BOARD MEETING DATE: July 11, 2014 AGENDA NO. 7

PROPOSAL: Transfer and Appropriate Funding to Establish Air Quality Sensor Performance Evaluation Center

SYNOPSIS: Manufacturers have begun marketing "low-cost" air monitoring sensors to measure air pollution, and local environmental groups and the public are considering them as inexpensive options to independently evaluate air quality. However, there are no ongoing established local, state or federal programs to evaluate the validity of data obtained from such devices or their overall performance. This action is to establish an Air Quality Sensor Performance Evaluation Center (AQ-SPEC) to perform systematic, detailed characterizations of currently available air monitoring sensors using both field- and laboratory-based testing and to communicate the results to the public. This action is to also transfer and appropriate funding up to $852,000 from the BP ARCO Settlement Projects Fund (46) to release solicitation documents and issue purchase orders or contracts for equipment and web development, fund program implementation costs and create and fill two new positions to support the AQ-SPEC.

COMMITTEE: Technology, June 20, 2014; Recommended for Approval with recommendation that the long-term goal of this program is for it to become self-sustaining.

RECOMMENDED ACTIONS:

1. Transfer up to $852,000 from the BP ARCO Settlement Projects Fund (46) to the General Fund;
2. Appropriate up to $852,000 in Science & Technology Advancement's FY 2014-15 budget as follows:
   a) $503,000 in the Capital Outlay Major Object in accordance with Tables 1A, 1B and 2 for equipment and development of website;
   b) $115,000 in the Services & Supplies Major Object in accordance with Table 3 for proposed recurring program implementation expenses; and
   c) $234,000 in the Salaries and Employee Benefits Major Object in accordance with Table 4 to fund two new positions to support AQ-SPEC.

3. Authorize the Procurement Manager, in accordance with SCAQMD Procurement Policy and Procedure, to:
   a) Release RFQs and issue purchase orders in an amount not to exceed $314,000 for laboratory and field equipment as listed in Table 1A;
   b) Issue purchase orders in an amount not to exceed $89,000 for laboratory and field equipment as listed in Table 1B; and
   c) Purchase or lease air monitoring sensors and purchase other supplies for field and laboratory testing in accordance with the SCAQMD Procurement Policy and Procedure, in an amount not to exceed $115,000 per year as listed in Table 3;
4. Authorize the Executive Officer to release an RFP and execute subsequent purchase order or contract in an amount not to exceed $100,000 for development of an information website to summarize testing results and disseminate information on technical specifications and capabilities of commercially available sensors to interested organizations and the public as listed in Table 2; and
5. Create and fill two new positions in the Office of Science & Technology Advancement to establish, support and maintain the AQ-SPEC in an amount not to exceed $234,000 for the first year of the program as listed in Table 4 as follows:
   a) One Air Quality Instrument Specialist II in Quality Assurance; and
   b) One Air Quality Specialist in Quality Assurance.

Barry R. Wallerstein, D.Env.
Executive Officer

MMM:LT:AP:PMF:RE:JL

Background

Manufacturers have recently begun marketing "low-cost" air monitoring sensors to measure air pollution, and considering how fast the air monitoring sensor technology is evolving, it is likely that the availability of such sensors in terms of type and numbers will continue to grow in the future. These devices, provided they produce reliable data, can significantly augment and improve current ambient air monitoring capabilities that predominantly rely on more sophisticated and expensive fixed-site federal-reference monitoring devices and methods. Specifically, these devices can be deployed near specific sources to better characterize local levels of air contaminants or over a wider geographic area to identify spatial and temporal trends. Given their low cost, these sensors are becoming an attractive means for local environment groups and individuals to attempt to independently evaluate air quality. The new approach is receiving acknowledgement from U.S. EPA and may move air monitoring towards a different paradigm which includes traditional air monitoring by air regulatory agencies supplemented by community-based monitoring using such low-cost air monitoring

sensors. Due to their low cost and ease of use, in addition to enhancing current monitoring capabilities, such devices also have the potential of becoming highly effective tools in introducing students to and engaging them in air quality matters.

There is, however, no independent objective means by which these devices can be evaluated, and data from these monitors are usually accepted at face value with no opportunity to evaluate their accuracy and overall quality. In fact, preliminary tests performed in the U.S. and in Europe seem to suggest that many of the commercially available air monitoring sensors have poor reliability, do not perform well in the field under "actual" ambient conditions, and do not typically correlate well with data obtained using "standard" measurement methods employed by regulatory agencies. Poor quality data obtained from unreliable sensors, especially that in conflict with data obtained from traditional, more sophisticated monitoring networks, may not only lead to confusion but may also jeopardize the successful evolution of the "low-cost" sensor technology. Therefore, there is an urgent need to better characterize the actual performance of air monitoring sensors as well as educate the public and users lacking specific technical training about the potential applications of these devices as well as their limitations.

Proposal

In an effort to provide the public with much-needed information about the actual performance of commercially available "low-cost" monitoring sensors, this action is to establish a testing center at SCAQMD. The AQ-SPEC would perform a thorough performance characterization of currently available "low-cost" sensors using both field- and laboratory-based testing and communicate such results to the public through an information website. This action is also to transfer and appropriate funding to release solicitation documents and issue purchase orders or contracts for equipment and web development, fund program implementation costs and create and fill two new positions to support the AQ-SPEC.

Field Testing

Air quality sensors would be operated side-by-side with more "standardized" air monitoring equipment such as Federal Reference Methods and Federal Equivalent Methods (FRM and FEM, respectively), which are routinely used to measure the ambient concentration of gaseous or particle pollutants for regulatory purposes. The testing would be conducted at one or more of SCAQMD's existing air monitoring stations (e.g. 710 station, a near-roadway site where concentrations of diesel PM, VOCs and other combustion pollutants are elevated) to test their overall performance. A Quality Assurance Project Plan (QAPP) document to formalize the field and laboratory testing procedure(s) is under development and will be available soon.

Laboratory Testing

Sensors that demonstrated an acceptable performance in the field would then be brought back to the lab for more detailed testing. A "characterization chamber" (to be set-up inside the SCAQMD laboratory or in another dedicated area) would be used to challenge the sensors with known concentrations of different particle and gaseous pollutants (i.e. both individual pollutants and different pollutant mixtures) under different temperature and relative humidity levels. The QAPP document mentioned earlier also includes the details of the laboratory testing procedure.

Information Website

Testing results for each sensor will be summarized in a technical report, along with other relevant information, and posted online on a dedicated website to educate the public about the capabilities of commercially available sensors and their potential applications. Other scientific organizations (i.e. air quality agencies, universities and national labs) would also be encouraged to submit their test data and reports to avoid duplication of efforts and to expand our knowledge on available sensor technology and their performance. All air monitoring sensors tested under this program would be purchased or leased directly from the manufacturer.

Proposed Purchases through RFQ Process

Two dedicated sets of FRM and FEM air monitoring instruments would be purchased to test the performance of "low-cost" sensors both in the field and in the laboratory. These include devices for measuring gaseous (i.e. ozone, sulfur dioxide, nitrogen oxides, carbon monoxide, and hydrogen sulfide) and particulate (i.e. fine and coarse particles) pollutants, as well as VOCs. Instruments for measuring other important air toxics, such as black carbon (an indicator of diesel particulate, a well-known carcinogen) and ultrafine particles (another combustion product that has been associated with adverse health effects in humans), are already available from previous air toxics studies (i.e. MATES IV). Data loggers will also be purchased to acquire, visualize and store data from the various monitoring instruments and sensors. A "characterization chamber" will be purchased to challenge the air sensors with known concentrations of different particle and gaseous pollutants and under different temperature and relative humidity levels. The chamber will also include an integrated aerosol generator and an aerosol neutralizer to test particle measuring sensors for their ability to accurately detect particles of different sizes. Table 1A includes a complete list of all field and laboratory equipment which would be purchased through an RFQ process and their estimated cost.

Proposed Purchases through Sole Source Purchase Orders

A Calibration/Dilution System with Ozone Generator (Teledyne Model T700U) would be purchased for precision gas analyzers. Using highly accurate mass flow controllers combined with compressed sources of standard gases, calibration standards are provided for multipoint span and zero checks using up to four gas sources. The Model T700U is

designed for the demanding requirements of very sensitive measurements and is ideal for testing air monitoring sensors with wide sensitivity and accuracy ranges.

A High Performance Zero Air System (Teledyne Model T701H) would be purchased to provide a self-contained source of high purity zero air for dilution calibrators, and would be used in conjunction with the Teledyne Model T700U calibration/dilution system mentioned above. It is ideal for use with highly sensitive gaseous analyzers in ambient background and trace level applications, and it has been used for accurately monitoring gaseous pollutants at all SCAQMD network air monitoring stations for several years.

An Aerodynamic Particle Sizer Spectrometer (APS) (TSI Model 3321) would be purchased to provide high-resolution, real-time aerodynamic measurements of particles from 0.5 to 20 microns. This particle sizer also measures light-scattering intensity in the equivalent optical size range of 0.37 to 20 microns. The APS would be used to characterize the particle size distribution of aerosols generated in the laboratory (i.e. inside the characterization chamber) to evaluate the ability of specific air monitoring sensors to accurately detect particles of different sizes.

Table 1B summarizes the equipment to be purchased from Teledyne Technologies and TSI Instruments through sole source purchase orders and the estimated costs.

Proposed Purchase Order or Contract through RFP Process

An essential part of the AQ-SPEC would be to communicate relevant facts about the air monitoring sensors with the public through the development of an information website (Table 2). The website would include a summary of the AQ-SPEC testing results, information on technical specifications and capabilities of commercially available sensors, validation and calibrations procedures, and potential applications. A well-organized air monitoring sensor website would be a valuable resource for citizens, community groups and various organizations in need of appropriate sensor technologies for specific applications, developers looking for opportunities to fill technology and price point gaps, and federal, state and local air quality officials seeking to understand and communicate the value and limitations of these technologies to the public. A purchase order or contract would be executed based on the results of an RFP to identify a vendor for development of the website.

Proposed Recurring Program Implementation Expenditures

Staff would maintain an updated list of all commercially available “low-cost” air monitoring sensors and periodically purchase or lease these devices directly from the manufacturer for testing. Other recurring program implementation costs associated with establishing the AQ-SPEC, summarized in Table 3, include certification, calibration and/or repair of field and laboratory equipment and purchase of “certified” gas standards for laboratory testing and other testing supplies.

Proposed Annual Staffing Costs

Two full-time positions would be created and filled in the Office of Science & Technology Advancement to support the AQ-SPEC, as follows:

- One Air Quality Instrument Specialist II in Quality Assurance - to conduct field evaluations of air monitoring sensors and operate, repair and maintain field equipment
- One Air Quality Specialist in Quality Assurance - to validate and analyze air monitoring sensor data, evaluate sensor performance, write reports and manage the content of the air monitoring sensor website

Given the rapid proliferation of portable sensor technology for air quality monitoring applications, it is expected that these new staff positions will dedicate 100% of their time to establish, support and maintain the AQ-SPEC. Table 4 summarizes the proposed staffing and associated costs.

Outreach

In accordance with SCAQMD's Procurement Policy and Procedure, a public notice advertising the RFQs and RFP and inviting bids will be published in the Los Angeles Times, the Orange County Register, the San Bernardino Sun, and Riverside County Press Enterprise newspapers to leverage the most cost-effective method of outreach to the South Coast Basin.

Additionally, potential bidders may be notified utilizing SCAQMD's own electronic listing of certified minority vendors. Notice of the RFP/RFQ will be e-mailed to the Black and Latino Legislative Caucuses and various minority chambers of commerce and business associations, and placed on the Internet at SCAQMD's website (http://www.aqmd.gov) where it can be viewed by making the selection "Grants & Bids." Information is also available on SCAQMD's bidder's 24-hour telephone message line (909) 396-2724.

Sole Source Justification

Section VIII.B.2 of the Procurement Policy and Procedure identifies four major provisions under which a sole source award may be justified. Section VIII.B.2.d(6) of the SCAQMD's Procurement Policy and Procedure allows for sole source purchases in which "Other circumstances exist which in the determination of the Executive Officer require such waiver in the best interests of the SCAQMD." Such circumstances may include but are not limited to "Projects requiring compatibility with existing specialized equipment." The purchase of the calibration/dilution and high performance zero air systems from Teledyne Technologies is proposed under this section since identical items are already in use in SCAQMD's air monitoring network stations and have been integrated well with a history of reliability. The request for sole source purchase of the

APS Spectrometer through TSI Instruments is made under Section VIII.B.2(1): "The unique experience and capabilities of the proposed contractor or contractor team."

Benefits to SCAQMD
Establishment of the AQ-SPEC will create the first air monitoring sensor center in the country and provide staff and the public with valuable knowledge on additional available sensor technology as well as their performance and data reliability and potential applications. The availability of such information will help contribute to and possibly shape the successful evolution and deployment of "low-cost" sensor technology. Furthermore, this effort will provide SCAQMD with an effective tool to engage and educate students on air quality matters.

Resource Impacts
An estimated $852,000 is required to establish, support and maintain the AQ-SPEC, including first year staffing costs (as listed in Tables 1-4). Up to $852,000 will be transferred from the BP ARCO Settlement Projects Fund (46) and appropriated into the General Fund in Fiscal Year 2014-15. Ongoing costs beyond Fiscal Year 2014-15 will be identified for consideration in future annual budgets. To defray future implementation costs, staff will pursue cost-sharing opportunities with other agencies (e.g., CARB, U.S. EPA, CAPCOA, etc.) as well as consider charging a "fee for service" to interested parties.

Attachments
Table 1A - Proposed Purchases through RFQ Process
Table 1B - Proposed Purchases through Sole Source Purchase Orders
Table 2 - Proposed Purchase Order or Contract through RFP Process
Table 3 - Proposed Recurring Program Implementation Expenditures
Table 4 – Proposed Annual Staffing Costs

Table 1A
Proposed Purchases through RFQ Process

Description	Qty	Estimated Cost
Ozone (O3) Analyzer	2	$26,000
Sulfur Dioxide (SO2) Analyzer	2	$30,000
Nitrogen Oxides (NOx) Analyzer	2	$32,000
Carbon Monoxide (CO) Analyzer	2	$28,000
Hydrogen Sulfide (H2S) Analyzer	2	$32,000
Continuous PM FEM Analyzer	2	$48,000
Total Non-methane HydroCarbon (NMHC) Analyzer	2	$48,000
Data Loggers	2	$20,000
Customized Testing Chamber With Integrated Aerosol Generator and Aerosol Neutralizer	1	$50,000
Total Proposed Purchases through RFQ Process		**$314,000**

Table 1B
Proposed Purchases through Sole Source Purchase Orders

Description	Qty	Estimated Cost
Calibration/Dilution System With Ozone (O3) Generator	1	$23,000
High Performance Zero Air System	1	$8,000
Aerodynamic Particle Sizer	1	$58,000
Total Proposed Purchases through Sole Source Purchase Orders		**$89,000**

Table 2

Proposed Purchase Order or Contract through RFP Process

Description	Estimated Cost
Development of an Air Monitoring Sensors Website	$100,000
Total Proposed Purchase Order or Contract through RFP Process	**$100,000**

Table 3

Proposed Recurring Program Implementation Expenditures

Description	Acct	Estimated Cost
Sensor Purchase or Lease (Approximately 50 Sensors)	67300	$60,000 / year
Instruments Certification, Calibration and Repair	67600	$20,000 / year
NIOSH or NIST Certified Standards	67550	$15,000 / year
Misc. Supplies	68050	$20,000 / year
Total Proposed Recurring Program Implementation Expenditures		**$115,000 / year**

Table 4

Proposed Annual Staffing Costs

Title	Quantity	Division	Estimated Cost
Air Quality Instrument Specialist II	1	Quality Assurance	$109,000 / year
Air Quality Specialist	1	Quality Assurance	$125,000 / year
Total Proposed Annual Staffing Costs	**2**		**$234,000***

*Salaries & Employee Benefits at Step 3 include base salary, retirement cost, insurance, FICA & SDI.