,302,000**	$108	$0.33
10.	2025	**$640,000**	$16	$0.05
TOTAL		**$73,226,000**		

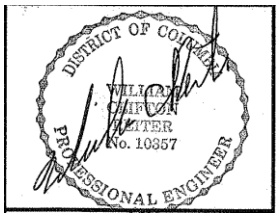
The large 2017 expenditure is to repair the heavily deteriorated Huntington South garage. This repair is due to deferred maintenance greatly affecting the garage's structural condition. The large 2018, 2019, and 2020 expenditures are to "catch up" on deferred repairs throughout the system.

Costs include structural, waterproofing, and storm water plumbing repairs, engineering costs, and 15% contingency. See appendix A for further detail.

Please see the following sections discussion for a detailed report of our findings.

February, 2015

Gregory J. Neiderer, P.E. Date
PA License No. 035809E



February, 2015

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INTRODUCTION

METRO'S STRATEGIC PLAN - MOMENTUM

Metro has engaged AECOM and Walker Parking Consultants ("Walker") to examine parking policies and outline parking strategies. These include 1) assessments of non-auto modes for station access, 2) shared parking strategies, 3) feasibility of public-private partnerships ("P3s") for delivering replacement parking, 4) examining the best design and maintenance practices, and 5) providing this Asset Management Plan ("AMP") for Metro parking facilities.

The goal of this AMP is to reduce the total trip cost for Metro riders through appropriate and efficient garage maintenance to reduce the total cost of ownership to Metro and; therefore, reduce costs to riders.

These efforts collectively support Momentum, which is Metro's strategic plan.

OBJECTIVE

Our scope was to review the parking garages' existing conditions and define the recommended repairs to extend service life and to lower the total cost of ownership. For a detailed description of our scope of service, see *Metro Task Order 14-FQ10065-PARK-03.*

This report assesses the following items:

- Structural
- Waterproofing
- Storm drain plumbing

This report does not assess the following out of scope items:

- Signage
- Security systems
- Parking access and revenue controls system, although cursory costing is included
- Elevator upgrades
- Lighting
- Life safety systems such as emergency generator, fire protection, fire alarm or security
- Storm water compliance upgrades
- Hazardous material abatement

RECOMMENDATIONS

IMMEDIATE CONCERNS

During our 2014 field visits, immediate safety concerns were occasionally observed and our recommended actions forwarded via email to Metro personnel. These emails are included within each individual garage's report within that report's appendix E.

In general, these concerns have a low probability of occurring, but a significant consequence if they do occur. The probability of loose concrete or brick dislodging increases during freeze-thaw cycles and large temperature swings, so survey and removal of materials prior to the first freeze in late fall and again in early spring after the last freeze are recommended.

RECOMMENDED WORK/IMPLEMENTATION

We understand that Metro is budgeting for an Asset Management Plan starting in 2016. In an effort to manage the cash flow impact, we have spread the work out over ten years according to priority.

Repairs to structural members are addressed in the AMP to mitigate further deterioration of these areas.

Typical waterproofing materials have an approximate lifespan of 5 to 7 years for roof levels (exposed to direct sunlight) and 10 to 12 years for lower levels (not in direct sunlight). The repairs and upgrades included in this AMP have been spread out, when practical to level repair costs, with the waterproofing repair cycle repeating every 7 to 12 years as these materials reach the end of their lifespan.

Routine tasks include washdown of the garage floors; repair of traffic topping damaged by snow plowing, and chloride ion content testing. These tasks help remove contaminants, maintain waterproofing, and monitor the penetration of chlorides into the concrete. They are proactive measures to mitigating repair costs.

The recommended repairs are provided in 3 categories –"Critical", "Near-Term", and "Long-Term" Repairs.

Critical Repairs – are those repairs urgently needed to either address safety issues or to dramatically arrest accelerating deterioration and total $23,000,000 of which $20,700,000 is for one heavily deteriorated garage.

Near-Term Repairs – are those repairs needed to systematically replace failed waterproofing at certain garages since those failed systems are permitting structural deterioration to accelerate and totals $33,400,000 over 3 years.

Long-Term Repairs – are those repairs needed to replace waterproofing systems as they age to the point where replacement is prudent and totals $16,700,000 over 5 years.

Both Critical Repairs and Near-Term Repairs are one-time costs to "catch up" on deferred maintenance while Long-Term Repairs are the continual maintenance needs to keep garages in good condition. Long-Term Repairs are likely to cost between $2,500,000 and $3,000,000 per year to maintain a system the size of Metro.

BENEFITS OF TIMELY REMEDIATION

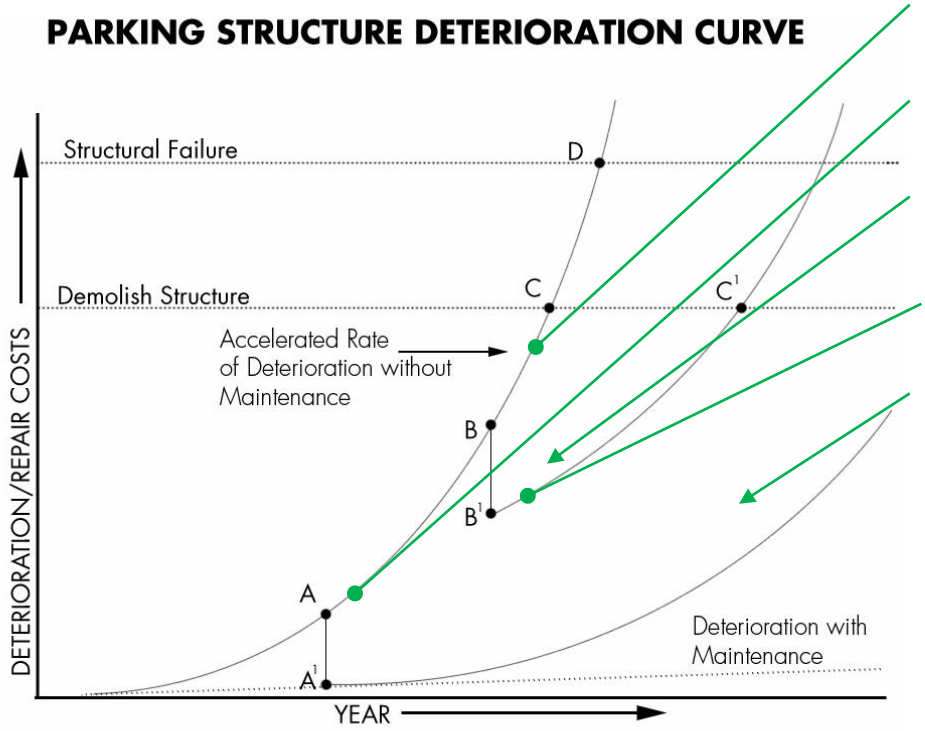
There are significant benefits to providing a proactive repair and maintenance program rather than a reactive repair program. An independent study of 3 virtually identical garages showed that poorly maintained garages cost approximately 4 times as much to repair as well maintained garages. Further literature containing examples of the cost impacts of deferring maintenance are included in Appendix B.

The main benefits from implementing the recommended repairs and waterproofing are:

- Maintain the structural capacity and maintain the service life for the structure.
- Cost savings due to avoidance of extensive structural repairs that are more expensive to perform as well as minimizing revenue loss while areas are encumbered for repairs over fewer days.
- Higher levels of service to the users of the facility due to fewer days of downtime because of more extensive structural repairs.
- Provides for a greater degree of safety by inhibiting deterioration mechanisms before they have a chance to cause serious disruption or harm.

The cost to repair and maintain this facility will continue to increase at progressively faster rates should the deterioration continue in the typical fashion modeled in the graph shown on the following page.

In the graph below, we have qualitatively identified the relative state of deterioration of these garages.



NOTE:

1. Points A - D represent stages of accelerated deterioration in parking structures.
2. Structures repaired at point A cost less overall and last longer than structures repaired at point B. (Compare curve A^1 to B^1)

"Poor" Garages are between points B and C

"Fair" and "Good" Garages are between points A and B

Short-term repairs (3-5 years) only move curve slightly

Repaired "Fair" and "Good" Garages are between points B^1 and C^1

Long-term repairs (12 to 20 years) move curve considerably

OPINION OF PROBABLE COSTS

Appendix A has Walker's Opinion of Costs for recommended work for all garages. These same costs tables are also located within each individual garage report. This opinion itemizes the recommended work items (tasks) identified as well as customary soft costs associated with performing this work.

Most costs are determined by defining approximate quantities of differing work items and multiplying those quantities by the average unit price for the same work item from recent competitively bid commercial projects in the Metro DC area. Category contingencies are added to account for potential growth in deterioration. Project contingency is added to account for bidding, regulatory, and project management variations that may affect total project costs. Some work items are extremely difficult to accurately assess costs because the quantities are very small, the scope is still undefined even though the item is identified, the repair is unusual and therefore has limited past pricing history, or the costs are heavily affected by regulatory or other variable constraints. In these cases, we have identified such costs as an "Allowance" to indentify it may vary significantly from the anticipated costs.

Once total work item costs are calculated, a series of multiplication factors are added to account for general conditions, mobilization, engineering, material testing during construction and project contingency.

The potential for cost savings exists in having Metro staff perform some of the repair work. In particular, washing down the decks each year via power washing does not require a specialty contractor On occasion, owners are willing to undertake installation of waterproofing items such as traffic topping or relighting if the total volume of work is deemed manageable.

An additional method of reducing costs is to 'bundle' repairs into 2 or 3 year packages in design and bidding, with construction continuing on a yearly basis. Savings comes from reducing Engineering fees by combining packages, obtaining more competitive contractor pricing due to offering larger contracts, and a reduction in Metro efforts during design and bidding. Some owners provide field inspection services to augment the design professional's periodic visits.

MATERIAL TESTING

Chloride Ion testing indicates the potential for future concrete spalling and delamination caused by road de-icing salt contamination of the slab. The testing was performed in 1-inch increments from the top of slab, and results can be found within each garage's report. As seen in the graphs, the concentrations of the samples diminish with depth indicating that the chlorides are filtering down through the concrete gradually. This is the typical condition for garages subject to chloride containing road de-icing salts brought into the garage by vehicles as opposed to chlorides added at the time of manufacture to accelerate concrete curing.

ASSUMPTIONS AND LIMITATIONS

Walker Parking Consultants developed this report to assist Metro in planning for improvements and maintenance of their parking garages. We have summarized the evaluation and recommendations in this report for use with additional judgments regarding financial, technical, and operational issues. The recommendations outlined represent current technology for parking structure rehabilitation and maintenance. We have assumed the facilities will continue in their present use and will require appropriate repairs and maintenance for this use.

The extent of our evaluation was limited and required that certain assumptions be made regarding existing conditions. Some of these assumptions cannot be verified within the physical, financial, and time constraints of our work. The report is our expression of our professional opinion but does not constitute a warranty or guarantee of the items noted, the present or future conditions, or the discovery of all possible latent conditions. Greater certainty can be obtained by expending additional time, effort, and cost and we would be pleased to discuss with you the potential increases in efforts and corresponding benefits.

OPINION OF PROBABLE COSTS

This condition assessment provides budgeting information based on site observations, limited field survey work, professional judgments, and the experience of Walker Parking Consultants with similar projects. The opinion of probable costs does not provide a warranty as to the accuracy of such cost opinions as compared to contractor bids or negotiated prices for the work.

DESIGN ANALYSIS, AND ADA

Our scope of work was limited to reviewing these garages to assess their deterioration based on the assumption that these garages were built to industry standards. These facilities are currently functioning without evidence of significant shortcomings in the original design of the building, and we have not included a review of the design or inspection for concealed conditions. A review of the facility for ADA compliance was not included in the scope of this project. Since ADA compliance is a legal determination and not an architectural or engineering finding, review of these facilities could be performed to meet current national guidelines, but meeting those guidelines may not meet the legal obligations as determined by local courts having jurisdiction. If you desire a review to meet current national guidelines we would be pleased to provide those services.

REUSE AND MODIFICATIONS

Metro may reuse the report but shall bear full responsibility for such use as this report contains assumptions that may change or be invalidated over time or require additional judgment of design professionals to fully comprehend. It is recommended that the Metro contact Walker or another qualified restoration specialist to assist in implementation.

FUTURE DESIGN AND CONSTRUCTION

This assessment provides planning and budgeting information and has not progressed beyond the conceptual stage. The report does not provide specific repair details or methods, construction contract documents, material specifications, details to develop the construction cost, or construction information to allow a contractor to price the work.

Because parking garages undergo harsh exposure to various environmental elements, further deterioration can take place with continued service related exposure. After reviewing this report, Metro should continue with the appropriate design and implementation of effective repairs and maintenance that can significantly reduce further deterioration and the associated cost.

WMATA GARAGE ASSET MANAGEMENT PLAN

SUMMARY - APPENDIX A

FEBRUARY 2015

WALKER RESTORATION CONSULTANTS

14-3944.04

DECK	FISCAL YEAR BUDGET										Deck Total	Annual Budget $/Space
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025		
Addison Road Garage	$ 37,432	$ -	$ -	$ -	$ 534,144	$ 229,119	$ -	$ 253,075	$ -	$ -	$ 1,053,770	$ 83.10
Anacostia Garage	$ 15,854	$ -	$ 1,160,656	$ 229,119	$ -	$ -	$ -	$ 219,738	$ -	$ -	$ 1,625,367	$ 147.09
College Park Garage	$ 61,280	$ -	$ -	$ -	$ 1,174,580	$ 229,119	$ -	$ -	$ -	$ 372,420	$ 1,837,399	$ 137.12
Dunn Loring Garage	$ 92,595	$ -	$ -	$ -	$ 326,360	$ 229,119	$ -	$ -	$ 341,624	$ -	$ 989,699	$ 49.26
Franconia Springfield Expansion Garage	$ 14,251	$ -	$ -	$ -	$ 713,275	$ 229,119	$ 283,523	$ -	$ -	$ -	$ 1,240,169	$ 117.66
Franconia Springfield Original Garage	$ 394,016	$ -	$ -	$ 3,224,368	$ 229,119	$ 1,318,527	$ -	$ -	$ -	$ -	$ 5,166,030	$ 133.97
Glenmont East Garage	$ 22,652	$ -	$ 1,868,642	$ 229,119	$ -	$ -	$ -	$ -	$ 2,987,323	$ -	$ 5,107,735	$ 286.79
Glenmont West Garage	$ 9,590	$ -	$ -	$ -	$ 531,887	$ 229,119	$ 41,581	$ -	$ -	$ -	$ 812,177	$ 66.79
Grosvenor Garage	$ 103,198	$ -	$ -	$ -	$ 1,297,060	$ 229,119	$ 775,105	$ -	$ -	$ -	$ 2,404,481	$ 162.25
Huntington III Garage	$ 11,417	$ -	$ -	$ -	$ 277,996	$ 229,119	$ 594,771	$ -	$ -	$ -	$ 1,113,303	$ 76.73
Huntington North Garage	$ 56,285	$ -	$ -	$ 373,645	$ -	$ -	$ 229,119	$ -	$ 780,262	$ -	$ 1,439,311	$ 112.36
Huntington South Garage	$ -	$ 20,653,303	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 20,653,303	$ 2,333.71
Largo North Garage	$ 24,187	$ -	$ -	$ -	$ 750,640	$ 229,119	$ 102,869	$ -	$ -	$ -	$ 1,106,815	$ 102.96
Largo South Garage	$ 39,884	$ -	$ -	$ 719,668	$ 229,119	$ -	$ -	$ -	$ 193,343	$ -	$ 1,182,015	$ 105.07
Minnesota Ave Garage	$ 13,070	$ -	$ -	$ 241,402	$ 229,119	$ -	$ 83,680	$ -	$ -	$ -	$ 567,271	$ 109.94
New Carrolton Garage	$ 41,014	$ -	$ -	$ 1,210,823	$ 229,119	$ -	$ 741,047	$ -	$ -	$ -	$ 2,222,002	$ 122.29
Prince George's Plaza Garage	$ 761,314	$ -	$ 1,960,544	$ 229,119	$ -	$ -	$ -	$ 374,098	$ -	$ -	$ 3,325,075	$ 311.34
Rhode Island Garage	$ 10,365	$ -	$ -	$ -	$ 36,467	$ 229,119	$ -	$ 61,028	$ -	$ -	$ 336,978	$ 151.11
Shady Grove North Garage	$ 11,630	$ -	$ 1,239,983	$ 229,119	$ -	$ 1,699,599	$ -	$ -	$ -	$ -	$ 3,180,330	$ 148.61
Shady Grove South Garage	$ 26,383	$ -	$ -	$ 882,692	$ 229,119	$ -	$ 456,230	$ -	$ -	$ -	$ 1,594,424	$ 121.71
Southern Avenue Garage	$ 27,789	$ -	$ 2,282,457	$ 229,119	$ -	$ -	$ -	$ 534,082	$ -	$ -	$ 3,073,447	$ 155.22
Suitland Garage	$ 26,537	$ -	$ -	$ -	$ 1,183,789	$ 229,119	$ -	$ -	$ -	$ 65,271	$ 1,504,716	$ 79.61
Twinbrook West Garage	$ -	$ -	$ -	$ -	$ -	$ 236,479	$ 229,119	$ -	$ -	$ -	$ 465,598	$ 109.30
Vienna North Garage	$ 38,469	$ -	$ 1,963,209	$ 229,119	$ -	$ -	$ -	$ 51,593	$ -	$ -	$ 2,282,390	$ 121.99
Vienna South Garage	$ 475,449	$ -	$ -	$ 1,544,153	$ 229,119	$ -	$ -	$ -	$ -	$ 202,569	$ 2,451,291	$ 112.75
West Falls Church	$ 18,110	$ -	$ -	$ -	$ 249,943	$ 229,119	$ -	$ 212,894	$ -	$ -	$ 710,066	$ 57.96
Wheaton Garage	$ 58,528	$ -	$ -	$ 739,277	$ 229,119	$ -	$ -	$ 298,576	$ -	$ -	$ 1,325,499	$ 135.67
White Flint Garage	$ 46,295	$ -	$ 3,744,699	$ 229,119	$ -	$ -	$ -	$ 438,499	$ -	$ -	$ 4,458,613	$ 351.07
TOTAL	**$ 2,437,593**	**$ 20,653,303**	**$ 14,220,189**	**$ 10,539,860**	**$ 8,679,973**	**$ 5,774,914**	**$ 3,537,044**	**$ 2,443,583**	**$ 4,302,553**	**$ 640,260**	**$ 73,229,273**	**$ 6,003**
	$ 23,090,896		**$ 33,440,023**			**$ 16,698,354**						
	CRITICAL REPAIRS		**NEAR-TERM REPAIRS**			**LONG-TERM REPAIRS**						
										$ 73,229,273		

WALKER RESTORATION CONSULTANTS

ADDISON ROAD GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 6,603				$ 59,429					
	102	Precast Tee Stem Repair					$ 4,523					
	103	Precast Beam Repair					$ 2,854					
	104	Precast Shear Connector Repair					$ 5,939					
	105	Precast Column/Wall Repair					$ 2,343					
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair	$ 4,688				$ 4,688					
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	114	Install Capstones in lieu of Brick Soldier Course					$ 209,063					
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,694				$ 43,326			$ 1,000		
		Structural Sub-Total	**$ 12,984**	**$ -**	**$ -**	**$ -**	**$ 332,164**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast								$ -		
	205	Cove Sealant Replacement - Precast Roof										
	206	Cove Sealant Replacement - Precast Covered Levels										
	209	Floor Sealant Replacement - Precast Roof										
	210	Floor Sealant Replacement - Precast Covered Levels										
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair								$ 119,831		
	213	Traffic Topping - New Installation										
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof								$ 43,125		
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	219											
	220											
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000			$ 16,296		
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ 179,252**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping	$ 4,813									
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000			$ 1,000		
		Mechanical Sub-Total	**$ 5,813**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000					$ 15,000		$ 1,000		
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 165,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow	$ 6,160									
	502	Repaint Traffic Markings					$ 28,000					
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings					$ 22,500					
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
	512											
		Miscellaneous Sub-Total	**$ 6,160**	**$ -**	**$ -**	**$ -**	**$ 50,500**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 26,957	$ -	$ -	$ -	$ 384,664	$ 165,000	$ -	$ 182,252	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 1,617	$ -	$ -	$ -	$ 23,080	$ 9,900	$ -	$ 10,935	$ -	$ -
		Construction Total	**$ 28,574**	**$ -**	**$ -**	**$ -**	**$ 407,744**	**$ 174,900**	**$ -**	**$ 193,187**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 4,286	$ -	$ -	$ -	$ 61,162	$ 26,235	$ -	$ 28,978	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 4,286	$ -	$ -	$ -	$ 61,162	$ 26,235	$ -	$ 28,978	$ -	$ -
		Material Testing During Construction	$ 286	$ -	$ -	$ -	$ 4,077	$ 1,749	$ -	$ 1,932	$ -	$ -
		Project Cost Totals Per Year:	**$ 37,432**	**$ -**	**$ -**	**$ -**	**$ 534,144**	**$ 229,119**	**$ -**	**$ 253,075**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work. Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

ANACOSTIA GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	106	P/T Slab Repair	$ 2,261		$ 20,351							
	107	P/T Beam Repair			$ 7,271							
	108	P/T Column Repair			$ 1,819							
	109	Stair Tread Concrete Repair			$ 3,750							
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000		$ 4,979					$ 1,000		
		Structural Sub-Total	**$ 3,261**	**$ -**	**$ 38,169**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Waterproofing												
	201	Facade Sealant Replacement - P/T								$ 12,377		
	203	Cove Sealant Replacement - P/T Roof										
	204	Cove Sealant Replacement - P/T Covered Levels								$ 27,333		
	207	Floor Sealant Replacement - P/T Roof										
	208	Floor Sealant Replacement - P/T Covered Levels								$ 7,640		
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair			$ 426,250					$ 12,788		
	213	Traffic Topping - New Installation			$ 24,300							
	214	Concrete Sealer			$ 116,600							
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof			$ 94,875							
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000		$ 66,203					$ 6,014		
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ 728,228**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 66,151**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping			$ 28,125							
	302	New Drain & Piping										
	303	Repair Existing Trench Drains			$ 8,250							
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000		$ 3,638					$ 1,000		
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ 40,013**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement				$ 150,000						
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 15,000				$ 1,000		
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 165,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow	$ 5,156							$ 5,156		
	502	Repaint Traffic Markings			$ 23,438					$ 23,438		
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame								$ 10,500		
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof								$ 50,000		
	511	Repair Broken Handrail										
	512	Repair Stair Tower Roof Landings			$ 6,000							
		Miscellaneous Sub-Total	**$ 5,156**	**$ -**	**$ 29,438**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 89,094**	**$ -**	**$ -**
		Construction Subtotal	$ 11,417	$ -	$ 835,846	$ 165,000	$ -	$ -	$ -	$ 158,244	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 685	$ -	$ 50,151	$ 9,900	$ -	$ -	$ -	$ 9,495	$ -	$ -
		Construction Total	**$ 12,102**	**$ -**	**$ 885,997**	**$ 174,900**	**$ -**	**$ -**	**$ -**	**$ 167,739**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 1,815	$ -	$ 132,900	$ 26,235	$ -	$ -	$ -	$ 25,161	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 1,815	$ -	$ 132,900	$ 26,235	$ -	$ -	$ -	$ 25,161	$ -	$ -
		Material Testing During Construction	$ 121	$ -	$ 8,860	$ 1,749	$ -	$ -	$ -	$ 1,677	$ -	$ -
		Project Cost Totals Per Year:	**$ 15,854**	**$ -**	**$ 1,160,656**	**$ 229,119**	**$ -**	**$ -**	**$ -**	**$ 219,738**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work. Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

COLLEGE PARK GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 11,024				$ 99,212					
	102	Precast Tee Stem Repair					$ 7,551					
	103	Precast Beam Repair					$ 4,765					
	104	Precast Shear Connector Repair					$ 9,916					
	105	Precast Column/Wall Repair					$ 3,911					
	109	Stair Tread Concrete Repair	$ 22,650									
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 5,051				$ 18,803					$ 1,000
		Structural Sub-Total	**$ 38,725**	**$ -**	**$ -**	**$ -**	**$ 144,158**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**
Waterproofing												
	202	Façade Sealant Replacement - Precast					$ 7,804					
	205	Cove Sealant Replacement - Precast Roof					$ 21,123					
	206	Cove Sealant Replacement - Precast Covered Levels										
	209	Floor Sealant Replacement - Precast Roof					$ 77,288					
	210	Floor Sealant Replacement - Precast Covered Levels										
	211	Rout and Seal Cracks					$ 12,188					
	212	Traffic Topping Repair										$ 72,141
	213	Traffic Topping - New Installation					$ 129,853					
	214	Concrete Sealer					$ 311,915					
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof					$ 35,219					
	217	Expansion Joint Replacement - Covered Levels										$ 140,875
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 59,539					$ 21,302
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 654,928**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 234,317**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping	$ 2,406				$ 2,406					
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000					$ 1,000
		Mechanical Sub-Total	**$ 3,406**	**$ -**	**$ -**	**$ -**	**$ 3,406**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000					$ 15,000				$ 1,000
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 165,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow					$ 5,569					$ 5,569
	502	Repaint Traffic Markings					$ 25,313					$ 25,313
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings					$ 12,500					
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
		Miscellaneous Sub-Total	**$ -**	**$ -**	**$ -**	**$ -**	**$ 43,381**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 30,881**
		Construction Subtotal	$ 44,131	$ -	$ -	$ -	$ 845,874	$ 165,000	$ -	$ -	$ -	$ 268,198
		Mobilization @ 6% of Construction Subtotal	$ 2,648	$ -	$ -	$ -	$ 50,752	$ 9,900	$ -	$ -	$ -	$ 16,092
		Construction Total	**$ 46,779**	**$ -**	**$ -**	**$ -**	**$ 896,626**	**$ 174,900**	**$ -**	**$ -**	**$ -**	**$ 284,290**
		Project Contingency @ 15%	$ 7,017	$ -	$ -	$ -	$ 134,494	$ 26,235	$ -	$ -	$ -	$ 42,644
		Engineering: Contract Documents/Field Rep @ 15%	$ 7,017	$ -	$ -	$ -	$ 134,494	$ 26,235	$ -	$ -	$ -	$ 42,644
		Material Testing During Construction	$ 468	$ -	$ -	$ -	$ 8,966	$ 1,749	$ -	$ -	$ -	$ 2,843
		Project Cost Totals Per Year:	**$ 61,280**	**$ -**	**$ -**	**$ -**	**$ 1,174,580**	**$ 229,119**	**$ -**	**$ -**	**$ -**	**$ 372,420**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work. Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

DUNN LORING GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 1,380				$ 4,140					
	102	Precast Tee Stem Repair										
	103	Precast Beam Repair										
	104	Precast Shear Connector Repair										
	105	Precast Column/Wall Repair										
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000				$ 1,000				$ 1,000	
		Structural Sub-Total	**$ 2,380**	**$ -**	**$ -**	**$ -**	**$ 5,140**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof									$ 18,086	
	206	Cove Sealant Replacement - Precast Covered Levels										
	209	Floor Sealant Replacement - Precast Roof									$ 66,177	
	210	Floor Sealant Replacement - Precast Covered Levels										
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation					$ 207,172				$ 36,560	
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof									$ 43,125	
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 20,717				$ 16,395	
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 227,889**	**$ -**	**$ -**	**$ -**	**$ 180,343**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping										
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000				$ 1,000	
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000	$ 15,000			$ 1,000	
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow	$ 11,303								$ 11,303	
	502	Repaint Traffic Markings									$ 51,375	
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
	512	Install Roof Level Storefront	$ 50,000									
		Miscellaneous Sub-Total	**$ 61,303**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 62,678**	**$ -**
		Construction Subtotal	$ 66,682	$ -	$ -	$ -	$ 235,028	$ 165,000	$ -	$ -	$ 246,021	$ -
		Mobilization @ 6% of Construction Subtotal	$ 4,001	$ -	$ -	$ -	$ 14,102	$ 9,900	$ -	$ -	$ 14,761	$ -
		Construction Total	**$ 70,683**	**$ -**	**$ -**	**$ -**	**$ 249,130**	**$ 174,900**	**$ -**	**$ -**	**$ 260,782**	**$ -**
		Project Contingency @ 15%	$ 10,602	$ -	$ -	$ -	$ 37,370	$ 26,235	$ -	$ -	$ 39,117	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 10,602	$ -	$ -	$ -	$ 37,370	$ 26,235	$ -	$ -	$ 39,117	$ -
		Material Testing During Construction	$ 707	$ -	$ -	$ -	$ 2,491	$ 1,749	$ -	$ -	$ 2,608	$ -
		Project Cost Totals Per Year:	**$ 92,595**	**$ -**	**$ -**	**$ -**	**$ 326,360**	**$ 229,119**	**$ -**	**$ -**	**$ 341,624**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work. Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

WALKER RESTORATION CONSULTANTS

14-3944.04

FRANCONIA/SPRINGFIELD EXPANSION GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 6,263				$ 56,367					
	102	Precast Tee Stem Repair					$ 4,290					
	103	Precast Beam Repair					$ 2,707					
	104	Precast Shear Connector Repair					$ 5,633					
	105	Precast Column/Wall Repair					$ 2,222					
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	114											
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000				$ 10,683		$ 1,000			
		Structural Sub-Total	**$ 7,263**	**$ -**	**$ -**	**$ -**	**$ 81,903**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof					$ 21,575					
	206	Cove Sealant Replacement - Precast Covered Levels							$ 32,915			
	209	Floor Sealant Replacement - Precast Roof					$ 78,942					
	210	Floor Sealant Replacement - Precast Covered Levels							$ 132,725			
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation					$ 66,060					
	214	Concrete Sealer					$ 200,256					
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof					$ 4,313					
	217	Expansion Joint Replacement - Covered Levels							$ 17,250			
	218	Caulk Handrail Bases										
	219											
	220											
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 37,115		$ 18,289			
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 408,260**	**$ -**	**$ 201,179**	**$ -**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping										
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000		$ 1,000			
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000	$ 15,000	$ 1,000			
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow					$ 3,878					
	502	Repaint Traffic Markings					$ 17,625					
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
		Miscellaneous Sub-Total	**$ -**	**$ -**	**$ -**	**$ -**	**$ 21,503**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 10,263	$ -	$ -	$ -	$ 513,665	$ 165,000	$ 204,179	$ -	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 616	$ -	$ -	$ -	$ 30,820	$ 9,900	$ 12,251	$ -	$ -	$ -
		Construction Total	**$ 10,879**	**$ -**	**$ -**	**$ -**	**$ 544,485**	**$ 174,900**	**$ 216,430**	**$ -**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 1,632	$ -	$ -	$ -	$ 81,673	$ 26,235	$ 32,464	$ -	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 1,632	$ -	$ -	$ -	$ 81,673	$ 26,235	$ 32,464	$ -	$ -	$ -
		Material Testing During Construction	$ 109	$ -	$ -	$ -	$ 5,445	$ 1,749	$ 2,164	$ -	$ -	$ -
		Project Cost Totals Per Year:	**$ 14,251**	**$ -**	**$ -**	**$ -**	**$ 713,275**	**$ 229,119**	**$ 283,523**	**$ -**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
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3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

FRANCONIA/SPRINGFIELD ORIGINAL GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair				$ 169,578						
	102	Precast Tee Stem Repair				$ 11,616						
	103	Precast Beam Repair				$ 7,329						
	104	Precast Shear Connector Repair				$ 15,253						
	105	Precast Column/Wall Repair				$ 6,017						
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad				$ 66,000						
	113	Repair Loose Bollard										
	114	Reconfigure Expansion Joint Blockout - Roof				$ 54,063						
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000			$ 49,478		$ 1,000				
		Structural Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 379,335**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof										
	206	Cove Sealant Replacement - Precast Covered Levels						$ 170,993				
	209	Floor Sealant Replacement - Precast Roof										
	210	Floor Sealant Replacement - Precast Covered Levels						$ 689,495				
	211	Rout and Seal Cracks				$ 12,188						
	212	Traffic Topping Repair	$ 252,387			$ 321,220						
	213	Traffic Topping - New Installation				$ 657,720						
	214	Concrete Sealer				$ 729,446						
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof				$ 43,125						
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 25,239			$ 176,370		$ 86,049				
		Waterproofing Sub-Total	**$ 277,625**	**$ -**	**$ -**	**$ 1,940,068**	**$ -**	**$ 946,537**	**$ -**	**$ -**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping										
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000		$ 1,000				
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement					$ 150,000					
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000	$ 15,000	$ 1,000				
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow										
	502	Repaint Traffic Markings										
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Repair Fencing @ Lightwall				$ 625						
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
	512	Repair Pedestrian Bridge Tile	$ 3,125									
		Miscellaneous Sub-Total	**$ 3,125**	**$ -**	**$ -**	**$ 625**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 283,750	$ -	$ -	$ 2,322,028	$ 165,000	$ 949,537	$ -	$ -	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 17,025	$ -	$ -	$ 139,322	$ 9,900	$ 56,972	$ -	$ -	$ -	$ -
		Construction Total	**$ 300,775**	**$ -**	**$ -**	**$ 2,461,349**	**$ 174,900**	**$ 1,006,509**	**$ -**	**$ -**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 45,116	$ -	$ -	$ 369,202	$ 26,235	$ 150,976	$ -	$ -	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 45,116	$ -	$ -	$ 369,202	$ 26,235	$ 150,976	$ -	$ -	$ -	$ -
		Material Testing During Construction	$ 3,008	$ -	$ -	$ 24,613	$ 1,749	$ 10,065	$ -	$ -	$ -	$ -
		Project Cost Totals Per Year:	**$ 394,016**	**$ -**	**$ -**	**$ 3,224,368**	**$ 229,119**	**$ 1,318,527**	**$ -**	**$ -**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work. Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

GLENMONT EAST GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	106	P/T Slab Repair			$ 65,825							
	107	P/T Beam Repair			$ 6,208							
	108	P/T Column Repair			$ 3,883							
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	113	Repair Loose Bollard										
	114	Repair Settlement At Stair Entry/Exit			$ 3,750							
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000		$ 11,950						$ 1,000	
		Structural Sub-Total	**$ 1,000**	**$ -**	**$ 91,616**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Waterproofing												
	201	Facade Sealant Replacement - P/T										
	203	Cove Sealant Replacement - P/T Roof										
	204	Cove Sealant Replacement - P/T Covered Levels										
	207	Floor Sealant Replacement - P/T Roof										
	208	Floor Sealant Replacement - P/T Covered Levels										
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair			$ 425,200							
	213	Traffic Topping - New Installation			$ 79,861						$ 1,916,654	
	214	Concrete Sealer			$ 343,352							
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof			$ 65,838							
	217	Expansion Joint Replacement - Covered Levels			$ 153,238							
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000		$ 106,749						$ 191,665	
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ 1,174,236**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 2,108,320**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping	$ 4,813		$ 4,813							
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000		$ 1,000						$ 1,000	
		Mechanical Sub-Total	**$ 5,813**	**$ -**	**$ 5,813**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Electrical												
	401	PARC System Replacement				$ 150,000						
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000		$ 1,000	$ 15,000					$ 1,000	
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow			$ 8,663							
	502	Repaint Traffic Markings			$ 39,375							
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door Hardware	$ 2,500									
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings			$ 25,000							
	508	Railing Infill for Excessive Gap	$ 5,000									
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof									$ 40,000	
	511	Repair Broken Handrail										
		Miscellaneous Sub-Total	**$ 7,500**	**$ -**	**$ 73,038**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 40,000**	**$ -**
		Construction Subtotal	$ 16,313	$ -	$ 1,345,702	$ 165,000	$ -	$ -	$ -	$ -	$ 2,151,320	$ -
		Mobilization @ 6% of Construction Subtotal	$ 979	$ -	$ 80,742	$ 9,900	$ -	$ -	$ -	$ -	$ 129,079	$ -
		Construction Total	**$ 17,291**	**$ -**	**$ 1,426,444**	**$ 174,900**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 2,280,399**	**$ -**
		Project Contingency @ 15%	$ 2,594	$ -	$ 213,967	$ 26,235	$ -	$ -	$ -	$ -	$ 342,060	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 2,594	$ -	$ 213,967	$ 26,235	$ -	$ -	$ -	$ -	$ 342,060	$ -
		Material Testing During Construction	$ 173	$ -	$ 14,264	$ 1,749	$ -	$ -	$ -	$ -	$ 22,804	$ -
		Project Cost Totals Per Year:	**$ 22,652**	**$ -**	**$ 1,868,642**	**$ 229,119**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 2,987,323**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work. Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

GLENMONT WEST GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	106	P/T Slab Repair	$ 1,846				$ 16,610					
	107	P/T Beam Repair					$ 2,374					
	108	P/T Column Repair	$ 1,060				$ 9,544					
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	113	Repair Loose Bollard					$ 1,125					
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000				$ 4,448		$ 1,000			
		Structural Sub-Total	**$ 3,906**	**$ -**	**$ -**	**$ -**	**$ 34,101**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Waterproofing												
	201	Facade Sealant Replacement - P/T										
	203	Cove Sealant Replacement - P/T Roof							$ 18,780			
	204	Cove Sealant Replacement - P/T Covered Levels										
	207	Floor Sealant Replacement - P/T Roof							$ 5,716			
	208	Floor Sealant Replacement - P/T Covered Levels										
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation										
	214	Concrete Sealer					$ 295,000					
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof										
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 29,500		$ 2,450			
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 324,500**	**$ -**	**$ 26,945**	**$ -**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping										
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000		$ 1,000			
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000	$ 15,000	$ 1,000			
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow										
	502	Repaint Traffic Markings					$ 22,438					
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
		Miscellaneous Sub-Total	**$ -**	**$ -**	**$ -**	**$ -**	**$ 22,438**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 6,906	$ -	$ -	$ -	$ 383,038	$ 165,000	$ 29,945	$ -	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 414	$ -	$ -	$ -	$ 22,982	$ 9,900	$ 1,797	$ -	$ -	$ -
		Construction Total	**$ 7,320**	**$ -**	**$ -**	**$ -**	**$ 406,020**	**$ 174,900**	**$ 31,741**	**$ -**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 1,098	$ -	$ -	$ -	$ 60,903	$ 26,235	$ 4,761	$ -	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 1,098	$ -	$ -	$ -	$ 60,903	$ 26,235	$ 4,761	$ -	$ -	$ -
		Material Testing During Construction	$ 73	$ -	$ -	$ -	$ 4,060	$ 1,749	$ 317	$ -	$ -	$ -
		Project Cost Totals Per Year:	**$ 9,590**	**$ -**	**$ -**	**$ -**	**$ 531,887**	**$ 229,119**	**$ 41,581**	**$ -**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
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3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

GROSVENOR GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 18,537				$ 166,835					
	102	Precast Tee Stem Repair					$ 12,698					
	103	Precast Beam Repair					$ 8,012					
	104	Precast Shear Connector Repair					$ 16,674					
	105	Precast Column/Wall Repair					$ 6,577					
	109	Stair Tread Concrete Repair					$ 3,750					
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 2,781				$ 32,182		$ 1,000			
		Structural Sub-Total	**$ 21,318**	**$ -**	**$ -**	**$ -**	**$ 246,727**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof					$ 26,296					
	206	Cove Sealant Replacement - Precast Covered Levels							$ 70,969			
	209	Floor Sealant Replacement - Precast Roof					$ 96,217					
	210	Floor Sealant Replacement - Precast Covered Levels							$ 286,169			
	211	Rout and Seal Cracks					$ 24,375					
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation					$ 291,668		$ 72,917			
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof					$ 43,125					
	217	Expansion Joint Replacement - Covered Levels							$ 43,125			
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 48,168		$ 47,318			
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 529,849**	**$ -**	**$ 520,498**	**$ -**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping					$ 4,813					
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000		$ 1,000			
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 5,813**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000	$ 15,000	$ 1,000			
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow					$ 6,256		$ 6,256			
	502	Repaint Traffic Markings					$ 28,438		$ 28,438			
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Repaint Stair Tower Roof Architectural Metals					$ 75,000					
	510	Replace Failing Storefront	$ 50,000									
	511	Repaint Spandrel Handrail					$ 39,120					
	512	Replace Stair Closure Gates					$ 1,875					
		Miscellaneous Sub-Total	**$ 50,000**	**$ -**	**$ -**	**$ -**	**$ 150,689**	**$ -**	**$ 34,694**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 74,318	$ -	$ -	$ -	$ 934,077	$ 165,000	$ 558,192	$ -	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 4,459	$ -	$ -	$ -	$ 56,045	$ 9,900	$ 33,491	$ -	$ -	$ -
		Construction Total	**$ 78,777**	**$ -**	**$ -**	**$ -**	**$ 990,122**	**$ 174,900**	**$ 591,683**	**$ -**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 11,817	$ -	$ -	$ -	$ 148,518	$ 26,235	$ 88,752	$ -	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 11,817	$ -	$ -	$ -	$ 148,518	$ 26,235	$ 88,752	$ -	$ -	$ -
		Material Testing During Construction	$ 788	$ -	$ -	$ -	$ 9,901	$ 1,749	$ 5,917	$ -	$ -	$ -
		Project Cost Totals Per Year:	**$ 103,198**	**$ -**	**$ -**	**$ -**	**$ 1,297,060**	**$ 229,119**	**$ 775,105**	**$ -**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
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3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

HUNTINGTON III GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair					$ 13,309					
	102	Precast Tee Stem Repair					$ 912					
	103	Precast Beam Repair					$ 575					
	104	Precast Shear Connector Repair					$ 1,197					
	105	Precast Column/Wall Repair	$ 472									
	109	Stair Tread Concrete Repair	$ 3,750									
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000				$ 2,399		$ 1,000			
		Structural Sub-Total	**$ 5,222**	**$ -**	**$ -**	**$ -**	**$ 18,392**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast							$ 8,480			
	205	Cove Sealant Replacement - Precast Roof					$ 31,860					
	206	Cove Sealant Replacement - Precast Covered Levels							$ 60,547			
	209	Floor Sealant Replacement - Precast Roof					$ 116,573					
	210	Floor Sealant Replacement - Precast Covered Levels							$ 244,145			
	211	Rout and Seal Cracks					$ 12,188					
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation										
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof							$ 43,125			
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 16,062		$ 35,630			
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 176,682**	**$ -**	**$ 391,926**	**$ -**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping										
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000		$ 1,000			
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000	$ 15,000	$ 1,000			
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow							$ 6,023			
	502	Repaint Traffic Markings							$ 27,375			
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail					$ 3,125					
		Miscellaneous Sub-Total	**$ -**	**$ -**	**$ -**	**$ -**	**$ 3,125**	**$ -**	**$ 33,398**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 8,222	$ -	$ -	$ -	$ 200,199	$ 165,000	$ 428,324	$ -	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 493	$ -	$ -	$ -	$ 12,012	$ 9,900	$ 25,699	$ -	$ -	$ -
		Construction Total	**$ 8,716**	**$ -**	**$ -**	**$ -**	**$ 212,210**	**$ 174,900**	**$ 454,023**	**$ -**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 1,307	$ -	$ -	$ -	$ 31,832	$ 26,235	$ 68,104	$ -	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 1,307	$ -	$ -	$ -	$ 31,832	$ 26,235	$ 68,104	$ -	$ -	$ -
		Material Testing During Construction	$ 87	$ -	$ -	$ -	$ 2,122	$ 1,749	$ 4,540	$ -	$ -	$ -
		Project Cost Totals Per Year:	**$ 11,417**	**$ -**	**$ -**	**$ -**	**$ 277,996**	**$ 229,119**	**$ 594,771**	**$ -**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work.
   Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

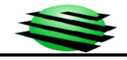
HUNTINGTON NORTH GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 21,622			$ 194,594						
	102	Precast Tee Stem Repair				$ 7,405						
	103	Precast Beam Repair				$ 4,673						
	104	Precast Shear Connector Repair				$ 9,724						
	105	Precast Column/Wall Repair				$ 3,836						
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard	$ 1,125									
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 3,412			$ 33,035					$ 1,000	
		Structural Sub-Total	**$ 26,159**	**$ -**	**$ -**	**$ 253,267**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast									$ 5,740	
	205	Cove Sealant Replacement - Precast Roof										
	206	Cove Sealant Replacement - Precast Covered Levels									$ 30,333	
	209	Floor Sealant Replacement - Precast Roof										
	210	Floor Sealant Replacement - Precast Covered Levels										
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair									$ 365,625	
	213	Traffic Topping - New Installation										
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof									$ 43,125	
	217	Expansion Joint Replacement - Covered Levels									$ 43,125	
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000					$ 48,795	
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 536,743**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping				$ 4,813						
	303	Repair Existing Trench Drains	$ 8,250									
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000					$ 1,000	
		Mechanical Sub-Total	**$ 9,250**	**$ -**	**$ -**	**$ 5,813**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Electrical												
	401	PARC System Replacement							$ 150,000			
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000			$ 15,000		$ 1,000	
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ 165,000**	**$ -**	**$ 1,000**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow				$ 4,876						
	502	Repaint Traffic Markings									$ 22,163	
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail	$ 3,125			$ 3,125						
		Miscellaneous Sub-Total	**$ 3,125**	**$ -**	**$ -**	**$ 8,001**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 22,163**	**$ -**
		Construction Subtotal	$ 40,534	$ -	$ -	$ 269,080	$ -	$ -	$ 165,000	$ -	$ 561,906	$ -
		Mobilization @ 6% of Construction Subtotal	$ 2,432	$ -	$ -	$ 16,145	$ -	$ -	$ 9,900	$ -	$ 33,714	$ -
		Construction Total	**$ 42,966**	**$ -**	**$ -**	**$ 285,225**	**$ -**	**$ -**	**$ 174,900**	**$ -**	**$ 595,620**	**$ -**
		Project Contingency @ 15%	$ 6,445	$ -	$ -	$ 42,784	$ -	$ -	$ 26,235	$ -	$ 89,343	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 6,445	$ -	$ -	$ 42,784	$ -	$ -	$ 26,235	$ -	$ 89,343	$ -
		Material Testing During Construction	$ 430	$ -	$ -	$ 2,852	$ -	$ -	$ 1,749	$ -	$ 5,956	$ -
		Project Cost Totals Per Year:	**$ 56,285**	**$ -**	**$ -**	**$ 373,645**	**$ -**	**$ -**	**$ 229,119**	**$ -**	**$ 780,262**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work.
   Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.



HUNTINGTON SOUTH GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	106	P/T Slab Repair		$ 11,250,000								
	107	P/T Beam Repair		$ 206,908								
	108	P/T Column Repair		$ 129,405								
	109	Stair Tread Concrete Repair		$ 22,500								
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)		$ 1,741,322								
		Structural Sub-Total	**$ -**	**$ 13,350,134**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Waterproofing												
	201	Facade Sealant Replacement - P/T										
	203	Cove Sealant Replacement - P/T Roof										
	204	Cove Sealant Replacement - P/T Covered Levels										
	207	Floor Sealant Replacement - P/T Roof										
	208	Floor Sealant Replacement - P/T Covered Levels										
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation		$ 1,012,500								
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof										
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)		$ 101,250								
		Waterproofing Sub-Total	**$ -**	**$ 1,113,750**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping										
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)		$ 1,000								
		Mechanical Sub-Total	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement		$ 150,000								
	402	Remove & Reinstall Lighting		$ 180,000								
	403	Electrical Allowance @ 10% (min $1,000.00)		$ 33,000								
		Electrical Sub-Total	**$ -**	**$ 363,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow		$ 3,713								
	502	Repaint Traffic Markings		$ 16,875								
	503	Clean and Paint Metal Pan Stairs		$ 25,000								
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
		Miscellaneous Sub-Total	**$ -**	**$ 45,588**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ -	$ 14,873,472	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ -	$ 892,408	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		Construction Total	**$ -**	**$ 15,765,880**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Project Contingency @ 15%	$ -	$ 2,364,882	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ -	$ 2,364,882	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		Material Testing During Construction	$ -	$ 157,659	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		Project Cost Totals Per Year:	**$ -**	**$ 20,653,303**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work. Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

LARGO NORTH GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 7,905				$ 71,143					
	102	Precast Tee Stem Repair					$ 5,415					
	103	Precast Beam Repair					$ 3,417					
	104	Precast Shear Connector Repair					$ 7,110					
	105	Precast Column/Wall Repair					$ 2,805					
	109	Stair Tread Concrete Repair	$ 1,500									
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,411				$ 13,483		$ 1,000			
		Structural Sub-Total	**$ 10,816**	**$ -**	**$ -**	**$ -**	**$ 103,373**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof							$ 13,870			
	206	Cove Sealant Replacement - Precast Covered Levels										
	209	Floor Sealant Replacement - Precast Roof							$ 50,749			
	210	Floor Sealant Replacement - Precast Covered Levels										
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation					$ 151,875					
	214	Concrete Sealer					$ 203,000					
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof					$ 25,875					
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 38,075		$ 6,462			
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 418,825**	**$ -**	**$ 71,081**	**$ -**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping										
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000		$ 1,000			
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000	$ 15,000	$ 1,000			
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow	$ 3,603									
	502	Repaint Traffic Markings					$ 16,375					
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
		Miscellaneous Sub-Total	**$ 3,603**	**$ -**	**$ -**	**$ -**	**$ 16,375**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 17,418	$ -	$ -	$ -	$ 540,573	$ 165,000	$ 74,081	$ -	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 1,045	$ -	$ -	$ -	$ 32,434	$ 9,900	$ 4,445	$ -	$ -	$ -
		Construction Total	**$ 18,463**	**$ -**	**$ -**	**$ -**	**$ 573,007**	**$ 174,900**	**$ 78,526**	**$ -**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 2,769	$ -	$ -	$ -	$ 85,951	$ 26,235	$ 11,779	$ -	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 2,769	$ -	$ -	$ -	$ 85,951	$ 26,235	$ 11,779	$ -	$ -	$ -
		Material Testing During Construction	$ 185	$ -	$ -	$ -	$ 5,730	$ 1,749	$ 785	$ -	$ -	$ -
		Project Cost Totals Per Year:	**$ 24,187**	**$ -**	**$ -**	**$ -**	**$ 750,640**	**$ 229,119**	**$ 102,869**	**$ -**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work.
   Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

LARGO SOUTH GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 14,479			$ 43,436						
	102	Precast Tee Stem Repair				$ 3,967						
	103	Precast Beam Repair				$ 2,503						
	104	Precast Shear Connector Repair				$ 5,209						
	105	Precast Column/Wall Repair				$ 2,055						
	109	Stair Tread Concrete Repair	$ 750									
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 2,284			$ 8,576					$ 1,000	
		Structural Sub-Total	**$ 17,513**	**$ -**	**$ -**	**$ 65,746**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof				$ 28,032						
	206	Cove Sealant Replacement - Precast Covered Levels									$ 24,611	
	209	Floor Sealant Replacement - Precast Roof				$ 102,569						
	210	Floor Sealant Replacement - Precast Covered Levels									$ 99,240	
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation										
	214	Concrete Sealer				$ 76,000						
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof	$ 4,317			$ 34,927						
	217	Expansion Joint Replacement - Covered Levels				$ 122,044						
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000			$ 36,357					$ 12,385	
		Waterproofing Sub-Total	**$ 5,317**	**$ -**	**$ -**	**$ 399,929**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 136,236**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping				$ 2,406						
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000					$ 1,000	
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 3,406**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Electrical												
	401	PARC System Replacement					$ 150,000					
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000	$ 15,000				$ 1,000	
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow	$ 3,768									
	502	Repaint Traffic Markings				$ 17,125						
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings				$ 1,688						
	505	Replace Door, Frame and Hardware				$ 4,375						
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Fencing	$ 125									
	512	Conduct an ASR Study				$ 25,000						
		Miscellaneous Sub-Total	**$ 3,893**	**$ -**	**$ -**	**$ 48,188**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 28,722	$ -	$ -	$ 518,269	$ 165,000	$ -	$ -	$ -	$ 139,236	$ -
		Mobilization @ 6% of Construction Subtotal	$ 1,723	$ -	$ -	$ 31,096	$ 9,900	$ -	$ -	$ -	$ 8,354	$ -
		Construction Total	**$ 30,446**	**$ -**	**$ -**	**$ 549,365**	**$ 174,900**	**$ -**	**$ -**	**$ -**	**$ 147,590**	**$ -**
		Project Contingency @ 15%	$ 4,567	$ -	$ -	$ 82,405	$ 26,235	$ -	$ -	$ -	$ 22,139	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 4,567	$ -	$ -	$ 82,405	$ 26,235	$ -	$ -	$ -	$ 22,139	$ -
		Material Testing During Construction	$ 304	$ -	$ -	$ 5,494	$ 1,749	$ -	$ -	$ -	$ 1,476	$ -
		Project Cost Totals Per Year:	**$ 39,884**	**$ -**	**$ -**	**$ 719,668**	**$ 229,119**	**$ -**	**$ -**	**$ -**	**$ 193,343**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
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3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

MINNESOTA GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair				$ 68,533						
	102	Precast Tee Stem Repair				$ 4,694						
	103	Precast Beam Repair				$ 2,962						
	104	Precast Shear Connector Repair				$ 6,164						
	105	Precast Column/Wall Repair				$ 2,432						
	109	Stair Tread Concrete Repair	$ 600									
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000			$ 12,718			$ 1,000			
		Structural Sub-Total	**$ 1,600**	**$ -**	**$ -**	**$ 97,503**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof							$ 11,173			
	206	Cove Sealant Replacement - Precast Covered Levels										
	209	Floor Sealant Replacement - Precast Roof							$ 40,883			
	210	Floor Sealant Replacement - Precast Covered Levels										
	211	Rout and Seal Cracks				$ 12,188						
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation										
	214	Concrete Sealer				$ 38,000						
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof										
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000			$ 5,019			$ 5,206			
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 55,206**	**$ -**	**$ -**	**$ 57,262**	**$ -**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping	$ 4,813									
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000			$ 1,000			
		Mechanical Sub-Total	**$ 5,813**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement					$ 150,000					
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000	$ 15,000		$ 1,000			
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow				$ 2,324						
	502	Repaint Traffic Markings				$ 10,563						
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings				$ 6,250						
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
		Miscellaneous Sub-Total	**$ -**	**$ -**	**$ -**	**$ 19,136**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 9,413	$ -	$ -	$ 173,846	$ 165,000	$ -	$ 60,262	$ -	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 565	$ -	$ -	$ 10,431	$ 9,900	$ -	$ 3,616	$ -	$ -	$ -
		Construction Total	**$ 9,977**	**$ -**	**$ -**	**$ 184,276**	**$ 174,900**	**$ -**	**$ 63,878**	**$ -**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 1,497	$ -	$ -	$ 27,641	$ 26,235	$ -	$ 9,582	$ -	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 1,497	$ -	$ -	$ 27,641	$ 26,235	$ -	$ 9,582	$ -	$ -	$ -
		Material Testing During Construction	$ 100	$ -	$ -	$ 1,843	$ 1,749	$ -	$ 639	$ -	$ -	$ -
		Project Cost Totals Per Year:	**$ 13,070**	**$ -**	**$ -**	**$ 241,402**	**$ 229,119**	**$ -**	**$ 83,680**	**$ -**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work.
   Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

NEW CARROLTON GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 3,510			$ 31,590						
	102	Precast Tee Stem Repair				$ 2,404						
	103	Precast Beam Repair				$ 1,517						
	104	Precast Shear Connector Repair				$ 3,157						
	105	Precast Column/Wall Repair				$ 1,245						
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000			$ 5,987			$ 1,000			
		Structural Sub-Total	**$ 4,510**	**$ -**	**$ -**	**$ 45,901**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof				$ 21,412						
	206	Cove Sealant Replacement - Precast Covered Levels							$ 95,865			
	209	Floor Sealant Replacement - Precast Roof				$ 78,346						
	210	Floor Sealant Replacement - Precast Covered Levels							$ 386,557			
	211	Rout and Seal Cracks				$ 12,188						
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation				$ 415,800						
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof	$ 8,776			$ 17,818						
	217	Expansion Joint Replacement - Covered Levels				$ 159,563						
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000			$ 70,513			$ 48,242			
		Waterproofing Sub-Total	**$ 9,776**	**$ -**	**$ -**	**$ 775,639**	**$ -**	**$ -**	**$ 530,665**	**$ -**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping				$ 2,406						
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000			$ 1,000			
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 3,406**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement					$ 150,000					
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000	$ 15,000		$ 1,000			
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow				$ 7,590						
	502	Repaint Traffic Markings				$ 34,500						
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door Hardware	$ 13,125									
	506	Clean and Paint Door and Door Frame				$ 3,938						
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Fencing	$ 125									
		Miscellaneous Sub-Total	**$ 13,250**	**$ -**	**$ -**	**$ 46,028**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 29,536	$ -	$ -	$ 871,974	$ 165,000	$ -	$ 533,665	$ -	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 1,772	$ -	$ -	$ 52,318	$ 9,900	$ -	$ 32,020	$ -	$ -	$ -
		Construction Total	**$ 31,308**	**$ -**	**$ -**	**$ 924,292**	**$ 174,900**	**$ -**	**$ 565,684**	**$ -**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 4,696	$ -	$ -	$ 138,644	$ 26,235	$ -	$ 84,853	$ -	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 4,696	$ -	$ -	$ 138,644	$ 26,235	$ -	$ 84,853	$ -	$ -	$ -
		Material Testing During Construction	$ 313	$ -	$ -	$ 9,243	$ 1,749	$ -	$ 5,657	$ -	$ -	$ -
		Project Cost Totals Per Year:	**$ 41,014**	**$ -**	**$ -**	**$ 1,210,823**	**$ 229,119**	**$ -**	**$ 741,047**	**$ -**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work.
   Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

PRINCE GEORGE'S PLAZA GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	106	P/T Slab Repair	$ 19,394		$ 77,578							
	107	P/T Beam Repair			$ 12,472							
	108	P/T Column Repair			$ 7,800							
	109	Stair Tread Concrete Repair			$ 1,950							
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 2,909		$ 14,970					$ 1,000		
		Structural Sub-Total	**$ 22,304**	**$ -**	**$ 114,770**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Waterproofing												
	201	Facade Sealant Replacement - P/T										
	203	Cove Sealant Replacement - P/T Roof										
	204	Cove Sealant Replacement - P/T Covered Levels										
	207	Floor Sealant Replacement - P/T Roof										
	208	Floor Sealant Replacement - P/T Covered Levels										
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair			$ 968,750					$ 242,188		
	213	Traffic Topping - New Installation										
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof	$ 10,781		$ 32,344							
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,078		$ 100,109					$ 24,219		
		Waterproofing Sub-Total	**$ 11,859**	**$ -**	**$ 1,101,203**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 266,406**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping			$ 28,125							
	302	New Drain & Piping	$ 4,813									
	303	Repair Existing Trench Drains			$ 24,750							
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000		$ 5,288					$ 1,000		
		Mechanical Sub-Total	**$ 5,813**	**$ -**	**$ 58,163**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement				$ 150,000						
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000		$ 1,000	$ 15,000				$ 1,000		
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow	$ 4,785									
	502	Repaint Traffic Markings			$ 21,750							
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware	$ 4,375									
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap	$ 498,125									
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof			$ 25,000							
	511	Repair Rusting Storefront			$ 90,000							
		Miscellaneous Sub-Total	**$ 507,285**	**$ -**	**$ 136,750**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 548,260	$ -	$ 1,411,885	$ 165,000	$ -	$ -	$ -	$ 269,406	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 32,896	$ -	$ 84,713	$ 9,900	$ -	$ -	$ -	$ 16,164	$ -	$ -
		Construction Total	**$ 581,156**	**$ -**	**$ 1,496,598**	**$ 174,900**	**$ -**	**$ -**	**$ -**	**$ 285,571**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 87,173	$ -	$ 224,490	$ 26,235	$ -	$ -	$ -	$ 42,836	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 87,173	$ -	$ 224,490	$ 26,235	$ -	$ -	$ -	$ 42,836	$ -	$ -
		Material Testing During Construction	$ 5,812	$ -	$ 14,966	$ 1,749	$ -	$ -	$ -	$ 2,856	$ -	$ -
		Project Cost Totals Per Year:	**$ 761,314**	**$ -**	**$ 1,960,544**	**$ 229,119**	**$ -**	**$ -**	**$ -**	**$ 374,098**	**$ -**	**$ -**

NOTES:

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4. Cost based on normal work week, daylight hours and non-union labor.

WALKER RESTORATION CONSULTANTS

14-3944.04

RHODE ISLAND AVENUE GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 946									
	102	Precast Tee Stem Repair										
	103	Precast Beam Repair										
	104	Precast Shear Connector Repair										
	105	Precast Column/Wall Repair	$ 2,518									
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	114											
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000				$ 1,000			$ 1,000		
		Structural Sub-Total	**$ 4,464**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof								$ 7,620		
	206	Cove Sealant Replacement - Precast Covered Levels										
	209	Floor Sealant Replacement - Precast Roof								$ 27,881		
	210	Floor Sealant Replacement - Precast Covered Levels										
	211	Rout and Seal Cracks					$ 12,188					
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation										
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof								$ 1,725		
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	219											
	220											
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,219			$ 3,723		
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 13,406**	**$ -**	**$ -**	**$ 40,949**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping										
	303	Repair Existing Trench Drains										
	304	Clean and Paint Floor Drains & Piping					$ 3,609					
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000			$ 1,000		
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 4,609**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000	$ 15,000		$ 1,000		
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow					$ 1,246					
	502	Repaint Traffic Markings										
	503	Clean and Paint Stair Tower Nosings					$ 5,000					
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
	512											
		Miscellaneous Sub-Total	**$ -**	**$ -**	**$ -**	**$ -**	**$ 6,246**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 7,464	$ -	$ -	$ -	$ 26,261	$ 165,000	$ -	$ 43,949	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 448	$ -	$ -	$ -	$ 1,576	$ 9,900	$ -	$ 2,637	$ -	$ -
		Construction Total	**$ 7,912**	**$ -**	**$ -**	**$ -**	**$ 27,837**	**$ 174,900**	**$ -**	**$ 46,586**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 1,187	$ -	$ -	$ -	$ 4,176	$ 26,235	$ -	$ 6,988	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 1,187	$ -	$ -	$ -	$ 4,176	$ 26,235	$ -	$ 6,988	$ -	$ -
		Material Testing During Construction	$ 79	$ -	$ -	$ -	$ 278	$ 1,749	$ -	$ 466	$ -	$ -
		Project Cost Totals Per Year:	**$ 10,365**	**$ -**	**$ -**	**$ -**	**$ 36,467**	**$ 229,119**	**$ -**	**$ 61,028**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
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3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

SHADY GROVE NORTH GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair			$ 32,643							
	102	Precast Tee Stem Repair			$ 2,236							
	103	Precast Beam Repair			$ 1,411							
	104	Precast Shear Connector Repair			$ 2,936							
	105	Precast Column/Wall Repair			$ 1,158							
	109	Stair Tread Concrete Repair			$ 300							
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000		$ 6,103			$ 1,000				
		Structural Sub-Total	**$ 1,000**	**$ -**	**$ 46,787**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast						$ 12,999				
	205	Cove Sealant Replacement - Precast Roof			$ 28,042							
	206	Cove Sealant Replacement - Precast Covered Levels						$ 108,993				
	209	Floor Sealant Replacement - Precast Roof			$ 102,605							
	210	Floor Sealant Replacement - Precast Covered Levels						$ 439,492				
	211	Rout and Seal Cracks			$ 12,188							
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation			$ 100,013							
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof			$ 50,313							
	217	Expansion Joint Replacement - Covered Levels			$ 175,375							
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000		$ 46,853			$ 110,997				
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ 515,388**	**$ -**	**$ -**	**$ 1,220,966**	**$ -**	**$ -**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping			$ 45,000							
	302	New Drain & Piping			$ 2,406							
	303	Repair Existing Trench Drains										
	304	Clean and Paint Floor Drains & Piping			$ 19,250							
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000		$ 6,666			$ 1,000				
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ 73,322**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement				$ 150,000						
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000		$ 1,000	$ 15,000		$ 1,000				
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow			$ 8,951							
	502	Repaint Traffic Markings			$ 40,688							
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings			$ 14,063							
	505	Replace Door Hardware	$ 4,375		$ 4,375							
	506	Clean and Paint Door and Door Frame										
	507	Repaint Facade Railings			$ 188,400							
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
		Miscellaneous Sub-Total	**$ 4,375**	**$ -**	**$ 256,476**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 8,375	$ -	$ 892,973	$ 165,000	$ -	$ 1,223,966	$ -	$ -	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 503	$ -	$ 53,578	$ 9,900	$ -	$ 73,438	$ -	$ -	$ -	$ -
		Construction Total	**$ 8,878**	**$ -**	**$ 946,552**	**$ 174,900**	**$ -**	**$ 1,297,404**	**$ -**	**$ -**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 1,332	$ -	$ 141,983	$ 26,235	$ -	$ 194,611	$ -	$ -	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 1,332	$ -	$ 141,983	$ 26,235	$ -	$ 194,611	$ -	$ -	$ -	$ -
		Material Testing During Construction	$ 89	$ -	$ 9,466	$ 1,749	$ -	$ 12,974	$ -	$ -	$ -	$ -
		Project Cost Totals Per Year:	**$ 11,630**	**$ -**	**$ 1,239,983**	**$ 229,119**	**$ -**	**$ 1,699,599**	**$ -**	**$ -**	**$ -**	**$ -**

NOTES:

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3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

SHADY GROVE SOUTH GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair				$ 54,537						
	102	Precast Tee Stem Repair				$ 3,736						
	103	Precast Beam Repair				$ 2,357						
	104	Precast Shear Connector Repair				$ 4,905						
	105	Precast Column/Wall Repair				$ 1,935						
	109	Stair Tread Concrete Repair				$ 150						
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000			$ 10,143			$ 1,000			
		Structural Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 77,763**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof										
	206	Cove Sealant Replacement - Precast Covered Levels										
	209	Floor Sealant Replacement - Precast Roof										
	210	Floor Sealant Replacement - Precast Covered Levels										
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair				$ 390,954			$ 229,608			
	213	Traffic Topping - New Installation										
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof				$ 73,600						
	217	Expansion Joint Replacement - Covered Levels							$ 56,350			
	218	Caulk Handrail Bases										
	219	Replace Façade Expansion Joints										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000			$ 46,455			$ 28,596			
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 511,010**	**$ -**	**$ -**	**$ 314,554**	**$ -**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping										
	303	Repair Existing Trench Drains										
	304	Clean and Paint Floor Drains & Piping				$ 17,325						
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,733			$ 1,000			
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 19,058**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement					$ 150,000					
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000	$ 15,000		$ 1,000			
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow				$ 4,840						
	502	Repaint Traffic Markings				$ 22,000			$ 11,000			
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail	$ 15,000									
	512	Repair Stairtower Windows										
		Miscellaneous Sub-Total	**$ 15,000**	**$ -**	**$ -**	**$ 26,840**	**$ -**	**$ -**	**$ 11,000**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 19,000	$ -	$ -	$ 635,670	$ 165,000	$ -	$ 328,554	$ -	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 1,140	$ -	$ -	$ 38,140	$ 9,900	$ -	$ 19,713	$ -	$ -	$ -
		Construction Total	**$ 20,140**	**$ -**	**$ -**	**$ 673,811**	**$ 174,900**	**$ -**	**$ 348,267**	**$ -**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 3,021	$ -	$ -	$ 101,072	$ 26,235	$ -	$ 52,240	$ -	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 3,021	$ -	$ -	$ 101,072	$ 26,235	$ -	$ 52,240	$ -	$ -	$ -
		Material Testing During Construction	$ 201	$ -	$ -	$ 6,738	$ 1,749	$ -	$ 3,483	$ -	$ -	$ -
		Project Cost Totals Per Year:	**$ 26,383**	**$ -**	**$ -**	**$ 882,692**	**$ 229,119**	**$ -**	**$ 456,230**	**$ -**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work. Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

SOUTHERN AVENUE GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 14,793		$ 133,139							
	102	Precast Tee Stem Repair			$ 10,133							
	103	Precast Beam Repair			$ 6,394							
	104	Precast Shear Connector Repair			$ 13,306							
	105	Precast Column/Wall Repair			$ 5,249							
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	114	Repair Expansion Joint Blockout										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 2,219		$ 25,233					$ 1,000		
		Structural Sub-Total	**$ 17,012**	**$ -**	**$ 193,454**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof										
	206	Cove Sealant Replacement - Precast Covered Levels										
	209	Floor Sealant Replacement - Precast Roof										
	210	Floor Sealant Replacement - Precast Covered Levels										
	211	Rout and Seal Cracks			$ 12,188							
	212	Traffic Topping Repair			$ 991,219					$ 346,927		
	213	Traffic Topping - New Installation										
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof			$ 273,125							
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000		$ 127,653					$ 34,693		
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ 1,404,184**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 381,619**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping										
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000		$ 1,000					$ 1,000		
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement				$ 150,000						
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000		$ 1,000	$ 15,000				$ 1,000		
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow			$ 7,948							
	502	Repaint Traffic Markings			$ 36,125							
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
	512	Install Vertical Clearance Bars			$ -							
		Miscellaneous Sub-Total	**$ -**	**$ -**	**$ 44,073**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 20,012	$ -	$ 1,643,711	$ 165,000	$ -	$ -	$ -	$ 384,619	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 1,201	$ -	$ 98,623	$ 9,900	$ -	$ -	$ -	$ 23,077	$ -	$ -
		Construction Total	**$ 21,213**	**$ -**	**$ 1,742,333**	**$ 174,900**	**$ -**	**$ -**	**$ -**	**$ 407,696**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 3,182	$ -	$ 261,350	$ 26,235	$ -	$ -	$ -	$ 61,154	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 3,182	$ -	$ 261,350	$ 26,235	$ -	$ -	$ -	$ 61,154	$ -	$ -
		Material Testing During Construction	$ 212	$ -	$ 17,423	$ 1,749	$ -	$ -	$ -	$ 4,077	$ -	$ -
		Project Cost Totals Per Year:	**$ 27,789**	**$ -**	**$ 2,282,457**	**$ 229,119**	**$ -**	**$ -**	**$ -**	**$ 534,082**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work. Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

SUITLAND GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 7,266				$ 65,391					
	102	Precast Tee Stem Repair					$ 4,977					
	103	Precast Beam Repair					$ 3,140					
	104	Precast Shear Connector Repair					$ 6,535					
	105	Precast Column/Wall Repair					$ 2,578					
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,090				$ 12,393					$ 1,000
		Structural Sub-Total	**$ 8,356**	**$ -**	**$ -**	**$ -**	**$ 95,015**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**
Waterproofing												
	202	Façade Sealant Replacement - Precast					$ 8,573					
	205	Cove Sealant Replacement - Precast Roof					$ 59,452					
	206	Cove Sealant Replacement - Precast Covered Levels					$ 40,024					
	209	Floor Sealant Replacement - Precast Roof					$ 217,532					
	210	Floor Sealant Replacement - Precast Covered Levels					$ 161,389					
	211	Rout and Seal Cracks					$ 12,188					
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation										
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof					$ 64,975					
	217	Expansion Joint Replacement - Covered Levels					$ 61,094					
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 62,523					$ 1,000
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 687,749**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping					$ 7,219					
	303	Repair Existing Trench Drains										
	304	Clean and Paint Floor Drains & Piping					$ 19,250					
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 2,647					$ 1,000
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 29,116**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000	$ 15,000				$ 1,000
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow	$ 7,755									$ 7,755
	502	Repaint Traffic Markings					$ 35,250					$ 35,250
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door Hardware					$ 4,375					
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
	512	Repair Stairtower Windows	$ -									
		Miscellaneous Sub-Total	**$ 7,755**	**$ -**	**$ -**	**$ -**	**$ 39,625**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 43,005**
		Construction Subtotal	$ 19,111	$ -	$ -	$ -	$ 852,505	$ 165,000	$ -	$ -	$ -	$ 47,005
		Mobilization @ 6% of Construction Subtotal	$ 1,147	$ -	$ -	$ -	$ 51,150	$ 9,900	$ -	$ -	$ -	$ 2,820
		Construction Total	**$ 20,257**	**$ -**	**$ -**	**$ -**	**$ 903,656**	**$ 174,900**	**$ -**	**$ -**	**$ -**	**$ 49,825**
		Project Contingency @ 15%	$ 3,039	$ -	$ -	$ -	$ 135,548	$ 26,235	$ -	$ -	$ -	$ 7,474
		Engineering: Contract Documents/Field Rep @ 15%	$ 3,039	$ -	$ -	$ -	$ 135,548	$ 26,235	$ -	$ -	$ -	$ 7,474
		Material Testing During Construction	$ 203	$ -	$ -	$ -	$ 9,037	$ 1,749	$ -	$ -	$ -	$ 498
		Project Cost Totals Per Year:	**$ 26,537**	**$ -**	**$ -**	**$ -**	**$ 1,183,789**	**$ 229,119**	**$ -**	**$ -**	**$ -**	**$ 65,271**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work. Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

TWINBROOK WEST GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair										
	102	Precast Tee Stem Repair										
	103	Precast Beam Repair										
	104	Precast Shear Connector Repair										
	105	Precast Column/Wall Repair										
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)						$ 1,000				
		Structural Sub-Total	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof										
	206	Cove Sealant Replacement - Precast Covered Levels										
	209	Floor Sealant Replacement - Precast Roof										
	210	Floor Sealant Replacement - Precast Covered Levels										
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair						$ 149,375				
	213	Traffic Topping - New Installation										
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof										
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)						$ 14,938				
		Waterproofing Sub-Total	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 164,313**	**$ -**	**$ -**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping										
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)						$ 1,000				
		Mechanical Sub-Total	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement							$ 150,000			
	403	Electrical Allowance @ 10% (min $1,000.00)						$ 1,000	$ 15,000			
		Electrical Sub-Total	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow										
	502	Repaint Traffic Markings						$ 2,988				
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
		Miscellaneous Sub-Total	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 2,988**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ -	$ -	$ -	$ -	$ -	$ 170,300	$ 165,000	$ -	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ -	$ -	$ -	$ -	$ -	$ 10,218	$ 9,900	$ -	$ -	$ -
		Construction Total	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 180,518**	**$ 174,900**	**$ -**	**$ -**	**$ -**
		Project Contingency @ 15%	$ -	$ -	$ -	$ -	$ -	$ 27,078	$ 26,235	$ -	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ -	$ -	$ -	$ -	$ -	$ 27,078	$ 26,235	$ -	$ -	$ -
		Material Testing During Construction	$ -	$ -	$ -	$ -	$ -	$ 1,805	$ 1,749	$ -	$ -	$ -
		Project Cost Totals Per Year:	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 236,479**	**$ 229,119**	**$ -**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work.
   Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

VIENNA NORTH GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 21,481		$ 193,331							
	102	Precast Tee Stem Repair			$ 14,714							
	103	Precast Beam Repair			$ 9,285							
	104	Precast Shear Connector Repair			$ 19,322							
	105	Precast Column/Wall Repair			$ 7,622							
	109	Stair Tread Concrete Repair			$ 3,750							
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 3,222		$ 37,204					$ 1,000		
		Structural Sub-Total	**$ 24,703**	**$ -**	**$ 285,227**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof										
	206	Cove Sealant Replacement - Precast Covered Levels			$ 59,693							
	209	Floor Sealant Replacement - Precast Roof										
	210	Floor Sealant Replacement - Precast Covered Levels			$ 240,698							
	211	Rout and Seal Cracks			$ 12,188							
	212	Traffic Topping Repair			$ 479,234							
	213	Traffic Topping - New Installation										
	214	Concrete Sealer			$ 153,000							
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof			$ 15,525							
	217	Expansion Joint Replacement - Covered Levels								$ 31,050		
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000		$ 96,034					$ 3,105		
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ 1,056,372**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 34,155**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping			$ 7,219							
	303	Repair Existing Trench Drains										
	304	Clean and Paint Floor Drains & Piping			$ 19,250							
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000		$ 2,647					$ 1,000		
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ 29,116**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement				$ 150,000						
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000		$ 1,000	$ 15,000				$ 1,000		
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow			$ 7,590							
	502	Repaint Traffic Markings			$ 34,500							
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
		Miscellaneous Sub-Total	**$ -**	**$ -**	**$ 42,090**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 27,703	$ -	$ 1,413,804	$ 165,000	$ -	$ -	$ -	$ 37,155	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 1,662	$ -	$ 84,828	$ 9,900	$ -	$ -	$ -	$ 2,229	$ -	$ -
		Construction Total	**$ 29,366**	**$ -**	**$ 1,498,633**	**$ 174,900**	**$ -**	**$ -**	**$ -**	**$ 39,384**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 4,405	$ -	$ 224,795	$ 26,235	$ -	$ -	$ -	$ 5,908	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 4,405	$ -	$ 224,795	$ 26,235	$ -	$ -	$ -	$ 5,908	$ -	$ -
		Material Testing During Construction	$ 294	$ -	$ 14,986	$ 1,749	$ -	$ -	$ -	$ 394	$ -	$ -
		Project Cost Totals Per Year:	**$ 38,469**	**$ -**	**$ 1,963,209**	**$ 229,119**	**$ -**	**$ -**	**$ -**	**$ 51,593**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work. Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

VIENNA SOUTH GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 10,914			$ 98,225						
	102	Precast Tee Stem Repair				$ 7,476						
	103	Precast Beam Repair				$ 4,717						
	104	Precast Shear Connector Repair				$ 9,817						
	105	Precast Column/Wall Repair				$ 3,872						
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	114	Repair Expansion Joint Blockout	$ -									
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,637			$ 18,616						$ 1,000
		Structural Sub-Total	**$ 12,551**	**$ -**	**$ -**	**$ 142,724**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**
Waterproofing												
	202	Façade Sealant Replacement - Precast				$ 13,908						
	205	Cove Sealant Replacement - Precast Roof										
	206	Cove Sealant Replacement - Precast Covered Levels				$ 111,858						
	209	Floor Sealant Replacement - Precast Roof										
	210	Floor Sealant Replacement - Precast Covered Levels				$ 451,045						
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair				$ 159,825						$ 79,913
	213	Traffic Topping - New Installation				$ 72,000						
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof										
	217	Expansion Joint Replacement - Covered Levels	$ 287,500									
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 28,750			$ 80,864						$ 7,991
		Waterproofing Sub-Total	**$ 316,250**	**$ -**	**$ -**	**$ 889,500**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 87,904**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping	$ 7,219			$ 21,656						
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 2,166						$ 1,000
		Mechanical Sub-Total	**$ 8,219**	**$ -**	**$ -**	**$ 23,822**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**
Electrical												
	401	PARC System Replacement					$ 150,000					
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000	$ 15,000					$ 1,000
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow				$ 9,914						$ 9,914
	502	Repaint Traffic Markings				$ 45,063						$ 45,063
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door Hardware	$ 4,375									
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
		Miscellaneous Sub-Total	**$ 4,375**	**$ -**	**$ -**	**$ 54,976**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 54,976**
		Construction Subtotal	$ 342,395	$ -	$ -	$ 1,112,022	$ 165,000	$ -	$ -	$ -	$ -	$ 145,880
		Mobilization @ 6% of Construction Subtotal	$ 20,544	$ -	$ -	$ 66,721	$ 9,900	$ -	$ -	$ -	$ -	$ 8,753
		Construction Total	**$ 362,938**	**$ -**	**$ -**	**$ 1,178,743**	**$ 174,900**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 154,633**
		Project Contingency @ 15%	$ 54,441	$ -	$ -	$ 176,811	$ 26,235	$ -	$ -	$ -	$ -	$ 23,195
		Engineering: Contract Documents/Field Rep @ 15%	$ 54,441	$ -	$ -	$ 176,811	$ 26,235	$ -	$ -	$ -	$ -	$ 23,195
		Material Testing During Construction	$ 3,629	$ -	$ -	$ 11,787	$ 1,749	$ -	$ -	$ -	$ -	$ 1,546
		Project Cost Totals Per Year:	**$ 475,449**	**$ -**	**$ -**	**$ 1,544,153**	**$ 229,119**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 202,569**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work.
   Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

WEST FALLS CHURCH GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 6,482				$ 58,336					
	102	Precast Tee Stem Repair					$ 4,440					
	103	Precast Beam Repair					$ 2,802					
	104	Precast Shear Connector Repair					$ 5,830					
	105	Precast Column/Wall Repair					$ 2,300					
	109	Stair Tread Concrete Repair	$ 2,250									
	110	Epoxy Crack Injection					$ 1,463					
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,310				$ 11,276			$ 1,000		
		Structural Sub-Total	**$ 10,042**	**$ -**	**$ -**	**$ -**	**$ 86,446**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof								$ 17,414		
	206	Cove Sealant Replacement - Precast Covered Levels										
	209	Floor Sealant Replacement - Precast Roof								$ 63,718		
	210	Floor Sealant Replacement - Precast Covered Levels										
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation										
	214	Concrete Sealer					$ 25,600			$ 25,600		
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof								$ 7,475		
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases					$ 2,750					
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 2,835			$ 11,421		
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 31,185**	**$ -**	**$ -**	**$ 125,628**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping					$ 6,750					
	302	New Drain & Piping					$ 21,656					
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 2,841			$ 1,000		
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 31,247**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000	$ 15,000		$ 1,000		
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow					$ 5,431					
	502	Repaint Traffic Markings					$ 24,688			$ 24,688		
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
		Miscellaneous Sub-Total	**$ -**	**$ -**	**$ -**	**$ -**	**$ 30,119**	**$ -**	**$ -**	**$ 24,688**	**$ -**	**$ -**
		Construction Subtotal	$ 13,042	$ -	$ -	$ -	$ 179,996	$ 165,000	$ -	$ 153,316	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 782	$ -	$ -	$ -	$ 10,800	$ 9,900	$ -	$ 9,199	$ -	$ -
		Construction Total	**$ 13,824**	**$ -**	**$ -**	**$ -**	**$ 190,796**	**$ 174,900**	**$ -**	**$ 162,515**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 2,074	$ -	$ -	$ -	$ 28,619	$ 26,235	$ -	$ 24,377	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 2,074	$ -	$ -	$ -	$ 28,619	$ 26,235	$ -	$ 24,377	$ -	$ -
		Material Testing During Construction	$ 138	$ -	$ -	$ -	$ 1,908	$ 1,749	$ -	$ 1,625	$ -	$ -
		Project Cost Totals Per Year:	**$ 18,110**	**$ -**	**$ -**	**$ -**	**$ 249,943**	**$ 229,119**	**$ -**	**$ 212,894**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work.
   Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

WHEATON GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 1,814									
	105	Precast Column/Wall Repair				$ 3,217						
	106	P/T Slab Repair				$ 137,423						
	107	P/T Beam Repair				$ 17,675						
	108	P/T Column Repair				$ 11,054						
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair	$ 15,234			$ 15,234						
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 2,557			$ 27,690				$ 1,000		
		Structural Sub-Total	**$ 19,605**	**$ -**	**$ -**	**$ 212,294**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Waterproofing												
	201	Facade Sealant Replacement - P/T										
	203	Cove Sealant Replacement - P/T Roof										
	204	Cove Sealant Replacement - P/T Covered Levels										
	207	Floor Sealant Replacement - P/T Roof										
	208	Floor Sealant Replacement - P/T Covered Levels										
	211	Rout and Seal Cracks				$ 12,188						
	212	Traffic Topping Repair				$ 193,119				$ 171,256		
	213	Traffic Topping - New Installation										
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof				$ 38,094						
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000			$ 24,340				$ 17,126		
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 267,740**	**$ -**	**$ -**	**$ -**	**$ 188,382**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping				$ 7,219						
	303	Repair Existing Trench Drains										
	304	Repair Missing Downspout	$ 44									
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000				$ 1,000		
		Mechanical Sub-Total	**$ 1,044**	**$ -**	**$ -**	**$ 8,219**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement					$ 150,000					
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000	$ 15,000			$ 1,000		
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow				$ 4,263				$ 4,263		
	502	Repaint Traffic Markings				$ 19,375				$ 19,375		
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail	$ 19,500			$ 19,500						
		Miscellaneous Sub-Total	**$ 19,500**	**$ -**	**$ -**	**$ 43,138**	**$ -**	**$ -**	**$ -**	**$ 23,638**	**$ -**	**$ -**
		Construction Subtotal	$ 42,149	$ -	$ -	$ 532,390	$ 165,000	$ -	$ -	$ 215,019	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 2,529	$ -	$ -	$ 31,943	$ 9,900	$ -	$ -	$ 12,901	$ -	$ -
		Construction Total	**$ 44,678**	**$ -**	**$ -**	**$ 564,333**	**$ 174,900**	**$ -**	**$ -**	**$ 227,921**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 6,702	$ -	$ -	$ 84,650	$ 26,235	$ -	$ -	$ 34,188	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 6,702	$ -	$ -	$ 84,650	$ 26,235	$ -	$ -	$ 34,188	$ -	$ -
		Material Testing During Construction	$ 447	$ -	$ -	$ 5,643	$ 1,749	$ -	$ -	$ 2,279	$ -	$ -
		Project Cost Totals Per Year:	**$ 58,528**	**$ -**	**$ -**	**$ 739,277**	**$ 229,119**	**$ -**	**$ -**	**$ 298,576**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work. Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

WHITE FLINT GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 5,382		$ 48,438							
	102	Precast Tee Stem Repair			$ 3,687							
	103	Precast Beam Repair			$ 2,326							
	104	Precast Shear Connector Repair			$ 4,841							
	105	Precast Column/Wall Repair			$ 1,910							
	109	Stair Tread Concrete Repair	$ 21,000									
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 3,957		$ 9,180					$ 1,000		
		Structural Sub-Total	**$ 30,339**	**$ -**	**$ 70,382**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast								$ 7,455		
	205	Cove Sealant Replacement - Precast Roof			$ 22,735							
	206	Cove Sealant Replacement - Precast Covered Levels			$ 57,330							
	209	Floor Sealant Replacement - Precast Roof			$ 83,187							
	210	Floor Sealant Replacement - Precast Covered Levels			$ 231,170							
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair								$ 250,000		
	213	Traffic Topping - New Installation			$ 1,800,000							
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof			$ 30,188							
	217	Expansion Joint Replacement - Covered Levels			$ 120,750							
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000		$ 234,536					$ 25,745		
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ 2,579,897**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 283,200**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping			$ 14,438							
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000		$ 1,444					$ 1,000		
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ 15,881**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement				$ 150,000						
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000		$ 1,000	$ 15,000				$ 1,000		
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow			$ 5,335					$ 5,335		
	502	Repaint Traffic Markings			$ 24,250					$ 24,250		
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
	512	Repair Loose Sidewalk Brick	$ -									
		Miscellaneous Sub-Total	**$ -**	**$ -**	**$ 29,585**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 29,585**	**$ -**	**$ -**
		Construction Subtotal	$ 33,339	$ -	$ 2,696,745	$ 165,000	$ -	$ -	$ -	$ 315,785	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 2,000	$ -	$ 161,805	$ 9,900	$ -	$ -	$ -	$ 18,947	$ -	$ -
		Construction Total	**$ 35,340**	**$ -**	**$ 2,858,549**	**$ 174,900**	**$ -**	**$ -**	**$ -**	**$ 334,732**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 5,301	$ -	$ 428,782	$ 26,235	$ -	$ -	$ -	$ 50,210	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 5,301	$ -	$ 428,782	$ 26,235	$ -	$ -	$ -	$ 50,210	$ -	$ -
		Material Testing During Construction	$ 353	$ -	$ 28,585	$ 1,749	$ -	$ -	$ -	$ 3,347	$ -	$ -
		Project Cost Totals Per Year:	**$ 46,295**	**$ -**	**$ 3,744,699**	**$ 229,119**	**$ -**	**$ -**	**$ -**	**$ 438,499**	**$ -**	**$ -**

NOTES:

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2. Estimated costs are based on historical records of similar types of work. Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

Three similar garages prove the importance of regular maintenance to a positive bottom line.

By Gregory J. Neiderer, PE

Some parking facility owners and operators believe that as long as their structures continue to serve the public, few maintenance-related tasks need to be performed. Nothing could be further from the truth—facility maintenance is downright essential. One of the most important things an owner or operator can do to extend the life of a parking structure is formulate and implement a proper maintenance plan.

Case studies of three different parking garages in Pennsylvania clearly demonstrate that ongoing maintenance programs minimize repair costs. In fact, well-maintained garages have significantly lower annualized repair costs, while repairs for lightly-maintained garages cost operators and owners two to four times as much (on an inflation-adjusted basis).

Garage Condition

All three Pennsylvania garages investigated were built in the early 1970s. They were all designed by the same design firm and all experienced similar weathering. The primary difference between the three garages was the extent of known maintenance. To easily identify the facilities, they will be referred to by their geographic location within the state: Eastern, Central, and Western.

The three garages feature the same structural systems: cast-in-place lightweight concrete, one-way slab and beam floor systems reinforced with unbonded post-tensioned (P/T) tendons. The garages share the following characteristics:

- The lightweight concrete has poor freeze-thaw durability, which is partially offset by significant floor drainage slopes throughout most floor areas. Where drainage slopes are minimal, the slabs exhibited significant freeze-thaw damage.
- The P/T tendons are 7-strand wire protected by plastic sheathing with minimal concrete cover (less than 3/16 of an inch). This was between the driving surface and the tendons where they crossed above beams. This thin concrete layer wore through in a number of locations, leaving the tendons vulnerable after the plastic sheathing also wore through. At locations where the sheathing had worn away, the tendons corroded and then broke.
- Perimeter walls consist of either concrete or clay hollow cell block similar to—but only half the height of—common concrete block (CMU). In the Eastern and Central garages, every other cell was grouted solid, while in the Western garage, all cells were grouted solid. The Eastern and Central garages sustained significant damage from having water trapped in the un-grouted (empty) cells. This was from water slowly saturating the concrete and tendons beneath it.

The Western garage had supplementary slab rebar to provide a safety mechanism for tendon failure. When these rebars corroded, they became a significant deterioration mechanism as well.

Condition on Investigation

Constructed in 1973, the Eastern garage is a 420-space, five-level facility. The garage's maintenance history was unknown, but appeared to consist of light maintenance (primarily repairing exposed broken slab tendons and installing weep holes into perimeter masonry walls to alleviate water storage within the ungrounded cells). During the investigation, the garage's critical issues were extensive perimeter wall and slab edge deterioration on the upper two levels (due to water saturation from the perimeter walls' ungrouted cells), localized slab P/T tendon breakage above beams, chloride-contaminated concrete, and brittle joint sealants.

Constructed in 1972, the Western parking garage is a 300-space, four-level facility. The maintenance history was unknown, but appeared to consist of light maintenance (primarily removing loose concrete and patching of spalls). This garage received a unique vertical expansion down into the soil beneath a portion of the facility (to make room for a 10,000-square-foot bus/train waiting area). During this project, a traffic-bearing, waterproofing membrane was installed above the waiting area and joint sealants were replaced. During the investigation, the garage's critical issues consisted of extensive slab freeze-thaw damage at roof-level flat areas, freeze-thaw damage to numerous beam and slab edges, localized slab P/T tendon breakage above beams, extensive rebar corrosion and concrete spalling over the top of beams, chloride contaminated concrete, brittle joint sealants, and a worn-out membrane.

Constructed in 1973, the Central garage is a 490-space, five-level facility. This garage was judged to be in fair condition, except for a 5,500-square-foot portion of the roof level where minimal floor drainage exhibited a significant number of broken slab P/T tendons. The known maintenance history consisted of two sets of structural and waterproofing repairs, as well as architectural reno-

Figure 1

	Eastern Garage (2004 Report)				Central Garage (1998 Report)						Western Garage (2003 Report)		
	Option 1	Option 2	Option 3	Option 4	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 1	Option 2	Option 3
Average Life Span (Years)	1	7.5	25	45	5	7.5	13.5	16	17.5	45	4	10	20
Total Project Cost in ($1,000)	$228	$2,179	$3,549	$9,429	$328	$855	$1,102	$1,149	$2,002	$5,668	$1,392	$1,895	$2,584
Structural Project Cost (in $1,000)	$139	$1,223	$2,216	$6,506	$253	$684	$882	$898	$1,624	$4,788	$899	$1,262	$1,855
Structural Project Cost/Car	$334	$2,940	$5,329	$15,639	$521	$1,407	$1,815	$1,848	$3,342	$9,852	$2,997	$4,207	$6,183
Cost/Space/Year in Report	$334	$392	$213	$348	$104	$188	$134	$115	$191	$219	$749	$421	$309
Cost/Space/Year in 2012 Dollars	$405	$475	$258	$421	$147	$265	$190	$163	$270	$309	$939	$527	$387

vations (the original perimeter wall was replaced with a brick-faced concrete wall). During the investigation, the garage's critical issues were the extensive P/T tendon damage at flat areas of the roof level, moderate slab edge deterioration due to water leakage through the original perimeter wall and then through the brick façade, chloride contaminated concrete, and brittle joint sealants.

Structural Repair Options

Detailed here are the structural repair options along with costs and lifespans for the garages. Excluded are non-structural costs included in the final repair options' costs. These, while real, varied greatly by client preference and constraints. These non-structural costs included lost revenue; construction management fees; design fees and contingencies; and lighting, elevator, parking equipment, and occupied space upgrades. Structural repair option costs include structural repairs and waterproofing to protect the structural repairs. Unless specifically noted, all repair options were designed to allow for another life extension at the end of the proposed repair (See Figure 1 for details).

- The Eastern garage had several proposed repair options: one-year life extension at $139,000; five-to-10-year life extension at $1,223,000; 20-to-30-year life extension at $2,216,000; and replacement with a new garage with a 45-year-plus lifespan at $6,506,000.
- The Western garage had these proposed repair options: three-to-five-year life extension at $889,000; seven-to-12-year life extension at $1,262,000; and 15-to-25-year life extension at $1,855,000. No replacement option was desired based on the anticipated lack of future additional parking demand and the resulting inability to recoup the large costs of a new facility.
- The Central garage had these proposed repair options: three-to-seven-year life extension at $253,000 (this option required demolition shortly past year 10); five-to-10-year life extension at $684,000; 12-to-15-year life extension at $882,000; 14-to-19-year life extension at $898,000; 15-to-20-year life extension at $1,624,000; and replacement with a new garage with a 45-year-plus lifespan at $4,788,000.

The repair options presented different challenges to each garage owner. Owners typically look at monetary factors such as total cost, length of life extensions, and the remaining durations of outstanding bonds, as well as non-monetary considerations that include the political environment and anticipated future parking demand. Newer parking garages often have significant annual bond payments as compared to revenues, while older garages with small or no annual bond payments provide strong cash flow to subsidize other newer garages or the entire parking system. New parking garages rarely provide significant positive cash flow because they compete with much cheaper on-street parking (which is generally paid for with either gasoline excise or property taxes) and are provided as a public service with no intent of generating significant positive cash flow.

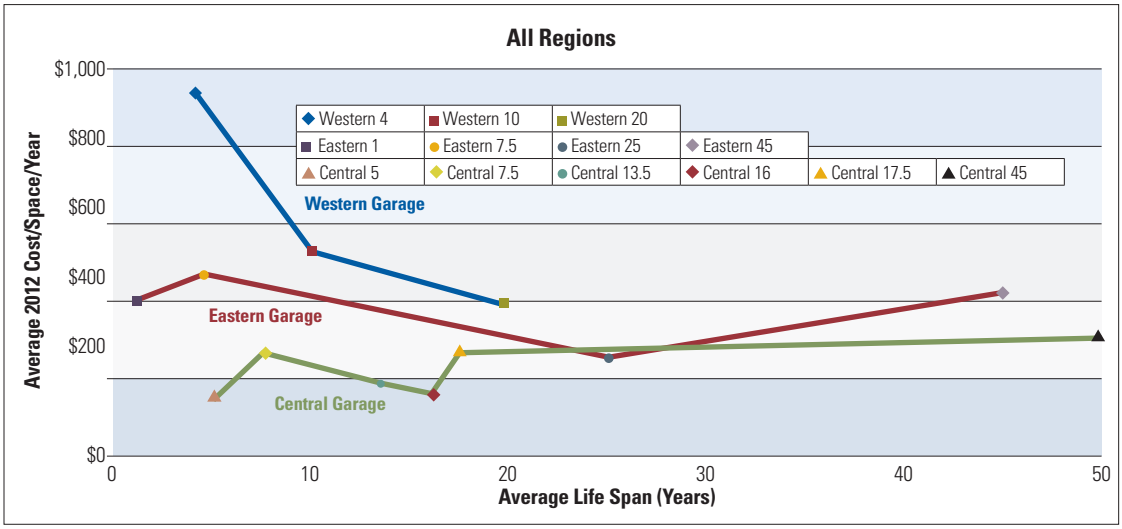
It's recommended to owners that when analyzing monetary factors, one should look primarily at the annualized cost effectiveness—or the ace—which is defined as cost-per-space per year (total cost divided by number of spaces divided by the mid-point between the anticipated lower and upper repair life spans).

Owners are also urged to look at total cost. The ace highlights the relative cost effectiveness of each option, while the total cost highlights total funding needs. Total cost often influences the political consequences of requesting funding and interacts with the anticipated likelihood of future parking demand and the current political will to fund anticipated future parking supply.

Selected Courses

The Eastern garage had four options presented, with a 20-to 30-year life extension being the most cost-effective. The facility's owner decided that additional parking demand was necessary for community growth. A demolish-and-re-

Figure 2



build solution was chosen: Minimal garage repairs were made to maintain safety until the facility was demolished and a new 680-space, seven-level garage was built with a construction cost of approximately $12.1 million.

The Western garage had three options, with a 15- to 25-year life extension being the most cost-effective. The owner chose the life extension based on its cost effectiveness and a low anticipation for future parking demand increase. The owner then proceeded with small repairs until funds became available to repair the garage in three phases. Construction costs totaled just less than $2 million.

The Central garage had six options presented, with a 14- to 18-year life extension being the most cost-effective. The owner chose the life extension based on its cost effectiveness, as future parking demand—while anticipated to increase—was uncertain as to the rate of growth and there was time before a new facility was needed. The garage was repaired in one phase with a construction cost totaling $1.5 million. A new 525-space, six-level garage with 20,000 square feet of retail was built several blocks away. The construction cost was $11.1 million.

Cost Comparison

Due to the effects of inflation on pricing, the U.S. Department of Labor's Bureau of Labor Statistics numbers were used to translate the ace pricing from each investigation into October 2012, prices. Figure 1 compares repair options with the translated ace pricing.

Figure 2 shows the translated ace costs versus option lifespan for all three garages.

The following conclusions can be inferred from the table and graph:

- The garage with the known comprehensive maintenance history had the most economical ace. The garages with apparent little maintenance history had ace that was typically two to five times as expensive for similar lifespans as the comprehensively maintained garage.
- Shorter term repairs typically have smaller total costs but also are less cost-effective (have higher aces) in extending the lifespan of a facility.
- There is typically an optimum repair scenario that extends the lifespan most cost-effectively.
- New garages are typically not the most cost-effective way to continue to provide structured parking supply, but it is difficult to accurately compare costs. It's particularly difficult to project maintenance costs throughout a new garage's lifespan, as this will significantly change the ace for the option. There is also difficulty in direct comparison because new garages often have non-mandatory items (such as faster elevators, surveillance equipment, emergency power systems, and better durability resistance) and mandatory items (more robust earthquake resistance) that simply did not exist when these garages were built. Other non-monetary issues that may be considered important are that new garages may be politically more acceptable than repairs, because old, repaired garages often appear similar to the general public when compared to their pre-repair appearance; newer features can be added; and few people may notice the increase in annual bond payments.

An interesting note is that the parking efficiency—the square feet per car—(which is set at the time of construction) affects maintenance costs. The Western garage has about 12 percent more square feet per car. Since every square foot must be maintained and repaired, the facility's costs are 12 percent higher due to is configuration based on "per space" repairs.

The Importance of Maintenance Plans

Parking facilities differ from most buildings because, like bridges, they are subject to weathering, large thermal cycles, and de-icing salts. To counteract these factors and cost-effectively prolong their lifespan, a carefully planned and monitored maintenance plan will minimize the total cost of ownership. Ⓟ

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WHY SHOULD I CARE ABOUT THE GARAGE?

MONEY.

The typical cost per parking space to build a freestanding parking garage is between $7,000 and $12,000 dollars. Repair costs of $1,000 to $5,000 per space are common. Garages are often large, rivaling the size of the buildings for which they provide parking. Typical demand requirements are one parking space for every 200 to 350 square feet of net leaseable space. Typical parking garages will require 300 to 340 square feet per parking space. Based on the above, it can be seen that the garage can exceed the size of the building. They often cost 15 to 20 percent of total project cost and can have a significant impact on profitability

Why Maintain a Building?

Most commercial buildings have two functions - they provide office, manufacturing or retail space to the occupants and they provide a return on investment to the owners. Buying, selling and operating the building for less than the lease revenue determines the return on the investment. Like other buildings, a parking structure's market value is affected by its physical shape. The rate of return from lease revenue and the buyer's opinion of repair costs often determine a buyer's offer to purchase. Appropriate maintenance is a good investment since it increases the sales price and reduces repair costs during ownership.

Unlike commercial buildings, buildings owned by hospitals, universities, and municipalities rely on funding from outside agencies or a public tax base. Prudent maintenance reduces repair costs and frees funds for healing, teaching and protecting.

Deferring maintenance has little immediate impact, but the effect increases exponentially as time passes. Maintenance neglect may impact an owner during a sale when buyers or mortgage lenders want to discount the building's value.

Unfortunately, many owner/operators learn about the costs associated with the repair of typical types of advanced deterioration only when they are forced to deal with (and live through) the actual repairs.

What Makes a Parking Garage Different?

Parking structures commonly have different maintenance requirements compared to other commercial buildings: utility costs are less, HVAC and fire protection systems are minimal, tenant complaints are few, and repairs are usually structural in nature. Open parking structures are exposed to wide temperature swings, rain, snow, freezing and thawing, application of deicing chemicals and ultraviolet exposure. Building codes typically consider parking structures open based on the percentage of openings in the façade. This eliminates the need for HVAC and fire sprinkler systems.

The garage's structural system affects its durability and therefore, maintenance costs. The structural design is either short span (typically 30± -foot bays) or long span (typically 60± -foot bays). While short spans often have lower per square foot costs, they often require more area for each parking space. The net result is often a higher cost per space both to build and to maintain. Another drawback of short span construction is poor flexibility to restripe parking spaces as vehicle size changes.

The two most common structural systems for long span open parking structures are the precast double tee slab system, and the post-tensioned slab and beam systems. These two systems provide durable, cost-effective long span structures. Other structural systems such as two-way or one way mildly reinforced flat slabs, two-way waffle slabs, one-way mildly reinforced joist pan, precast plank and steel system are also used for garages, but are typically less efficient and durable. Each system has its own strengths and weaknesses.

The location of the parking structure also requires cost con-

BY GREGORY J. NEIDERER, P.E.

sideration. A parking structure built in Chicago require higher durability characteristics to resist the weather and salt contamination as compared to a parking structure built in Dallas.

What Causes Deterioration?

Most deterioration can be attributed to poor quality concrete, chloride ion (salt) contamination, inadequate drainage, inadequate thermal expansion or waterproofing system failure.

Poor quality concrete lacks the density to resist chloride ion contamination or the microscopic air entrainment to resist the freezing and thawing cycle.

Chloride ion contamination wrecks havoc when the ions contact embedded steel causing it to rust. The rusting steel swells in size causing spalling (potholes) and loses its ability to support the structure.

Inadequate drainage causes water- ponding creating slipping hazards and accelerating water-induced damage.

Inadequate thermal expansion creates tearing, ripping and crushing at joints unable to accept the thermal growth caused by wide temperature swings.

Failed waterproofing systems permit water to leak into joints, cracks and concrete itself rather then running off the structure. The leakage accelerates rusting, rotting and other water damage.

In many cases, the damage is hidden in the early stages and does not become readily apparent until the damage is widespread.

Routine Cleaning Versus Maintenance

Like all buildings, open parking structures require routine cleaning and maintenance.

Routine cleaning typically includes, washing down the floors, sweeping, inspecting the waterproofing, replacing lights, regular upkeep on stairs, elevators, security equipment and access and revenue equipment. Washing the floors is of particular importance during and after the winter. This washing removes salts from the floor surface before they penetrate into the concrete.

Structural maintenance includes expansion and control joint maintenance, monitoring chloride ion intrusion, waterproofing repairs and concrete repairs. The responsibility for both cleaning and maintenance varies between owner and tenant based on the negotiated agreements. (A word of caution: the potential financial impact of poor structural maintenance can be quite large.)

An appropriate analogy for parking structure cleaning and maintenance is washing and waxing your car. Most people understand the need for this maintenance, especially after driving for a winter on salt laden roads. The consequence of no maintenance or cleaning will be — sooner or later — an expensive repair bill on the rusting car. Yet people are surprised when they have a large repair bill on a parking structure that endured many winters without maintenance. The analogy continues with the fact that maintenance can be ignored for a long time. When finally recognized, the cost to repair can be painfully large.

To clarify this issue, we will review two hypothetical, but realistic examples of good versus poor maintenance on a typical 15-year-old parking structure with 500 supported spaces in an area with snow-laden winters. Costs for washing down the floors were included even though they are routine cleaning costs because they do affect maintenance costs. In these examples the parking structures were either maintained or repairs were necessary and completed so that the garages were in similar visual condition at the end of the 15th year. The costs and quantities exclude slab-on-grade parking since these spaces do not require much maintenance and unnecessarily complicate the examples.

CHART 1

COSTS FOR WELL-MAINTAINED GARAGE A-1

ITEM	YEAR(S) WHEN WORK PERFORMED	DESCRIPTION OF WORK	SUM OF COST OVER LIFESPAN
A	8, 15	Replace all Joint Sealant and Expansion Joints	$160,000.00
B	8, 15	Penetrating Sealer on Field Cast Concrete Wash (16,000 sf @ 50¢/sf)	$16,000.00
C	Every year	Wash down Floor (160,000 sf @ 2¢/sf)	$48,000.00
D	8, 15	Lost revenue during repairs (50 contractor occupied spaces per week for 4 weeks @ 50/week)	$20,000.00
TOTAL COST			$244,000.00
TOTAL COST PER SQUARE FOOT PER YEAR			$0.10
TOTAL COST PER SPACE PER YEAR			$33.00

Garage A: Precast Double Tee Structural System

Garage A is a precast concrete double tee long span parking structure with a total supported area of 160,000 square feet at 320 square feet per space. There are a large number of joints that require maintenance. Approximately every 8 years, the sealant in these joints should be replaced. In Garage A, the total length of joints is between 5 to 7 miles which can cost $40,000 to $80,000 to replace.

After 15 years, the Well-Maintained Garage A has had its joint system replaced twice, but because of this maintenance, little else has been necessary. Garage A-1 had the following maintenance costs (see chart 1).

The Poorly-Maintained Garage A did not replace its joint system. Therefore, water leaked through the failing joints which initiated and accelerated the rusting of the embedded steel connection plates found within the joints. These plates rusted, and started to break by the fifteenth year. Garage A-2 had the following costs (see chart 2).

CHART 2

COSTS FOR POORLY-MAINTAINED GARAGE A-2

ITEM	YEAR(S) WHEN WORK PERFORMED	DESCRIPTION OF WORK	SUM OF COST OVER LIFESPAN
A	15	Replace all Joint Sealant and Expansion Joints	$80,000.00
B	15	Clean and paint 85% of steel connectors between double tee (2,500 connectors @ $90 each)	$225,000.00
C	15	Double tee edge repairs at same connectors (2500 locations @ $50 each)	$125,000.00
D	15	Replace 25% of field cast concrete approximately 4,000 sf @ $25/sf	$100,000.00
E	15	Lost revenue—100 contractor occupied spaces per week x 16 weeks @ $50/week	$80,000.00
TOTAL COST			$610,000.00
TOTAL COST PER SQUARE FOOT PER YEAR			$0.25
TOTAL COST PER SPACE PER YEAR			$81.00

Garage B: Cast-In-Place Flat slab Structural System

Garage B is a steel reinforced two-way field cast concrete solid slab parking structure with a total supported area of 175,000 square feet at 350 square feet per space. This short-span garage requires 30 more square feet (10% more area) per parking space primarily due to column location. Also, the repair program is different from Garage A, not only in that it costs more per space but also because short span structures have poor durability characteristics.

After 15 years, the Well-Maintained Garage B had a traffic topping installed to address the extensive cracking, and the topping recoated as it wore under heavy traffic. Garage B-1 had the following costs (see chart 3).

The cracks in the Poorly-Maintained Garage B-2 were not repaired and salt-laden water traveled through these cracks to the reinforcing steel. The steel rusted causing extensive spalling, rendering the garage undesirable to the public. Garage B-2 required

CHART 3

COST FOR WELL-MAINTAINED GARAGE B-1

ITEM	YEAR(S) WHEN WORK PERFORMED	DESCRIPTION OF WORK	SUM OF COST OVER LIFESPAN
A	1	Install traffic topping over entire surface at $3/sf.	$525,000.00
B	8, 15	Recoat traffic topping over areas of wear (35% of area @ $1/sf.)	$122,500.00
C	Every year	Wash down garage @ 2c/sf.	$52,500.00
D	1	Lost revenue during repairs (recoating done at night) original coating done over entire garage (500 contractor occupied spaces, per day for 4 days @ $10/space/day	$20,000.00
TOTAL COST			$720,000.00
TOTAL COST PER SQUARE FOOT PER YEAR			$0.28
TOTAL COST PER SPACE PER YEAR			$92.00

significant spot patching at spalled areas and a traffic topping to reduce the rate of future spalling. Garage B-2 had the following repairs (see chart 4).

Important Simplifications Used in the Examples

In the above examples, the total maintenance costs for poorly maintained garages were roughly 2.5 times greater these for well maintained garages. These examples were simplified in five important ways that understate the additional costs incurred by poor maintenance. These simplifications are:

1. Indirect Project Costs – Engineering and field inspection fees, contractor overhead costs, internal owner project management, and lending fees were ignored. These costs typically increase project costs by 15% to 25% and further exaggerate the difference between poorly and well maintained decks.

2. We assumed that major structural damage did not occur. Poorly-built and -maintained structures deteriorate more quickly than the examples used, and repairs can sometimes cost as much as the economic value of the building in a relatively short time.

3. The time between successive repair programs typically becomes shorter if structures are not repaired until seriously damaged. This is due to the fact that chloride ion contamination, alkali-silica reaction, and poor freeze/thaw resistance are currently very difficult to cost-effectively eliminate. Most lower-cost repair schemes attempt to reduce the rate of deterioration, not eliminate it.

4. The cost to defend against slip and fall or trip and fall lawsuits has been excluded. Frozen water ponds create slipping hazards. Exposed steel and spalls create tripping hazards. Lawsuits from slipping or tripping in a garage constitutes approximately 75% of all lawsuits filed against garage owners. Lawsuits for medical costs alone often exceed the $500 to $4,000 supplemental drain installation cost. Lawsuits including pain and suffering and lost wages can easily exceed the cost for a supplemental drain installation by a factor of ten or more.

5. The time value of money and the consequences of inflation were ignored for the examples, but they do exist.

The net result is that poor maintenance is likely to cost 3 to 4 times as much as good maintenance. Of course, if the parking structure can be sold to a new owner without repairs or a sale price reduction for repairs, then the first owner does save money on maintenance. However, the new owner spends the money "saved" by the first owner. The deterioration does not "self heal". Someone will have to pay to fix it — sooner or later. Not maintaining the garage starts an expensive game of musical chairs, except at the end, the last owner pays a big repair bill. Also, most property owners and lenders are becoming aware of the potential repair liability in parking structures. This awareness increases the probability of a discount at sale or when obtaining a mortgage for poorly maintained structures. Repair costs between 5% to 30% of the market value are common for a poorly maintained parking structure.

CHART 4

COSTS FOR POORLY-MAINTAINED GARAGE B-2

ITEM	YEAR(S) WHEN WORK PERFORMED	DESCRIPTION OF WORK	SUM OF COST OVER LIFESPAN
A	15	Concrete repair 20% of area (35,000 sf) @ $30/sf.	$1,050,000.00
B	15	Install traffic topping over entire surface @ $3/sf.	$525,000.00
C	15	Lost revenue during repair (100 contractor occupied spaces per week for 20 weeks @ $50 per space per week	$100,000.00
TOTAL COST			$1,675,000.00
TOTAL COST PER SQUARE FOOT PER YEAR			$0.64
TOTAL COST PER SPACE PER YEAR			$223.00

Maintenance Strategies

To reduce repair costs, the strategy is simple: KEEP WATER OUT! Maintenance of the waterproofing system can help prevent leaks from affecting embedded steel and lighting systems, as well as deter water ponding. A moderate waterproofing maintenance program should occur every 7 to 10 years, since this is the life span of most waterproofing materials. A more sophisticated maintenance plan also includes monitoring chloride ion concentrate to upgrade waterproofing, if necessary, before deterioration begins.

What is a Reasonable Maintenance Budget?

A reasonable maintenance budget depends on a number of factors, including the type of repair, the level of deterioration, the square footage areas and the desired lifespan for these repairs.

The range of typical maintenance and repair unit costs is as follows (see chart 5).

Since each parking structure

CHART 5

TYPE OF REPAIR	RANGE OF COST	LIFESPAN
Routing and Sealing Cracks	$1 to $1/1f	5 to 12 yrs.
Replacing Joint Sealant	$1 to $3/1f	5 to 12 yrs.
Replacing Expansion Joints	$10 to $100/1f	9 to 12 yrs.
Repairing Floor Spalls	$10 to $40/1f	3 to 5 yrs.
Repairing Ceiling Spalls	$40 to $100/sf	3 to 12 yrs.
Installing Supplementary Drains & Piping	$500 to $4,000/each	20+ yrs.
Penetrating Sealer	$0.20 to $0.60/sf	4 to 6 yrs.
Traffic Bearing Membrane	$2 to $5/sf	4 to 12 yrs.

has different physical layouts and levels of deterioration, a Condition Appraisal survey is the best way to determine the extent of deterioration. Also, discussions with the Owner are necessary to determine the desired time span until additional repairs are required. Repairs for a 20-year time span will cost more than a 10-year time span, which in turn will cost more than a 2-year time span. However, the average annual cost may be more or less for an initially more expensive, but longer lasting repair program based on the specific conditions. To find out which repair costs the least over time requires further analysis.

The maintenance budget for a well-maintained garage should be in the range of $30 to $90 per space per year (10¢ to 30¢ per square foot per year) based on the location, age and structural system. Typical maintenance activities can be done during periods of low parking demand reducing the impact on revenue. If maintenance is neglected, repairs become necessary and can often impact revenues as well as increased ownership costs.

SUMMARY

Each year, parking structure owners and operators all over the country face major unwanted "surprises" in their parking structures. Either through lack of knowledge, awareness, or budget, their parking structures have deteriorated to the point of needed major repairs. Repairs that cost a great deal. Repairs that, in many cases, would not have been necessary if the parking structure had been properly maintained on a regular basis since it was put into service. ■

ADDISON ROAD

WALKER
RESTORATION CONSULTANTS

The summary data for the facility is as follows:

Table ADDIS-1: Facility Information Summary

	ADDISON ROAD – SEAT PLEASANT
Location:	100 Addison Road South Capitol Heights, MD
Overall Condition:	**FAIR**
Current Needs:	**MINOR**
Chloride Contamination:	**MINOR**
Year built:	1980
Supported Levels:	3
Levels Below Grade:	1
Parking Space Capacity:	1,268
Parking Efficiency:	353 SF/Space
Footprint:	Approximately 300' x 410'
Bridges:	1 Pedestrian
Vehicle Circulation:	Single Helix
Pedestrian Circulation:	7 Stairs, 1 Elevator
Parking Area: Ground (S.O.G.) Total Supported Area Total Parking Area	 147,000 ± SF 301,000 ± SF 448,000 ± SF
Structural System:	Precast Un-topped Double Tee
Façade Spandrel Treatment:	Precast with Full Thickness Brick

FACILITY DESCRIPTION

NORTH VIEW

SOUTH VIEW

EAST VIEW

WEST VIEW

PLAN VIEW

EXECUTIVE SUMMARY

This 1980 garage is in fair shape, has minor chloride contamination and has minor current repair needs

Its scheduled repairs are anticipated to cost:

2020 – Near Term - $534,144
2022 – Long-term - $253,075

See Appendix A for cost details.

CRITICAL REPAIRS

The following safety related items requiring urgent action were identified in our 5/22/14 email to Metro:

1. Overhead spalls
2. At grade bulging brick
3. Floor slab spalls
4. Unpainted curbs/ramps/wheel stops (trip hazard)
5. Ponding water

Please see the above reference email, found in Appendix E, for more detail and recommended actions. We have no further immediate concerns.

NEAR-TERM REPAIRS

Due to the age and condition of the garage we recommend most of the non-critical repairs be completed in 2020, year five of the master repair plan. These near-term repairs include addressing the structural items found including:

1. Remove and replace bulging brick on spandrels with brick anchored with masonry ties.
2. Install capstones in lieu of brick soldier course.
3. Remove and replace concrete slab on grade floor spalls
4. Repaint traffic markings
5. Repaint curbs
6. Repaint stairtower nosing

Based on chloride test results, we so not recommend any improvements to protect the floor structural system.

LONG-TERM REPAIRS

Long term repairs include a second round of structural and waterproofing repairs in 2022, two years after the near-term repairs to address continued deterioration of the concrete and the end of the useful life of the waterproofing products. Long-term repairs items include the following:

1. Replace façade joint sealants
2. Replace roof level expansion joint glands
3. Repair roof level drive lane traffic topping

CONDITION ASSESSMENT

OBSERVATIONS AND DISCUSSION

The following observations were made during a facility walk through on the May 19 to 20, 2014 site visit. Photographs referenced within the observations are found in Appendix B of the report. Observations are immediately followed by a brief discussion of the repair in italics.

1. Roof level floor sealants are in good condition beneath traffic topping. (Photo 1)
2. Interior floor sealants are in good condition and require replacement within 10 years.
3. Roof level expansion joints are in good condition and require replacement within 10 years. (Photo 1)
4. Interior level expansion joints are in good condition and require replacement beyond 10 years.
5. The roof level wash traffic topping is in good shape (Photo 1).
6. Changes in floor elevation wheel stops, curbs, handicap ramps, are not readily visually apparent and require painting now with safety yellow paint to emphasize elevations changes (Photo 2)
7. Minor slab ceilling (soffit) delaminations were observed and loose concrete requires removal now. (Photo 4)
8. Moderate stair soffit delaminations was observed and loose concrete requires removal now. (Photo 15,16)
9. Much of the slab on grade was observed to be spalled which requires repair. (Photo 18)
10. The perimeter spandrels are clad in brick which is

extensively leaching and requires header course replacement now. (Photo 6,7,8,9,10)

11. Some of the stairtower brick cladding is extensively leaching and requires header course replacement now. (Photos 11,12)
12. A moderate amount of localized ponding was observed and new supplemental drains need to be installed. (Photo 3)
13. At several stairs, a trip hazard exits at the door opening. The trip hazard is a change in elevation between the inside and outside of the stair. A landing and railing should be installed outside the stair tower to alleviate the trip hazard. (Photo 14)
14. At the bottom of several stairs, an area beneath is open which creates a potential area for trash accumulation or a hiding place for assailants. (Photo 14)

MATERIAL TESTING

Concrete powder samples were extracted from floor surfaces of the roof and intermediate supported levels of the parking garage as shown in Appendix C. The chloride content was determined at 3 locations: near the surface (0-1 inch depth), near the design location for top reinforcing steel/tee connections (1 to 2 inch depth), and near the center of the slab (2 to 3 inch depth). Locations were taken in both cast-in-place concrete as well as precast concrete, if present, to determine the extent of chloride contamination in these differing concretes. The results are included in Appendix D. These chloride contents provide an indication of the current and expected future deterioration of the parking structure due to chloride-induced corrosion of the reinforcing steel. A typical threshold chloride value for the onset of corrosion is between 280 and 410 parts per million. The determined values are defined as minor (less than 200 ppm at the 1 to 2 inch depth), moderate (between 200 ppm and 400 ppm at the 1 to 2 inch depth, and large (greater than 400 ppm at the 1 to 2 inch depth. The extent of chloride contamination directly influences our recommended floor surface treatment (nothing, penetrating sealer, traffic topping).

The summary of chlorides test results in Appendix C are;

Level	Depth	Type	PPM
2	1 to 2	P/C	190
3	1 to 2	CIP	30
4	1 to 2	CIP	160

APPENDIX A

WALKER
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ADDISON ROAD GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 6,603				$ 59,429					
	102	Precast Tee Stem Repair					$ 4,523					
	103	Precast Beam Repair					$ 2,854					
	104	Precast Shear Connector Repair					$ 5,939					
	105	Precast Column/Wall Repair					$ 2,343					
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair	$ 4,688				$ 4,688					
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	114	Install Capstones in lieu of Brick Soldier Course					$ 209,063					
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,694				$ 43,326			$ 1,000		
		Structural Sub-Total	**$ 12,984**	**$ -**	**$ -**	**$ -**	**$ 332,164**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast								$ -		
	205	Cove Sealant Replacement - Precast Roof										
	206	Cove Sealant Replacement - Precast Covered Levels										
	209	Floor Sealant Replacement - Precast Roof										
	210	Floor Sealant Replacement - Precast Covered Levels										
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair								$ 119,831		
	213	Traffic Topping - New Installation										
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof								$ 43,125		
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	219											
	220											
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000			$ 16,296		
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ 179,252**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping	$ 4,813									
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000			$ 1,000		
		Mechanical Sub-Total	**$ 5,813**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000					$ 15,000		$ 1,000		
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 165,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow	$ 6,160									
	502	Repaint Traffic Markings					$ 28,000					
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings					$ 22,500					
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
	512											
		Miscellaneous Sub-Total	**$ 6,160**	**$ -**	**$ -**	**$ -**	**$ 50,500**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 26,957	$ -	$ -	$ -	$ 384,664	$ 165,000	$ -	$ 182,252	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 1,617	$ -	$ -	$ -	$ 23,080	$ 9,900	$ -	$ 10,935	$ -	$ -
		Construction Total	**$ 28,574**	**$ -**	**$ -**	**$ -**	**$ 407,744**	**$ 174,900**	**$ -**	**$ 193,187**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 4,286	$ -	$ -	$ -	$ 61,162	$ 26,235	$ -	$ 28,978	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 4,286	$ -	$ -	$ -	$ 61,162	$ 26,235	$ -	$ 28,978	$ -	$ -
		Material Testing During Construction	$ 286	$ -	$ -	$ -	$ 4,077	$ 1,749	$ -	$ 1,932	$ -	$ -
		Project Cost Totals Per Year:	**$ 37,432**	**$ -**	**$ -**	**$ -**	**$ 534,144**	**$ 229,119**	**$ -**	**$ 253,075**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work. Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

APPENDIX B

WALKER
RESTORATION CONSULTANTS

Photo 1

Expansion joint and roof level traffic topping in good shape.

Photo 2

Unpainted wheel stops along potential pedestrian path. Wheel stops are recommended to be painted yellow or removed.

Photo 3

Staining indicates ponding at top level.

Photo 4

Soffit has spalls at shear wall.

Photo 5

Traffic Topping typical at lower level perimeter and interior washes, including ramps.

Rusting within speed ramp floor.

Photo 6

Exterior brick façade exhibits extensive mortar leaching.

Photo 7

Leaching through mortar joints on the spandrel.

Photo 8

Buckled bricks on header course of spandrel

Photo 9

Buckled bricks on header course above concrete spandrel. Same location as photo 9.

Deteriorated sealant at mortar joint in concrete spandrel.

Photo 10

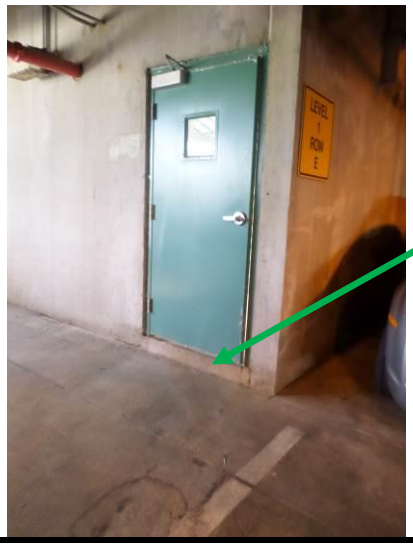
Stair tower façade.

Leaching through mortar joints at stair tower.

Photo 11

Close-up of leaching through mortar joints at stair tower.

Photo 12



Several stair towers require landing to eliminate trip hazard.

Photo 13

Open area underneath stairs is a potential area for trash accumulation or assaults.

Stair landing and treads are traffic topped.

Photo 14

Cracking and spalls underneath stairs.

Photo 15

Spalls underneath stairs.

Photo 16

Pedestrian Bridge.

Photo 17

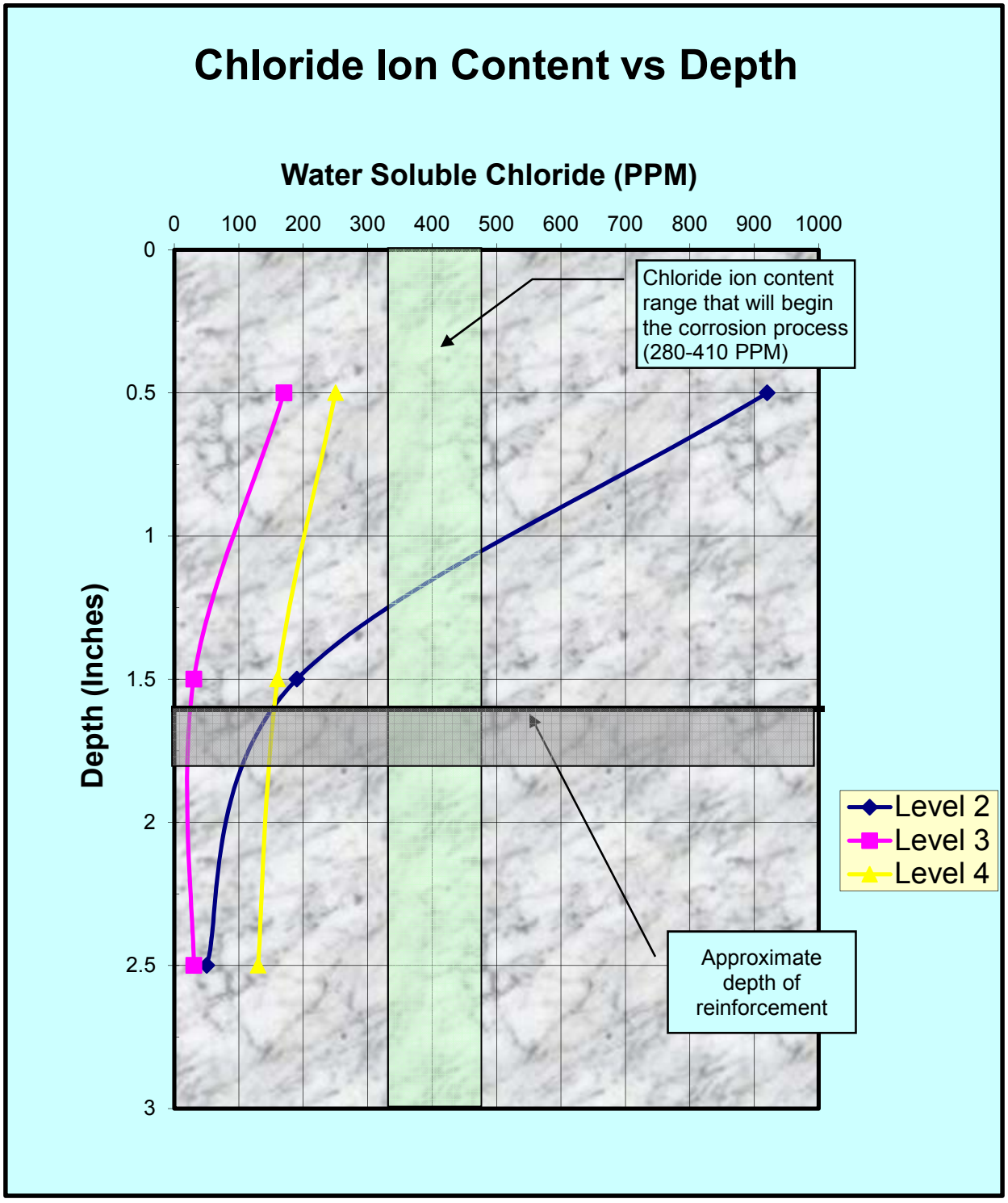
Slab on grade pavement is heavily spalled.

Photo 18

APPENDIX C

WALKER
RESTORATION CONSULTANTS

Project # 14-3944.04
Date Jun-14



UNIVERSAL CONSTRUCTION TESTING, Ltd.

Project: Washington Metropolitan Area Transit Authority
Maryland, Virginia & Washington DC

UCT Project No. 14084
Walker Project No. 14-3994.00

Client: Walker Restoration Consultants

Date: May 12, 2014

Table 1.1. **Chloride Content of Concrete**
(Water-Soluble)
AASHTO T 260

Sample Number	Location in Structure	Level tested, inch from top	Chloride ion (CL^-) Content		
			by weight of concrete %	by weight of cement* %	by weight of concrete (ppm)*
Addison Garage					
2	Level 2	0-1	0.092	**0.58**	920
	Intermediate	1-2	0.019	**0.12**	190
		2-3	0.005	**0.04**	50
3	Level 3	0-1	0.017	**0.11**	170
	Intermediate	1-2	0.003	**0.02**	30
		2-3	0.003	**0.02**	30
4	Level 4	0-1	0.025	**0.16**	250
	Roof	1-2	0.016	**0.10**	160
		2-3	0.013	**0.08**	130

Remarks: *) Assumed cement content 600 lbs/cu.yd. and U.W. = 3800 pcy.

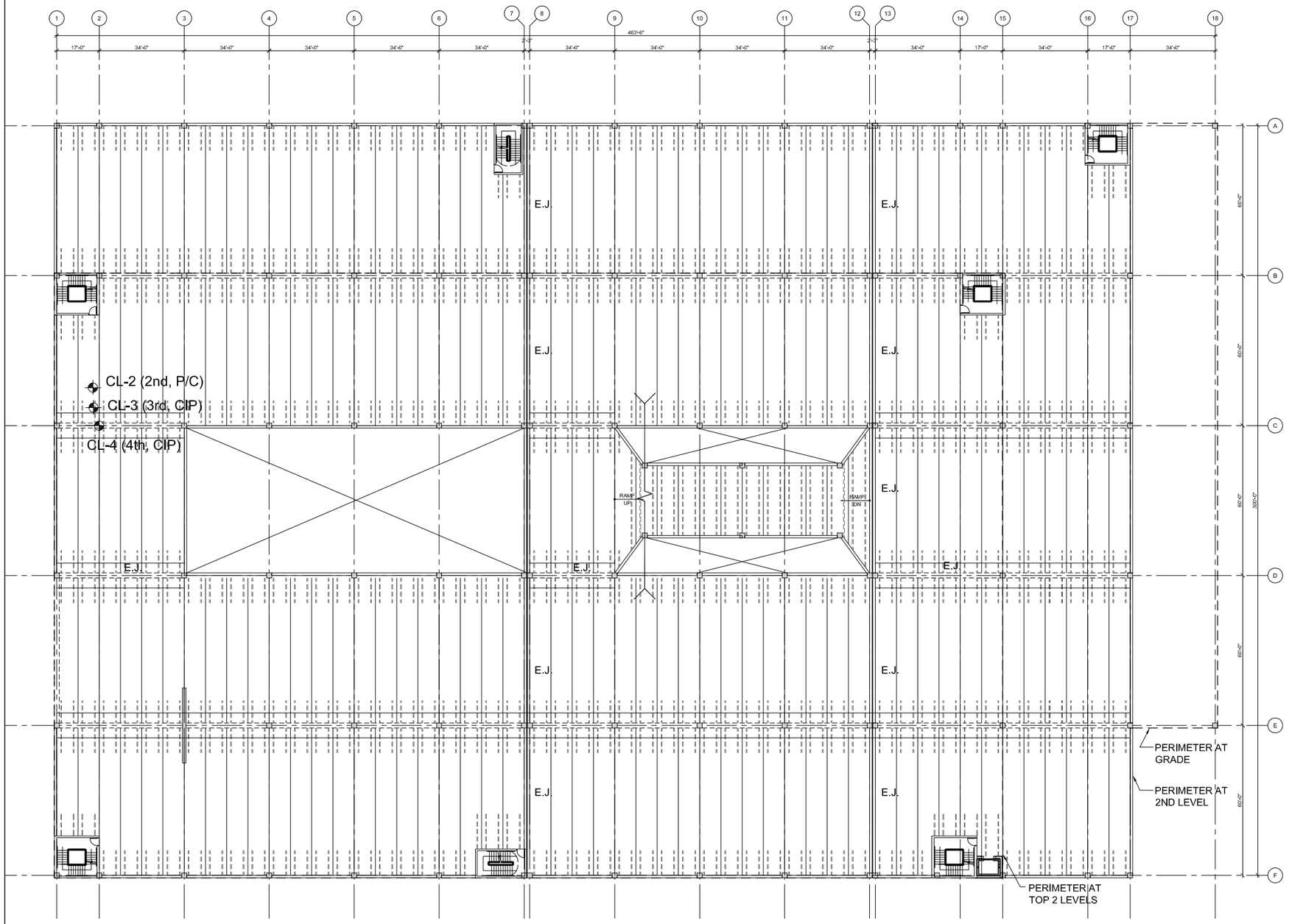
UNIVERSAL CONSTRUCTION TESTING

APPENDIX D

WALKER
RESTORATION CONSULTANTS

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY - ADDISON ROAD GARAGE
CAPITOL HEIGHTS, MARYLAND

WALKER PARKING CONSULTANTS



CHLORIDES
SAMPLE LOCATIONS

LEGEND:

CL-1 CONCRETE SAMPLE
THE FIRST NUMBER REFERS TO THE SAMPLE NUMBER. THE SECOND NUMBER REFERS TO THE FLOOR WHERE THE SAMPLE WAS TAKEN. THE FINAL SYMBOL (P/C = PRECAST, CIP = CAST IN PLACE) REFERS TO THE TYPE OF CONCRETE FROM WHICH THE SAMPLE WAS TAKEN. TAKEN 4/14/2014

LEGEND

NORTH

Scale: 1/16" = 1' - 0"

R-701

04/03/2014 14-944.00

APPENDIX E

WALKER
RESTORATION CONSULTANTS

Kletsko, Marissa

From: Neiderer, Greg
Sent: Thursday, May 22, 2014 12:12 PM
To: Patrick Schmitt @ WMATA Pkg
Cc: Stairs, Kathryn; Gross, Jason @ Walker; Pudleiner, Jim; Rogers, Phillip @ WMATA Pkg
Subject: 2014 05 22 WMATA Addison Road Near Term Actions
Attachments: SAM_1533.jpg; SAM_1512.jpg; DSCN0505.jpg; R-701.pdf; DSCN0513.jpg; DSCN0516.jpg

Patrick,

We reviewed this garage on 5/19 and we found the following items in need of action:

1. Small floor spalls (<1 s.f.) were found on the pedestrian bridge between the garage and the station, that need to be repaired to reduce tripping hazards.
2. Loose overhead concrete, which should be removed, was found on:
    a. the Southeast stair, closest to the Station (C.L. F-14)
    b. on soffit of vehicular ramp of level 2
    c. multiple loose (<1sqft) overhead spalls on level 2 from grid 6-16 and D-F, and
    d. loose overhead concrete on soffit around shear wall grid E3 Top level and third tier grid C6 (see photo 513).
3. Three stair towers (Northeast, West, and Southwest) have a step at the door, which when coming out of the stair tower is a trip hazard. A sign should be put on the inside of the door until a landing can be installed on the outside of the door (see picture 1512). Please note the North central stair was not surveyed as it was occupied by an intimidating homeless person. This stair serves one level of the garage, and there appeared to be no loose overhead concrete.
4. A portion of the brick parapet wall was damaged, possibly during plowing operations and there is bowing of the brick façade and loose header bricks. This wall is at grade, and therefore poses minimal risk, but spaces adjacent should be blocked off until a repair can be made. See picture 1533.
5. Numerous SOG shallow depth spalls were found on the ground tier on the exposed bay grid 16-17 that need to be repaired to reduce tripping hazards (See Photo 516).
6. Potential ponding was found on the top tier at clogged drain grid E11 that need to be unclogged to reduce slipping hazards (see Photo 505).

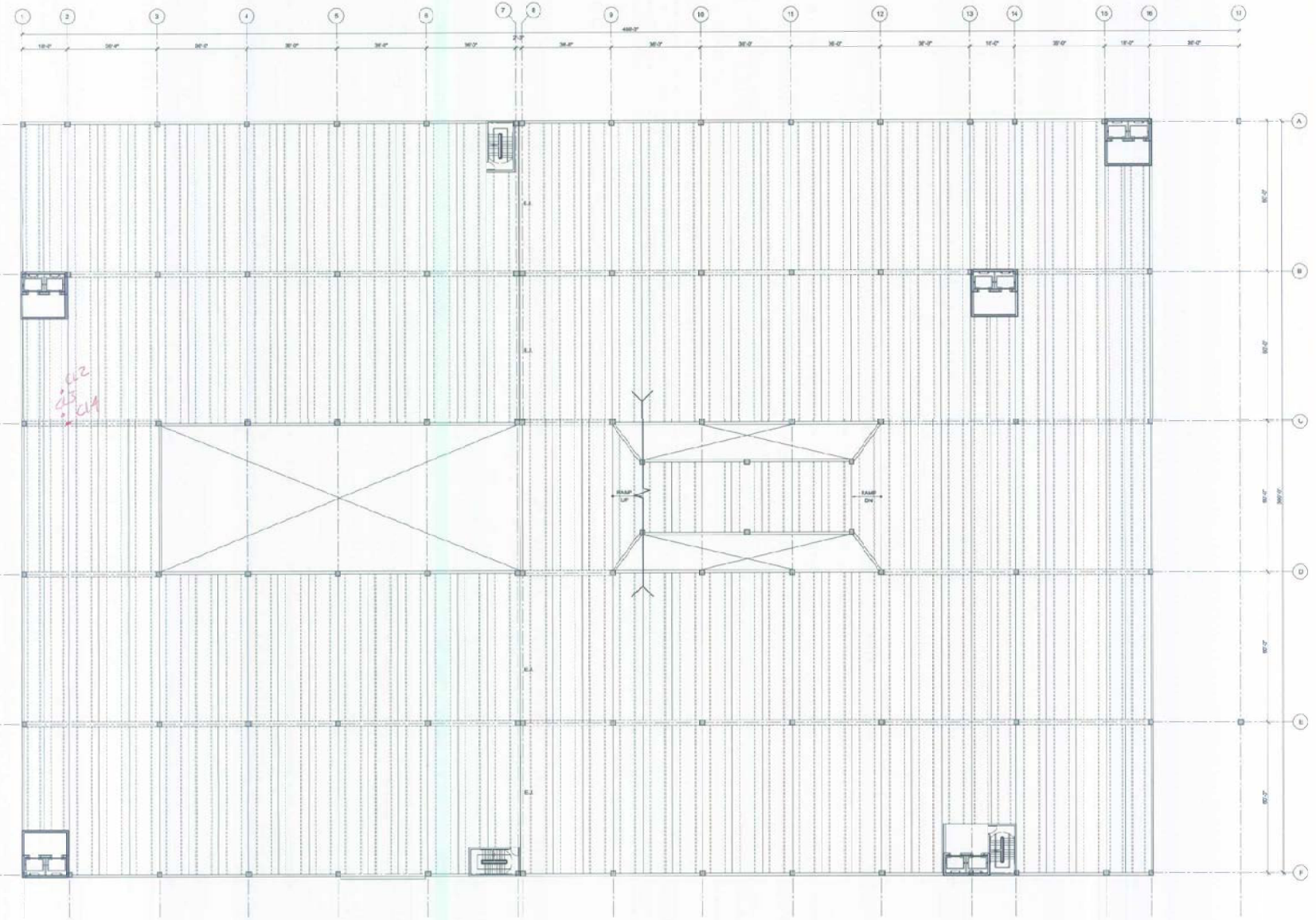
Gregory J. Neiderer, PE
Principal

Walker Restoration Consultants | Walker Parking Consultants
565 East Swedesford Road, Suite 300 | Wayne, PA 19087
610.995.0260 x 1408 (Office) | 610.659.6967 (Cell) | 610.995.0261 (Fax)
www.walkerrestoration.com | www.walkerparking.com

To send me a file larger than 10MB, please use this File Transfer

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY - ADDISON ROAD GARAGE
CAPITOL HEIGHTS, MARYLAND

WALKER PARKING CONSULTANTS



CHLORIDES SAMPLE LOCATIONS

LEGEND:

- CL-1 CONCRETE CORE SAMPLE THE FIRST NUMBER REFERS TO THE CORE SAMPLE NUMBER. TAKEN 4/ /2014

CL4: @ INV. T WASH
CL3: DT WASH
CL2: DT

LEGEND

NORTH

Scale: 1/16" = 1' - 0"

R-701

04/03/2014 14-844.00

ANACOSTIA

WALKER
RESTORATION CONSULTANTS

The summary data for the facility is as follows:

Table ANACO-1: Facility Information Summary

	ANACOSTIA
Location:	876 Howard Road, SE Washington, DC 20020
Overall Condition:	**FAIR**
Current Needs:	**MINOR**
Chloride Contamination	**MODERATE**
Year built:	1991
Supported Levels	3
Levels Below Grade	None
Parking Space Capacity:	1105
Parking Efficiency:	339 SF/Space
Footprint:	Approximately 780' x 180'
Bridges:	2 Vehicular
Vehicle Circulation:	Single Helix
Pedestrian Circulation	8 Stairs, 0 Elevators
Parking Area: Slab on Grade Total Supported Area Total Parking Area	 122,000 ± SF 253,000 ± SF 375,000 ± SF
Structural System	Post-Tensioned 1-way Beam & Slab
Façade Spandrel Treatment	Cast-in Place Post-Tensioned

FACILITY DESCRIPTION

NORTH VIEW

SOUTH VIEW

EAST VIEW

WEST VIEW

PLAN VIEW

FEBRUARY 2015 14-3944.04

EXECUTIVE SUMMARY

This 1991 garage is in fair shape, has moderate chloride contamination and has minor current repair needs

Its scheduled repairs are anticipated to cost:

2018 – Near Term - $1,160,656
2023 – Long-term - $219,738

See Appendix A for cost details.

CRITICAL REPAIRS

The following safety related items requiring urgent action were identified in our 4/15/14 email to Metro:

1. Overhead spalls beneath stair risers, bridge and roof level
2. Unpainted curbs/ramps/wheel stops (trip hazard)

Please see the above reference email, found in Appendix E, for more detail and recommended actions. We have no further immediate concerns.

NEAR-TERM REPAIRS

Due to the age and condition of the garage we recommend most of the non-critical repairs be completed in 2018, year three of the master repair plan. These near-term repairs include addressing the structural items found including:

1. Remove and replace spalled overhead concrete found on ceilings (soffits), bridges and beams with repair concrete anchored with supplementary embedded steel pins. Monitor this condition at least every 6 months until replacement and remove loose concrete.
2. Remove and replace stair tread spalled concrete with repair concrete.
3. Repair deteriorated column haunch connections
4. Coat construction joints within P/T slab
5. Repair roof level expansion joint glands

RECOMMENDATIONS

6. Repair roof level traffic topping
7. Install stairtower landings/treads traffic topping
8. Repair and coat the existing trench drains
9. Replace existing floor drain piping
10. Repaint traffic markings
11. Repaint curbs
12. Repair stairtower roof level landings

Based on chloride test results, we recommend the following improvements to protect the floor structural system:

1. Install penetrating sealer at all supported levels

LONG-TERM REPAIRS

Long term repairs include a second round of structural and waterproofing repairs in 2023, five years after the near-term repairs to address continued deterioration of the concrete and the end of the useful life of the waterproofing products. Long-term repairs items include the following:

1. Repair deteriorated beam to column connections
2. Replace interior level floor sealants
3. Replace façade joint sealants
4. Install stairtower landings/treads traffic topping
5. Replace stairtower door and frame
6. Replace stair tower door hardware
7. Replace stairtower roofs
8. Repaint traffic markings
9. Repaint curbs

CONDITION ASSESSMENT

OBSERVATIONS AND DISCUSSION

The following observations were made during a facility walk through on the April 8 to 10, 2014 site visit. Photographs referenced within the observations are found in Appendix B of the report. Observations are immediately followed by a brief discussion of the repair in italics.

1. Roof level floor sealants are in good condition beneath traffic topping and require replacement beyond 10 years. (Photo 3,15)
2. Interior floor sealants are in fair condition and require replacement within 10 years.

3. Roof level expansion joint glands were observed to have moderate damage and require replacement/repair. (Photo 1).
4. Interior level expansion joints are in good condition and require replacement beyond 10 years.
5. A minor portion of the roof level floor traffic topping is damaged by scrapes and wear which requires repair.
6. Changes in floor elevation- wheelstops, curbs, and handicap ramps are not readily visually apparent and require painting now with safety yellow paint to emphasize elevations changes (Photo 2, 12, 15, 17)
7. Significant stair soffit leaching/delaminations was observed and loose concrete requires removal now. (Photo 10)
8. Stair landings were observed to have metal plates and unusual leaching which require repair within 5 years. (Photo 12)
9. Floor and bridge slab soffits were observed to have delaminations, moderate but localized leaching cracks and extensive but localized effloresence which require structural repair and waterproofing to address deterioration (Photo 4,8,10,13,14,16)
10. A few column haunches were observed to be cracked which requires structural repair. (Photo 6)
11. A minor portion of the existing floor drain piping is rusted and requires cleaning and painting. (Photo 9)
12. The roof level trench drains located at the bottom of the ramp intercept significant storm water and inadvertently hold significant quantities of ponded water within the uncoated concrete trench. This ponded water is causing extensive but localized damage. The concrete should be repaired and the trench coated to reduce future damage. (Photos 7,8)
13. Beams were observed to have significant localized leaching which should be repaired within 5 years. (Photo 17)
14. Expansion joint repairs at slab to beam bearing are performing well. (Photo 5)

MATERIAL TESTING

Concrete powder samples were extracted from floor surfaces of the roof and intermediate supported levels of the parking garage as shown in Appendix C. The chloride content was determined at 3 depths: near the surface (0-1 inch depth), near the design location for top reinforcing steel/tee connections (1 to 2 inch depth), and near the center of the slab (2 to 3 inch depth). Locations were taken in both cast-in-place concrete as well as precast concrete, if present, to determine the extent of chloride contamination in these differing concretes. The results are included in Appendix D. These chloride contents provide an indication of the current and expected future deterioration of the parking structure due to chloride-induced corrosion of the reinforcing steel. A typical threshold chloride value for the onset of corrosion is between 280 and 410 parts per million. The determined values are defined as minor (less than 200 ppm at the 1 to 2 inch depth), moderate (between 200 ppm and 400 ppm at the 1 to 2 inch depth, and large (greater than 400 ppm at the 1 to 2 inch depth. The extent of chloride contamination directly influences our recommended floor surface treatment (nothing, penetrating sealer, traffic topping).

The summary of chlorides test results in Appendix C are;

Level	Depth	Type	PPM
1	1 to 2	CIP	740
2	1 to 2	CIP	260
3	1 to 2	CIP	30

APPENDIX A

WALKER
RESTORATION CONSULTANTS

ANACOSTIA GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

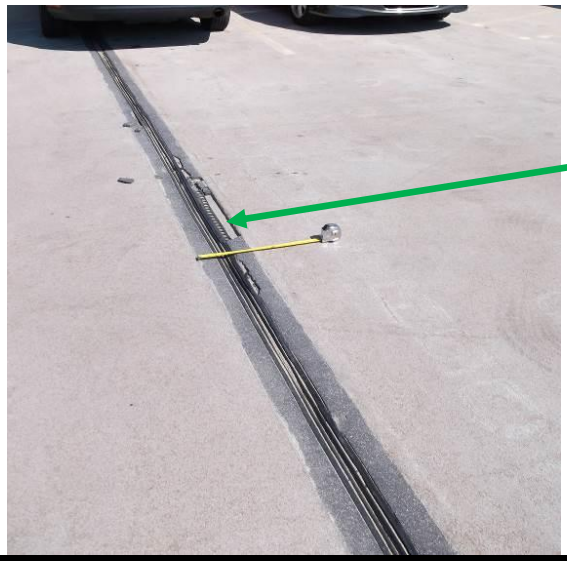
	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	106	P/T Slab Repair	$ 2,261		$ 20,351							
	107	P/T Beam Repair			$ 7,271							
	108	P/T Column Repair			$ 1,819							
	109	Stair Tread Concrete Repair			$ 3,750							
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000		$ 4,979					$ 1,000		
		Structural Sub-Total	**$ 3,261**	**$ -**	**$ 38,169**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Waterproofing												
	201	Facade Sealant Replacement - P/T								$ 12,377		
	203	Cove Sealant Replacement - P/T Roof										
	204	Cove Sealant Replacement - P/T Covered Levels								$ 27,333		
	207	Floor Sealant Replacement - P/T Roof										
	208	Floor Sealant Replacement - P/T Covered Levels								$ 7,640		
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair			$ 426,250					$ 12,788		
	213	Traffic Topping - New Installation			$ 24,300							
	214	Concrete Sealer			$ 116,600							
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof			$ 94,875							
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000		$ 66,203					$ 6,014		
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ 728,228**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 66,151**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping			$ 28,125							
	302	New Drain & Piping										
	303	Repair Existing Trench Drains			$ 8,250							
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000		$ 3,638					$ 1,000		
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ 40,013**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement				$ 150,000						
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 15,000				$ 1,000		
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 165,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow	$ 5,156							$ 5,156		
	502	Repaint Traffic Markings			$ 23,438					$ 23,438		
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame								$ 10,500		
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof								$ 50,000		
	511	Repair Broken Handrail										
	512	Repair Stair Tower Roof Landings			$ 6,000							
		Miscellaneous Sub-Total	**$ 5,156**	**$ -**	**$ 29,438**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 89,094**	**$ -**	**$ -**
		Construction Subtotal	$ 11,417	$ -	$ 835,846	$ 165,000	$ -	$ -	$ -	$ 158,244	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 685	$ -	$ 50,151	$ 9,900	$ -	$ -	$ -	$ 9,495	$ -	$ -
		Construction Total	**$ 12,102**	**$ -**	**$ 885,997**	**$ 174,900**	**$ -**	**$ -**	**$ -**	**$ 167,739**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 1,815	$ -	$ 132,900	$ 26,235	$ -	$ -	$ -	$ 25,161	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 1,815	$ -	$ 132,900	$ 26,235	$ -	$ -	$ -	$ 25,161	$ -	$ -
		Material Testing During Construction	$ 121	$ -	$ 8,860	$ 1,749	$ -	$ -	$ -	$ 1,677	$ -	$ -
		Project Cost Totals Per Year:	**$ 15,854**	**$ -**	**$ 1,160,656**	**$ 229,119**	**$ -**	**$ -**	**$ -**	**$ 219,738**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work.
   Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

APPENDIX B

WALKER
RESTORATION CONSULTANTS



Deteriorated expansion joint gland and header at roof level.

Photo 1

Unpainted curb and wheel stops along pedestrian path. Curbs are recommended to be painted yellow.

Photo 2

Localized infrequent spalls on top level.

Photo 3

Photo 4

Leaching and spalls in soffit.

Photo 5

Previous repair at expansion joint soffit.

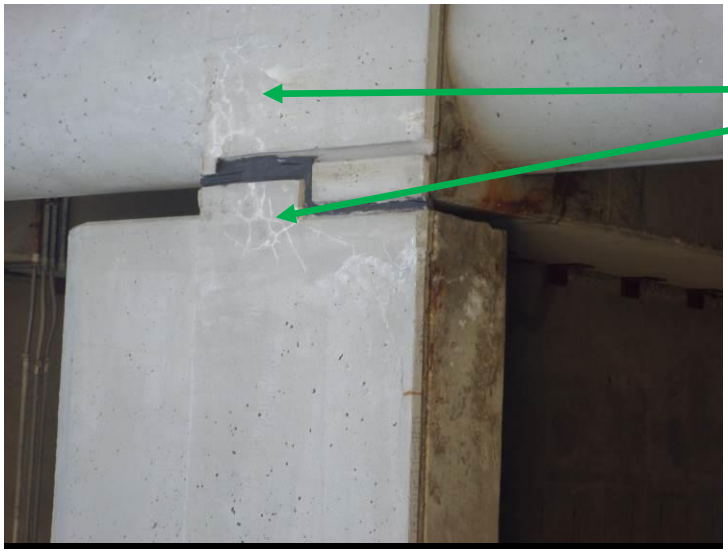


Photo 6

Cracking and leaching at beam /column connection.

Photo 7

Concrete trench drain at bottom of roof level ramp collects storm water but significant quantities of water remain ponded within this uncoated trench.

Photo 8

Spalling, moisture staining and efflorescence under concrete trench drain shown in Photo 7.

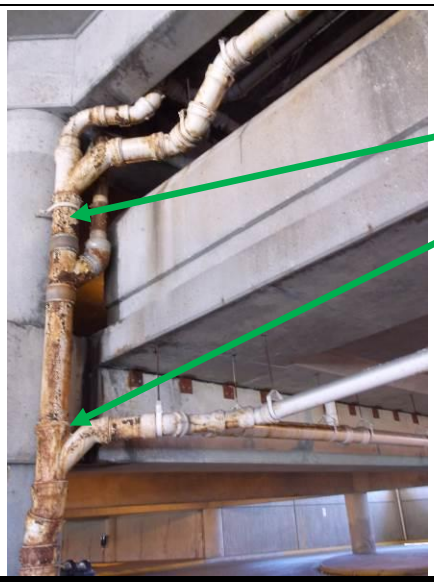


Photo 9

Rusted drain piping from trench drain shown in Photo 7.

Spall within stair landing soffit.

Photo 10

Deteriorated expansion joint at stair towers.

Photo 11

Metal floor plate above top level of landing in stairs is typical.

Holes drilled into stair riser to permit water to drain out of landing.

Photo 12

Photo 13

Cracking, leaching and spalls on underside of bridge over entrance drive and parking area.

Photo 14

Spall with exposed reinforcing at beam connection at expansion joint.

Photo 15

Unpainted wheel stops in pedestrian and vehicular paths. Wheel stops are recommended to be painted yellow or removed.

Spalls on bridge soffit over entrance drive.

Photo 16

Leaching along edge of beam.

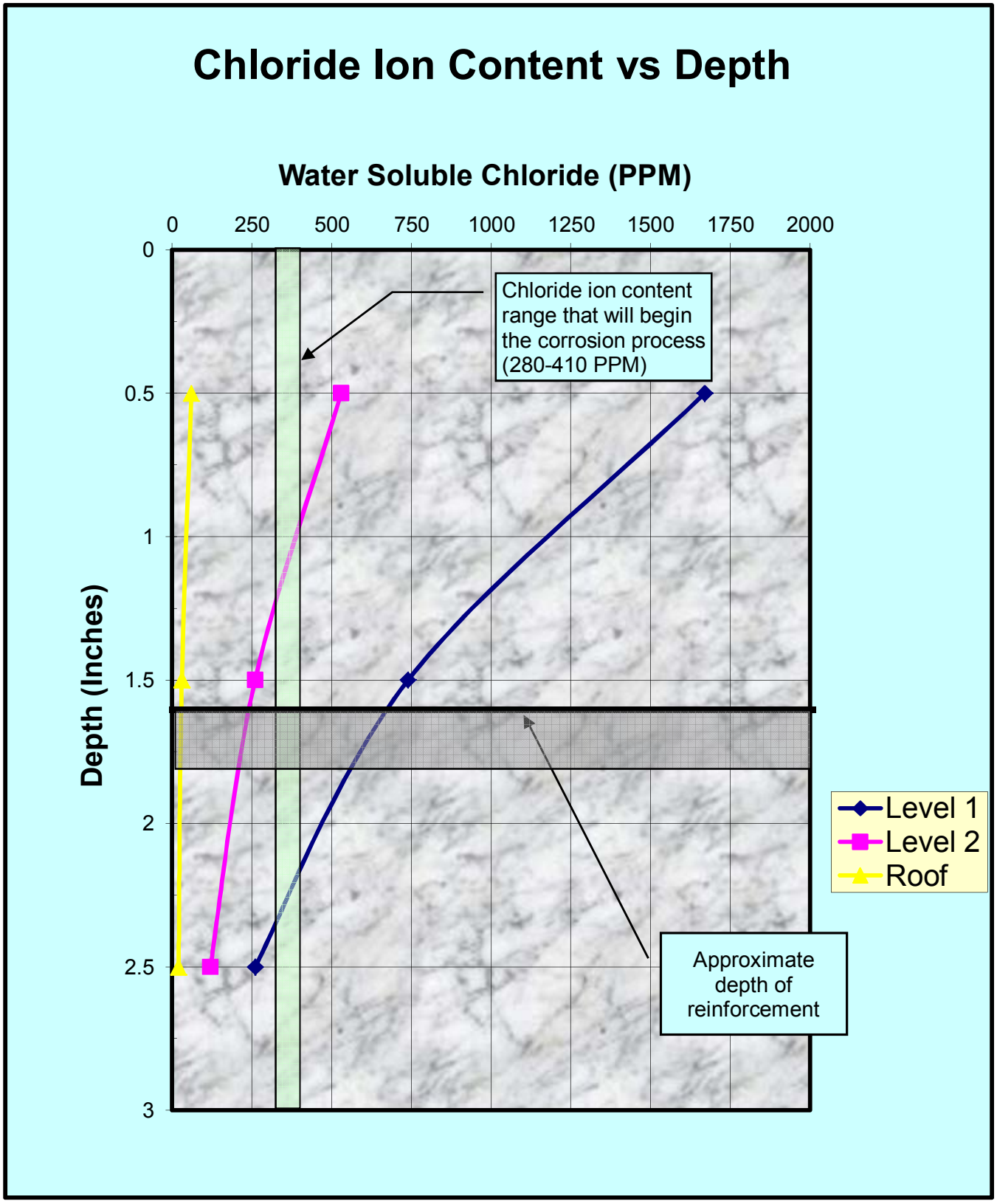
Curb is unpainted. Curbs are recommended to be painted yellow.

Photo 17

APPENDIX C

WALKER
RESTORATION CONSULTANTS

ACADEMY HOUSE GARAGE



UNIVERSAL CONSTRUCTION TESTING, Ltd.

Project: Washington Metropolitan Area Transit Authority
Maryland, Virginia & Washington DC

UCT Project No. 14073
Walker Project No. 14-3994.04

Client: Walker Restoration Consultants

Date: May 2, 2014

Table 1.8. **Chloride Content of Concrete**
(Water-Soluble)
AASHTO T 260

Sample Number	Location in Structure	Level tested, inch from top	Chloride ion (CL^-) Content		
			by weight of concrete %	by weight of cement* %	by weight of concrete (ppm)*
Anacostia Garage					
Top	Level 4	0-1	0.006	**0.04**	60
	Roof Level	1-2	0.003	**0.02**	30
		2-3	0.002	**0.01**	20
1	1st Supported Level	0-1	0.167	**1.06**	1670
		1-2	0.074	**0.47**	740
		2-3	0.026	**0.16**	260
2	Intermediate Level	0-1	0.053	**0.33**	530
		1-2	0.026	**0.16**	260
		2-3	0.012	**0.08**	120

Remarks: *) Assumed cement content 600 lbs/cu.yd. and U.W. = 3800 pcy.

APPENDIX D

WALKER
RESTORATION CONSULTANTS

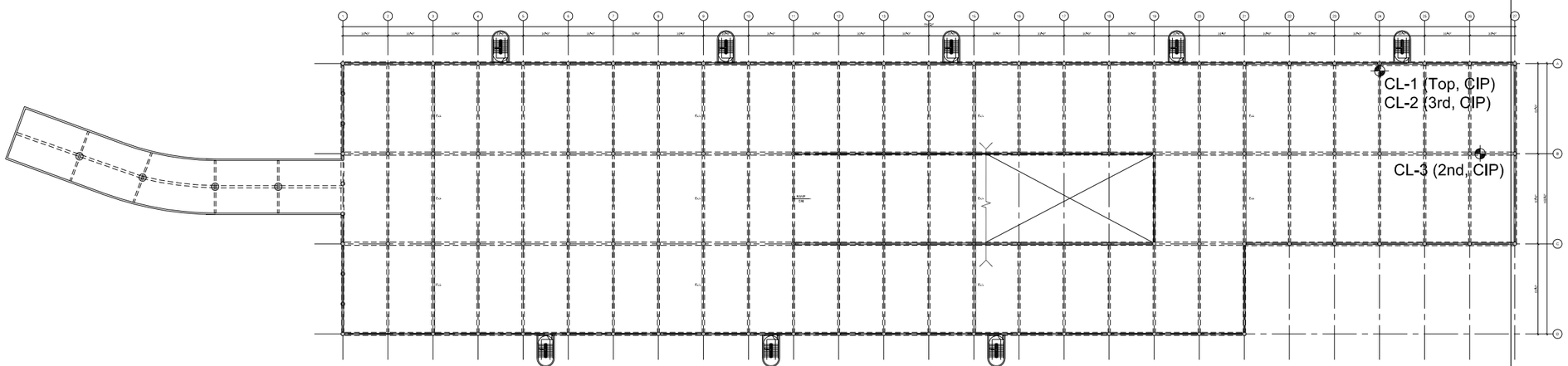
WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY - ANACOSTIA GARAGE
WASHINGTON, DC

WALKER PARKING CONSULTANTS

CHLORIDES
SAMPLE LOCATIONS

LEGEND:

CL-1 CONCRETE SAMPLE
THE FIRST NUMBER REFERS TO THE SAMPLE NUMBER. THE SECOND NUMBER REFERS TO THE FLOOR WHERE THE SAMPLE WAS TAKEN. THE FINAL SYMBOL (P/C = PRECAST, CIP = CAST IN PLACE) REFERS TO THE TYPE OF CONCRETE FROM WHICH THE SAMPLE WAS TAKEN. TAKEN 4/10/2014



LEGEND

NORTH

Scale: 1" = 30' - 0"
R-701

04/03/2014 14-944.00

APPENDIX E

WALKER
RESTORATION CONSULTANTS

Kletsko, Marissa

From: Neiderer, Greg
Sent: Tuesday, April 15, 2014 5:35 PM
To: Patrick Schmitt @ WMATA Pkg
Cc: Rogers, Phillip @ WMATA Pkg; Pudleiner, Jim
Subject: 2014 04 15 WMATA Anacostia Garage Urgent Actions - Soffit Spalls, Wheel Stops

Patrick,

Upon reviewing the garage at the above station we found:

1. A number of soffit spalls beneath the roof in the 5 bays adjacent to stair tower 3 that should be removed. Please see attached photos 23, 32, 33 and 34.
2. A number of soffit spalls beneath the bridge that spans the entrance road, both directly beneath the road and in parking spaces adjacent to the road that should be removed. Please see attached photo 51.
3. Within the garage are wheel stops, which in our opinion, are tripping hazards and should be removed. In particular some wheel stops are not adjacent to walls but in the open which are in our opinion an even greater tripping hazards.

Please see attached photo 1. We recommend their removal.

Sincerely,

Gregory J. Neiderer, PE
Principal

Walker Restoration Consultants | Walker Parking Consultants
565 East Swedesford Road, Suite 300 | Wayne, PA 19087
610.995.0260 x 1408 (Office) | 610.659.6967 (Cell) | 610.995.0261 (Fax)
www.walkerrestoration.com | www.walkerparking.com

To send me a file larger than 10MB, please use this File Transfer

COLLEGE PARK

WALKER
RESTORATION CONSULTANTS

FEBRUARY 2015 14-3944.04

The summary data for the facility is as follows:

Table COLPK-1: Facility Information Summary

	COLLEGE PARK
Location:	4901 Paint Branch Parkway College Park, MD 20740
Overall Condition:	**GOOD**
Current Needs:	**MODERATE**
Chloride Contamination	**LARGE**
Year built:	2004
Supported Levels	5
Levels Below Grade	None
Parking Space Capacity:	1,340
Parking Efficiency:	302 SF/Space
Footprint:	Approximately 405' x 185'
Bridges:	None
Vehicle Circulation:	Single Helix
Pedestrian Circulation	2 Stair(s), 2 Elevator(s)
Parking Area: Slab on Grade Total Supported Area Total Parking Area	 70,000 ± SF 335,000 ± SF 405,000 ± SF
Structural System	Precast Un-topped Double Tee
Façade Spandrel Treatment	Precast with Thin Brick Tile

FACILITY DESCRIPTION

NORTH VIEW

SOUTH VIEW

EAST VIEW

WEST VIEW

PLAN VIEW

EXECUTIVE SUMMARY

This 2004 garage is in good shape, has significant chloride contamination and has moderate current repair needs

Its scheduled repairs are anticipated to cost:

2020 – Near Term - $1,174,580
2025 – Long-term - $372,420

See Appendix A for cost details.

CRITICAL REPAIRS

The following safety related items requiring urgent action were identified in our 5/22/14 email to Metro:

1. Overhead spalls
2. Stair tread spalls
3. Ponding water

Please see the above reference email, found in Appendix E, for more detail and recommended actions. We have no further immediate concerns.

NEAR-TERM REPAIRS

Due to the age and condition of the garage we recommend most of the non-critical repairs be completed in 2020, year five of the master repair plan. These near-term repairs include addressing the structural items found including:

1. Remove and replace spalled overhead concrete found on ceilings with repair concrete anchored with supplementary embedded steel pins. Monitor this condition at least every 6 months until replacement and remove loose concrete.
2. Remove and replace stair tread and landing spalled concrete with repair concrete.
3. Reweld double tee floor connections
4. Remove and replace spalled/deteriorated wash concrete
5. Replace roof level floor sealants
6. Replace façade joint sealants

RECOMMENDATIONS

7. Install new supplemental floor drains
8. Install new supplemental floor piping
9. Repaint curbs
10. Repaint stairtower handrails
11. Replace roof level expansion joint glands

Based on chloride test results, we recommend the following improvements to protect the floor structural system:

1. Install penetrating sealer at all supported levels
2. Install traffic topping at all cast-in-place washes on the interior

LONG-TERM REPAIRS

Long term repairs include a second round of structural and waterproofing repairs in 2025, five years after the near-term repairs to address continued deterioration of the concrete and the end of the useful life of the waterproofing products. Long-term repairs items include the following:

1. Replace roof level floor sealants
2. Replace interior level floor sealants
3. Replace façade joint sealants
4. Replace interior level expansion joint glands
5. Repair interior wash traffic topping
6. Repaint traffic markings
7. Repaint curbs

CONDITION ASSESSMENT

OBSERVATIONS AND DISCUSSION

The following observations were made during a facility walk through on the May 19 to 20, 2014 site visit. Photographs referenced within the observations are found in Appendix B of the report. Observations are immediately followed by a brief discussion of the repair in italics.

1. Roof level floor sealants are in poor condition and require replacement within 5 years. (Photo 3, 4, 15)
2. Interior floor sealants are in good condition and require replacement within 10 years. (Photo 1)
3. Roof level expansion joints are in good condition and require replacement within 10 years. (Photo 2)
4. Interior level expansion joints are in good condition

and require replacement beyond 10 years.

5. Minor slab ceilling (soffit) delaminations was observed and loose concrete requires removal now. (Photo 11,12)
6. Stair treads were observed to have ponding and spalls which require repair now to eliminate trip and slip hazards. (Photo 14)
7. Floor slab washes were observed to have moderate cracks and require structural repair and waterproofing to address deterioration (Photo 7, 8)
8. A minor number of the double tee to double tee floor surfaces were observed to have rebar rusting through the concrete surface which requires waterproofing repair (Photo 5).
9. A minor number of double tee to double tee flanges above stems and at corners were observed to be cracked which requires structural repair. (Photo 6, 10)
10. The roof level storefront has a missing bollard which requires replacement (Photo 1).
11. The stair handrails are rusting and require repainting now. (Photo 13).
12. A minor amount of localized ponding was observed and new supplemental drains need to be installed. (Photo 9)

MATERIAL TESTING

Concrete powder samples were extracted from floor surfaces of the roof and intermediate supported levels of the parking garage as shown in Appendix C. The chloride content was determined at 3 depths: near the surface (0-1 inch depth), near the design location for top reinforcing steel/tee connections (1 to 2 inch depth), and near the center of the slab (2 to 3 inch depth). Locations were taken in both cast-in-place concrete as well as precast concrete, if present, to determine the extent of chloride contamination in these differing concretes. The results are included in Appendix D. These chloride contents provide an indication of the current and expected future deterioration of the parking structure due to chloride-induced corrosion of the reinforcing steel. A typical threshold chloride value for the onset of corrosion is between 280 and 410 parts per million. The determined values are defined as minor (less than 200 ppm at the 1 to 2 inch depth), moderate (between 200 ppm and 400 ppm at the 1 to 2 inch depth, and large (greater than 400 ppm at the 1 to 2 inch depth. The extent of chloride contamination directly influences our

recommended floor surface treatment (nothing, penetrating sealer, traffic topping).

The summary of chlorides test results in Appendix C are;

Level	Depth	Type	PPM
2	1 to 2	P/C	620
3	1 to 2	CIP	200
4	1 to 2	P/C	560
5	1 to 2	CIP	420
6	1 to 2	CIP	220

APPENDIX A

WALKER
RESTORATION CONSULTANTS

COLLEGE PARK GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 11,024				$ 99,212					
	102	Precast Tee Stem Repair					$ 7,551					
	103	Precast Beam Repair					$ 4,765					
	104	Precast Shear Connector Repair					$ 9,916					
	105	Precast Column/Wall Repair					$ 3,911					
	109	Stair Tread Concrete Repair	$ 22,650									
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 5,051				$ 18,803					$ 1,000
		Structural Sub-Total	**$ 38,725**	**$ -**	**$ -**	**$ -**	**$ 144,158**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**
Waterproofing												
	202	Façade Sealant Replacement - Precast					$ 7,804					
	205	Cove Sealant Replacement - Precast Roof					$ 21,123					
	206	Cove Sealant Replacement - Precast Covered Levels										
	209	Floor Sealant Replacement - Precast Roof					$ 77,288					
	210	Floor Sealant Replacement - Precast Covered Levels										
	211	Rout and Seal Cracks					$ 12,188					
	212	Traffic Topping Repair										$ 72,141
	213	Traffic Topping - New Installation					$ 129,853					
	214	Concrete Sealer					$ 311,915					
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof					$ 35,219					
	217	Expansion Joint Replacement - Covered Levels										$ 140,875
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 59,539					$ 21,302
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 654,928**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 234,317**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping	$ 2,406				$ 2,406					
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000					$ 1,000
		Mechanical Sub-Total	**$ 3,406**	**$ -**	**$ -**	**$ -**	**$ 3,406**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000					$ 15,000				$ 1,000
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 165,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow					$ 5,569					$ 5,569
	502	Repaint Traffic Markings					$ 25,313					$ 25,313
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings					$ 12,500					
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
		Miscellaneous Sub-Total	**$ -**	**$ -**	**$ -**	**$ -**	**$ 43,381**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 30,881**
		Construction Subtotal	$ 44,131	$ -	$ -	$ -	$ 845,874	$ 165,000	$ -	$ -	$ -	$ 268,198
		Mobilization @ 6% of Construction Subtotal	$ 2,648	$ -	$ -	$ -	$ 50,752	$ 9,900	$ -	$ -	$ -	$ 16,092
		Construction Total	**$ 46,779**	**$ -**	**$ -**	**$ -**	**$ 896,626**	**$ 174,900**	**$ -**	**$ -**	**$ -**	**$ 284,290**
		Project Contingency @ 15%	$ 7,017	$ -	$ -	$ -	$ 134,494	$ 26,235	$ -	$ -	$ -	$ 42,644
		Engineering: Contract Documents/Field Rep @ 15%	$ 7,017	$ -	$ -	$ -	$ 134,494	$ 26,235	$ -	$ -	$ -	$ 42,644
		Material Testing During Construction	$ 468	$ -	$ -	$ -	$ 8,966	$ 1,749	$ -	$ -	$ -	$ 2,843
		Project Cost Totals Per Year:	**$ 61,280**	**$ -**	**$ -**	**$ -**	**$ 1,174,580**	**$ 229,119**	**$ -**	**$ -**	**$ -**	**$ 372,420**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work.
   Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

APPENDIX B

WALKER
RESTORATION CONSULTANTS

Photo 1

Missing Bollard at stair tower.

Photo 2

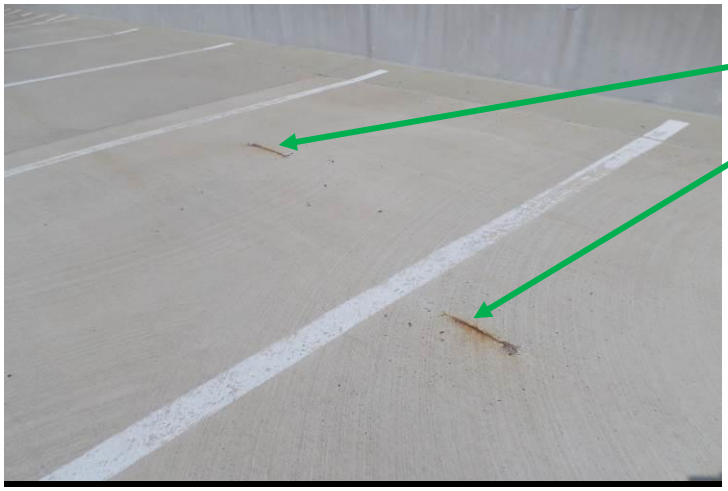
Expansion joint in good condition.

Photo 3

Typical cracked concrete and sealant failure at tee to tee welded connector.

Typical sealant failure at tee to tee joint.

Photo 4

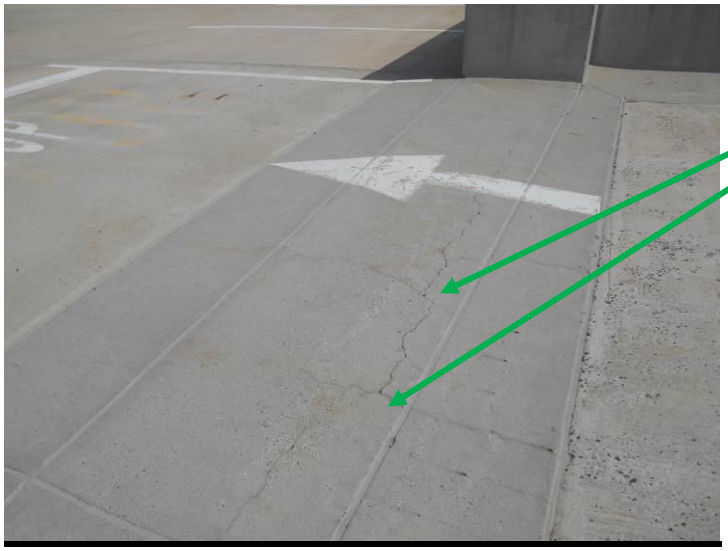


Exposed reinforcing due to inadequate cover in precast tee floor slab.

Photo 5

Tee cracked corner flange.

Photo 6

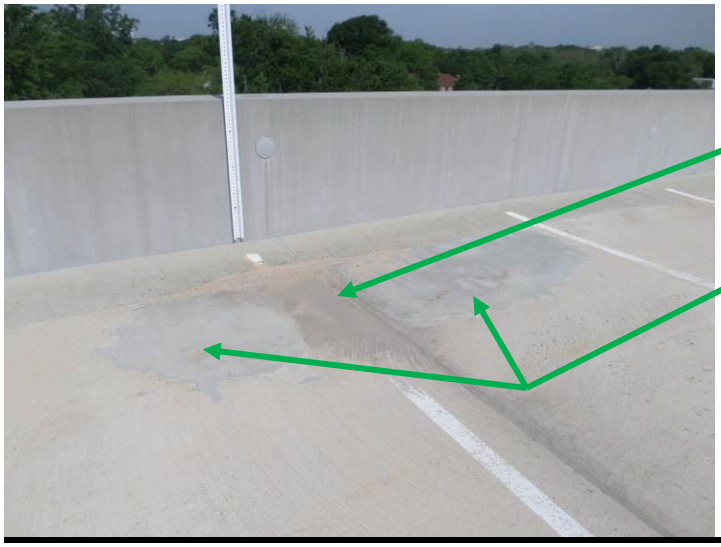


Cracking in wash.

Photo 7

Cracked cast-in-place perimeter wash.

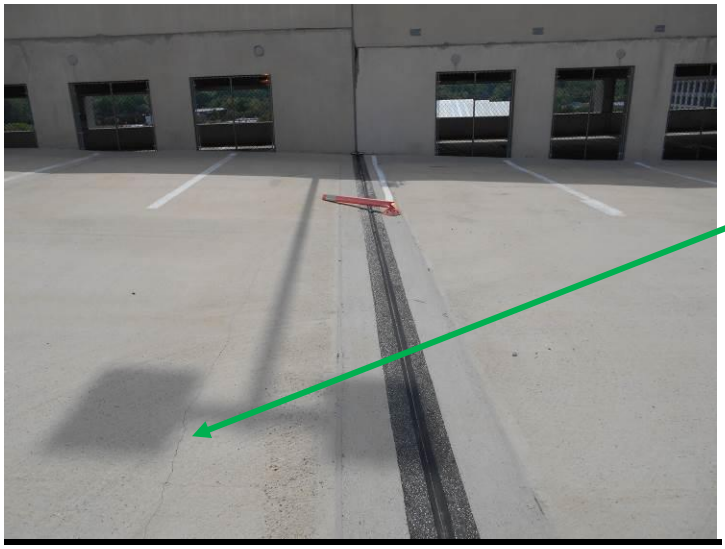
Photo 8



Staining indicates ponding on top level.

Thin cementitious parge coat on tee ends may indicate attempt to alleviate ponding.

Photo 9

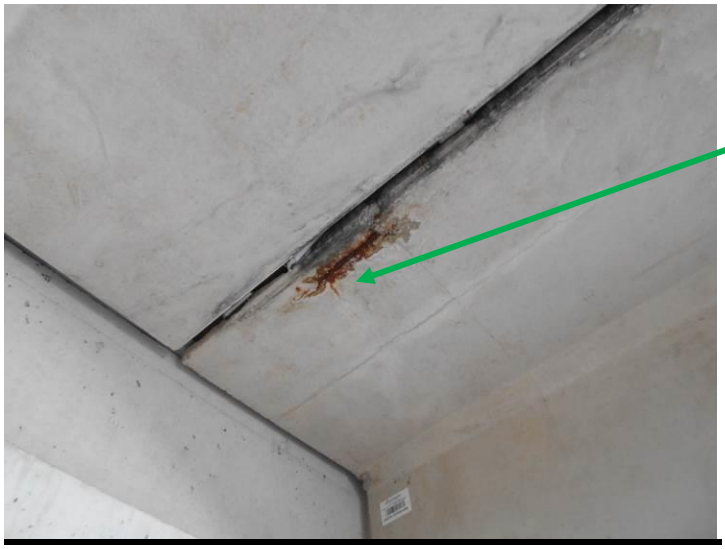


Cracked floor slab above tee stem.

Photo 10

Spalled concrete at the underside of tee to tee joint.

Photo 11



Spalled concrete with exposed reinforcing at tee flange soffit.

Photo 12

Rusted railing.

Photo 13

Ponding on stair landing.

Spalls on stair treads. Black stair nosings provide color contrast so no yellow paint is recommended.

Photo 14

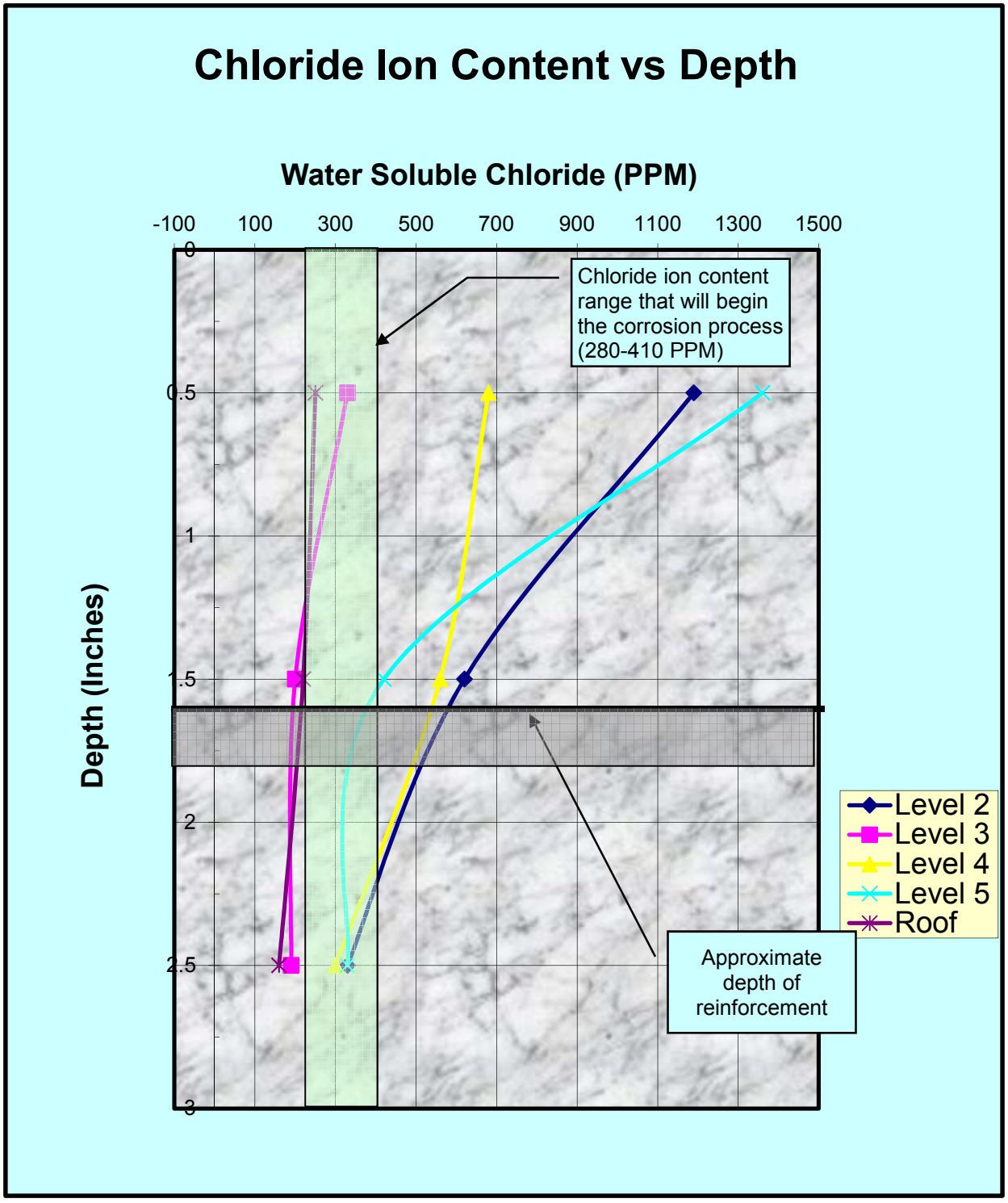
Failing sealant at stair tower floor joint.

Photo 15

APPENDIX C

WALKER
RESTORATION CONSULTANTS

Project # 14-3944.04
Date Jun-14



UNIVERSAL CONSTRUCTION TESTING, Ltd.

Project: Washington Metropolitan Area Transit Authority
Maryland, Virginia & Washington DC

UCT Project No. 14084
Walker Project No. 14-3994.00

Client: Walker Restoration Consultants

Date: May 12, 2014

Table 1.2. **Chloride Content of Concrete**
(Water-Soluble)
AASHTO T 260

Sample Number	Location in Structure	Level tested, inch from top	Chloride ion (CL^-) Content		
			by weight of concrete %	by weight of cement* %	by weight of concrete (ppm)*
College Parking Garage					
2	Level 2	0-1	0.119	**0.75**	1190
	Intermediate	1-2	0.062	**0.39**	620
		2-3	0.033	**0.21**	330
3	Level 3	0-1	0.033	**0.21**	330
	Intermediate	1-2	0.020	**0.13**	200
		2-3	0.019	**0.12**	190
4	Level 4	0-1	0.068	**0.43**	680
	Intermediate	1-2	0.056	**0.35**	560
		2-3	0.030	**0.19**	300
5	Level 5	0-1	0.136	**0.86**	1360
	Intermediate	1-2	0.042	**0.26**	420
		2-3	0.033	**0.21**	330
6	Level 6	0-1	0.025	**0.16**	250
	Roof	1-2	0.022	**0.14**	220
		2-3	0.016	**0.10**	160

Remarks: *) Assumed cement content 600 lbs/cu.yd. and U.W. = 3800 pcy.

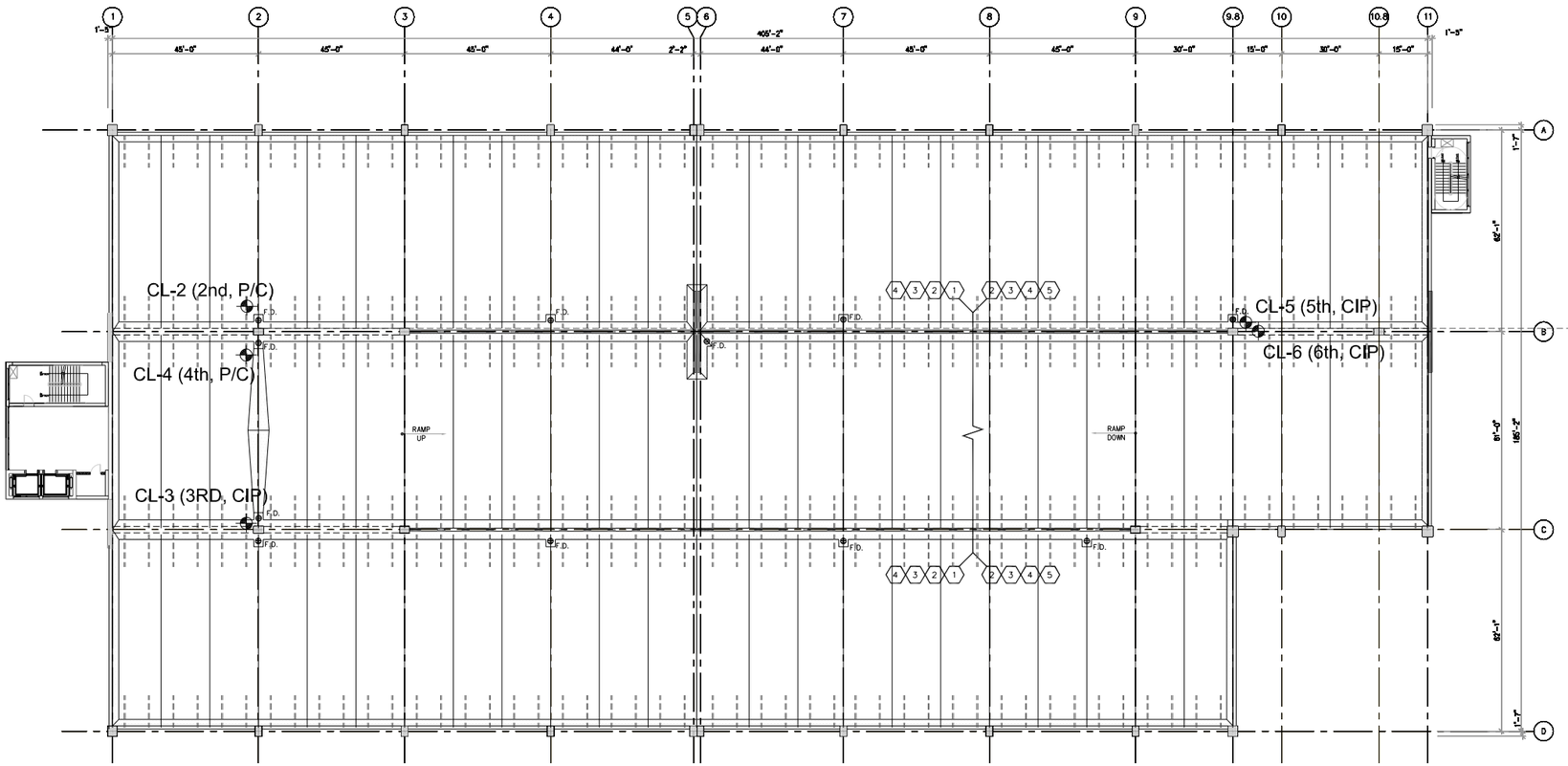
APPENDIX D

WALKER
RESTORATION CONSULTANTS

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY - COLLEGE PARK GARAGE
COLLEGE PARK, MARYLAND

WALKER PARKING CONSULTANTS

CHLORIDES
SAMPLE LOCATIONS



LEGEND:

CL-1 CONCRETE SAMPLE
THE FIRST NUMBER REFERS TO THE SAMPLE NUMBER. THE SECOND NUMBER REFERS TO THE FLOOR WHERE THE SAMPLE WAS TAKEN. THE FINAL SYMBOL (P/C = PRECAST, CIP = CAST IN PLACE) REFERS TO THE TYPE OF CONCRETE FROM WHICH THE SAMPLE WAS TAKEN. TAKEN 4/14/2014

LEGEND

NORTH

Scale: 1/16" = 1' - 0"

R-701

04/03/2014 14-944.00

APPENDIX E

WALKER
RESTORATION CONSULTANTS

Kletsko, Marissa

From: Neiderer, Greg
Sent: Thursday, May 22, 2014 1:33 PM
To: Patrick Schmitt @ WMATA Pkg
Cc: Rogers, Phillip @ WMATA Pkg; Pudleiner, Jim; Gross, Jason @ Walker; Stairs, Kathryn
Subject: 2014 05 22 WMATA College Park Near Term Actions
Attachments: SAM_1669.JPG; SAM_1662.JPG

Patrick,

Below are the items we observed that require near term actions:

1. Loose overhead flange concrete along Column Line B between C.L. 1 & 2 on the soffit of level 2.
2. Numerous small (<1 s.f.) spalls on stair treads, multiple levels, main and secondary stairs. See photo 1669.
3. There is evidence of ponding on the roof along Column Line A, near C.L. 8. See photo 1662.

Please address the soffit spalls by removal, fill the stair spalls and unclog the floor drains.

Thanks,

Kathryn E. Stairs, P.E.
Project Manager

Walker Restoration Consultants | **Walker Parking Consultants**
565 East Swedesford Road, Suite 300 | Wayne, PA 19087
610.995.0260 x 1405 (Office) | 610.662.8854 (Cell) | 610.995.0261 (Fax)
www.walkerrestoration.com | www.walkerparking.com

DUNN LORING

WALKER
RESTORATION CONSULTANTS

The summary data for the facility is as follows:

Table DUNLG-1: Facility Information Summary

	DUNN LORING- MERRIFIELD	
Location:	2700 Gallows Road Vienna, VA 22180	
Overall Condition:		**GOOD**
Current Needs:		**MINOR**
Chloride Contamination:		**MODERATE**
Year built:	Phase 1-2013, Phase 2-2014	
Supported Levels:	8	
Levels Below:	1.5	
Parking Space Capacity:	2009 WMATA, 176 Retail	
Parking Efficiency:	376 SF/Space	
Footprint:	Approximately 122' x 468'	
Bridges:	None	
Vehicle Circulation:	Double Helix	
Pedestrian Circulation	3 Stair(s), 3 Elevator(s)	
Parking Area: Slab on Grade Total Supported Area Total Parking Area	 68,000 ± SF 754,800 ± SF 822,000 ± SF	
Structural System	Precast Un-topped Double Tee	
Façade Spandrel Treatment	Precast	

FACILITY DESCRIPTION

NORTH VIEW

SOUTH VIEW

WEST VIEW

PLAN VIEW

EXECUTIVE SUMMARY

This 2013/2014 garage is in good shape, has minor chloride contamination and has minor current repair needs. This garage is unusual since it has both segregated retail parking and retail space beneath Metro structure parking, as well as segregated retail stairs and elevators. No costs or actions are included for retail related scope.

Its scheduled repairs are anticipated to cost:

2020 – Near Term - $326,360
2024 – Long-term - $341,624

See Appendix A for cost details.

CRITICAL REPAIRS

The following safety related items requiring urgent action were identified in our 4/14/14 email to Metro:

1. Overhead spalls at double tee welded connections

The following warranty related items requiring action were identified in our 4/16/14 email to Metro:

1. Leaks at numerous double tee welded connections primarily due to cracked concrete adjacent to weld.
2. Cracked cast-in-place wash at primary vehicle entrance.

Please see the above reference email, found in Appendix E, for more detail and recommended actions. We have no further immediate concerns.

NEAR-TERM REPAIRS

Due to the age and condition of the garage we recommend most of the non-critical repairs be completed in 2020, year five of the master repair plan. These near-term repairs include addressing the structural items found including:

1. Install roof level storefront
2. Repaint curbs

RECOMMENDATIONS

Based on chloride test results, we recommend the following improvements to protect the floor structural system:

1. Install traffic topping at the lowest supported level and the 5th level at the cast-in-place washes.

LONG-TERM REPAIRS

Long term repairs include a second round of structural and waterproofing repairs in 2024, four years after the near-term repairs to address continued deterioration of the concrete and the end of the useful life of the waterproofing products. Long-term repairs items include the following:

1. Replace roof level floor sealants
2. Replace roof level expansion joint glands
3. Install roof level crossover/interior wash traffic topping
4. Install interior level 3 crossover/interior wash traffic topping
5. Repaint traffic markings
6. Repaint curbs

OBSERVATIONS AND DISCUSSION

CONDITION ASSESSMENT

The following observations were made during a facility walk through on the April 8 to 10, 2014 site visit. Photographs referenced within the observations are found in Appendix B of the report. Observations are immediately followed by a brief discussion of the repair in italics.

1. Roof level floor sealants are in good condition but require localized replacement at tee to tee connections within 5 years.
2. Interior floor sealants are in good condition but require localized replacement at tee to tee connections within 5 years.
3. Roof level expansion joints are in good condition and require replacement within 10 years. (Photo 4,5)
4. Interior level expansion joints are in good condition and require replacement beyond 10 years.
5. Stair treads, landings, and handrails are in good shape. (Photo 13, 14)
6. A moderate amount of the concrete adjacent to double tee to double tee welded connections was observed to be cracked which requires structural

repair. (Photo 7,8,9)

7. A few concrete washes at the main entrance were observed to be cracked/spalled which requires structural repair. (Photo 10,11,12)
8. The roof level stair tower landings are open without any storefront and were extensively wet during our visit the day after a hard rain. Install storefront to dramatically reduce water into elevator shafts and onto adjacent landing to reduce slipping hazards in freezing weather (Photos 1,2,3). If storefront is not acceptable, provide traffic topping to protect slab from deicing salts which will be necessary during freezing weather to eliminate slipping on ice.

MATERIAL TESTING

Concrete powder samples were extracted from floor surfaces of the roof and intermediate supported levels of the parking garage as shown in Appendix C. The chloride content was determined at 3 locations: near the surface (0-1 inch depth), near the design location for top reinforcing steel/tee connections (1 to 2 inch depth), and near the center of the slab (2 to 3 inch depth). Locations were taken in both cast-in-place concrete as well as precast concrete, if present, to determine the extent of chloride contamination in these differing concretes. The results are included in Appendix D. These chloride contents provide an indication of the current and expected future deterioration of the parking structure due to chloride-induced corrosion of the reinforcing steel. A typical threshold chloride value for the onset of corrosion is between 280 and 410 parts per million. The determined values are defined as minor (less than 200 ppm at the 1 to 2 inch depth), moderate (between 200 ppm and 400 ppm at the 1 to 2 inch depth, and large (greater than 400 ppm at the 1 to 2 inch depth. The extent of chloride contamination directly influences our recommended floor surface treatment (nothing, penetrating sealer, traffic topping).

The summary of chlorides test results in Appendix C are;

Level	Depth	Type	PPM
1	1 to 2	CIP	240
2	1 to 2	P/C	70
3	1 to 2	CIP	70
4	1 to 2	P/C	100
5	1 to 2	CIP	280
6	1 to 2	P/C	40

APPENDIX A

WALKER
RESTORATION CONSULTANTS

DUNN LORING GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 1,380				$ 4,140					
	102	Precast Tee Stem Repair										
	103	Precast Beam Repair										
	104	Precast Shear Connector Repair										
	105	Precast Column/Wall Repair										
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000				$ 1,000				$ 1,000	
		Structural Sub-Total	**$ 2,380**	**$ -**	**$ -**	**$ -**	**$ 5,140**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof									$ 18,086	
	206	Cove Sealant Replacement - Precast Covered Levels										
	209	Floor Sealant Replacement - Precast Roof									$ 66,177	
	210	Floor Sealant Replacement - Precast Covered Levels										
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation					$ 207,172				$ 36,560	
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof									$ 43,125	
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 20,717				$ 16,395	
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 227,889**	**$ -**	**$ -**	**$ -**	**$ 180,343**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping										
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000				$ 1,000	
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000	$ 15,000			$ 1,000	
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow	$ 11,303								$ 11,303	
	502	Repaint Traffic Markings									$ 51,375	
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
	512	Install Roof Level Storefront	$ 50,000									
		Miscellaneous Sub-Total	**$ 61,303**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 62,678**	**$ -**
		Construction Subtotal	$ 66,682	$ -	$ -	$ -	$ 235,028	$ 165,000	$ -	$ -	$ 246,021	$ -
		Mobilization @ 6% of Construction Subtotal	$ 4,001	$ -	$ -	$ -	$ 14,102	$ 9,900	$ -	$ -	$ 14,761	$ -
		Construction Total	**$ 70,683**	**$ -**	**$ -**	**$ -**	**$ 249,130**	**$ 174,900**	**$ -**	**$ -**	**$ 260,782**	**$ -**
		Project Contingency @ 15%	$ 10,602	$ -	$ -	$ -	$ 37,370	$ 26,235	$ -	$ -	$ 39,117	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 10,602	$ -	$ -	$ -	$ 37,370	$ 26,235	$ -	$ -	$ 39,117	$ -
		Material Testing During Construction	$ 707	$ -	$ -	$ -	$ 2,491	$ 1,749	$ -	$ -	$ 2,608	$ -
		Project Cost Totals Per Year:	**$ 92,595**	**$ -**	**$ -**	**$ -**	**$ 326,360**	**$ 229,119**	**$ -**	**$ -**	**$ 341,624**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work. Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

APPENDIX B

WALKER
RESTORATION CONSULTANTS

Photo 1

Stair tower at top level.

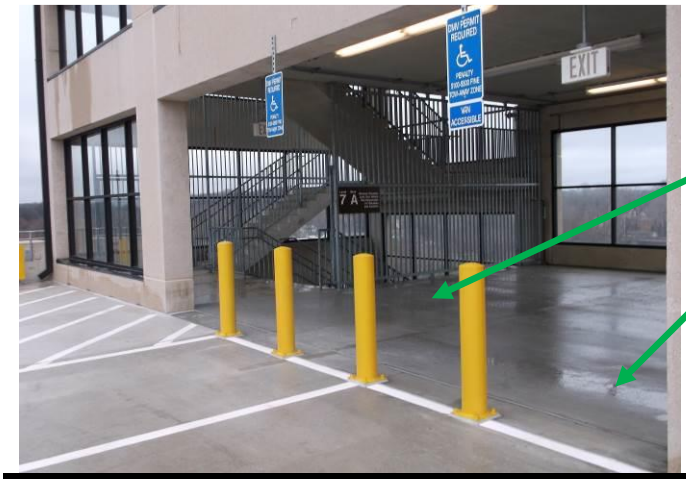


Photo 2

Wind driven rain within stair tower.

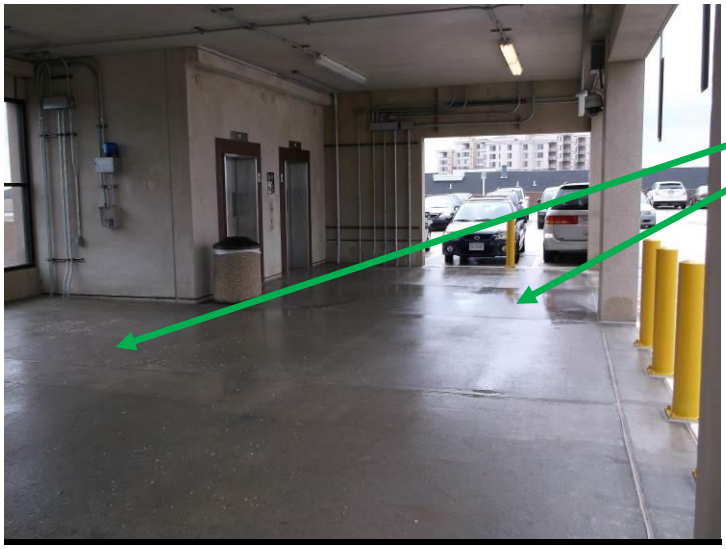


Photo 3

Wind driven rain within stair tower.

Expansion joint in good condition.

Photo 4

Expansion joint shear transfer devices in good condition.

Photo 5

Floor drains not yet cast into wash.

Photo 6

Joint leaks at double tee welded connection.

Photo 7

Joint leaks at double tee welded connection.

Photo 8

Close up of joint leaking at double tee welded connection showing cracked concrete.

Photo 9

Photo 10

Cracked concrete L-beam and wash at main entrance.

Photo 11

Cracked concrete L-beam and wash at main entrance.

Photo 12

Leaking at cast-in-place wash to tee boundary.

Leaking beneath main entrance L-beam and wash.

Photo 13

Interior of stair tower at level B2

Photo 14

Stair tower at level 6A.

Black stair nosings provide color contrast so no yellow paint is recommended.

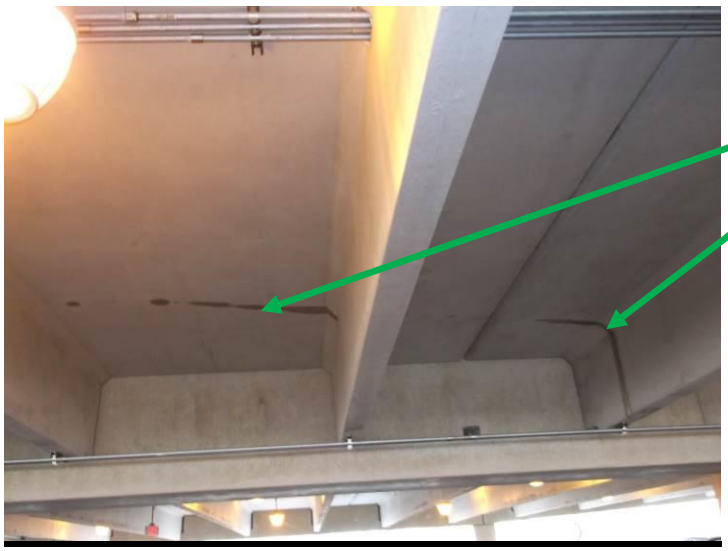


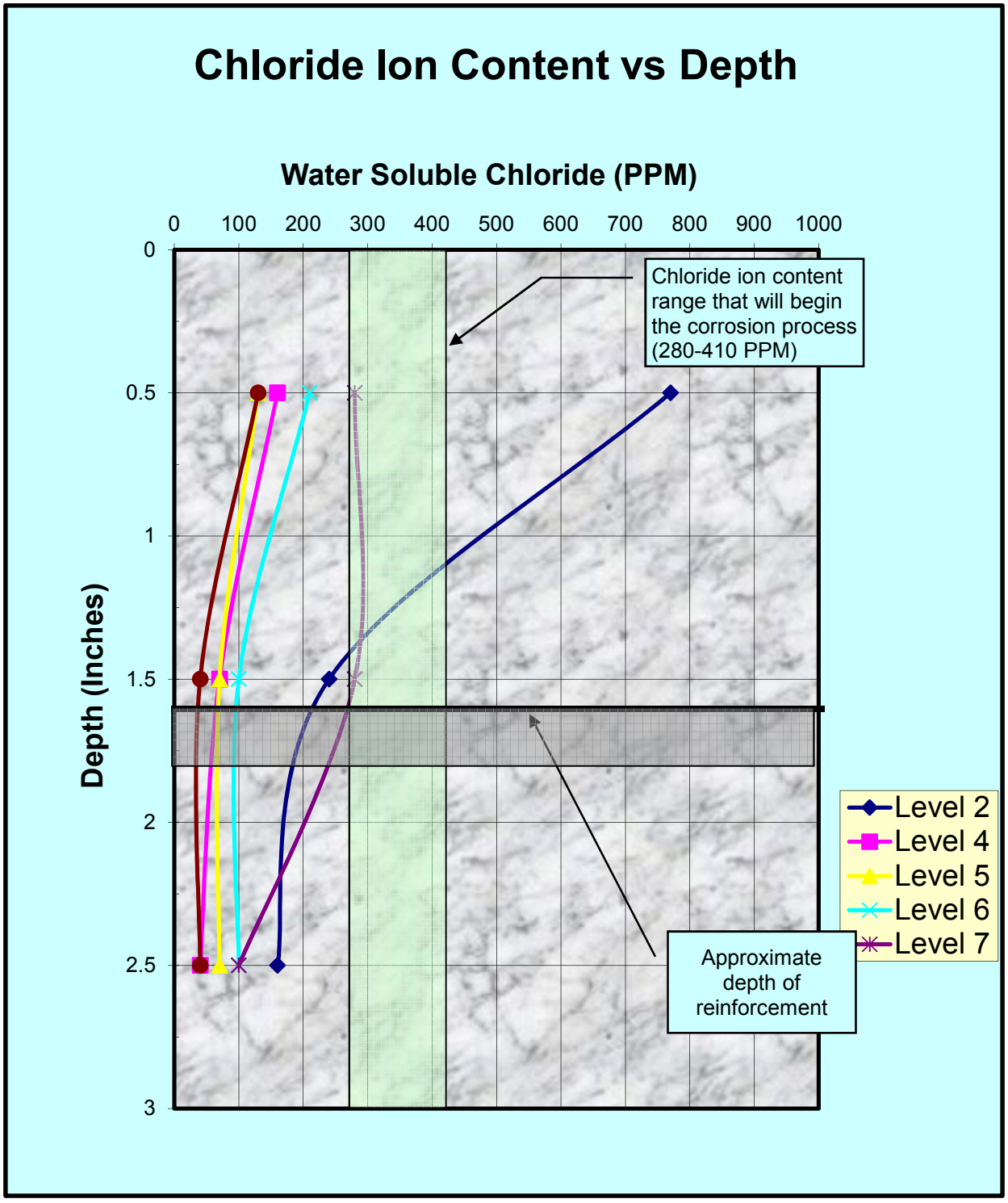
Photo 15

Leaking at cast-in-place wash to tee boundary.

APPENDIX C

WALKER
RESTORATION CONSULTANTS

Project # 14-3944.04
Date Jun-14



UNIVERSAL CONSTRUCTION TESTING, Ltd.

Project: Washington Metropolitan Area Transit Authority
Maryland, Virginia & Washington DC

UCT Project No. 14073
Walker Project No. 14-3994.04

Client: Walker Restoration Consultants

Date: May 2, 2014

Table 1.11. **Chloride Content of Concrete**
(Water-Soluble)
AASHTO T 260

Sample Number	Location in Structure	Level tested, inch from top	Chloride ion (CL^-) Content		
			by weight of concrete %	by weight of cement* %	by weight of concrete (ppm)*
Dunn Loring Garage					
G1	Level 2	0-1	0.077	**0.48**	770
	Intermediate Level	1-2	0.024	**0.15**	240
		2-3	0.016	**0.10**	160
G2	Level 4	0-1	0.016	**0.10**	160
	Intermediate Level	1-2	0.007	**0.05**	70
		2-3	0.004	**0.03**	40
G3	Level 5	0-1	0.013	**0.08**	130
	Intermediate Level	1-2	0.007	**0.05**	70
		2-3	0.007	**0.05**	70
G4	Level 6	0-1	0.021	**0.13**	210
	Intermediate Level	1-2	0.010	**0.07**	100
		2-3	0.010	**0.07**	100
G5	Level 7	0-1	0.028	**0.17**	280
	Intermediate Level	1-2	0.028	**0.17**	280
		2-3	0.010	**0.07**	100
G6	Level 8	0-1	0.013	**0.08**	130
	Roof Level	1-2	0.004	**0.03**	40
		2-3	0.004	**0.03**	40

Remarks: *) Assumed cement content 600 lbs/cu.yd. and U.W. = 3800 pcy.

UNIVERSAL CONSTRUCTION TESTING

UNIVERSAL CONSTRUCTION TESTING, Ltd.

Project: Washington Metropolitan Area Transit Authority
Maryland, Virginia & Washington DC

UCT Project No. 14073
Walker Project No. 14-3994.04

Client: Walker Restoration Consultants

Date: May 2, 2014

Table 1.11. **Chloride Content of Concrete**
(Water-Soluble)
AASHTO T 260

Sample Number	Location in Structure	Level tested, inch from top	Chloride ion (CL^-) Content		
			by weight of concrete %	by weight of cement* %	by weight of concrete (ppm)*
Dunn Loring Garage					
G7	-	0-1	0.007	**0.05**	70
		1-2	0.003	**0.02**	30
		2-3	0.002	**0.01**	20

Remarks: *) Assumed cement content 600 lbs/cu.yd. and U.W. = 3800 pcy.

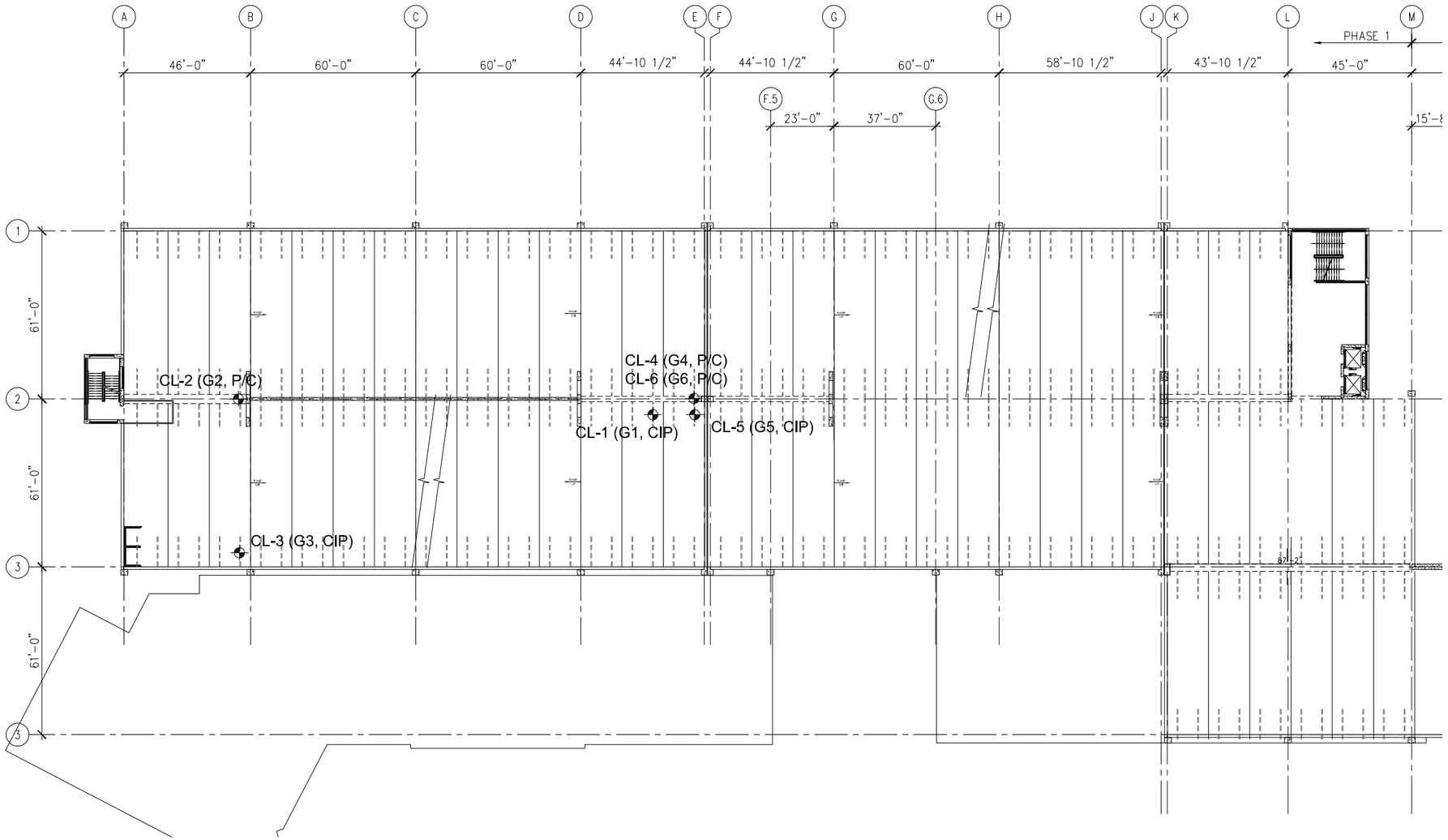
APPENDIX D

WALKER
RESTORATION CONSULTANTS

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY - DUNN LORING GARAGE
FALLS CHURCH, VIRGINIA

WALKER PARKING CONSULTANTS

CHLORIDES
SAMPLE LOCATIONS



LEGEND:

CL-1 CONCRETE SAMPLE
THE FIRST NUMBER REFERS TO THE SAMPLE NUMBER. THE SECOND NUMBER REFERS TO THE FLOOR WHERE THE SAMPLE WAS TAKEN. THE FINAL SYMBOL (P/C = PRECAST, CIP = CAST IN PLACE) REFERS TO THE TYPE OF CONCRETE FROM WHICH THE SAMPLE WAS TAKEN. TAKEN 4/8/2014

LEGEND

NORTH

Scale: 1/16" = 1' - 0"

R-701

04/03/2014 14-944.00

APPENDIX E

WALKER
RESTORATION CONSULTANTS

Kletsko, Marissa

From: Neiderer, Greg
Sent: Wednesday, April 16, 2014 11:11 AM
To: Patrick Schmitt @ WMATA Pkg
Cc: Rogers, Phillip @ WMATA Pkg; Pudleiner, Jim; Stairs, Kathryn
Subject: 2014 04 16 WMATA Dunn Loring Potential Warranty Items

Patrick,

We reviewed this garage on 4/8/14 the day after heavy rains and we found:

1. A number of leaks beneath the roof level. These leaks typically occur at the tee to tee weld locations. This often occurs when the welding overheats the connection and cracks the concrete behind the connection which is beyond the sealant to tee edge location. Please see photo 50 for a close up of the leaking and photos 46 and 51 for views along tee soffits that show the general locations. I anticipate that about 15% to 25% of the roof had these cracks. It is more difficult to determine if the frequency is the same at lower levels as they had much less water upon them.
2. At the vehicular entrance to the garage the cast-in-place concrete wash is cracked and leaking. Please see attached photo 39.

These items are not urgent safety items, but since they may be within your warranty period I wanted to alert you to them.

Sincerely,

Gregory J. Neiderer, PE
Principal

Walker Restoration Consultants | **Walker Parking Consultants**
565 East Swedesford Road, Suite 300 | Wayne, PA 19087
610.995.0260 x 1408 (Office) | 610.659.6967 (Cell) | 610.995.0261 (Fax)
www.walkerrestoration.com | www.walkerparking.com

To send me a file larger than 10MB, please use this File Transfer

FRANCONIA-SPRINGFIELD EXPANSION

WALKER
RESTORATION CONSULTANTS

FEBRUARY 2015 14-3944.04

The summary data for the facility is as follows:

Table FRSPE-1: Facility Information Summary

	FRANCONIA EXPANSION
Location:	6880 Frontier Drive Springfield, VA
Overall Condition:	**GOOD**
Current Needs:	**MINOR**
Chloride Contamination	**MODERATE**
Year built:	2003
Supported Levels	4
Levels Below Grade	NONE
Parking Space Capacity:	1,054
Parking Efficiency:	289 SF/Space
Footprint:	Approximately 305' x 248'
Bridges:	3 Vehicular
Vehicle Circulation:	Single Helix
Pedestrian Circulation	2 Stairs
Parking Area: Slab on Grade Total Supported Area Total Parking Area	 70,000 ± SF 212,000 ± SF 282,000 ± SF
Structural System	Precast Un-topped Double Tee
Façade Spandrel Treatment	Precast with Steel Railings

FACILITY DESCRIPTION


NORTH VIEW


SOUTH VIEW


EAST VIEW


WEST VIEW


PLAN-ORIGINAL-WEST, EXPANSION-EAST

FEBRUARY 2015 14-3944.04

Executive Summary

This 2003 garage is in good shape, has moderate chloride contamination and has minor current repair needs.

Its scheduled repairs are anticipated to cost:

2020 – Near Term - $713,275
2022 – Long-term - $283,523

See Appendix A for cost details.

CRITICAL REPAIRS

The following safety related items requiring urgent action were identified in our 4/16/14 email to Metro:

1. Broken curbs (trip hazard)

Please see the above reference email, found in Appendix E, for more detail and recommended actions. We have no further immediate concerns.

NEAR-TERM REPAIRS

Due to the age and condition of the garage we recommend most of the non-critical repairs be completed in 2020, year five of the master repair plan. These near-term repairs include addressing the structural items found including:

1. Remove and replace concrete floor slab spalls
2. Repair spalled concrete at double tee floor connections
3. Remove and replace spalled wash concrete
4. Replace roof level floor sealants
5. Replace roof level expansion joint glands
6. Repaint traffic markings
7. Repaint curbs

Based on chloride test results, we recommend the following improvements to protect the floor structural system:

1. Install penetrating sealer at all supported levels

RECOMMENDATIONS

2. Install traffic topping at all cast-in-place washes on the interior

LONG-TERM REPAIRS

Long term repairs include a second round of structural and waterproofing repairs in 2022, two years after the near-term repairs to address continued deterioration of the concrete and the end of the useful life of the waterproofing products. Long-term repairs items include the following:

1. Replace interior level floor sealants
2. Replace interior level expansion joint glands

OBSERVATIONS AND DISCUSSION

CONDITION ASSESSMENT

The following observations were made during a facility walk through on the April 8 to 10, 2014 site visit. Photographs referenced within the observations are found in Appendix B of the report. Observations are immediately followed by a brief discussion of the repair in italics.

1. Roof level floor sealants are in fair condition and require replacement within 5 years. (Photo 2)
2. Interior floor sealants are in good condition and require replacement within 10 years.
3. Roof level expansion joints are in fair condition and require replacement within 5 years. (Photo 6)
4. Interior level expansion joints are in good condition and require replacement beyond 10 years.
5. A minor portion of the roof level wash concrete is spalled which requires repair (Photo 1, 2).
6. Changes in floor elevation, curbs, are not readily visually apparent and require painting now with safety yellow paint to emphasize elevations changes (Photo 3)
7. A minor number of the double tee to double tee welded connections were observed to be rusting which requires structural repair (Photo 4, 5).
8. A minor amount of the concrete adjacent to double tee to double tee welded connections was observed to be cracked and spalling which requires structural repair. (Photo 4, 5)

FEBRUARY 2015 14-3944.04

MATERIAL TESTING

Concrete powder samples were extracted from floor surfaces of the roof and intermediate supported levels of the parking garage as shown in Appendix C. The chloride content was determined at 3 depths: near the surface (0-1 inch depth), near the design location for top reinforcing steel/tee connections (1 to 2 inch depth), and near the center of the slab (2 to 3 inch depth). Locations were taken in both cast-in-place concrete as well as precast concrete, if present, to determine the extent of chloride contamination in these differing concretes. The results are included in Appendix D. These chloride contents provide an indication of the current and expected future deterioration of the parking structure due to chloride-induced corrosion of the reinforcing steel. A typical threshold chloride value for the onset of corrosion is between 280 and 410 parts per million. The determined values are defined as minor (less than 200 ppm at the 1 to 2 inch depth), moderate (between 200 ppm and 400 ppm at the 1 to 2 inch depth, and large (greater than 400 ppm at the 1 to 2 inch depth. The extent of chloride contamination directly influences our recommended floor surface treatment (nothing, penetrating sealer, traffic topping).

The summary of chlorides test results in Appendix D are;

Level	Depth	Type	PPM
3	1 to 2	CIP	180
4	1 to 2	P/C	340
5	1 to 2	CIP	540
6 (Roof)	1 to 2	P/C	130

APPENDIX A

WALKER
RESTORATION CONSULTANTS

FRANCONIA/SPRINGFIELD EXPANSION GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 6,263				$ 56,367					
	102	Precast Tee Stem Repair					$ 4,290					
	103	Precast Beam Repair					$ 2,707					
	104	Precast Shear Connector Repair					$ 5,633					
	105	Precast Column/Wall Repair					$ 2,222					
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	114											
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000				$ 10,683		$ 1,000			
		Structural Sub-Total	**$ 7,263**	**$ -**	**$ -**	**$ -**	**$ 81,903**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof					$ 21,575					
	206	Cove Sealant Replacement - Precast Covered Levels							$ 32,915			
	209	Floor Sealant Replacement - Precast Roof					$ 78,942					
	210	Floor Sealant Replacement - Precast Covered Levels							$ 132,725			
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation					$ 66,060					
	214	Concrete Sealer					$ 200,256					
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof					$ 4,313					
	217	Expansion Joint Replacement - Covered Levels							$ 17,250			
	218	Caulk Handrail Bases										
	219											
	220											
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 37,115		$ 18,289			
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 408,260**	**$ -**	**$ 201,179**	**$ -**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping										
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000		$ 1,000			
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000	$ 15,000	$ 1,000			
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow					$ 3,878					
	502	Repaint Traffic Markings					$ 17,625					
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
		Miscellaneous Sub-Total	**$ -**	**$ -**	**$ -**	**$ -**	**$ 21,503**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 10,263	$ -	$ -	$ -	$ 513,665	$ 165,000	$ 204,179	$ -	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 616	$ -	$ -	$ -	$ 30,820	$ 9,900	$ 12,251	$ -	$ -	$ -
		Construction Total	**$ 10,879**	**$ -**	**$ -**	**$ -**	**$ 544,485**	**$ 174,900**	**$ 216,430**	**$ -**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 1,632	$ -	$ -	$ -	$ 81,673	$ 26,235	$ 32,464	$ -	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 1,632	$ -	$ -	$ -	$ 81,673	$ 26,235	$ 32,464	$ -	$ -	$ -
		Material Testing During Construction	$ 109	$ -	$ -	$ -	$ 5,445	$ 1,749	$ 2,164	$ -	$ -	$ -
		Project Cost Totals Per Year:	**$ 14,251**	**$ -**	**$ -**	**$ -**	**$ 713,275**	**$ 229,119**	**$ 283,523**	**$ -**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work.
   Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

APPENDIX B

WALKER
RESTORATION CONSULTANTS

Photo 1

Significant cracking and debonding in cast-in-place topping on bridge between original garage and expansion.

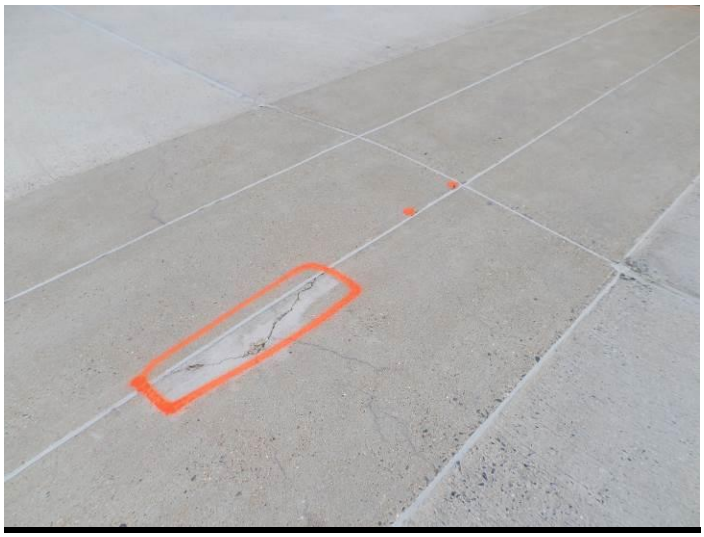


Photo 2

Spall at cast-in-place wash.

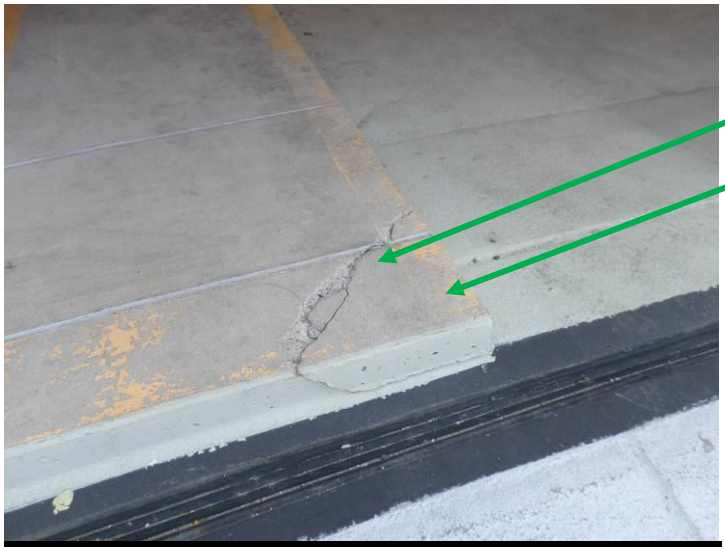


Photo 3

Damaged curb.

Curbs are recommended to be painted yellow.

Leaking and rusting at tee to tee connections is typical.

Photo 4

Spall and rust damage in soffit at leaking tee to tee connections.

Photo 5

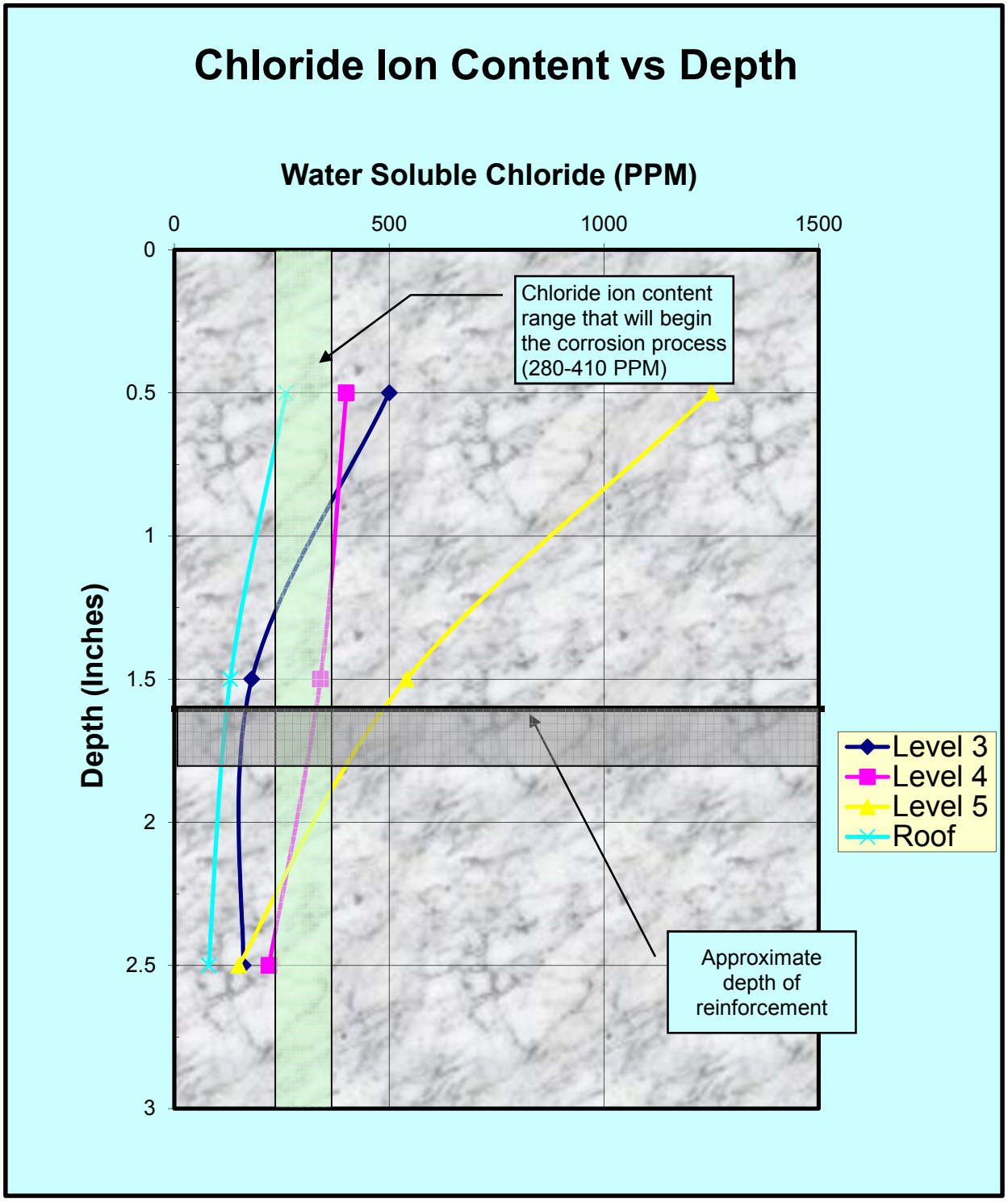
Leaking and leaching through expansion joint.

Photo 6

APPENDIX C

WALKER
RESTORATION CONSULTANTS

Project # 14-3944.04
Date Jun-14



UNIVERSAL CONSTRUCTION TESTING, Ltd.

Project: Washington Metropolitan Area Transit Authority
Maryland, Virginia & Washington DC

UCT Project No. 14073
Walker Project No. 14-3994.04

Client: Walker Restoration Consultants

Date: May 2, 2014

Table 1.14. **Chloride Content of Concrete**
(Water-Soluble)
AASHTO T 260

Sample Number	Location in Structure	Level tested, inch from top	Chloride ion (CL^-) Content		
			by weight of concrete %	by weight of cement* %	by weight of concrete (ppm)*
Spring/Franconia Expansion Garage (New)					
3	Level 3	0-1	0.050	**0.32**	500
	Intermediate Level	1-2	0.018	**0.12**	180
		2-3	0.016	**0.10**	160
4	Level 4	0-1	0.040	**0.25**	400
	Intermediate Level	1-2	0.034	**0.21**	340
		2-3	0.022	**0.13**	220
5	Level 5	0-1	0.125	**0.79**	1250
	Intermediate Level	1-2	0.054	**0.34**	540
		2-3	0.015	**0.10**	150
6	Level 6	0-1	0.026	**0.17**	260
	Roof Level	1-2	0.013	**0.09**	130
		2-3	0.008	**0.05**	80

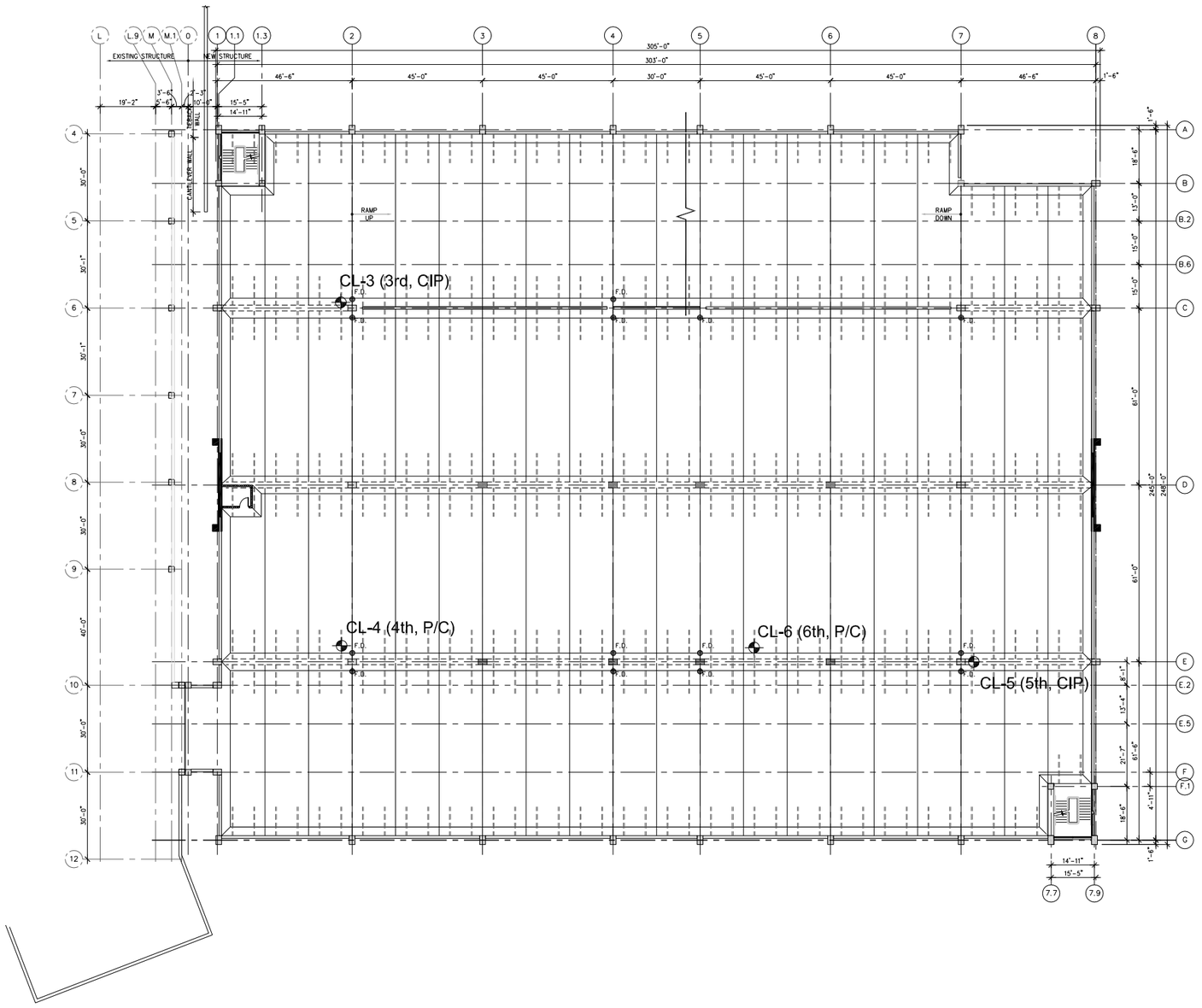
Remarks: *) Assumed cement content 600 lbs/cu.yd. and U.W. = 3800 pcy.

APPENDIX D

WALKER
RESTORATION CONSULTANTS

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY - FRANCONIA EXPANSION GARAGE
SPRINGFIELD, VIRGINIA

WALKER PARKING CONSULTANTS



CHLORIDES
SAMPLE LOCATIONS

LEGEND:

- CL-1 CONCRETE SAMPLE
  THE FIRST NUMBER REFERS TO THE SAMPLE NUMBER. THE SECOND NUMBER REFERS TO THE FLOOR WHERE THE SAMPLE WAS TAKEN. THE FINAL SYMBOL (P/C = PRECAST, CIP = CAST IN PLACE) REFERS TO THE TYPE OF CONCRETE FROM WHICH THE SAMPLE WAS TAKEN. TAKEN 4/9/2014

LEGEND

NORTH

Scale: 1/16" = 1' - 0"

R-701

04/03/2014 14-944.00

APPENDIX E

WALKER
RESTORATION CONSULTANTS

Kletsko, Marissa

From: Neiderer, Greg
Sent: Wednesday, April 16, 2014 3:21 PM
To: Patrick Schmitt @ WMATA Pkg
Cc: Rogers, Phillip @ WMATA Pkg; Pudleiner, Jim; Stairs, Kathryn; Gross, Jason @ Walker
Subject: 2014 04 16 WMATA Franconia Springfield Near Term Actions - Loose Curb , Debonded Traffic Topping
Attachments: 2014 04 09 WMATA Franconia Springfield KES 24.jpg; 2014 04 09 WMATA Franconia Springfield JCG 23.jpg

Patrick,

We reviewed this garage on 4/9 and we found:

1. A broken curb edge at the bridge between the newer expansion and the original garage. This is a tripping hazard. See photo 23. We recommend you patch this curb promptly.
2. At the roof level there is a bay that has debonding traffic topping that is a potential tripping hazard. See photo 23. The loose traffic topping should be removed.

Sincerely,

Gregory J. Neiderer, PE
Principal

Walker Restoration Consultants | Walker Parking Consultants
565 East Swedesford Road, Suite 300 | Wayne, PA 19087
610.995.0260 x 1408 (Office) | 610.659.6967 (Cell) | 610.995.0261 (Fax) www.walkerrestoration.com | www.walkerparking.com

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FRANCONIA-SPRINGFIELD ORIGINAL

WALKER
RESTORATION CONSULTANTS

FEBRUARY 2015 14-3944.04

The summary data for the facility is as follows:

Table FRSPO-1: Facility Information Summary

	FRANCONIA ORIGINAL
Location:	6880 Frontier Drive Springfield, VA
Overall Condition:	**FAIR**
Current Needs:	**MODERATE**
Chloride Contamination	**MODERATE**
Year built:	1997
Supported Levels	5
Levels Below Grade	NONE
Parking Space Capacity:	3,856
Parking Efficiency:	293 SF/Space
Footprint:	Approximately 540' x 346'
Bridges:	1 Pedestrian, 4 Vehicular
Vehicle Circulation:	Two Double Helix
Pedestrian Circulation	5 Stairs, 2 Elevators
Parking Area: Slab on Grade Total Supported Area Total Parking Area	 168,000 ± SF 913,000 ± SF 1,081,000 ± SF
Structural System	Precast Un-topped Double Tee
Façade Spandrel Treatment	Precast with Steel Railings

FACILITY DESCRIPTION


NORTH VIEW


WEST VIEW


WEST VIEW


WEST VIEW


PLAN-ORIGINAL IS LEFT OF BRIDGE

Executive Summary

This 1997 garage is in fair shape, has moderate chloride contamination and has moderate current repair needs

Its scheduled repairs are anticipated to cost:

2019 – Near Term - $3,224,368
2021 – Long-term - $1,318,527

See Appendix A for cost details.

CRITICAL REPAIRS

The following safety related items requiring urgent action were identified in our 4/16/14 and 5/8/14 emails to Metro:

1. Loose traffic topping (trip hazard)
2. Uneven tile on pedestrian bridge (trip hazard).

Please see the above reference emails, found in Appendix E, for more detail and recommended actions. We have no further immediate concerns.

NEAR-TERM REPAIRS

Due to the age and condition of the garage we recommend most of the non-critical repairs be completed in 2019, year four of the master repair plan. These near-term repairs include addressing the structural items found including:

1. Remove and replace spalled overhead concrete found on ceilings (soffits), with repair concrete anchored with supplementary embedded steel pins. Monitor this condition at least every 6 months until replacement and remove loose concrete.
2. Install continuous expansion joint blockout at roof level light walls
3. Replace double tee bearing pads with slide bearings at expansion joint
4. Replace roof level expansion joint glands
5. Repair roof level traffic topping at delaminations
6. Repair bridge expansion joint glands and nosings

RECOMMENDATIONS

7. Repair fencing

Based on chloride test results, we recommend the following improvements to protect the floor structural system:

1. Install penetrating sealer at all supported levels
2. Install traffic topping at all cast-in-place washes on the interior

LONG-TERM REPAIRS

Long term repairs include a second round of structural and waterproofing repairs in 2021, two years after the near-term repairs to address continued deterioration of the concrete and the end of the useful life of the waterproofing products. Long-term repairs items include the following:

1. Replace interior level floor sealants

CONDITION ASSESSMENT

OBSERVATIONS AND DISCUSSION

The following observations were made during a facility walk through on the April 8 to 10, 2014 site visit. Photographs referenced within the observations are found in Appendix B of the report. Observations are immediately followed by a brief discussion of the repair in italics.

1. Roof level floor sealants are in good condition beneath traffic topping and require replacement beyond 10 years. (Photo 1,5)
2. Interior floor sealants are in good condition and require replacement within 10 years. (Photo 8)
3. Roof level expansion joints are in fair condition and require replacement within 5 years.
4. Interior level expansion joints are in good condition and require replacement within 10 years.
5. A moderate portion of the roof level traffic topping is delaminating which requires repair. (Photo 1,2)
6. Changes in floor elevation, curbs and handicap ramps, are not readily visually apparent and require painting now with safety yellow paint to emphasize elevations changes
7. Significant slab ceilling (soffit) leaching was observed at tee to inverted tee beam locations and loose

concrete requires removal now. (Photo 7)

8. Spandrel beams were observed to have moderate crazing crack patterns indicative of ASR and an investigation to determine if ASR is underway is recommended. (Photo 9)
9. Many double tee stem bearing pads beneath the expansion joints have moved which requires replacement with slide bearing joints. (Photo 4)
10. Roof level expansion joint glands were observed to be discontinuous at the light wall and are recommended to be modified to be continuous. (Photo 5)
11. The interior fencing is damaged and require repair now. (Photo 6).
12. A minor amount of localized ponding was observed and clogged drains need to be cleared of debris. (Photo 8)
13. At most bridge expansion joints, there is uneven tile, a tripping hazard, that needs to be repaired now. (Photo 12)

MATERIAL TESTING

Concrete powder samples were extracted from floor surfaces of the roof and intermediate supported levels of the parking garage as shown in Appendix C. The chloride content was determined at 3 depths: near the surface (0-1 inch depth), near the design location for top reinforcing steel/tee connections (1 to 2 inch depth), and near the center of the slab (2 to 3 inch depth). Locations were taken in both cast-in-place concrete as well as precast concrete, if present, to determine the extent of chloride contamination in these differing concretes. The results are included in Appendix D. These chloride contents provide an indication of the current and expected future deterioration of the parking structure due to chloride-induced corrosion of the reinforcing steel. A typical threshold chloride value for the onset of corrosion is between 280 and 410 parts per million. The determined values are defined as minor (less than 200 ppm at the 1 to 2 inch depth), moderate (between 200 ppm and 400 ppm at the 1 to 2 inch depth, and large (greater than 400 ppm at the 1 to 2 inch depth. The extent of chloride contamination directly influences our recommended floor surface treatment (nothing, penetrating sealer, traffic topping).

The summary of chlorides test results in Appendix C are;

Level	Depth	Type	PPM
2	1 to 2	CIP	30
3	1 to 2	P/C	2,320
4	1 to 2	CIP	840
5	1 to 2	CIP	40
6	1 to 2	P/C	60
7	1 to 2	CIP	600

APPENDIX A

WALKER
RESTORATION CONSULTANTS

FRANCONIA/SPRINGFIELD ORIGINAL GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair				$ 169,578						
	102	Precast Tee Stem Repair				$ 11,616						
	103	Precast Beam Repair				$ 7,329						
	104	Precast Shear Connector Repair				$ 15,253						
	105	Precast Column/Wall Repair				$ 6,017						
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad				$ 66,000						
	113	Repair Loose Bollard										
	114	Reconfigure Expansion Joint Blockout - Roof				$ 54,063						
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000			$ 49,478		$ 1,000				
		Structural Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 379,335**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof										
	206	Cove Sealant Replacement - Precast Covered Levels						$ 170,993				
	209	Floor Sealant Replacement - Precast Roof										
	210	Floor Sealant Replacement - Precast Covered Levels						$ 689,495				
	211	Rout and Seal Cracks				$ 12,188						
	212	Traffic Topping Repair	$ 252,387			$ 321,220						
	213	Traffic Topping - New Installation				$ 657,720						
	214	Concrete Sealer				$ 729,446						
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof				$ 43,125						
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 25,239			$ 176,370		$ 86,049				
		Waterproofing Sub-Total	**$ 277,625**	**$ -**	**$ -**	**$ 1,940,068**	**$ -**	**$ 946,537**	**$ -**	**$ -**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping										
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000		$ 1,000				
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement					$ 150,000					
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000			$ 1,000	$ 15,000	$ 1,000				
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow										
	502	Repaint Traffic Markings										
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Repair Fencing @ Lightwall				$ 625						
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
	512	Repair Pedestrian Bridge Tile	$ 3,125									
		Miscellaneous Sub-Total	**$ 3,125**	**$ -**	**$ -**	**$ 625**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 283,750	$ -	$ -	$ 2,322,028	$ 165,000	$ 949,537	$ -	$ -	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 17,025	$ -	$ -	$ 139,322	$ 9,900	$ 56,972	$ -	$ -	$ -	$ -
		Construction Total	**$ 300,775**	**$ -**	**$ -**	**$ 2,461,349**	**$ 174,900**	**$ 1,006,509**	**$ -**	**$ -**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 45,116	$ -	$ -	$ 369,202	$ 26,235	$ 150,976	$ -	$ -	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 45,116	$ -	$ -	$ 369,202	$ 26,235	$ 150,976	$ -	$ -	$ -	$ -
		Material Testing During Construction	$ 3,008	$ -	$ -	$ 24,613	$ 1,749	$ 10,065	$ -	$ -	$ -	$ -
		Project Cost Totals Per Year:	**$ 394,016**	**$ -**	**$ -**	**$ 3,224,368**	**$ 229,119**	**$ 1,318,527**	**$ -**	**$ -**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work.
   Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

APPENDIX B

WALKER
RESTORATION CONSULTANTS

Photo 1

Delaminating traffic topping at several bays at roof level.

Photo 2

Well bonded traffic topping.

Delaminating traffic topping.

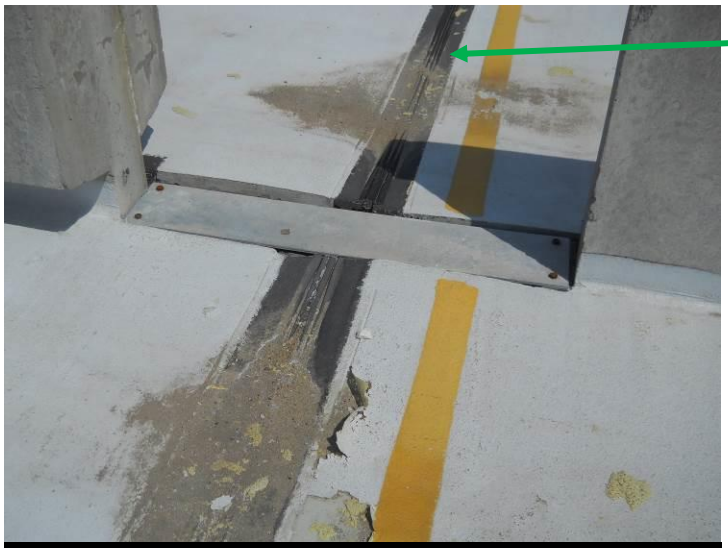


Photo 3

Expansion joint in good condition but should exist in a cruciform joint beneath cover plate.

Photo 4

Slipping bearing pad adjacent to expansion joint indicates excessive movement for joint.

Photo 5

Expansion joint along lightwall interrupted at each lightwall gap and recommended to be continuous at roof level.

Photo 6

Fencing detached from railing.

Photo 7

Leaching and rusting at tee to inverted tee beam joints.

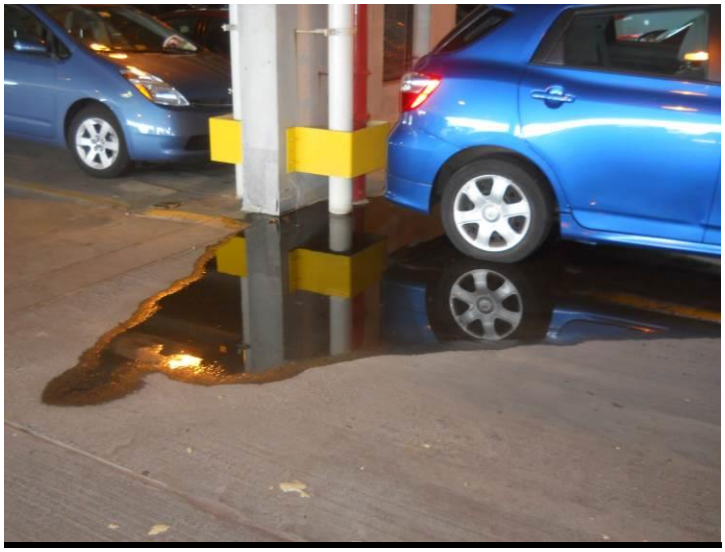


Photo 8

Ponding at clogged drain.

Photo 9

Crack pattern indicative of ASR in original garage spandrels.

Photo 10

Pedestrian bridge connection to garage.

Photo 11

Pedestrian bridge connection to station.

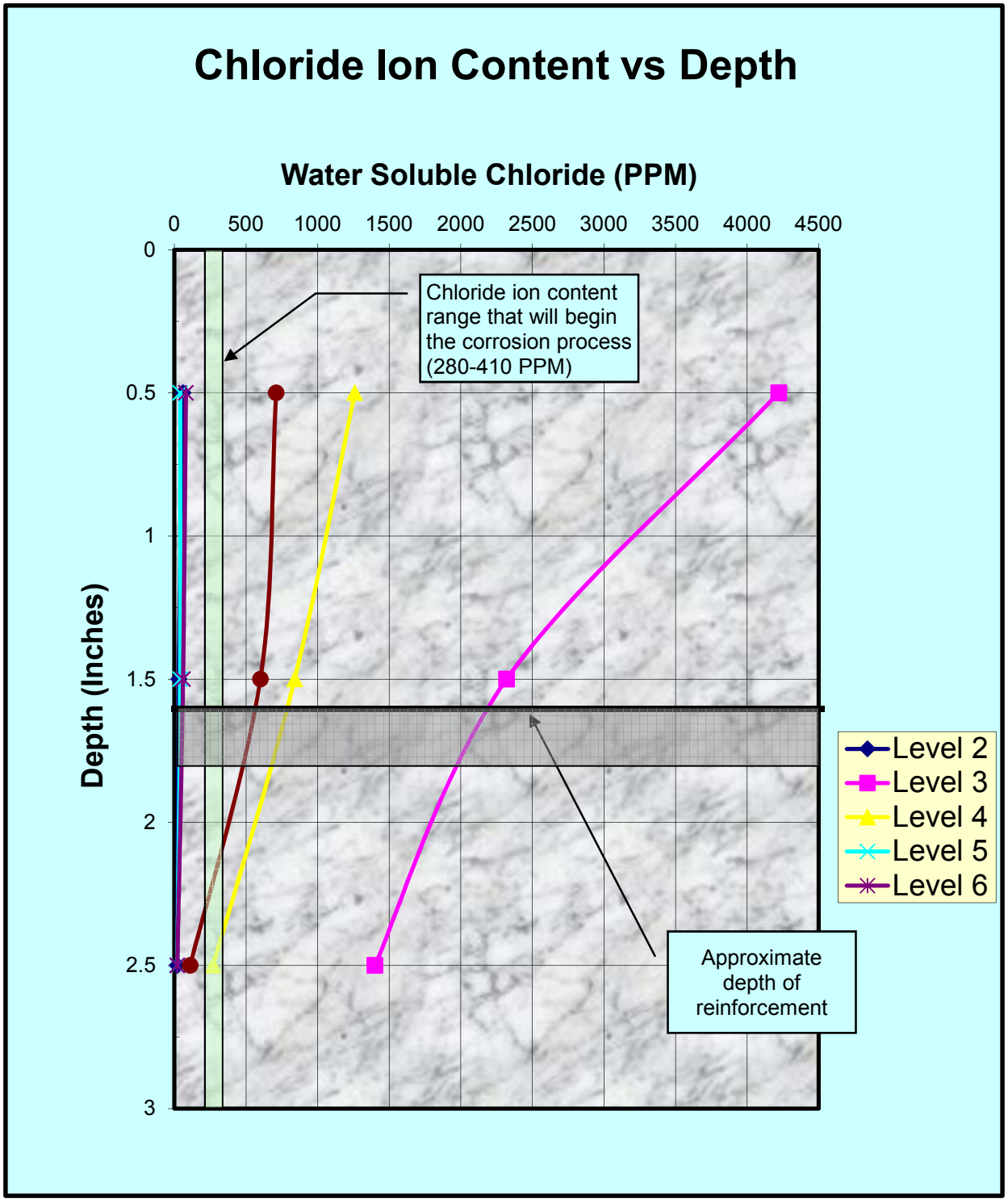
Photo 12

Pedestrian bridge trip hazard at joint with garage.

APPENDIX C

WALKER
RESTORATION CONSULTANTS

Project # 14-3944.04
Date Jun-14



UNIVERSAL CONSTRUCTION TESTING, Ltd.

Project: Washington Metropolitan Area Transit Authority
Maryland, Virginia & Washington DC

UCT Project No. 14073
Walker Project No. 14-3994.04

Client: Walker Restoration Consultants

Date: May 2, 2014

Table 1.15. **Chloride Content of Concrete**
(Water-Soluble)
AASHTO T 260

Sample Number	Location in Structure	Level tested, inch from top	Chloride ion (CL^-) Content		
			by weight of concrete %	by weight of cement* %	by weight of concrete (ppm)*
Springfield / Franconia Garage (Old)					
2	Level 2	0-1	0.006	**0.04**	60
	Intermediate Level	1-2	0.003	**0.02**	30
		2-3	0.002	**0.01**	20
3	Level 3	0-1	0.422	**2.68**	4220
	Intermediate Level	1-2	0.232	**1.47**	2320
		2-3	0.140	**0.89**	1400
4	Level 4	0-1	0.126	**0.80**	1260
	Intermediate Level	1-2	0.084	**0.53**	840
		2-3	0.027	**0.17**	270
5	Level 5	0-1	0.004	**0.03**	40
	Intermediate Level	1-2	0.004	**0.03**	40
		2-3	0.002	**0.0**	20
6	Level 6	0-1	0.008	**0.05**	80
	Intermediate Level	1-2	0.006	**0.04**	60
		2-3	0.002	**0.01**	20
7	Level 7	0-1	0.071	**0.45**	710
	Roof Level	1-2	0.060	**0.38**	600
		2-3	0.011	**0.07**	110

Remarks: *) Assumed cement content 600 lbs/cu.yd. and U.W. = 3800 pcy.

UNIVERSAL CONSTRUCTION TESTING

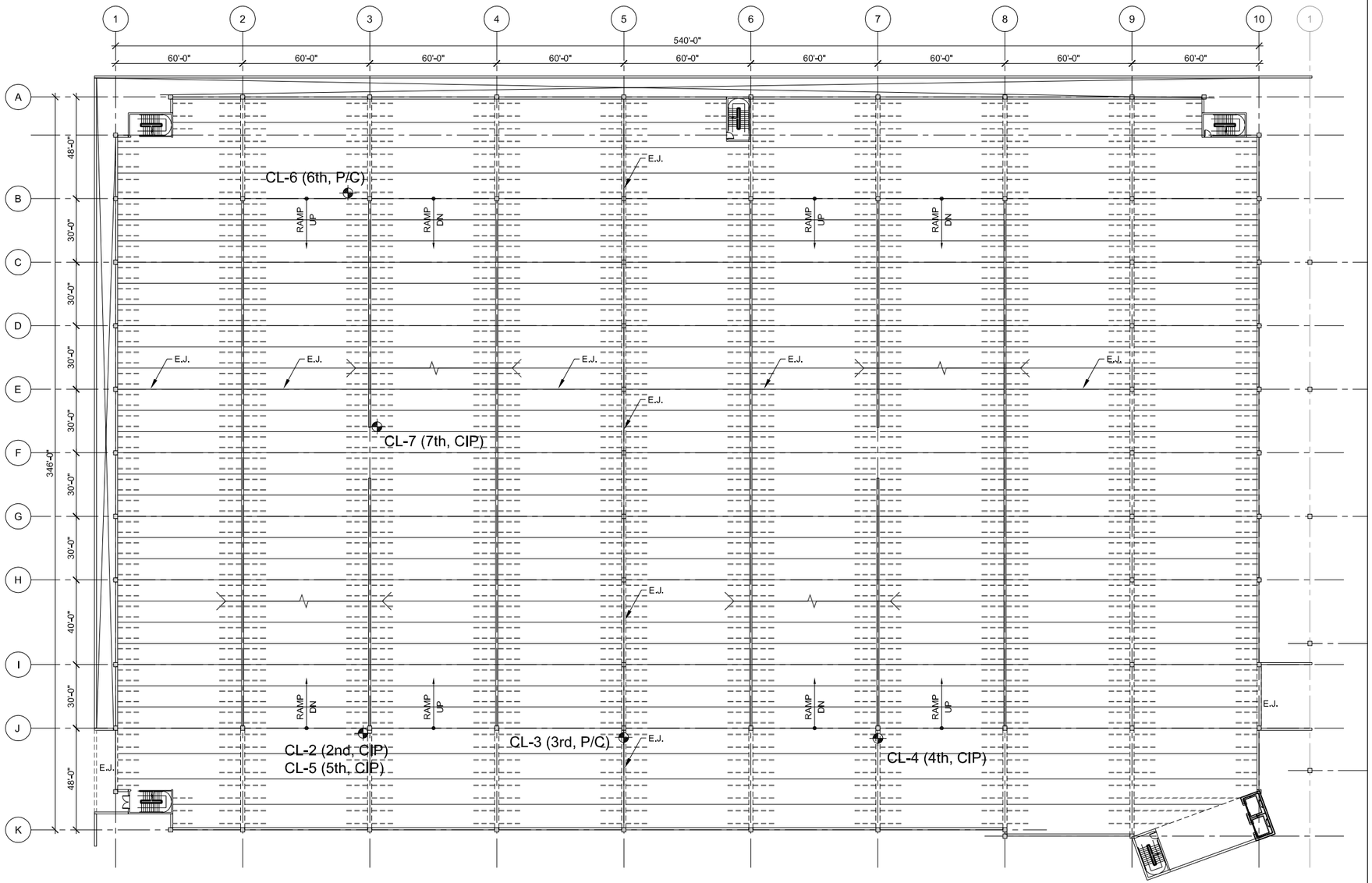
APPENDIX D

WALKER
RESTORATION CONSULTANTS

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY - FRANCONIA ORIGINAL GARAGE
SPRINGFIELD, VIRGINIA

WALKER PARKING CONSULTANTS

CHLORIDES
SAMPLE LOCATIONS



LEGEND:

CL-1 CONCRETE SAMPLE
THE FIRST NUMBER REFERS TO THE SAMPLE NUMBER. THE SECOND NUMBER REFERS TO THE FLOOR WHERE THE SAMPLE WAS TAKEN. THE FINAL SYMBOL (P/C = PRECAST, CIP = CAST IN PLACE) REFERS TO THE TYPE OF CONCRETE FROM WHICH THE SAMPLE WAS TAKEN. TAKEN 4/9/2014

LEGEND

NORTH

Scale: 1" = 20' - 0"

R-701

04/03/2014 14-044.00

APPENDIX E

WALKER
RESTORATION CONSULTANTS

Kletsko, Marissa

From: Neiderer, Greg
Sent: Thursday, May 08, 2014 8:49 AM
To: Patrick Schmitt @ WMATA Pkg
Cc: Pudleiner, Jim; Rogers, Phillip @ WMATA Pkg; Stairs, Kathryn; Gross, Jason @ Walker
Subject: 2014 05 08 WMATA Franconia Springfield Garage Bridge to Station Near Term Actions
Attachments: photo 1.JPG; photo 2.JPG; photo 3.JPG

Patrick, yesterday while we were surveying the bridge between the garage and the station we noticed the following pedestrian tripping hazards both in the expansion joint (see photos 2 and 3) and in the construction joints (see photo 1) of the tiled walking surface of the bridge.

We recommend you repair these tripping hazards as soon as practical.

Please call or email if you have any questions.

Gregory J. Neiderer, PE
Principal

Walker Restoration Consultants | Walker Parking Consultants
565 East Swedesford Road, Suite 300 | Wayne, PA 19087
610.995.0260 x 1408 (Office) | 610.659.6967 (Cell) | 610.995.0261 (Fax) www.walkerrestoration.com | www.walkerparking.com

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GLENMONT EAST

WALKER
RESTORATION CONSULTANTS

The summary data for the facility is as follows:

Table GLMTE-1: Facility Information Summary

	GLENMONT EAST
Location:	Georgia Avenue & Urbana Drive Silver Spring, MD 20906
Overall Condition:	**FAIR**
Current Needs:	**MODERATE**
Chloride Contamination	**MODERATE**
Year built:	1998
Supported Levels	4
Levels Below Grade	0.5
Parking Space Capacity:	1,781
Parking Efficiency:	353 SF/Space
Footprint:	Approximately 394' x 362'
Bridges:	2 Pedestrian, 1 Vehicular
Vehicle Circulation:	Side by Side Single Helix
Pedestrian Circulation	4 Stair(s), 6 Elevator(s)
Parking Area: Slab on Grade Total Supported Area Total Parking Area	 139,000 ± SF 491,000 ± SF 630,000 ± SF
Structural System	Post-Tensioned 1-way Beam & Slab
Façade Spandrel Treatment	Precast with Full Thickness Brick on Column

FACILITY DESCRIPTION

NORTH VIEW

SOUTH VIEW

EAST VIEW

WEST VIEW

PLAN VIEW

FEBRUARY 2015 14-3944.04

EXECUTIVE SUMMARY

This 1998 garage is in fair shape, has moderate chloride contamination and has moderate current repair needs

Its scheduled repairs are anticipated to cost:

2018 – Near Term - $1,868,642
2024 – Long-term - $2,987,323

See Appendix A for cost details.

CRITICAL REPAIRS

The following safety related items requiring urgent action were identified in our 4/21/14 email to Metro:

1. Emergency stair exit landing settlement (trip hazard)
2. Inadequate handrail (excessive gap) spacing
3. Failing door hinge hardware
4. Ponding water within emergency stairs

Please see the above reference email, found in Appendix E, for more detail and recommended actions. We have no further immediate concerns.

NEAR-TERM REPAIRS

Due to the age and condition of the garage we recommend most of the non-critical repairs be completed in 2018, year three of the master repair plan. These near-term repairs include addressing the structural items found including:

1. Repair stair railing gaps
2. Repaint stair railings
3. Modify existing swales in concrete floor slab
4. Replace roof level expansion joint glands
5. Replace interior level expansion joint glands
6. Repair roof level traffic topping
7. Install new supplemental floor drains
8. Install new supplemental floor piping
9. Replace stair tower door hardware
10. Repaint traffic markings

RECOMMENDATIONS

11. Repaint curbs
12. Repair stairtower handrails

Based on chloride test results, we recommend the following improvements to protect the floor structural system:

1. Install penetrating sealer at the interior supported levels
2. Install traffic topping at all P/T pour strips and expansion joints

LONG-TERM REPAIRS

Long term repairs include a second round of structural and waterproofing repairs in 2024, six years after the near-term repairs to address continued deterioration of the concrete and the end of the useful life of the waterproofing products. Long-term repairs items include the following:

1. Install traffic topping at interior supported levels
2. Replace stairtower roofs

CONDITION ASSESSMENT

OBSERVATIONS AND DISCUSSION

The following observations were made during a facility walk through on the March 24 to 26, 2014 site visit. Photographs referenced within the observations are found in Appendix B of the report. Observations are immediately followed by a brief discussion of the repair in italics.

1. Roof level floor sealants are in good condition beneath traffic topping and require replacement beyond 10 years.
2. Interior floor sealants are in fair condition and require replacement within 10 years. (Photo 2)
3. Many P/T pourstrips were observed to have indications of leakage which requires waterproofing repair now (Photo 2,3)
4. The roof and interior level stairtower doors' hinges are deformed which require replacement (Photo 18).
5. A moderate amount of localized ponding was observed and new supplemental drains need to be installed as well as swales ground into the floor slab modified. (Photo 1,4,10,12,16,17)

6. A minor portion of the roof level floor traffic topping is damaged by scrapes and wear which requires repair.
7. Changes in floor elevation, curbs and handicap ramps, are not readily visually apparent and require painting now with safety yellow paint to emphasize elevations changes (Photo 11,20)
8. Floor slab soffits, particularly at the lowest supported level in the northeast corner, were observed to have minor leaching cracks with effloresence which require waterproofing to address deterioration (Photo 8)
9. A few columns and walls were observed to be cracked and previously repaired. (Photo 6,13,14)
10. A moderate portion of the existing elevator landing handrails are rusted and requires cleaning and painting. (Photo 7)
11. A roof drain on the main elevator/stair is clogged and should be unclogged (Photo 19).
12. Expansion joints at secondary stairtowers only partially isolate the stairs from the garage, but no cracking was observed at areas without the expansion joint (Photo 21).

MATERIAL TESTING

Concrete powder samples were extracted from floor surfaces of the roof and intermediate supported levels of the parking garage as shown in Appendix C. The chloride content was determined at 3 depths: near the surface (0-1 inch depth), near the design location for top reinforcing steel/tee connections (1 to 2 inch depth), and near the center of the slab (2 to 3 inch depth). Locations were taken in both cast-in-place concrete as well as precast concrete, if present, to determine the extent of chloride contamination in these differing concretes. The results are included in Appendix D. These chloride contents provide an indication of the current and expected future deterioration of the parking structure due to chloride-induced corrosion of the reinforcing steel. A typical threshold chloride value for the onset of corrosion is between 280 and 410 parts per million. The determined values are defined as minor (less than 200 ppm at the 1 to 2 inch depth), moderate (between 200 ppm and 400 ppm at the 1 to 2 inch depth, and large (greater than 400 ppm at the 1 to 2 inch depth. The extent of chloride contamination directly influences our recommended floor surface treatment (nothing, penetrating

sealer, traffic topping).

The summary of chlorides test results in Appendix C are;

Level	Depth	Type	PPM
2	1 to 2	CIP	380
3	1 to 2	CIP	300
4	1 to 2	CIP	40
5 (Roof)	1 to 2	CIP	440

APPENDIX A

WALKER
RESTORATION CONSULTANTS

GLENMONT EAST GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

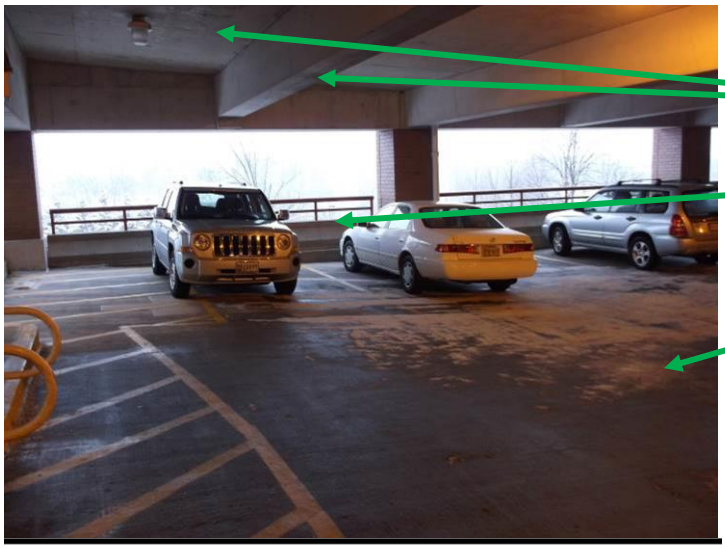
	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	106	P/T Slab Repair			$ 65,825							
	107	P/T Beam Repair			$ 6,208							
	108	P/T Column Repair			$ 3,883							
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	113	Repair Loose Bollard										
	114	Repair Settlement At Stair Entry/Exit			$ 3,750							
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000		$ 11,950						$ 1,000	
		Structural Sub-Total	**$ 1,000**	**$ -**	**$ 91,616**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Waterproofing												
	201	Facade Sealant Replacement - P/T										
	203	Cove Sealant Replacement - P/T Roof										
	204	Cove Sealant Replacement - P/T Covered Levels										
	207	Floor Sealant Replacement - P/T Roof										
	208	Floor Sealant Replacement - P/T Covered Levels										
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair			$ 425,200							
	213	Traffic Topping - New Installation			$ 79,861						$ 1,916,654	
	214	Concrete Sealer			$ 343,352							
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof			$ 65,838							
	217	Expansion Joint Replacement - Covered Levels			$ 153,238							
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000		$ 106,749						$ 191,665	
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ 1,174,236**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 2,108,320**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping	$ 4,813		$ 4,813							
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000		$ 1,000						$ 1,000	
		Mechanical Sub-Total	**$ 5,813**	**$ -**	**$ 5,813**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Electrical												
	401	PARC System Replacement				$ 150,000						
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000		$ 1,000	$ 15,000					$ 1,000	
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ 1,000**	**$ 165,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow			$ 8,663							
	502	Repaint Traffic Markings			$ 39,375							
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door Hardware	$ 2,500									
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings			$ 25,000							
	508	Railing Infill for Excessive Gap	$ 5,000									
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof									$ 40,000	
	511	Repair Broken Handrail										
		Miscellaneous Sub-Total	**$ 7,500**	**$ -**	**$ 73,038**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 40,000**	**$ -**
		Construction Subtotal	$ 16,313	$ -	$ 1,345,702	$ 165,000	$ -	$ -	$ -	$ -	$ 2,151,320	$ -
		Mobilization @ 6% of Construction Subtotal	$ 979	$ -	$ 80,742	$ 9,900	$ -	$ -	$ -	$ -	$ 129,079	$ -
		Construction Total	**$ 17,291**	**$ -**	**$ 1,426,444**	**$ 174,900**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 2,280,399**	**$ -**
		Project Contingency @ 15%	$ 2,594	$ -	$ 213,967	$ 26,235	$ -	$ -	$ -	$ -	$ 342,060	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 2,594	$ -	$ 213,967	$ 26,235	$ -	$ -	$ -	$ -	$ 342,060	$ -
		Material Testing During Construction	$ 173	$ -	$ 14,264	$ 1,749	$ -	$ -	$ -	$ -	$ 22,804	$ -
		Project Cost Totals Per Year:	**$ 22,652**	**$ -**	**$ 1,868,642**	**$ 229,119**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 2,987,323**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work.
   Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

APPENDIX B

WALKER
RESTORATION CONSULTANTS

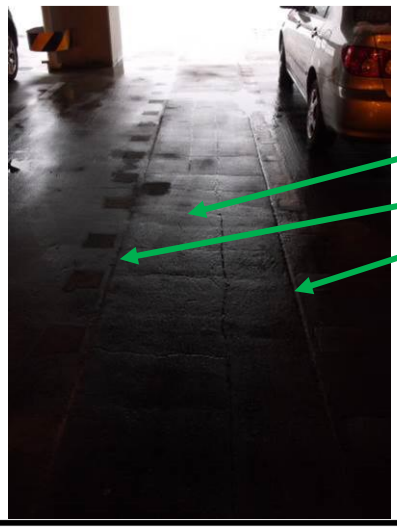


P/T slabs and beams.

Precast spandrel with railing at perimeter.

Lower levels are uncoated. Levels exposed to sunlight are traffic topped.

Photo 1



Lower level p/t pourstrip.

Unsealed pourstrip boundaries.

Photo 2

Leaking and leaching cracks in soffit at pourstrip boundaries.

Photo 3

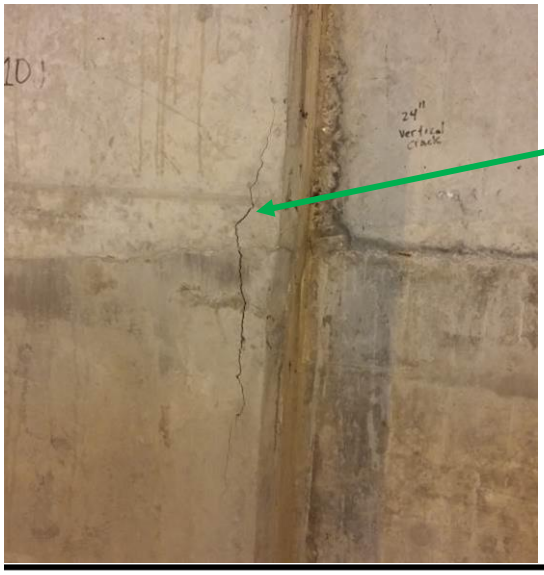
Lower level expansion joint is leaking.

Ponding at slab-on-grade.

Photo 4

Roof level expansion joint is leaking.

Photo 5



Vertical crack in wall at expansion joint.

Photo 6

Handrail gap too large.

Moisture at elevator landing.

Rusting handrails.

Failed expansion joint glands at stair tower.

Photo 7

Leaching through numerous cracks in supported slab.

Photo 8

Crack in wall and leaching at beam connection.

Photo 9

Photo 10

Swale ground into floor slab to drain water into floor slab is common near main stair tower. Several of these swales were clogged with debris and should be cleaned and rough edges ground smooth.

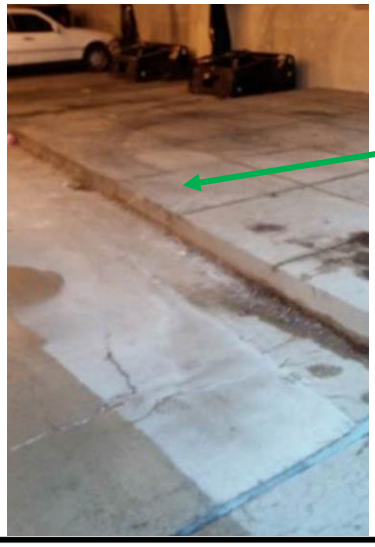


Photo 11

Unpainted curb. Curbs are recommended to be painted yellow.

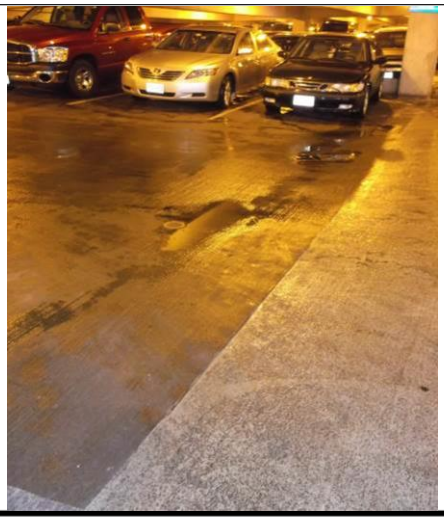


Photo 12

Ponding adjacent to floor drains at slab on grade.

Previous repair

Photo 13

Previous repair

Photo 14

Typical stair landing riser configuration. Black stair nosings provide color contrast so no yellow paint is recommended.

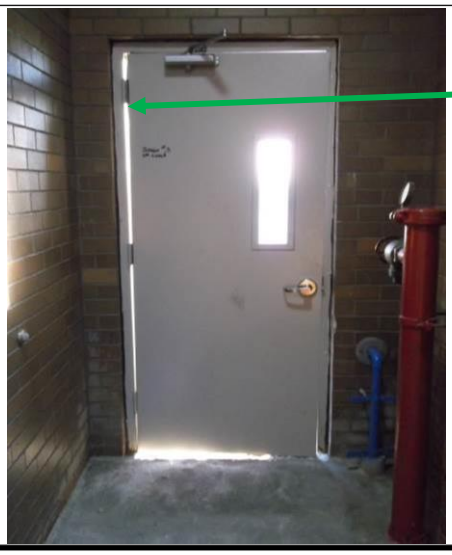
Photo 15

Ponding and salt staining on stair treads.

Photo 16

Ponding in stair tower.

Photo 17

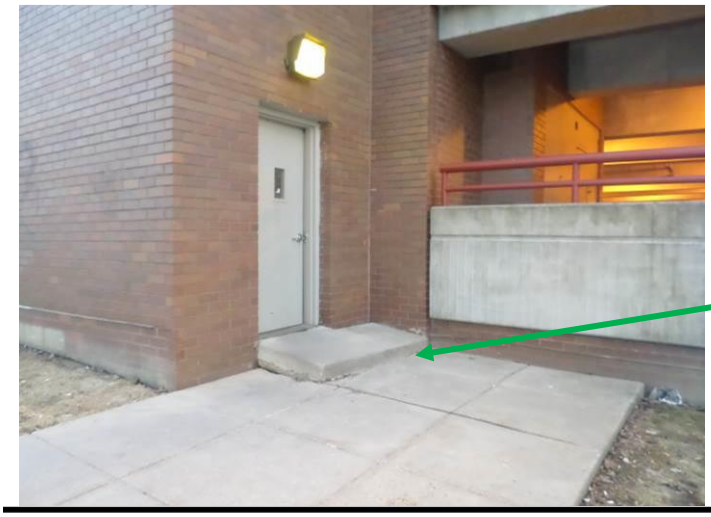


Door hinges are damaged.

Photo 18

Clogged roof drain.

Photo 19



Excessive settlement at secondary stairs exit creates tripping hazard.

Curbs are recommended to be painted yellow.

Photo 20

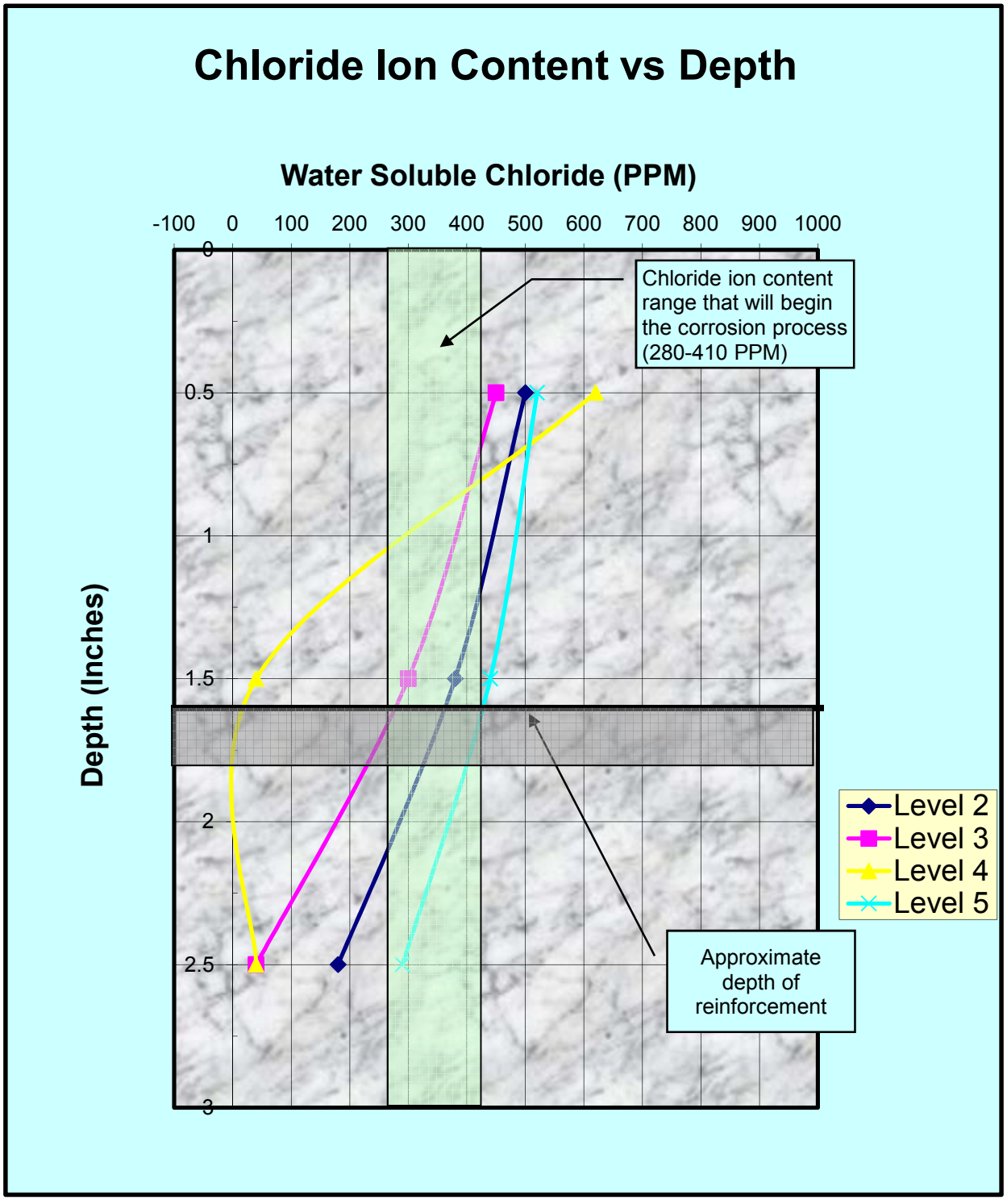
Roof level expansion joint occurs only for a portion of stair tower.

Photo 21

APPENDIX C

WALKER
RESTORATION CONSULTANTS

Project # 14-3944.04
Date Jun-14



UNIVERSAL CONSTRUCTION TESTING, Ltd.

Project: Washington Metropolitan Area Transit Authority
Maryland, Virginia & Washington DC

UCT Project No. 14066
Walker Project No. 14-3994.00

Client: Walker Restoration Consultants

Date: April 14, 2014

Table 1.1. **Chloride Content of Concrete**
(Water-Soluble)
AASHTO T 260

Sample Number	Location in Structure	Level tested, inch from top	Chloride ion (CL^-) Content		
			by weight of concrete %	by weight of cement* %	by weight of concrete (ppm)*
Glenmont East Garage					
2	Level 2	0-1	0.050	**0.32**	500
		1-2	0.038	**0.24**	380
		2-3	0.018	**0.11**	180
3	Level 3	0-1	0.045	**0.29**	450
		1-2	0.030	**0.19**	300
		2-3	0.004	**0.03**	40
4	Level 4	0-1	0.062	**0.39**	620
		1-2	0.004	**0.03**	40
		2-3	0.004	**0.03**	40
5	Level 5	0-1	0.052	**0.33**	520
	Roof	1-2	0.044	**0.28**	440
		2-3	0.029	**0.18**	290

Remarks: *) Assumed cement content 600 lbs/cu.yd. and U.W. = 3800 pcy.

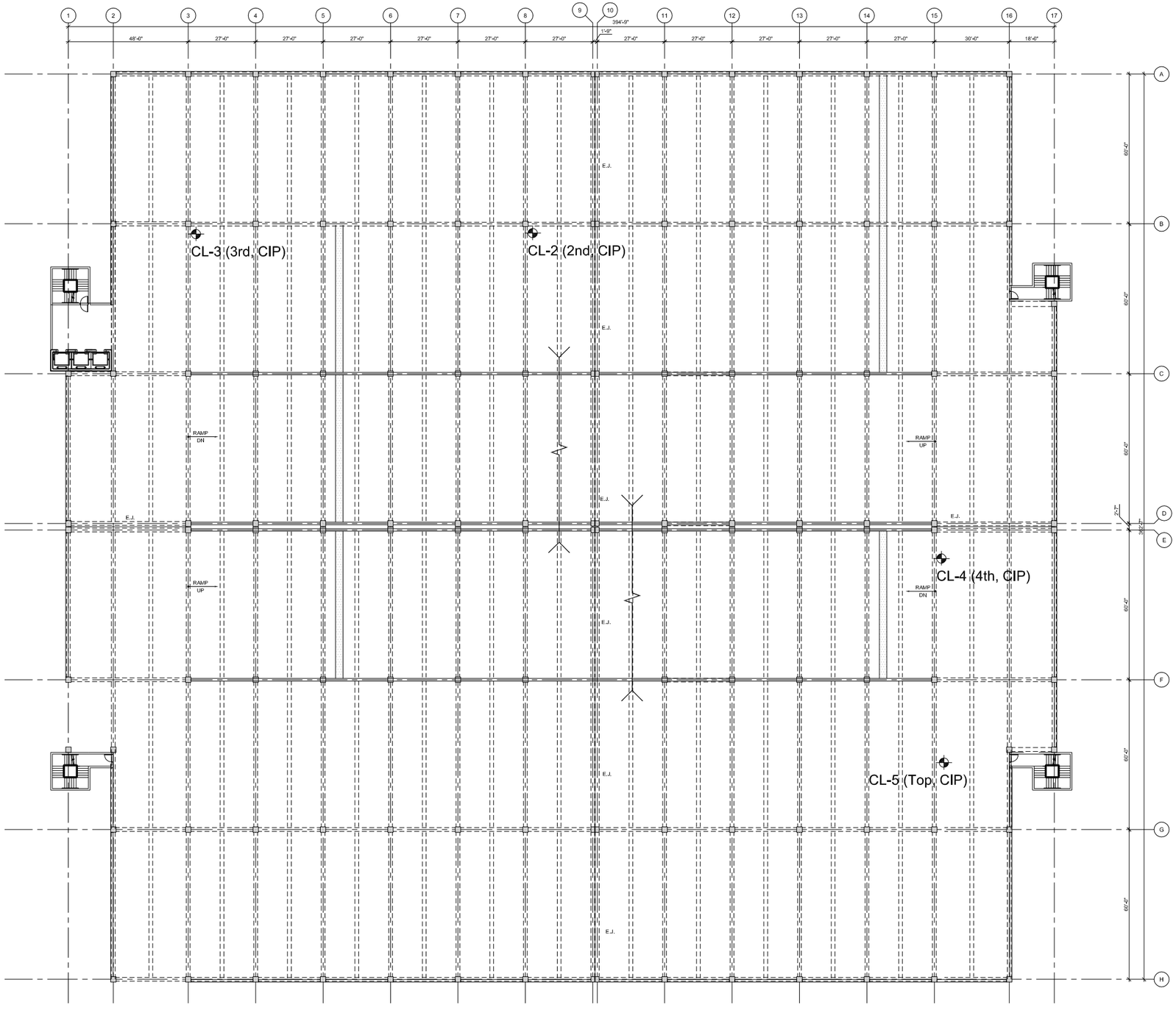
UNIVERSAL CONSTRUCTION TESTING

APPENDIX D

WALKER
RESTORATION CONSULTANTS

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY - GLENMONT EAST GARAGE
SILVER SPRING, MARYLAND

WALKER PARKING CONSULTANTS



CHLORIDES
SAMPLE LOCATIONS

LEGEND:

CL-1 CONCRETE SAMPLE
THE FIRST NUMBER REFERS TO THE SAMPLE NUMBER. THE SECOND NUMBER REFERS TO THE FLOOR WHERE THE SAMPLE WAS TAKEN. THE FINAL SYMBOL (P/C = PRECAST, CIP = CAST IN PLACE) REFERS TO THE TYPE OF CONCRETE FROM WHICH THE SAMPLE WAS TAKEN. TAKEN 4/24/2014

LEGEND

NORTH

Scale: 1/16" = 1' - 0"

R-701

04/03/2014 14-044.00

APPENDIX E

WALKER
RESTORATION CONSULTANTS

Kletsko, Marissa

From: Neiderer, Greg
Sent: Monday, April 21, 2014 5:10 PM
To: Patrick Schmitt @ WMATA Pkg
Cc: Rogers, Phillip @ WMATA Pkg; Pudleiner, Jim; Stairs, Kathryn; Gross, Jason @ Walker
Subject: 2014 04 21 WMATA Glenmont East Near Term Actions

Patrick,

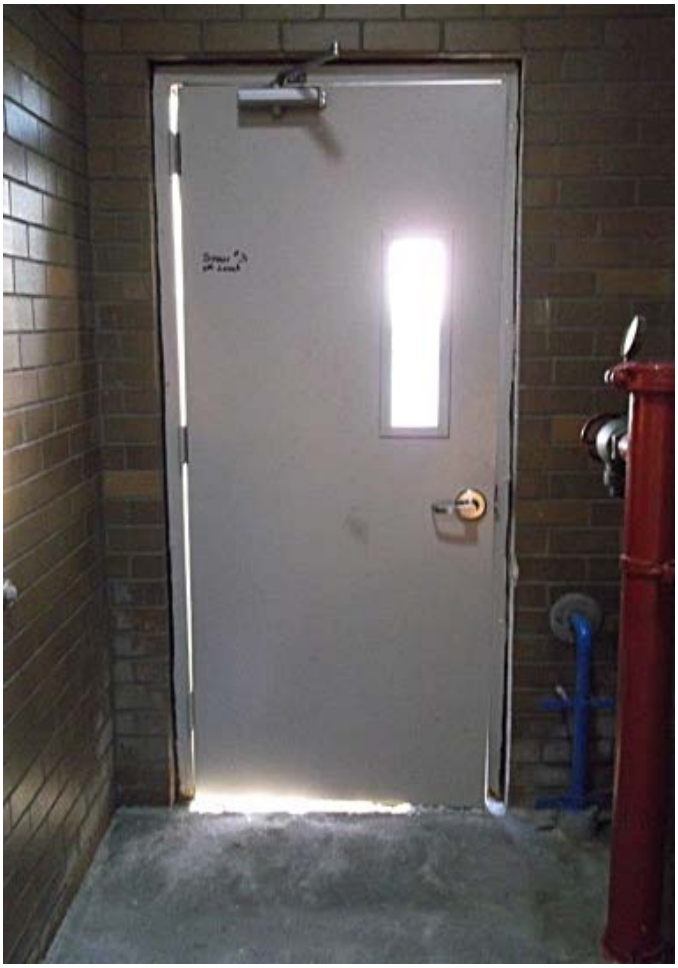
While at the site in March we noticed the following items which we recommend be addressed:

1. The handrail adjacent to the main elevator (W corner of garage) has a 5 inch gap rather than the code mandated gap of 4 inches. See Photo 19. We recommend this gap be closed by welding a steel plate to the handrail to reduce the gap soon.
2. The emergency egress stairs in the N corner of the garage has stair tower door hinges at the roof level that are damaged and will not close. See photo 4. We recommend this door have its hinges replaced and other hinges in this stair tower needed to be tightened to keep from being damaged in a similar manner this summer..
3. The emergency egress stairs in the E corner of the garage has ponding with it, and it has a significant trip hazard at grade where you exit. See photos 9 and 15. The ponding appears to be entering though the brick and will likely take some investigation to resolve this summer. The exit landing should be easy to fix by either replacing or "slab jacking" to raise the existing slab soon.

Gregory J. Neiderer, PE
Principal

Walker Restoration Consultants | **Walker Parking Consultants**
565 East Swedesford Road, Suite 300 | Wayne, PA 19087
610.995.0260 x 1408 (Office) | 610.659.6967 (Cell) | 610.995.0261 (Fax)
www.walkerrestoration.com | www.walkerparking.com

To send me a file larger than 10MB, please use this File Transfer



GLENMONT WEST

WALKER
RESTORATION CONSULTANTS

The summary data for the facility is as follows:

Table GLMTW-1: Facility Information Summary

	GLENMONT WEST
Location:	Georgia Avenue at Glenallan Avenue Silver Spring, MD 20906
Overall Condition:	**GOOD**
Current Needs:	**MINOR**
Chloride Contamination	**MODERATE**
Year built:	2012
Supported Levels	5
Levels Below Grade	0
Parking Space Capacity:	1,216
Parking Efficiency:	295 SF/Space
Footprint:	Approximately 350' x 180'
Bridges:	None
Vehicle Circulation:	Single Helix
Pedestrian Circulation	2 Stair(s), 2 Elevator(s)
Parking Area: Slab on Grade Total Supported Area Total Parking Area	 63,000 ± SF 295,000 ± SF 359,000 ± SF
Structural System	Post-Tensioned 1-way Beam & Slab
Façade Spandrel Treatment	Precast with Thin Brick Tile

FACILITY DESCRIPTION

NORTH VIEW

SOUTH VIEW

EAST VIEW

WEST VIEW

PLAN VIEW

EXECUTIVE SUMMARY

This 2012 garage is in good shape, has minor chloride contamination and has minor current repair needs

Its scheduled repairs are anticipated to cost:

2020 – Near Term - $531,887
2022 – Long-term - $41,581

See Appendix A for cost details.

CRITICAL REPAIRS

The following safety related items requiring urgent action were identified in our 4/21/14 email to Metro:

1. Overhead spalls at exterior column
2. Broken curbs (trip hazard)

Please see the above reference email, found in Appendix E, for more detail and recommended actions. We have no further immediate concerns.

NEAR-TERM REPAIRS

Due to the age and condition of the garage we recommend most of the non-critical repairs be completed in 2020, year five of the master repair plan. These near-term repairs include addressing the structural items found including:

1. Remove and replace spalled overhead concrete found on columns with repair concrete anchored with supplementary embedded steel pins. Monitor this condition at least every 6 months until replacement and remove loose concrete.
2. Repair spalled concrete at stair tower bollards.
3. Remove and replace spalled column corner concrete.

Based on chloride test results, we recommend the following improvements to protect the floor structural system:

1. Install penetrating sealer at all supported levels

RECOMMENDATIONS

LONG-TERM REPAIRS

Long term repairs include a second round of structural and waterproofing repairs in 2022, two years after the near-term repairs to address continued deterioration of the concrete and the end of the useful life of the waterproofing products. Long-term repairs items include the following:

1. Replace roof level floor sealants

CONDITION ASSESSMENT

The following observations were made during a facility walk through on the March 24 to 26, 2014 site visit. Photographs referenced within the observations are found in Appendix B of the report. Observations are immediately followed by a brief discussion of the repair in italics.

1. Roof level floor sealants are in good condition and require replacement within 10 years. (Photo 1)
2. Interior floor sealants are in good condition and require replacement beyond 10 years.
3. Roof level expansion joints are in good condition and require replacement beyond 10 years.
4. Interior level expansion joints are in good condition and require replacement beyond 10 years.
5. A few bollards were observed to have minor spalling which require structural repair and waterproofing to address deterioration (Photo 5)
6. A roof level curb and roof level column corner were observed to be broken which requires structural repair. (Photo 2,3)
7. One perimeter column had a minor spall which requires removal and replacement. (Photo 6)

MATERIAL TESTING

Concrete powder samples were extracted from floor surfaces of the roof and intermediate supported levels of the parking garage as shown in Appendix C. The chloride content was determined at 3 depths: near the surface (0-1 inch depth), near the design location for top reinforcing steel/tee connections (1 to 2 inch depth), and near the

OBSERVATIONS AND DISCUSSION

center of the slab (2 to 3 inch depth). Locations were taken in both cast-in-place concrete as well as precast concrete, if present, to determine the extent of chloride contamination in these differing concretes. The results are included in Appendix D. These chloride contents provide an indication of the current and expected future deterioration of the parking structure due to chloride-induced corrosion of the reinforcing steel. A typical threshold chloride value for the onset of corrosion is between 280 and 410 parts per million. The determined values are defined as minor (less than 200 ppm at the 1 to 2 inch depth), moderate (between 200 ppm and 400 ppm at the 1 to 2 inch depth, and large (greater than 400 ppm at the 1 to 2 inch depth. The extent of chloride contamination directly influences our recommended floor surface treatment (nothing, penetrating sealer, traffic topping).

The summary of chlorides test results in Appendix C are;

Level	Depth	Type	PPM
2	1 to 2	CIP	290
3	1 to 2	CIP	70
4	1 to 2	CIP	260
5	1 to 2	CIP	130
6	1 to 2	CIP	20

APPENDIX A

WALKER
RESTORATION CONSULTANTS

GLENMONT WEST GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	106	P/T Slab Repair	$ 1,846				$ 16,610					
	107	P/T Beam Repair					$ 2,374					
	108	P/T Column Repair	$ 1,060				$ 9,544					
	109	Stair Tread Concrete Repair										
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	113	Repair Loose Bollard					$ 1,125					
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 1,000				$ 4,448		$ 1,000			
		Structural Sub-Total	**$ 3,906**	**$ -**	**$ -**	**$ -**	**$ 34,101**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Waterproofing												
	201	Facade Sealant Replacement - P/T										
	203	Cove Sealant Replacement - P/T Roof							$ 18,780			
	204	Cove Sealant Replacement - P/T Covered Levels										
	207	Floor Sealant Replacement - P/T Roof							$ 5,716			
	208	Floor Sealant Replacement - P/T Covered Levels										
	211	Rout and Seal Cracks										
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation										
	214	Concrete Sealer					$ 295,000					
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof										
	217	Expansion Joint Replacement - Covered Levels										
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 29,500		$ 2,450			
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 324,500**	**$ -**	**$ 26,945**	**$ -**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping										
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000		$ 1,000			
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000	$ 15,000	$ 1,000			
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow										
	502	Repaint Traffic Markings					$ 22,438					
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Install Fencing under Lowest Stair Run										
	510	Replace Stair Tower Roof										
	511	Repair Broken Handrail										
		Miscellaneous Sub-Total	**$ -**	**$ -**	**$ -**	**$ -**	**$ 22,438**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 6,906	$ -	$ -	$ -	$ 383,038	$ 165,000	$ 29,945	$ -	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 414	$ -	$ -	$ -	$ 22,982	$ 9,900	$ 1,797	$ -	$ -	$ -
		Construction Total	**$ 7,320**	**$ -**	**$ -**	**$ -**	**$ 406,020**	**$ 174,900**	**$ 31,741**	**$ -**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 1,098	$ -	$ -	$ -	$ 60,903	$ 26,235	$ 4,761	$ -	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 1,098	$ -	$ -	$ -	$ 60,903	$ 26,235	$ 4,761	$ -	$ -	$ -
		Material Testing During Construction	$ 73	$ -	$ -	$ -	$ 4,060	$ 1,749	$ 317	$ -	$ -	$ -
		Project Cost Totals Per Year:	**$ 9,590**	**$ -**	**$ -**	**$ -**	**$ 531,887**	**$ 229,119**	**$ 41,581**	**$ -**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work. Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

APPENDIX B

WALKER
RESTORATION CONSULTANTS

Photo 1

Top level.

Photo 2

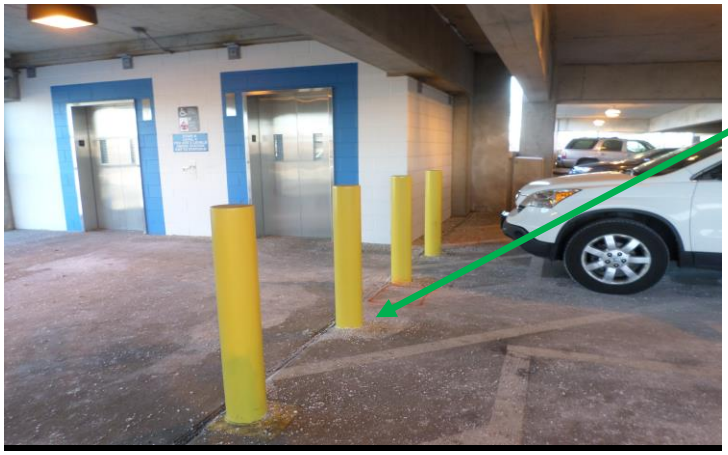
Localized damaged curb.

Photo 3

Localized damaged column.

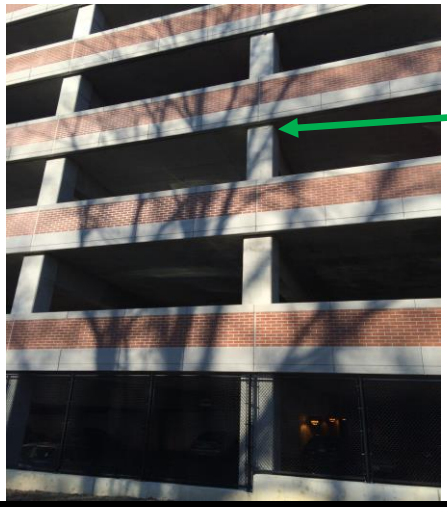
Interor of garage shows excessive salt use.

Photo 4



Bollards around elevator acess are often locations of minor spalls.

Photo 5



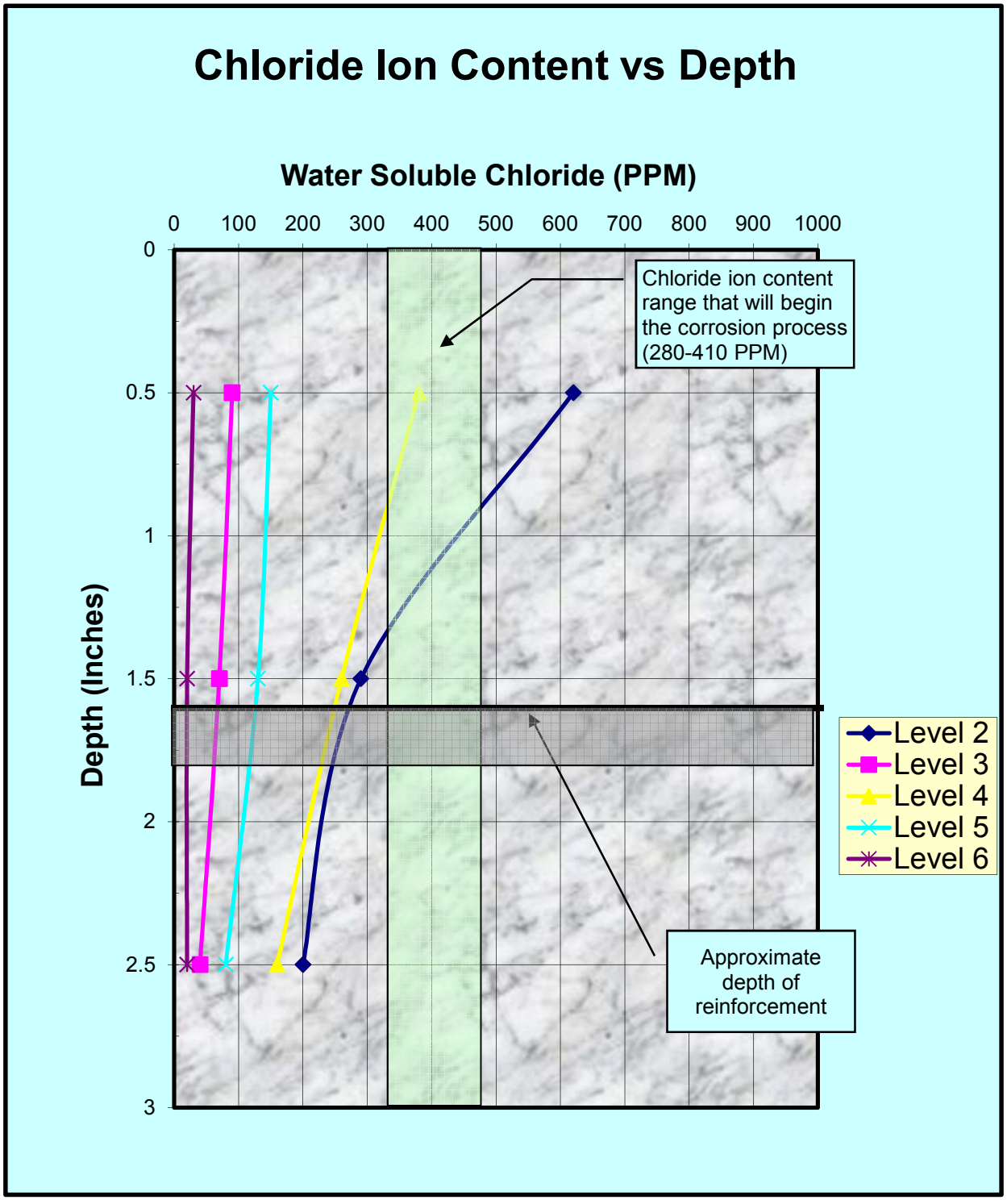
Spall on column beneath 3rd level.

Photo 6

APPENDIX C

WALKER
RESTORATION CONSULTANTS

Project # 14-3944.04
Date Jun-14



UNIVERSAL CONSTRUCTION TESTING, Ltd.

Project: Washington Metropolitan Area Transit Authority
Maryland, Virginia & Washington DC

UCT Project No. 14066
Walker Project No. 14-3994.00

Client: Walker Restoration Consultants

Date: April 14, 2014

Table 1.2. **Chloride Content of Concrete**
(Water-Soluble)
AASHTO T 260

Sample Number	Location in Structure	Level tested, inch from top	Chloride ion (CL^-) Content		
			by weight of concrete %	by weight of cement* %	by weight of concrete (ppm)*
Glenmont West Garage					
2	Level 2	0-1	0.062	**0.39**	620
		1-2	0.029	**0.18**	290
		2-3	0.020	**0.13**	200
3	Level 3	0-1	0.009	**0.06**	90
		1-2	0.007	**0.05**	70
		2-3	0.004	**0.03**	40
4	Level 4	0-1	0.038	**0.24**	380
		1-2	0.026	**0.17**	260
		2-3	0.016	**0.10**	160
5	Level 5	0-1	0.015	**0.09**	150
		1-2	0.013	**0.08**	130
		2-3	0.008	**0.05**	80
6	Level 6	0-1	0.003	**0.02**	30
	Roof	1-2	0.002	**0.01**	20
		2-3	0.002	**0.01**	20

Remarks: *) Assumed cement content 600 lbs/cu.yd. and U.W. = 3800 pcy.

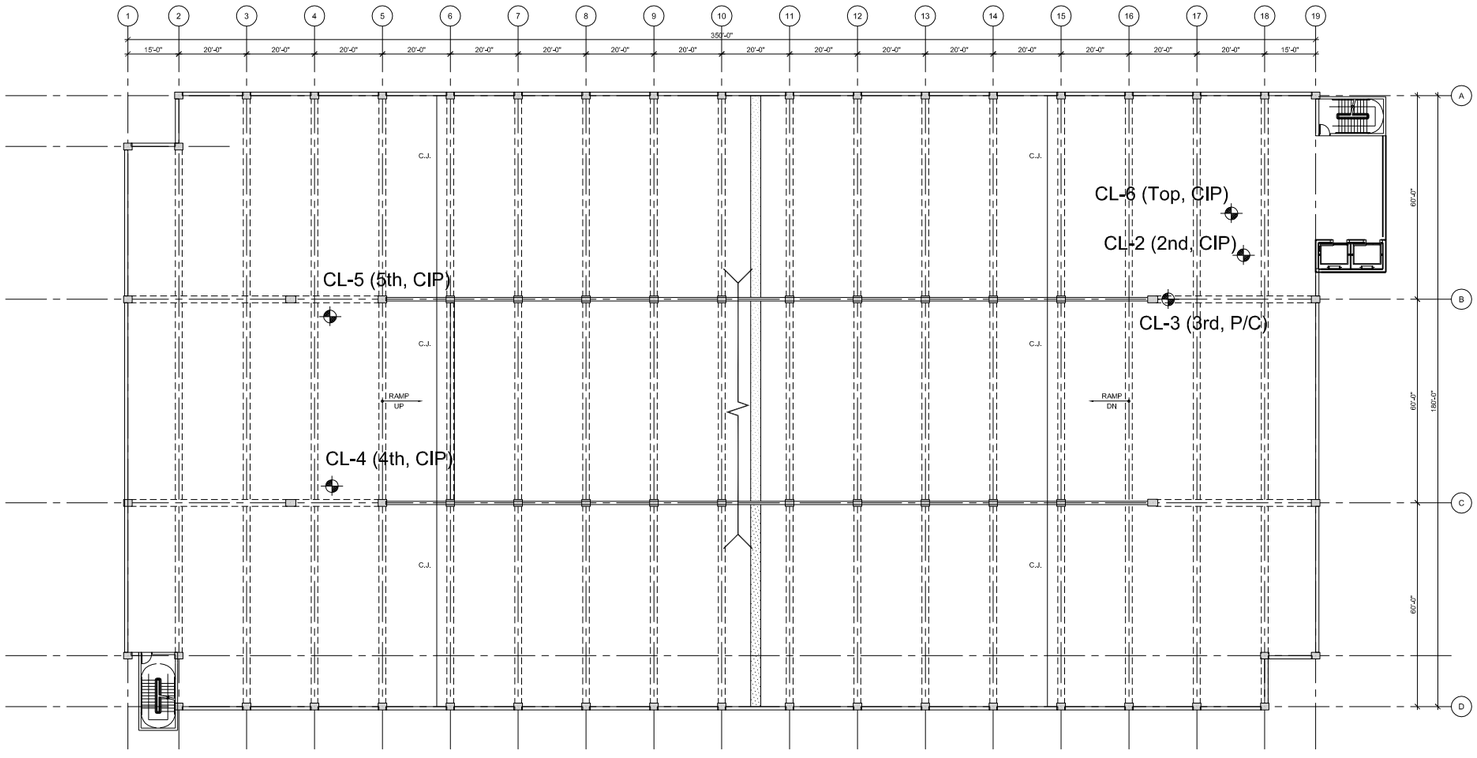
APPENDIX D

WALKER
RESTORATION CONSULTANTS

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY - GLENMONT WEST GARAGE
SILVER SPRING, MARYLAND

WALKER PARKING CONSULTANTS

CHLORIDES
SAMPLE LOCATIONS



LEGEND:

CL-1 CONCRETE SAMPLE
THE FIRST NUMBER REFERS TO THE SAMPLE NUMBER. THE SECOND NUMBER REFERS TO THE FLOOR WHERE THE SAMPLE WAS TAKEN. THE FINAL SYMBOL (P/C = PRECAST, CIP = CAST IN PLACE) REFERS TO THE TYPE OF CONCRETE FROM WHICH THE SAMPLE WAS TAKEN. TAKEN 3/24/2014

LEGEND

NORTH

Scale: 1/16" = 1' - 0"

R-701

04/03/2014 14-044.00

APPENDIX E

WALKER
RESTORATION CONSULTANTS

Kletsko, Marissa

From: Neiderer, Greg
Sent: Monday, April 21, 2014 5:18 PM
To: Patrick Schmitt @ WMATA Pkg
Cc: Rogers, Phillip @ WMATA Pkg; Pudleiner, Jim; Gross, Jason @ Walker; Stairs, Kathryn
Subject: 2014 04 21 WMATA Glenmont West Near Term Actions

Patrick,

While at the site in March we noticed the following items which we recommend be addressed:

1. At the roof level there is a curb which has broken and now a tripping and loose debris hazard. I suspect the curb was put there for blocking rain water from cascading off the roof and that a snow plow hit it in the winter. See photo 9. We recommend the curb be replaced.
2. At the SW side of the garage (the far side from Georgia Avenue) there is a spall on the column just beneath the 3rd level precast spandrel as shown in photo 15. This is not a typical public walkway, but since it is accessible we recommend this be removed promptly.

Thanks

Gregory J. Neiderer, PE
Principal

Walker Restoration Consultants | **Walker Parking Consultants**
565 East Swedesford Road, Suite 300 | Wayne, PA 19087
610.995.0260 x 1408 (Office) | 610.659.6967 (Cell) | 610.995.0261 (Fax)
www.walkerrestoration.com | www.walkerparking.com

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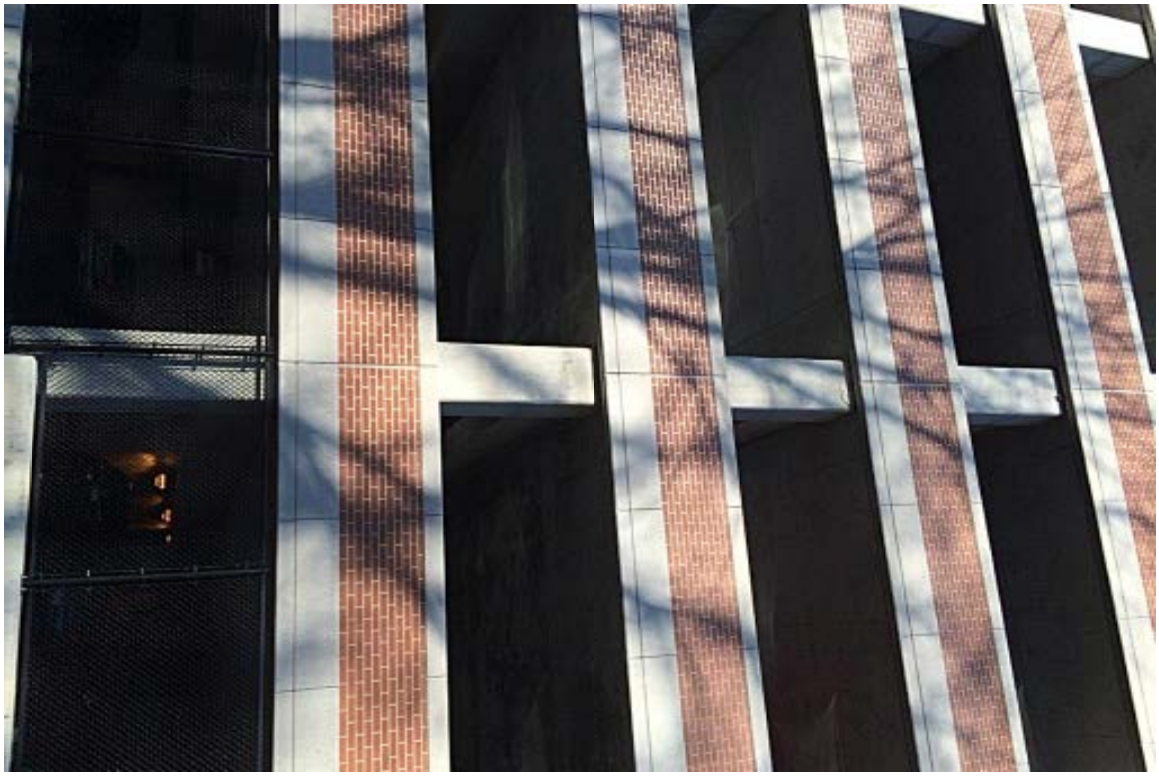


GROSVENOR

WALKER
RESTORATION CONSULTANTS

FEBRUARY 2015 14-3944.04

The summary data for the facility is as follows:

Table GROSV-1: Facility Information Summary

	GROSVENOR
Location:	5500 Tuckerman Lane Rockville, MD 20852
Overall Condition:	**FAIR**
Current Needs:	**MODERATE**
Chloride Contamination	**LARGE**
Year built:	2004
Supported Levels	5
Levels Below Grade	None
Parking Space Capacity:	1,482
Parking Efficiency:	307 SF/Space
Footprint:	Approximately 334' x 268'
Bridges:	1 Pedestrian, 3 Vehicular
Vehicle Circulation:	Double Helix
Pedestrian Circulation	3 Stair(s), 4 Elevator(s)
Parking Area: Slab on Grade Total Supported Area Total Parking Area	 65,000 ± SF 390,000 ± SF 455,000 ± SF
Structural System	Precast Un-topped Double Tee
Façade Spandrel Treatment	Precast with Pipe and Mesh Railing

FACILITY DESCRIPTION

NORTH VIEW

SOUTH VIEW

EAST VIEW

WEST VIEW

PLAN VIEW

FEBRUARY 2015 14-3944.04

EXECUTIVE SUMMARY

This 2004 garage is in good/fair/poor shape, has significant chloride contamination and has moderate current repair needs

Its scheduled repairs are anticipated to cost:

2020 – Near Term - $1,297,060
2022 – Long-term - $775,105

See Appendix A for cost details.

CRITICAL REPAIRS

The following safety related items requiring urgent action were identified in our 3/26/14 and 3/28/14 emails to Metro:

1. Floor slab spalls
2. Failing storefront

Please see the above reference email, found in Appendix E, for more detail and recommended actions. We have no further immediate concerns.

NEAR-TERM REPAIRS

Due to the age and condition of the garage we recommend most of the non-critical repairs be completed in 2020, year five of the master repair plan. These near-term repairs include addressing the structural items found including:

1. Remove and replace stair tread and landing spalled concrete with repair concrete.
2. Repair spandrel railing anchor points
3. Repaint spandrel railings
4. Repair (fill) concrete floor slab spalls
5. Repair double tee slab cracks
6. Replace roof level floor sealants
7. Replace roof level expansion joint glands
8. Replace vehicular bridge floor sealants
9. Repaint stairtower roof architectural metals
10. Install new supplemental floor drains

RECOMMENDATIONS

11. Install new supplemental floor piping
12. Replace storefront
13. Replace stair closure gates
14. Repaint traffic markings
15. Repaint curbs

Based on chloride test results, we recommend the following improvements to protect the floor structural system:

1. Install traffic topping at all cast-in-place washes on the interior

LONG-TERM REPAIRS

Long term repairs include a second round of structural and waterproofing repairs in 2022, two years after the near-term repairs to address continued deterioration of the concrete and the end of the useful life of the waterproofing products. Long-term repairs items include the following:

1. Replace interior level floor sealants
2. Replace interior level expansion joint glands
3. Install roof level wash traffic topping
4. Repaint traffic markings
5. Repaint curbs
6. Replace roof level expansion joint glands

OBSERVATIONS AND DISCUSSION

CONDITION ASSESSMENT

The following observations were made during a facility walk through on the March 24 to 26, 2014 site visit. Photographs referenced within the observations are found in Appendix B of the report. Observations are immediately followed by a brief discussion of the repair in italics.

1. Roof level floor sealants are in poor condition and require replacement within 5 years. (Photo 2)
2. Interior floor sealants are in fair condition and require replacement within 10 years.
3. Bridge floor sealants are in poor condition and require replacement within 5 years. (Photo 4,5)
4. Roof level expansion joints are in poor condition and require replacement within 5 years. (Photo 3)
5. Interior level expansion joints are in fair condition and

require replacement within 10 years.

6. Changes in floor elevation- curbs, handicap ramps are not readily visually apparent and require painting now with safety yellow paint to emphasize elevations changes (Photo 9)
7. Stair treads and landings were observed to have spalls which require repair now to eliminate trip hazards. (Photo 16)
8. Floor slab soffits were observed to have moderate leaching cracks which require structural repair and waterproofing to address deterioration (Photo 1)
9. The roof level storefront mullions and transoms are heavily corroded which requires replacement of the entire storfront. (Photo 9,10,11)
10. The stairtower roof architectural grilles are moderately corroded which requires painting. (Photo 7,8)
11. The stair tower interior gate to warn patrons in the event of a fire to exit at grade is damaged and requires repair now. (Photo 17)
12. The perimeter fencing is damaged and requires repair now. (Photo 13)
13. A few of the existing stairtower door hinges are damaged due to water leaking through expansion joints and require replacement and expansion joint gland repair. (Photo 15)
14. A minor amount of localized ponding was observed and clogged drains need to be cleared of debris now. (Photo 6)
15. A moderate portion of the existing spandrel guardrail anchor connections are rusted and require cleaning, sealant installation and painting. (Photo 19)

MATERIAL TESTING

Concrete powder samples were extracted from floor surfaces of the roof and intermediate supported levels of the parking garage as shown in Appendix C. The chloride content was determined at 3 depths: near the surface (0-1 inch depth), near the design location for top reinforcing steel/tee connections (1 to 2 inch depth), and near the center of the slab (2 to 3 inch depth). Locations were taken in both cast-in-place concrete as well as precast concrete, if present, to determine the extent of chloride contamination in these differing concretes. The results are included in Appendix D. These chloride contents provide an indication of the current and expected future deterioration of the

parking structure due to chloride-induced corrosion of the reinforcing steel. A typical threshold chloride value for the onset of corrosion is between 280 and 410 parts per million. The determined values are defined as minor (less than 200 ppm at the 1 to 2 inch depth), moderate (between 200 ppm and 400 ppm at the 1 to 2 inch depth, and large (greater than 400 ppm at the 1 to 2 inch depth. The extent of chloride contamination directly influences our recommended floor surface treatment (nothing, penetrating sealer, traffic topping).

The summary of chlorides test results in Appendix C are;

Level	Depth	Type	PPM
2	1 to 2	CIP	220
3	1 to 2	P/C CIP	760
4	1 to 2	P/C CIP	50
5	1 to 2	P/C CIP	270
6(Roof)	1 to 2	CIP	1040

APPENDIX A

WALKER
RESTORATION CONSULTANTS

GROSVENOR GARAGE

Opinion of Probable Cost for Master Repair Plan
Recommended Phasing : 10 Year Program

	Work Item	Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Structural												
	101	Precast Slab Repair	$ 18,537				$ 166,835					
	102	Precast Tee Stem Repair					$ 12,698					
	103	Precast Beam Repair					$ 8,012					
	104	Precast Shear Connector Repair					$ 16,674					
	105	Precast Column/Wall Repair					$ 6,577					
	109	Stair Tread Concrete Repair					$ 3,750					
	110	Epoxy Crack Injection										
	111	Masonry Repair										
	112	Replace Double Tee Bearing Pad										
	113	Repair Loose Bollard										
	115	Structural Repair Allowance @15% (min $1,000.00)	$ 2,781				$ 32,182		$ 1,000			
		Structural Sub-Total	**$ 21,318**	**$ -**	**$ -**	**$ -**	**$ 246,727**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Waterproofing												
	202	Façade Sealant Replacement - Precast										
	205	Cove Sealant Replacement - Precast Roof					$ 26,296					
	206	Cove Sealant Replacement - Precast Covered Levels							$ 70,969			
	209	Floor Sealant Replacement - Precast Roof					$ 96,217					
	210	Floor Sealant Replacement - Precast Covered Levels							$ 286,169			
	211	Rout and Seal Cracks					$ 24,375					
	212	Traffic Topping Repair										
	213	Traffic Topping - New Installation					$ 291,668		$ 72,917			
	214	Concrete Sealer										
	215	Masonry Sealer										
	216	Expansion Joint Replacement - Roof					$ 43,125					
	217	Expansion Joint Replacement - Covered Levels							$ 43,125			
	218	Caulk Handrail Bases										
	221	Waterproofing Repair Allowance @ 10% (min $1,000.00)	$ 1,000				$ 48,168		$ 47,318			
		Waterproofing Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 529,849**	**$ -**	**$ 520,498**	**$ -**	**$ -**	**$ -**
Mechanical												
	301	Repair Leaking Drainage Piping										
	302	New Drain & Piping					$ 4,813					
	303	Repair Existing Trench Drains										
	305	Mechanical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000		$ 1,000			
		Mechanical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 5,813**	**$ -**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Electrical												
	401	PARC System Replacement						$ 150,000				
	403	Electrical Allowance @ 10% (min $1,000.00)	$ 1,000				$ 1,000	$ 15,000	$ 1,000			
		Electrical Sub-Total	**$ 1,000**	**$ -**	**$ -**	**$ -**	**$ 1,000**	**$ 165,000**	**$ 1,000**	**$ -**	**$ -**	**$ -**
Miscellaneous												
	501	Paint Curbs, Wheelstops and Islands Safety Yellow					$ 6,256		$ 6,256			
	502	Repaint Traffic Markings					$ 28,438		$ 28,438			
	503	Clean and Paint Metal Pan Stairs										
	504	Repair Loose Stair Nosings										
	505	Replace Door, Frame and Hardware										
	506	Clean and Paint Door and Door Frame										
	507	Repaint Stair Railings										
	508	Railing Infill for Excessive Gap										
	509	Repaint Stair Tower Roof Architectural Metals					$ 75,000					
	510	Replace Failing Storefront	$ 50,000									
	511	Repaint Spandrel Handrail					$ 39,120					
	512	Replace Stair Closure Gates					$ 1,875					
		Miscellaneous Sub-Total	**$ 50,000**	**$ -**	**$ -**	**$ -**	**$ 150,689**	**$ -**	**$ 34,694**	**$ -**	**$ -**	**$ -**
		Construction Subtotal	$ 74,318	$ -	$ -	$ -	$ 934,077	$ 165,000	$ 558,192	$ -	$ -	$ -
		Mobilization @ 6% of Construction Subtotal	$ 4,459	$ -	$ -	$ -	$ 56,045	$ 9,900	$ 33,491	$ -	$ -	$ -
		Construction Total	**$ 78,777**	**$ -**	**$ -**	**$ -**	**$ 990,122**	**$ 174,900**	**$ 591,683**	**$ -**	**$ -**	**$ -**
		Project Contingency @ 15%	$ 11,817	$ -	$ -	$ -	$ 148,518	$ 26,235	$ 88,752	$ -	$ -	$ -
		Engineering: Contract Documents/Field Rep @ 15%	$ 11,817	$ -	$ -	$ -	$ 148,518	$ 26,235	$ 88,752	$ -	$ -	$ -
		Material Testing During Construction	$ 788	$ -	$ -	$ -	$ 9,901	$ 1,749	$ 5,917	$ -	$ -	$ -
		Project Cost Totals Per Year:	**$ 103,198**	**$ -**	**$ -**	**$ -**	**$ 1,297,060**	**$ 229,119**	**$ 775,105**	**$ -**	**$ -**	**$ -**

NOTES:

1. Estimated costs are based on multi-year construction seasons.
2. Estimated costs are based on historical records of similar types of work.
   Costs may vary due to time of year, local economy, or other factors.
3. Costs assume no hazardous waste and a landfill located within 50 miles.
4. Cost based on normal work week, daylight hours and non-union labor.

APPENDIX B

WALKER
RESTORATION CONSULTANTS

Leaking and leaching through tee flange cracks.

Photo 1

Leaking beneath tee to tee joint

Photo 2

Leaking beneath expansion joint

Photo 3

Photo 4

Vehicular bridge floor slab joints typically leak

Photo 5

Side view of vehicular bridge

Photo 6

Ponding at clogged drain.

Photo 7

Stair tower at top level.

Photo 8

Rusted metal on top of stair towers.

Photo 9

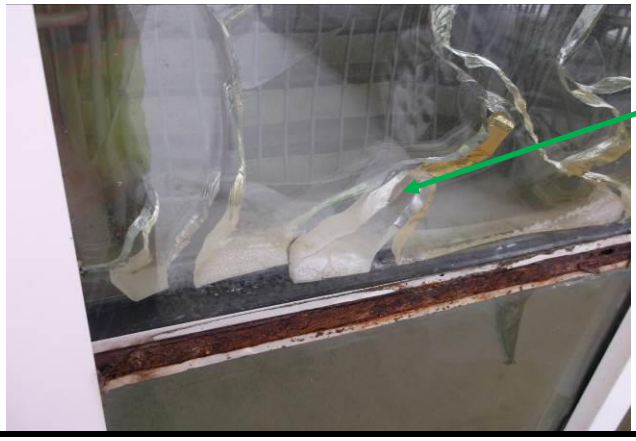
Damaged panic hardware at top level.

Failed mullions and transoms on storefront system.

Curbs are recommended to be painted yellow.

Heavily rusting cold rolled carbon steel frame beneath aluminum cladding at transom in storefront system.

Photo 10



Failed plastic infill between glass panes above transom.

Photo 12

Fencing missing from railing.

Photo 13

Photo 14

Broken window.

Photo 15

Damaged door hinges at leaking stair tower expansion joint.

Photo 16

Spall on stair tread at lifting lug patch.

Black stair nosings provide color contrast so no yellow paint is recommended.

Photo 17

Emergency exit egress barrier is inoperative.

Photo 18

Damaged roof.

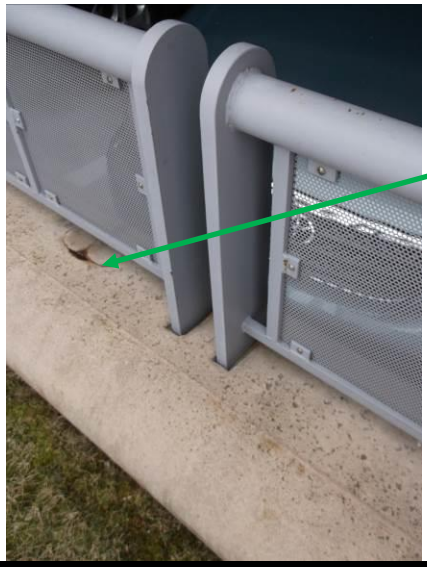


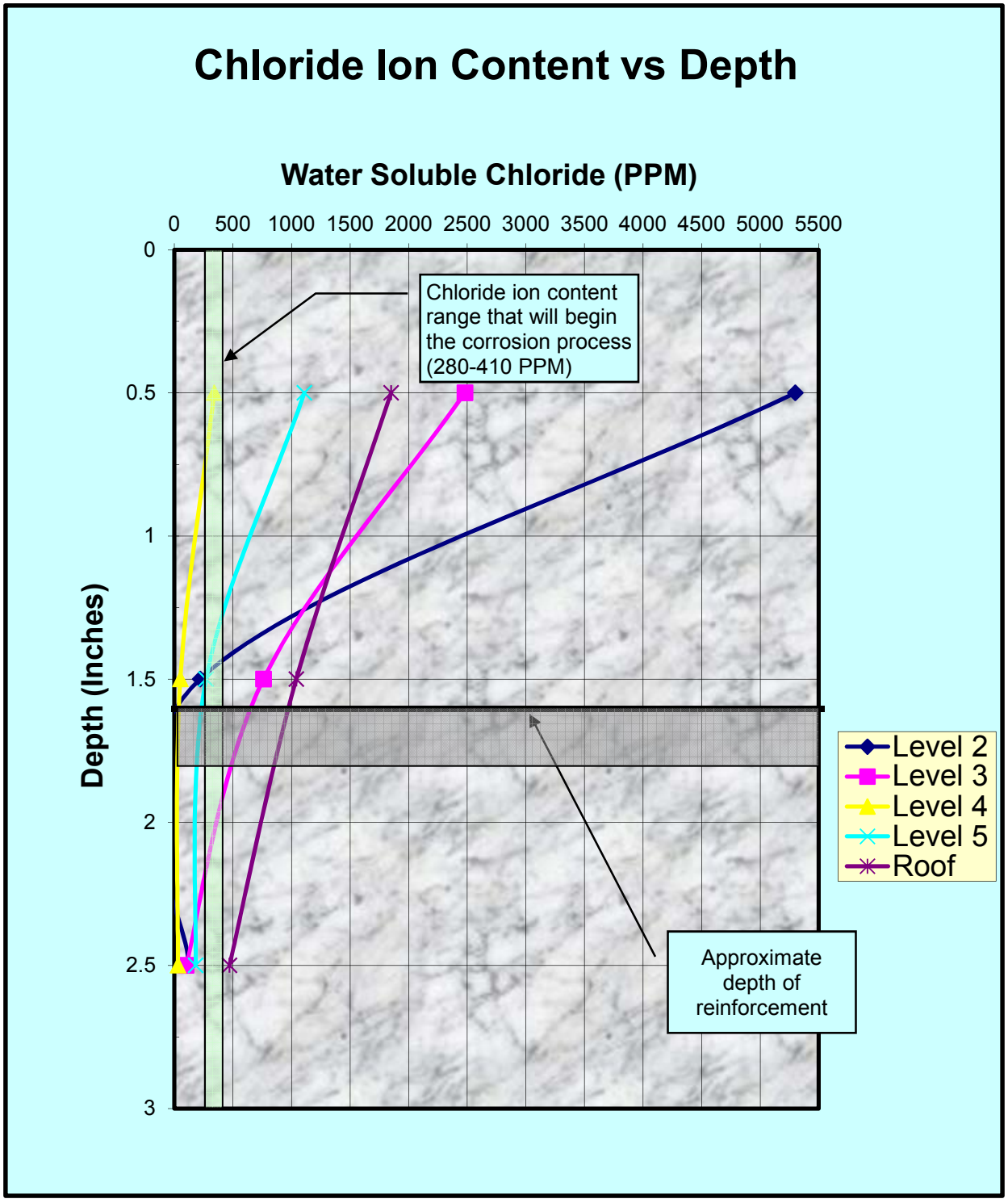
Photo 19

Rusting of spandrel guardrail anchor points.

APPENDIX C

WALKER
RESTORATION CONSULTANTS

Project # 14-3944.04
Date Jun-14



UNIVERSAL CONSTRUCTION TESTING, Ltd.

Project: Washington Metropolitan Area Transit Authority
Maryland, Virginia & Washington DC

UCT Project No. 14073
Walker Project No. 14-3994.04

Client: Walker Restoration Consultants

Date: May 2, 2014

Table 1.1. **Chloride Content of Concrete**
(Water-Soluble)
AASHTO T 260

Sample Number	Location in Structure	Level tested, inch from top	Chloride ion (CL^-) Content		
			by weight of concrete %	by weight of cement* %	by weight of concrete (ppm)*
Grosvenor Garage					
Top	Roof Level	0-1	0.185	**1.17**	1850
		1-2	0.104	**0.65**	1040
		2-3	0.047	**0.29**	470
5	Intermediate Level	0-1	0.111	**0.71**	1110
		1-2	0.027	**0.17**	270
		2-3	0.018	**0.11**	180
4	Intermediate Level	0-1	0.034	**0.22**	340
		1-2	0.005	**0.03**	50
		2-3	0.003	**0.02**	30
3	Intermediate Level	0-1	0.248	**1.57**	2480
		1-2	0.076	**0.48**	760
		2-3	0.010	**0.06**	100
2	Intermediate Level	0-1	0.530	**3.35**	5300
		1-2	0.022	**0.14**	220
		2-3	0.012	**0.07**	120

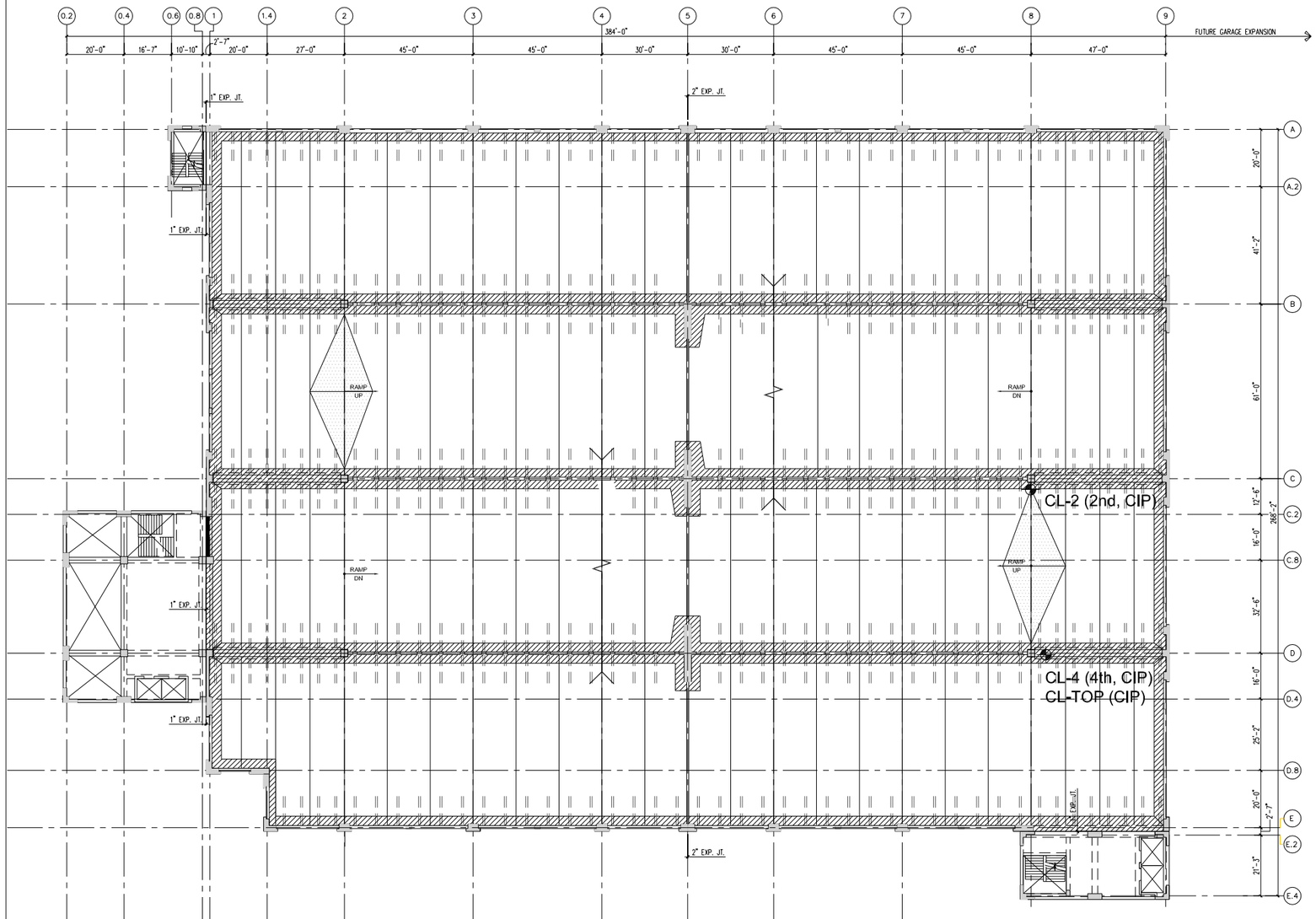
Remarks: *) Assumed cement content 600 lbs/cu.yd. and U.W. = 3800 pcy.

UNIVERSAL CONSTRUCTION TESTING

APPENDIX D

WALKER
RESTORATION CONSULTANTS

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY - GROSVENOR GARAGE
ROCKVILLE, MARYLAND



1 TYPICAL TIER PLAN

WALKER PARKING CONSULTANTS

CHLORIDES
SAMPLE LOCATIONS

LEGEND:

CL-1 CONCRETE SAMPLE
THE FIRST NUMBER REFERS TO THE SAMPLE NUMBER. THE SECOND NUMBER REFERS TO THE FLOOR WHERE THE SAMPLE WAS TAKEN. THE FINAL SYMBOL (P/C = PRECAST, CIP = CAST IN PLACE) REFERS TO THE TYPE OF CONCRETE FROM WHICH THE SAMPLE WAS TAKEN. TAKEN 3/25/2014

LEGEND

NORTH

Scale: 1/16" = 1' - 0"

R-701

04/03/2014 14-944.00

APPENDIX E

WALKER
RESTORATION CONSULTANTS

Kletsko, Marissa

From: Neiderer, Greg
Sent: Wednesday, March 26, 2014 8:59 PM
To: Patrick Schmitt @ WMATA Pkg
Cc: Rogers, Phillip @ WMATA Pkg; Pudleiner, Jim; Stairs, Kathryn; Gross, Jason @ Walker
Subject: 2014 03 26 Grosvenor Garage Floor Trip Hazard
Attachments: photo 2.jpg; photo 3.jpg

Patrick,

While at Grosvenor we observed several (about 12) floor spalls on the slab on grade near the bottom of the ramp adjacent to the Strathmore Stair/Elevator tower that present a tripping hazard as shown in the attached photos. We recommend you repair this spall promptly and that a permanent repair occur this summer.

Gregory J. Neiderer, PE
Principal

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Kletsko, Marissa

From: Neiderer, Greg
Sent: Friday, March 28, 2014 1:52 PM
To: Patrick Schmitt @ WMATA Pkg
Cc: Rogers, Phillip @ WMATA Pkg; Pudleiner, Jim; Stairs, Kathryn; Gross, Jason @ Walker
Subject: 2014 03 28 Grosvenor Garage Roof Level Storefront Hazard
Attachments: 201403 25 Grosvenor GJN 44.jpg; 201403 25 Grosvenor GJN 45.jpg; 201403 25 Grosvenor GJN 41.jpg; 201403 25 Grosvenor GJN 42.jpg; 201403 25 Grosvenor GJN 43.jpg

Patrick,

While at Grosvenor on Tuesday we observed at the roof level that both storefronts (adjacent to the train elevator/stair tower and adjacent to the Strathmore elevator/stair tower) are in poor shape, where the mullion interior - consisting of steel members - was heavily corroded and literally falling apart as shown in the attached photos. We recommend you remove the loose mullion parts promptly and that a permanent repair occur this summer.

Gregory J. Neiderer, PE
Principal

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