

# Uptown District Energy Center

June 28, 2016

# Pittsburgh District Energy System Vision

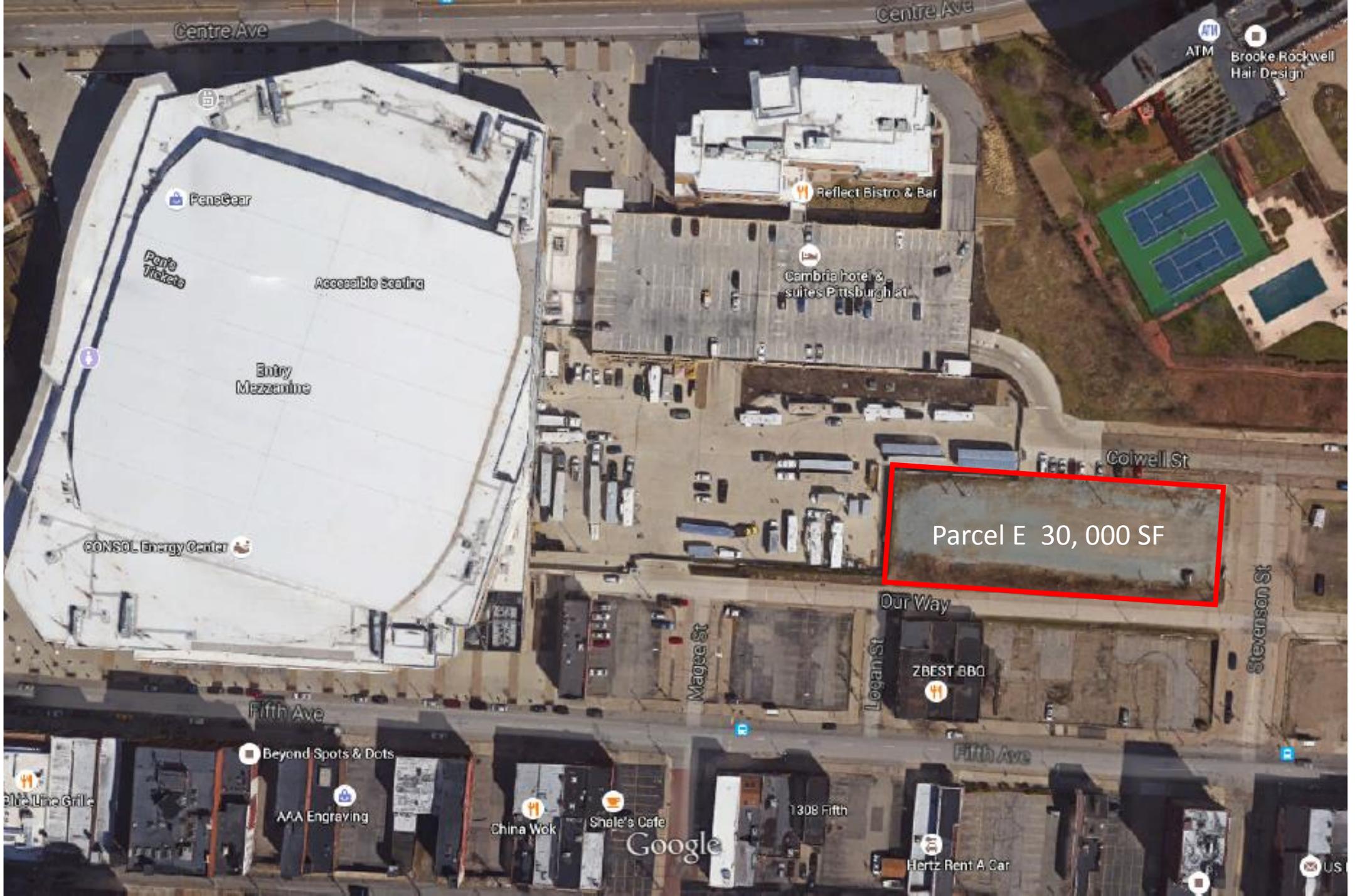


# NRG Energy Center Pittsburgh

- ECP has been in operation since early 1960's; owned by NRG for over 18 years
- ECP serves Allegheny General Hospital, CCAC, Carnegie Science Museum, PNC Park and Heinz Stadium, Allegheny Center, and others (over 50 customers).
- NRG ECP Health and Safety Record
- NRG Operations and Maintenance procedures exceed OSHA and DEP regulatory requirements

# NRG – PACT Consultation

- NRG is consulting with PACT :
  - Improve overall system performance
  - Improve and repair aging infrastructure
  - Reduce costs
  - Regain customers
- NRG is evaluating opportunities to provide additional services, including chilled water and Combined Heat & Power



Centre Ave

ATM  
Brooke Rockwell  
Hair Design

PensGear

Reflect Bistro & Bar

Pens  
Tickets

Accessible Seating

Cambria hotel &  
suites Pittsburgh at

Entry  
Mezzanine

Cowell St

Parcel E 30,000 SF

CONSOL Energy Center

Dur Way

ZBEST BBQ

Maggee St

Logan St

Stevenson St

Fifth Ave

Beyond Spots & Dots

AAA Engraving

China Wok

Shale's Cafe

1308 Fifth

Google

Hertz Rent A Car

1st Line Grille

# NRG Uptown District Energy Center

- UDEC site was selected based on central location and proximity to UPMC Mercy Hospital, PAR site, Chatham Center, Consol Energy Center, and Uptown EcoInnovation District.
- URA Parcel “E” is an appropriate site for a District Energy Center –
  - Bounded by Consol service yard, Penguins garage and future garage on Parcel F
  - Cambria Suites Hotel separated by garage; City View apartments separated by hillside, approximately 280 ft separation from building on Colwell
  - Site separated by Our Way from surface parking lots and existing 3-story buildings on 5<sup>th</sup> Avenue.
  - Utilities available to support a District Energy Center; routing for piping distribution

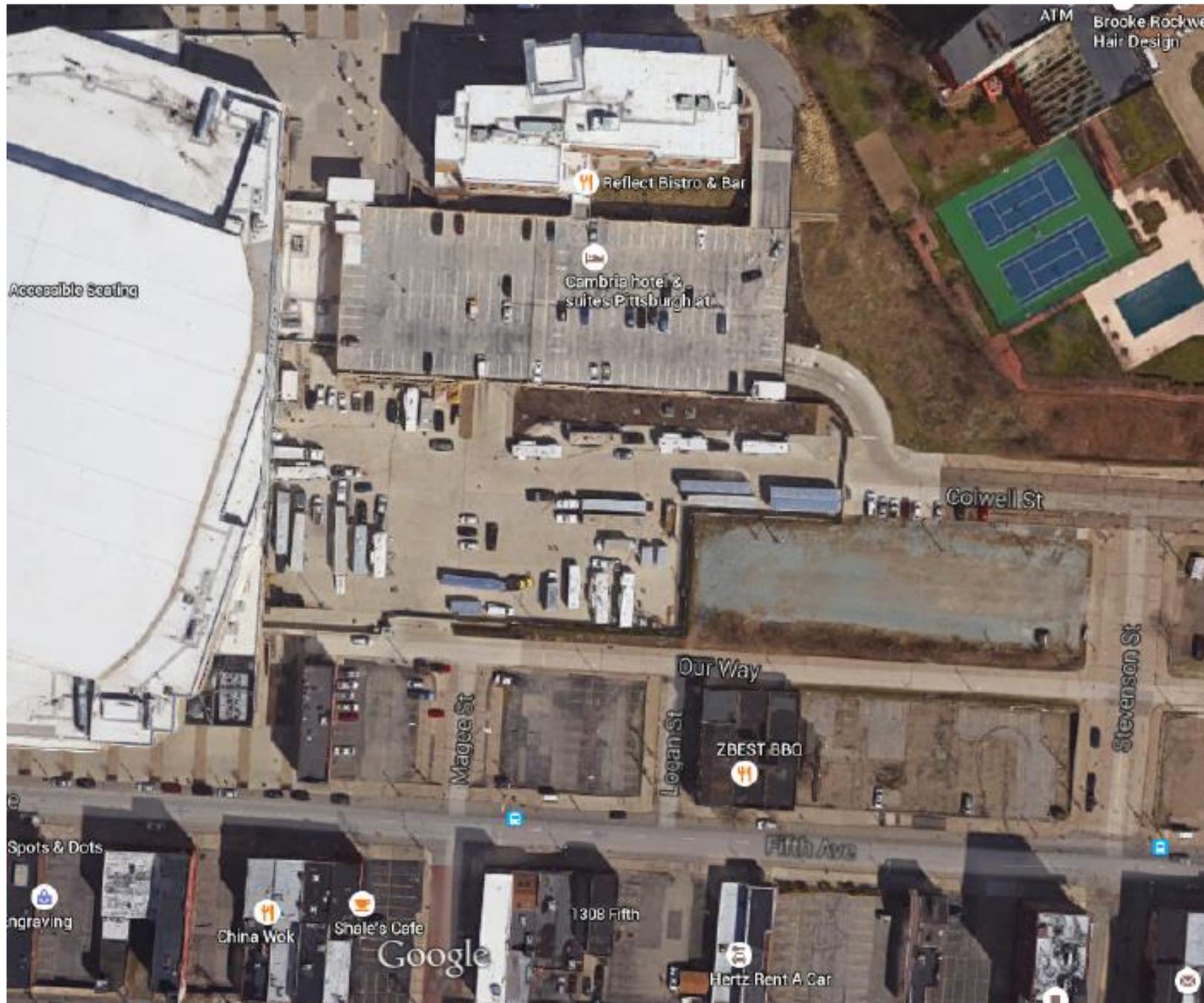


PLANNED DEVELOPMENT



# Traffic Impact

- No Pedestrian Sidewalks
- Existing CEC and Pens Garage traffic on Colwell, Stevenson, and Our Way will remain
- UDEC will have operating staff of 3 – 5 personnel over 3 shifts 24/7.
- UDEC will have intermittent visitors including, service contractors, utility personnel, vendors, community visitors
- Parcel E surface parking spaces eliminated (87)
- NRG secure parking for 4 – 6 spaces at basement level off of Our Way.
- Loading dock entry from Our Way.





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Cowell St

Phase 1  
15KSF

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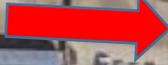
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Entry Mezzanine



Cowell St

CONSOL Energy Center

Phase 3  
20KSF

Dur Way

ZBEST BBQ

Stevenson St

Fifth Ave

Beyond Spots & Dots

AAA Engraving

China Wok

Shale's Cafe

1308 Fifth

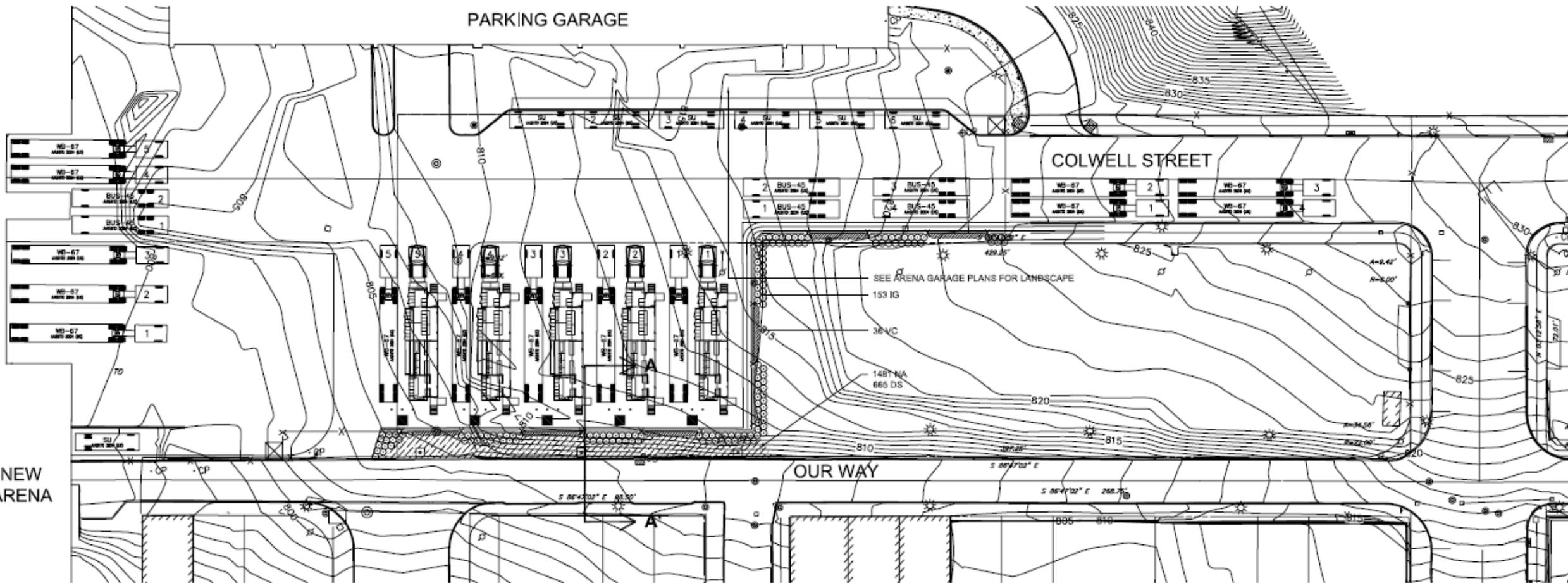
Fifth Ave

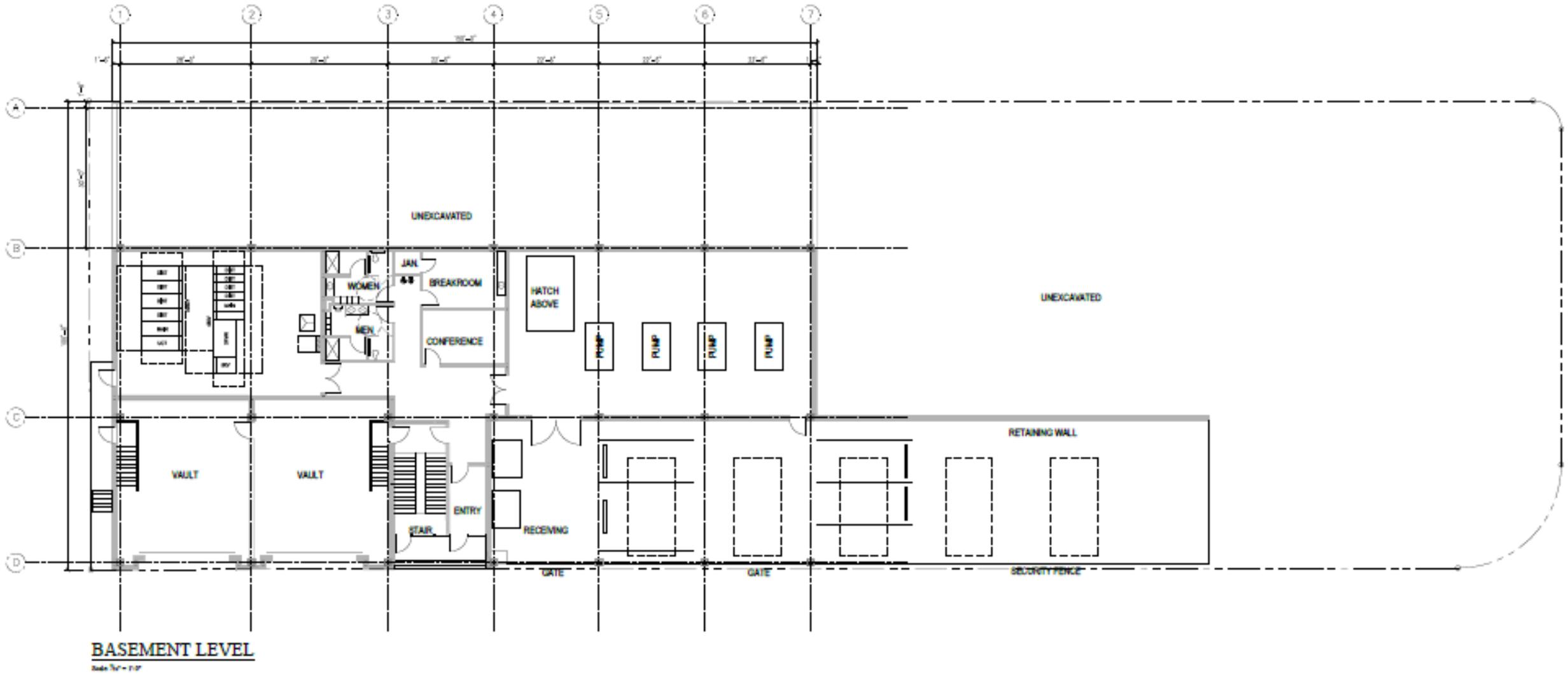
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US

# Site Slope





Phase 1 Basement



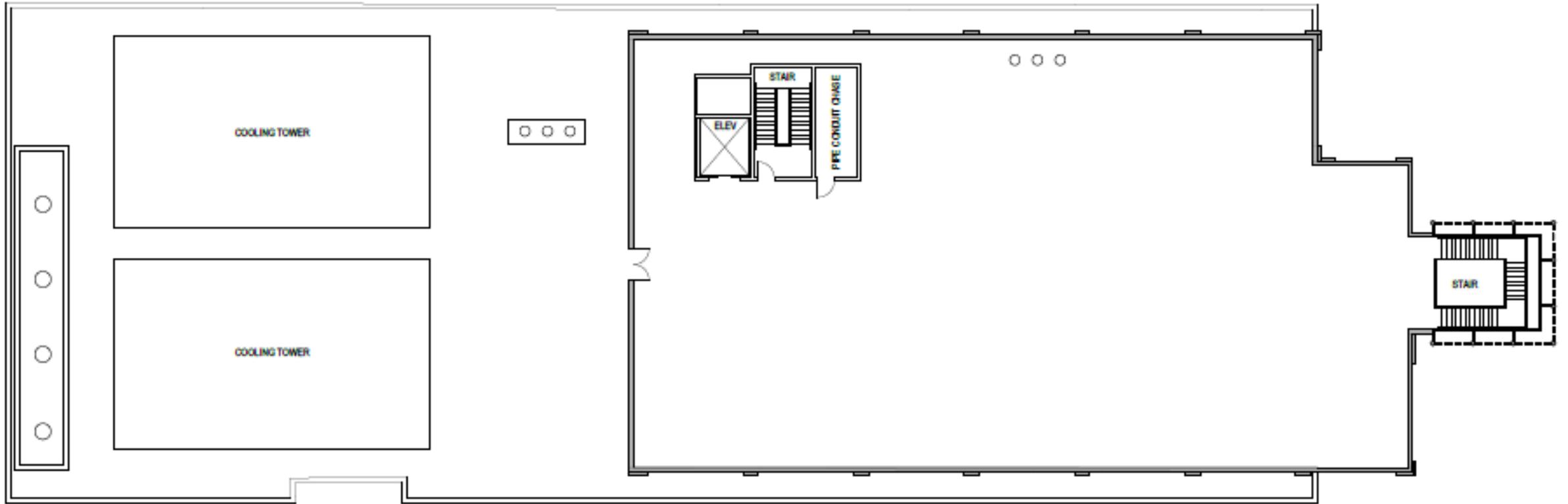
**MAIN LEVEL**  
 Scale: 1/4" = 1'-0"

Phase 1 Main Level



MAIN LEVEL

Phase 1 and 2 Main Level

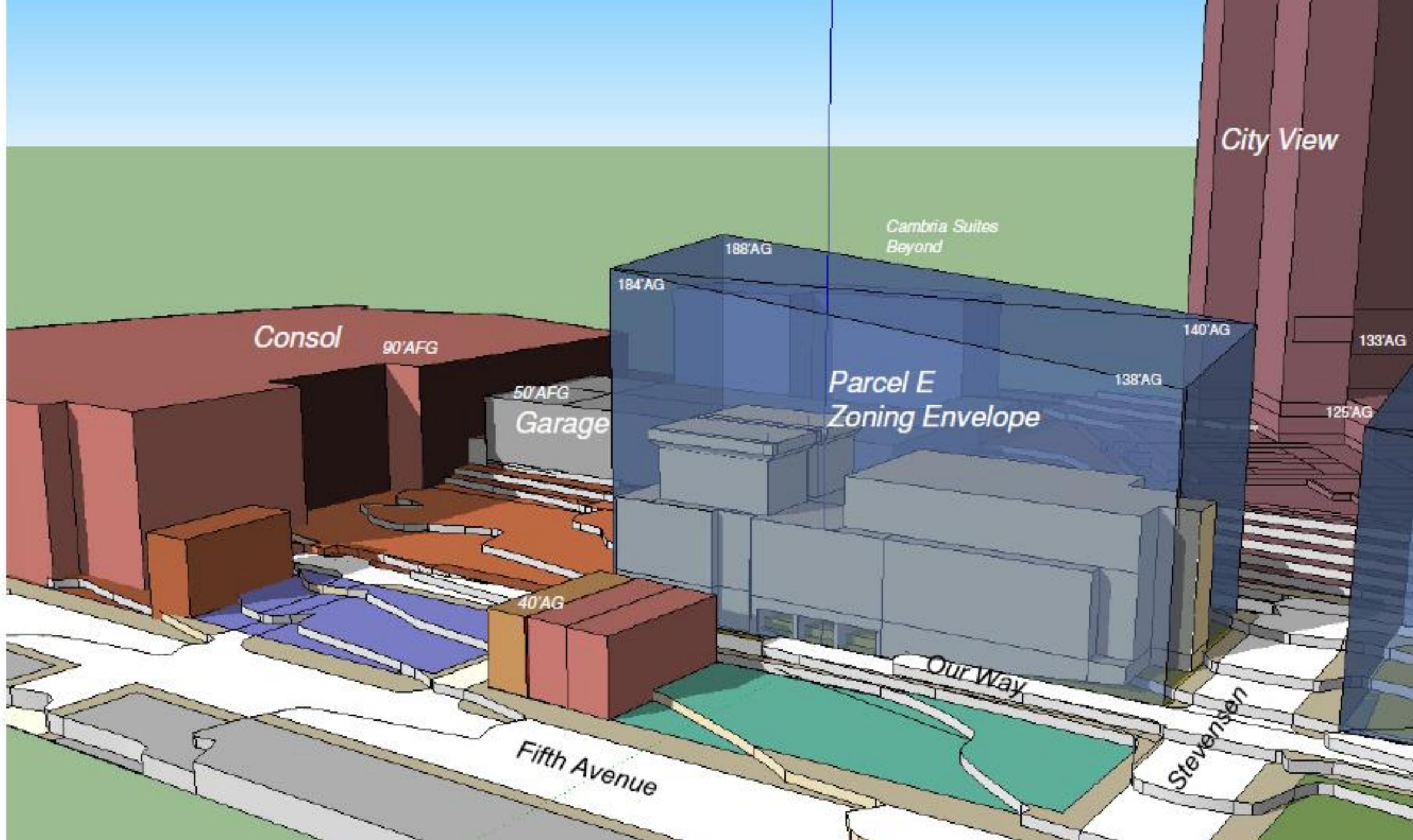


ROOF LEVEL

Phase 3 Roof Level







City View

Cambria Suites  
Beyond

Consol

90'AFG

50'AFG  
Garage

Parcel E  
Zoning Envelope

188'AG

184'AG

140'AG

138'AG

133'AG

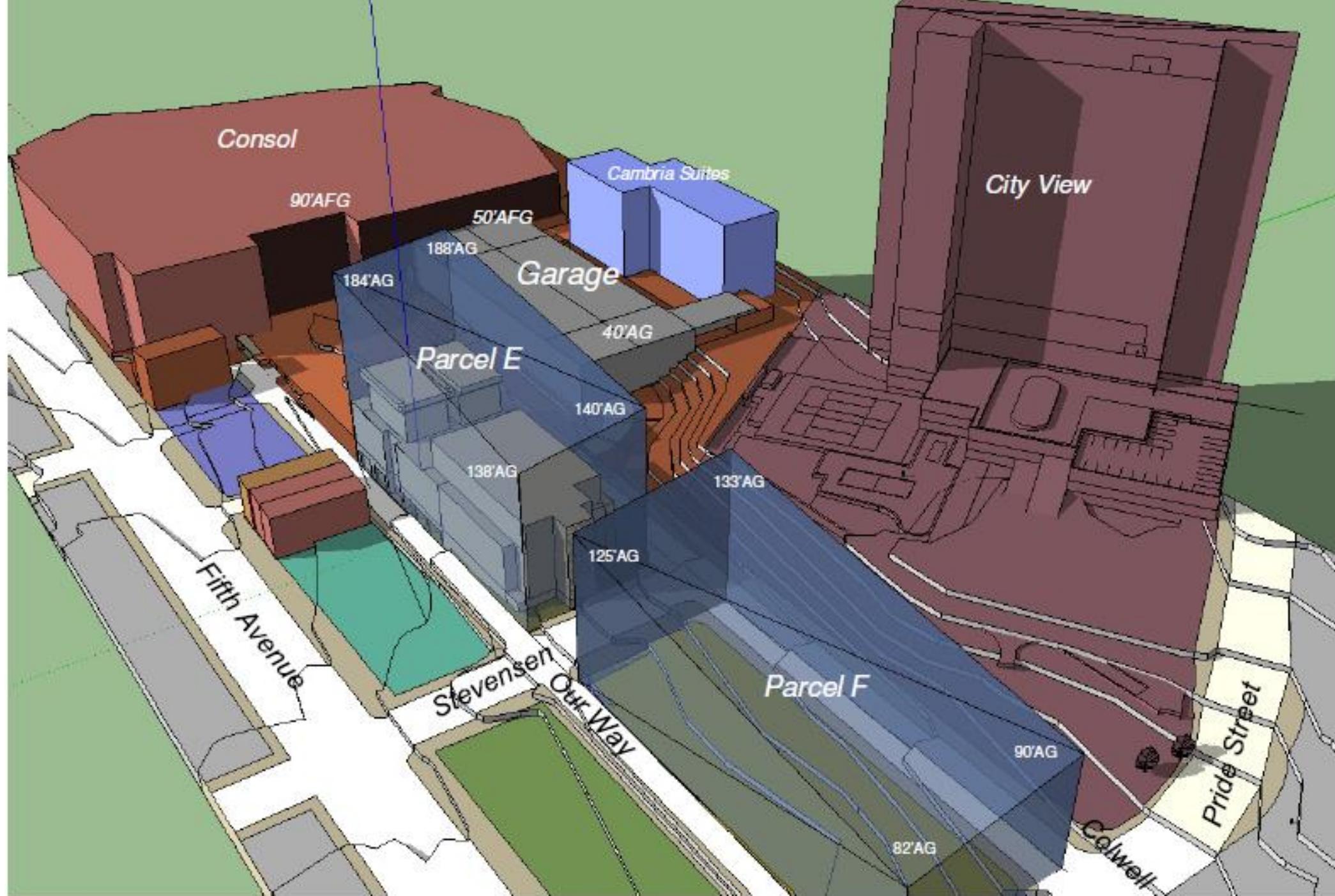
125'AG

40'AG

Our Way

Fifth Avenue

Stevensen







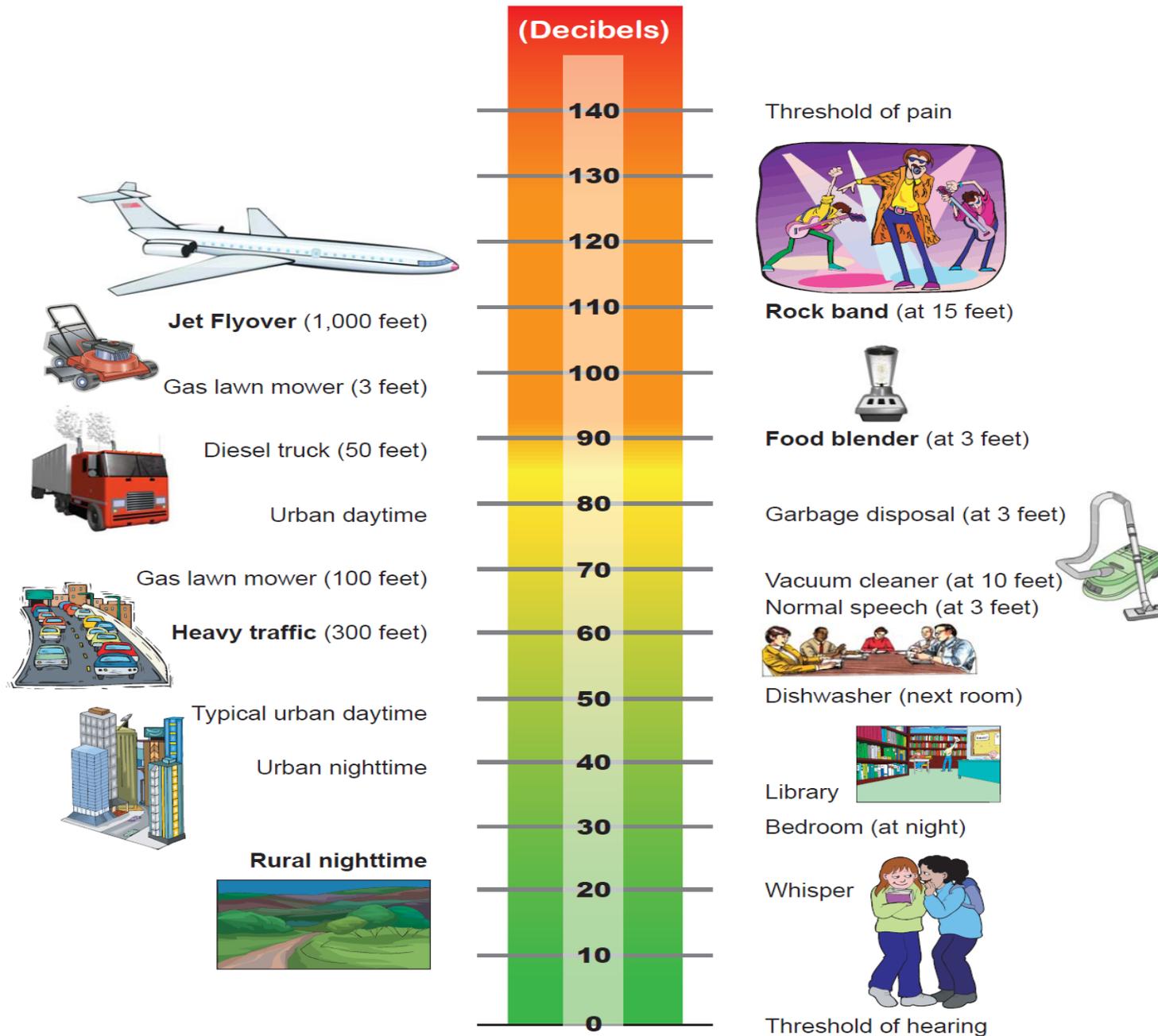
# Typical Ambient Sound Pressure Levels

Outdoor Sound Pressure (dB)									
Conditions		<u>Octave Band</u> Center Frequency (Hz)							
		63	125	250	500	1000	2000	4000	8000
Night-time	Rural, no nearby traffic of concern	42	37	32	27	22	18	14	12
	Suburban, no nearby traffic of concern	47	42	37	32	27	23	19	17
	Urban, no nearby traffic of concern	52	47	42	37	32	28	24	22
	Business or commercial area	57	52	47	42	37	33	29	27
Daytime	Business or commercial area	62	57	52	47	42	38	34	32
	Industrial or manufacturing area	67	62	57	52	47	43	39	37
	Within 300 ft (91 m) of continuous heavy traffic	72	67	62	57	52	48	44	42

## Common Outdoor Noises

## Sound Level (Decibels)

## Common Indoor Noises



# Duquesne Univ Cooling Towers



**CCS-1524 DUQUESNE UNIVERSITY**  
**PREDICTED SOUND DATA @ 50' From Tower and 5' Above Basin Curb**

Date:	3/3/2014
CCS Model:	5FT-2133-100-P7
Motor HP:	100
Fan Dia.:	16
Fan RPM:	233.3
Distance, ft.:	50
Q/A, gpm/ft^2	8.27
Inlet ht., ft	10

# Cells/Tower	4
# Cells/Oper.	4
Total GPM	22920
GPM/Cell	5730
HWT	98.3
CWT	85
WBT	75

<b>16H-8</b>	
Options	

Motor SPL (dBA)  
 @ 3ft = **80**

	Side A	Side B	Side C	Side D
Barrier Wall:	No	No	No	No
Distance to Wall, ft.:	0.0	0.0	0.0	0.0
Height of Wall, ft.:	0.0	0.0	0.0	0.0
Measure above Grade, ft:	5.0	5.0	5.0	5.0
Blockage:	100%	100%	100%	100%

**SPL @ 50' from Open wall- A**

Hz	Mechanical Sound	Water & Air Sound	Total SPL
63	80	61	80
125	68	67	70
250	61	63	65
500	58	63	64
1k	60	62	64
2k	55	60	61
4k	50	62	62
8k	41	59	59
dBA	64	68	69

**SPL @ 50' from Closed wall- B**

Hz	Mechanical Sound	Water & Air Sound	Total SPL
63	77	52	77
125	64	57	65
250	56	53	58
500	53	53	56
1k	54	52	56
2k	49	49	52
4k	44	50	51
8k	33	47	47
dBA	59	57	61

**SPL @ 50' from Open wall- C**

Hz	Mechanical Sound	Water & Air Sound	Total SPL
63	80	61	80
125	68	67	70
250	61	63	65
500	58	63	64
1k	60	62	64
2k	55	60	61
4k	50	62	62
8k	41	59	59
dBA	64	68	69

**SPL @ 50' from Closed wall- D**

Hz	Mechanical Sound	Water & Air Sound	Total SPL
63	77	52	77
125	64	57	65
250	56	53	58
500	53	53	56
1k	54	52	56
2k	49	49	52
4k	44	50	51
8k	33	47	47
dBA	59	57	61

**SPL @ 50' Overhead**

Hz	Mechanical Sound	Water & Air Sound	Total SPL
63	84	60	84
125	80	55	80
250	74	55	74
500	70	58	71
1k	69	57	70
2k	64	55	64
4k	57	56	60
8k	50	52	54
dBA	74	62	74

**Total Tower PWL**

Hz	Mech PWL	Water & Air PWL	Total PWL
63	122	99	122
125	114	104	115
250	109	100	109
500	105	101	106
1k	104	100	106
2k	99	97	101
4k	93	99	100
8k	85	96	97
dBA	109	106	111

# Prevention is critical to avoid the amplification of Legionella in cooling towers....

- Easier in new construction:
  - Continuous chlorination to insure chlorine levels are always present
  - Filtration and basin sweeping systems to minimize debris and dirt build up, and stagnant conditions
  - Use the best “drift eliminators” to reduce potential for aerosols escaping with the evaporation
    - Also prevents dusting of cars/windows and other structures with water droplets. When the water droplets evaporate they form white deposits due to the minerals in the water.
  - **All of these technologies are being incorporated into the new design.**

# NRG supports ASHRAE 188 - 2015

- The new NRG facility will be fully compliant and have an ASHRAE 188 – 2015 program that will entail
  - On-going validation of all systems that are designed to prevent scale, manage corrosion or minimize microbiological activity.
  - Testing for Legionella on a quarterly basis
  - Feedback and verification that systems are functioning properly
- The ASHRAE 188 – 2015 program is roughly based off of the HACCP (Hazard Analysis and Critical Control Point) program used in the food production industry
  - Feed back based program for continuous improvement.

General Description	1	Factory Mutual Approved Construction	No		17
		Number of Towers	1		18
	3	Total Number of Cells	4		19
	3	Comments	Cooling Tower designed for future expansion to the North. Cells CT-2 through CT-5 provided. Cell CT-1 is for future expansion. FRP to be Standard Bedford Color: Beige CT		20
Tower Description		Number of Cells	4		21
	1 3	Model Number	4FT-2133-100-P7		22
		Tower Configuration	In-line		23
		Comments			24
Performance - Guaranteed	3	Water Flow, Tower Total	22920 gpm	(5202.84 m <sup>3</sup> /hr)	25
		Water Flow, per Cell	5730 gpm	(1300.71 m <sup>3</sup> /hr)	26
	1	Hot (Inlet) Water Temperature	98.3 °F	(36.8 °C)	27
		Cold (Outlet) Water Temperature	85.0 °F	(29.4 °C)	28
		Design Inlet Wet Bulb Temperature	75.0 °F	(23.9 °C)	29
	1	Design Horsepower	100 hp	(75 kw)	30
		Drift Loss, per Cell	0.03 gpm	(0.01 m <sup>3</sup> /hr)	31
	1 1	Guaranteed Drift Rate	0.0005%	(% of flow)	32
		Evaporation Loss, per Cell	69.1 gpm	(15.69 m <sup>3</sup> /hr)	33
		Water Loading (Q/A)	8.3 gpm/ft <sup>2</sup>	(20.21 m <sup>3</sup> /hr/m <sup>2</sup> )	34
	Pump Head from C/L of Inlet Connection	28.00 ft	(83.7 kPa)	35	
	Comments			36	
Structural Design Conditions		Design Code	per ASCE 7-05		37
		Design Wind Load	90 mph	(145 km/h)	38
		Exposure	C		39
		Design Seismic Load	per ASCE 7-05		40
		Comments	S <sub>1</sub> = 0.049, S <sub>S</sub> = 0.125, S <sub>d5</sub> = 0.125		41
Elevation		Top of Air Inlet - Above Basin Curb (Air Inlet Height)	10.00 ft	(3048 mm)	42
		Top of Fill - Above Top of Fill Support (Fill Height)	7.00 ft	(2134 mm)	43
		Top of Plenum - Above Top of DEs (Plenum Height)	8.50 ft	(2591 mm)	44

# NRG will use MIOX – mixed oxidant generator

- This device uses salt (NaCl) and electricity to generate a mixed oxidant solution - a combination of sodium hypochlorite bleach and peroxides
  - Allows us to make as much as we need in the system
  - Reduces the amount of chemical necessary on-site
    - Is much safer to handle and store versus bleach.
  - Better efficacy than bleach



# NRG is fully committed to implementing the new ASHRAE 188 – 2015 standard

- Prior to the ASHRAE 188 – 2015 standard - NRG had taken a proactive stance and tested cooling towers for Legionella in the Thermal Energy Division for over 10 years.
  - NRG actively manages their chemical program by
    - Continuous feed of oxidizing biocide
    - Cleaning/Sanitizing of cooling tower basins
    - Filters/basin sweepers where applicable
    - Legionella counts are routinely non-detectable.



# INDUSTRIAL WATERTUBE BOILERS

Innovative solutions for maximum efficiency

**Cleaver-Brooks Engineered Boiler Systems**  
Manufacturers of Nebraska Boilers, NATCOM  
Burners and ERI HRSG Systems

## FEATURES

- Multi-fuels applications including natural gas, refinery gas, landfill gas (LFG) and other processed waste gases, light to heavy fuel oils, and liquid waste streams
- On-line adjustability and possible removal of individual gas injectors
- No refractory burner throat
- Unmatched flame stability with Center-Core technology
- NO<sub>x</sub> levels available to <7ppm with FGR and <30ppm without FGR
- Ultra-low excess air for high efficiency
- High turndown ratio of 40:1 on gas and 10:1 on oil

# Sustainability

- District Energy is more efficient than comparable standalone systems
  - Energy efficient operations taking advantage of 24/7 load diversities
  - Continuously supervised operations
  - Reduced electrical, gas, water usage
  - Reduced emissions at plant and at utility sources (**District Energy emissions reductions**)
  - Centralized O & M, reduced vehicular energy usage
  - Longer lived systems (30 – 50 years)
  - Energy recovery and high efficiency systems
  - LEED Building Certification

# DISTRICT ENERGY IN CITIES

Unlocking the Potential of Energy Efficiency  
and Renewable Energy

UNEP in collaboration with



# District Energy – Climate Change

The development of modern (i.e., energy-efficient and climate-resilient) and affordable district energy systems in cities is one of the least-cost and most-efficient solutions for reducing greenhouse gas emissions and primary energy demand. A transition to such systems, combined with energy efficiency measures, could contribute as much as 58 per cent of the carbon dioxide (CO<sub>2</sub>) emission reductions required in the energy sector by 2050 to keep global temperature rise to within 2–3 degrees Celsius.

# User Benefits

- District Energy is more efficient than comparable standalone systems
  - Energy efficient heating/cooling services
  - Reduced equipment requirements and replacement costs
  - Reduced mechanical/electrical space requirements, shafts, etc.
  - Reduced emissions
  - Reduced O & M, vehicular energy usage
  - Reduced heating/cooling costs, as more District Energy users added to system

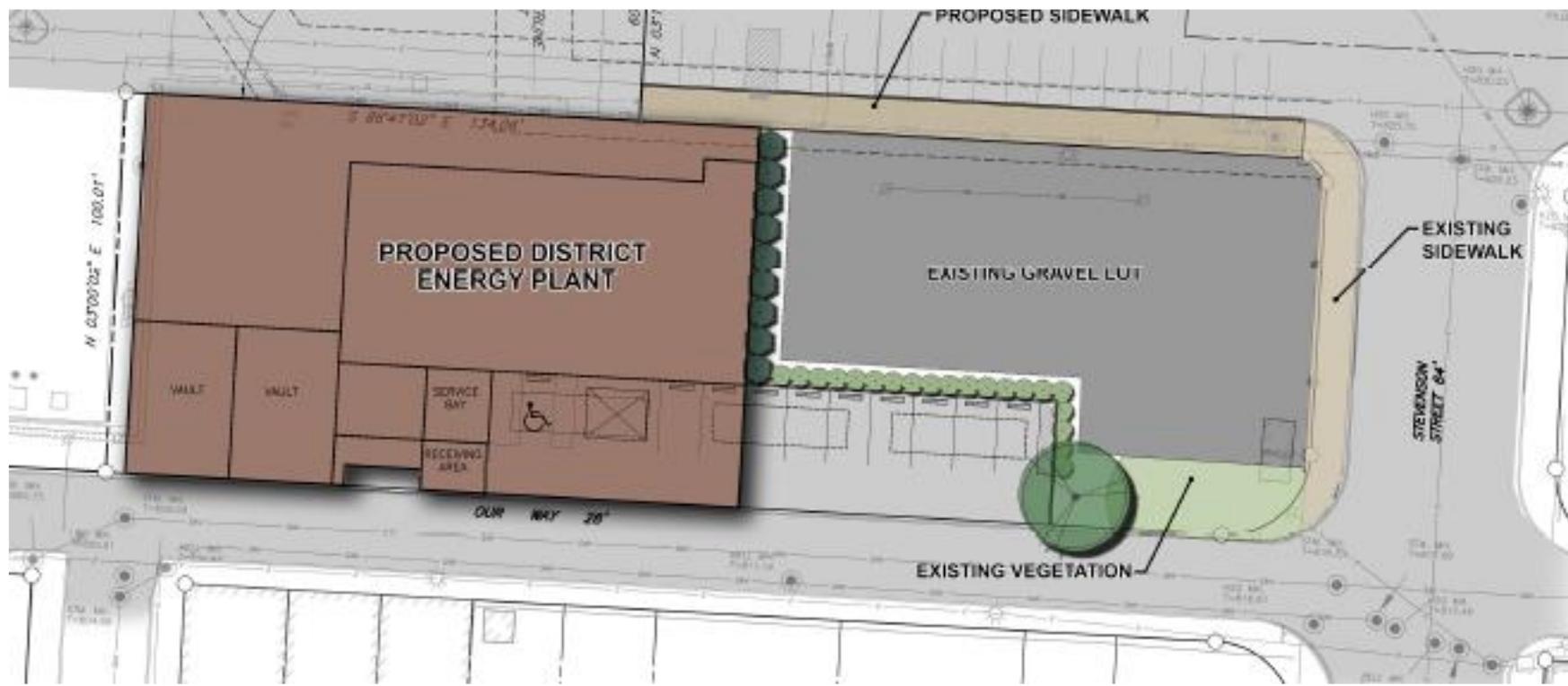
# District Energy Center Opportunities



## Showcase for Pittsburgh

- Grid Modernization
- Resiliency
- Climate Change
- Training
- Workforce  
Development

- **Combined Heat & Power/Micro Grid**
  - **Fuel Cells**
  - **Turbine**
- **Smart Grid**
- **2-5 MW Battery Energy Storage**
- **Thermal Energy Storage (Chilled Water)**
- **Solar PV**
- **Waste Water Heat Recovery**
- **Electric Vehicle Charging Stations**



# Community

- Penguins Energy Advisory Panel – CMU, GBA, Sustainable Pittsburgh
- District Energy meetings with Penguins, CMU, Chatham Center, UPMC, Duquesne University, SEA, URA, City of Pittsburgh, Energy Innovation Center
- Uptown Partnership – September 2015, June 2016
- EcoInnovation District – Mondre Energy – Jan 2016, Jun 2016
- EcoInnovation District – Neighborhood Open House Feb 2016
- MBE/WBE participation in project
- Future workforce development
- University, school, neighborhood tours
  
- Landscaping
  
- Stormwater Management, Erosion & Sedimentation Control
  
- Construction practices