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INTERNATIONAL CONFERENCE AND EXPO

Make wellness standard.
Make resilience standard.
Make sustainability standard.
Let's make a new living standard.

Case Study of Parksmart^{SM} certified Gold 1 Garage Pittsburgh, PA

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Course Description: The Parksmart Rating System is an innovative process that addresses a type of structure that isn't fully addressed by other green building rating systems. The Gold 1 Garage design team realized that parking garages can be thoughtfully planned and just as sustainable as their building counterparts.

Learning Objectives

The First Learning Objective is to define and understand the Parksmart Rating System and why Pittsburgh chose to pursue certification

The Second Learning Objective is to explain the importance of electric vehicle charging infrastructure in parking structures and how it is recognized in Measure C5 – EV Charging of Parksmart

The Third Learning Objective is to describe why designing for durability is a priority for sustainable parking structures and how it earns points under Measure C17 – Design for Durability of Parksmart

The Fourth Learning Objective is to explain the opportunities and challenges for photovoltaic arrays in parking structures and how they can fulfill the requirements of Parksmart's Measure C16 – Renewable Energy

Learning Level: Moderate

Rating System: Parksmart

Introduction and Brief Overview

- The vision behind Parksmart was to create a tool that could:
  - Provide a roadmap for parking structures seeking to increase performance and reduce environmental impact
  - Verify the successful implementation of sustainability initiatives within parking structures
  - Recognize high performing parking structures for their sustainability achievements
- Parksmart is organized as a "menu" of strategies that parking structures can choose from to improve their sustainability performance
- Garages that successfully implement a minimum number of these strategies are recognized as Parksmart certified
  - Certification Levels: Existing – Pioneer and New – Bronze, Silver, Gold
- Firm Profile
  - 20+ Parking Facilities
  - 3.2M+ Square Feet
  - 8.3K+ Parking Spaces
  - 1 Parksmart Gold Certified Project

Why Parksmart?

The Sports & Exhibition Authority has always been a leader in sustainability and working with LEED and the USGBC. The SEA owns the first LEED certified convention center, David L. Lawrence Convention Center.

Using Parksmart to create a more sustainable garage was a natural fit for the SEA and the City of Pittsburgh.

Sports & Exhibition Authority of Pittsburgh and Allegheny County Profile

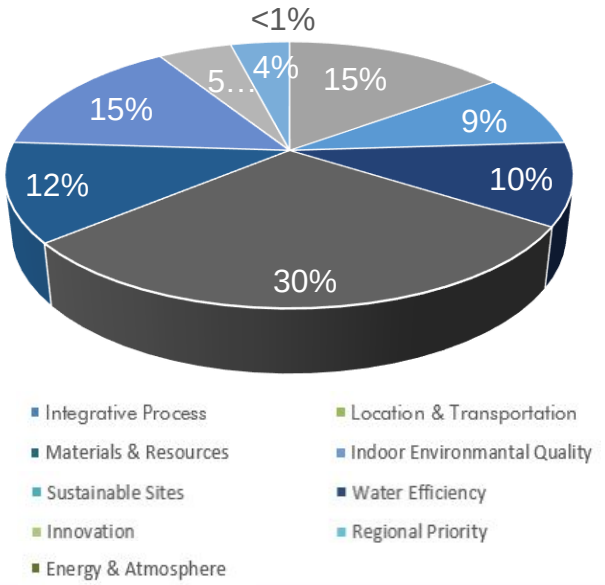
- David L. Lawrence Convention Center 1.5 million sq ft
- Heinz Field 1.49 million sq. ft
- PNC Park 970k sq. ft
- PPG Paints arena 720k sq. ft
- North Shore garages 3,243 spaces
- North Shore Riverfront park
- Lower Hill Redevelopment Project and the “cap” public park

Parksmart Rating System

- 2014 – Green Garage Certification Standard
  - Green Parking Council, an affiliate of the International Parking Institute
  - 50+ Beta Sites
  - Categories: Management, Programs, Technology & Structure Design, and Innovation
- 2016 – Rebranded as Parksmart[SM]
  - Administered by GBCI
  - Project Registration Fee
  - Measurement Amendments
- 2018 – 95 Projects Registered

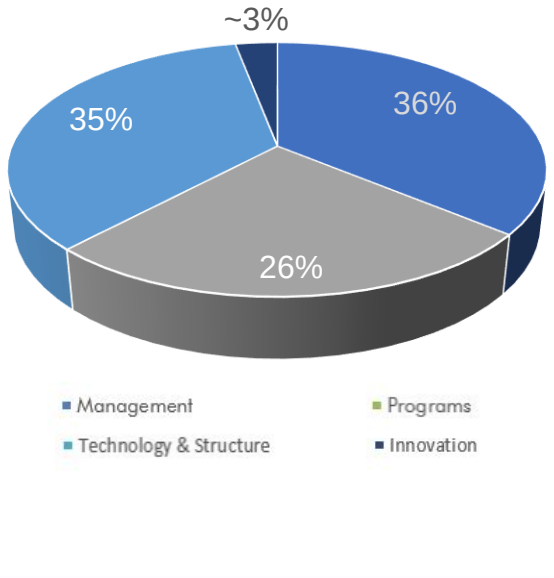
LEED v4 BD+C

Possible Points 110



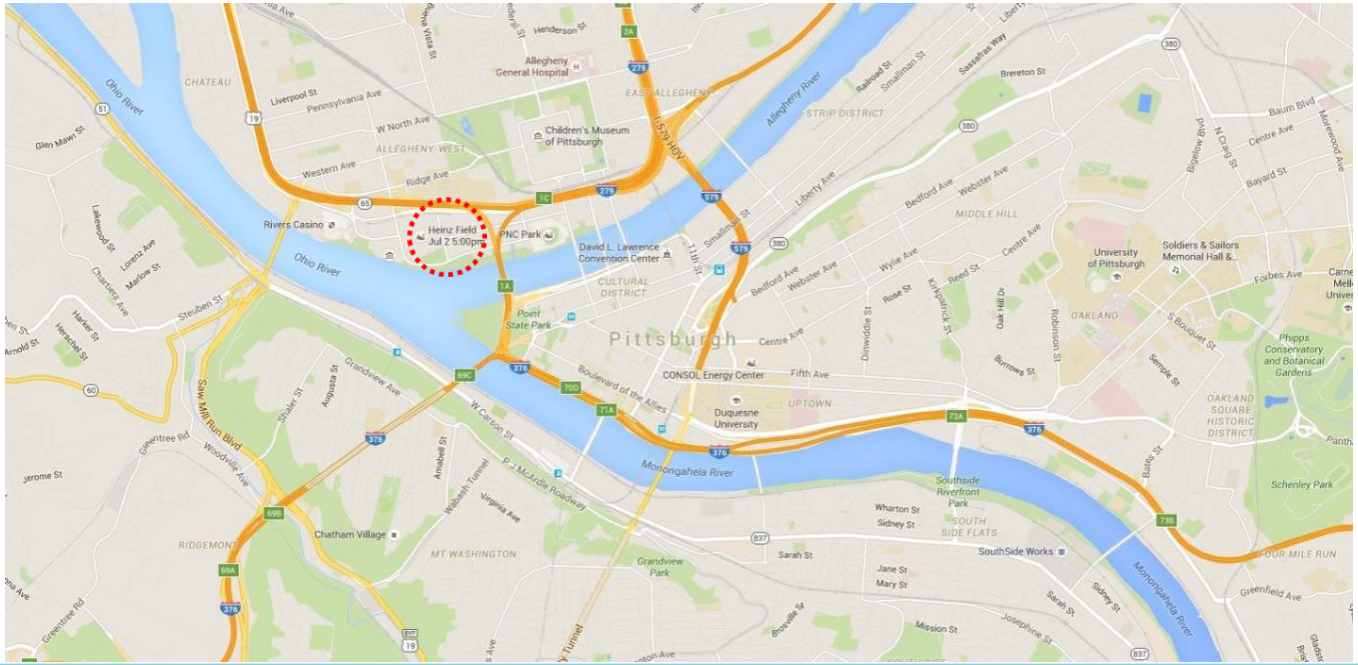
Parksmart[SM]

Possible Points 248



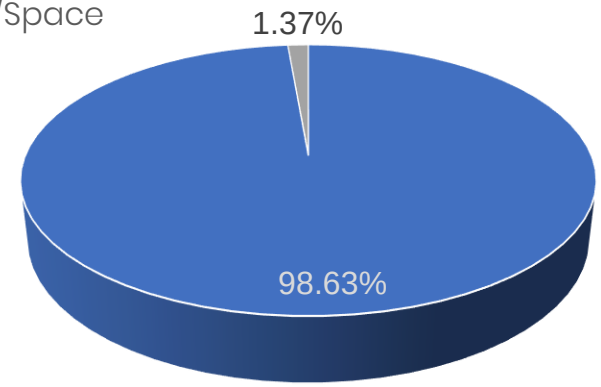
Project Introduction

- New structured parking facility located within Gold 1 Surface Parking Lot
- Schedule
  - Design: January – June 2016
  - Construction: May 2016 – April 2017
- Project area is about 6 acres
- 331,600 GSF with 1,000 parking spaces
- Protected Bicycle Parking, 100 spaces
- Situated near
  - HOV, LRT, bus stops, bike share, water taxi, and Three Rivers Heritage Trail



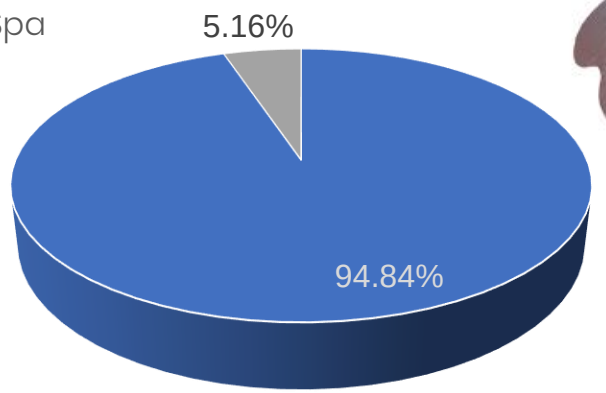
Project Metrics – Hard Costs | Construction

$22,061/Space



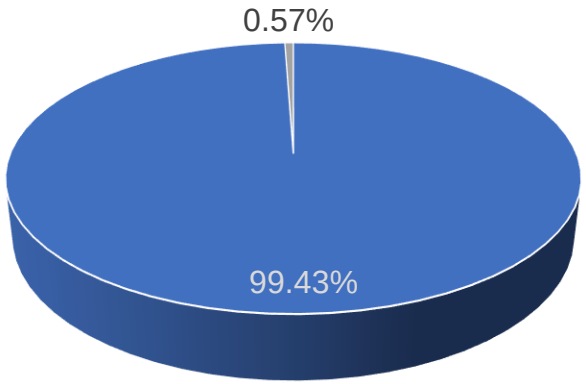
■ Construction: $22,060,690 ■ Parksmart Measures w/o PV

$22,943/Space

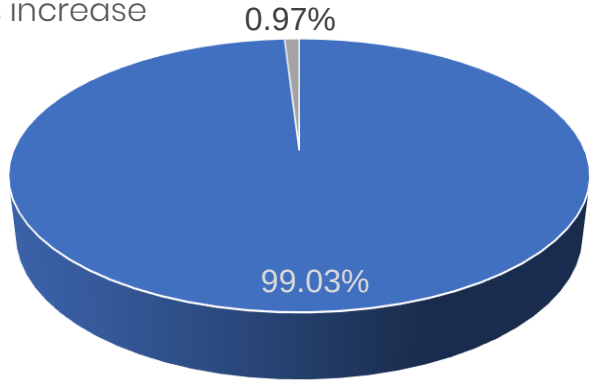


■ Construction: $22,943,000 ■ Parksmart Measures w/PV

~3.8% increase

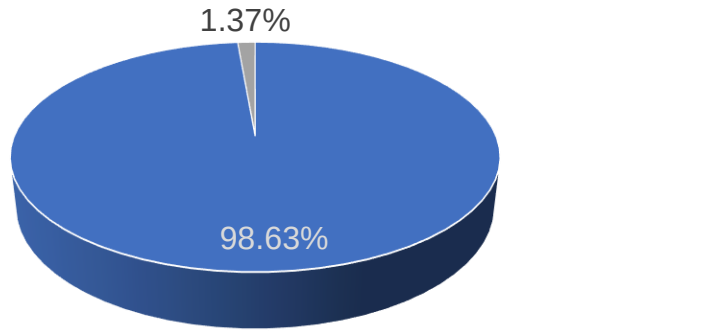


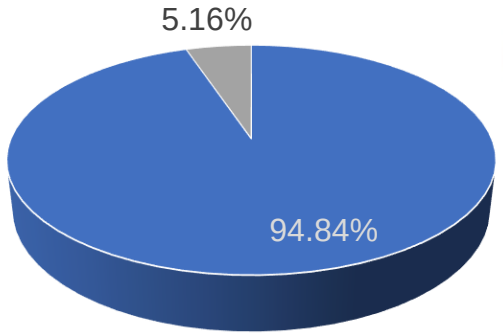
■ Design Fee ■ Parksmart Measures w/o PV

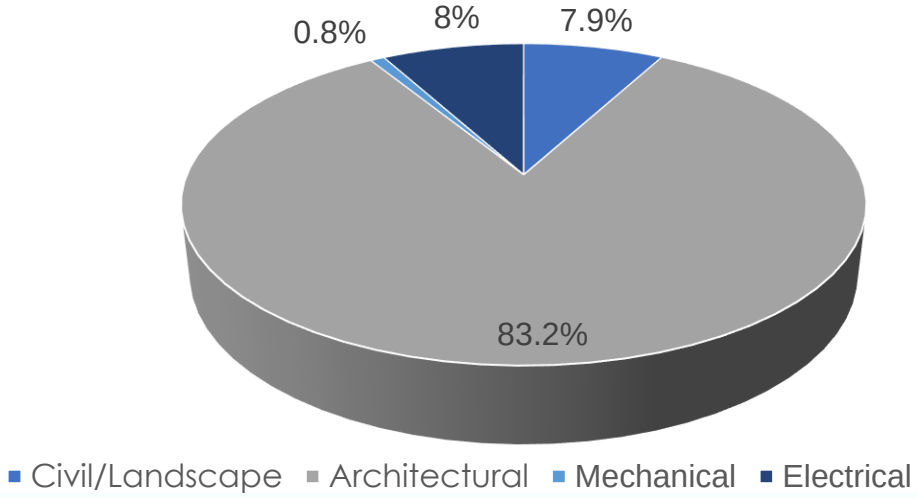


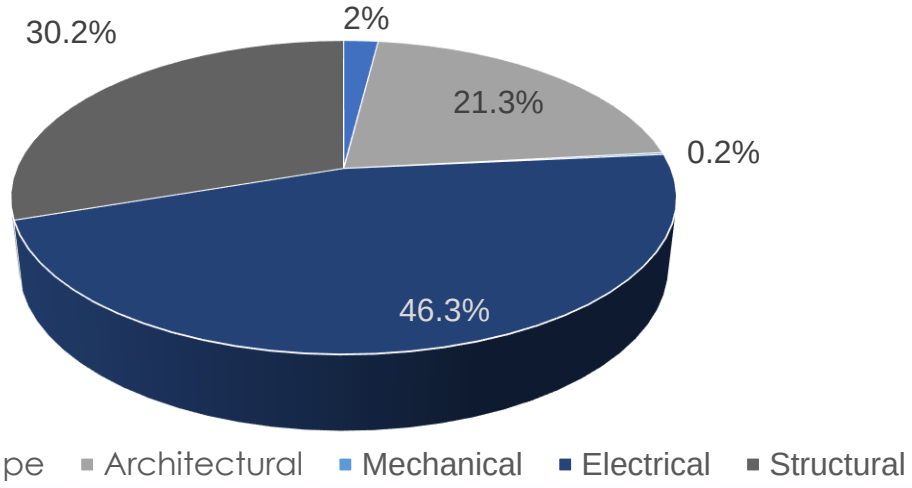
■ Design Fee ■ Parksmart Measures w/PV

Project Metrics – Hard Costs | Discipline

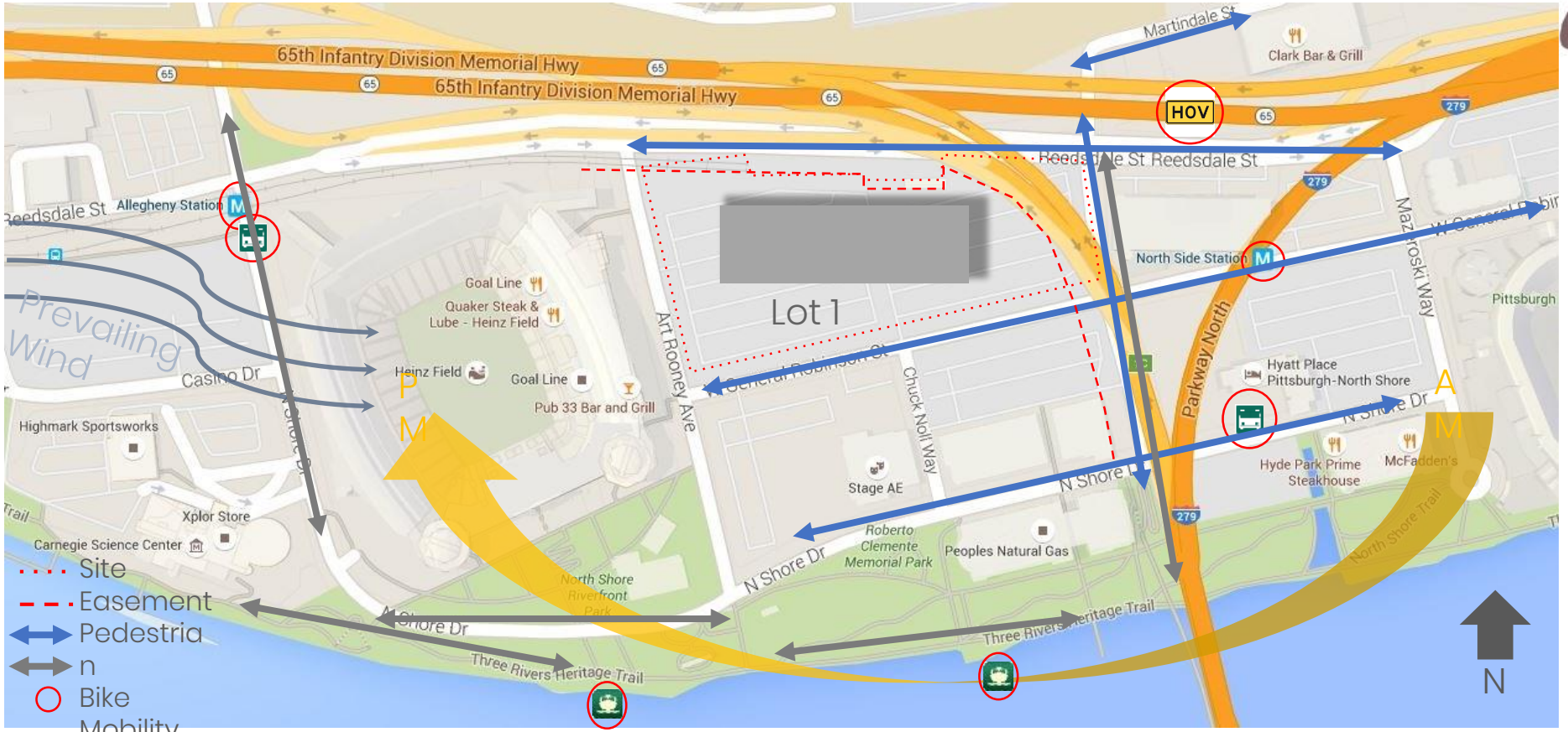




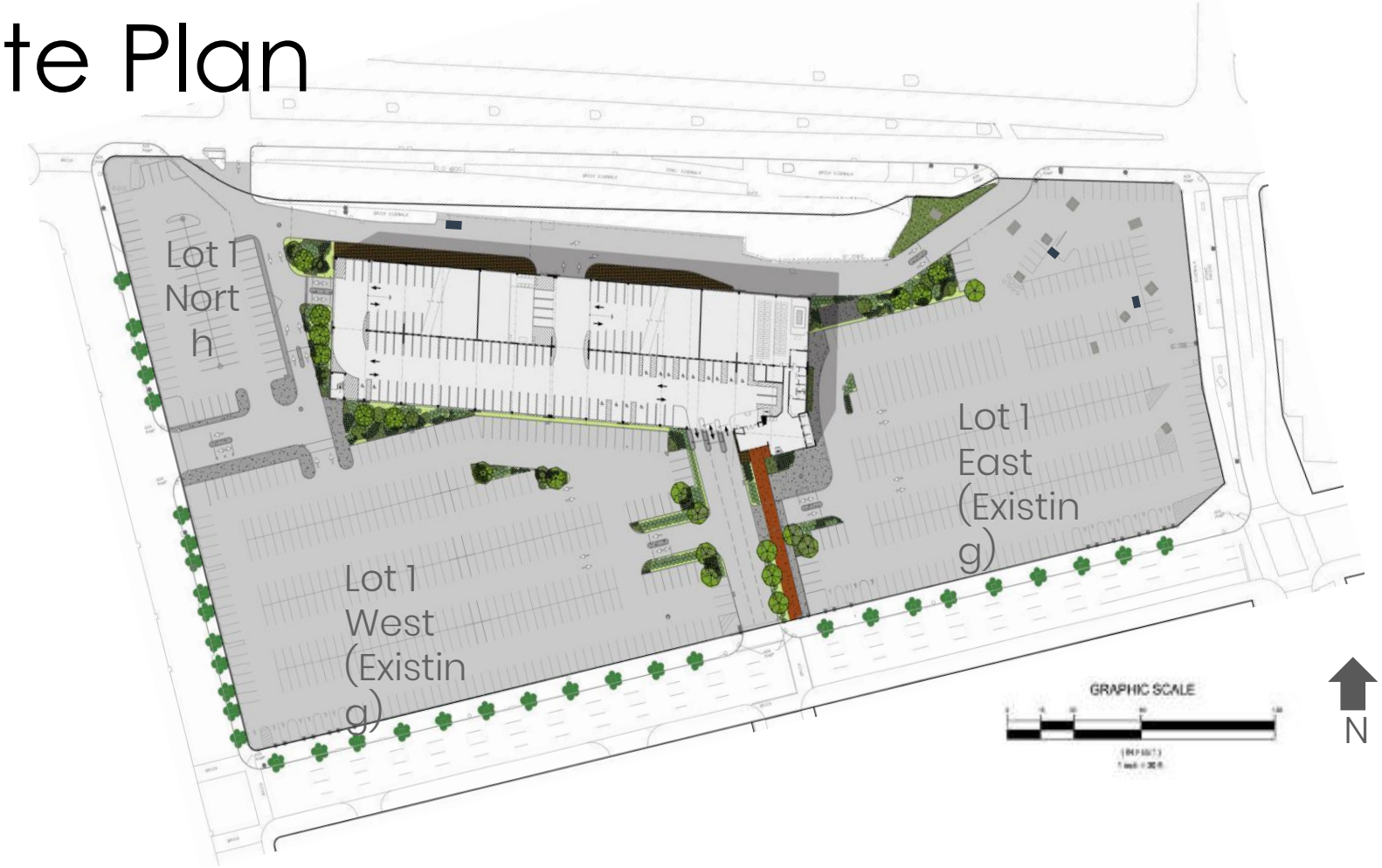




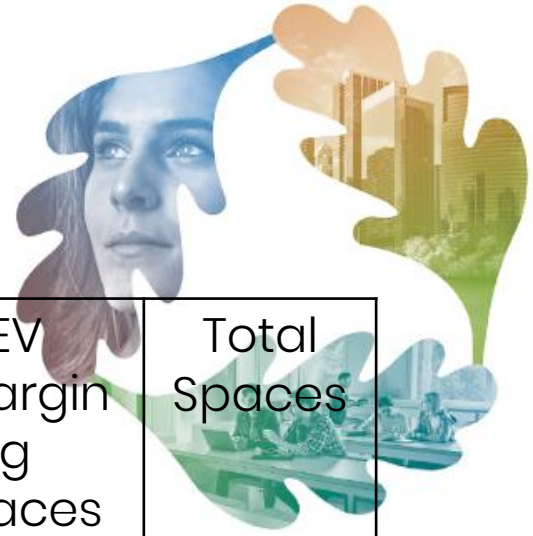
Site Influences



Site Plan



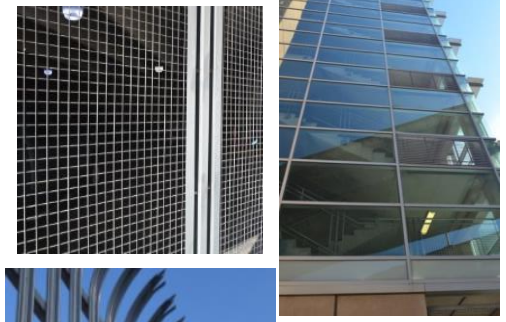
Net Parking Analysis

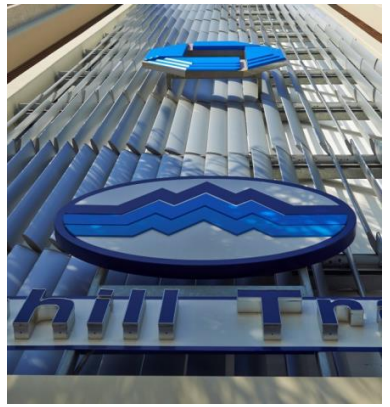


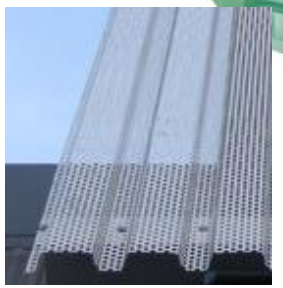
Location	Standard Spaces	Standard Compact Spaces	Wide Compact Spaces	Accessible Car Spaces	Accessible Van Spaces	EV Charging Spaces	Total Spaces
6 Level Facility:	911	45	20	17	4	3	1,000
Lot 1 – North:	70	0	0	4	0	0	74
Lot 1 – West:	352	0	0	7	1	0	360
Lot 1 – East:	316	0	0	7	1	0	324
Total:	1,649	45	20	35	6	3	1,758
Existing Lot 1:	1,128	0	0	20	2	0	1,150
Net Increase:	521	45	20	15	4	3	608

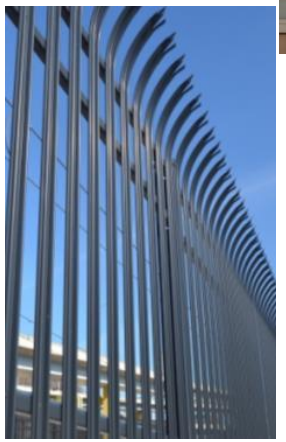
Materials

- Exterior
  - Natural & colored, smoothed & textured concrete
  - Aluminum louvers, curtain-wall and storefront framing
  - Glass
  - Green screens
  - Perforated screens
  - Exposed steel
  - Concrete with GGBFS
- Plant and Landscape
  - Increase pervious surface
  - Low maintenance, native, and indigenous
  - Biodiversity
  - Appropriate mature size
  - Groundcover, perennials, shade, trees
  - Consistent fencing and bollards









Elements of Parksmart Certification
Project Scorecard - Construction Document Phase
Registration Number - PS2016110

Project Name: Stadium Authority - Gold 1 Garage
Date: June 6, 2018

Measure	MANAGEMENT	MAX	Y	?	N	Supporting Info.	Status	Initial Photos	Photo Status
1	Parking Pricing (Must Charge for Use of Parking Spaces)	6	6			O	C	Y	C
2	Shared Parking (3 Options Based on Implemented Strategies)	6	6			O	C	N	--
3	TMO/TMA (Based on Affiliation w/Transportation Management Organization or Association)	4	4			O/O	C	N	--
4	Recycling Program (3 Options Based on Implemented Strategies)	4	3		1	O/O	C	Y	C
5	Sustainable Purchasing Program (2 Options Based on Implemented Strategies)	2	2			O/O	C	N	--
6	Proactive Operational Maintenance (Must Achieve 9 of 11 Outlined Strategies)	6	6			O/O	C	N	--
7	Cleaning Procedures - Occupied Spaces (2 Options Based on Implemented Strategies)	2	2			O/O	C	Y	C
8	Cleaning Procedures - Parking Decks (5 Options Between 3 Categories)	6 [1]	3		3	O/O	C	N	--
9	Building Systems Commissioning (5 Options Based on Implemented Process)	8 [2]	6		2	O	C	N	--
10	Construction Waste Management (20% - <50%, >50% - <95%, ≥95%)	6	6			CM	C	N	--
11	Regional Materials (Within 500 Mile Radius)	6	6			CM	C	N	--
12	Regional Labor (Within 75 Miles, Pays 1 Point for Volunteer Program)	4	4			CM	C	N	--
13	Reused/Repurposed/Recycled Materials (20% - <50%, >50% - <95%, ≥95%)	6	2		4	CM	C	N	--
14	Third Party Sustainability Certification (Requires LEED, Green Globes or Other)	12			12	O	--	--	--
15	Credentialed Management (Ops. Manager Accredited LEED or Green Globes or Other)	4	2		2	O/O	C	N	--
16	Life Cycle Assessment (4 Levels w/Points Based on Project Cost)	8	8			O/DT	C	Y	C
	Totals:	90	66	0	24				

73% Anticipated

Measure	PROGRAMS	MAX	Y	?	N	Supporting Info.	Status	Initial Photos	Photo Status
1	Placemaking (Subjective Design Scoring Category)	6 [3]	6			O/DT	C	Y	C
2	Access to Mass Transit (1/2 Mile Proximity or Provide Supplemental Transportation)	4	4			O/DT	C	Y	C
3	Wayfinding Systems - External (3 Options Based on Implemented Strategies)	4	3		1	O	C	Y	C
4	Wayfinding Systems - Internal (4 Options Based on Implemented Strategies)	4 [4]	1		3	O/O	C	Y	C
5	Traffic Flow Plan (4 Options Based on Implemented Strategies)	4	4			O	C	Y	C
6	Carshare Program (2 Options Based on Implemented Strategies)	6			6	O	C	Y	C
7	Rideshare Program (2 Options Based on Implemented Strategies)	6	6			O	C	Y	C
8	Low-emitting and Fuel Efficient Vehicles (2 Options Based on Implemented Strategies)	4	2		2	O	C	Y	C
9	Alternative Fuel Vehicles (2 Options Based on Implemented Strategies)	6			6	O	C	Y	C
10	Alternative Fuel Fleet Vehicles (2 Options Based on Percentage of Fleet Using Alt. Fuels)	4	4			O	C	Y	C
11	Bicycle Parking (Based on Implementing 1 of 2 Tiers)	6	6			O/DT	C	Y	C
12	Bicycle Sharing/Rental (Based on Implementing 1 of 2 Options)	6	4		2	O/DT	C	Y	C
13	Marketing/Educational Program (Must Successfully Meet 5 Criteria)	4	4			O/DT	C	Y	C
	Totals:	64	44	0	20				

69% Anticipated

Measure	INNOVATION	MAX	Y	?	N	Supporting Info.	Status	Initial Photos	Photo Status
	Innovative Approach (Points Awarded for Innovative Approach and/or Exemplary Performance)	6	--	--	--				
1	Innovative Approach: Brownfield Development (Pending Further Review)		1			DT	C	--	C
2	Innovative Approach: Incorporating 100% LED Lighting (Pending Further Review)				1	DT	C	--	C
3	Innovative Approach: Exemplary Performance for Access to Mass Transit (Pending Further Review)		1			O	I	--	--
4	Innovative Approach: Community Involvement (Fees documented on Awarded LEED Innovation Credit)		1			DT	C	--	C
5	Innovative Approach: Using Eco-Friendly Devices		1			O	P	--	--
6	Innovative Approach: ISO 14001 Certification by GM (Pending Further Review)				1	CM	--	--	--
7	Innovative Approach: Designed for Flexibility/Conversion to Office Space (Pending Further Review)				1	DT	--	--	--
8	Innovative Approach: Incentivize Smaller Vehicle Choices (Pending Further Review)				1	O	--	--	--
9	Innovative Approach: Excess power from PV's back into the grid (Pending further Review)				1	DT	--	--	--
10	Innovative Approach: Exemplary Performance for Providing Additional Tier 2 EV Charging Stations (Pending Further Review)				1	O	--	--	--
11	Innovative Approach: Flat re-striping Lot 1 and ELCC (Pending Further Review)				1	DT	--	--	--
12	Innovative Approach: Building Performance Educational Display (Pending Further Review) [5]				1	DT	--	--	--
13	Innovative Approach: 5% partnered w/Bike Pittsburgh - Bike to Work Program				1	O	--	--	--
14	Innovative Approach: Remote water metering platform				1				
15	Innovative Approach: No inventory in specified lighting				1	O	--	--	--
	Totals:	6	4	0	11				

67% Anticipated

Measure	TECHNOLOGY AND STRUCTURE DESIGN	MAX	Y	?	N	Supporting Info.	Status	Initial Photos	Photo Status
1	Idle Reduction Payment Systems (Pay-on-Foot, Pay-by-Cell, Vehicle ID System, or Other)	4	4			O	C	Y	C
2	Fire Suppression Systems (Specified System Must be Halon-Free)	2	2			CM/DT	C	Y	C
3	Nox/Low VOC Coatings, Paints, Sealants	2	2			O/DT	C	N	--
4	Tire Inflation Stations (Based on Meeting 5 Design Strategies)	2	2			O/DT	C	Y	C
5	EV Charging Stations (Based on Implemented Strategy and Cost to Access)	6 [6]	6			O/DT	C	Y	C
6	HVAC Systems - Occupied Spaces (Based on Energy, Control & Coolant Strategies)	6	5		1	DT	C	Y	C
7	Ventilation Systems - Parking Decks (Based on 5 Possible Strategies)	6	6			DT	C	N	--
8	Lighting Controls (Based on % plus setting 5 Interior and/or 2 Exterior Strategies)	8	8			DT	C	Y	C
9	Energy Efficient Lighting System (Based on Lighting Power Density & Average Lamp Life)	8	5		3	DT	C	N	--
10	Stormwater Management (Cost Varies, Based on % plus setting 3 Strategies)	6	4		2	DT	C	N	--
11	Rainwater Harvesting (Based on Ability to Store a Minimum of 1,500 Gallons or 3%)	4			4	DT	--	--	--
12	Greywater Reuse (Based on Implementing Appropriate System)	2			2	DT	--	--	--
13	Indoor Water Efficiency (Based on Conforming w/Specific Water Sense or LEED Criteria)	2	2			DT/CM	C	N	--
14	Water Efficient Landscaping (Based on Meeting 1 of 4 Strategies, and Cover 10% of Project Boundary)	2 [6]	2			DT	C	N	--
15	Roofing Systems (Points Vary Based on % plus setting 1 of 5 Strategies for Min)	6 [7]			6	DT	--	Y	--
16	Renewable Energy Generation (Based on Combination of Production or Purchase Strategies)	12 [8]	2		10	O/DT	C	N	--
17	Design for Durability (Must Align w/ Specific Strategies for Precast or Steel Systems)	6	6			DT	C	N	C
18	Energy Resiliency - Storage (Points Vary Based on % plus setting 1 of 2 Strategies)	4			4	DT	--	--	--
	Totals:	88	56	0	32				

64% Anticipated

MEASURE QUALIFICATIONS

1. ALCO to confirm if power sweeping/scrubber will be used for cleaning.
2. Measure requires Third Party CxA hired by SACP.
3. Documentation notes this is a subjective measure, final points are determined by GBCI reviewer.
4. Measure for 2 points is identified as a Bid Alternate.
5. Infrastructure being provided, EVCS's furnished and installed by SACP.
6. Temporary irrigation provided by GC for 1 year per specs, no permanent irrigation system will be installed.
7. Traffic coatings identified as a Bid Alternate but was not taken. Pending its final size, the PV array could provide 1 additional point for this Measure.
8. 2 points for purchase of REC's and 10 additional points are available depending on the size of any installed PV array.
9. Innovative Approach credit may be applied to Programs Measure #13 and may not be applicable as a separate Innovative Approach.

CATEGORY TOTALS	MAX	Y	?	N
Total Management Points (Weighted at 36.2%)	90	66	0	24
Total Program Points (Weighted at 25.8%)	64	44	0	20
Total Technology & Structure Design Points (Weighted at 35.4%)	88	56	0	32
Total Innovation Points (Weighted at 2.4%)	6	4	0	11
Total Green Garage Certification Points:	248	170	0	87
Delta to Gold Award Level:	10	Points		

PARKSMART CERTIFICATION AWARD LEVELS

Pioneer:	90	→ Existing Facility
Bronze:	110-134	→ New Construction
Silver:	135-159	
Gold:	160+	

LEGEND: SUPPORTING INFORMATION PROVIDED BY

O: Owner
O/O: Owner/Operator
DT: Design Team
CM: Construction Manager
N/A: Not Applicable

LEGEND: SUPPORTING INFORMATION PROVIDED BY

O: Owner

O/O: Owner/Operator

DT: Design Team

CM: Construction Manager

N/A: Not Applicable

LEGEND: SUPPORTING INFORMATION & PHOTO STATUS

P: Pending (Awaiting Supporting Information and/or Photographs)

I: In Progress (Compiling Supporting Information and/or Photographs)

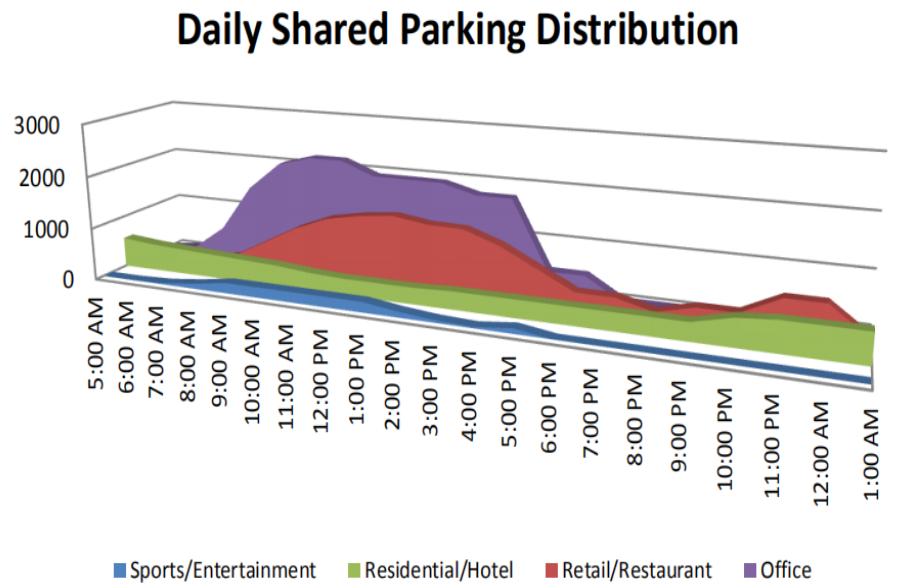
R: Review (Ready to Review Supporting Information and/or Photographs)

C: Completed (Ready for Submission)

-- : Not Pursuing (Measure and/or No Photographs Required)

Management

- Measure A2 – Shared Parking
- Devote less land to parking while serving the same sized community
    - Shared parking analysis
    - Implement or participate in shared parking program
    - Oversubscribe permits
  - Urban Land Institute Standards for building occupancy and parking needs as well as typical parking patterns
  - ULI standards can be supplemented with real world data of your site
- Shared parking:
  - When a structure is used by office workers, apartment residents, entertainment seekers, shoppers and/or hotel guests
  - Most urban parking structures would probably qualify
- Analysis should be done before construction as well as after opening to determine parking structure size, placement, and design



Management

- Measure A4 – Recycling Program
  - Employee and patron recycling program
  - Provide Recycling and Landfill containers clearly marked and accessible
  - Check for contamination and rates periodically through simple trash audit.

- Measure A7 – Cleaning: Occupied Spaces
  - Implement environmentally safe cleaning procedures
  - Cleaning personnel training
  - Monitor purchasing of products
  - Some garage products can be difficult to source sustainably

Management

- Measure A8 – Cleaning: Parking Decks
  - Implement environmentally safe and water efficient deck cleaning procedures
  - Minimize pollutant discharge
  - Review deck cleaning design
- Measure A12 – Regional Labor
  - Use regional labor for new rehabilitation or retrofit projects
  - Reside within 75 miles of project
- Measure A15 – Credentialed Management
  - Ensures manager's understanding of operations and sustainability

Management

- Measure A9 – Building Systems Commissioning
  - Meet LEED 2009 Fundamental Commissioning of Building Energy Systems prerequisite or v4 Fundamental Commissioning and Verification prerequisite
  - Ensures that all mechanical systems operating optimally, catch problems early, and find ideal settings
    - Saves energy, and over time saves money
    - Combined with a larger structural and building assessment program with SEA properties

- Measure A16 – Life Cycle Assessment
  - LCA reports describing the various construction options, including the typical baseline, and the data associated with each option. Data must include 6 primary categories:
  - Look at garages in the three rivers area that have similar functions and see the same usage density but have used different construction techniques
  - Look at cradle to grave and maintenance of structures
  - Used Athena Impact Estimator

Programs

- Measure B1 – Placemaking
  - Parking structure has implemented placemaking features and/or programming on the property that successfully integrates the garage into the surrounding community
  - Living walls raise awareness
  - Multi-colored accent lighting
  - Bicycle facilities support city's goals
  - Commute shuttle reduces congestion
- Measure B10 – Alternative Fuel (Fleet)
  - Encourages use of shuttle security and other fleet vehicles
  - Powered by one or more of the following: electricity/hybrid-electric, compressed or liquified natural gas, propane, hydrogen, biodiesel, ethanol, compressed air
- Measure B11 – Bike Parking
  - Capacity for 100 bikes
  - Bike maintenance station
  - Adjacent to manager's office
  - Security cameras
  - Dedicated entrance
  - Strategic signage
- Measure B12 – Bike Sharing
  - Option 1: facility promotes bike sharing via signage; hub within ¼ mile
  - Option 2: Facility contains, maintains and promotes bike sharing hub; minimum of five bikes; well maintained with signage

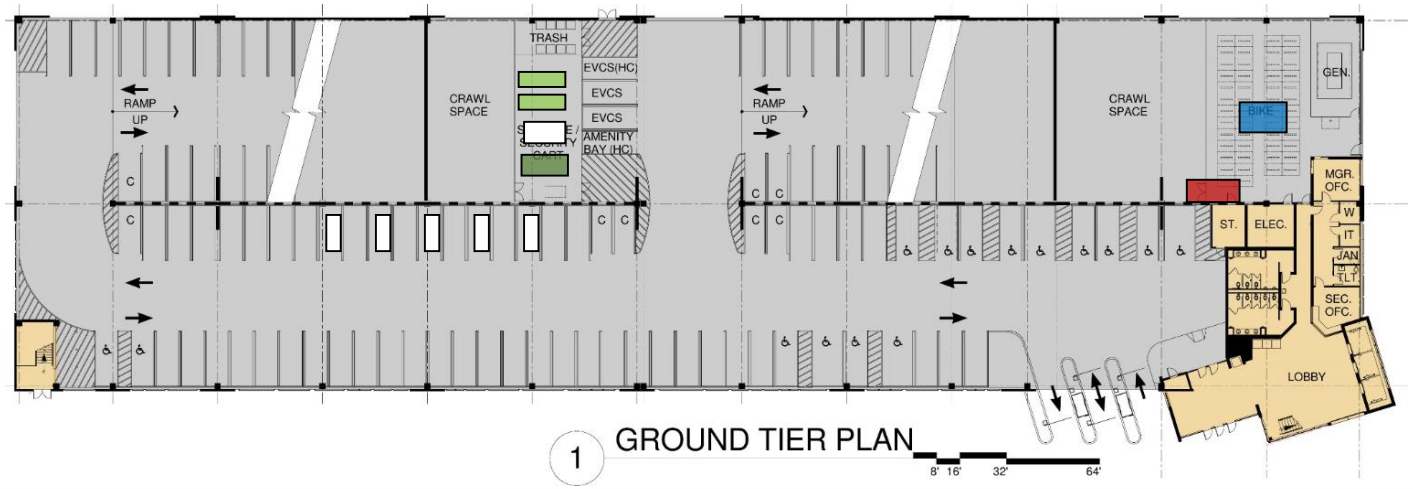
Technology and Structure

- Measure C1 – Idle Reduction Systems
  - Reduce or eliminate idling upon exiting
  - Pay-on-Foot (PoF)
  - Pay-by-Cell (PbC)
  - Automated Vehicle Identification (AVI)
    - Radio Frequency Identification (RFID)
    - License Plate Recognition (LPR)
    - Toll Transponder Readers
  - Infrastructure for future PoF stations
- Measure C4 – Tire Inflation Stations
  - Low cost easy to install feature
  - Great amenity for lease holders
  - Helps increase fuel efficiency
  - Requires 1-2 spots and power source
  - Free of charge, accessible to all patrons

Technology and Structure

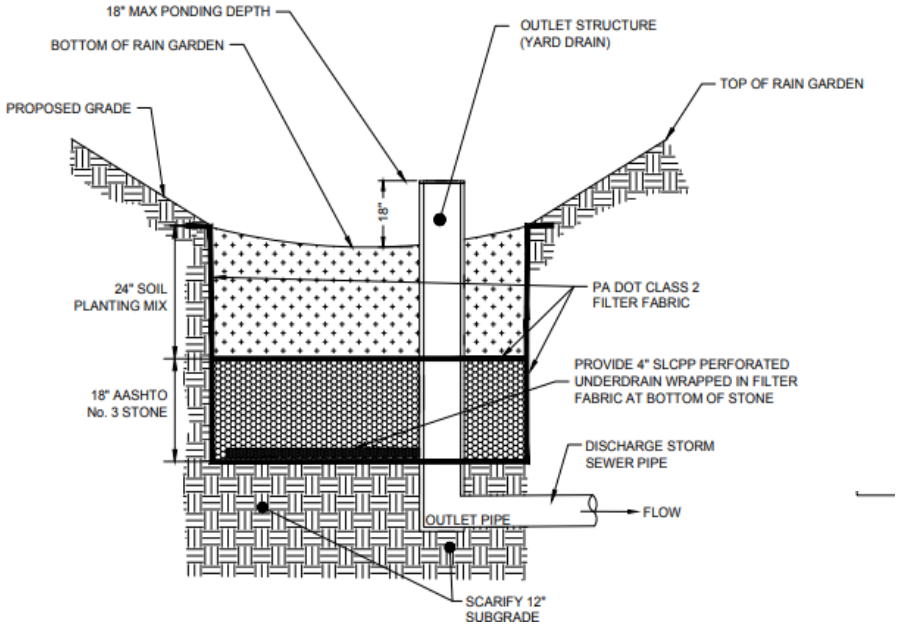
- Measure C5 – EV Charging
  - Level 1 – 0.5% of spaces
  - Level 2 – 0.5% to 1% of spaces
  - Fast DC charging – 1 to 2+
  - Provide signage
  - Free of charge
  - Consider partnership opportunities
  - Provide multiple charging stations
- Original Installation: 2 DC Fast Chargers
- Added in 2018: 2 Universal Level II Chargers and 4 Tesla Level II Chargers

Legend
- Tire Inflation Station
- Fast DC Charging Stations
- Level 2 Charging Stations
- Bike Maintenance Station
- Lock Docks



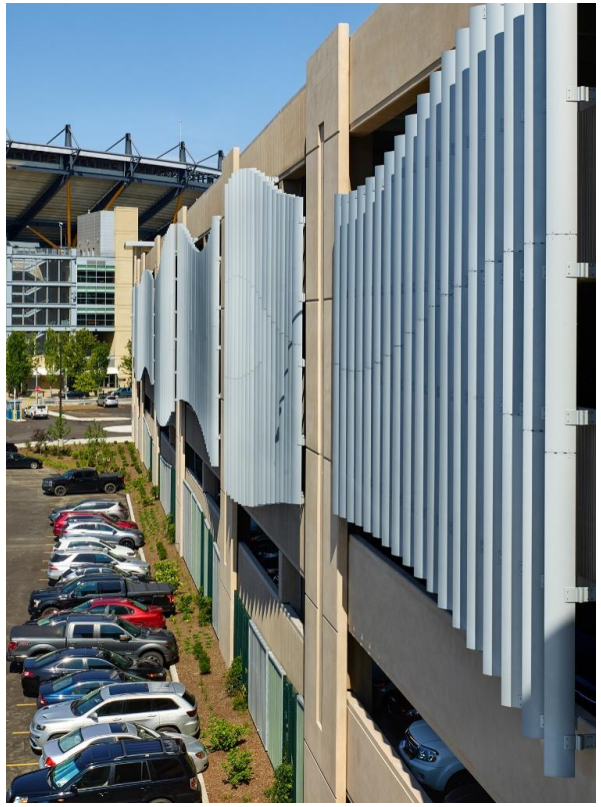
Technology and Structure

- Measure C9 – Energy Efficient Lighting Systems
  - Based on Lighting Power Density calculations (LPD)
  - Changing existing metal halide to LED with sensors can save 40-60% in energy use
    - Feasible upgrade in any garage
    - LED's equate to less maintenance and cost neutral option
  - Addressable wireless occupancy and daylight sensors
    - Time out: 3 minutes in lieu of 20 minutes
- Measure C10 – Stormwater Management
  - Low Impact Development and green infrastructure
    - Rain garden
  - Erosion and sedimentation plan that exceeds US EPA Construction General Permit
  - Good stormwater stewardship in Pittsburgh



Technology and Structure

- Measure C17 – Design for Durability
  - Adequate slope and draining
  - Epoxy coated rebar
  - Concrete corrosion inhibitor
  - Penetrating sealer at vertical surfaces
  - Durable concrete characteristics
  - Galvanized and stainless steel connections
  - Rigid metal conduits in lieu of PVC
  - Silicone sealants maximizes longevity and movement
  - Slip connections



Innovation

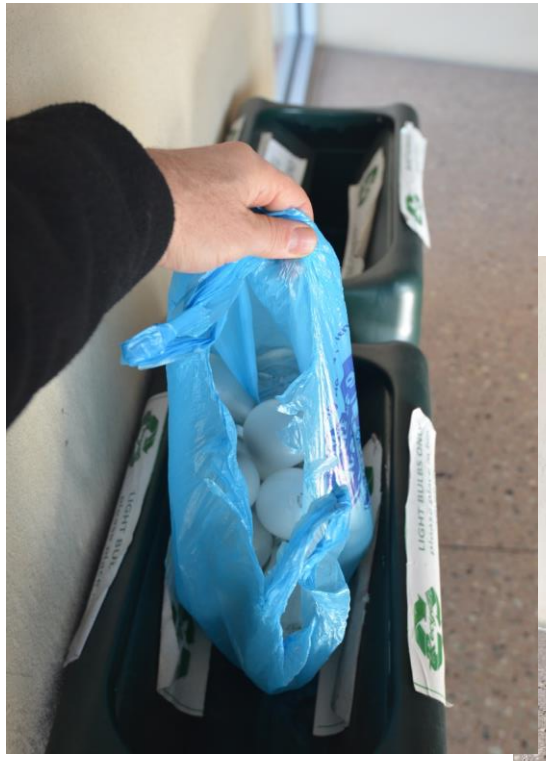
- Brownfield Re-use
- Access to mass transit
  - Transit oriented parking
  - Bus, LRT, Water Taxi, biking paths
- Community involvement
- Eco-friendly de-icer
  - Biodegradable
  - Gentle on vegetation
  - Child and pet friendly
- 100% LED lighting
- Bulb/battery recycling program
  - Commuters see bins daily

Community Involvement

- Northside leadership conference
  - Allegheny City Central Association
  - Allegheny West
  - East Allegheny Community Council
  - Manchester Citizens Council
- North Shore Stakeholder Group
- Pittsburgh Pirates and Steelers
- ALCO Parking
- Continental Real Estate
- Green Building Alliance
- Pittsburgh Bike Share
- Pittsburgh Downtown Partnership
- Port Authority of Allegheny County
- Public Stadium Authority Board Meetings
- Riverlife
- M/W/DBE Outreach

Bulb/Battery Recycling Program

- Free recycling
  - Incandescent and compact fluorescent bulbs
  - Cell phones
  - Rechargeable batteries
  - Alkaline batteries
- Raise awareness
  - Lease Patrons see bins daily
  - Requests to add fluorescent tube and other recycling are being investigated
- Issues
  - Bins must be removed during game days



Strategies for Success

- Initiate early
- Integrate Owners and Managers
- Continuous track
- Reference other rating systems
- Consider impacts and opportunities
  - Infrastructure for EV Charging and dynamic signage
  - Digital platform implications
  - Impact of photovoltaics
  - Mobility as a service
  - Autonomous vehicles
  - Design for re-use

Design Challenges and Lessons Learned

- Radius and texture of pavement made using more sustainable surface cleaning/sweeping equipment more difficult
  - Lesson: Involve third party cleaning company in design or material phase
- Long term electrical vehicle charging
  - Garage is capable of increasing EV charging stations (6 added after Parksmart certification issued) with minimal cost increase
  - Future garages should have even more EV charger expansion
- Conversion into non-garage use
  - Live and Static Loads
- Recycling facilities
  - Include sorting and more opportunities for receptacle placement

Sustainable Highlights of the Project

- USGBC
  - Increased energy efficiency and performance
  - Reduced environmental impact
  - Efficient parking space management
  - Integrated sustainable mobility services and technologies
  - Diversity of sustainable transportation options
  - Stronger community relationships
  - Goal: Gold Green Garage Award Level
- Stormwater Management
  - Increasing pervious surface area
  - Stormceptor
  - Bio swales (planted and river rock)
  - Ground cover
  - Plant diversity

Managing the Data

- Construction Worker Commutes and Carpooling; Data tracked by Construction Manager
- Recycled material content: Tracked by Construction Manager and analyzed by Sustainability Coordinator
- Waste/Recycling Data
  - Survey done with "low tech" methods
    - Cleaning Crew kept one week's worth of trash/recycling segregated and items were weighed using luggage scale
      - Recycling contamination rate was determined through hand separation
- EV charging data
  - capacity to track usage by kwh not available
  - David L. Lawrence convention center is tracked and has shown large increases year to year in usage
- Carpool
  - Registration with CommuteInfo and entrance into raffle

Current Day-to-Day Operations

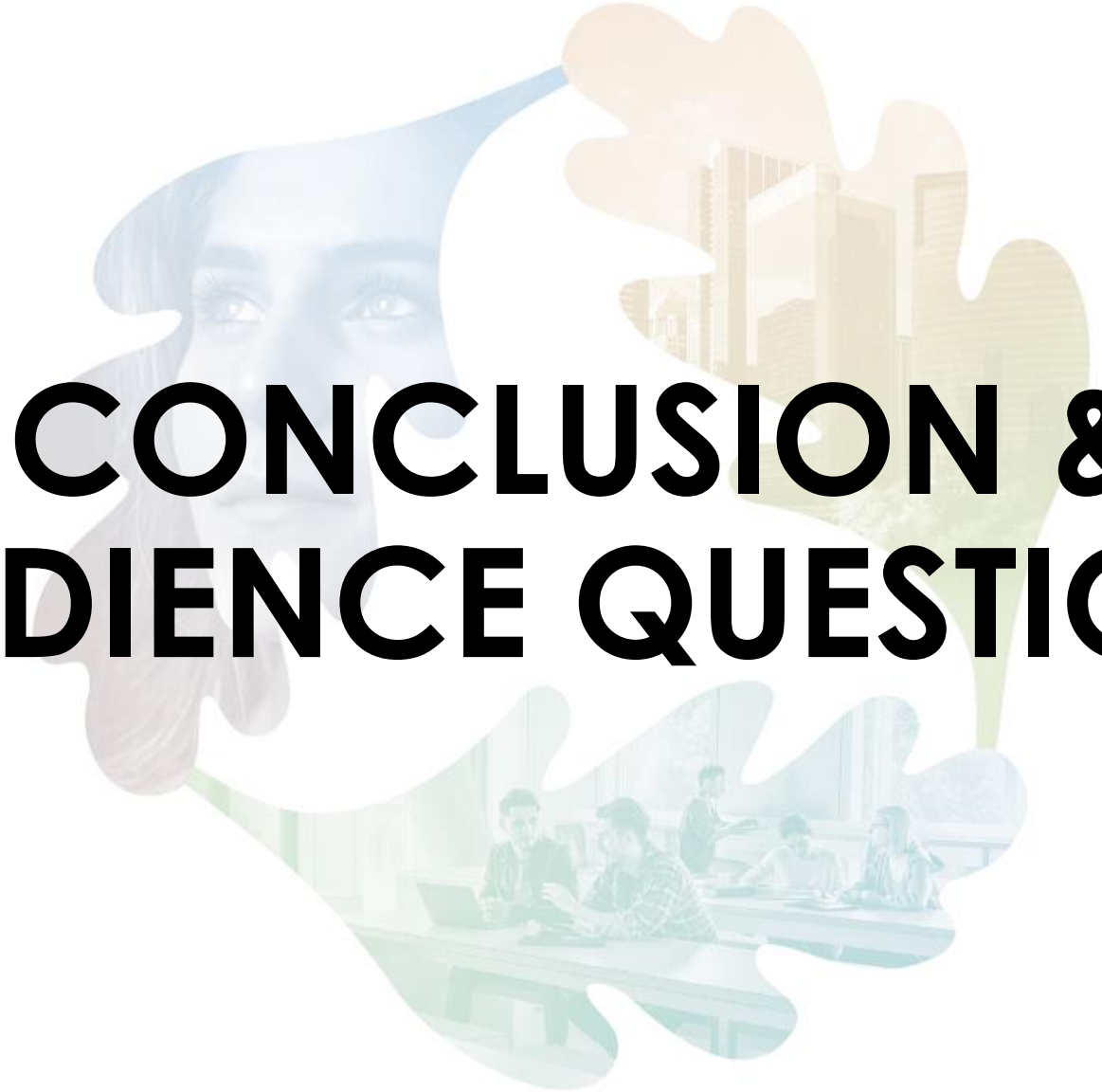
- Trash and Recycling is kept separately
  - Glass has been an issue due to tailgaters
  - Signage during games and switching up signage on receptacles used day-to-day to increase attention
- Battery/Bulb/phone recycling collected by SEA Sustainability Coordinator and combined with David L. Lawrence Convention Center items
- Usage of sustainable and Green alternative cleaning products and practices used in all SEA facilities
  - Reduces confusion and extends sustainability philosophy throughout all facilities
  - Need to frequently reinforce purchasing with Garage Management company and third party cleaning companies
- Monthly Garage Manager meetings with SEA include reminders about sustainability and Parksmart.

Day-to-Day Challenges

- Controlling Purchasing through third party management
- Cleaning personnel turn-over
- Dynamic Usage Population
- Signage and message

On-ramp to Parksmart

- Recycling on-site
  - Offer Battery/bulb/phone recycling all the time or special collection events
- Switch to sustainable cleaning materials
- CPP Certification for garage manager
- Use subsidies and offers from companies like Tesla to install EV charging equipment
- Upgrade to LED lighting and use subsidies
- Integrate landscaping and rain gardens/stormwater control around garage
- Offer bicycle parking and bike/scooter-share facilities



CONCLUSION & AUDIENCE QUESTIONS

GREENBUILD INTERNATIONAL CONFERENCE AND EXPO

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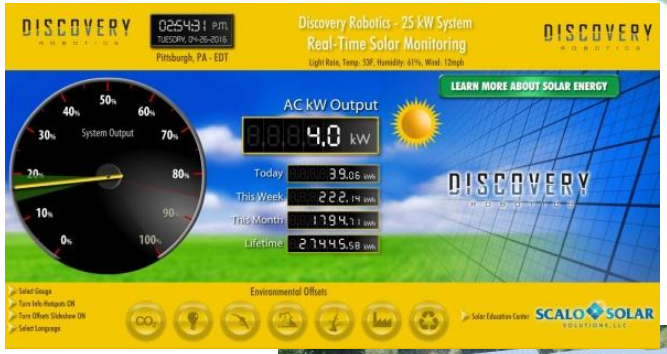
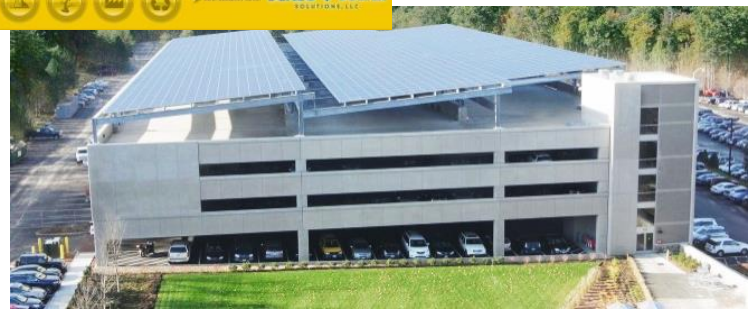
Technology and Structure

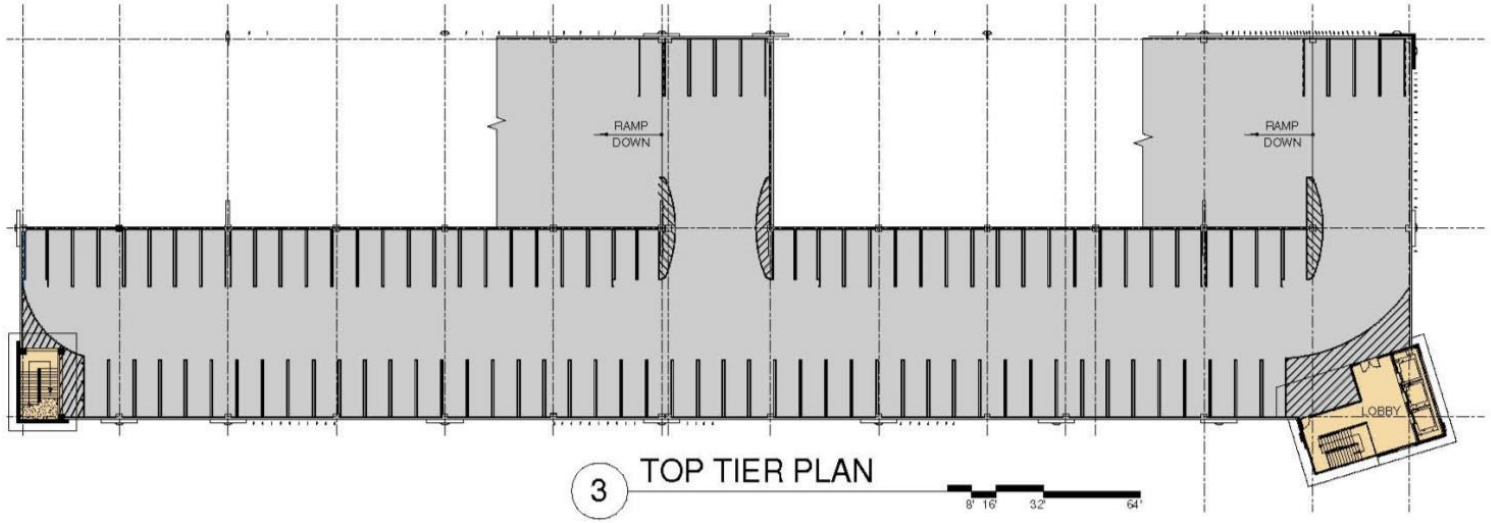
- Measure C16 – Renewable Energy
  - Implementation of renewable energy generation equipment
    - Thresholds: 5%, 25%, 50% and 75%
  - Purchase of REC's supporting off-site renewable energy generation
    - Thresholds: 5%, 25%, 50% and 75%
    - Operator must commit to maintaining same or greater level of REC's
- PV Array Considerations
  - Typically expansion joints every 60 ft.
  - ¾" to 1" gap between panels
  - LED fixtures under canopy
  - Average: 13 watts/SF
    - Typical solar panel is 18 SF
  - Largest area, simplest detailing
  - Inverters – below canopy, provides additional disconnect between house panel (PtD strategy)
    - 4 inverters anticipated
  - Monitoring available and perimeter columns





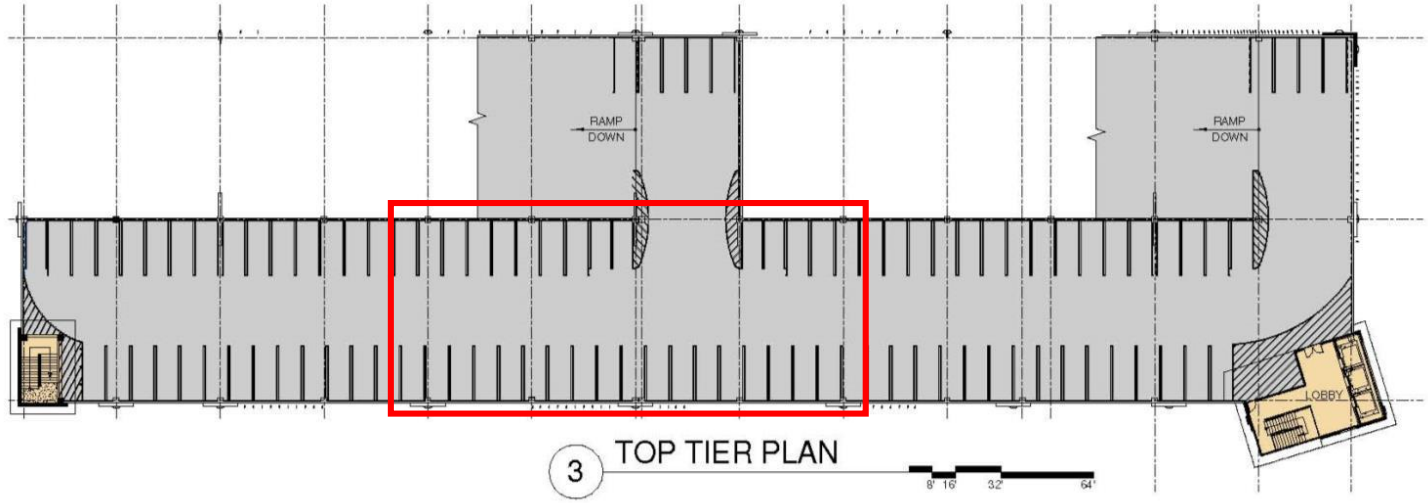
Array Outline – Initial Design

- 32’ X 400’
- 13,133 SF
- Approximately 169 kW array
- Connected load: 547 kVA/438 kW
- Demand load: 528 kVA/422 kW
  - Includes garage, feature lighting, elevators, signage and toilet rooms



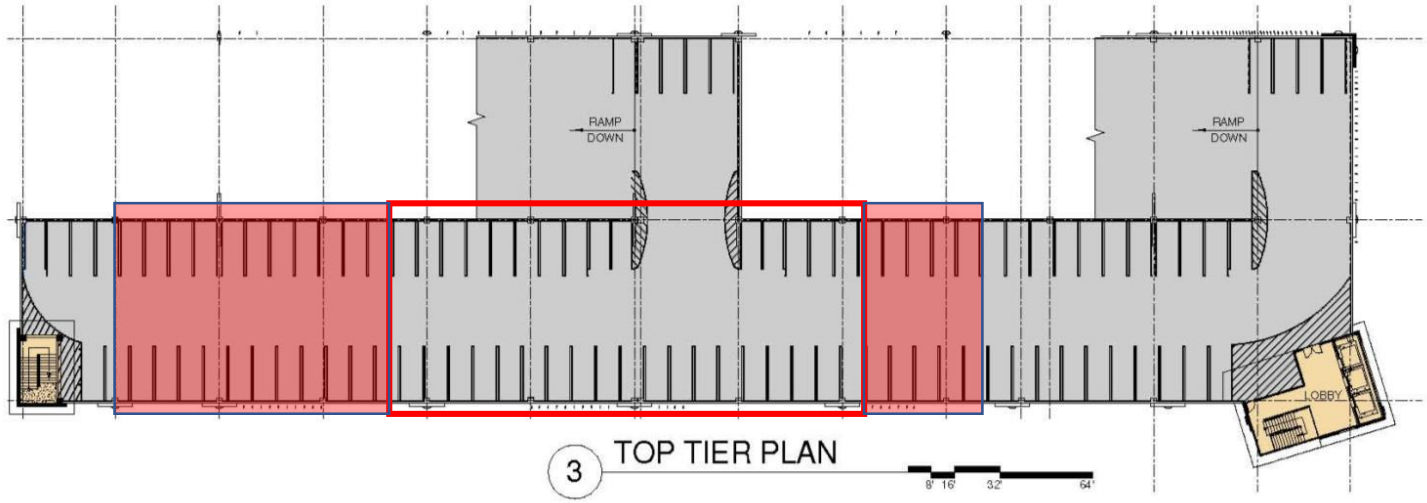
Array Outline – Alternate

- Approximately 64’ X 151’
- 9,788 SF
- Approximately 122 kW array (330 panels)
- Considerations for future expansion



Array Outline – Optimized

- Approximately 64’ X 296’
- 19,087 SF
- Approximately 237 kW array (664 panels)
- Considered entry and maintaining standard bay spacing



Array Outline – Maximized

- 64’ X 366’
- 22,936 SF
- Approximately 298 kW array
- Maximized size and maintained standard bay spacing