Pursuant to the U.S. Environmental Protection Agency's (U.S. EPA) solicitation for pilot demonstration projects under the "Community-Scale Air Toxics Ambient Monitoring – Request for Proposals (RFP)" (EPA-OAR-OAQPS-07-01), the South Coast Air Quality Management District (SCAQMD) proposed to conduct a comprehensive community assessment program that would enhance regional air toxics exposure studies currently underway in the South Coast Air Basin (Basin). The project consisted of community-scale studies to identify how emissions from large commercial international airports are dispersed into the surrounding community and was expanded to other emissions sources such as industrial complexes and railyards. These measurements will be used to address community exposure and risk issues within the Basin as they complement other air pollution studies being conducted concurrently. This draft report, in part, is intended to satisfy Task 4: *Prepare Draft and Final Technical Report*.

BACKGROUND

The Basin is a highly urbanized area, home to about 16 million people who own and operate about 11 million motor vehicles, and contains some of the highest concentrations of industrial operations in the country. The Basin is one of the worst areas for ozone and particulate matter air quality in the U.S. The high population density within the Basin often results in little separation between source emitters and neighboring communities. In addition, there is heightened community awareness within the Basin of the potential air toxic impacts from nearby sources. These concerns are continually presented at town hall meetings the SCAQMD holds in communities within the Basin. SCAQMD Programs such as Multiple Air Toxics Exposure Study (MATES) are designed to monitor and characterize toxic emissions over the entire Basin.

In 1986, the SCAQMD conducted the first MATES to determine Basin wide risks associated with major airborne carcinogens. At the time the state of technology was such that only ten known air toxic compounds could be analyzed. In 1998, a second study, MATES-II, (SCAQMD, 2000) was conducted representing one of the most comprehensive air toxics measurement programs conducted in an urban environment. MATES-II included a comprehensive monitoring program consisting of ten fixed sites sampling 40 known air toxic compounds, an updated emissions inventory of toxic air contaminants, and a regional air toxics modeling effort to characterize health risks from toxic air pollutants. Additional sampling was also conducted during MATES-II at 14 various locations near source emissions utilizing two mobile sampling platforms. Two of the ten sites are part of the U.S. EPA's Photochemical Assessment Monitoring Stations (PAMS) and seven of the ten sites are part of the National Ambient Monitoring Stations (NAMS) network. NAMS and PAMS ambient data are uploaded to the U.S. EPA Air Quality System (AQS). Two of the MATES sites are now part of the U.S. EPA National Air Toxics Trends Stations (NATTS) program.

A limited number of communities located near industrial sources and large mobile source facilities (such as marine ports and commercial airports) were studied under MATES-III which was initiated in February 2004. Sampling was completed in April 2006. This was the most comprehensive air toxics exposure study with twice the amount of samples being collected compared to MATES-II. The same ten fixed sites used in MATES-II were used for MATES-III. Trends and general risk levels in the Basin were calculated as part of MATES-III based on an updated air toxic emissions inventory and the monitoring data and indicated that the carcinogenic risk from air toxics in the Basin, based on the average concentrations at the fixed monitoring

sites, is about 1,200 per million. This risk refers to the expected number of additional cancers in a population of one million individuals that are exposed over a 70-year lifetime. Using the MATES-III methodology, about 94% of the risk is attributed to emissions associated with mobile sources, and about 6% of the risk is attributed to toxics emitted from stationary sources, which include industries, and businesses such as dry cleaners and chrome plating operations. From July 2012 through August 2013, SCAQMD conducted measurements for MATES-IV. MATES-IV added additional continuous measurements including ultra-fine particles and black carbon at the ten fixed sites. Local scale measurement studies from MATES-IV are included as part of this Community-Scale Air Toxics Ambient Monitoring final report as further demonstration of community air toxics monitoring that have been conducted with the trailers. The data from those projects will be published as part of the appendices of the MATES-IV Final Report.

A community-scale air toxics monitoring campaign funded by the U.S. EPA "National Air Toxics Monitoring Program – Community Assessments" solicitation was initiated in 2004. This study contains three components: one focused on a highly industrial community in Sun Valley, CA; the second on general aviation airports; and the third on hexavalent chromium. Results from these studies are currently being compiled and analyzed. This report includes general aviation airports, industrial complexes, and railyards.

More recently, goods movement activities have become a major focus relative to regional air quality and community exposure to air toxic pollutants from goods movement related sources. Over 40% of the nation's goods move through Southern California marine ports. As such, a community-scale monitoring program was initiated in January 2007 to characterize the impacts of the Ports of Los Angeles and Long Beach, goods movement operations, and other industrial sources in communities adjacent to these activities. Monitoring at over 12 air monitoring stations includes the full suite of air toxics measured in the MATES studies, all criteria pollutants, as well as continuous instrumentation for black carbon, particle number, and PM2.5. New monitoring techniques are being deployed to enhance the information collected under this program. Gradient measurements have been conducted near the Interstate 710 freeway, which has the highest level of diesel truck traffic in the Basin.

Given these previous and on-going air toxics studies, a gap remains in the understanding of community-scale air toxic exposure with respect to large commercial airports, industrial complexes, and railyards which are considered part of the overall goods movement activities in the region. Emissions from these complex facilities include not only aircraft and locomotive emissions, but also emissions from ground equipment, and other vehicles for ground transportation under often congested conditions. To date, only a few limited studies have been conducted measuring the impacts of large commercial airports on nearby communities. Due to the potential expansion at Los Angeles International Airport (LAX) and community concerns, a work plan was developed for an extensive air monitoring and source apportionment study to be carried out by the LAX operator, Los Angeles World Airports (LAWA). The SCAQMD staff was involved in the technical aspects of the work plan development. The current plan calls for measurements of a wide range of criteria pollutants, air toxics and particulate characteristics with both time integrated and continuous measurements. Three primary sites were originally proposed, two at the end of major runways and one community site. A series of 10 – 15 satellite sites are proposed, with less instrumentation and only passive sampling for air toxic volatile

organic compounds (VOCs). Given the complex nature of goods-related sources and emissions, the mix of other sources in the surrounding areas such as the busy I405 and I105 freeways, and the very short time scales of emissions variability due to aircraft, cargo transport, industrial complex, and railyard operations, continuous and more detailed monitoring at more community sites will be essential to distinguish sources and determine short and long term risk to the community.

PROJECT OBJECTIVE

The objective of this study is to further characterize ambient air toxics levels in communities surrounding goods movement sources such as large commercial airports, industrial complexes, and railyards in the Basin. Several SCAQMD studies have measured and continue to measure air toxics. These studies focus on region-wide air toxic levels as well as potential hotspots near sources such as industrial facilities, freeways, general aviation airports, and major seaports. The original study was intended to focus on two of the Basin's large and expanding commercial international airports, LAX and Long Beach Airport. Originally, measurements at Long Beach Airport were to be included but due to time and permission constraints, that portion of the study will be conducted and reported at a later time, but the project was expanded to include measurements of air toxics at an industrial complex, and railyard which are other identified potential hot spots in the Basin. The monitoring efforts were accomplished with a unique set of rapidly deployable mobile air toxics monitoring platforms using the latest technologies for air toxics measurements, including continuous instrumentation. The objective of these studies is consistent with several of the community-scale monitoring goals of the U.S. EPA solicitation, including delineation of local air toxic concentration gradients driven by proximity to sources, characterizing near-source concentrations from specific transportation facilities, and developing a baseline reference for longer term measurements tracking airport expansion and emissions reduction strategies. The proposed study enhanced the LAWA study by providing additional capabilities for air toxics monitoring at multiple locations in the surrounding communities. Also, the added studies will yield more information on other areas potentially impacted by increased goods movement.

A set of mobile and flexible monitoring platforms developed under this solicitation provided the means to accomplish these objectives. The mobile platforms deploy on the time scale of hours rather than weeks, allowing for more spatial coverage and rapid adjustment to locations based on monitoring results. The platforms and equipment have sufficient flexibility to operate on both land-based power and self-contained battery power. Instrumentation includes both traditional air toxics monitoring equipment, as well as lower power equipment for battery operation. A variety of traditional time-integrated methods would be combined with newer continuous methods for air toxics measurements. Continuous data, combined with continuous meteorological data, is extremely valuable in determining source locations, emission profiles, and exposure variability. Thus, Evaluation of Hydrocarbon Data from the LAX Air Quality Source Apportionment Study's Demonstration Project, the LAX gradient study, Mira Loma/60 Freeway Gradient Study, and San Bernardino Rail Yard Gradient Study have been conducted to address Task 3*: Conduct Field Monitoring at Airports and Surrounding Communities***.**

A subset of the air toxics to be measured is included in Table 1. Airports are a complex mix of many source types, including aircraft, ground equipment, terminal operations and road traffic. Therefore, the full suite of pollutants measured as part of MATES-IV, the NATTS Program, and other SCAQMD air toxics measurement studies will be examined. Of particular relevance to airports is lead, which is a component of general aviation fuel, acetaldehyde and acrolein, which have been shown to be emitted from jet engines at relatively higher levels than internal combustion engines, and the typical mobile source air toxics such as 1,3-butadiene and benzene.

Table 1. Selected Substances to be Monitored.

Target Pollutants		
Benzene	Carbon Tetrachloride	Chloroform
1,3-Butadiene	Propylene Dichloride	Trichloroethylene, TCE
Methylene Chloride	Tetrachloroethylene (Perchloroethylene)	Beryllium and Compounds
Acrolein	Arsenic and Compounds	Lead and Compounds
Cadmium and Compounds	Hexavalent Chromium	Acetaldehyde
Manganese and Compounds	Nickel and Compounds	Elemental Carbon
Formaldehyde	Organic Carbon	PM_{10}

Mobile Monitoring Platform (MMP)

The development and testing of the flexible MMPs satisfies Task 2: *Acquire and Test Instrumentation and Modify Mobile Platforms for Community Monitoring*. The MMPs are equipped with two BGI (Omni instruments), filter-based particulate samplers that are supplied with an interchangeable orifice to allow selectable measurements of TSP, PM10, PM4, PM2.5, or PM1. A DustTrak DRX (TSI, Inc.) measures the mass concentration of different size fractions of PM continuously. Further particulate measurements are achieved with a Condensation Particle Counter (CPC, model 3781; TSI, Inc.), which monitors UFP down to 6 nm and in concentrations of up to 500,000 particles per cubic centimeter (#/cm3). A portable Aethalometer (Magee, Inc.) for real-time measurements of BC (black carbon) was also installed. To achieve optimal sampling conditions the inlets of all particulate instruments are mounted inside a 0.2 m wide x 0.4 m high (standard 8" x 16") HVAC duct, which is equipped with variable speed DC fans and has no air flow restrictions from the inlet to the exit. The inlet duct, elevated to 3.8 meters from the ground, maintains a 0.4 meter radius curve before entering the MMP. Each instrument's inlet is either centered or offset from the center of the duct by 2.5 cm (1 inch) to minimize air stream shadow effects from the previous inlet head. The Particle Loss Calculator (Von der Weiden, et al., 2009) was implemented to achieve isokinetic conditions for 3/8" tubing inlets utilized for both the CPC and the DustTrak DRX. To attain these calculated values a Dwyer 641RM-12-LED air flow velocity meter has been implemented to measure air velocities at several points in the manifold. This is currently achieved manually, with eventual computer control to compensate for variable exterior wind velocities. These variable fans are the only constituent of the particulate collection system, other than the CPC, without an internal power supply. An added gel-cell battery supplies power to the variable fans during power loss events; this gel-cell battery also provides back-up power to the Climatronics All-In-One weather sensor, which measures temperature, humidity, wind speed and direction, and barometric pressure. The MMP (Figure 1)

also allows for measurements of gaseous species via a modified permanent station gaseous manifold inlet. A rotating inlet rises to 4.3 meters in operation mode and is in-line with a standard 6 port Pyrex glass station manifold. A Nitric Oxide Monitor with the NO2 converter add-on (2B Technologies) allows for the measurement of NO-NOx. A Baseline-Mocon Series 9000 NMHC (Mocon, Inc.) continuously measures methane and NMHC levels. This in conjunction with a Xontech 912 multi-canister sampling system (Xontech, Inc.) allows for triggering the collection of Silonite lined canister samples (Figure 2) at user defined levels programmed with a Barix Barionet 100 PLC. A Syntech Spectras GC (Syntech Inc.) complements the NMHC and is equipped with either a light (1 to 6 carbon chain) or heavy (7 to 12 carbon chain) column depending on the focus of the study. The only gaseous instrument not installed off the gaseous manifold is the Q-Trak CO-CO2 monitor (TSI, Inc.), which is installed inside the HVAC manifold with the particulate instruments.

Figure 1 Mobile Measurement Station

Figure 2 Mocon and Xontech 912 with Canisters

Power for the MMP is provided via 220 Volt shore power, a propane generator, or a bank of 8 deep cycle batteries wired at 24 Volts. Shore power is the optimal choice for this particular application and the MMP can accept up to 60 Amps, although in the field this rarely is an option. The Magnum ME-AGS (Auto Generator Start) monitors the battery bank voltage, and initiates the generator start as the battery voltage drops to a given level, nominally set at 20 Volts. Generator operation during certain times of the day (i.e. nighttime in residential areas) may be limited due to noise concerns. For the study in Colton the ME-AGS initiates generator start at either 21 or 22 Volts depending on required generator no-run time-span. Our solar panel option is not available at this time, but optimally six 195 Watt solar photovoltaic panels or flexible panels totaling up to 350 Watt will be installed. The 1170 Watt rigid solar panels will be equipped with a second air conditioner (600 Watt DC) to eliminate the impact of direct solar heating. Cooling the MMP is a primary energy-use requirement and when shore power is unavailable, the air conditioner only operates in series along the generator powered AC to DC inverter. As a result, not just voltage but interior temperature is an initiator for the ME-AGS and starts the generator at 90 °F (31.5 °C).

Pilot Study: Colton

A pilot study was conducted in Colton, CA, to evaluate the performance of the MMP and to determine the impact of motor-vehicle emissions from two major freeways on a proposed future soccer field and park. Previous studies have shown high levels of ultra fine particles (UFP) and

other air pollutants along major interstates in Southern California (Hua et al., 2008; Zhu et al., 2002). In addition to UFP, increased BC (black carbon, a product of incomplete combustion and an indicator of diesel particles) concentrations have been measured near freeways characterized by a high heavy duty diesel traffic volume (Zhu et al., 2002).

The MMP was located roughly at midpoint of the field, about 30 meters north of the side access street, and less than 700 m from two major freeways. The nearby San Bernardino and Fontana monitoring stations (both part of the SCAQMD monitoring network) served as control sites. The MMP is equipped with a power line conditioner for low quality high noise AC shore power. The initial portion of the pilot study included the power conditioner in-line with the battery bank. The current draw of the power line conditioner is over 22 Amps, and the particulate instruments collectively have a current draw of less than 3 Amps. Figure 3a shows that when operated in-line with the battery bank the power line conditioner introduces a noticeable background noise on the collected UFP data. After removal of the power line conditioner in series with the DC to AC inverter, this noise is substantially reduced (Figure 3b) because of lower power requirements resulting in ME-AGS initiating the generator approximately every 10 hours as opposed to a start every 2 hours.

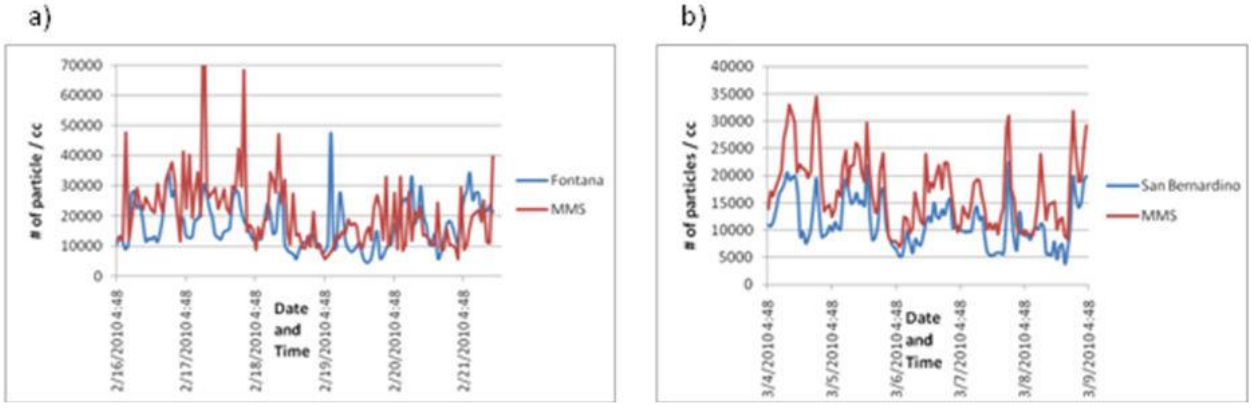


Figure 3 Ultrafine particle number concentration (UFP; #/ cm3) data obtained with the power conditioner in-line with the battery bank (a) and off-line (b)

All data collected during this field study were analyzed to evaluate the MMP as a monitoring platform and also the data was used to assess the effect of motor-vehicle emissions from nearby freeways on the UFP and BC levels measured at the Colton site. The full report, *Air Toxics Ambient Monitoring at a Proposed Recreational Park in Colton, CA*, was publically released (Appendix A).

Los Angeles Airport Study: Evaluation of Hydrocarbon Data from the LAX Air Quality Source Apportionment Study's Demonstration Project

One MMP was deployed at the Los Angeles International Airport as part of the Countless Environmental speciated hydrocarbon study started in 2008. To complement the measurements made during the study, several days of VOC monitoring were conducted at two sites downwind of a taxiway at LAX in April 2011. The two monitoring sites are shown in Figure 4; the rectangle represents the SCAQMD MMP in a parking lot and the circle represents the blast fence

site. The two sites were approximately 170 meters and 120 meters respectively from the South Runway site.

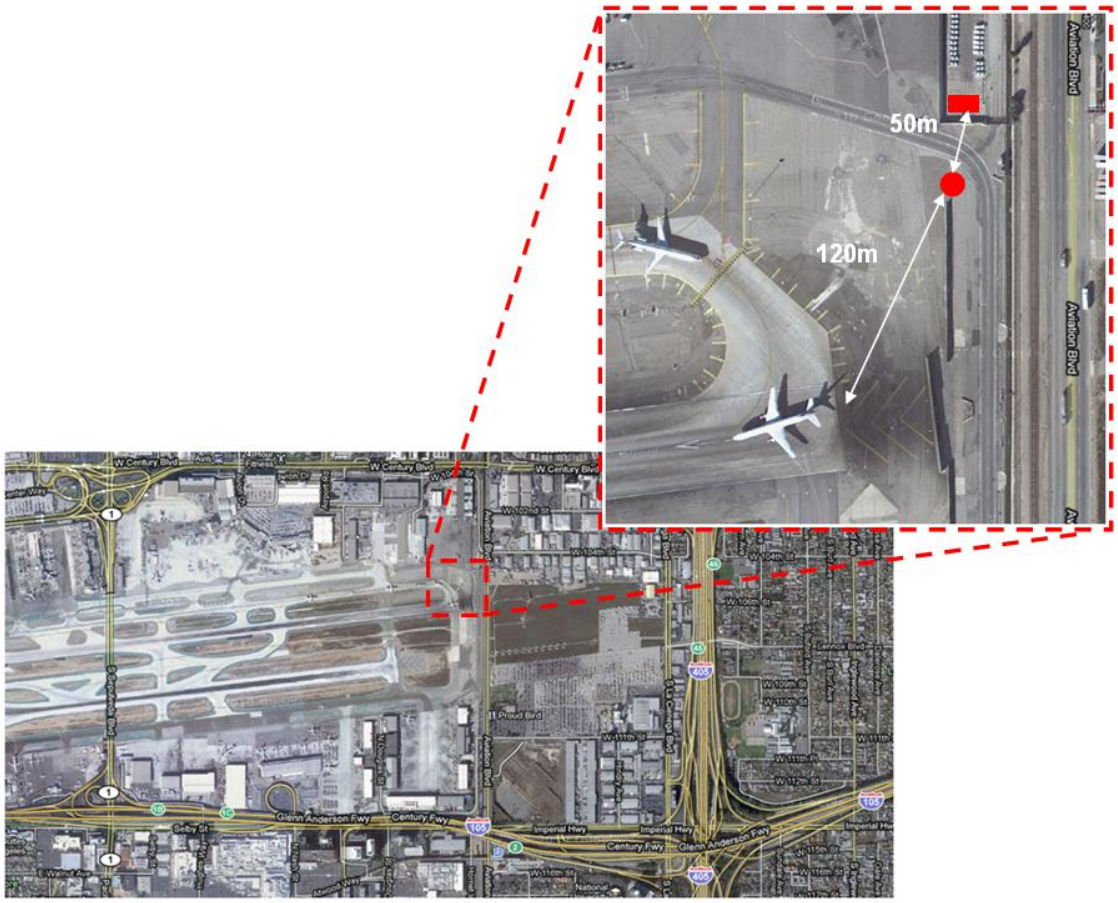


Figure 4 SCAQMD Monitoring Sites for LAX Air Quality Source Apportionment Study's Demonstration Project

Los Angeles International Airport Gradient Study

As part of MATES IV, enclosures, each containing a micro aethalometer (Magee AE22) and portable CPC (TSI 3781), were placed along the anticipated landing and take off routes as shown in Figure 5 to capture a potential gradient from the airport runways. One MMP conducted measurements simultaneously with Desert Research Institute (DRI) as a quality control check.

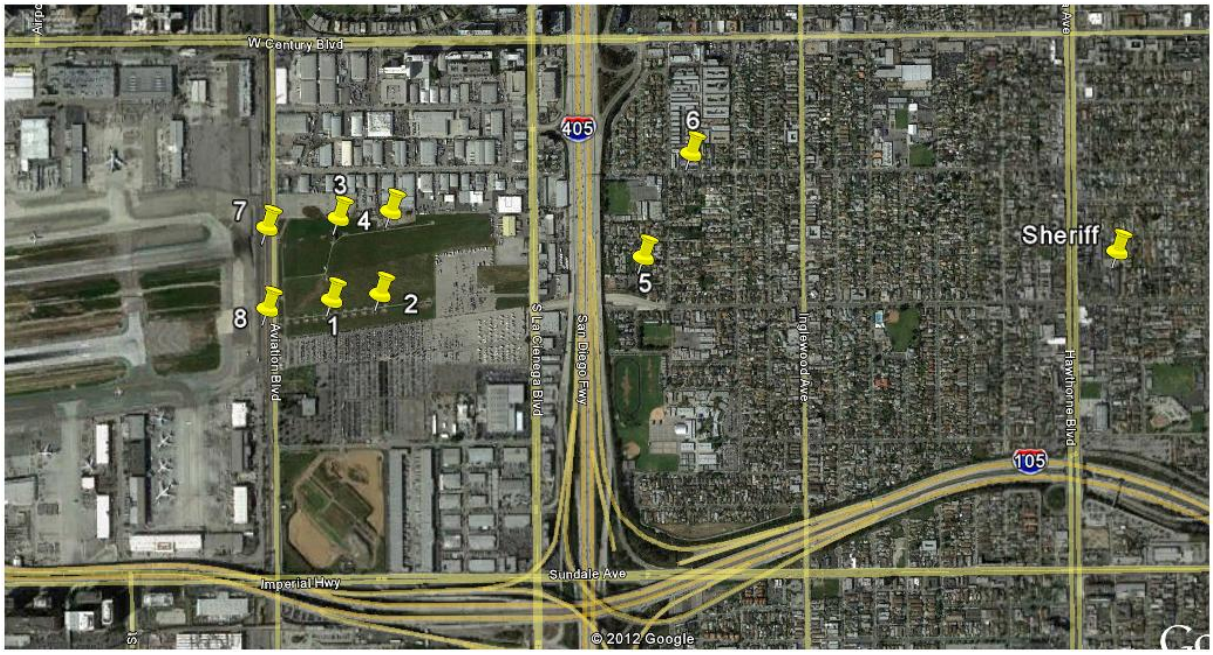


Figure 5 SCAQMD Monitoring Sites for LAX Gradient Study

In addition, to assess impacts to neighboring communities, the two MMPs were deployed to community locations North, South, East, and West of LAX.

- The Southern sites were monitored for a 24 hour period 10-31-12. The southern sites consisted of LAX's Community South (CS) monitoring sites and Hilltop Park. Both these sites are in the City of El Segundo.
- The Northern sites were monitored 9-5-12 through 9-7-12. The Northern sites consisted of SCAQMD LAXH air monitoring station and a Southern California Gas Company facility located in Playa Del Rey.
- The Eastern sites were monitored 10-23-12 through 10-25-12. The Eastern sites consisted of LAX Lot B and Lennox Middle School.
- The Western sites were monitored 10-3-12 through 10-5-12. The Western sites consisted of SCAQMD "Dunes" wind monitoring site and Dockweiler State Beach.

Refer to Figure 6 for location of community sampling sites.

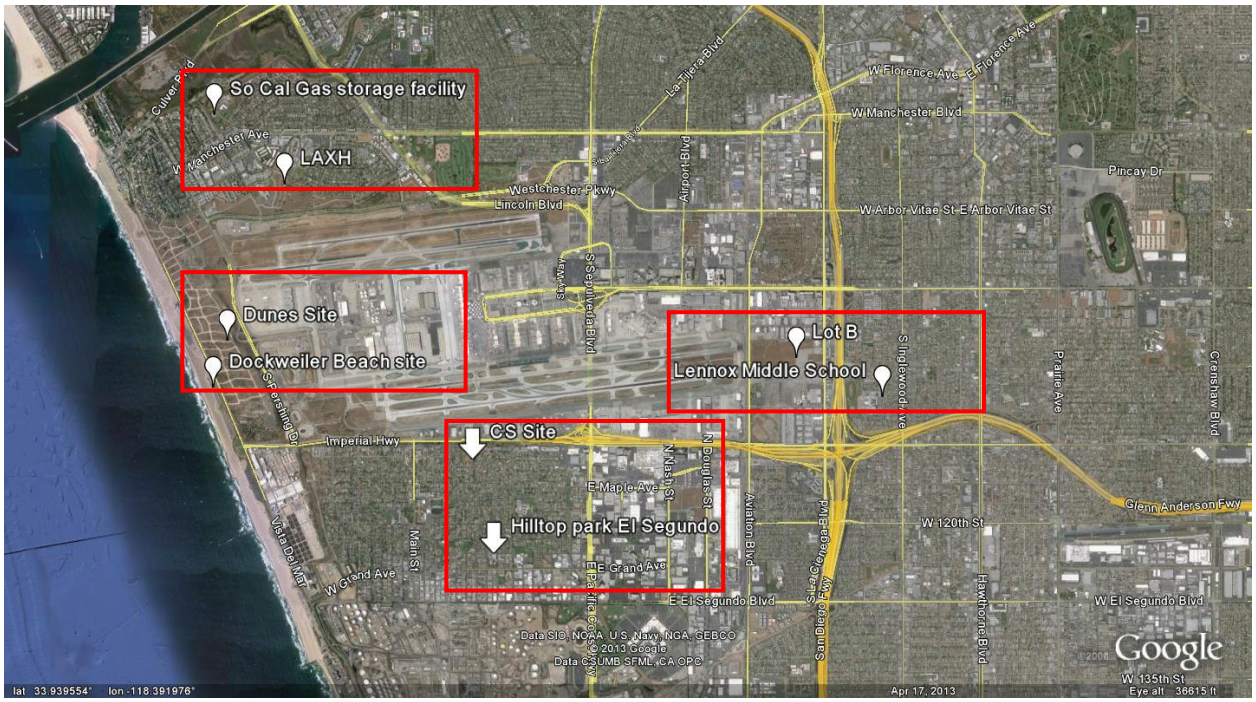


Figure 6 LAX Community Sampling Locations

Data for the LAX Gradient Study is being finalized and will be reported as part of the *MATES IV Final Report*.

Mira Loma/60 Freeway Gradient Study

As part of MATES IV, the MMPs and enclosures were placed throughout the Mira Loma neighborhood, as shown in Figure 7 to capture a potential gradient due to the 60 Freeway / Etiwanda Ave / Industrial complex. The enclosures were configured identically as in the LAX gradient study; each containing a micro Aethalometer (Magee AE22) and portable CPC (TSI 3781). The MMPs were configured with a Magee Portable Aethalometer, TSI 3785 CPC, a TSI DustTrak DRX Aerosol Monitor, and a Climatronics AIO compact weather station. Sampling was conducted on 7 different dates from mid January to early March, 2013. Each sampling period started before pre-morning rush hour traffic and concluded mid afternoon.

Figure 7 Mira Loma Community Sampling Locations

Collocation with an Air Monitoring station for the MATES IV Mira Loma Community gradient study was conducted in early January. The collocation of the CPCs and Aethalometers comprised the MMPs, the enclosures, and the MLVB station. For this collocation study, a Magee Portable Aethalometer and a TSI 3785 CPC were installed at the MLVB station in a similar manner as the MATES stations which the installations occurred later in the year in mid 2013.

In addition to the initial collocation with the MLVB station, daily collocations were performed between enclosures. For this stage of the Mira Loma deployment, one enclosure was designated as the primary. Collocation consisted of the primary enclosure rotating hourly between each of the enclosure sites.

Data for the Mira Loma/60 Freeway Gradient Study is being finalized and will be reported as part of the *MATES IV Final Report*.

San Bernardino Rail Yard Gradient Study

As part of MATES IV, the MMPs and enclosures were placed to capture a potential gradient due to the San Bernardino Rail Yard just west of the adjacent Interstate-215, as shown in Figure 8. The enclosures were configured in the same manner as in the LAX gradient study; each containing a micro Aethalometer (Magee AE22) and portable CPC (TSI 3781). The MMPs were configured with a Magee Portable Aethalometer, TSI 3785 CPC, a TSI DustTrak DRX Aerosol Monitor, and a Climatronics AIO compact weather station. Sampling was conducted on three separate dates in September, 2013.

Figure 8 MATES IV San Bernardino Rail Yard Sampling Locations

For the San Bernardino Rail Yard deployment the daily collocation was conducted at the ParkWest site prior to rush hour traffic adjacent to I-215. Immediately following collocation between the MMPs and enclosures, the MMPs and enclosures were deployed to their designated sites. The sampling period concluded in the mid afternoon.

Data for the San Bernardino Rail Yard Gradient Study is being finalized and will be reported as part of the *MATES IV Final Report*.

Appendix A

Air Toxics Ambient Monitoring at a Proposed Recreational Park in Colton, CA

December 16, 2010

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

M E M O R A N D U M

DATE: 12/16/10

TO: Interested Parties

FROM: Atmospheric Measurements Branch, SCAQMD

SUBJECT: Air Toxics Ambient Monitoring at a Proposed Recreational Park in Colton, CA

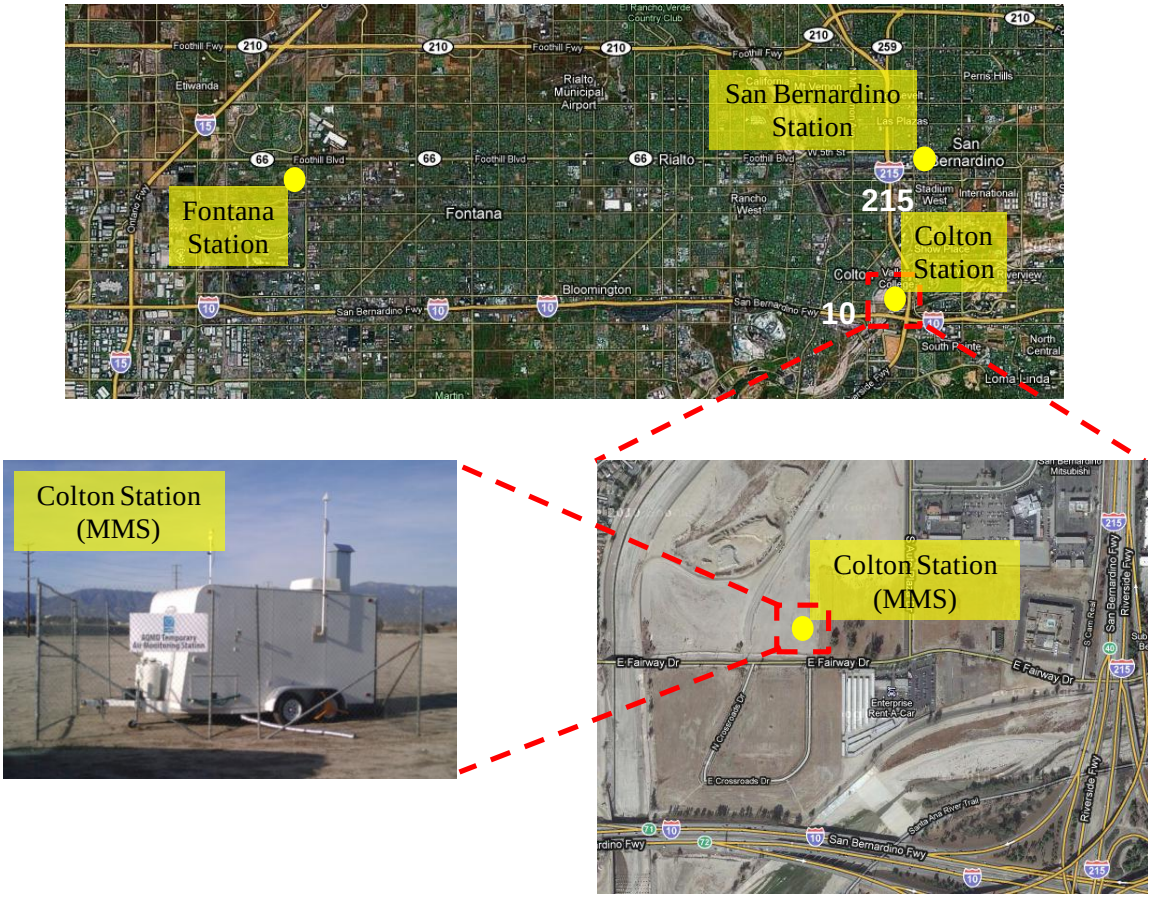
EXECUTIVE SUMMARY: In the Winter/Spring of 2010, the atmospheric concentrations of particulate matter (PM_{10}), ultrafine particles (UFP) and black carbon (BC) were measured at a proposed recreational park in Colton, CA to evaluate the extent to which motor-vehicle emissions from the nearby I-10 and the I-215 influence local air quality. A comparison between measurements taken at the proposed park and at two permanent air monitoring stations located much further from freeways shows that the atmospheric levels of the measured pollutants were similar at all sites. This suggests that the proposed park location experiences pollution levels that are typical for the region and thus is not impacted by on-road sources any more than areas located further away from freeways. A follow-up study will be conducted in 2011 during different seasonal conditions.

TECHNICAL ANALYSIS: Between 02/16/10 and 04/07/10, the South Coast Air Quality Monitoring District (AQMD) conducted a measurement study in Colton, CA, at a location proposed for a recreational park / sport complex. This area is situated in a flood plain near the intersection of two major freeways (the I-10 and I-215), both characterized by heavy vehicular traffic. The main objective of this field campaign was to evaluate the extent to which motor-vehicle emissions from the I-10 and the I-215 influence air quality at the proposed park site. Proximity to a freeway could potentially lead to increased exposure to one or more combustion-related pollutants and an accurate assessment of local air quality conditions before the beginning of the construction project will allow the city to better evaluate the extent of such exposure.

For this purpose a Mobile Measurement Station (MMS) comprised of a 14 foot dual axle trailer equipped with a wide array of air quality measurement instruments was deployed at the southern edge of the proposed park area closest to the I-10 freeway. The MMS allows for the measurement of both particle and gaseous air pollutants including: coarse particulate matter mass (PM_{10}; particles with an aerodynamic diameter less than 10 µm), black carbon (BC, primarily from diesel emissions and other combustion processes), and particle number (an indicator of ultrafine particles, or UFP, here defined as particles with an aerodynamic diameter less than 100 nm) concentrations. A weather system was used to measures barometric pressure, temperature, wind speed and direction. Unlike PM_{10}, UFP is currently not regulated by the U.S. EPA although recent studies have shown that exposure to this PM fraction is associated with the occurrence of both respiratory and cardiovascular problems.

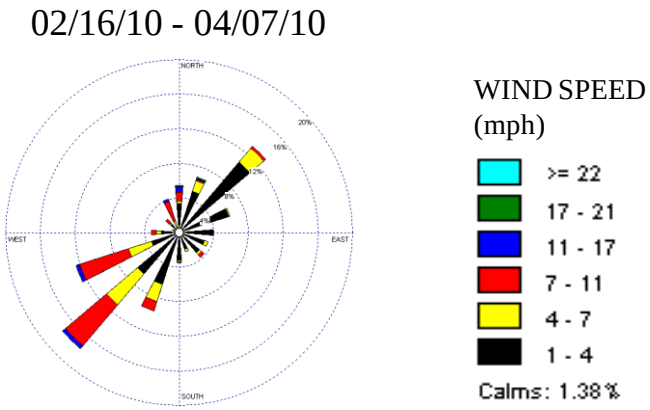
The MMS was set-up about 650 m west of the I-215 and approximately 450 m north of the I-10. All air pollutant concentrations measured in Colton were then compared to those obtained at the permanent San Bernardino and Fontana air monitoring stations during the same time period. These are two of 36 permanent air monitoring sites operated by AQMD in the South Coast Basin and are located further away from the influence of both the I-10 and the I-215. The Fontana station is upwind of the temporary site in Colton and was intended to represent urban background concentrations for the study area. Figure 1 shows the geographical location of the Colton site with respect to the San Bernardino and Fontana stations, and a picture of the MMS.

Figure 1 Aerial view of the study area illustrating the geographical location of the Colton site with respect to the San Bernardino and Fontana stations. An actual picture of the MMS is also included



As shown in Figure 2, the wind flow measured at the Colton station through the duration of study was primarily from the south-west, although a low speed north-east component was also present. The same wind pattern was observed during both February and March 2009 (not shown). These data demonstrate that the site in Colton was located downwind of the I-10 freeway for most of this field campaign.

Figure 2 Average wind speed and direction at the Colton site between 02/16/10 and 04/07/10. Similar wind roses were observed during both February and March 2009 (not shown)



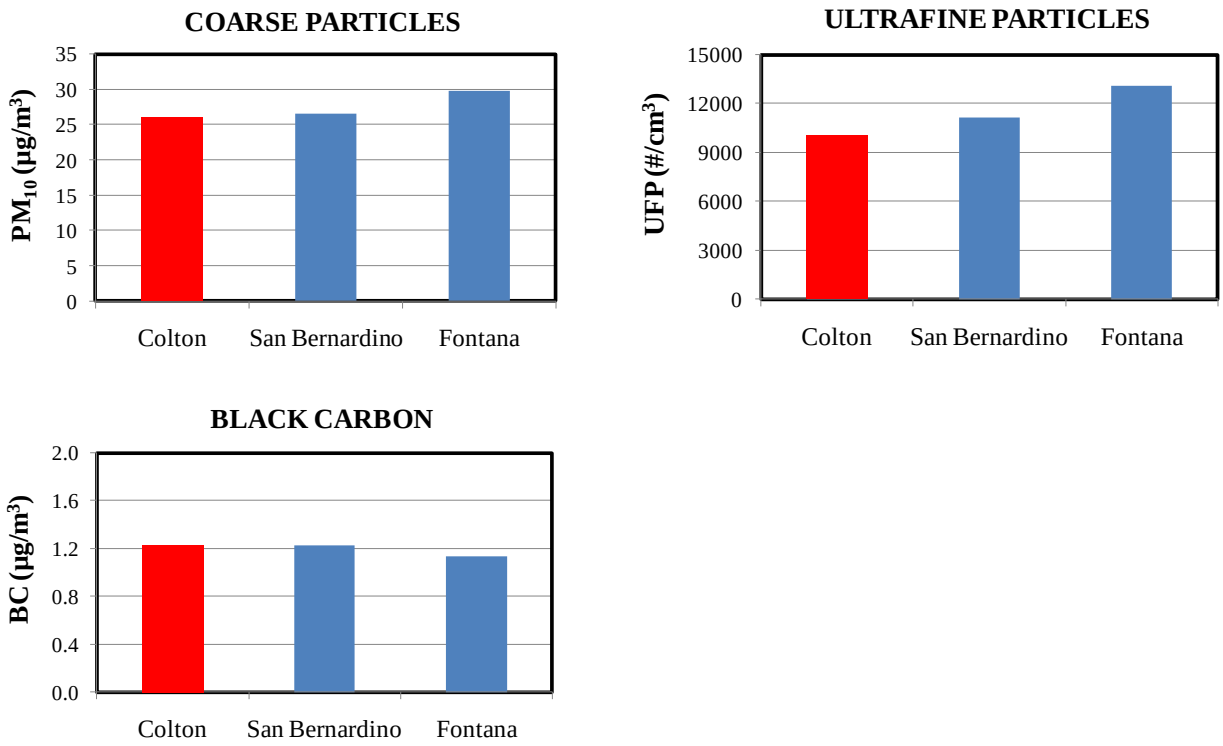
As shown in Table 1 and Figure 3, the study average PM_{10} levels at the Colton site and at the San Bernardino and Fontana stations were 25.8, 27.4 and 31.0 $\mu g/m^3$, respectively. The fact that the average PM_{10} concentration in Colton was lower than the corresponding levels in San Bernardino and Fontana (background) suggests that motor-vehicle emissions from the I-10 and I-215 freeways did not have a substantial impact on the atmospheric levels of this pollutant measured at the proposed park during the study period. These values are lower than the study average PM_{10} concentration observed in the South Coast Air Basin during the Multiple Air Toxics Exposure Study (MATES III; 2004-2006) (37.0 $\mu g/m^3$). None of the daily PM_{10} concentrations measured during the current field campaign was close to or higher than 150 $\mu g/m^3$, the present 24-hour National Ambient Air Quality Standard (NAAQS) for PM_{10}.

Table 1 Summary statistics for the PM_{10}, UFP and BC measurements taken at the Colton site and at the San Bernardino and Fontana stations

	Colton			San Bernardino			Fontana		
	#PM_{10} ($\mu g/m^3$)	*UFP ($\#/cm^3$)	^BC ($\mu g/m^3$)	#PM_{10} ($\mu g/m^3$)	*UFP ($\#/cm^3$)	^BC ($\mu g/m^3$)	#PM_{10} ($\mu g/m^3$)	*UFP ($\#/cm^3$)	^BC ($\mu g/m^3$)
Average	25.8	9888	1.23	27.4	11170	1.23	31.0	13069	1.13
Median	26.0	8348	1.00	30.0	10641	0.96	33.0	12685	0.88
Min	9.40	1824	0.00	14.0	1237	0.04	12.0	1363	0.02
Max	42.0	34595	7.06	44.0	33862	7.04	56.0	37653	9.31
Standard Deviation	9.66	6188	0.88	11.8	4405	0.94	16.0	5322	0.96

#PM_{10} data were collected only between 02/17/10 and 03/31/10
*UFP data at all stations are only available between 03/16/10 and 04/07/10
^BC data were collected between 02/16/10 and 04/07/10

Figure 3 Average PM_{10}, UFP and BC levels at the Colton site (red bars) and at the San Bernardino and Fontana stations



Because of an instrument malfunction, UFP data at the Colton station were only collected between 03/04/10 and 04/07/10, and particle count information is available at all three monitoring sites only between 03/16/10 and 04/07/10. During this time period the average UFP number concentrations in Colton, San Bernardino, and Fontana were 9888, 11170, and 13069

#/cm^3, respectively (Table 1). The average particle count level at the proposed recreational park was about 11 and 24% lower than the corresponding values observed in San Bernardino and Fontana (Figure 3). These ambient UFP levels are close to or lower than those observed at other urban sites of the South Coast Air Basin located away from the influence of a major freeway. Previous studies have shown that the concentration of most combustion-related pollutants emitted from motor-vehicles during daytime decreases exponentially downwind of a freeway and reaches background levels after 300-400 m. This data is consistent the previous studies given that the sampling location at the proposed park was more than 450 meters from both freeways

The average BC concentration at the Colton site and at the San Bernardino and Fontana stations were 1.23, 1.23, and 1.13 #/cm^3, respectively (Table 1). These BC levels are comparable to or lower than those observed in the South Coast Air Basin during previous monitoring studies. A comparison of the 1-hour average BC data collected at the Colton and at the San Bernardino stations showed a relatively good correlation (R^2 = 0.70; Figure 4a), while the relationship between the BC levels measured in Colton and Fontana was only moderate (R^2 = 0.45; Figure 4b), indicating a higher degree of variability between the BC values at these two sites. However, the 1-hour average BC concentrations at all three sampling locations tracked each other well (Figure 5) and, as was observed for PM_{10} and UFP, our results indicate that motor-vehicle emissions from the I-10 and I-215 freeways did not have a substantial impact on the atmospheric BC levels measured at the proposed recreational park.

Overall, the similarities between measurements at the proposed park and the permanent AQMD monitoring stations suggest that the concentrations of PM_{10}, UFP and BC at the proposed park in Colton were influenced primarily by emissions from regional pollution sources. Pollutant levels at the park location were not impacted by on-road sources to a greater extent than areas located further away from freeways. A follow-up study will be conducted in 2011 during different seasonal conditions.

Figure 4 Linear regression between the 1-hour average BC data collected a) at the Colton and San Bernardino sampling stations and b) at the Colton and Fontana sites

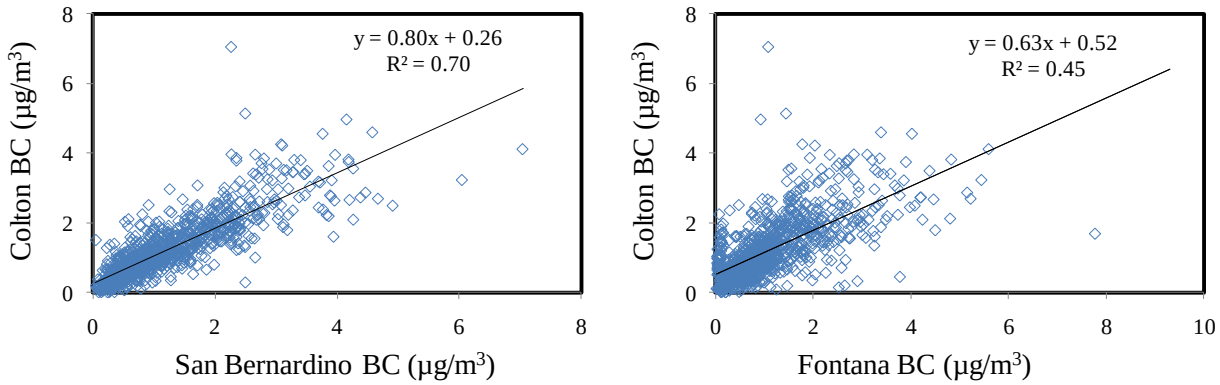
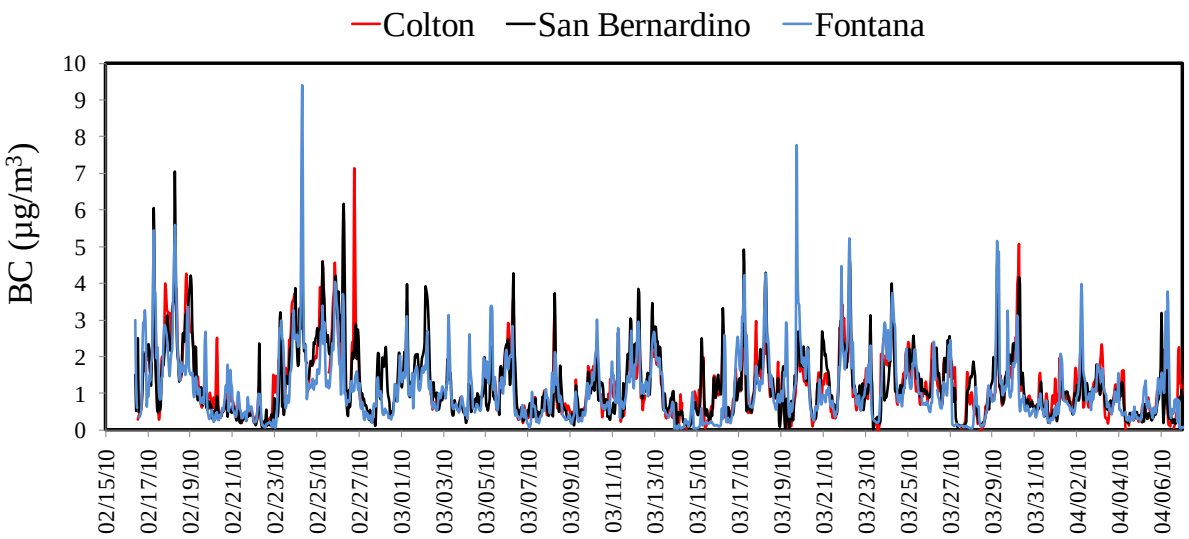


Figure 5 Time series showing highly resolved (1-hr average) BC data at the three sampling sites


Colton
San Bernardino
Fontana
BC (µg/m3)
10
9
8
7
6
5
4
3
2
1
0
02/15/10
02/17/10
02/19/10
02/21/10
02/23/10
02/25/10
02/27/10
03/01/10
03/03/10
03/05/10
03/07/10
03/09/10
03/11/10
03/13/10
03/15/10
03/17/10
03/19/10
03/21/10
03/23/10
03/25/10
03/27/10
03/29/10
03/31/10
04/02/10
04/04/10
04/06/10