Pollutant Reduction
The proposed project includes bicycle facilities along Lottie Avenue and Northeast 24th Street/East Madison Street to connect to Kelley Avenue. This project is part of many bicycle and pedestrian facilities to be built and/or expanded following the adoption of the City's bikewalk**okc** bicycle-pedestrian master plan and the successful elections for the Better Streets, Safer City sales tax extension and the MAPS 4 sales tax. In bikewalk**okc**, pollutant reduction and the role of active transportation are addressed thusly (page 7):

> Reliance on the automobile for transportation brings negative impacts on the environment, while increasing active transportation commuting can lead to a reduction in regional motor vehicle miles traveled (VMT), thus reducing vehicle emissions and improving air quality … Another negative impact of motor vehicle traffic that can be mitigated by a modal shift toward active transportation is the degradation of air quality associated with automobile emissions. According to the website Stateoftheair.org, Oklahoma City is ranked 24th in the country for worst air quality by ozone amounts, with a score of F for the number of "orange ozone days". Ground-level ozone is not emitted directly into the air by automobiles but is the result of chemical reactions between nitrogen oxides (NOx) and volatile organic compounds (VOCs) with sunlight. Motor vehicle emissions and gasoline vapors are major sources of NOx and VOC, and the resultant ground-level ozone can exacerbate or trigger respiratory conditions such as asthma, especially the elderly and young children.

In Oklahoma County alone, the U.S. Environmental Protection Agency's (EPA) 2017 National Emissions Inventory found on-road, non-diesel light duty vehicles emit approximately 5,870 tons of NOx annually, 5,060 tons of VOCs annually, and more than 3.9 million tons of carbon dioxide annually. Based on the latest estimates published by EPA, the average U.S. light duty vehicle emits 0.289 grams of NOx from exhaust alone; the transportation sector in the U.S. is responsible for more than 55% of total NOx emissions but fewer than 10% of U.S. VOC emissions per the EPA. On-street bicycle facilities such as those proposed by this project – and especially those with protected components to separate bicyclists from auto drivers – can do much to provide safe connections to a larger network in addition to health and wellness necessities such as city parks, businesses, medical resources, neighborhoods, and more. With each trip's replacement, a quantum of tailpipe emissions are eliminated; this not only contributes to maintaining the Oklahoma City region's attainment designation for the 8-hour ozone standard but encourages greater physiological health on the part of residents who might not use on-street bicycle facilities if not for their protected and traffic-separated design and installation.

Cost Effectiveness
A May 2015 report published by the Federal Highway Administration's Office of Planning, Environment, and Realty sought to "develop estimates of the cost-effectiveness of a range of project types funded under the Congestion Mitigation and Air Quality (CMAQ) Improvement program," with cost effectiveness "measured in terms of dollars per short ton of pollutant reduced." In assessing project types of their cost-effectiveness in specifically reducing just NOx, the report states that:

> Park and ride, transit service expansion, bicycle-pedestrian and incident management projects also exhibited high cost-effectiveness in reducing NOx emissions. With the exception of incident management, these projects reduce NOx emissions by encouraging modal shift, thus reducing VMT in order to achieve emission reductions … These projects achieved a median cost effectiveness of between $91,000 and $168,000 per ton of emissions reduced.

Similarly, when project types were assessed for cost effectiveness in relation to VOC emissions:

> Park and ride, transit service expansion, and bicycle-pedestrian projects also exhibited high cost-effectiveness in reducing VOC emissions. These projects reduce VOC emissions by encouraging modal shift, thus reducing VMT in order to achieve emission reductions. These projects achieved a median cost effectiveness of between $464,000 and $685,000 per ton of emissions reduced.

Additional research found ways to refine the quantification of what on-street bicycle facilities can provide from a cost effectiveness standpoint. A case study published in a 2017 issue of *Injury Prevention*, a peer-reviewed medical journal, sought to "evaluate the cost-effectiveness of investments in bike lanes" in New York City based on the City's investments during a single fiscal year. Via a model, researchers determined the $8,109,511.47 invested in the construction of 45.5 miles of bicycle lanes in New York City during 2015 and considered variables such as reduced risk of injury and increased probability of ridership, costs associated with bike lane implementation and maintenance, and effectiveness due to physical activity and reduced pollution. The researchers conclude "investments in bicycle lanes come with an exceptionally good value because they simultaneously address multiple public health problems. Investments in bike lanes are more cost-effective than the majority of preventive approaches used today." Researchers used a standard economic measure called quality-adjusted life years, or QALYs, which is a scale from 0 to 1 where 0 represents death and 1 represents a year of life in a state of perfect health; new bicycle riders were found to gain an average of 0.033 QALYs due to increased exercise and New York City residents as a whole gain 0.047 QALYs annually due to reduced exposure to pollutants. The researchers found the addition of each QALY has a cost to the City of New York City of $1,297, but because they use QALYs, they can compare that cost to other health interventions and countermeasures to determine efficacy.

Finally, reduced pollutants also contribute to staving off the loss of a regional attainment designation from the EPA for the current 8-hour ambient air quality standard of 0.070 parts per million. Avoided emissions are growing increasingly important given the gradual reduction of the 8-hour standard over decades alongside increasingly hotter springs and summers fomenting favorable conditions for ozone formation. Trips made by bicycle rather than auto obviously eliminate tailpipe emissions but also reduce wear-and-tear to local streets and roads due to the weight disparity between bicycling residents and automobiles. The average car weight is estimated at equal to or greater than 4,000 lbs.; given that bicycles can range anywhere from about 10 pounds to 30 pounds depending on type, the efficacy of increased bicycle trips also relates to road quality which can impact, positively or negatively, vehicle emissions. Research conducted by the University of Texas at El Paso's Center for Transportation Infrastructure Systems, in cooperation with the Federal Highway Administration and the Texas Department of Transportation, found "the better the pavement condition the lower the vehicle gas emissions," including NOx.

Transportation Impact

The proposed project **(a.) promotes multimodal options and aims to reduce single occupancy vehicle trips** given its nature as bicycle infrastructure; bikewalk**okc**'s Executive Summary describes how "a focus on active transportation infrastructure will bring a healthy balance to our transportation system, allowing people to comfortably travel or recreate on our trails, bike lanes, and sidewalks under their own power."

The proposed project also **(b1.) addresses a gap in the existing bicycle, pedestrian, or transit facilities network by creating a new connection from one existing network to another**. This project will expand existing bicycle trail connections and connect on-street facilities to accumulate into a large network across much of northeast Oklahoma City that will connect with other facilities across the city. Where North Lottie Avenue terminates to the south on Northeast 4th Street is Booker T. Washington Park, which serves as a trailhead for the Katy Trail, a 7.3-mile trail which runs through much of northeast Oklahoma City including Frederick Douglass Park and the Oklahoma City Zoo and Botanical Gardens

and will ultimately connect to the Deep Fork Trail that runs along the Deep Fork River and terminates at the intersection of Northwest 63rd Street and Northwest Grand Boulevard.

The proposed project will connect to Kelley Avenue at East Madison Street, which connects to a significant bicycle infrastructure network project that runs from Springlake Drive at North Martin Luther King Avenue to North Laird Avenue; from there, it turns south to Northeast 26th Street which connects at Kelley Avenue south, turns to the southwest at Culbertson Drive, and terminates at the intersection of North Phillips Avenue and Northeast 13th Street, right in the heart of the University of Oklahoma Health Sciences Center. The neighborhoods connected via the aforementioned network include Capitol View, Medical Community, Harrison-Walnut, John F. Kennedy, Culbertson East Highland Parked, South Park Estates, Northeast Renaissance, Culbertson, and Lincoln Terrace.

The proposed project **(c.) does improve safety** through the addition of bollards to establish bicycle-only lanes amid vehicular traffic. In a study published in April 2019's issue of *Transportation Research*, data from 1,064 bicyclists across 20 different countries was used to determine encouraging and discouraging factors influencing cyclists' decision to bike; the results indicated that physical health and fitness (38%), contribution to environmental sustainability (14%), economy (13%) and time saving (10%) were the most frequent factors which encouraged cycling but perceived crash risk (17%), adverse weather conditions (17%) and lack of safety (16%) were found to be the most relevant discouraging factors.

In November 2019, the National Transportation Safety Board (NTSB) published their first bicycle safety research since 1972, *Bicyclist Safety on US Roadways: Crash Risks and Countermeasures*. This report discusses separated bike lanes as "engineering countermeasures" (a term used by the Federal Highway Administration) that "reduce the chance of the most serious bicycle crash types, such as those occurring at midblock locations" (page 32). Furthermore, the report discusses prior literature related to the safety provided by separated bike lanes (page 35):

> For example, in 2014, a study of separated bike lanes conducted in five US cities—Austin, Texas; Chicago, Illinois; Portland, Oregon; San Francisco, California; and the District of Columbia—found that installing separated bike lanes increased bicycle ridership and bicyclist compliance with intersection rules (Monsere and others 2014). In general, bicyclists reported feeling more comfortable riding in a separated bike lane, even if the bike lane was separated only by flexible posts. The study also noted that no collisions were observed during its 144 hours of video recordings of nearly 13,000 bicyclists traveling through the study area (Monsere and others 2014).

When looking at separated bike lane research done internationally, the NTSB report concludes that "separated bike lanes improve safety" (page 35).

Community Involvement
Letters of support are included with this application.

Additionally, the project was identified, developed, and first documented in bikewalk**okc**, which had four distinct and robust components of public participation and community involvement: a stakeholder steering committee comprised of local advocates and nonprofits, government agency and transportation officials, residents, business owners, developers, and more, whom met for six sessions during development of bikewalk**okc** to identify and recommend types of facilities, alignments, and projects; the results of more than 1,700 residents responding to a bicycle and pedestrian survey; in-person public outreach events held at multiple locations including the Ralph Ellison and Almonte libraries, the OSU-OKC Farmers Market, the EMBARK Transit Center, and more; and finally, an online presence including interactive project maps, updates, and social media messaging. The resulting plan, within which the

proposed project is included, was adopted by the City of Oklahoma City's Planning Commission on April 26, 2018, and adopted by Oklahoma City Council on May 8, 2018.

Additionally, projects funded through the temporary, 27-month Better Streets, Safer City sales tax extension are overseen by the Community and Neighborhood Enhancement Advisory Board, an 11-member body comprised of representatives from each of the City's eight wards as well as three at-large members. Members of this body, recommended by each ward's City Council member and appointed by the Mayor, oversee and approve projects, hear presentations from City staff, and hear public comment.

Consistent Planning

The proposed project is consistent with Encompass 2040, the OCARTS region's latest metropolitan transportation plan. In Chapter 7, "Bicycle and Pedestrian," page 48 features Figure 7.3, Existing and Planned Bicycle Facilities, where Lottie Avenue is identified as appropriate for a protected bike lane and the stretch of East Madison Street that connects to North Kelley Avenue as a shared bike path. These projects are listed, albeit separately, in Encompass 2040's List of Planned Bicycle/Pedestrian Projects, first on page 105 as a 1.57-mile protected bike lane project along Lottie Avenue north of NE 23rd Street and south of NE 10th and again on NE 24th Street/East Madison Street to Kelley Avenue as a 0.28-mile "Signed-On-Road Bicycle Route," defined as a "[b]icycle facility operating outside of traffic lanes with informational signs or markers."

This, too, is consistent with bikewalk**okc**, Oklahoma City's first master plan for bicycle and pedestrian infrastructure, as the proposed project is a combination of two projects identified in bikewalk**okc**. On page 39 of bikewalk**okc**, Map 2.10, "Central OKC Proposed Bicycle Facilities," the Lottie Avenue facility is identified as Tier 1 and the facility along East Madison Street to North Kelley Avenue as Tier 3. In bikewalk**okc**, Tier 1 infrastructure represents the highest level of safety consideration for on-street cyclists. This classification is used where automobile traffic and/or speeds are relatively high, but where on-street facilities are still desirable. The preferred facility type for this classification is a protected bicycle lane with the option to elevate the facility to a separated multi-use trail in case of complications in design and engineering. Tier 3 infrastructure is reserved for streets too narrow to accommodate a bicycle lane or protected bicycle lane. These are traditionally referred to as bicycle routes.

Finally, the proposed project is consistent with plan**okc**, the City of Oklahoma City's comprehensive plan. Policies from plan**okc** that intersect with the proposed project include:

C-11: Improve the functionality and efficiency of the street network by:

- Providing direct connections from residential developments to nearby places and to each other.
- Providing street and sidewalk stubs to adjacent vacant land in anticipation of future developments.
- Connecting new developments to existing street and sidewalk stubs, and to existing trail, open space, and bicycle networks.
- Reducing block sizes and use of dead-end streets.
- Maintaining the existing street grid to preserve connectivity and mobility options.

C-16: Prioritize construction of pedestrian and bicycle facilities that improve connectivity and eliminate gaps in the transportation network.

C-23: Increase the miles of bike lanes by:

- Including bicycle lanes in future road widening, reconstruction, and resurfacing projects; and
- Adding bicycle lanes to streets that have sufficient capacity.

C-24: Create and implement a citywide bicycle and pedestrian master plan that addresses riders of all levels.
C-42: Work with the Association of Central Oklahoma Governments to implement the Early Action Compact to mitigate air quality issues.

These all come from the connect**okc** element of plan**okc**, the section that focuses on how our "transportation preferences are undergoing change both locally and nationally."

Community Benefit
The proposed project will benefit the community on the macroscale and the microscale; certainly, as discussed in the following Vulnerable Populations section, the project's surrounding area has significant ozone exposure and proximity to traffic, meaning vehicular emissions are accumulating and imposing negative health consequences.

Additionally, the area is in the 93rd percentile statewide for low income population and a safe, protected, and connected on-street bicycle facility can offer an opportunity for low-cost transportation as a means to basic services, recreation, and employment, whereas the financial burden of acquiring, operating, and maintaining a vehicle is a significant barrier to said services, recreation, and employment. Furthermore, this project contributes to an overall network with wider connectivity to come that represents an opportunity to connect homes and businesses in a historically disadvantaged area – due to past policies such as the "redlining" conducted by the federal government's Home Owners' Loan Corporation – in a way that can support, create, and encourage greater livability and quality of life.

Additionally, businesses in the area could see direct benefits – and with it, the City itself seeing indirect benefit – from safe on-street bicycle facilities. Research published by Portland State University in 2012 linked the mode of transportation used by consumers with consumer spending done at commercial destinations in Portland, Oregon. Comparisons between consumers who traveled to convenience stores, bars, and restaurants revealed those who arrived by bicycle more frequently visited those commercial destinations and, on a monthly basis, spent more at those destinations than consumers who arrived by automobile. For example, a consumer who traveled to a bar by bicycle spent less ($16.90) per trip than a consumer who traveled by automobile ($19.98), yet the consumer by bicycle makes 2.9 more trips per month and ultimately spent about $40 more per month at bars than consumers who arrived by automobile. This could be a benefit to local businesses and, because Oklahoma municipalities are limited to sales tax for operating and maintenance revenue, such infrastructure helps to induce and encourage consumer expenditures beneficial to city budgets.

Vulnerable Populations
Based on the ACOG EJ Index Ozone Map, the proposed project runs through six block groups with two in percentiles above 80% - one in the 81st percentile and the other in the 83rd percentile. The other four block groups range from the 64th percentile to the 79th percentile. Additionally, because of the on-street nature of the proposed facilities, the project abuts another four block groups that range from the 59th percentile to the 79th percentile. The on-street project corridor was mapped in U.S. EPA's full EJSCREEN tool and rendered with a ¼-mile buffer to generate demographic data for a 1.12 square mile area surrounding the proposed facilities. When this project area, made up of U.S. Census block groups, is compared to all other block groups in Oklahoma, the area is:

- In the 98th percentile for minority population
- In the 93rd percentile for low income population
- In the 94th percentile for exposure to particulate matter from diesel
- In the 87th percentile for 2.5 micron and below particulate matter

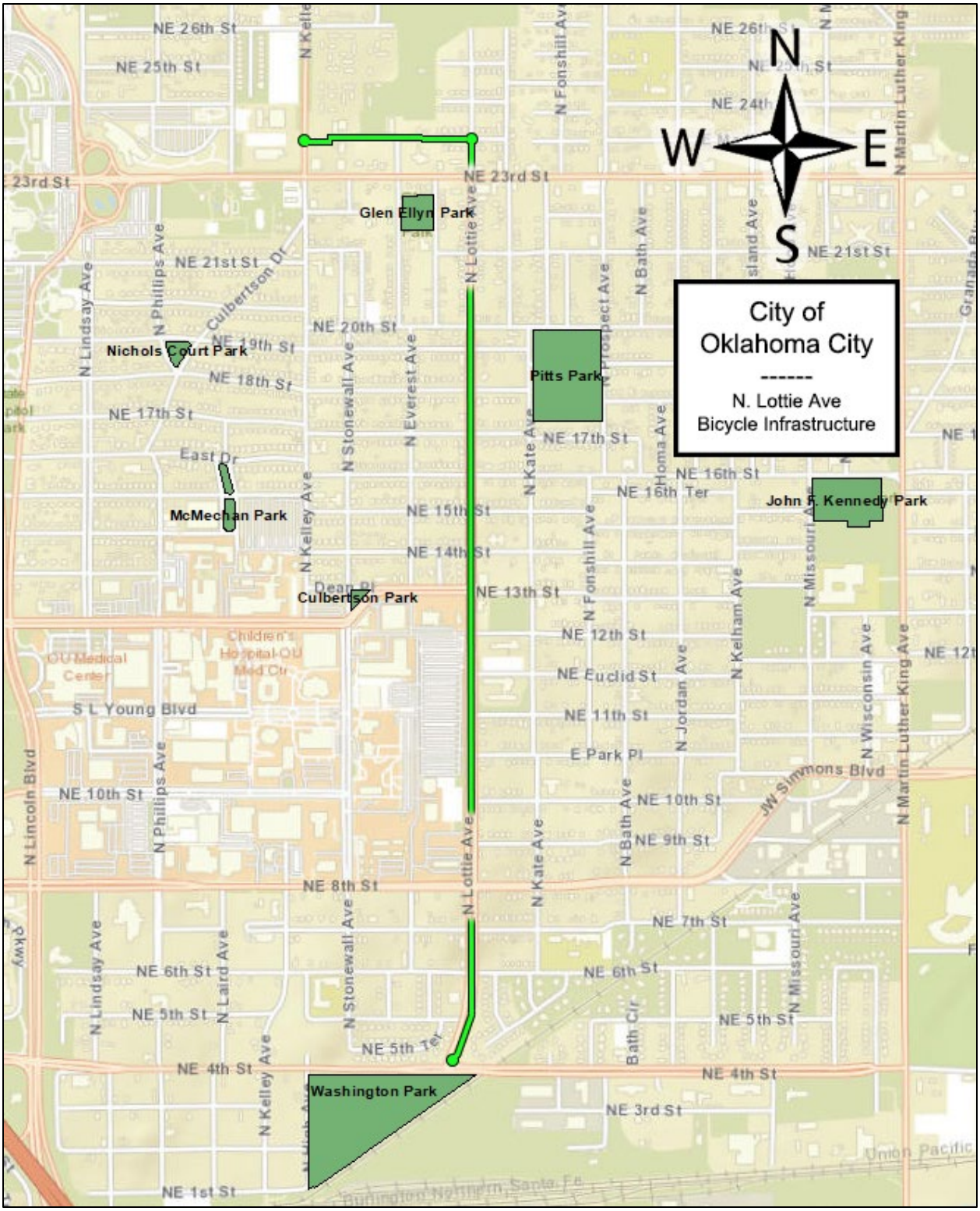
- In the 88th percentile for exposure to ozone
- In the 83rd percentile for proximity to and volume from traffic

Schools with the greatest proximity to the proposed project include Northeast Academy/Northeast High School/Classen School of Advanced Studies (approximately 0.45 miles), F.D. Moon Middle School (approximately 0.56 miles), and the Oklahoma School of Science and Math (about 0.75 miles).

Funding
The proposed project **(a.) uses a local match of 21 percent** via the Better Streets, Safer City sales tax extension approved by voters in 2017. This application includes **(b.) a detailed and realistic cost estimate**, based on City of Oklahoma City purchasing policies and available City contracts, to confirm project readiness upon award and grant award contract execution. The proposed project also **(c.) includes a maintenance plan** that reflects the fact the installed infrastructure will be public property with the City of Oklahoma City itself bound to maintain this project in perpetuity. Routine street repair such as patching as well as large projects such as resurfacing can, long-term, be easily addressed by the simple-to-remove bollards creating the protected lane and striping/pavement markings can be easily redone (and improved) in the case of a full road resurface.

Project Readiness
The proposed project schedule is included and **(a.) detailed and realistic**, especially given the frequency with which the City of Oklahoma City undertakes infrastructure projects – especially street and road projects. The project description similarly includes **(b.) clear and adequate project descriptions.** Prior to submission of this application, engineering plans for this project were at 80% and as such this project, should the City receive a grant award, should be virtually shovel-ready and completed before the end of calendar year 2021.

Evaluation Metrics
The proposed project (a) includes detailed plans for gathering evaluation metrics.


City of
Oklahoma City

N. Lottie Ave
Bicycle Infrastructure
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W
E
S
Glen Ellyn Park
Nichols Court Park
Pitts Park
McMechan Park
John F. Kennedy Park
Culbertson Park
Washington Park
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N Stonewall Ave
N Everest Ave
N Kate Ave
N Fonshill Ave
N Prospect Ave
N Bath Ave
N Bath Cir
N Jordan Ave
N Kelham Ave
N Missouri Ave
N Wisconsin Ave
N Martin Luther King Ave
N Lindsay Ave
N Phillips Ave
N Laird Ave
N Lincoln Blvd
Culbertson Dr
East Dr
Dean Pl
S L Young Blvd
JW Simmons Blvd
Children's Hospital-OU Med Ctr
OU Medical Center
Union Pacific
Burlington Northern Santa Fe

Budget: OKC Air Quality Small Grant

Proposed Project Budget

Below is the full project budget irrespective of CMAQ dollars; the highlighted line regarding Epoplex LS65 is the proposed usage of grant funds as part of this overall project. The Epoplex LS65 is an epoxy coating material designed as a slow setting highway marking coating with excellent UV stability and abrasion resistance. It is long-lasting and used frequently for both edging and center line street, road, and highway markings.

Summary of Quantities			
Description	**Quantity**	**Unit Price**	**Total**
Traffic Stripe (Multi-polymer, 4-Inch)	1,788	$1.25	$2,235
Traffic Stripe (Multi-polymer, 8-Inch)	6,436	$2	$12,872
Traffic Stripe (Multi-polymer, 24-Inch)	651	$6	$3,906
Traffic Stripe (Multi-polymer, Arrows)	2	$125	$250
Traffic Stripe (Multi-polymer, Bike Lane Symbol)	12	$400	$4,800
Traffic Stripe (Multi-polymer, Sharrow Symbol)	18	$400	$7,200
Traffic Stripe (Multi-polymer-Epoplex LS65, Green Paint with Crushed Granite)	11,754	$12	$141,048
Traffic Stripe (Thermoplastic, 4-Inch)	12,973	$1.25	$16,216.25
Traffic Stripe (Thermoplastic, 8-Inch)	35,886	$2	$71,772
Traffic Stripe (Thermoplastic, 24-Inch)	251	$6	$1,506
Traffic Stripe (Thermoplastic, Arrows)	70	$125	$8,750
Traffic Stripe (Thermoplastic, Bike Lane Symbol)	58	$400	$23,200
Remove Traffic Stripe (4-Inch)	7,533	$1	$7,533
Remove Traffic Stripe (24-Inch)	369	$6	$2,214
Remove Traffic Stripe (Words)	4	$65	$260
Remove Traffic Stripe (Arrows)	18	$65	$1,170
Vertical Delineator	325	$60	$19,500
1 ¾" Square Post	350	$12	$4,200
Sheetmetal Sign – Up to Two Colors	132	$25	$3,300
Construction Signing and Traffic Control (Arterial Street)	1	$12,800	$12,800
Work Zone Permit	1	$600	$600
Mobilization	1	$17,300	$17,300
TOTAL PROJECT COST			**$362,700**
TOTAL PROJECT COST WITH 20% CONTINGENCY			**$435,300**

Proposal Total	**$112,000.00**
ACOG 79%	$112,000.00
OKC 21%	$31,048.00

Work Plan: ACOG Air Quality Small Grant

Proposed Project Timeline

The City of Oklahoma City Public Works Department is managing the overall project alongside a contracted consulting firm, Atkins Engineering, who is responsible for planning and design work and will oversee construction. This is a City of Oklahoma City, publicly-funded project and as such can accommodate any schedule changes.

Month / Year	Milestone
October 2020	Preliminary Plan Design
November 2020	Preliminary Plan Design
	Grant Application Deadline
December 2020	Preliminary Plan Design
	Project Presentations to BPAC, APTAC, ITTC, ITPC, Board
January 2021	Final Plan Design
	Contract Execution with ACOG (estimated)
February 2021	Final Plan Design
March 2021	Final Plan Design
April 2021	Pre-Work
May 2021	Construction
June 2021	Construction
July 2021	Construction
August 2021	Construction
September 2021	Construction
October 2021	Construction
November 2021	Construction
December 2021	Construction