



# Development of VOCs Monitoring Plan

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## **Objective of VOCs monitoring program**

- To study existing status of VOCs as hazardous air pollutants (HAPs)
- Determination ambient VOCs level as annual average to assess health risk for setting up air quality standards for VOCs in Thailand

# What is defined the program?

- I. **Site selection**
- II. **Target Compounds**
- III. **Schedule**
- IV. **QA/QC**

## I. Site Selection

### 1. Category of monitoring site

- **Roadside (5 sites)**
- **Residential (5 sites)**
- **Industrial (13 sites)**  
(Including gas station and fugitive sources)

## 2. Data used for site selection

### Roadside and Residential

- ◆ Number of Population in 50 districts in Bangkok area (2004)
- ◆ Car density in Bangkok area (2005)
- ◆ Availability of Meteorological data
- ◆ PCD Air quality monitoring data (conventional parameters e.g., NO<sub>2</sub>, O<sub>3</sub>, PM10 and air toxic)

## 2. Data for residential site selection

### Ten priority orders of number of populations per district in BKK (roadside and residential)

<u>Districts</u>	<u>No. of populations (persons)</u>
1. Bangkae	186,744
2. Bangken	177,062
3. Jatujuk	169,983
4. Jomthong	167,794
5. Saimai	161,749
6. Donmuang	157,989
7. Bangsue	154,079
8. Bangkapi	147,694
9. Dindang	147,398
10. Thonburi	139,573

## 2. Data for roadside site selection

### Ten priority orders of Car density (roadside)

<u>Roads</u>	<u>Cars density (cars/hr)</u>
1. Vipawadee	12,576
2. Radchadapisek	9,048
3. Asoke dindang	7,343
4. Pahonyotin	6,961
5. Dindang	6,838
6. Ramkhamhang	6,305
7. Rama 3	5,834
8. Pechaburi	5,815
9. Rachapreuk	5,492
10. Srinakarin	5,455

## 2. Criteria for site selection

- Available meteorological data
- Available ambient air quality data
- Security
- Avoid obstructions and ground dust
- Sampling height approx. 1.5 m above the ground
- Distance for roadside area : 10 m from the major road
- Distance for residential area: 15-60 m from the major road

## Roadside site selected

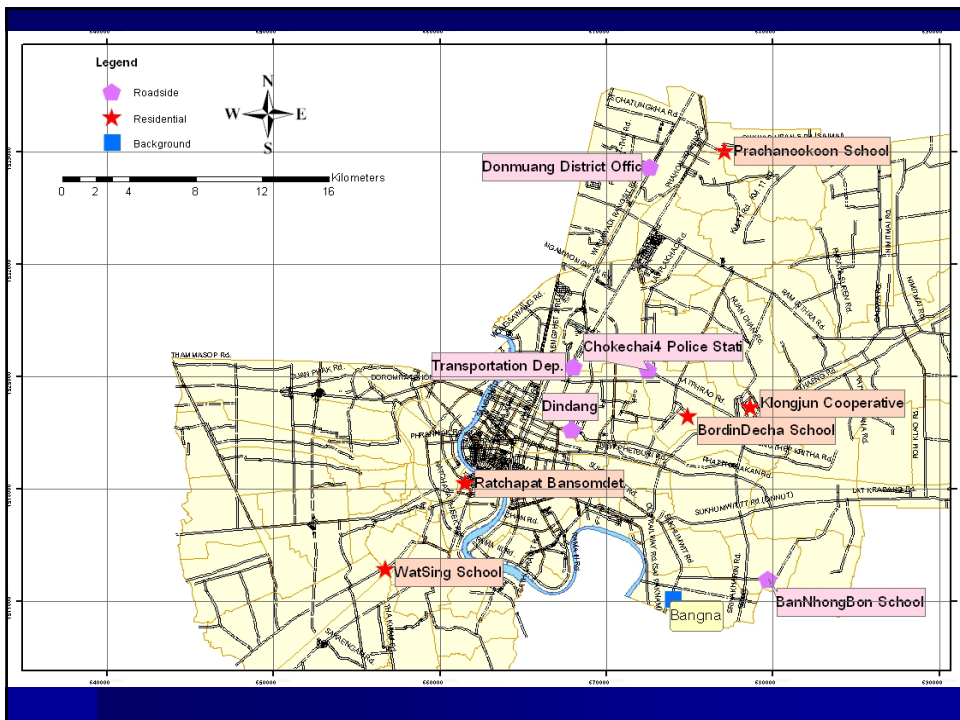
Stations	UTM Coordinate		Dominant wind direction	Nearest Meteorological Station
	X(WGS84)	Y(WGS84)		
1.Donmuang District Office	672318	1538355	S,W	Donmuang (Met.Dep.)
2.Transportation Department	667714	1525914	Calm	-
3.Chokechai4 Police Station	672180	1525636	SW	Chokechai4 (PCD)
4.Dindang station	667609	1522005	no observed	Dindang (PCD)
5.BanNhongBon School	679577	1512599	W,SW	-

## Residential site selected

Stations	UTM Coordinate		Dominant wind direction	Nearest Meteorological Station
	X(WGS84)	Y(WGS84)		
1.Bangkapisukum School	680340	1524712	SW	Klonjun (PCD)
2.BordinDecha School	674557	1522832	SW	Ramkhamheang (PCD)
3.WatSing School	656372	1513271	S,W	Watsing (PCD)
4.Bangkok Naval Base	660128	1520475	No observed	Bansomdet (PCD)
5.Prachanookoon School	676790	1539354	W,SW	-

# City Background

Stations	UTM Coordinate		Dominant wind direction	Nearest Meteorological Station
	X(WGS84)	Y(WGS84)		
Bangna	673673	1511376	No Observed	Bangna (PCD)



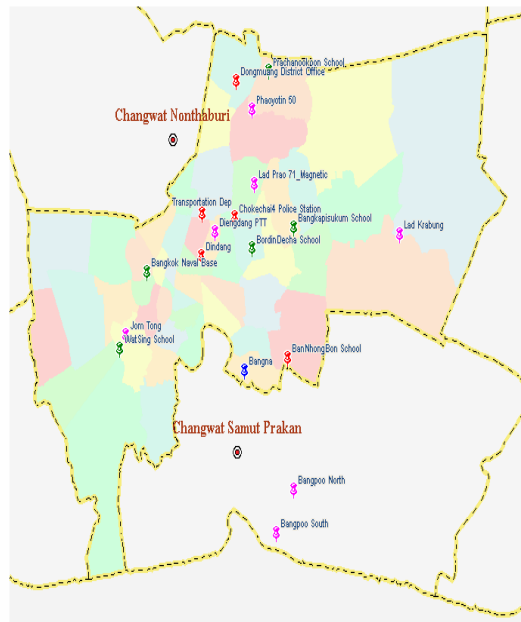
## 2. Data used for site selection

### Industrial site

1. PCD monitoring data (conventional parameters)
2. Complain record related to smell, bad odor 2004-2006
3. Initial inventory data
4. Potential source
5. Screening Survey (with portable GC)

### Industrial site (BKK & vicinity)

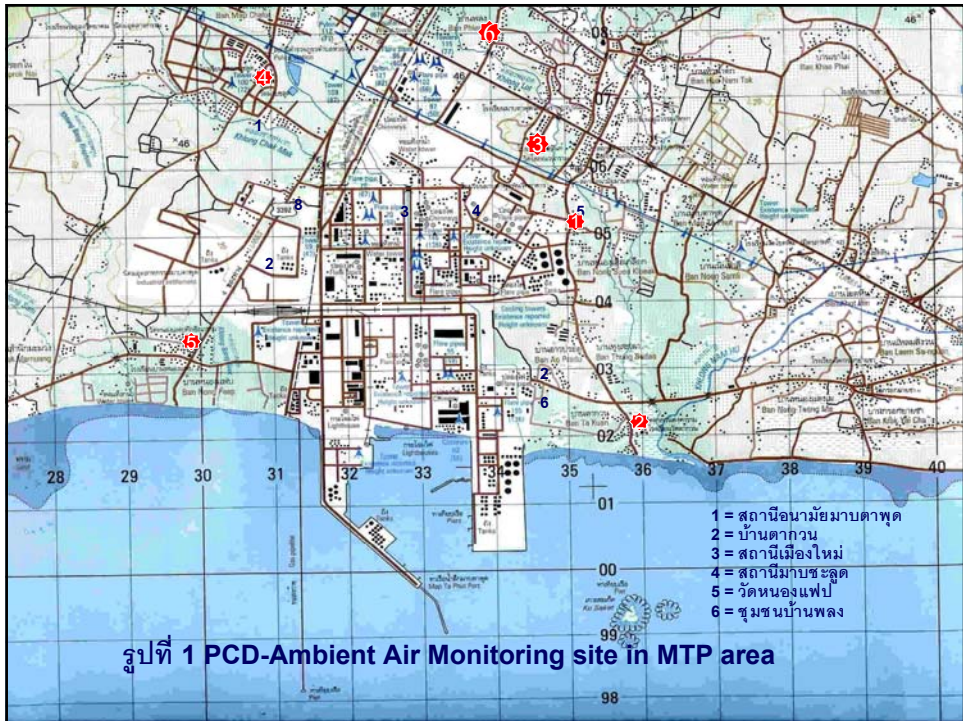
Stations	UTM Coordinate		Dominant wind direction	Nearest Meteorological Station
	X(WGS84)	Y(WGS84)		
1.Ladkrabung (Wattippawas school)	678322	1523365	SW	Bangna(PCD)
2.Bangpoo North (Sriubon Village)	674557	1522832	SW	Bangna(PCD)
3.Bangpoo South (Somboon House)	656372	1513271	S,W	Bangna(PCD)
4.Jomthong	-	-	S,W	Watsing (PCD)
5.Ladprod 71	-	-	W,SW	Chokechai4 (PCD)
6.Phaholyotin 50	-	-		



## Industrial site (Mabtaput)

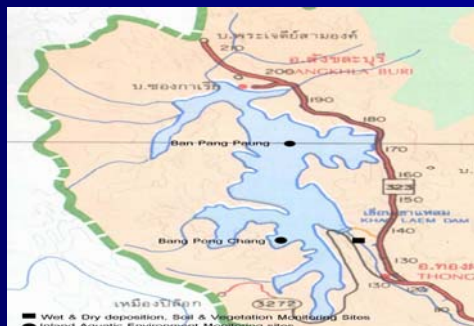
Stations	UTM Coordinate		Dominant wind direction	Nearest Meteorological Station
	X(WGS84)	Y(WGS84)		
1.Mabtaput Health Center	0735198	1405891	SW	Maptaput Health Center (PCD)
2.Bantaguan Sanitation Center	0735522	1402762	SW	Maptaput Health Center (PCD)
3.New Town Station	0734643	1406326	S,W	New Town Station (Maptaput Industrial Estrate)
4.Wat Mapchalood	0730905	1407345		Mabchalood (Maptaput Industrial Estrate)
5.Wat Nongfab	0729828	1403346	W,SW	
6.Bannpong	0734099	1408033		

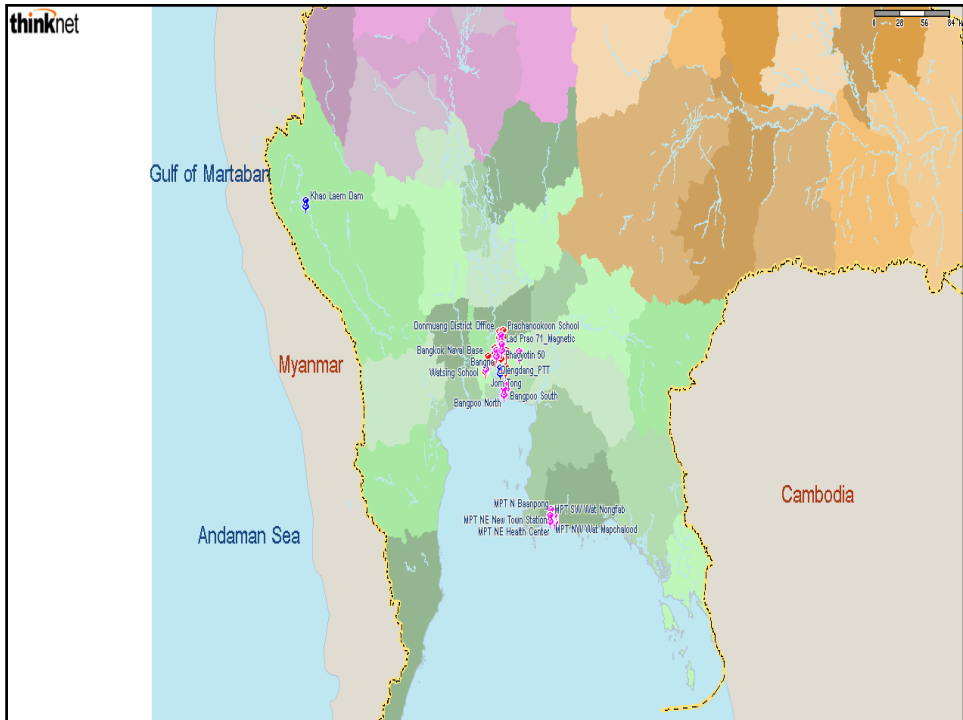




## Reference/ Background site

Stations	UTM Coordinate		Dominant wind direction	Nearest Meteorological Station
	X(WGS84)	Y(WGS84)		
Khao Laem Dam	673673	1511376	No Observed	Mobile





## II. Target Compounds

44 compounds to be analyzed canister-GC-MS system

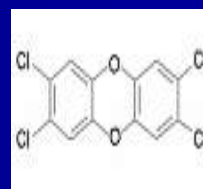
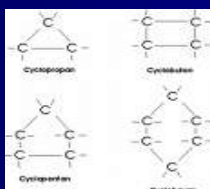
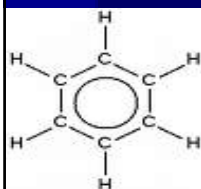
1 Freon12	13 Acrylonitrile	25 <i>trans</i> -1,3-Dichloropropene	37 1,3,5-Trimethylbenzene
2 Freon114	14 1,1-Dichloroethane	26 1,1,2-Trichloroethane	38 1,2,4-Trimethylbenzene
3 Chloromethane	15 1,1-Dichloroethene	27 Tetrachloroethene	39 <i>m</i> -Dichlorobenzene
4 Chloroethane	16 Chloroform	28 1,2-Dibromoethane	40 <i>o</i> -Dichlorobenzene
5 1,3-Butadiene	17 1,1,1-Trichloroethane	29 Chlorobenzene	41 Benzyl chloride
6 Bromomethane	18 Carbon tetrachloride	30 Ethylbenzene	42 <i>o</i> -Dichlorobenzene
7 Methyl chloride	19 1,2-Dichloroethane	31 <i>m</i> -Xylene	43 1,2,4-Trichlorobenzene
8 Freon11	20 Benzene	32 <i>o</i> -Xylene	44 Hexachlorbutadiene
9 Freon113	21 Trichloroethene	33 <i>p</i> -Xylene	
10 <i>cis</i> -1,2-Dichloroethene	22 1,2-Dichloropropane	34 Styrene	
11 3-Chloro-1-propene	23 <i>cis</i> -1,3-Dichloropropene	35 1,1,2,2-Tetrachloroethane	
12 Dichloroethane	24 Toluene	36 4-Ethyltoluene	

Additional 3 Compounds

1. Formaldehyde 2. Acetaldehyde 3. Ethylene Oxide

# Criteria for Target Compounds

- Current capacity of laboratory
- US EPA Method TO- 14
- US EPA Method TO- 15
- Availability of standard gas



## III. Schedule

- Frequency one a month
- Sampling Duration 24 hours
- Randomized schedule for 12 months



## IV. QA/QC Plan

- SOPs for Ambient Sampling & Laboratory
- Training and staff qualification system
- Canister cleaning and testing program
- Field Data sheet
- QA/QC sample (Duplicate , Blank)
- Standard Gas
- Inter laboratory cross check



# Field Data sheet

Date	Year	Date	Month
Location: Name	Address		
GPS (UTM unit)	X:	Y:	Z:
Name of collector			
Canister serial number			
Cleaning date	Who cleaned		
Cleaning method name	Number of times repeating evacuating and filling:		
Result of leak check	Final pressure:		
pressure	Start of the test	End of the test	
Passive sampler #			
Flow rate	Calculated based on pressure		
	Start of sampling	End of sampling	Elapsed time
Time			
Pressure			
Duplicate sampling	Cani. #	Travel blank	Cani. #
Digital camera shooting	Yes/ No		
Weather	Start of sampling	End of sampling	Throughout sampling
Temperature	Lowest	Highest	Average
Relative humidity	Lowest	Highest	Average
Wind direction			
Wind speed			
Remarks			
Date receiving canister	Year	Date	Month
Name of person who measures the pressure and dilutes			
	Before dilution	After dilution	Dilution rate
Pressure			
Name of analyst			
Date of analysis	Year	Date	Month
Data file name	Data sheet #		
Name of person who check this record			

## When you will see the data ?

- Monitoring data will be compiled as data report.
- Content of the report will be presented in the seminar 2007.
- Then report will be available from PCD web site.