6 AIR QUALITY

6.1 Key Issues

Impacts on air quality during construction will be due to dust emissions from :

(a) earthmoving (loading, unloading, bulldozing);
(b) wind erosion;
(c) haul road traffic; and
(d) construction of infrastructure.

It has been assumed that the construction of the breakwater will not be dust generating as the construction material used will be large rocks and no soft fill will be used.

Impacts on air quality during operation will be due to vehicle emissions comprising NO_x, CO and RSP.

6.2 Baseline Conditions

The following data have been analysed to determine baseline conditions:

(a) meteorological data from the Royal Observatory fixed monitoring station at the Mobil Oil Depot, Tsing Yi;

(b) CO data collected at Tung Chung in 1991; and

(c) background data collected for the LAPH studies.

A summary of the NO_2, CO, TSP and RSP data used in the assessment is presented in Table 6.1.

Table 6.1 Concentration of Selected Pollutants at Discovery Bay and Tung Chung

Location	Pollutant	Mean Concentration ($\mu g/m^3$)	Air Quality Objective ($\mu g/m^3$)
Discovery Bay	NO_2 (1 hr) TSP (24 hr) RSP (24 hr)	41 91 75	300 260 180
Tung Chung	CO (1 hr)	296	30000

The air quality in the study area is relatively good and levels of TSP and RSP are well below the Hong Kong Air Quality Objectives (AQO). The 24 hour levels of TSP were measured as 91 $\mu g/m^3$ and levels of RSP were 75 $\mu g/m^3$ at Discovery Bay. Both the 1 hour levels of NO_2 and CO measured at Discovery Bay and Tung Chung respectively, were within the AQO.

6.3 Air Sensitive Receivers

Areas containing sensitive receivers have been discussed in Section 4.2. The air sensitive receivers are similar to the noise sensitive receivers.

The air sensitive receivers are listed in Table 6.2 and are shown on Figure 4.1.

Table 6.2 Air Sensitive Receivers

Air Sensitive Receiver No	Location
1	Fa Peng
2	Sz Pak
3	Peng Chau
4	Tso Wan
5	Yi Pak
6	Ma Wan
7	Yi Pak Au
8	Discovery Bay Hillside
9	Discovery Bay Central Plaza
10	Discovery Promontory 1
11	Discovery Promontory 2
12	Penny's Bay Power Station

In addition there will be a health centre in the commercial centre which will be classified as an air sensitive receiver during operation of the project.

6.4 Construction Phase

6.4.1 Assessment Methodology

The Fugitive Dust Model (FDM) has been used to predict air quality at the receivers during construction. The FDM is specifically designed for computing construction impacts from dust sources and uses an area or line source alogarithm to quantify dust impacts from construction activities. The input data required for the model are:

(a)	receiver data	-	location & height
(b)	meteorological data	-	wind speed
		-	wind direction
		-	atmospheric stability
		-	temperature
		-	mixing height
(c)	source data	-	location
		-	source characteristics
		-	emission rates

Hourly meteorological data for 1992 have been supplied by the Royal Observatory from their weather station at Tsing Yi. The data were scanned to identify the worst case condition (in terms of wind speed, wind direction, stability class, temperature and mixing height) for each combination of receiver and dust source. Both the worst case scenario of one hour and 24 hour average concentrations of TSP at the receivers have been calculated. One year averages have also been predicted for the construction phase to show the long term effect. The results generated by various meteorological conditions have been compared and the highest value chosen for each receiver to estimate the worst case conditions.

Wind erosion, unloading, bulldozing and hauling will be the major dust generating activities on the reclamation. Heavy construction and haul road traffic will cause dust during infrastructure construction. It has been assumed that there will be no blasting or concrete batching plant in the study area except that there will be blasting of the cutting at Yam O Interchange. Approximately 450,000m^3 of rock will be excavated by drilling and blasting but this is not expected to have any effect on the cumulative impacts. Emission factors for dust activities were derived from 'Compilation of Air Pollutant Emission Factors' (AP42) (USEPA, 4th edition, 1985) and are shown in Appendix E. A silt content of 1.6% and a moisture content of 0.7% have been assumed.

The FDM model has been used to predict total suspended particulates (TSP) which includes all sizes of particulates. However those with aerodynamic diameters greater than 30 μm tend to settle out a few metres from the source under typical wind conditions; smaller particles have much slower rates of settling and deposition and are therefore more affected by wind turbulence. Particle sizes of 30 μm with an average particle density of 2000 kg/m^3 have been assumed in this study. RSP have been assumed to be 50% of TSP.

It has been assumed that reclamation and construction of infrastructure would be carried out in different periods. The projects will be carried out 30 days per month and 16 hours per day (0700 - 2300). 24 hour working may be required for sandfilling in the reclamation. Full details of the analysis are given in Appendix E and the results are summarised below.

6.4.2 Impact from the Ancillary Works

Without Mitigation Measures

The predicted TSP levels at air sensitive receivers for the years 1995 to 1999 are summarised in Table 6.3. Dust impacts reach their maximum at the first half of 1996. Truck movement over unpaved haul roads and bulldozing are the main causal factors of the dust pollution. At Penny's Bay power station, the TSP concentration has been predicted to exceed the standard unless mitigation is applied. The high levels will last for about one and a half years. The rest of the sensitive receivers are located far from the study area and predicted impacts are within the standards.

Table 6.3 Predicted TSP Levels without Mitigation

Receiver	Concentration (μg/m^3)		
	1 Hour Average	24 Hour Average	Annual Average
Fa Peng	218	93	17
Tso Wan	155	66	12
Yi Pak Au	114	43	7
DB Hillside	88	26	5
DB Central Plaza	104	30	6
DB Promontory 1	108	29	6
DB Promontory 2	119	30	6
Peng Chau	99	27	4
Penny's Bay Power Station	990	332	90
Ma Wan	88	15	6
Sz Pak	250	34	18
Yi Pak	137	19	9

Note : TSP concentrations do not include background.

Mitigation Measures

High dust impacts will be experienced at Penny's Bay power station and mitigation measures will be required to reduce the impacts to acceptable levels. Two options for mitigation were investigated. The first of these (Option A) comprises watering of haul roads and fill material, both in stockpiles and during handling. The second (Option B) comprises watering as in Option A plus paving of the haul road. The following control efficiencies have been assumed in modelling.

(a) watering of the haul road will reduce its emission by 50%;

(b) watering of fill materials will increase their moisture content from 0.7% to 3%;

(c) 90% of material handling emissions will be suppressed by watering; and

(d) up to 85% of emissions can be suppressed by paving the haul road.

The effects of these are as follows:

(a) Option A (Watering Only)

Predicted TSP levels at receivers with the incorporation of watering as mitigation are shown in Table 6.4.

Table 6.4 Predicted TSP Levels with Mitigation Option A

Receiver	Concentration ($\mu g/m^3$)		
	1 Hour Average	24 Hour Average	Annual Average
Fa Peng	124	54	10
Tso Wan	87	37	6
Yi Pak Au	59	22	4
DB Hillside	45	14	2
DB Central Plaza	54	15	3
DB Promontory 1	56	15	3
DB Promontory 2	63	16	3
Peng Chau	52	14	2
Penny's Bay Power Station	460	158	45
Ma Wan	48	7	3
Sz Pak	128	16	9
Yi Pak	70	9	4

Note : TSP concentrations do not include background.

It can be seen that TSP levels at the receivers will be significantly reduced if the dust sources are mitigated by watering. However, levels of 1 hour TSP at Penny's Bay Power Station still cannot satisfy the standards when the background levels are taken into account.

(b) Option B (Watering and Paving of the Haul Road)

Paving the haul road together with watering will provide a more effective means of dust emission control. Fugitive emissions generated from vehicle movements over the haul road comprise one of the major dust sources. If these emissions can be suppressed effectively, dust levels at the sensitive receivers will be significantly reduced. The drawback of this option is that it is quite costly.

Predicted TSP levels at receivers, with the incorporation of watering and paving as mitigation, are shown in Table 6.5.

Table 6.5 Predicted TSP Levels with Mitigation Option B

Receiver	Concentration ($\mu g/m^3$)		
	1 Hour Average	24 Hour Average	Annual Average
Fa Peng	64	30	4
Tso Wan	43	20	3
Yi Pak Au	26	10	2
DB Hillside	20	6	1
DB Central Plaza	24	6	1
DB Promontory 1	26	6	1
DB Promontory 2	30	7	1
Peng Chau	25	7	1
Penny's Bay Power Station	207	84	24
Ma Wan	24	11	1
Sz Pak	65	20	4
Yi Pak	31	12	2

Note : TSP concentrations do not include background levels.

TSP levels are well within the standards at all sensitive receivers with the incorporation of Option B.

6.4.3 Impact from CT10 and 11

The concentration of TSP at sensitive receivers due to construction of the Container Terminals was calculated in the container terminal study. The worst impacts are expected at Penny's Bay Power station during the first stage of the works. Mitigation measures have been recommended to reduce the impacts. The predicted mitigated dust levels for construction of CT10 and 11 together are summarised in Table 6.6. Dust levels at sensitive receivers Sz Pak, and Yi Pak were not calculated in the container terminal study.

Table 6.6 Predicted Mitigated TSP Concentration due to CT10 and 11

Receiver	Concentration ($\mu g/m^3$)		
	1 Hour Average	**24 Hour Average**	**Annual Average**
Fa Peng	220	127	18
Tso Wan	143	70	9
Discovery Bay	126	19	2
Peng Chau	84	26	1
Penny's Bay Power Station	218	157	28
Ma Wan	73	23	3

6.4.4 Cumulative Impact

The Ancillary Works are scheduled to be constructed between 1995 and 1999 with the worst impacts predicted to occur during 1995 and 1996. From 1997 onward, the TSP levels gradually decrease. The dust generating activities associated with the Container Terminals will not have begun until 1997 and the worst case scenarios of the two projects will thus not occur at the same time.

The cumulative assessment has assumed that sensitive receivers at Yi Pak Au, DB Hillside, DB Central Plaza, DB Promontory 1 and 2 in the Ancillary Works Study are equivalent to the sensitive receiver "Discovery Bay" in the CT10 and 11 assessment. Dust levels at these receivers are equal to those at Discovery Bay.

The cumulative impact assessment has assumed that mitigation of dust will be applied to both the Ancillary Works and CT10 and 11. Option A and B, similar to those assumed for the Ancillary Works, have been assumed as follows:

(a) Option A (Watering Only)

Option A has assumed that dust levels are mitigated by watering of both the Ancillary Works areas and the container terminal areas. The haul road is unpaved in this option.

The results (Table 6.7) show that Penny's Bay Power Station will be adversely affected unless additional mitigation is applied. The 500 $\mu g/m^3$ criteria will be exceeded once background levels are taken into account although the AQO for 24 hour TSP will be achieved. Dust levels at other sensitive receivers are well within the criteria.

Table 6.7 Cumulative TSP Levels at Sensitive Receivers (Option A)

Receiver	TSP Concentration ($\mu g/m^3$)			
	Pre 1997		Post 1997	
	1 Hour Average	24 Hour Average	1 Hour Average	24 Hour Average
Fa Peng	124	53	116	50
Tso Wan	87	37	88	30
Yi Pak Au	58	22	73	15
DB Hillside	45	13	70	12
DB Central Plaza	53	15	75	13
DB Promontory 1	56	14	78	13
DB Promontory 2	63	15	84	14
Peng Chau	52	14	65	18
Penny's Bay Power Station	<u>460</u>	157	272	122
Ma Wan	48	21	43	12
Sz Pak	127	42	98	27
Yi Pak	70	27	21	8

Note : 1. Background TSP levels of 91 μg are not included.
2. Underlined values exceed the standards (once the background is included).

(b) Option B (Watering and Paving of the Haul Road within the Ancillary Works)

The impacts associated with the construction of CT10 and 11 will occur after 1997 and these impacts are sufficiently mitigated by Option A only. Pre 1997 impacts are due mainly to the Ancillary Works and the calculations for Option B mitigation have shown a reduction of about 250$\mu g/m^3$ if the haul road is paved. This reduction will be sufficient to reduce the cumulative 1 hour impacts to acceptable levels at the power station.

These predictions have been based on an assumption of a haul road speed limit of 10 km/hr for the Ancillary Works. The impacts associated with a 15km/hr speed limit have been modelled and this has shown that the criteria will not be met at Penny's Bay Power Station pre-1997 if the haul roads are left unpaved and vehicles are allowed to travel at this speed. It is therefore recommended that either the haul roads are paved or a speed limit of 10km/hr is imposed.

<u>Sensitivity to Revisions in the Construction Programme</u>

The assessment described above was carried out using the construction programme that was available at the start of the study. There have been some changes to this programme during the course of the study as discussed in Chapter 3.

A sensitivity test was conducted to assess the impacts associated with the revised construction programme. The results show that the impacts are more evenly spread across the time period and can be mitigated by watering only. These results were modelled assuming a 10km/hr haul road speed limit and based upon these results it would not be necessary to pave the haul road.

The impacts have also been assessed assuming a 15km/hr haul road speed limit and the results show that impacts can be kept within the standards with watering only and it will therefore not be necessary to pave the haul road, assuming the revised construction programme.

Advance Works Dredged Design

The assessment described above has considered a drained design for the Advance Works reclamation as this was the design that was considered at the start of the project. It has subsequently been decided that a dredged design will be used for the reclamation and a sensitivity test has been carried out to determine if the impacts would be materially different with the dredged design. The cumulative impacts for Option A mitigation are summarised in Table 6.8. The impacts are significantly reduced when compared with the drained option for the Advance Works. Paving of haul roads in the vicinity of the power station (as in Option B mitigation) will, however, still be required to reduce the dust impacts to acceptable levels.

Table 6.8 Dust Levels for the Advance Works Dredged Design with Option A Mitigation

Receiver	TSP Concentration ($\mu g/m^3$)			
	Pre 1997		Post 1997	
	1-hr Average	24-hr Average	1-hr Average	24-hr Average
Fa Peng	36	15	36	12
Tso Wan	26	12	28	0
Yi Pak Au	13	4	15	4
DB Hillside	11	3	12	3
DB Central Plaza	13	3	14	3
DB Promontory 1	14	3	15	3
DB Promontory 2	17	3	16	4
Peng Chau	14	4	14	3
Penny's Bay Power Station	197	57	129	49
Ma Wan	15	6	16	5
Sz Pak	33	11	28	8
Yi Pak	15	5	17	5

Notes : TSP concentrations do not include background

6.4.5 Recommendation

The following mitigation measures are recommended to reduce the dust impact at Penny's Bay Power Station:

(a) either control vehicle speeds along all unpaved haul routes with a speed limit of 10km/hr or pave all haul roads near Penny's Bay Power Station;

(b) avoid any dust generating activities near the power station. For example stockpiles of loose material should be located as far from the power station as possible; and

(c) water materials before handling.

The effectiveness of watering depends on the frequency of application and extent of coverage. In general twice-daily watering reduces dust emissions by up to 50% but will depend on parameters such as surrounding site activity and ambient temperature and humidity. Chemical wetting agents can enhance the level of mitigation achieved but could have adverse effects on plants and animals exposed to runoff. Adequate dust suppression plant including water bowsers with spray bars or means of applying surface chemical treatment should be provided by the contractor and the details of these should be approved by the Resident Site Staff.

Further dust mitigation should include the following general measures :

(a) no debris or any other material should be burnt on the site;

(b) water sprays should be used during the handling of fill material at the site, at cuts, excavation and fill sites when dust is likely to be created and to dampen all stored materials during dry and windy weather. Chemical stabilization is not effective at these locations due to the degree of disturbance but can be used on completed cuts to prevent wind erosion;

(c) dump trucks should not be loaded to a level higher than the side and tail boards and the contents should be dampened and covered prior to transport. Dust levels can be further reduced by providing a ground surface or a temporary sealed surface on paved areas within the site where there is a regular movement of vehicles and such areas should also be kept clear of loose surface material;

(d) wheel washing troughs should be provided at all vehicle exit points from construction areas onto public roads;

(e) all stockpiles of aggregate or spoil should be enclosed or covered and water applied in dry or windy conditions. Enclosures should be rigid and reach above the height of the stockpile. In addition wetting may be applied. The access area around the stockpile should be paved to reduce the emissions arising from mobile equipment manoeuvring in its vicinity; and

(f) wetting and use of windbreaks can minimise material loss at loading, unloading and transfer points. Alternatively if these activities can be confined to an enclosure a baghouse filter may be used to filter dust during transfer.

The mitigation measures listed above should be specified in the construction contracts. It is recommended that the contract includes a provision that the contractor may either restrict haul road speeds to 10 km/hr or that he should pave the haul road. This decision should be notified to the Engineer for the contract who will then monitor dust levels in accordance with the Monitoring and Audit Manual. The action plan specified in that manual would be put into force if the dust levels exceed the trigger, action or target levels.

6.4.6 Dust Monitoring & Audit

Monitoring of the site should be undertaken at the construction boundary and should ensure that the EPD recommended boundary criteria (1 hour TSP, 500 μ/m^3) is not exceeded. 24 hour TSP levels should also be monitored close to the air sensitive receivers. Refer also to the Environmental Monitoring and Audit Manual.

Baseline Monitoring

Dust monitoring stations for baseline impact monitoring should be established at the site boundary and at the air sensitive receivers. TSP baseline monitoring should be carried out for at least two weeks to include continuous measurements of 24 hour TSP, with at least three one hour TSP measurements to be taken every day at each of the monitoring stations, at times expected to have the highest dust impact.

Impact Monitoring

Impact monitoring of 1 hour TSP levels should then be carried out throughout the works at the site boundary and 24 hour TSP levels at the air sensitive receivers. The programme for impact monitoring should be determined when the Contractor's detailed works programme is available and should be updated to reflect any changes in the Contractor's programme as the works progress. As a guide, 24 hour samples should be taken on 3 in every 6 days at the sensitive receivers that are likely to be affected at selected points around the site boundary. EPD's guideline for 1-hour TSP sampling is that 1-hour TSP sampling should be carried out at least 3 times for every 6 days at the occasions of highest dust impact.

Weather conditions such as relative humidity, rainfall and wind speed and direction should also be monitored.

The reporting and auditing of the dust impact monitoring programme should be carried out on a monthly basis and should commence on completion and approval of the environmental monitoring and audit (EM&A) manual. This manual should include contingency plans to take account of the following :

(a) prolonged non-availability of monitoring assistants;
(b) non-suitability of monitoring site;
(c) equipment failure or shaft;
(d) non-availability of laboratory facilities; and
(e) adverse weather conditions.

The contingency plans should also be included in contract documents.

Where monitoring of the air quality at the site boundary indicates deteriorating air quality (i.e. the trigger, action or target levels are exceeded) the Contractor should take the necessary additional steps to ensure that these actions are not contributing to the deterioration. These steps should include, but not be limited to the following :

(a) checking of all plant and equipment;
(b) maintenance or replacement of any plant or equipment contributing to the deterioration; and
(c) review of working methods. The Engineer should be kept informed of steps taken, and written reports and proposals for action should be passed to the Engineer by the Contractor whenever monitoring shows an adverse impact upon site boundary air quality.

Table 6.9 shows the proposed trigger, action and target levels for dust.

Table 6.9 Trigger, Action and Target Levels for Dust

TSP Monitoring Parameter in $\mu g/m^3$	Location	1 hr TSP Level in $\mu g/m^3$		
		Trigger	Action	Target
1 hr TSP level	Site boundary	30% above baseline	average of trigger and target levels	500
24 hr TSP level	Air sensitive receivers	30% above baseline	average of trigger and target levels	AQO (260)

Table 6.10 shows a proposed action plan should any of the trigger, action or target levels be exceeded.

Table 6.10 Proposed Action Plan for Dust

Event	Action	
	Engineer	Contractor
Trigger level exceeded for one sample	Repeat measurement as soon as possible	Identify source.
Trigger level exceeded for more than one consecutive sample	Repeat measurements as soon possible Notify contractor and EPD immediately	Identify source and impose necessary mitigation measures
Action level exceeded for one sample	Repeat measurement as soon as possible Notify contractor and EPD immediately	Identify source and impose necessary mitigation measures
Action level exceeded for more than one consecutive sample	Daily monitoring to be imposed Notify contractor and EPD immediately Require contractor to make additional proposals for dust suppression	Identify source Review plant and equipment and working procedures Submit proposals for reducing dust to Engineer Implement remedial action to dust emission immediately Notify Engineer of action taken
Target level exceeded for one sample	Daily monitoring is to be imposed Notify Contractor and EPD immediately Require Contractor to make additional proposals for dust suppression Provide investigation report which should be sent to EPD as soon as possible	Identify source Review plant and equipment and working procedures Submit proposals for reducing dust to Engineer Implement remedial action to reduce the dust emission immediately Notify Engineer of action taken Provide investigation report

Event	Action	
	Engineer	Contractor
Target level exceeded for more than one sample	Daily monitoring is to be imposed immediately Notify contractor and EPD immediately Require Contractor to make additional proposals and to take immediate steps to reduce dust, and to provide report for such instance to the EPD as soon as possible	Identify source Review plant and equipment and working procedures Submit proposals for reducing dust to Engineer Implement dust suppression measures to reduce dust immediately Notify Engineer of action taken Provide investigation report which should include the findings and suggestions to prevent such exceedance happening again Stop the relevant portion of work as necessary as determined by the Engineer

6.5 Operation Phase

6.5.1 Assessment Methodology and Impact Assessment

The impact of air emissions arising from the study area has been calculated at the air sensitive receivers identified in Section. The only air pollution impact during operation will be from vehicles.

Vehicle emission rates are dependent on the engine size and type (diesel or petrol) although emission levels from individual vehicles will also be affected by vehicle age and condition, whether the engine is running hot or cold. Total emissions on a given stretch of road will therefore be largely determined by vehicle flow rate and vehicle mix. In addition, the power output can also influence the pollutant emission rate (for a given vehicle, this will be a function of vehicle speed and gradient).

The CALINE4 computer model has been used to predict the levels of air pollution. Emission factors of NO_x, CO and RSP (which take account of average speed, percentage cold start and year of concern) for each vehicle type in 2001 and 2011 were supplied by EPD and compound emission factors were calculated to represent average emission rates for all traffic using the port road network. NO_x has been assumed to be inert and levels of NO_2 were taken as 20% of the total NO_x emission.

Projected morning peak hour traffic flows and the vehicle mix in 2001 and 2011 were obtained from the transport model.

Levels of NO_2, RSP and CO have been calculated and superimposed on baseline conditions to predict the total air pollution levels for worst case meterological conditions. Both the levels at 2001 and 2011 have been modelled.

The input parameters for the CALINE 4 model were :

Stability Class	D
Wind speed	2 m/s
Wind direction	worst case for each receiver
Wind direction variation	18 deg.
Mixing height	1000m
Temperature	25 deg. C

The road network was split into homogeneous links. The pollutant contribution from each link was calculated and summed to predict peak hour design year pollution (NO_x, CO and RSP) levels. The roads have been assumed to be at-grade.

6.5.2 Impact Assessment and Evaluation

Pollution contours of NO_2 RSP and CO during operation for design years 2001 and 2011 are shown on Figures 6.1 to 6.6 and the results are summarised in Table 6.11.

The highest 1 hour NO_2 levels of 67 $\mu g/m^3$ and 56 $\mu g/m^3$ are predicted at Penny's Bay Power Station and Sz Pak respectively for 2001. NO_2 levels however are well within the criteria of 300 $\mu g/m^3$. Penny's Bay Power Station has the highest 1 hour NO_2 level of 184 $\mu g/m^3$ in 2011 but this is still within the AQO.

Predicted RSP levels for 2001 are also shown in Table 6.11. Hourly averages range from 77 $\mu g/m^3$ at Discovery Bay to 91 $\mu g/m^3$ at Penny's Bay Power Station. Levels for 2001 are low compared to the AQO of 180 $\mu g/m^3$.

RSP levels for 2011 range from 79 $\mu g/m^3$ at Discovery Bay to 149 $\mu g/m^3$ at Penny's Bay Power Station. Again these are within the AQOs.

All predictions are within the standards and the 10m planning setback distance on the Master Layout Plan will not need to be altered to accommodate any air pollution problems. Air pollution at the health centre should also be within the AQOs.

Table 6.11 Predicted Hourly Pollutant Levels at Sensitive Receivers

Receiver	Concentration of Pollutant at 2001 ($\mu g/m^3$)			Concentration of Pollutant at 2011 ($\mu g/m^3$)		
	RSP	NO_2	CO	RSP	NO_2	CO
Fa Peng	79	49	354	114	120	1216
Tso Wan	78	45	354	89	71	630
Yi Pak Au	77	45	331	79	49	400
DB Hillside	77	45	331	78	49	377
DB Central Plaza	78	45	342	79	49	400
DB Promontory 1	78	45	342	79	49	411
DB Promontory 2	78	49	354	80	52	423
Peng Chau	78	45	342	79	49	388
Penny's Bay Power Station	91	67	676	149	184	2067
Ma Wan	77	45	331	80	52	423
Sz Pak	84	56	492	83	60	549
Yi Pak	78	45	342	80	49	411

NOTE : Predicted levels include background pollutant levels of :

RSP = 75 $\mu g/m^3$
CO = 296 $\mu g/m^3$
NO_2 = 41 $\mu g/m^3$

6.5.3 Industrial Emissions

The service activities expected to occupy the zoned industrial area include manufacturing of high technology products with advanced processes, laboratory testing, research and development, product design, quantity control, data processing, software development, industrial training, office, marketing and sales, showroom and ancillary warehousing.

None of these activities is likely to produce air emissions that will have any significant impact on the environment. Compared to the potential impacts produced by the large traffic volumes and predicted congestion by 2011, we do not consider it feasible or necessary to model for the impact of industrial emissions.

6.5.4 Mitigation Measures

Neither RSP, NO_2 nor CO emissions from vehicles will have significant environmental impacts on receivers in 2011. No special mitigating measures will therefore be required.

6.6 Conclusions and Recommendations

6.6.1 Construction Activities

These could be nuisance from dust at some sensitive receivers unless dust levels are mitigated at source.

Practicable dust mitigation measures have been recommended to reduce dust emission from the site. These include :

(a) reducing haul road speeds, water sprays during handling of fill;
(b) paving of haul roads;
(c) avoiding dusty activities bear the power station;
(d) watering haul roads and the surrounding site; and
(e) watering materials before handling.

These measures will reduce the impacts to acceptable levels.

Dust monitoring and audit have been recommended to check for compliance with the dust standards and the effectiveness of the dust control measures adopted.

6.6.2 Operation Activities

Modelling of NO_2, CO and RSP emissions predict that the AQO's will not be exceeded in either the 2001 or the 2011 design years at any receivers. Planning setback distances presented on the Master Layout Plan will therefore not need to be increased. Air pollution levels at the health centre in the commercial area should also be within the standards.

Figure 6.1
Predicted 1 Hour Pollution Contours 2001 - RSP

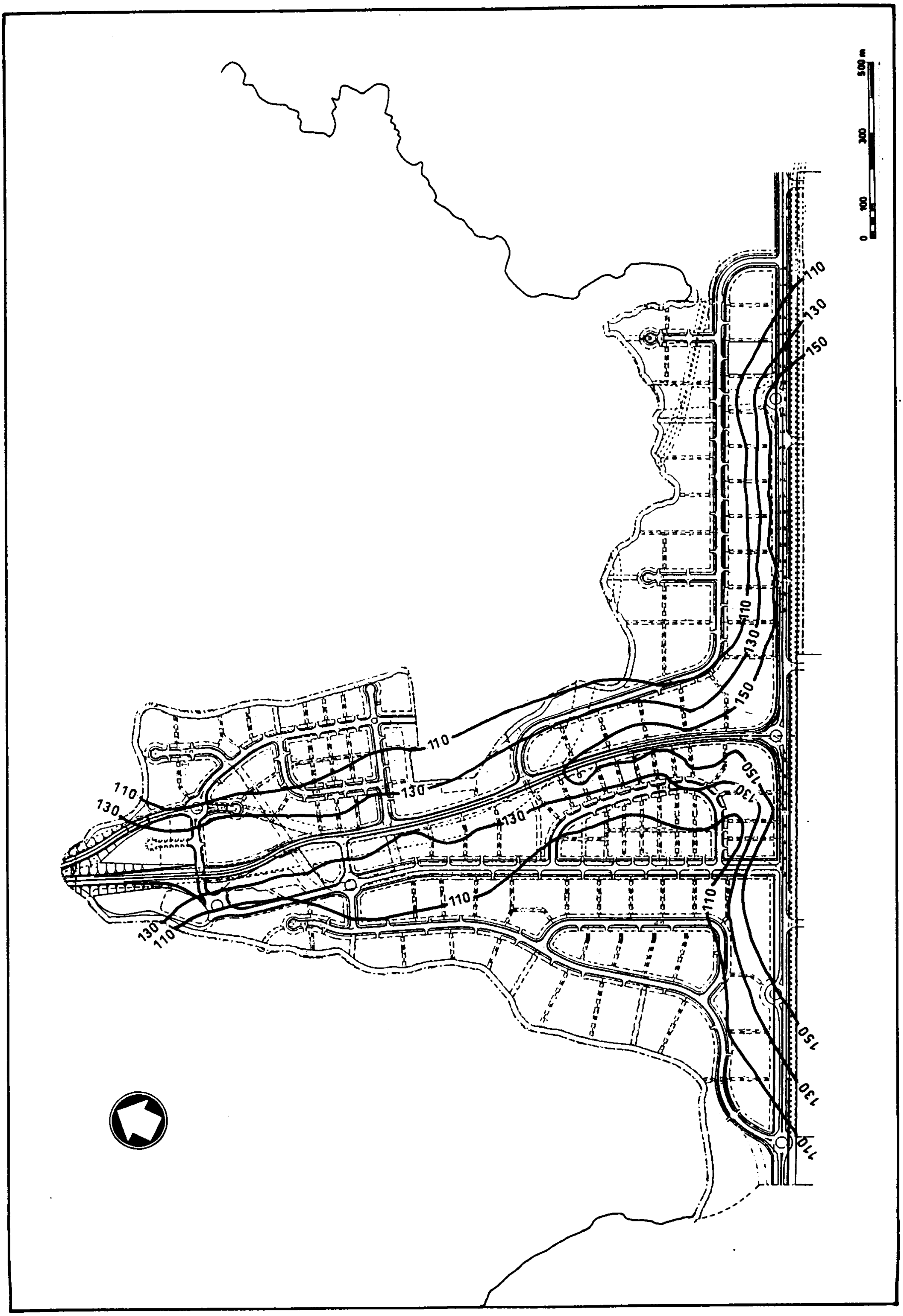

Figure 6.2
Predicted 1 Hour Pollution Contours 2001 - NO_2

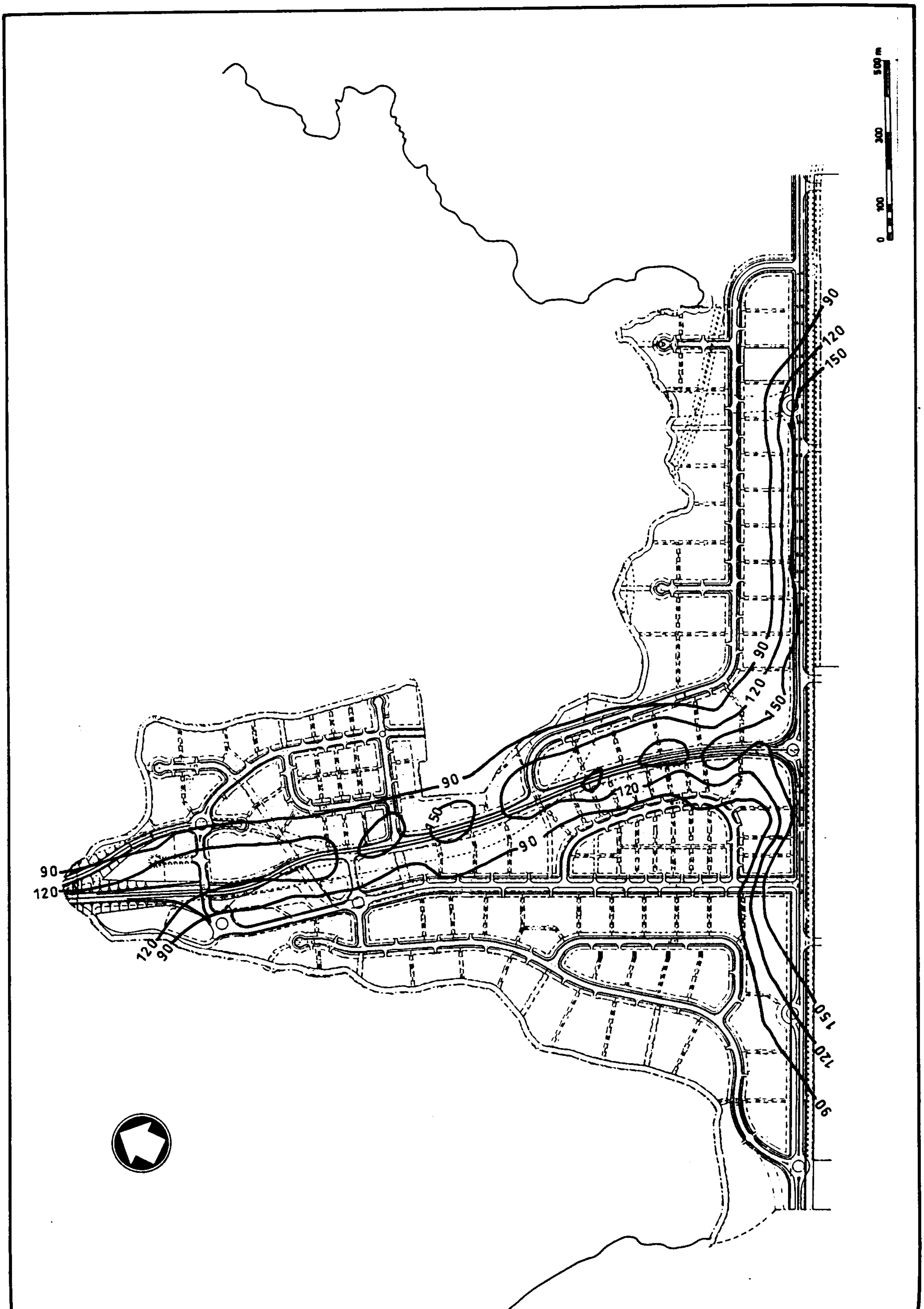

Figure 6.3
Predicted 1 Hour Pollution Contours 2001 - CO

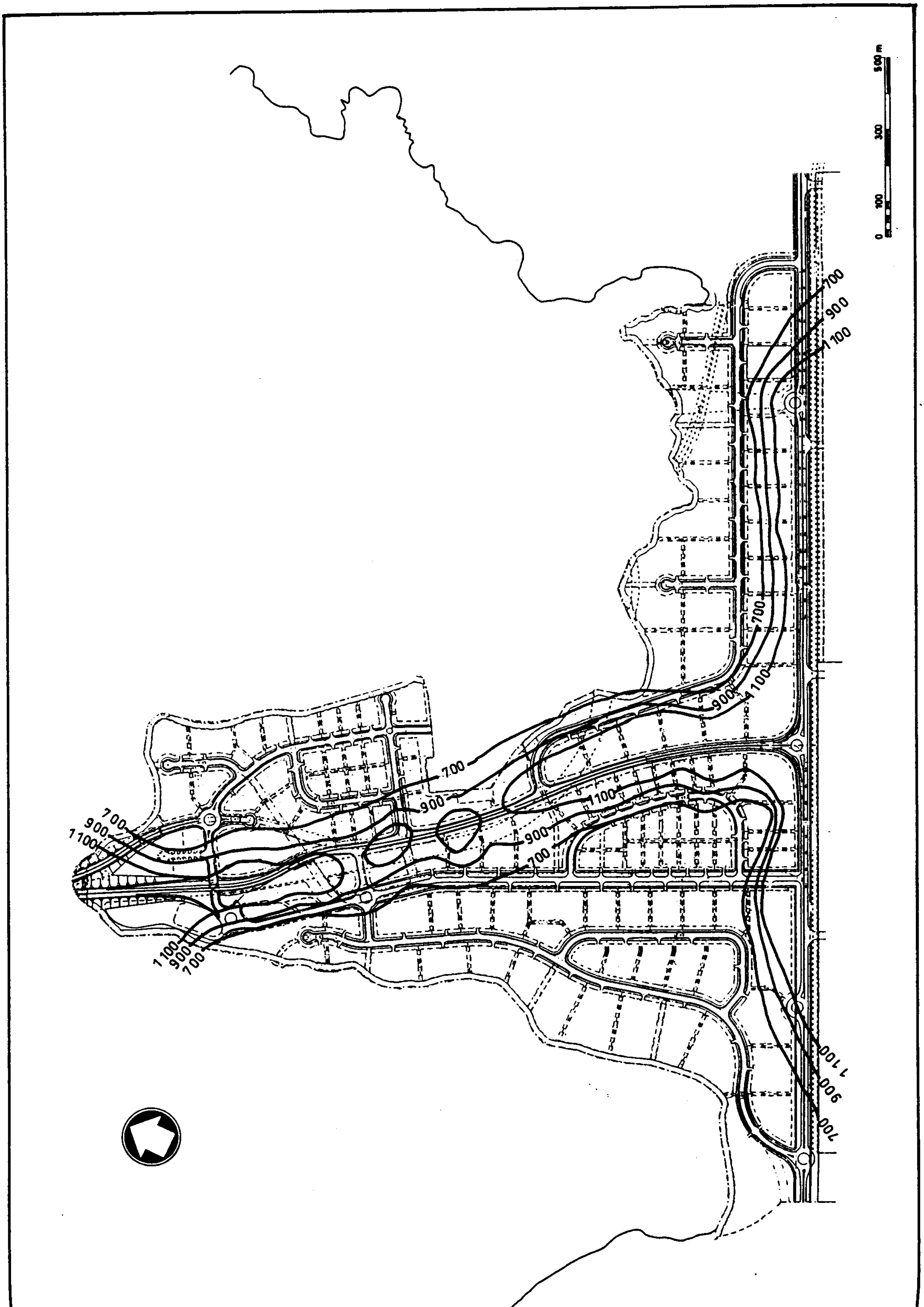

Figure 6.4
Predicted 1 Hour Pollution Contours 2011 - RSP

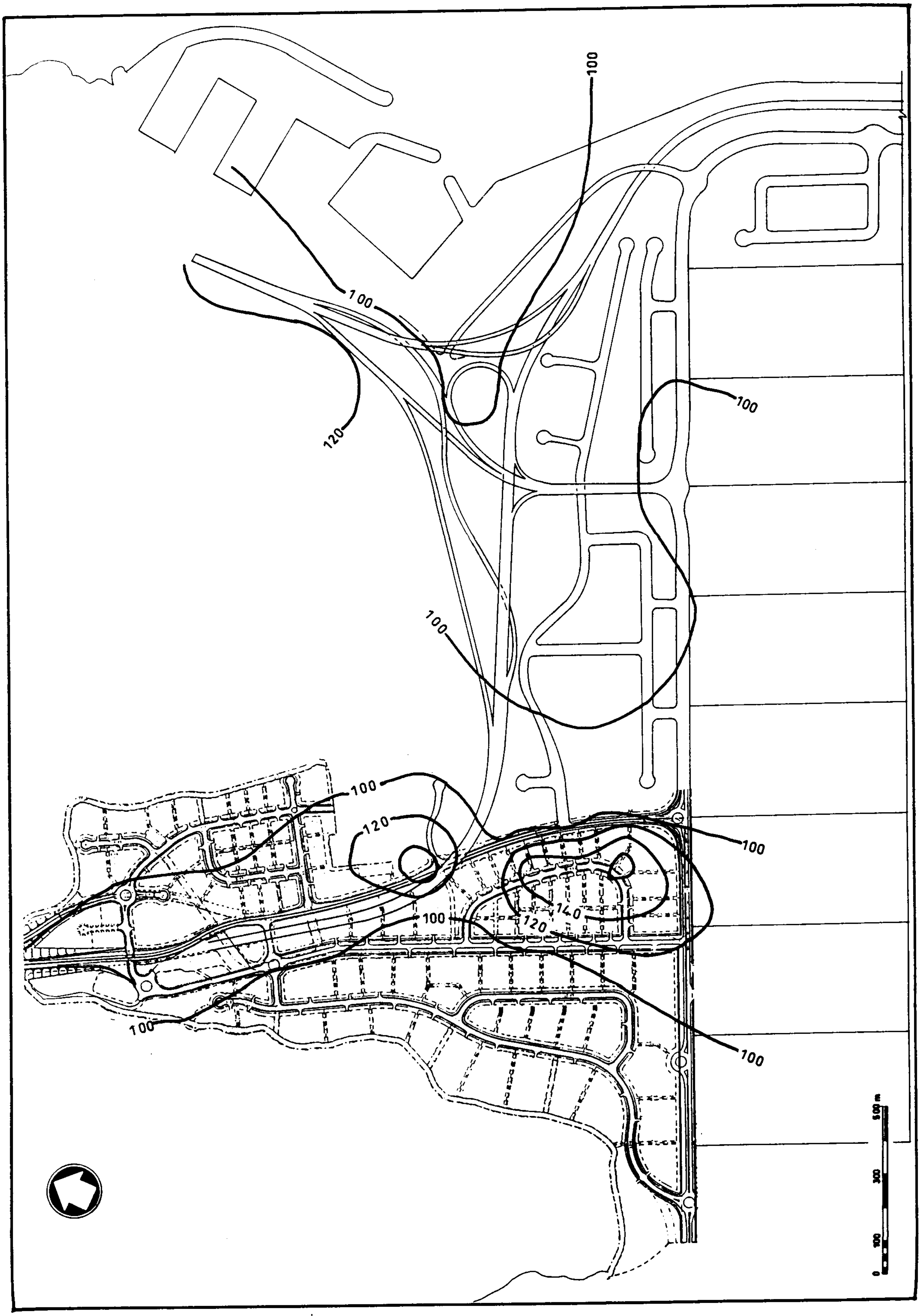

Figure 6.5
Predicted 1 Hour Pollution Contours 2011 - NO_2

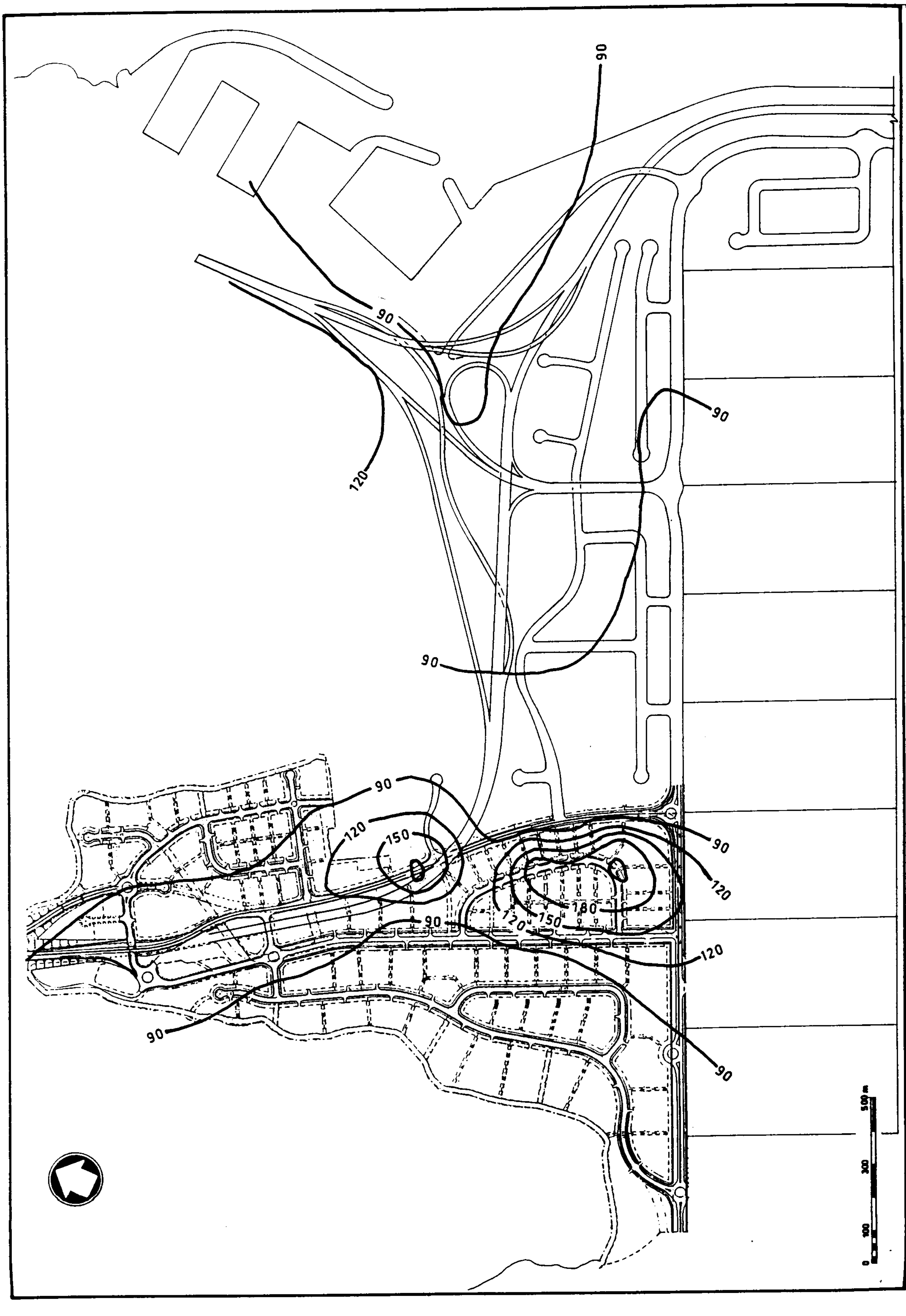

Figure 6.6
Predicted 1 Hour Pollution Contours 2011 - CO