

2.0 AIR QUALITY

2.1 Applicable Environmental Standards and Guidelines

Construction Phase

2.1.1 Air quality is regulated through Annex 4 of the Technical Memorandum on EIA Process (TMEIA) which specified compliance with the Air Pollution Control Ordinance, 1983 Cap. 311. This provides, inter alia, statutory Air Quality Objectives (AQO) for each Air Control Zone in the Territory.

2.1.2 In addition to the Air Quality Objectives, the TMEIA also stipulates that a maximum hourly average level of 500 Fg/m³ of Total Suspended Particulates (TSP) should not be exceeded at the boundary of any construction works or at the nearest sensitive receivers and this is the criteria relevant to this project.

2.2 Air Quality Parameters

2.2.1 Monitoring of the 1 hourly average of Total Suspended Particulates (TSP) levels only shall be carried out by the Environmental Specialist to ensure that construction works are not generating dust which exceeds the acceptable level. Timely action should be taken to rectify the situation if an exceedance is detected. 1-hour TSP levels shall be measured by direct reading methods.

2.2.2 All relevant data shall also be recorded by the Environmental Specialist (ES). A sample data sheet is shown in Drawing 2.1.

2.3 Monitoring Equipment

2.3.1 The Contractor shall be responsible for provision of an acceptable dust sampler or monitoring equipment and ensuring the instruments are properly calibrated and maintained. A hand-held wind speed and direction anemometer shall also be used.

2.4 Monitoring Locations

2.4.1 The air quality sensitive receivers as determined by the EIA and recommended dust monitoring locations are shown in Drawing 2.2a-h. The specific locations of the monitoring stations are to be determined by the ES and approved by the DEP prior to monitoring. The status and locations of dust sensitive receivers may change after issue of this manual. If this happens, the ES shall propose updated monitoring locations and seek approval from the Engineer's Representative (ER) and agreement from the Independent Checker (Environmental) (IC(E)) and EPD.

2.4.2 When alternative monitoring locations are proposed, the following preferred locations and factors shall be considered:

- (i) the site boundary or locations close to the major dust emission source;

- (ii) close to the sensitive receptors; and
- (iii) the prevailing meteorological conditions.

2.4.3 Prior to project construction, the construction schedule shall be established and the dust monitoring schedule shall be developed by the ES and the IC(E) shall be informed of the impact monitoring programme such that he can conduct on-site audit to ensure accuracy of the impact monitoring results. The environmental monitoring schedule shall be approved by the ER.

2.5 Baseline Monitoring

2.5.1 Prior to the commencement of construction works, the ES shall carry out 1 hour baseline dust monitoring, 3 times per day, for a period of at least 14 consecutive days at the representative sensitive receivers as listed below:

- C C1, C2, TC8, TC9, TC15, TC18, WU2, LT6, LT1, LT3, WK2, TC21, P1, C3, LC6, LC9, ST18, ST5, ST9, ST15, SS3.

2.5.2 During the baseline monitoring, there should not be any construction or dust generation activities in the vicinity of the monitoring stations.

2.5.3 In case the baseline monitoring cannot be carried out at the designated monitoring locations during the baseline monitoring period, the Environmental Specialist shall carry out the monitoring at alternative locations which can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring locations shall be approved by the Engineer's Representative and agreed with DEP.

2.5.4 In the event that insufficient baseline monitoring data or questionable results are obtained, the Environmental Specialist shall liaise with the DEP to agree on an appropriate set of data to be used as a baseline reference and submit this data to the Engineer's Representative for approval.

2.5.5 Ambient conditions may vary seasonally and shall be reviewed at three monthly intervals. If the Environmental Specialist considers that the ambient conditions have changed and a repeat of the baseline monitoring is required to be carried out for obtaining updated baseline levels, the monitoring should be at times when the Contractor's activities are not generating dust, at least in the proximity of the monitoring stations. Should a change in ambient conditions be determined, the baseline levels and, in turn, the air quality criteria, shall be revised. The revised baseline levels and air quality criteria shall be agreed with the DEP.

2.6 Impact Monitoring

2.6.1 The Environmental Specialist shall carry out impact monitoring during the course of the works at the pumping stations and along the sewer alignment as shown in Drawing 2.2a-h. For regular impact monitoring, the sampling frequency of at least once per week shall be strictly observed at designated monitoring stations for 1-hr TSP monitoring using the direct reading method. The stations to be monitored should be selected based on their proximity to the pumping stations

and the sewer alignment during active construction works. Other relevant data that will need to be recorded will include the prevailing weather conditions, including wind speed and direction.

2.7 Event and Action Plan for Air Quality

- 2.7.1 The baseline monitoring results will form the basis for determining the air quality criteria for the impact monitoring. The Environmental Specialist shall compare the impact monitoring results with air quality criteria set up for and 1-hour TSP. Table 2.1 shows the air quality criteria, namely Action and Limit levels to be used. Should non-compliance with the air quality criteria occur, the Environmental Specialist, the Engineer's Representative and the Contractor shall undertake their specified actions in accordance with the Action Plan shown in Table 2.2.

Table 2.1 Action and Limit Levels for Air Quality

Parameters	Action	Limit
1 Hour TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $\leq 384 \mu\text{g}/\text{m}^3$, Action level = $(\text{Baseline level} * 1.3 + \text{Limit level}) / 2$; For baseline level $> 384 \mu\text{g}/\text{m}^3$, Action level = Limit level	500

- 2.7.2 In case of non-compliance with the air quality criteria, more frequent monitoring exercise, shall be conducted within 24 hours after the result is obtained. This additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified. The Event/Action Plan for air quality is given in the attached Table 2.2.
- 2.7.3 The (IC(E)) shall be empowered to audit the environmental performance of construction, all aspects of the EM&A programme, validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations and procedures. If any exceedance occurs, the IC(E) shall follow the actions stated in Table 2.2 Event and Action Plan.

2.8 Dust Mitigation Measures

- 2.8.1 The EIA report has recommended dust control and mitigation measures. The Contractor shall be responsible for the design and implementation of the following measures. The recommended construction dust mitigation measures are summarised in the Environmental Mitigation Implementation Schedule provided in Appendix A and are listed below:
- (i) The Contractor shall at his own cost and to the satisfaction of the Engineer, install effective dust suppression measures and take such other measures as may be necessary to ensure that dust measures are within acceptable levels at the site boundary and any nearby sensitive receiver.
 - (ii) The Contractor shall not burn debris or other materials on the works areas.
 - (iii) The Contractor shall implement dust suppression measures which shall include, but not be limited, to be following:

- (a) Stockpiles of imported material kept on site shall be contained within hoardings, dampened and/or covered during dry and windy weather.
- (b) Material stockpiled alongside trenches should be covered with tarpaulins whenever works are within village boundaries.
- (c) Water sprays shall be used during the delivery and handling of cement, sand, aggregate and the like.
- (d) No batching of concrete should be carried out on site. Concrete should be used in ready mixed form and off loaded adjacent to designated works areas.
- (e) Any vehicle used for moving cement, sand, aggregate and construction waste shall have properly fitting side and tail boards. Materials shall not be loaded to a level higher than the side and tail boards, and shall be covered by a clean tarpaulin. The tarpaulin shall be properly secured and shall extend at least 300mm over the edges of the side and tail boards.
- (f) No earth, mud, debris, dust and the like shall be deposited on public roads. The Contractor shall submit details of proposals for the wheel cleaning facilities to the Engineer. Such wheel washing facility shall be usable prior to any earthworks excavation activity on the Site.

2.8.2 If the above measures are not sufficient to restore the air quality to acceptable levels upon the advice of the Environmental Specialist, the Contractor shall liaise with the Environmental Specialist on other mitigation measures and consult the IC(E) for their effectiveness, and then propose these measures to the Engineer's Representative for approval and implement the measures.

Drawing 2.1 Data Sheet for TSP Monitoring

Monitoring Location:	
Details of Location:	
Sampler Identification:	
Date & Time of Sampling:	
Elapsed-time	Start (min.)
Meter Reading	Stop (min.)
Total Sampling Time (min.):	
Weather Conditions:	
Site Conditions:	
Measured TSP Level (Fg/m ³):	

	<u>Name & Designation</u>	<u>Signature</u>	<u>Date</u>
Field Operator :	_____	_____	_____
Laboratory Staff :	_____	_____	_____
Checked by :	_____	_____	_____

Table 2.2 Event / Action Plan for Air Quality

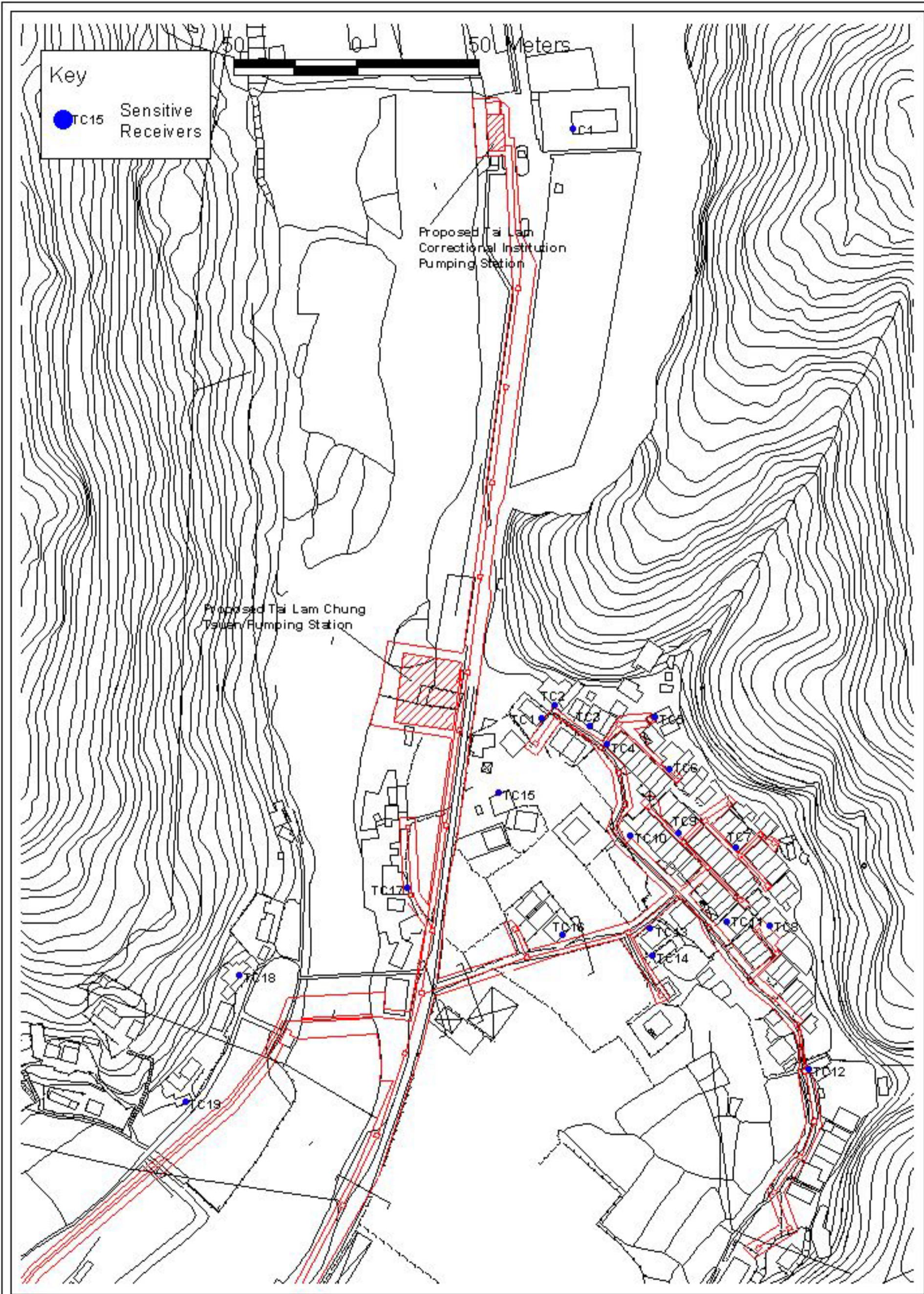
EVENT	ACTION			
	ES	IC(E)	ER	Contractor
<i>Action Level</i>				
1. Exceedance for one sample	<ol style="list-style-type: none"> 1. Identify the source. 2. Inform the IC(E) and the ER. 3. Repeat measurement to confirm finding. 4. Increase monitoring frequency to daily. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by the ES. 2. Check Contractor's working method. 	<ol style="list-style-type: none"> 1. Notify Contractor. 	<ol style="list-style-type: none"> 1. Rectify any unacceptable practice 2. Amend working methods if appropriate
2. Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> 1. Identify the source. 2. Inform the IC(E) and the ER. 3. Repeat measurements to confirm findings. 4. Increase monitoring frequency to daily. 5. Discuss with the IC(E) and the Contractor on remedial actions required. 6. If exceedance continues, arrange meeting with the IC(E) and the ER. 7. If exceedance stops, cease additional monitoring. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by the ES. 2. Check the Contractor's working method. 3. Discuss with the ES and the Contractor on possible remedial measures. 4. Advise the ER on the effectiveness of the proposed remedial measures. 5. Supervisor implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Ensure remedial measures properly implemented. 	<ol style="list-style-type: none"> 1. Submit proposals for remedial actions to IC(E) within 3 working days of notification 2. Implement the agreed proposals 3. Amend proposal if appropriate

Table 2.2 Cont'd...

EVENT	ACTION			
	ES	IC(E)	ER	Contractor
<i>Limit Level</i>				
1. Exceedance for one sample	1. Identify the source. 2. Inform the ER and the DEP. 3. Repeat measurement to confirm finding. 4. Increase monitoring frequency to daily. 5. Assess effectiveness of Contractor's remedial actions and keep the IC(E), the DEP and the ER informed of the results.	1. Check monitoring data submitted by the ES. 2. Check Contractor's working method. 3. Discuss with the ES and the Contractor on possible remedial measures. 4. Advise the the ER on the effectiveness of the proposed remedial measures. 5. Supervisor implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Ensure remedial measures are properly implemented.	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IC(E) within 3 working days of notification 3. Implement the agreed proposals 4. Amend proposal if appropriate

Table 2.2 Cont'd...

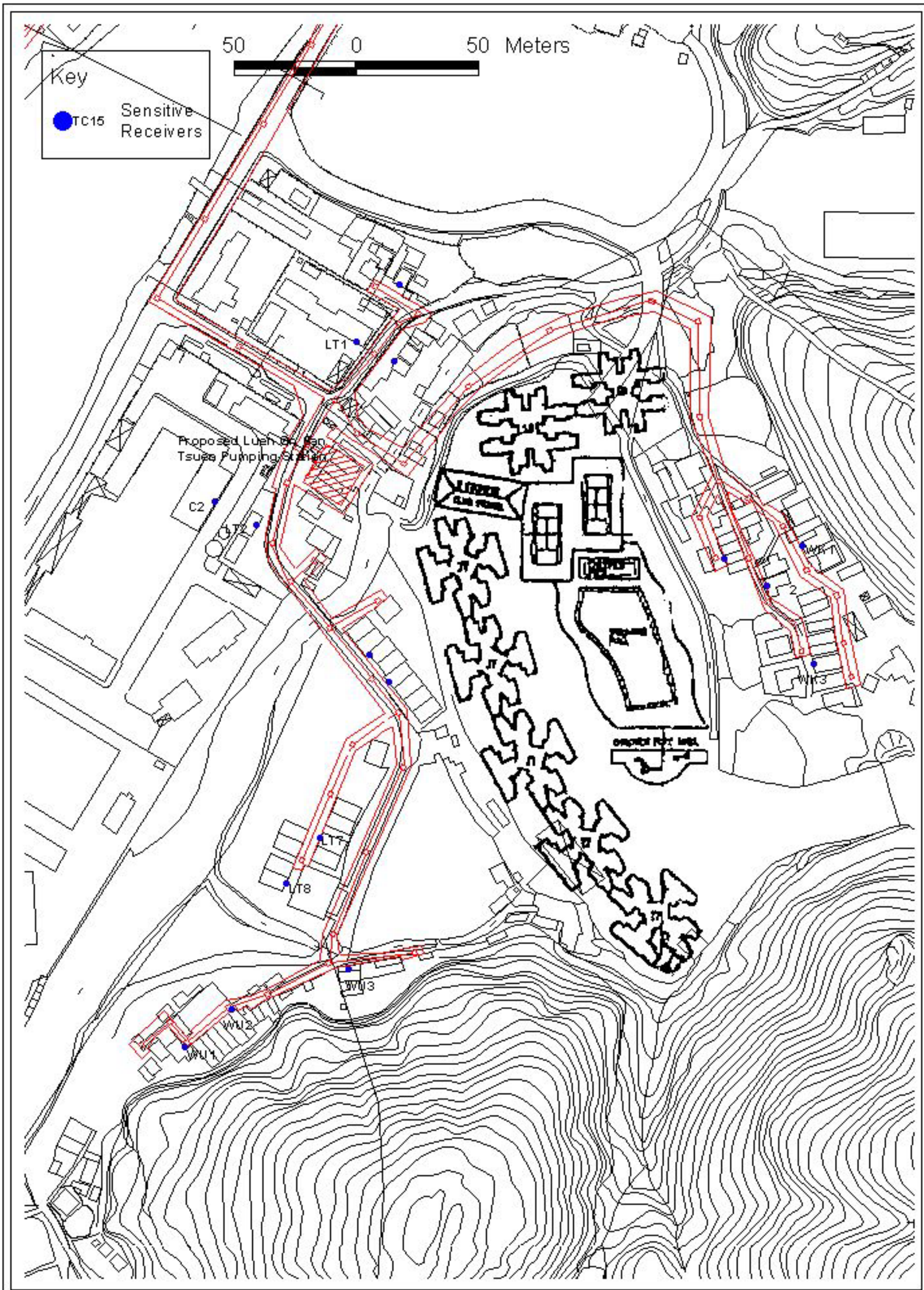
EVENT	ACTION			
	ES	IC(E)	ER	Contractor
<i>Limit Level</i>				
2. Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> 1. Notify the IC(E), the ER, the DEP and the Contractor. 2. Identify the source. 3. Repeat measurements to confirm findings. 4. Increase monitoring frequency to daily. 5. Carry out analysis of the Contractor's working procedures to determine possible mitigation to be implemented. 6. Arrange meeting with the IC(E) and the ER to discuss the remedial actions to be taken. 7. Assess effectiveness of the Contractor's remedial actions and keep the IC(E), the DEP and the ER informed of the results. 8. If exceedance stops, cease additional monitoring. 	<ol style="list-style-type: none"> 1. Discuss amongst the ER, ES and the Contractor on the potential remedial actions. 2. Review the Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly. 3. Supervise the implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. In consultation with the IC(E), agree with the Contractor on the remedial measures to be implemented. 4. Ensure remedial measures are properly implemented. 5. If exceedance continues, consider what activity of the work is responsible and instruct the Contractor to stop that activity of work until the exceedance is abated. 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance. 2. Submit proposals for remedial actions to IC(E) within 3 working days of notification. 3. Implement the agreed proposals. 4. Resubmit proposals if problem still not under control. 5. Stop the relevant activity of works as determined by the ER until the exceedance is abated.



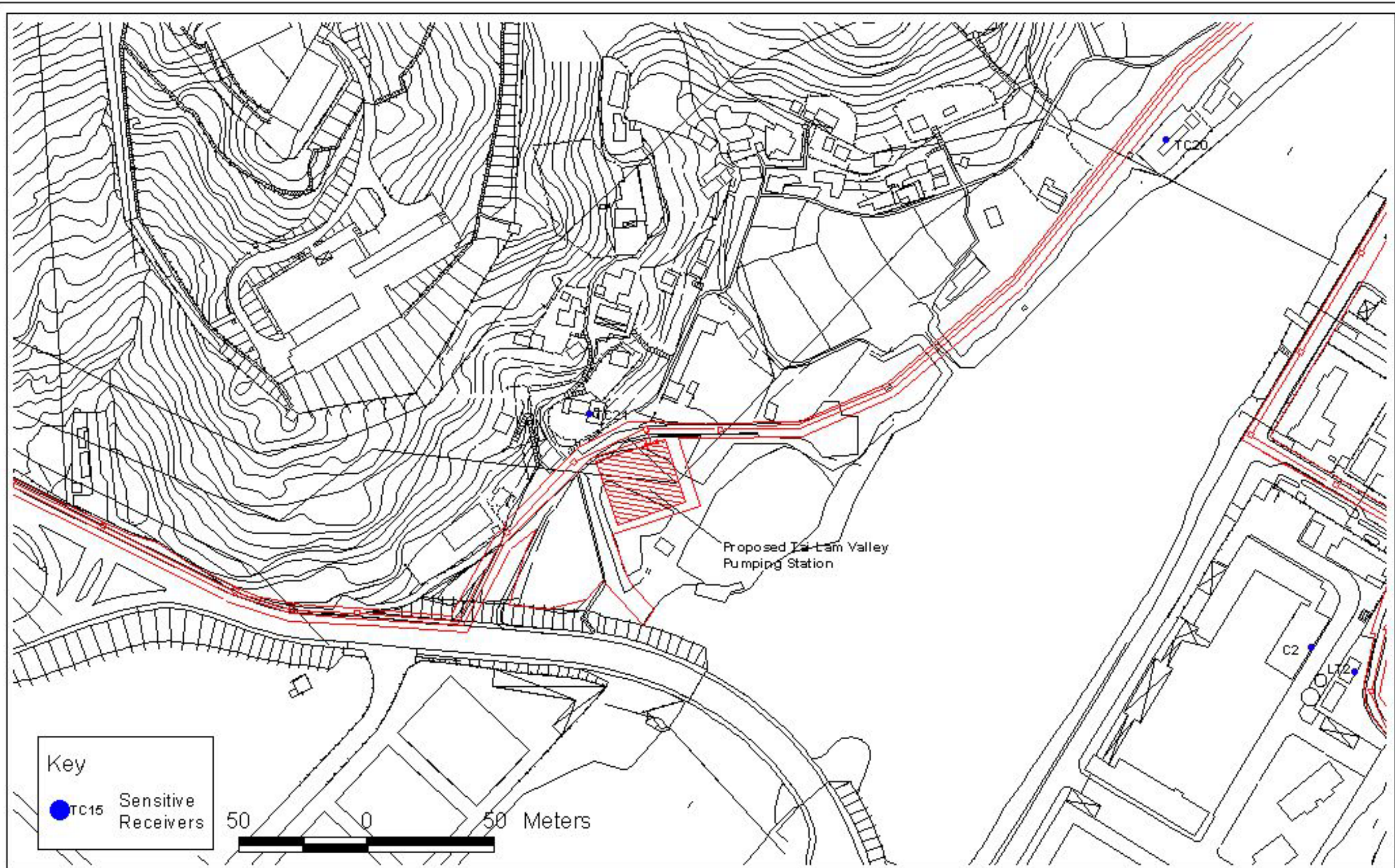
Recommended Dust Monitoring Locations (1 of 8)

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Drawing No. **2.2a**



Recommended Dust Monitoring Locations (2 of 8)

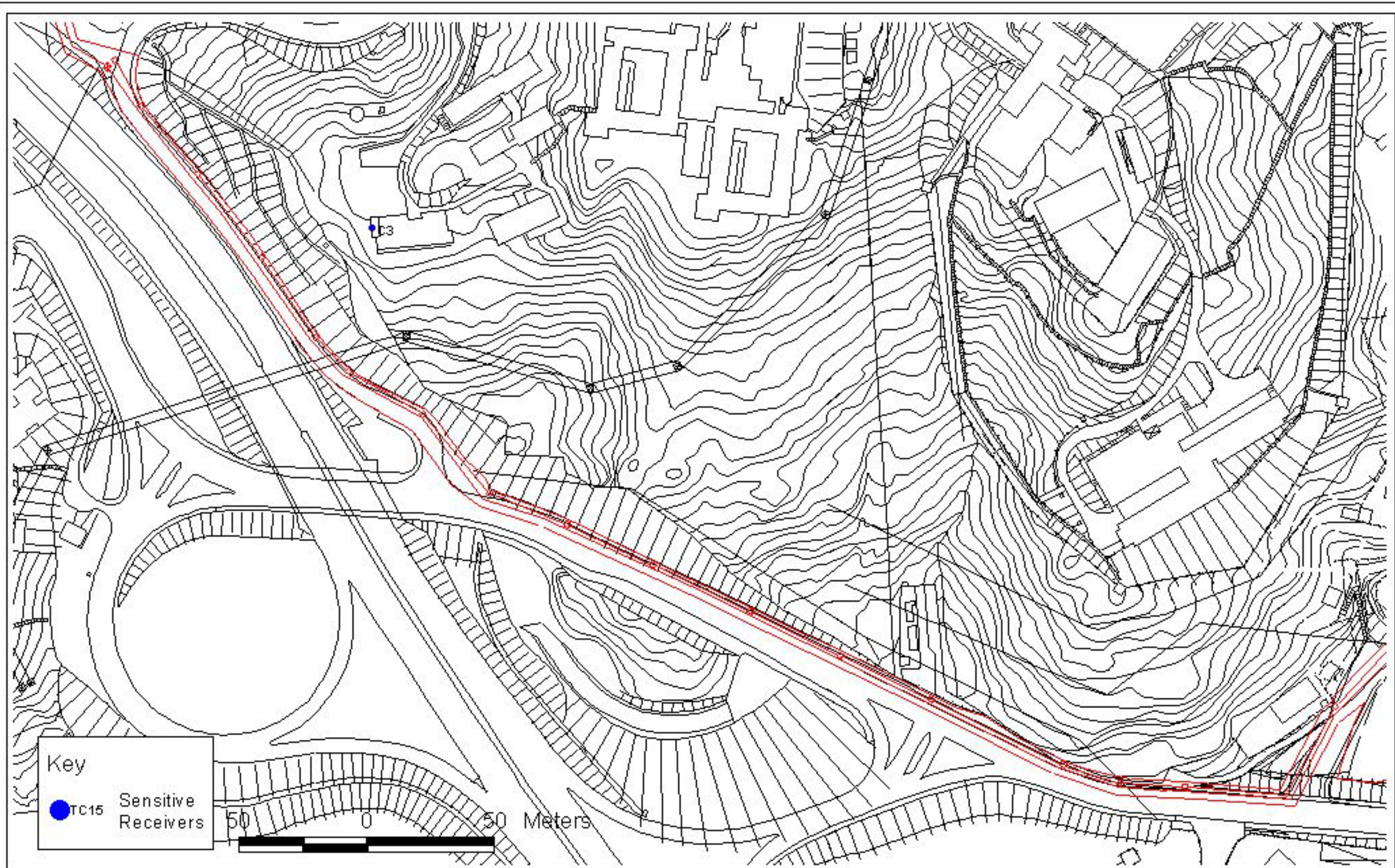


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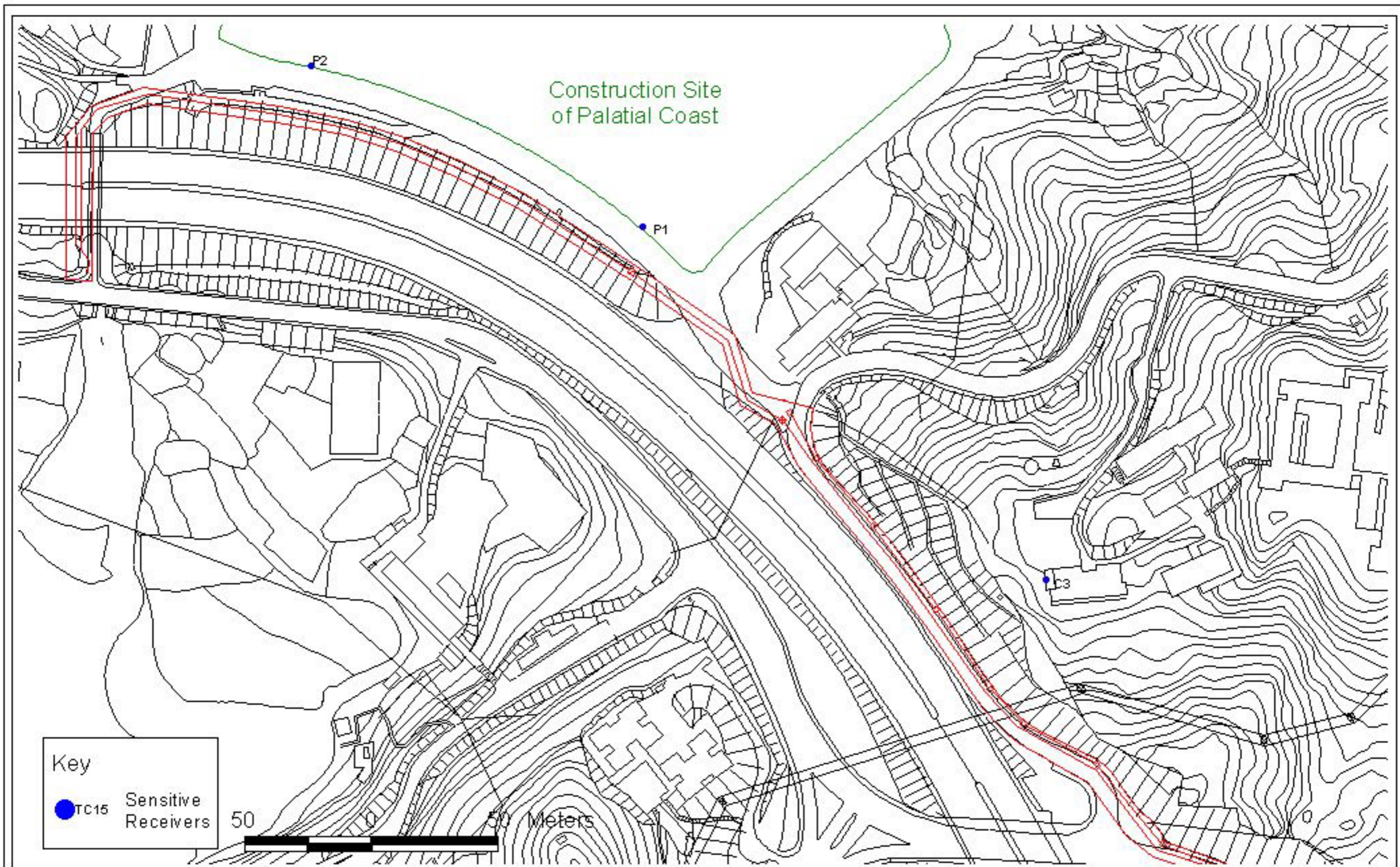
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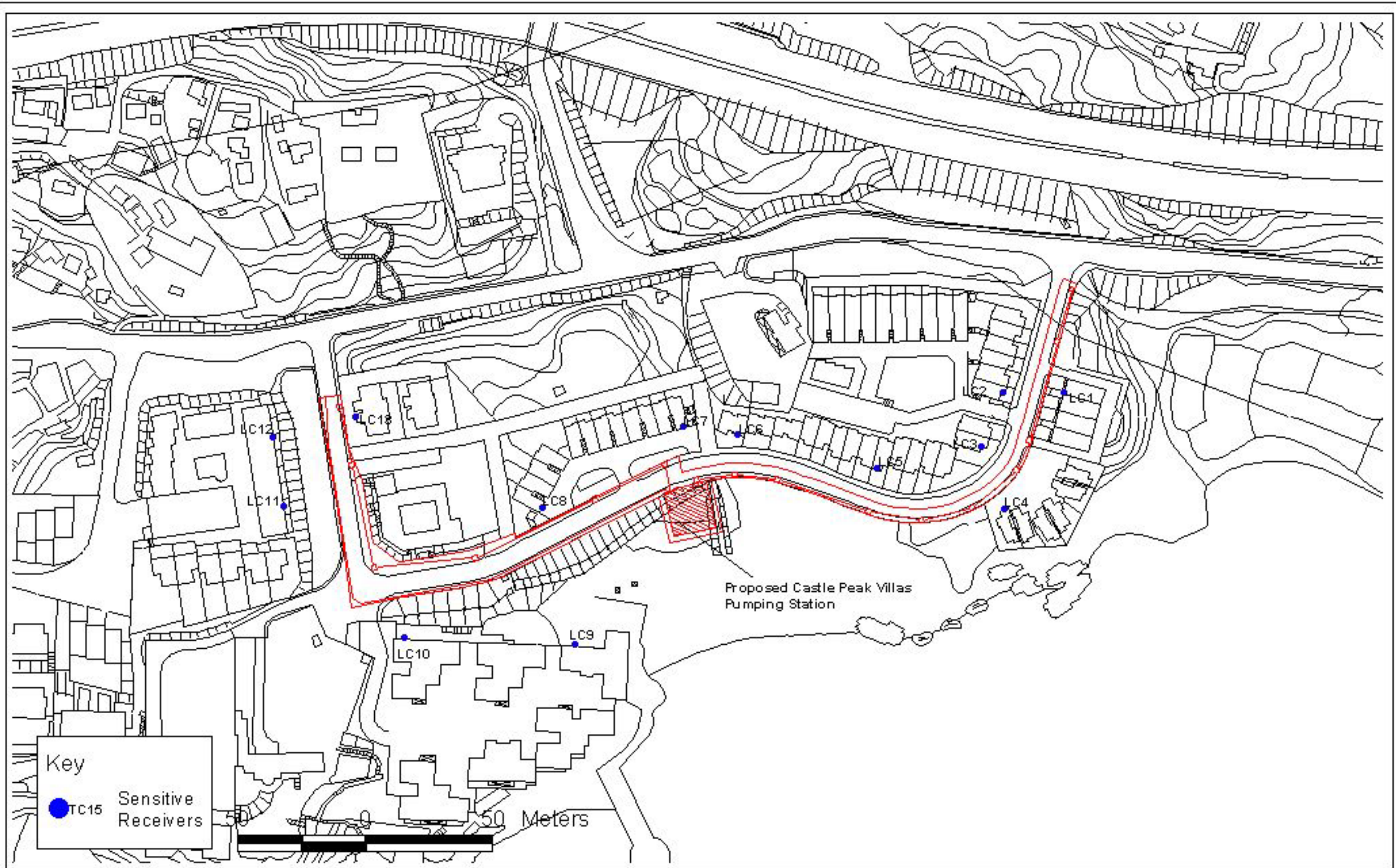
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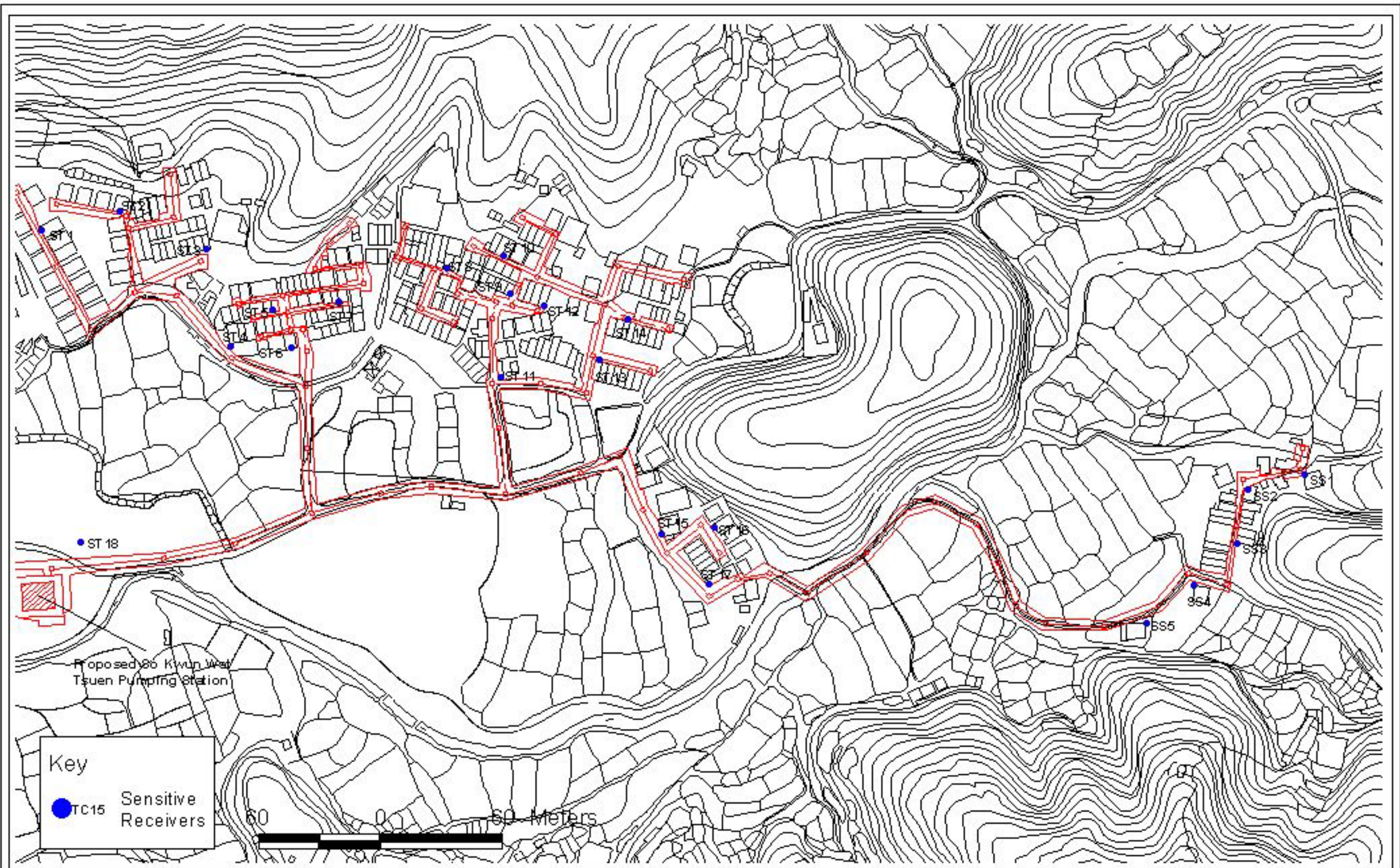
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Recommended Dust Monitoring Locations (5 of 8)



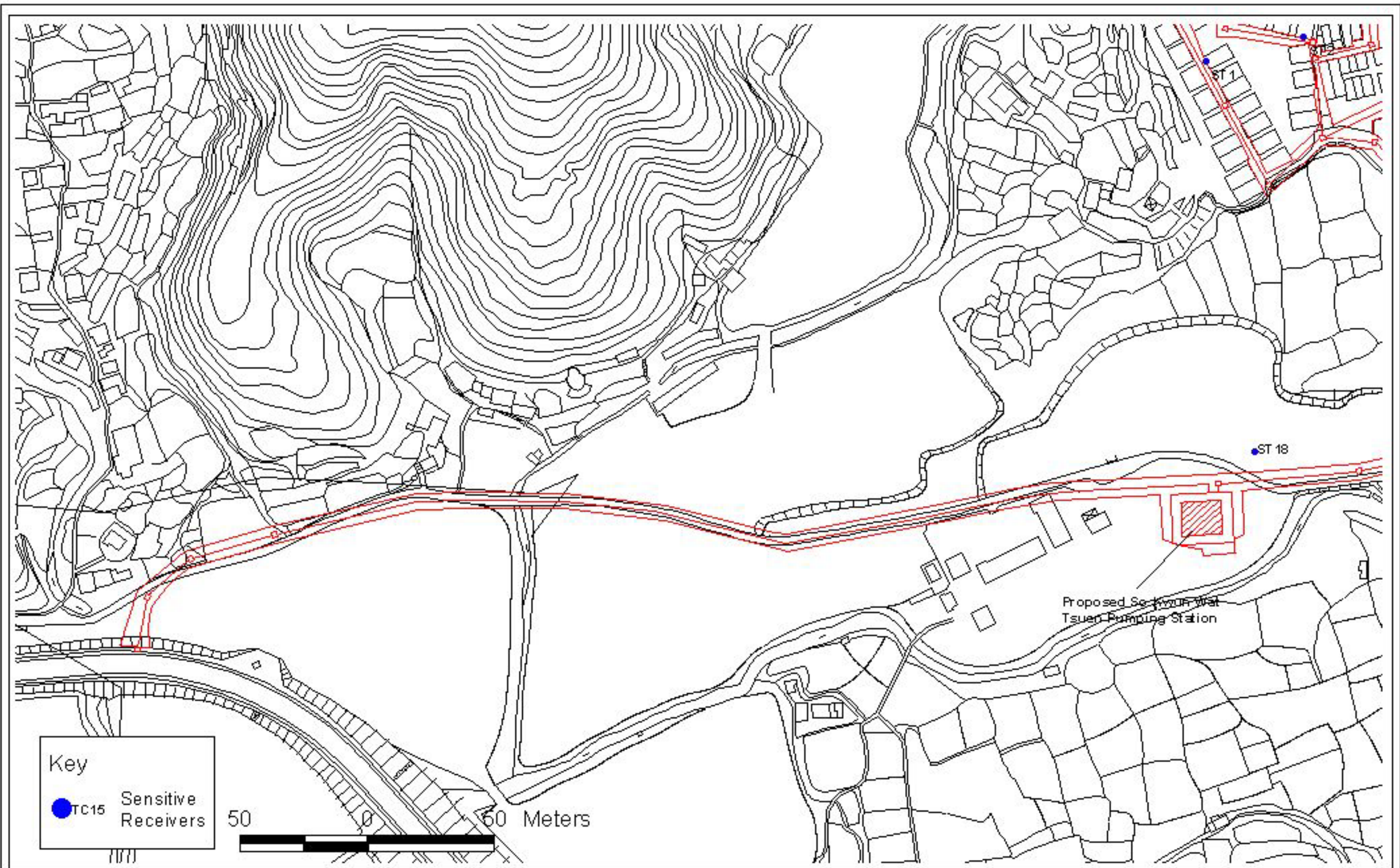
Recommended Dust Monitoring Locations (6 of 8)



Recommended Dust Monitoring Locations (7 of 8)

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Recommended Dust Monitoring Locations (8 of 8)

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Drawing No. 2.2h