

**REDEVELOPMENT &  
REHABILITATION FOR  
CLIMATE RESILIENCY**

**10/15/15**

**The Chazen Companies**  
Kelsey Carr: LEED AP BD+C, GPRO CM, Project Engineer  
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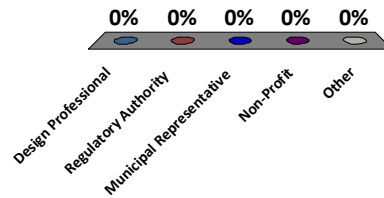
**THE  
Chazen  
COMPANIES**  
Proud to be Employee Owned  
Engineers  
Land Surveyors  
Planners  
Environmental Professionals  
Landscape Architects

## PRESENTATION OUTLINE

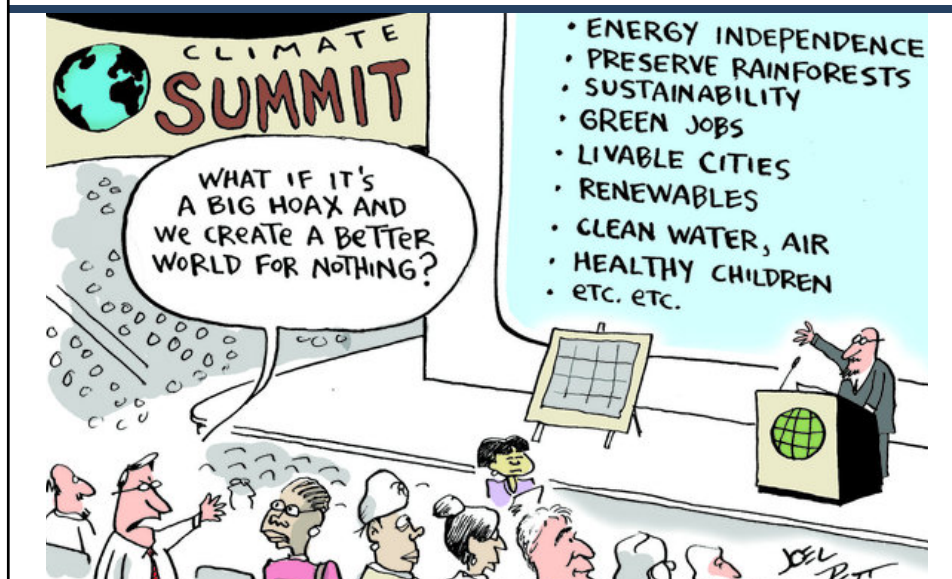
- Climate Change Considerations
- Who Cares?
- Designing/Planning for Climate Resiliency
- Case Studies
- Audience Participation – What Challenges Have You Faced?
- Q&A – Live Voting/Results

## WHO ARE YOU?

- A. Design Professional
- B. Regulatory Authority
- C. Municipal Representative
- D. Non-Profit
- E. Other



## CLIMATE CHANGE



## CLIMATE CHANGE VS. WEATHER

### Climate Change

A change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties and that persists for an extended period of time, typically decades or longer

### Weather

The state of the air and atmosphere at a particular time and place with respect to heat or cold, wetness or dryness, calm or storm, clearness or cloudiness

## GLOBAL RESEARCH ON CLIMATE CHANGE

Intergovernmental Panel on Climate Change (IPCC)

1990

1995

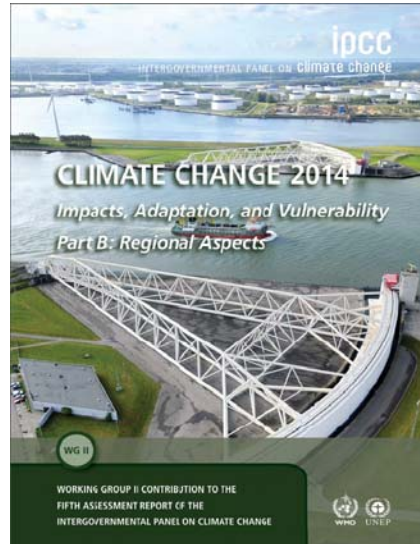
2001

2007

2013

IPCC consists of **thousands of scientists** who review and assess scientific, technical, and socio-economic information produced worldwide relevant to climate change

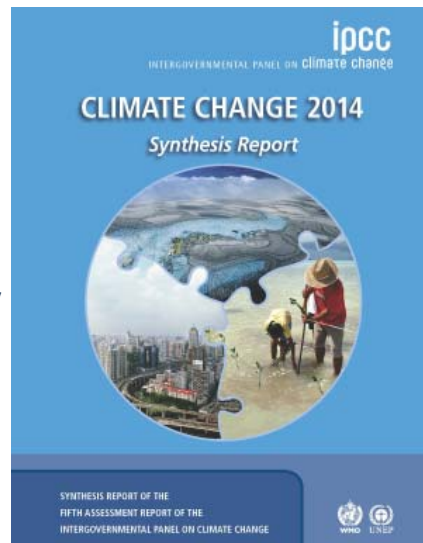
## GLOBAL RESEARCH ON CLIMATE CHANGE



## GLOBAL RESEARCH ON CLIMATE CHANGE

### What are the Conclusions?

- **95% certain** that humans are leading cause of current global warming
- Greenhouse gas emissions are **extremely likely** to have been dominant cause of observed warming since the mid-20<sup>th</sup> century
- **Documented increase** in the rate of Climate Change since pre-industrial era (pre-1760)
- Climate change impacts **already occurring** and future impacts are inevitable





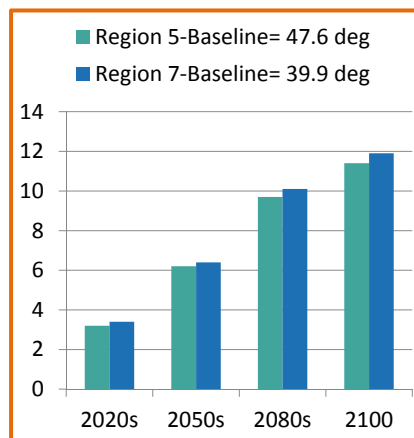
## REGIONAL RESEARCH ON CLIMATE CHANGE



## NYS TEMPERATURE CONSIDERATIONS

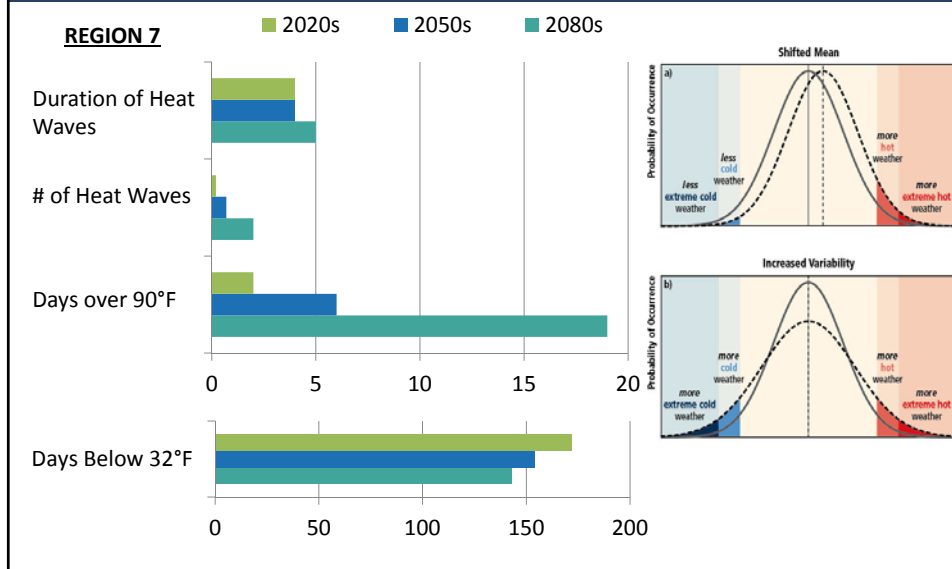
- Average temperatures have **increased** by approx. **0.6°F per decade** since **1970**, with winter warming exceeding **1.1°F per decade**
- 1983–2012 was **likely** the warmest 30-yr period in 1400 years
- Last **three decades** each **successively warmer** than **any** preceding decade since **1850**
- Projected Average Annual Increase:
  - 2.0-3.4°F by 2020s
  - 4.1-6.8°F by 2050s
  - 5.3-10.1°F by 2080s

Projected Temperature Increase (In)



\*compared to baseline data 1971-2000

## NYS TEMPERATURE EXTREMES



## WHO CARES?

- More frequent and hotter heat waves; heat waves are silent killers; ozone days
- Stressed electric grid for A/C
- Material failures
- Ag zones move north. Dairy. Maple syrup.
- Hot (energy) oceans spawn storms
- Less winter snow pack – more rapid runoff (12 percent less snow cover in June over last 30 yrs)

## ECOLOGICAL CONSIDERATIONS

- Increased CO<sub>2</sub> means:
  - Plants become less nutritious – insects and animals eat more
  - Ocean acidifies – harming coral & fisheries
  - More poisonous poison ivy
- Hardiness zones move North
- Southern flora and fauna species move North
- Precipitation/temperature changes = more insects

## WHO CARES?

- Mosquitoes: disease
- Nutria: eats wetlands leaving mudflats
- Cockroaches? Argh!
- Reduced winter freeze – increased pest population
- New weeds & diseases for agriculture
- Extended pollen allergy seasons
- North can grow southern plants & animals. What invasive species will come?

## SEA LEVEL CONSIDERATIONS

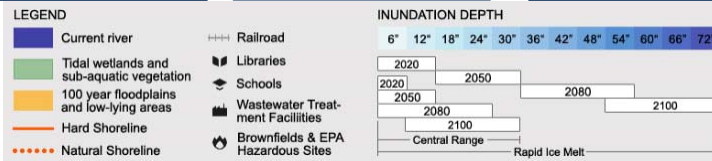
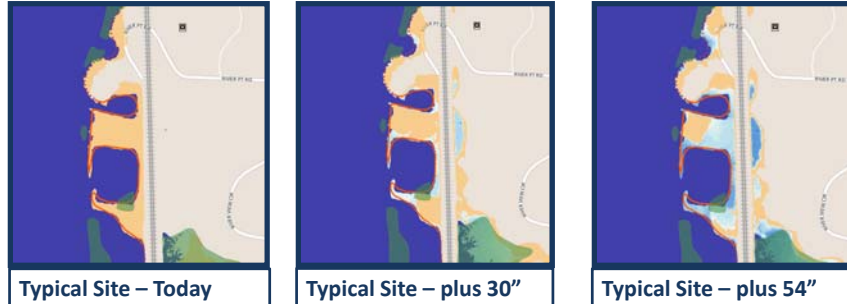
- Sea level along NY's coastline has **already risen** by approximately 1-ft since 1900
- Sea level rise projections:
  - 1 to 5 inches by 2020s
  - 5 to 12 inches by 2050s
  - 8 to 23 inches by 2080s
- PLUS: Risk of a rapid ice melt scenario, Sea level could rise 37 to 55 inches by 2080s
- Coastal flooding – increase in intensity, frequency, and duration

## WHO CARES?

- Influences shoreline buildable land calculations
- Requires unique hardscape/softscape approaches
- Presents unique exposure and hardening challenges
- Needs wetland/ecological evaluations under present & future scenarios
- Access and drainage may change over time



## TOOLS FOR VISUALIZING SEA LEVEL RISE

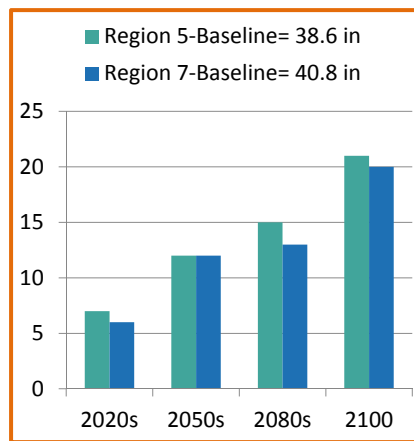


**Sea Level Rise Mapper**  
<http://www.scenichudson.org/slr/mapper#>

## NYS PRECIPITATION CONSIDERATIONS

- USA northeast, **only area** with predicted increases
- But potentially biased to Winter, less in Summer
  - So, more flooding in winter?
  - And droughts in summer?
- Projected Annual Increase:
  - 1-8% by 2020s
  - 3-12% by 2050s
  - 4-15% by 2080s
- Increase in the frequency, intensity, and duration of extreme precipitation events

**Projected Precipitation Increase (%)**



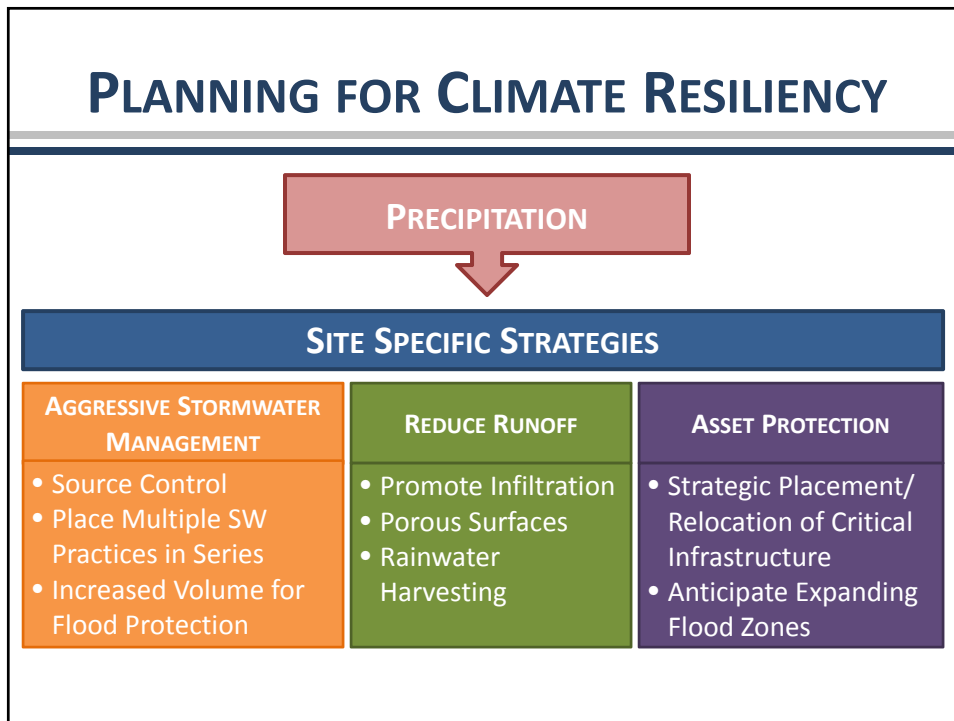
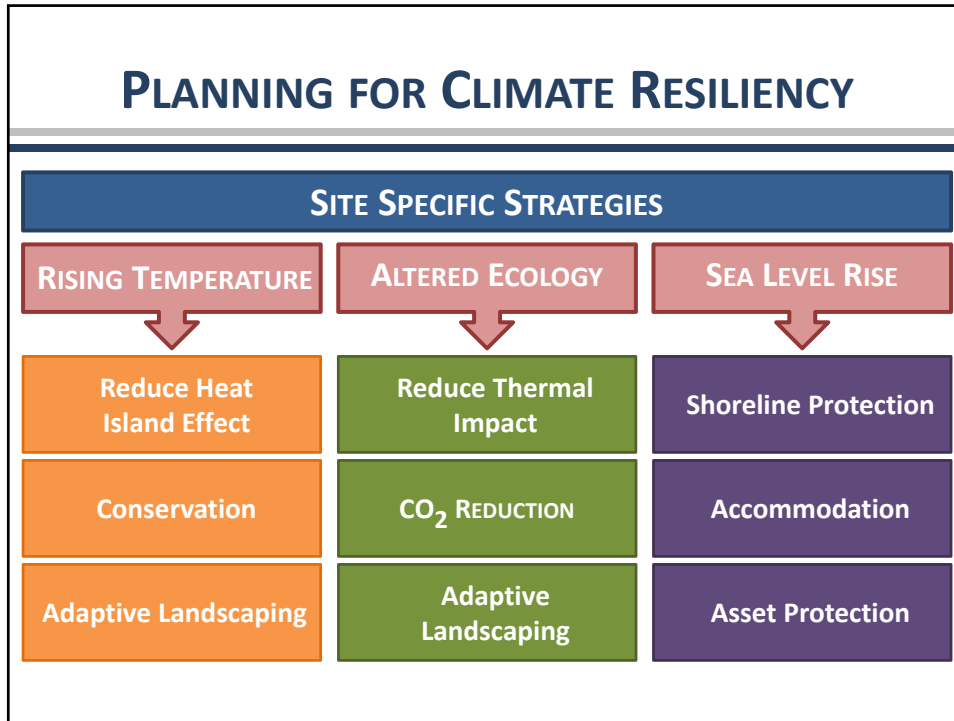
\*compared to baseline data 1971-2000

## CLIMATE OR WEATHER?



## WHO CARES?

- Winter rain – flooding rather than snow pack. Lost winter recreation \$
- General flooding: property damage
- Summer drought: water supplies and agriculture. Less summer aquifer recharge?
- Reservoir management dilemmas
- Summer fire risk



## HOW TO START?

- Urban Areas may be affected more dramatically
- Suburban and Rural Areas also affected
- Include resiliency in design now where possible
- Continue and expand efforts to separate Combined Sewers
- Continue to address I/I issues by replacement and/or rehabilitation

## CASE STUDIES

- Case Study No. 1 – Capital Root's – Troy, NY
- Case Study No. 2 – Tapestry on the Hudson – Troy, NY
- Case Study No. 3 – IDA Yarbrough Residential Housing Development – Albany, NY
- Case Study No. 4 – Dixon Road Culvert Rehabilitation Project – Queensbury, NY

*\*\*Common Theme – Resiliency*

**CASE STUDY No. 1: EXISTING SITE**

**CAPITAL ROOTS URBAN GROW CENTER – TROY, NY**



**CASE STUDY No. 1: CLIENT OBJECTIVES**

**CAPITAL ROOTS URBAN GROW CENTER – TROY, NY**



1. Renovate Existing Building
2. Demolish Existing Addition
3. Construct Building Addition
4. Remain consist with the Organization's Core Values: merging built and natural environment, public access, and education

## CASE STUDY NO. 1: DESIGN CONSIDERATIONS

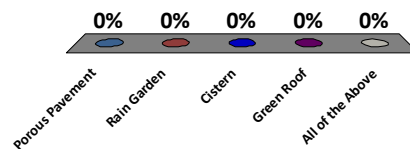
### CAPITAL ROOTS URBAN GROW CENTER – TROY, NY

- Stormwater currently discharges untreated/uncontrolled to the City of Troy combined sewer and Hudson River
- On-Site Soils: miscellaneous fill material imported over years of development
- Reduce Impervious Surfaces

## AUDIENCE ENGAGEMENT

What stormwater practices would you implement?

- Porous Pavement
- Rain Garden
- Cistern
- Green Roof
- All of the Above





**CASE STUDY No. 1: DESIGN DEVELOPMENT**

**CAPITAL ROOTS URBAN GROW CENTER – TROY, NY**



**CASE STUDY No. 1: DESIGN DEVELOPMENT**

**CAPITAL ROOTS URBAN GROW CENTER – TROY, NY**



**CASE STUDY No. 1: CONSTRUCTED SITE**  
**CAPITAL ROOTS URBAN GROW CENTER – TROY, NY**



**CASE STUDY No. 1: RAINWATER HARVESTING**  
**CAPITAL ROOTS URBAN GROW CENTER – TROY, NY**





**CASE STUDY NO. 1: GREEN ROOF**

**CAPITAL ROOTS URBAN GROW CENTER – TROY, NY**



**CASE STUDY NO. 1: GREEN ROOF**

**CAPITAL ROOTS URBAN GROW CENTER – TROY, NY**



**CASE STUDY NO. 1: POROUS PAVEMENT**

**CAPITAL ROOTS URBAN GROW CENTER – TROY, NY**



**CASE STUDY NO. 1: RAIN GARDEN**

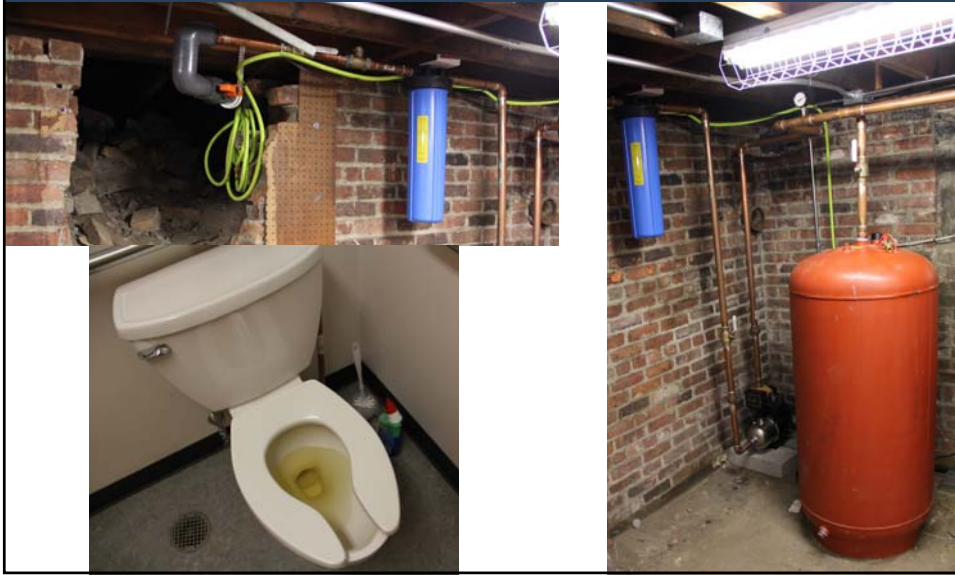
**CAPITAL ROOTS URBAN GROW CENTER – TROY, NY**





**CASE STUDY NO. 1: LESSONS LEARNED**

**CAPITAL ROOTS URBAN GROW CENTER – TROY, NY**



**CASE STUDY NO. 1: LESSONS LEARNED**

**CAPITAL ROOTS URBAN GROW CENTER – TROY, NY**



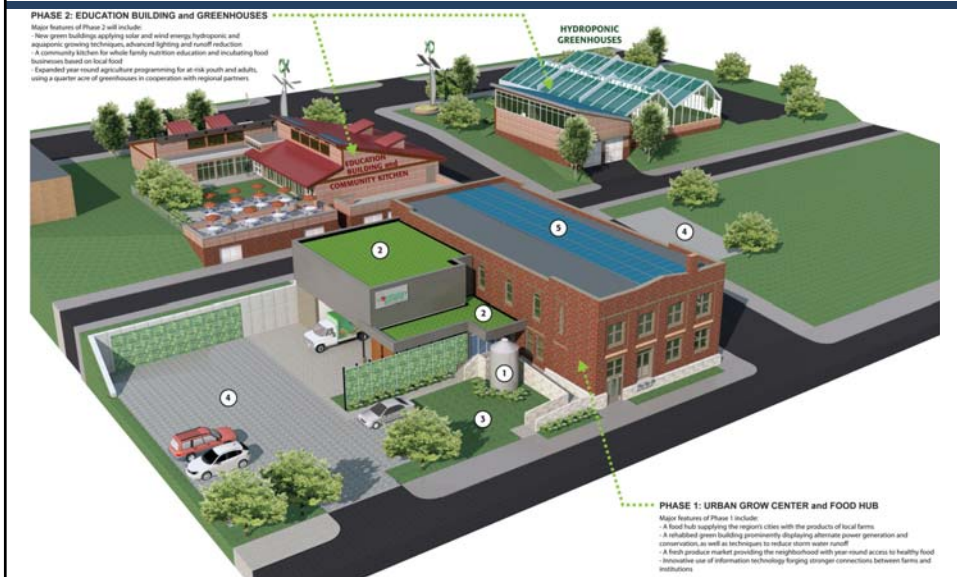
**CASE STUDY No. 1: LESSONS LEARNED**

**CAPITAL ROOTS URBAN GROW CENTER – TROY, NY**



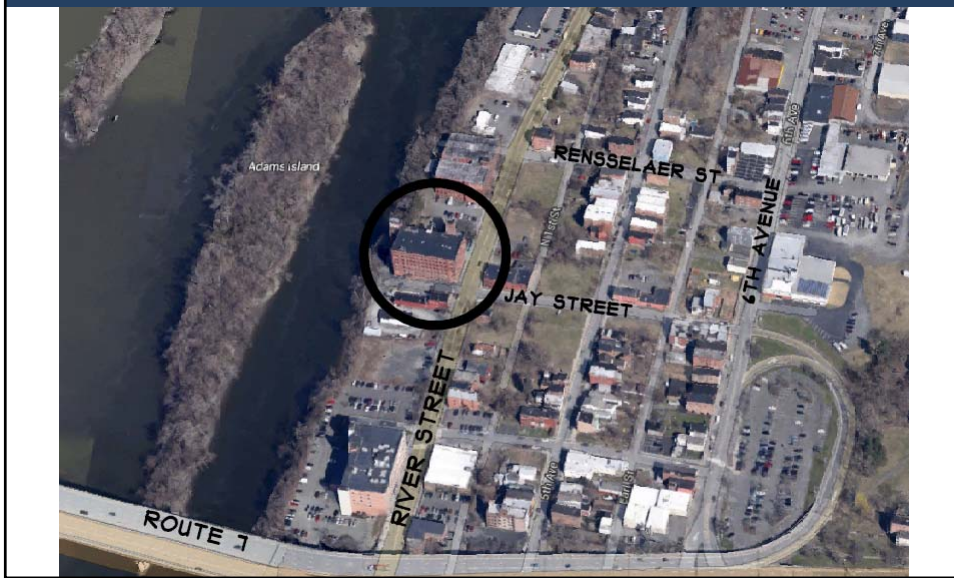
**CASE STUDY No. 1: FUTURE PLANS**

**CAPITAL ROOTS URBAN GROW CENTER – TROY, NY**





**CASE STUDY NO. 2: PROJECT LOCATION**  
**TAPESTRY ON THE HUDSON – TROY, NY**



**CASE STUDY NO. 2: PROJECT LOCATION**  
**TAPESTRY ON THE HUDSON – TROY, NY**



*Mission: To enhance the functionality and aesthetics of the area with implementation of a variety of green infrastructure practices to promote environmental awareness and improve water quality.*

**CASE STUDY NO. 2: PROPOSED CONDITION**  
**TAPESTRY ON THE HUDSON – TROY, NY**

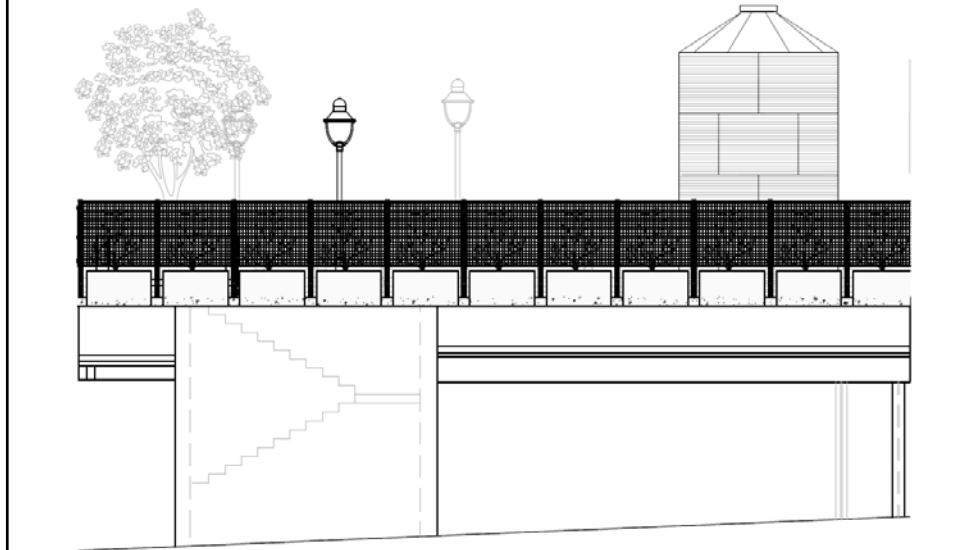


**CASE STUDY NO. 2: THE NUMBERS**  
**TAPESTRY ON THE HUDSON – TROY, NY**

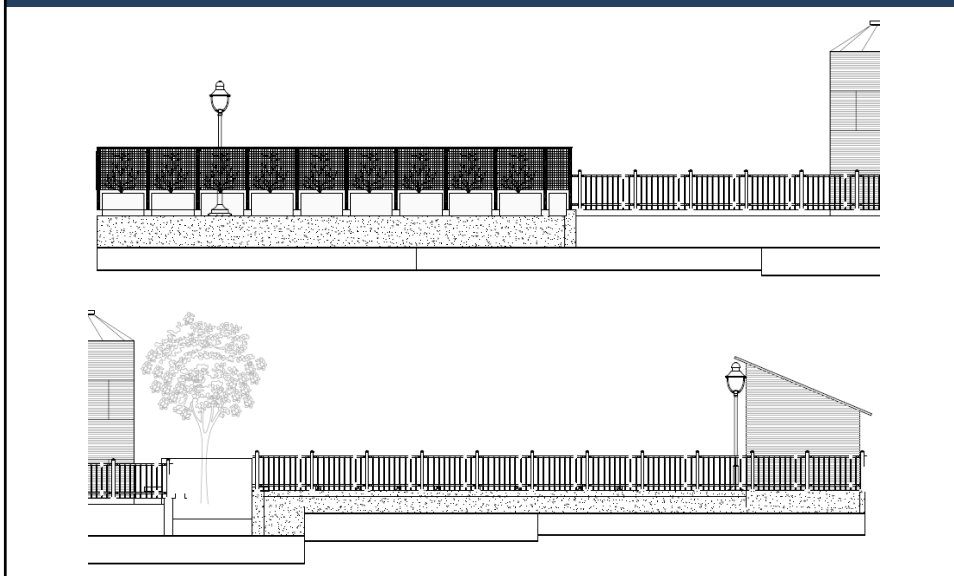
- Existing Condition – 97% Impervious
- Proposed Condition – 20% Less Impervious surface (46% if pavement did not drain to PA)
  - Community Planter Beds
  - Tree Boxes
  - Permeable Pavers
  - Lawn Areas
  - Playground Area
  - Shrub Area
  - Cistern
  - Planters/Landscaping/Bioretenion
  - Green Roof (On Existing Building)

**CASE STUDY NO. 2: THE NUMBERS****TAPESTRY ON THE HUDSON – TROY, NY**

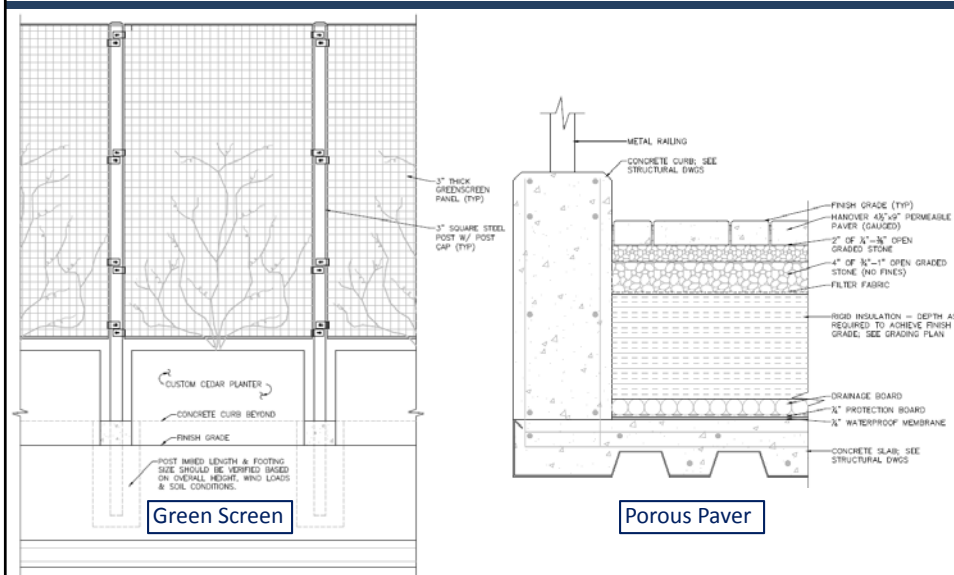
- Sky Garden
  - Rainwater Cistern – 5,100-gallons = 681-CF
  - Lawn Area/Community Garden/Landscaping – 237-CF
  - Permeable Pavers – 172-CF
- Other Green Infrastructure Practices
  - Porous Asphalt System – 6,641-SF = 2,656-CF
  - Permeable Pavers – 90-CF
- Results
  - Existing Condition WQv=2,790-CF
  - Proposed Condition WQv=2,270-CF (net reduction 520-CF)
  - RRv=3,355-CF

**CASE STUDY NO. 2: SKY GARDEN - SOUTH ELEVATION****TAPESTRY ON THE HUDSON – TROY, NY**

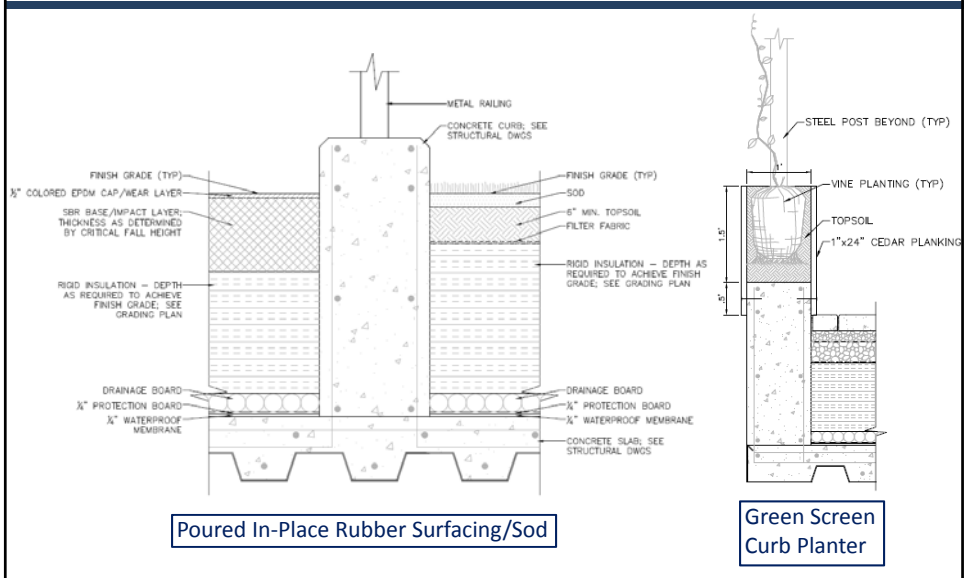
**CASE STUDY No. 2: SKY GARDEN - WEST ELEVATION**  
**TAPESTRY ON THE HUDSON – TROY, NY**



**CASE STUDY No. 2: SKY GARDEN - DETAILS**  
**TAPESTRY ON THE HUDSON – TROY, NY**



**CASE STUDY No. 2: SKY GARDEN - DETAILS**  
**TAPESTRY ON THE HUDSON – TROY, NY**



**CASE STUDY No. 3: PROJECT LOCATION**  
**IDA YARBROUGH RESIDENTIAL – ALBANY, NY**





**CASE STUDY NO. 3: EXISTING CONDITION**  
**IDA YARBROUGH RESIDENTIAL – ALBANY, NY**



**CASE STUDY NO. 3: DESIGN CRITERIA**  
**IDA YARBROUGH RESIDENTIAL – ALBANY, NY**





**CASE STUDY NO. 3: DESIGN CRITERIA**

**IDA YARBROUGH RESIDENTIAL – ALBANY, NY**



**CASE STUDY NO 4: EXISTING CULVERT**

**DIXON ROAD CULVERT REHABILITATION – QUEENSBURY, NY**

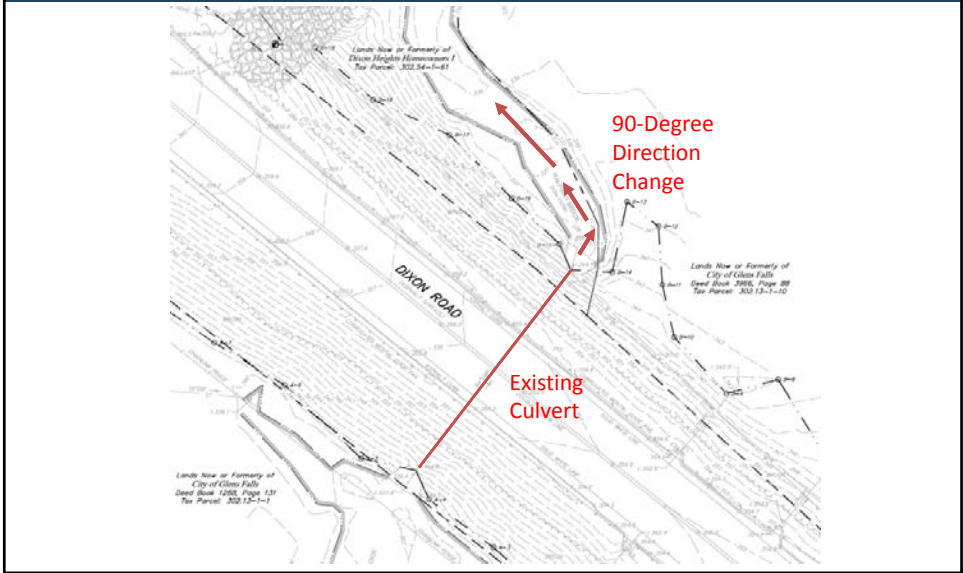


**CASE STUDY NO 4: DESIGN CRITERIA****DIXON ROAD CULVERT REHABILITATION – QUEENSBURY, NY****UNIQUE DESIGN CRITERIA**

- Significant Joint Separation
- Class AA(T) Stream
- Road Crown 17-Feet over Pipe Invert
- Heavily Traveled Corridor
- Significant Change in Direction in Stream
- Bound by Halfway Brook Dam and I-87
- Sensitive to Halfway Brook Dam EAP

**CASE STUDY NO 4: PROJECT LOCATION****DIXON ROAD CULVERT REHABILITATION – QUEENSBURY, NY**

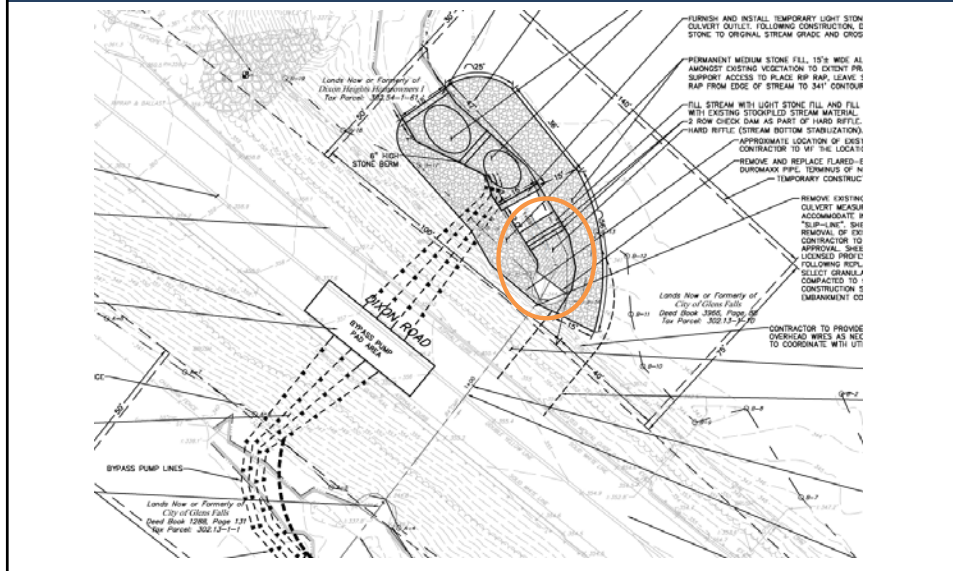
**CASE STUDY NO 4: EXISTING CONDITIONS**  
**DIXON ROAD CULVERT REHABILITATION – QUEENSBURY, NY**



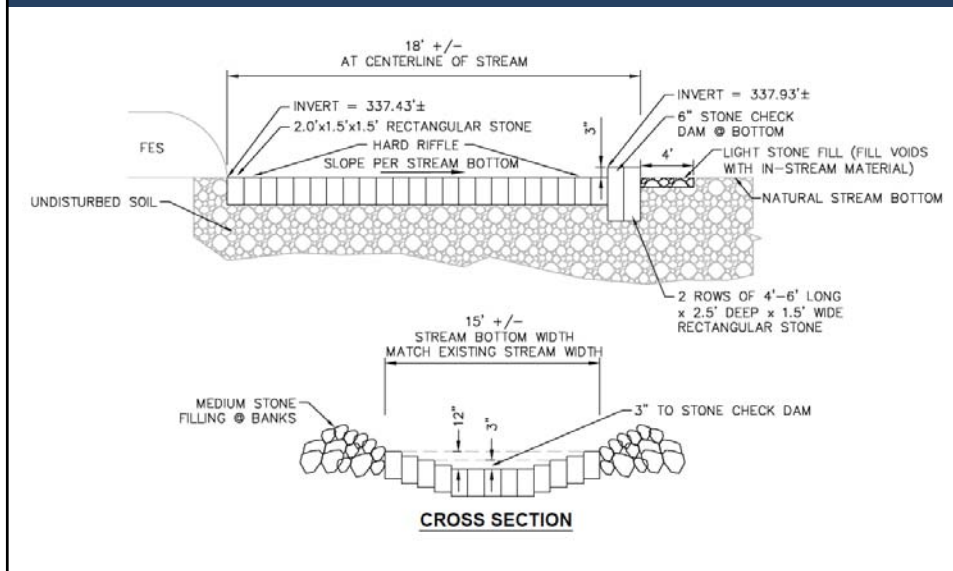
**CASE STUDY NO 4: EXISTING CONDITIONS**  
**DIXON ROAD CULVERT REHABILITATION – QUEENSBURY, NY**



## CASE STUDY NO 4: DESIGN FOR REHABILITATION DIXON ROAD CULVERT REHABILITATION – QUEENSBURY, NY



## CASE STUDY NO 4: DESIGN FOR REHABILITATION DIXON ROAD CULVERT REHABILITATION – QUEENSBURY, NY





**CASE STUDY NO 4: CONSTRUCTION**

**DIXON ROAD CULVERT REHABILITATION – QUEENSBURY, NY**



**CASE STUDY NO 4: CONSTRUCTION**

**DIXON ROAD CULVERT REHABILITATION – QUEENSBURY, NY**



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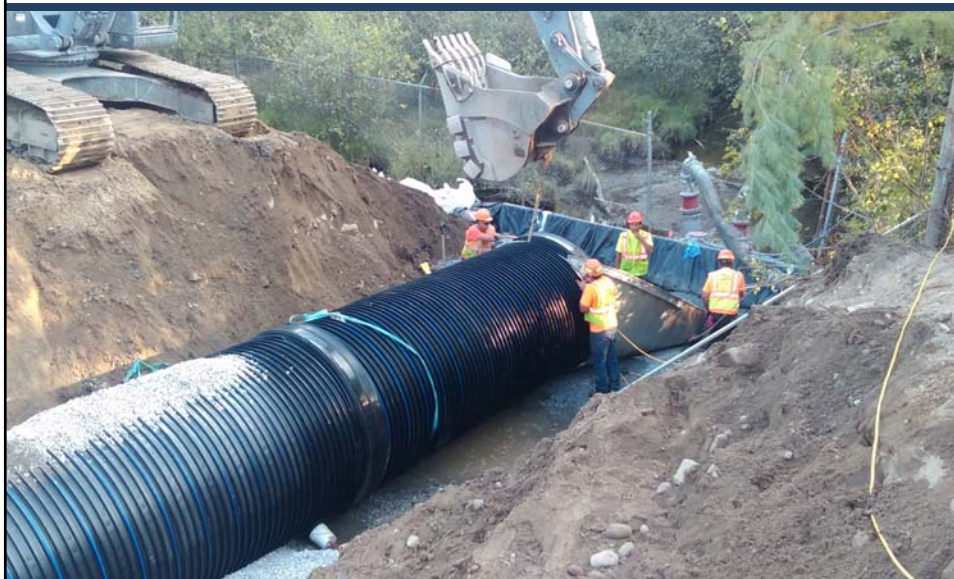
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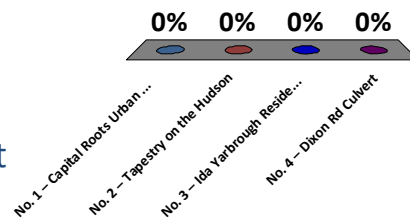
## CASE STUDY NO 4: PROJECT RESILIENCY DIXON ROAD CULVERT REHABILITATION – QUEENSBURY, NY

- Steel Reinforced Pipe - 100-year life span, 70-year Warranty
- Hard Riffle Scour Protection, Trout Movement
- Stream and Road Bank Stabilization
- Slope Protection
- Culvert Designed to Convey 150-year Storm

## AUDIENCE ENGAGEMENT

What is your favorite Case Study?

- No. 1 – Capital Roots Urban Grow Center
- No. 2 – Tapestry on the Hudson
- No. 3 – Ida Yarbrough Residential
- No. 4 – Dixon Rd Culvert



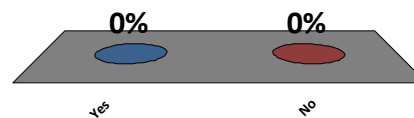
## AUDIENCE ENGAGEMENT



## AUDIENCE ENGAGEMENT

Do you believe stormwater management design and regulation are headed in the right direction?

- A. Yes
- B. No



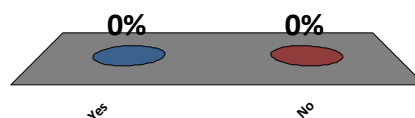
## AUDIENCE ENGAGEMENT: DESIGN PROFESSIONALS

1. What unique projects have you tackled?
2. What issues? Design constraints?
3. How were they resolved?

## AUDIENCE ENGAGEMENT

Do you believe that the benefits of Green Infrastructure outweigh the challenges?

- A. Yes
- B. No





## AUDIENCE ENGAGEMENT: MUNICIPAL FORCES

1. What unique projects have you tackled?
2. What issues? Design constraints?
3. How were they resolved?



**QUESTIONS?**

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Sean Doty: [sdoty@chazencompanies.com](mailto:sdoty@chazencompanies.com)

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*Chazen*  
COMPANIES  
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