

## REVISED

### Sustainability and Economic Vitality

Council Committee Meeting Agenda  
*Virtual and In-Person Meeting in City Council Chambers*  
31 East 5<sup>th</sup> Street, Tempe, AZ 85281  
December 12, 2022

2 p.m.

Members of the City Council will attend in person.

Ways to connect:

1. On your computer/tablet (*Recommended*)
  - a. Click this link <https://www.tempe.gov/SEV> or copy and paste into your browser
  - b. Click "Join the Virtual Meeting"
  - c. Enter "SEV" in the prompt "enter the meeting password"
2. On your phone – Dial in +1 408-418-9388; access code: 2481 279 2588

Register to speak during Public Comments agenda item:

At least 1 hour prior to the start of the meeting you must submit a public comment card by clicking this [link](#).

For further accommodations or information please contact, Nikki Amberg at (602) 885-7482 or email [Nikki\\_Amberg@tempe.gov](mailto:Nikki_Amberg@tempe.gov) or Tonya Gray at (480) 431-6096 or email [Tonya\\_Gray@tempe.gov](mailto:Tonya_Gray@tempe.gov).

***Members of the public may attend the meeting in person or virtually through Cisco Webex Events or view the meeting recording by visiting [www.tempe.gov/SEV](http://www.tempe.gov/SEV) for more information.***

**1. CALL TO ORDER/ ROLL CALL**

**2. REVIEW MEETING MINUTES**

A. November 7, 2022

- 3. PUBLIC COMMENTS** - The committee welcomes public comment. According to the Arizona Open Meeting Law, the Committee may only discuss matters listed on the agenda. Matters brought up by the public under public appearances that are not listed on the agenda cannot be discussed by the Committee. A 3-minute limit per person will be in effect.

A. Comment Cards Submitted

**4. COMMITTEE SESSION ITEMS**

A. Current Items and Updates

1. Sustainability and Economic Vitality FY23 Work Plan
2. Streetcar Project and Fare Update
3. Cool Pavement
  - Presentation from City of Tempe Engineering and Transportation Department
  - Presentation from Jennifer Vanos, Associate Professor, School of Sustainability, Arizona State University
  - Discussion available with Davis Koleas, Sustainability Director, CoolSeal by GuardTop.

B. New Items for Consideration

1. Presentation Proposals for Future Council Committee Meetings

C. Announcements

1. No new announcements

5. **NEXT MEETING DATE:** Wednesday, January 11, 2023  
3 p.m.

6. **ADJOURN**

## Sustainability and Economic Vitality

Council Committee Meeting Minutes  
*Virtual and In-Person Meeting in City Council Chambers*  
31 East 5<sup>th</sup> Street  
November 7th, 2022  
2:00 pm  
Members of the City Council will attend in-person

### 1. CALL TO ORDER/ ROLL CALL

*Meeting called to order by VM Adams at 2:04 pm with both members present.*

### 2. REVIEW MEETING MINUTES

- A. June 29, 2022 meeting of previously named Sustainable and Livable Communities minutes.  
*June 29, 2022 meeting minutes were approved unanimously.*

### 3. PUBLIC COMMENTS - The committee welcomes public comment. According to the Arizona Open Meeting Law, the Committee may only discuss matters listed on the agenda. Matters brought up by the public under public appearances that are not listed on the agenda cannot be discussed by the Committee. A 3-minute limit per person will be in effect.

#### A. Comment Cards Submitted

*David Sokolowski submitted a card on 11/7/22 and joined via Webex to read:*

*The city of Tempe has performance measure 4.11 to achieve a 25% city wide tree coverage by 2040. we need to plant trees so that they can sequester carbon over several decades to mitigate climate change and improve our air quality. we need trees to promote biodiversity and maintain a healthy eco system. we're not just planting trees for the sake of shading ourselves but also to provide natural habitat for birds. most artificial materials absorb a lot of heat and that heat is released through the urban heat island effect. Trees naturally cool our environment through transpiration, they're able to absorb heat without releasing it. Sometimes artificial shade is appropriate, like at bus stops but artificial shade will always be inferior to tree coverage. For example, trees can reduce noise pollution and can also improve our mental health. We all know that we're experiencing an extreme drought and rising temperatures will make it more difficult to establish trees in the future. Many of our trees will die from extreme heat and our city could be left even more vulnerable to extreme heat in the future. That's why it's important that we plant trees before water becomes even more scarce. Established trees are more likely to survive heat waves, so it's important that we're planting trees now to prepare for the next heat wave and the heat wave after that. I would like to hear an update about performance measure 4.11 to achieve a 25% city wide tree coverage by 2040 and I hope this committee will include it as a future agenda item.*

### 4. COMMITTEE SESSION ITEMS

#### A. Current Items and Updates

1. Sustainable and Livable Communities/Workforce Readiness and Economic Vitality Work Plans Review: Discussion with City Staff from Economic Development, Engineering and Transportation, and Sustainability and Resilience Office

*As a new committee with different areas of interest, CM Chin and VM Adams are building a new work plan. CM Chin stated they were looking at previous priorities from a different council committee. Council aides Tonya Gray and Nikki Amberg presented work plans from 2 years ago and CM Chin said some of the priorities and indicators deserve to be addressed and not lost, though perhaps housed better elsewhere. VM Adams and CM Chin discussed the old work plan as written.*

2. Discussion with City Staff from Economic Development, Engineering and Transportation, and Sustainability and Resilience Office: Discussion with City Staff from Economic Development, Engineering and Transportation, and Sustainability and Resilience Office Looking to a WREV Work Plan adopted 2 years ago, VM Adams read Priority B. CM Chin asked if they could remove irrelevant items pertaining to COVID-19's inception. CM Chin asked staff if they could expand on OpenTempe business directory. Economic Development staff Maria Laughner and Jill Buschbacher explained it was conceived by CM Keating to help small businesses during COVID but has not been used since and would require an RFP/outside vendor now. CM Chin read Priority C and they agreed it would be moved to WRLC. VM Adams read Priority D and asked if this was staying within their committee as events bring in a lot of revenue. VM Adams expressed she would like it to stay within their community. CM Chin asked Tempe Sustainability Director Dr. Braden Kay to expand on Priority B1 about greening/improving streets and streetscapes. Maria Laughner said the Economic Development Department would like to discuss and add more—exploring developments throughout the city in terms of both housing and commercial. Nikki Amberg mentioned WRLC would be presenting their work plan at Thursday's WSS and there would be room for discussion there.
3. Fiscal Year 22/23 Council Committee Schedule  
*Tonya Gray stated they were seeking to keep this a static meeting every 3<sup>rd</sup> Monday of the month out of interest to both staff and community members. VM Adams and CM Chin agreed this time works for both of them.*

B. New Items for Consideration

1. Presentation Proposals for Future Committee Meetings: CM Chin mentioned the International Green Construction Code and asked how we can encourage the adoption of a voluntary code. Dr. Kay stated the last position out of last year's budget cycle is a policy and grants director who will hopefully be hired this winter to reach a federal grant strategy. He also said Brianne Fisher from his team could do an IGCC presentation in December or January.
2. VM Adams stated she would like to add a presentation on both the City of Phoenix's CoolSeal program and how it could be added to Tempe's CIP plan, as well as an update on the annexation on the county island. VM Adams would also like to discuss plans for how to deal with adding a fee for using the Tempe Streetcar when the free fare model ends in May 2023.

C. Announcements

1. None  
*There were no announcements.*

5. **NEXT MEETING DATE: December 5<sup>th</sup>, 2022**

**6. ADJOURN**

*Meeting was adjourned at 2:58 PM by VM Adams.*

**Proposed**  
**Council Committee Work Plan**  
**Sustainable and Economic Vitality**  
**2022 - 2023**  
(Last update: 12/9/2022)

## ***Overview***

The primary objective of the Committee is to ensure Tempe develops and promotes innovative programs, infrastructure and policies that foster a sustainable, resilient, and economically vibrant community for both residents and businesses.

### **Committee Co-Chairs:**

Vice Mayor Jennifer Adams  
Councilmember Arlene Chin

### **Liaisons:**

Council Aide Nikki Amberg  
Council Aide Tonya Gray

## ***Priorities and Indicators***

### **A. Priority: Support implementation of the City of Tempe Climate Action Plan**

1. Support and ensure investment in the Climate Action Plans' highlight actions including green codes and standards, mobility hubs and transportation demand management and resilience hubs.
2. Seek additional opportunities for investing in programs and infrastructure to achieve carbon neutrality for City of Tempe operations.

### **B. Priority: Identify and prioritize potential green infrastructure investments**

1. Support policy development adoption through the Resilient Tempe Master Plan to provide more shade and green stormwater infrastructure on city and private property.
2. Implement low-carbon and sustainable transportation system including increasing transit, increased electric vehicle charging infrastructure, and implementing best practice approaches to multi-modal streets.
3. Support City in using appropriate certifications for Capital Improvement Projects including the International Green Construction Code (IGCC), the EnVISION rating system, and the SITES rating for parks infrastructure.

**C. Priority: Focusing to achieve the City's Economic Development key strategies, especially in areas including the Downtown District, Apache Boulevard and North Tempe**

1. Entice new retail and restaurants to establish and expand operations to Tempe.
2. Aid Economic Development's efforts on strategic acquisition, relationships with property owners, and zoning changes for blighted properties to foster redevelopment.
3. Support annexation process for redevelopment in County Island
4. Continue collaboration with Rio Reimagined and Brownfields Coalition.
5. Revitalize Downtown Tempe in coordination with Downtown Tempe Authority and other stakeholders

**D. Priority: Create a toolbox of strategies, resources, and communication plans to support growth for existing businesses and attract new business to Tempe**

1. Foster the successful implementation of the Downtown Retail Study, marketing brochure and tenant outreach and recruitment to fulfill Tempe's downtown retail vision.
2. Highlight and support programs like Tempe Biz HUUB, a business assistance program to promote business retention and expansion, and equity in action initiatives like BIPOC Micro-Manufacturing grant program, which generates new Tempe businesses and products from minority entrepreneurs.
3. Continue to support initiatives and strategy development to attract new business and help existing Tempe businesses.

## ***City Council Committee Focus Performance Measures***

### ***Sustainable Growth and Development***

[4.03 Water Conservation and Efficiency](#)

[4.10 Urban Core Vision](#)

[4.11 Tree Coverage](#)

[4.18 Community Carbon Neutrality](#)

[4.19 Municipal Carbon Neutrality](#)

### ***Financial Stability and Vitality***

[5.01 Quality of Business Services](#)

[5.02 New Jobs Created](#)

[5.03 Capital Investment Created](#)

# Streetcar Project & Fare Update

Sustainability & Economic Vitality Council Committee  
Monday, December 12 2022







# Streetcar Update



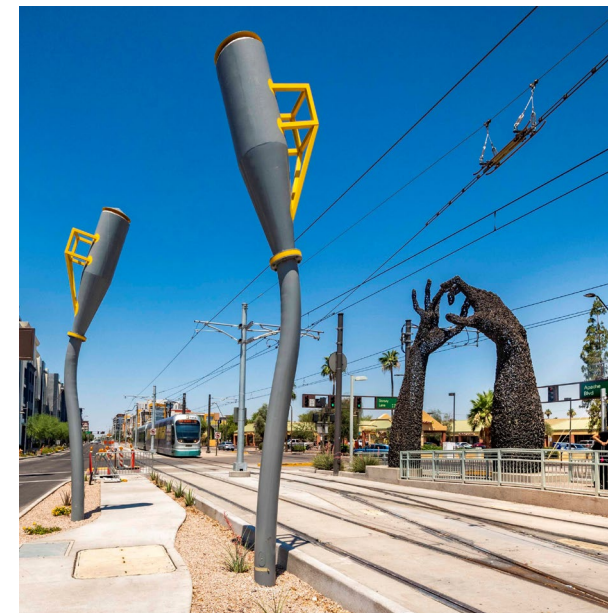
- Opened Friday May 20, 2022
- \$200M infrastructure investment (\$13 PPP & Tempe, \$75M FTA, \$112M Prop 400)
- \$6M annual operations (Tempe)
  - Operators, cleaning, system maintenance
- 5 of 6 trains operational
  - 6<sup>th</sup> train arrival 1<sup>st</sup> quarter 2023
- 20-minute frequency current
  - 12 minute in spring '23 (w/ final



# Streetcar Operations & Ridership Updates



- Strong initial performance & traffic integration
- Free for 1 year
- 157,920 boardings May – September (APC technology)
- Roughly 1170 Daily Boardings
- ASU, downtown employees & residents, visitors, special events
- Transformational & generational project (land use, sustainability, transportation)



# Streetcar & Regional Fare Ongoing



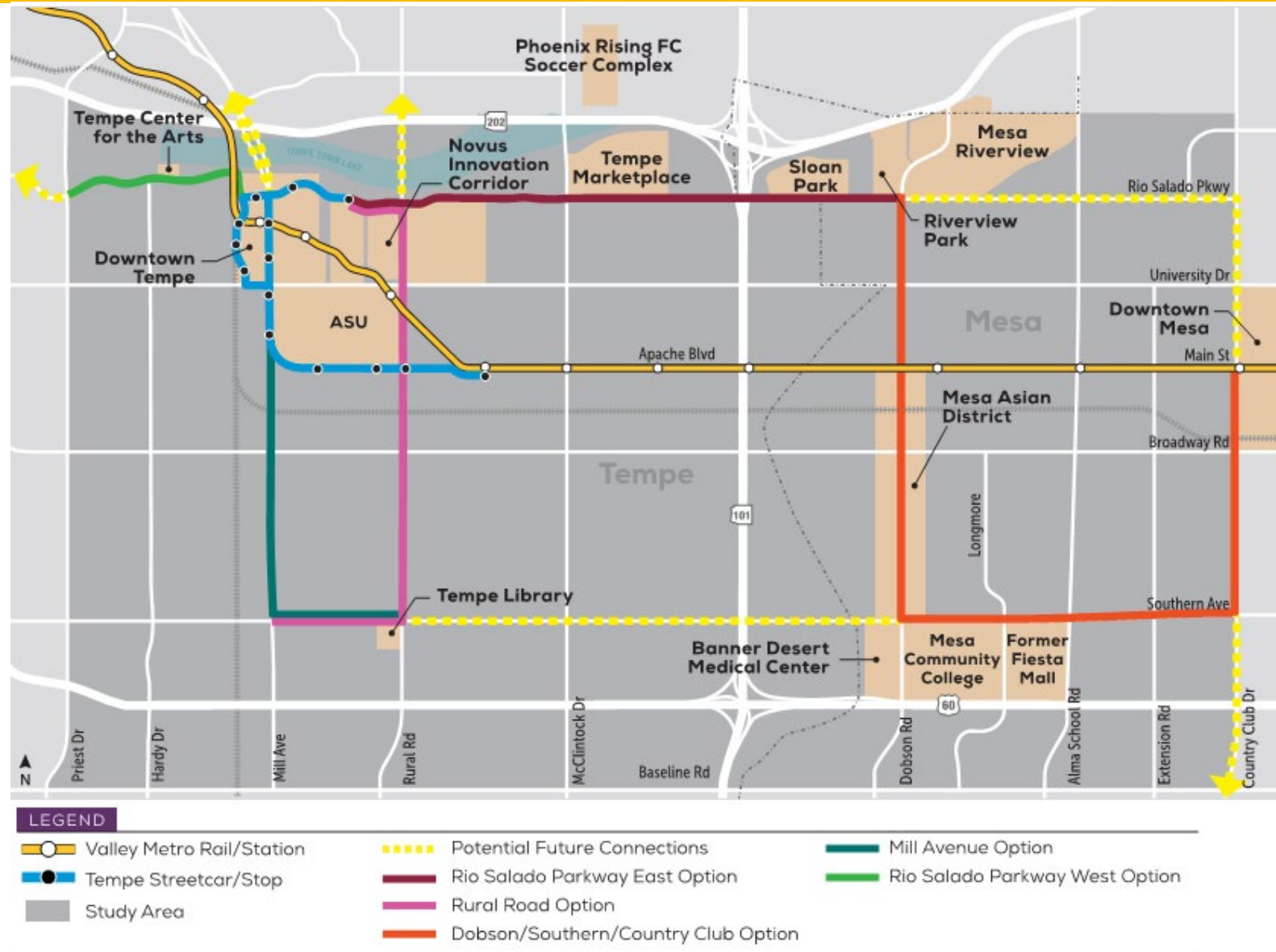
- May 22, 2023 begin \$1 fare
- Regional Fare Policy: Approved by Valley Metro Rail Board
  - City Council direction for free year 5/22-5/23
- Annual fare collection history FY's 2017-2020 (bus & rail)
  - \$6.5M 2017 - \$4.7M 2020 farebox recovery (using a formula based on monthly avg fare)
    - 2021: \$500K+-
    - Rail upwards of 30% recovery of ops costs
  - Important revenue for Tempe Transit Fund & system expenses
  - Observe ridership & fare revenues for 1 year
- 2022-2024 public integration of NEW regional



# 2023 NEXT STEPS

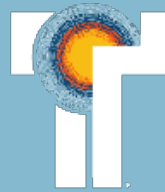


- Coordinate with Valley Metro on public messaging and prep for collection of fares
  - Spring 2023 messaging
  - ASU Fall Semester coordination
  - Outreach to Boards & Commissions
  - Begin collection of fare May 22, 2023
- Continue rollout of regional fare collection systems
- Continue a seamless ticket system
  - All fare works on all systems (bus, s/car, rail)
  - May 22, 2023



- Rio East Streetcar Extension Study

# THANK YOU!



Eric Iwersen  
[eric\\_iwersen@tempe.gov](mailto:eric_iwersen@tempe.gov)

# Cool Pavement

Sustainability and Economic Development Committee

December 12, 2022



# Performance Measure



- 1.22: Achieve adopted standards for Pavement Quality Index (PQI) equal to a citywide average rating of 70 or higher.



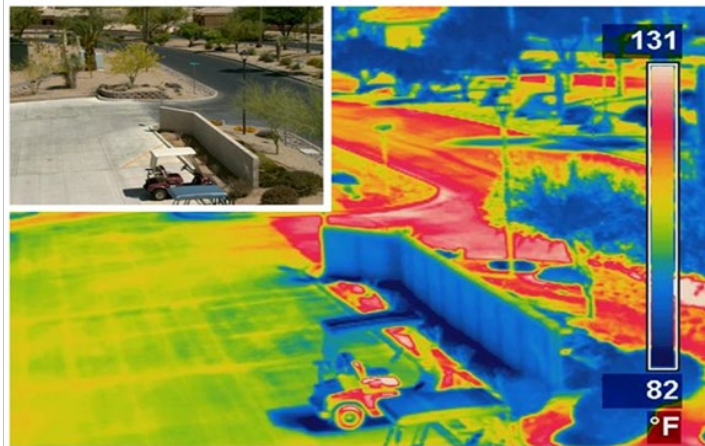
Safe & Secure  
Communities





# Cool Pavement

- What is Cool Pavement?
  - Seal Coat Designed to Reflect Heat
- Why Cool Pavement?
  - Urban Heat Island Effect



Perfect reflection



Perfect absorption

# City of Phoenix Cool Pavement Pilot Program



## What is the Cool Pavement pilot program?



# City of Phoenix Cool Pavement Pilot Program

- Where Cool Pavement Product Installed in Phoenix?
  - Esteban Park Parking Lot
  - Local streets in seven different neighborhoods
- Measured Temperature Results
  - Surface Temperature: approximately 10 degrees cooler
  - Air Temperature: on average, 0.5 degree cooler measure at 6ft above pavement surface
  - Radiant Temperature: 2.6 to 9.2 degrees higher due to the higher surface reflectivity



22°F Surface Temperature difference  
10°F to 15°F Average Surface temperature difference in neighborhoods

# Observations and Findings from City of Phoenix Pilot

- Pavement Performance
- Solar Reflectivity



# Observations and Findings from City of Phoenix Pilot

- Pavement Aesthetics
- Public Perception



# Staff Recommendations

## ● Future Installations

- Product Technology - Current
  - CoolSeal – Light Grey
  - Asphalt Rejuvenator Plus TI – Translucent
- City Owned Parking Lot – CoolSeal
- Public Street (Hardy Dr) – Rejuvenator Plus Ti
- Product Technology - Future



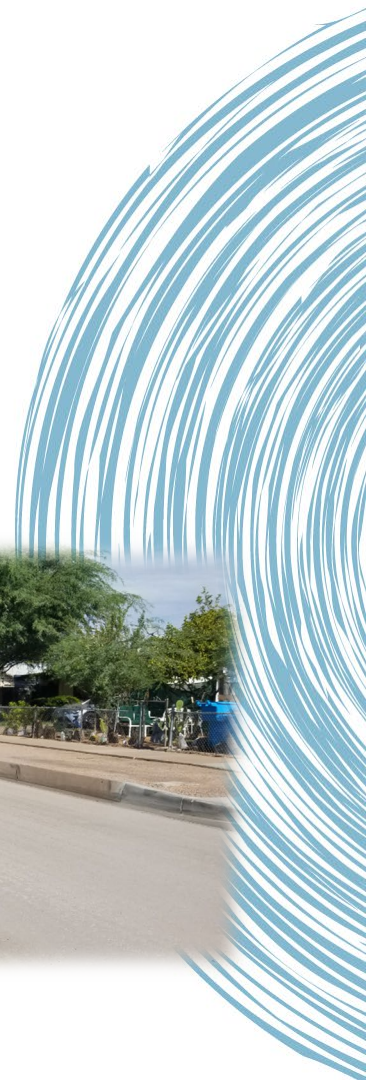
# Staff Recommendations

## ● Projected Costs

- Typical Sealcoat - \$1.75 per Square Yard
- Rejuvenator Plus Ti - \$3.50 per Square Yard
- CoolSeal - \$5.00 per Square Yard

## ● Funding Sources

- Federal Funding
  - Healthy Streets Program
- Local Funding



# Questions?





# Cool Pavement Pilot Program

**Joint Study between the City of Phoenix  
and Arizona State University**



**A report prepared for:**  
The City of Phoenix  
September 2021



# ACKNOWLEDGEMENTS

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The authors wish to acknowledge and thank the following individuals, whose support and input in this project was invaluable:

## **Phoenix City Council**

**The Honorable Kate Gallego** | Mayor

**Vice Mayor Carlos Garcia** | District 8

**Ann O'Brien** | District 1

**Jim Waring** | District 2

**Debra Stark** | District 3

**Laura Pastor** | District 4

**Betty Guardado** | District 5

**Sal DiCiccio** | District 6

**Yessamin Ansari** | District 7

## **City of Phoenix Street Transportation Department**

**Kini Knudson** | Street Transportation Director

**Rubben Lolly** | Special Projects Administrator, Street Maintenance Division

**Ryan Stevens** | Civil Engineer III, Pavement Management Engineer

## **City of Phoenix Office of Sustainability**

**Mark Hartman** | Chief Sustainability Officer

## **Volunteers:**

**Aaron Mehner, Adora Shortridge, Peter Crank, Samuel Castro Brockman, Julia Marturano, Maddie Potts, Ananth Udupa, Nicholas Weis**

Funding for this report was made possible by the City of Phoenix and a contribution from the Healthy Urban Environments program at ASU, which is grateful for support from the Maricopa County Industrial Development Authority (MCIDA) Award #AWD00033817.

# THE PROJECT TEAM

## Arizona State University

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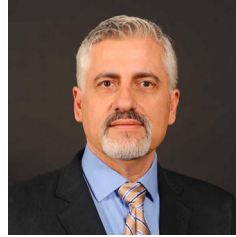
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Project Manager, Rob and Melani Walton Sustainability Solutions Service

## Undergraduate Students, School of Sustainability

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Erin Epel, Brendan Rice, Ruth Garcia



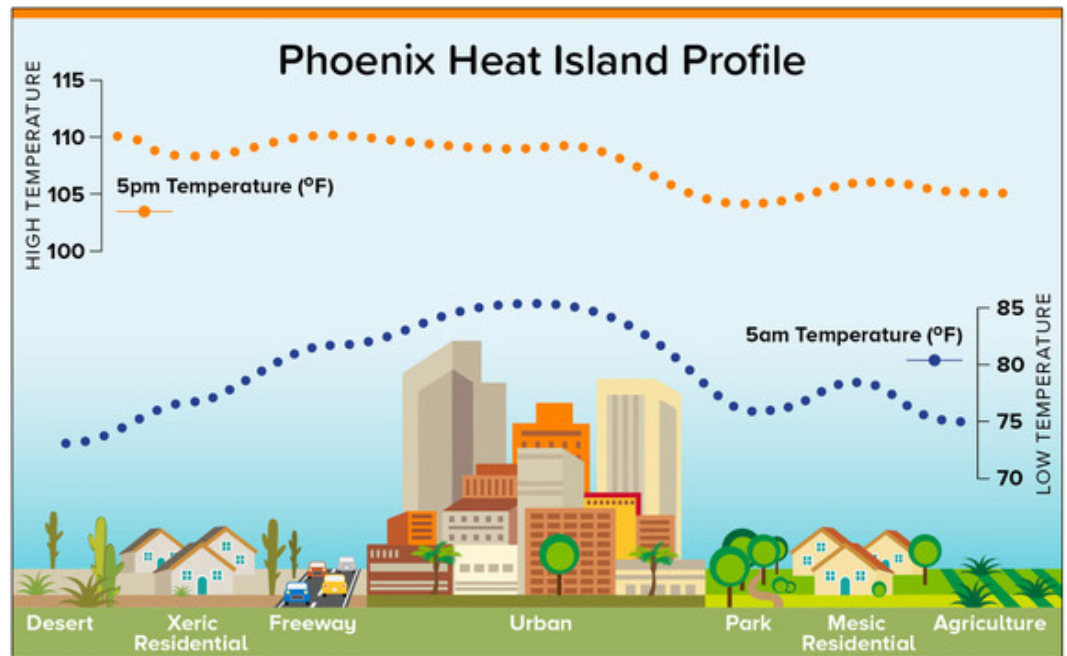
# BACKGROUND

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Many cities around the world, including the City of Phoenix, are experiencing elevated temperatures due to the built environment that are exacerbated by climate change. Paved surfaces with impervious materials, such as asphalt concrete (roads, sidewalks, parking lots, etc.), absorb and store heat during the day and release this heat overnight creating higher temperatures than surrounding rural areas. This phenomenon is known as the Urban Heat Island (UHI) effect (Figure 1). With paved surfaces comprising about 40% of the urban land area in Phoenix, they are often considered one of the primary causes of the UHI.

One of many strategies to mitigate increased temperatures and reduce heat storage in pavements is the use of coatings that reflect (rather than absorb) solar radiation to reduce the heat absorbed by the pavement, thus reducing surface temperatures. Lowering surface temperatures and the heat retained in the built urban environment may help reduce elevated day and nighttime air temperatures. Such reflective coatings are easy to apply to existing paved surfaces and, in most cases, use light-colored pigments and materials to increase reflectivity compared to traditional asphalt concrete roads.

The City of Phoenix recently initiated the Cool Pavement Pilot Program in which the City applied the product CoolSeal by GuardTop® to 36 miles of residential neighborhood roads and one public parking lot. This effort resulted in the most miles of road surface coverage with a reflective coating of any municipality globally. It is designed to achieve lower pavement surface temperatures through its lighter color and reflectivity. One neighborhood in each of the eight council districts of Phoenix was chosen for application of CoolSeal in consultation and with the support of the City Council Offices (Figure 2).



Urban heat profile of Phoenix showing air temperatures during daytime maximum (afternoon) and daytime minimum (overnight) based on weather station data in the region. This profile also demonstrates intraurban heat variability across the city, as affected by types of land cover (e.g., xeric landscape versus parks) and urban design.

*Design by Lisa MacCollum / City of Phoenix.*



# THE PROJECT

*July 15, 2020–July 14, 2021*

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The City of Phoenix Street Transportation Department partnered with the Rob and Melani Walton Sustainability Solutions Service at Arizona State University (ASU) and researchers from various ASU schools to evaluate the effectiveness, performance, and community perception of the new pavement coating. The data collection and analysis occurred across multiple neighborhoods and at varying times across days and/or months over the course of one year (July 15, 2020–July 14, 2021), allowing the team to study the impacts of the surface treatment under various weather conditions.

## ON-SITE DATA COLLECTION

Numerous types of platforms and sensors were used to collect data, with further analysis completed in ASU laboratories.

In the field, a mobile human-biometeorological cart (MaRTy, short of Mean Radiant Temperature) and a vehicle completed traverses across three neighborhoods treated with CoolSeal and directly compared the measurements to untreated roads.

- » **MaRTy** measures mean radiant temperature, air temperature, relative humidity, and wind speed and direction at pedestrian height at two-second intervals. MaRTy measurements were performed for 45–60 seconds at pre-defined stops.



MaRTy engages 12 radiometers that measure incoming radiation from six directions. This includes shortwave radiation (visible sunlight and UV radiation) and longwave radiation (heat emitted from hot surfaces). The shortwave and longwave radiation can be integrated into mean radiant temperature, the sum of all the radiation that hits a person's body from 360 degrees.

- » **A vehicle** was equipped with fast-response, shielded, and naturally aspirated thermocouples to measure air temperature at 6 feet above the surface and an infrared radiometer attached to the bottom front of the vehicle (12 inches from the ground) to measure surface temperature of the pavement. These instruments collected readings at one-second intervals.

These mobile measurements were conducted for one hour at four times of day in each of the three neighborhoods: Before sunrise (~4:30–5:30am), solar noon (~12:00–1:00pm), afternoon at maximum daily air temperature (3:00–4:00pm), and after sunset (~7:30–8:30pm).

Long-term (7–10 months) assessments of performance indicators were also completed in the field:

- » **iButton** sensors were buried within the pavement at 0.5 and 3in depth at 10 sites to determine sub-surface temperature across treated asphalt concrete roads.
- » **A spectroradiometer** was used to measure changing solar reflectivity across treated asphalt concrete roads.



## FINDINGS

The main research findings, outlined below are organized into three categories based on field campaign type and temperature metrics of importance. Together, these findings guide the holistic understanding of how the applied Cool Pavement (CP) treatment impacts the environmental temperatures and the people of the residential neighborhoods.

### 1 Assessment 1

Detailed on-site, full-day assessments of local microclimates in three newly treated neighborhoods on extreme heat days, using both vehicle traverses and ASU's proprietary human-biometeorological mobile platform MaRTy, completed August & September 2020.

- » **Surface temperatures** of the CP were systematically lower than non-treated asphalt concrete across all times of day. The CP surface temperature was, on average, 12.0°F and 10.5°F lower than the asphalt concrete at noon and afternoon hours (ranging from 9–16°F lower), and 2.4°F lower, on average, at sunrise. These lower surface temperatures indicate that the CP-treated roads are not absorbing as much heat as asphalt concrete roads, which helps to reduce overall levels of urban heat.
- » **Air temperature** at 6 feet height was lower above the CP than the non-treated surface in the evening by approximately 0.5°F (ranging from 0.9°F lower to 0.1°F higher), which may help reduce the nighttime Urban Heat Island. Daytime differences averaged 0.3°F lower above the CP (ranging from 1.2°F lower to 0.2°F higher).
- » **Mean radiant temperature**, representing a human's total radiant heat exposure walking on the surfaces, was increased at noon and afternoon hours by approximately 5.5°F, on average (ranging from 2.6 to 9.2°F higher), due to higher surface reflectivity. These higher values, which cause a reduction in human comfort, may be a necessary tradeoff to reduce surface temperatures using a reflective surface. These values were lower than the traditional asphalt concrete at sunrise and sunset (-0.5°F), and overall were similar to that experienced if walking over a concrete road.



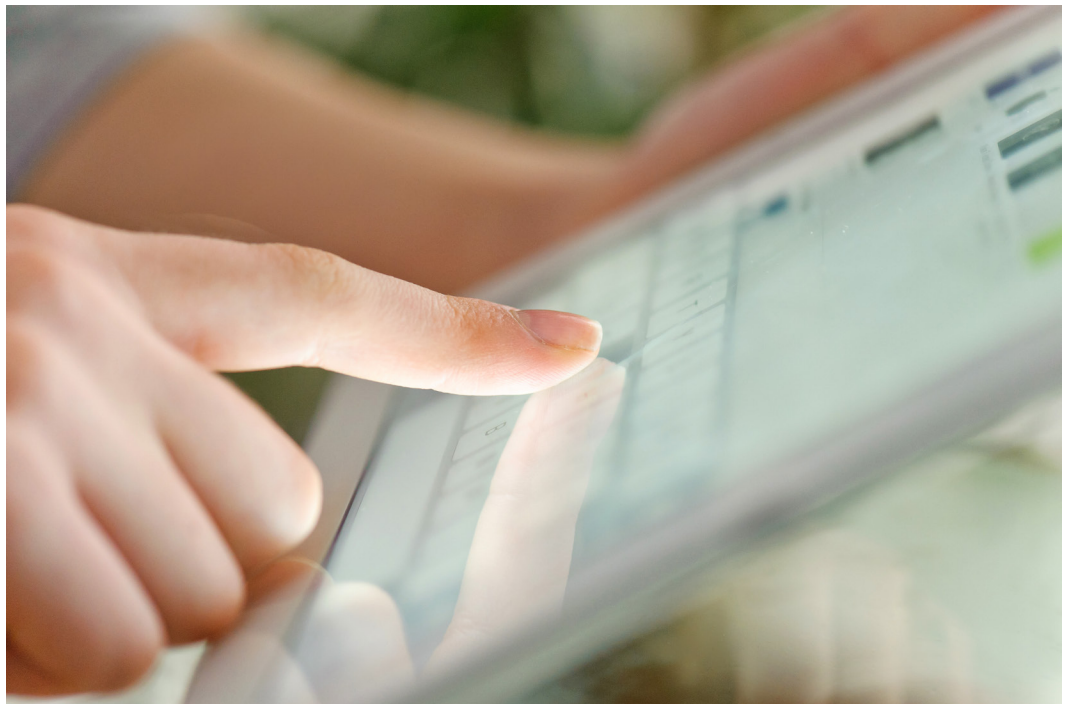
## 2 Assessment 2

Long-term (7–10 months) assessments of sub-surface temperature and solar reflectivity across treated asphalt concrete roads.

- » **Sub-surface temperatures** beneath the CP were lower (4.8°F on average) than beneath the untreated asphalt concrete surfaces.
- » **Surface solar reflectivity** of the CP was around 33–38% when installed and declined over time. The solar reflectivity 10 months after installation ranged from 19–30% across the eight neighborhoods. These reductions in reflectivity can result in less decreases in surface and sub-surface temperatures. For comparison, an untreated asphalt concrete surface had a consistent reflectivity of 12%, hence absorbing more solar radiation.

3 Resident interviews (early 2021) and surveys (June 2021) were conducted to understand the community perception and impact of the Cool Pavement. Survey results will continue to be tabulated through summer 2021. Preliminary findings include:

- » **Satisfaction** with communication from the City about the CP pilot program and **interest** in learning more from the evaluation.
- » **Divergent opinions** were expressed among residents concerning visual appeal and aesthetics, impacts on property values, the longevity of the coating, and surface friction.
- » Collectively, the interview and preliminary survey results point to **opportunities** for additional resident engagement and education concerning CP.





## RECOMMENDATIONS

Numerous important topline takeaways and recommendations arise from these initial Year 1 findings of the Cool Pavement Pilot Program. These include the following:

- » The reductions in surface and sub-surface temperatures are positives for improving the lifespan and performance of the pavement. These factors are particularly important if the treatment is applied in the early years when the road is in very good condition. It is recommended that longer-term testing is completed to assess the changes in reflectivity, traction/skid, degradation, and subsurface temperature over time, particularly as the CP ages.
- » While surface temperature reductions were strong, air temperature reductions were minor, yet influenced by numerous factors in an uncontrolled environment. It is recommended that enhanced fine-scale, precise assessments of air temperature changes are conducted, particularly to determine the energy, water, and health impacts of any temperature differences. Further work is also required to provide Phoenix-based guidelines to mitigate surface dirt, tire markings, and degradation due to a lack of precipitation and the hot climate.
- » There was a wide range of resident opinions and perceptions that provided important insight into other CP considerations, which cannot be quantified using atmospheric sensors but are also important. Additional exploration of the potential use of this technology and other pavement coatings with similar performance yet a darker color may help improve public perception.

Additional and more detailed recommendations are provided as part of the full report based on study findings. A broad assessment of these physical and social indicators of the pavement coating at various timescales will provide critical insight and valuable information for the City of Phoenix to better understand how CP technology will impact street construction and maintenance operations, while also reducing the impact of asphalt concrete on urban heat levels in a hot desert climate.