VECTOR CONTROL BACKGROUND MONITORING PLAN (MOSQUITOES AND MIDGES) FOR CALTRANS BMP RETROFIT PILOT PROJECT SITES CALTRANS DISTRICT 7

JULY 1998

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VECTOR CONTROL BACKGROUND MONITORING PLAN FOR CALTRANS RETROFIT BMP PILOT PROJECT SITES

1.0 INTRODUCTION/EXECUTIVE SUMMARY

1.1 Overview

Mosquito abatement is an important concern in southern California because the climate is amenable for a large portion of the year to mosquitoes and the diseases that they can transmit. Biting flies such as mosquitoes are important vectors of disease to humans and domesticated animals. The diseases have a variety of causative agents (e.g., viruses, bacteria, protistans). Approximately eighteen (18) viruses are known to be transmitted by biting flies to humans and other mammals in California; eight (8) of the viruses have been shown to cause febrile and central nervous system illnesses in humans. The rapid increase in population and the addition of new sources of standing water into a historically dry region creates the potential for disease transmission by mosquitoes.

Each year, encephalitis virus transmission is detected in sentinel bird populations which are used as an early warning system of virus activity within urban and rural settings of the region. Ongoing monitoring of wild bird populations in Orange County has indicated that the St. Louis encephalitis virus has been present every year since monitoring began in 1987. Mosquitoes that utilize storm drains, organically-enriched puddles and ponds, wetlands, etc., are capable of transmitting encephalitis to humans and horses, as well as to birds. While the last serious encephalitis outbreak among humans in Southern California occurred in the mid-1980s, mosquitoes and other flies which originate from freeway and stormwater drainage systems, treatment wetlands, and from nearly any unmanaged source of standing water has become a nuisance to people. New or existing habitat that might produce large numbers of mosquitoes is a concern to the public agencies charged with vector control.

1.2 Purpose/Objectives

As a result of litigation between the State of California Department of Transportation (Caltrans) and the National Resources Defense Council (NRDC), Caltrans is currently in the process of developing a Best Management Practice (BMP) Retrofit Pilot Program in Caltrans District 7. During the summer and autumn of 1998, Caltrans will be constructing devices to evaluate the efficiency of eleven (11) designs for improving the water quality of stormwater discharge at thirty-four (34) sites in southern California. The proposed stormwater devices have the potential to produce vectors of human disease and nuisance insects. To document any change in site conditions (i.e., mosquito populations)

it is necessary to perform background monitoring. The purpose of background monitoring is to determine the relative abundance of adult host-seeking and gravid mosquitoes, as well as non-biting midges at Caltrans Stormwater Best Management Practices (BMPs) locations within Los Angeles County (Caltrans, District 7) prior to stormwater device operation. The background monitoring program is designed to duplicate the trapping efforts included in the vector/nuisance insect monitoring programs under development for the operational BMPs. The data collected by the background monitoring program will permit comparison of insect abundance before and after the BMP devices are operational.

1.3 Sampling Overview

Potential vector control problems are foreseen at some of the BMP sites in Caltrans' Retrofit Pilot Program at sites in Los Angeles County. In order to evaluate the background levels of mosquito and midge populations at BMP pilot sites, a monitoring program will be undertaken to sample the following:

(1) host-seeking adult female mosquitoes by carbon dioxide-baited traps,
(2) gravid female mosquitoes by gravid traps, and
(3) adult midge populations by light traps.

The methods employed will be similar to those planned for the BMP pilot sites after construction of the projects are completed. Larval surveys by dipping will be an important component of the post-construction mosquito monitoring program; however, because standing water is not present at the sites prior to and during construction, larval surveys by dipping are not included in the background monitoring program.

1.4 Equipment Overview

1.4.1 CO2-Light Traps

In order to sample both mosquitoes and midges, carbon dioxide-baited and ultraviolet light will be combined into a single trap. A miniature CDC light trap with single 4-watt blacklight lamp (wavelength range: 320-420 nm in the near ultraviolet) will be retrofitted to include a carbon dioxide source. The top of the trap will be replaced with (i) an adapter and (ii) an insulated storage container for solid carbon dioxide equipped with a manifold for delivering approximately 500 ml CO2/min. The carbon dioxide sublimates above the fan and motor which provide the suction to draw host-seeking mosquitoes into the collection chamber. The downdraft from the fan also prohibits the mosquitoes from exiting the trap. In order to standardize the trapping period, the trap will be equipped with a photoswitch and gate system that will be activated at dusk and deactivated after sunrise. The gate will close and restrict entrance and egress from the trap after sunrise.

1.4.2 Gravid Trap

The Reiter-Cummings gravid or oviposition trap is based on a modification of a design by Reiter (1983, 1986, 1987). The modifications include improved electronics and photo-activated switches. The trap has two major components. The upper component assembly (42 X 21 X 17 cm) includes the motor, fan, intake and exhaust manifolds, power supply, and the collection chamber. The parts are nested for transport and the reassembled on site. The lower component is a heavy-duty black plastic tray (approximately 20 X 38 X 13 cm) that serves as a basin for the organic infusion and as a support for the upper component assembly. The trap weight (without infusion) is 2.5 kg.

1.5 Roles and Responsibilities

The background monitoring program will be carried out from June 1998 through December 1998 by personnel under the supervision of Dr. William Walton, Department of Entomology, University of California, Riverside.

A report summarizing the abundance and composition of host-seeking adult mosquitoes and midges collected at the BMP sites from the period of June 1998 to December 1998 will be forwarded to Caltrans by January 8, 1999. Data analysis and the writing of the final report will be carried out by Dr. William Walton.

2.0 SAMPLING STRATEGY

2.1 Mosquitoes

Two of the most important attractants to hematophagous (blood-feeding) flies, such as mosquitoes, are carbon dioxide and olfactory cues emitted by the potential host (Service 1993). While host odors are highly specific, carbon dioxide produced by breathing is universally emitted by hosts. A female mosquito searching for blood will follow the concentration gradient of carbon dioxide in the plume emitted by a prospective host for approximately 3 meters. Other cues such as host odors, body heat, etc., tend to be more important once the female mosquito is in proximity (<2 m) to the prospective host. Consequently, carbon dioxide is routinely used as bait when sampling the subset of the adult mosquito population that is actively seeking hosts. In addition to differentiating the sexes, adult mosquito populations are often separated into three general categories: resting, host-seeking, and gravid subpopulations. The resting population consists of male and female mosquitoes that are not actively flying and are associated with vegetation, vertical structures, shaded habitats, etc. Sampling the resting population requires considerable effort and the number of individuals collected per unit sampling effort is often quite variable. Resting populations are not frequently sampled as part of routine mosquito surveillance. The host-seeking and gravid subpopulations consist only of females and are routinely sampled by traps containing some form of attractant as part of mosquito surveillance programs. Nearly all female mosquitoes require blood as a protein source for egg development. Male mosquitoes do not ingest blood; they obtain carbohydrates (i.e., sugars) primarily from flowers.

Host-seeking mosquitoes are sampled at night from before dusk until after dawn because most mosquito species seek out hosts during the night, with peaks of host-seeking activity during the crepuscular periods at dusk and dawn. Mosquitoes, like many other insects, are attracted to lights during the night; however, light is appreciably less attractive than is carbon dioxide to host-seeking mosquitoes (Service 1993). While there are mosquitoes associated with wetlands that will take blood meals during the day, feeding is generally restricted to hosts that are within wetland vegetation or are near wetland vegetation (< 6 m).

2.2 Midges

Midges are non-biting flies in the family Chironomidae which are also known as chironomids. Although midges do not blood-feed like mosquitoes, they can become a serious nuisance near wetlands, drainage channels, lakes, golf course ponds, etc. The immature stages of the midge life cycle occur in water. Adult midges are very similar in appearance to mosquitoes and are attracted to lights and to vertical structures, such as the walls of human residences, adjacent to larval habitats. Midges can be a serious concern

near airports where swarms of the flies attracted to runway lights and can interfere with airport operations. Midges are also attracted to light traps. A reasonable approach to estimating the relative size of nuisance midge populations in an area is to use light traps.

2.3 Sampling Equipment

Center for Disease Control (CDC)-type traps which incorporate carbon dioxide as bait are routinely used in mosquito surveillance programs in many areas of the United States (Service 1993), including California. The distance at which a female of a particular mosquito species responds to carbon dioxide is influenced by factors affecting the carbon dioxide plume such as release rate, environmental factors such as wind speed, and by innate host preferences. Mosquitoes that preferentially feed on birds are less receptive to carbon dioxide plumes than are mosquitoes that feed on mammals (McIver and McElligott 1989). The extent of the attractancy of carbon dioxide to mosquitoes is species-specific; several species from North America were attracted from 3-11 m at release rates of 250-4000 ml/min (McIver and McElligott 1989, Service 1993).

Light traps are generally very useful for catching large numbers of particular mosquito species and for measuring relative changes in abundance both temporally and spatially, but, like most trapping methods, light traps attract species unequally (Service 1993). The use of light as an attractant is more artificial than most other attractants because light has been found to disrupt normal behavior of several insects, including mosquitoes (Service 1993). The abnormal behavior is associated with flight around the light source where insects can be repelled by strong incandescent light bulbs. Trap avoidance is overcome by the incorporation of suction devices into trap designs (Southwood 1978). The attractancy of a particular light trap will depend on its design and type of light (Taylor and Brown 1972) and on background light levels. Both natural (e.g., light differences caused by the phase of the moon) and man-made light levels will affect the attractancy of light traps. Light traps that are effective in rural settings with comparative low levels of background light may perform poorly in urban settings containing comparatively high background light levels. Although most light trap designs use incandescent light sources, the attractancy of ultraviolet lamps to mosquitoes was greater than for traps using incandescent or infrared light sources (Ikeuchi 1967, Wilton and Fay 1972, Kloter et al. 1983). Therefore, in urban environments, ultraviolet lamps may provide a more effective, attractant light source than do incandescent lamps.

One important tool for mosquito-borne disease surveillance is the Reiter-Cummings gravid trap based on the original design by Reiter (1983, 1986, 1987). This trap is routinely used throughout the United States to survey gravid and potentially disease-transmitting mosquitoes. Gravid traps caught nearly 90 times as many mosquitoes as did labor-intensive hand collecting techniques at potential mosquito resting sites (Service 1993) and represent an effective, labor-saving method for mosquito surveillance. A

water-based, organic infusion serves as an attractant to gravid (egg carrying) female mosquitoes. As gravid females approach to deposit eggs on the water surface, they are pulled upward into a collection chamber by a battery-operated fan. Because the gravid females will have utilized blood as a protein source for their eggs, there is a greater likelihood that the females trapped by this method will be carrying arbovirus as compared to females collected by carbon dioxide traps. Females that have never taken a blood meal tend to predominate the trap catches in carbon dioxide-baited traps. A second reason for using gravid traps is some of the mosquitoes found in southern California, such as Culex quinquefasciatus and Culex stigmatosoma which are not strongly attracted to carbon dioxide-baited traps, are attracted to gravid traps. Consequently, a better indication of the mosquito fauna in an area will be available when two trapping methods are used concurrently in contrast to only one method.

3.0 SAMPLING LOCATIONS-DISTRICT 7

3.1 Sampling Site Selections

The various BMP pilot sites have been selected so that retrofit options allow for observations pertaining to technical feasibility, costs of retrofitting and benefits. Typical sites were selected along Caltran's right-of-way, including interchanges, park and rides (P & R) and maintenance stations (MS). Each site for a retrofit pilot project has been selected to be appropriate to the type of best management practice to be evaluated and without pre-judgement about the outcome of the associated retrofit pilot study. The specific retrofit BMP locations are described in Table 3-1, below. Selected BMP pilot sites are identified on Exhibit A within Appendix A. In addition, BMP pilot site locations and proposed BMP siting maps are contained within Appendix A.

BMP RETROFIT PILOT PROGRAM SITES-DISTRICT 7, LOS ANGELES
Table 3-1

BMP	Location	Map I.D.	Location Description
Trapping Catch Basin			
	210 West of Orcas	1	The trapping catch basin is located approximately 850 feet (259 meters) west of Orcas Avenue in the City of Lake View Terrace, and consists of four drain inlets, two on each side of the I-210 freeway. The monitoring location can be accessed from Foothill Boulevard.
	210 East of Orcas	2	The trapping catch basin site is located approximately 150 feet (46 meters) east of Orcas Avenue in the City of Lake View Terrace, and consists of a total of four drain inlets, all of which are situated along the westbound I-210 shoulder. The site can be accessed from Orcas Avenue.
	210 East of Filmore	3	The trapping catch basin site is located east of Filmore Street near the I-210/SR-118 interchange in the City of Lake view Terrace.
	210 East of Van Nuys Blvd.	4	The trapping catch basin is located just north of Carl Street, east of Foothill Boulevard, on slopes adjacent to the shoulders of both westbound and eastbound I-210 in the City of Lake View Terrace. The monitoring area can be accessed by the Pierce Street entrance to the Caltrans right-of-way south of the I-210 eastbound freeway.
Catch Basin Inserts			
	Las Flores MS	5	The Las Flores Maintenance Station is located at 2503 Las Flores Canyon Road in the City of Malibu, approximately one-half mile east of Pacific Coast Highway. The site is located in a rural, sparsely populated area.
	Rosemead MS	6	The Rosemead Maintenance Station is located at 9153 Lower Azusa Road, about one mile north of the I-10 freeway, Rosemead off-ramp. The station is located in a commercial area. The BMPs will be installed in the southwest corner of the maintenance station.
	Foothill MS	7	The Foothill Maintenance Station is located at 850 East Huntington Drive, just off the I-210 freeway, Mountain Avenue off-ramp. The station is located in an industrial area with a major storm channel located along the western side of the facility.

Extended Detention Basin			
	I-605 (south)/SR-91 Interchange	8	The site is located between the SR-91 (eastbound)/I-605 (southbound) connector and I-605 (southbound) in the City of Cerritos. The site lies at a depth of approximately 20 feet below grade of I-605. Access to the site is provided from Artesia Boulevard.
	I-5/I-605 (south)	9	The site is located between the I-5 and the I-605 (southbound)/I-5 (southbound) connector in the City of Downey in southeastern Los Angeles County. Maintenance access is provided by an access road off the I-5 southbound roadway.
Infiltration Basin			
	I-605 (north)/SR-91 (west)	10	The infiltration basin site is located in the cloverleaf interchange from the I-605 northbound to the SR-91 westbound in the City of Cerritos. The site may be accessed from the I-605 northbound freeway. No major structures are located within the vicinity of the infiltration basin.
Infiltration Trench			
	Altadena MS	11	The Altadena Maintenance Station is located at 212 North Windsor Avenue just off the I-210 freeway, North Windsor Avenue off-ramp. The site is located in an urban area with commercial uses on adjacent sides and the I-210 freeway located to the west.
Biofiltration Swale			
	Cerritos MS	12	The biofiltration swale site is located behind the southern side of the Cerritos Maintenance Station, along the SR-91 westbound embankment. The site can be accessed from the maintenance station, which is located at 16849 Studebaker Road in the City of Cerritos. The precise location for the swale is from the SR-91 drainage outlet, located at the foot of the SR-91 westbound slope, to the main area outlet culvert.
	I-605 (north)/SR-91	13	The site is located behind the I-605 northbound, the SR-91 westbound/I-605 southbound connector, and the I-605 northbound/SR-91 westbound connector.
	I-5 (south)/I-605 (south)	14	The site is located between the I-5 southbound and I-605 northbound connector.
	I-605 (north)/Carson & Del Amo	15	The site is located along the I-605 northbound freeway between the Del Amo Boulevard and Carson Street exits. Access to the area can be achieved from the I-605 northbound shoulder.
Biofiltration Strip			
	Altadena MS	11	Refer to Map I.D. No. 11 Location Description, above.
	I-605 (north)/SR-91	13	Refer to Map I.D. No. 13 Location Description, above.

Media Filter			
	Eastern Regional MS	16	A media filter will be sited at the Eastern Regional Maintenance Station located at 1945 Workman Mill Road, just off the 60 freeway in the City of Whittier. The maintenance station has multi-crew operations and experiences heavy vehicular traffic. The media filter is located in an area that is free from traffic and storage facilities, allowing acceptable access. The site is approximately 5 acres and is located in a commercial/industrial area.
	Foothill MS	7	Refer to Map I.D. No. 7 Location Description, above.
	Termination P & R	17	The Termination Park & Ride is a large facility at the eastern terminus of I-105 at the I-105/I-605 interchange in the City of Norwalk. A small portion of the facility is located on the westside of I-605. The facility is adjacent to a Green Line Metrolink station and has a bus terminal integrated into the park & ride facility. The lot has direct access to the car pool lanes on I-105. It is located in a predominately residential area, and is bounded by residential areas to the east , south and west, and by on-ramps and off-ramps for I-105 to the north.
	Paxton P & R	18	The Paxton Park & Ride facility is located near the I-210/SR-118 interchange in the Pacoima region of the City of Los Angeles. It is located on the southeast corner of Paxton Street and Foothill Boulevard, with access from both streets.
Oil/Water Separator			
	Alameda MS	19	The Alameda Maintenance Station is located at 1740 East 15th Street, just off the I-10 freeway/Alameda Street off-ramp. The site is located under an I-10 freeway bridge.
MCCT			
	Metro MS	20	The Metro Maintenance Station is located at 2187 Riverside Drive, about 1 mile from the Riverside Drive off-ramp of the I-5 freeway. It is located directly under State Route 2.
	Via Verde P & R	21	The Via Verde Park & Ride site is located on the north side of Via Verde Road, upslope of and adjacent to the southbound off-ramp of the I-210 freeway to Via Verde Road.
	I-105/Lakewood P&R	22	From the I-105 take the Lakewood exit. Cross over the freeway and enter the park and ride facility from Lakewood. The MCCT is located on the southeast corner of the lot.

4.0 SAMPLING PROCEDURES

4.1 Logistics

A set of traps (one CO2-light and one gravid trap) will be run on the same night at each BMP pilot site location (refer to maps contained within Appendix A). For locations where more than one BMP device is planned (BMP sites 7, 11, 13), one set of traps will be run. The exact siting of the traps at each BMP location will be determined after site visits and discussions with Caltrans personnel. Traps will be placed as close to prospective sites of the BMP devices as possible so not to interfere with daily operations at Maintenance Stations (MS) and Park and Rides (P&R), and so not to be jeopardized by or interfere with construction of the BMP devices. Traps should be situated in comparatively sheltered locations, preferably near vegetation or buildings. At freeway interchanges, placing the traps in vegetation will reduce the likelihood that traps will be vandalized and power supplies will be stolen. Encroachment permits for construction and monitoring activities have been filed for each individual BMP pilot site within District 7.

One person will put out sets of traps at sites 21, 7, 11, 1, 2, 4, 3, 18, 5 (refer to Exhibit A contained within Appendix A). This person will spend the night in Malibu, collect the traps the following morning, and return to Riverside to process the samples. A second person will put out sets of traps at sites 16, 6, 20, 19, 22, 9, 14, 17, 13, 10, 12, 8, 15 (Exhibit A). This person will spend the night in Los Angeles, collect the traps the following morning, and return the samples to Riverside.

Additional duties for the two persons will include (1) processing samples, (2) computer data entry, (3) preparing the oviposition infusion, (4) cleaning the infusion chambers, (4) servicing the traps (i.e., motors, fans, batteries), (5) cleaning traps, and (6) routine maintenance of vehicles as required by the University Fleet Services.

4.2 Data Collection

4.2.1 CO2-Light Traps

One CO2-light trap will be run for one night each week at each BMP pilot site from June until October 31, 1998; and then biweekly until December 15, 1998. This sampling frequency represents weekly samples during the peak activity for mosquitoes in southern California and biweekly samples during the late autumn when host-seeking and reproductive activities decline. Each trap will carry a site-specific tag/label attached to the collection bag. The air-actuated gate and the fan of each CO2-light trap will be programmed to turn on at dusk and to turn off after sunrise. As previously mentioned, the trap will be equipped with a single 4-watt ultraviolet lamp (wavelength range: 320-

420 nm). Each CO2-light trap will be stocked with 1 kg of solid carbon dioxide (dry ice). During the night, the carbon dioxide will sublimate and be released by the manifold directly above the fan and collection bag at approximately 500 ml/min.

If mosquitoes are collected, then the catch will be labeled with a site-specific tag, placed into an insulated cooler, and returned to the laboratory. Prior to identification, the mosquitoes will be killed by freezing. Freezing will eliminate the need to use poisons (e.g., potassium cyanide) or putatively harmful chemicals to humans (e.g., trichloroethylene) as a means of killing insects in the samples.

4.2.2 Gravid Traps

One gravid trap will be run for one night each week at each BMP pilot site from June until October 31, 1998; and then biweekly until December 15, 1998.

Each week a new infusion of oviposition medium will be set up in a pair of large plastic trash bins. The inner trash bin will be perforated on the bottom and sides, and set inside of a second trash bin prior to adding the infusion constituents. The oviposition attractant is an infusion of 0.5 kg hay, 5 g dried brewer's yeast, 5 g lactalbumen and 114 liters of water. Water aged for a minimum of seven days is preferred to distilled/deionized water or water directly from the tap. The mixture is covered, and left to incubate for 5 days out-of-doors. In order to keep water temperatures below 40^{o}C, the infusion chambers are to be kept out of direct sunlight.

Prior to leaving Riverside, one week-old infusion will be screened through the small holes in the bottom and sides of the inner plastic trash bin (opening: ~0.6 cm) to remove floating debris. The coarsely filtered infusion will be transferred from the infusion chamber into 20 liter carboys. The carboys will be capped and used to transport the infusion to the BMP pilot sites. At each BMP pilot site, four liters of infusion will be added to the bottom of the gravid trap and then the top components of the trap will be assembled and placed onto the trap's base. The motor/fan of the gravid trap at each BMP pilot site location will be programmed to activate at dusk. The motors will be turned off the following morning when the trap is retrieved. If mosquitoes are collected, then the catch will be labeled with a site-specific tag, placed into an insulated cooler, and returned to the laboratory. Prior to identification, the mosquitoes will be killed by freezing. Freezing will eliminate the need to use poisons or putatively harmful chemicals to humans as a means of killing insects in the samples.

4.3 Analysis

For each type of trap, the number of mosquitoes collected at each BMP location will be ranked and compared across time using a nonparametric repeated-measures analysis of

variance. Analyses will carried out for individual species and for the sum of all individuals collected on each sample date. If an ANOVA is statistically significant ($P < 0.05$), then a posteriori comparisons between the medians for each BMP location will be carried out to determine whether particular locations had consistently large mosquito populations relative to other BMP locations. Similar analyses will be carried out for midge collections by the CO2-light traps.

If the data fulfill the assumptions of parametric statistical analyses, measures of central tendency and variation in abundance data will be calculated for each BMP location. If abundance data have a non-normal distribution, nonparametric measures of central tendency and variation will be calculated.

The similarity of host-seeking or gravid mosquitoes species composition among the sites will be examined by multivariate statistical analyses using ordination. The ordinations for the background monitoring period can then be compared to those for the period of BMP operation to assess whether the mosquito faunal composition differed temporally.

4.4 Identification

Mosquitoes will be identified using Bohart and Washino (1978). In instances where the names of species have been changed since the publication of this key, updated species names will be used.

Midges will be identified to genus using Merritt and Cummins (1997). Type specimens will be sent to systematic experts for identification below the generic level.

Voucher specimens either will be maintained in the Entomology Research Museum, Department of Entomology, University of California-Riverside for five years after the termination of the baseline monitoring program in January 1999 or will be forwarded to a location which is mutually agreed upon by the litigants.

5.0 SAFETY CONSIDERATIONS

5.1 Introduction

The importance of safety when conducting surveys or monitoring activities within any of the proposed BMP areas identified above cannot be overemphasized. Individual safety must be a paramount consideration when conducting monitoring activities and/or surveys. Maintenance personnel, inspectors, mosquito control personnel, and equipment operators, who must work in and around the proposed BMP areas and within the Caltrans right-of-way are considered to be at risk. Typical hazards include deep water, excessively steep slopes, slippery or unstable footing, limited or unsafe access, and threats posed by insects and animals.

Prior to performing the necessary vector monitoring within the selected District 7 BMP pilot sites, each monitoring technician will be required to attend a Caltrans safety briefing. The briefing will include, but not be limited to, typical safety procedures related to entering, working, and leaving the BMP pilot sites as well as standard safety procedures for parking within Caltrans right-of-way. In addition, keys for certain BMP pilot sites will be distributed/coordinated at the briefing. Standard safety measures associated with stormwater management systems are outlined below. Refer to Appendix B, *Caltrans Highway Maintenance Manual-Chapter 8*, for additional safety guidelines and provisions.

5.2 Safety Issues Monitoring Activities

Safety issues during monitoring activities are, for the most part, common sense items which should be considered in any outdoor activity. Possible concerns or issues include:

- Look out for holes. A hole can be very small in circumference but deep. In the vicinity of a stormwater management facility a hole can be an indication of a serious problem. While monitoring and/or performing a survey, ***look where you walk.***

- Animals can present a serious concern. Rabies is a concern with wildlife and animal bites which could have severe consequences. Be careful around geese. Geese are very territorial, and can be extremely aggressive. Look out for snakes

- Be careful lifting manhole covers or other structural covers that may be located within the area of the proposed stormwater facilities. These items can be very heavy, can slip, and cause serious injury, such as the loss of a

finger. In addition, since they are heavy, back problems can occur if covers are lifted alone or incorrectly.

- Poison ivy, poison oak, or other plants can present a problem depending on the individual's allergic reaction to them. This can also present a problem during maintenance when vines from cutting woody vegetation may lie all over a site.

- Never enter a confined space unless you have been trained and have proper safety equipment in accordance with OSHA Regulations. Do not enter pipes or conduits unless another individual is present during the inspection. Do not enter a pipe or conduit, even with others present, if there is any concern regarding the structural strength of the pipe or conduit.

- Be careful not to walk in water when the depth is unknown or where there may be steep slopes below the water line.

- Be careful of nails, broken glass, or other sharp objects. Soft bottom shoes, such as athletic shoes, may be more comfortable for general wear, but they are not as safe as hard soled shoes. Fences can tear clothing or cause cuts, which may necessitate medical treatment.

- Gloves should be worn if any mechanical parts or structural components are going to be handled. This should be done for safety reasons (cuts, abrasions, etc.) and for health reasons, especially where pollutants or other materials can coat the hands then get rubbed into eyes or the mouth. Always wash hands after an inspection where items are manipulated, especially if gloves are not worn.

- In systems which are somewhat sealed with poor ventilation, be careful with cigarettes, lighters, or other open flames. Also be sure to allow a facility to vent for a period of time if a peculiar odor is present. Do not enter any confined space unless the atmosphere has been checked and proper safety equipment is worn and/or erected.

- Hard hats should be worn during all monitoring and/or inspection surveys.

- For daytime work, a vest, shirt or jacket should be orange, yellow, strong yellow green or fluorescent versions of these colors. For nighttime work, similar outside garments should be retroreflective.

- It is recommended that monitoring activities be conducted in teams of two or more. However, one monitoring technician will conduct monitoring surveys for each BMP site within District 7. Prior to commencement of field work, the monitoring technician shall notify Bill Walton at the University of California, Riverside (UCR) and/or the Caltrans District 7 Stormwater Coordinator (213-897-5638) to report the anticipated monitoring locations and schedule for that day.

5.3 Safety Considerations For Monitoring Equipment

Safety issues while utilizing the vector control monitoring equipment are outlined below:

- Each CO2 light trap stocked with solid carbon dioxide (dry ice) shall be placed in insulated chests (sealed) until set up for monitoring. Transportation of all CO2 light traps shall be via truck (not by automobile) since the heavy CO2 is a suficant. A release of the CO2 gas in confined conditions would result in immediate danger to individuals located within the confined space.

- All personnel involved in handling the CO2 light traps should wear protective gloves to prevent ice burns in the event of leaks or spills.

- Precautions should be taken during the assembling and dismantling of the CO2 light traps so as to prevent an electrical shock from the 6-volt battery which is required to operate each light.

- Individuals involved with assembling and dismantling the CO2 light traps should wear protective eyewear to provide protection from occasional breaking of the dry ice.

- A flashlight and cellular phone should be kept with each person during monitoring activities. The flashlight is a particular necessity for monitoring activities during the early morning or late evening hours.

5.4 Parking

- Vehicles utilized during monitoring activities should park in designated parking areas, if available. Where no defined parking areas are available, vehicles should be parked a safe distance from the roadway, preferably on

a concrete area. If a concrete area is not available a gravel or dry dirt area is recommended as a temporary parking area.

- At all maintenance station and park and ride facilities, vehicles shall be parked in designated parking stalls so as not to create an obstruction for pedestrians, bicycles and/or vehicular traffic. Prior to conducting a monitoring survey at a maintenance station, the monitoring technicians should discuss any potential safety concerns associated with the monitoring area(s) with the supervisor of the maintenance station.

- Refer to Appendix B, *Caltrans Highway Maintenance Manual-Chapter 8*, for additional information regarding safety issues related to parking.

5.5 Emergency Contacts

In the event of an accident/emergency at one of the BMP sites during monitoring surveys, 911 should be immediately contacted. In addition to contacting 911, the following Caltrans District 7 emergency contacts should be immediately notified as a result of the following situations. Refer to Appendix C, *Emergency Routes*, for the closest medical facility to each of the individual BMP sites.

Emergency-911
All Emergencies

Communication Center-24 hour hotline
(213) 897-0383
All Emergencies

Mike Lopez
Construction Engineering Department
(909) 305-1250
Construction and traffic related accidents/emergencies within Caltrans right-of-way.