

Automated Monitoring Systems

Noise and Air Quality

Automated Monitoring Definition

- Automatic recording and archiving of measurement data and simple methods to extract recorded data
- Type A - Monitored data is stored in a buffer at the instrument and is batch uploaded at regular (hourly) intervals to server.
- Type B - Real-time data is continuously uploaded to server and is available with minimal time-lag (a few seconds)

Type A – Batch Upload Monitoring

- For
 - Lower cost for installation,
 - Can use mobile phone
 - Can send warnings SMS, Emails
- Against
 - There can be a time lag between collection and review
 - May not respond to direct access

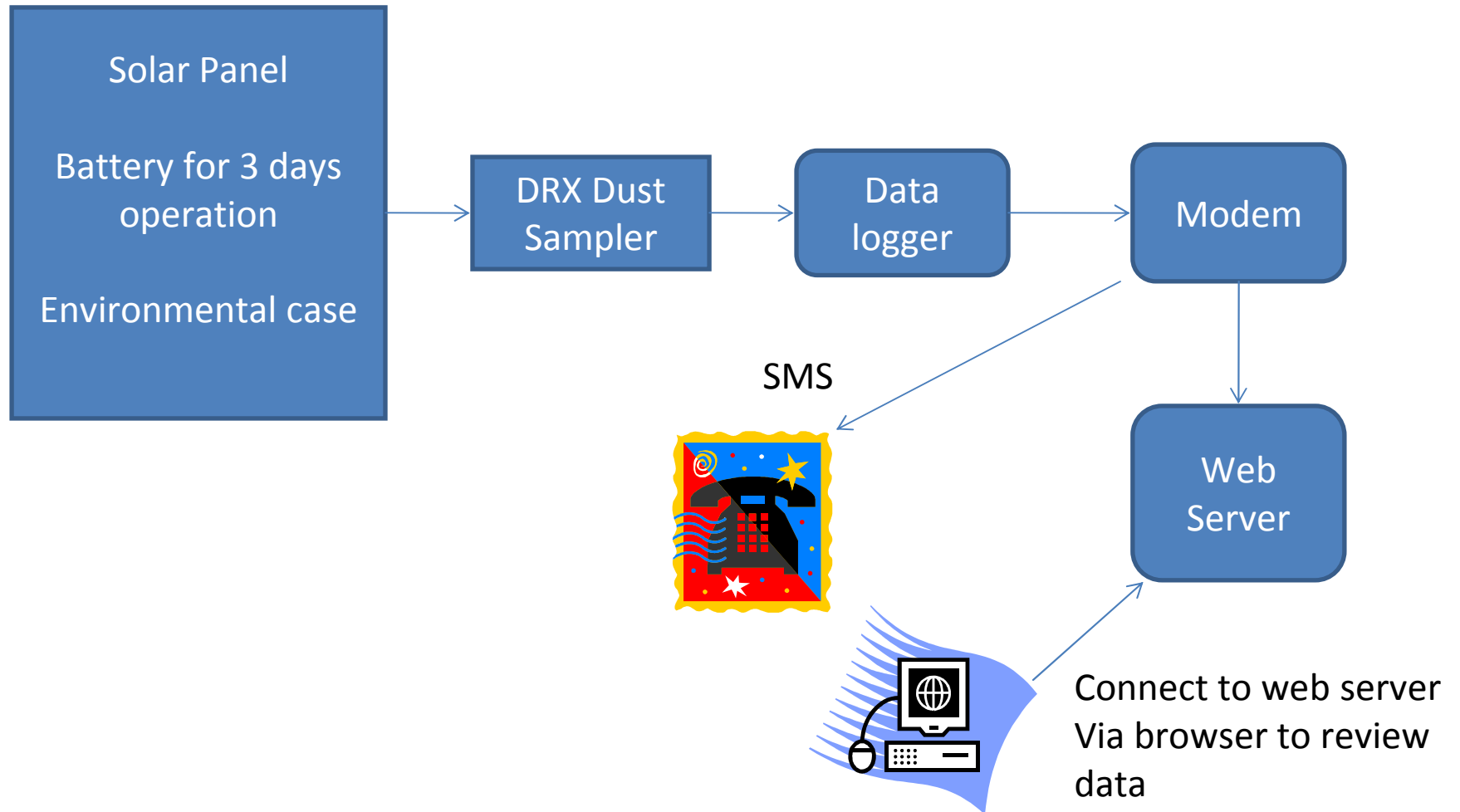
Type B - Real-Time Monitoring

- For
 - Allows immediate feedback to staff for operational checks and response to complaints
 - Can send warning (SMS or email)
 - Combined with operational information and weather data to produce real-time dynamic mapping
- Against
 - Reliable low-cost network connection
 - Requires an intelligent controller

Demonstration

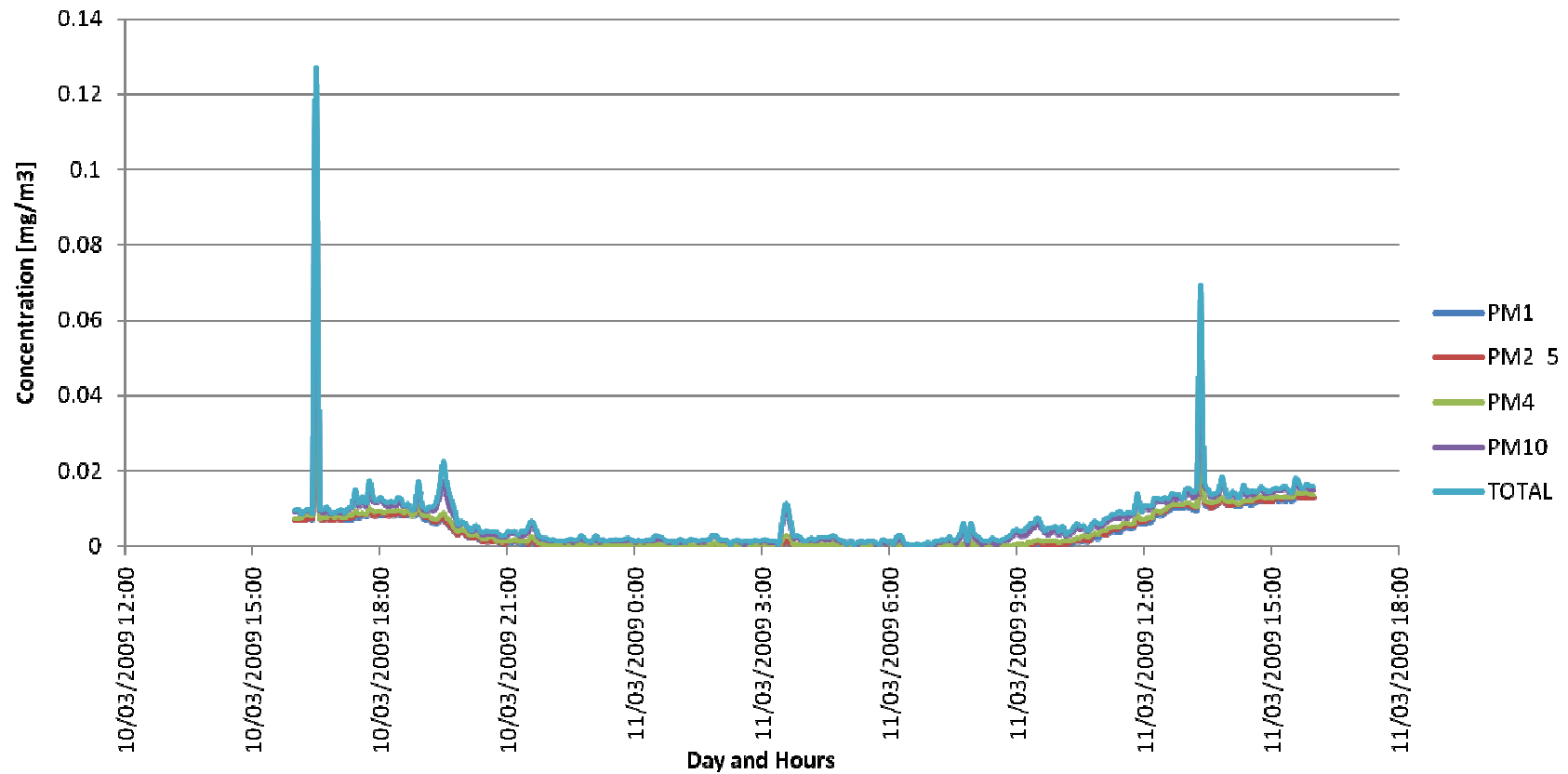
- Demonstration of batch monitoring - Installed at a Coal Mine using ESI Dusttrac DRX monitors and web server to display archived data
- Demonstration of real-time monitoring- North-South Bypass Tunnel Noise Monitoring using NMA's Soundweb. Low-cost Rion sound level meters, Soundweb (NMA developed) software and Telstra's Next G internet service

DRX Batch Diagrammatically



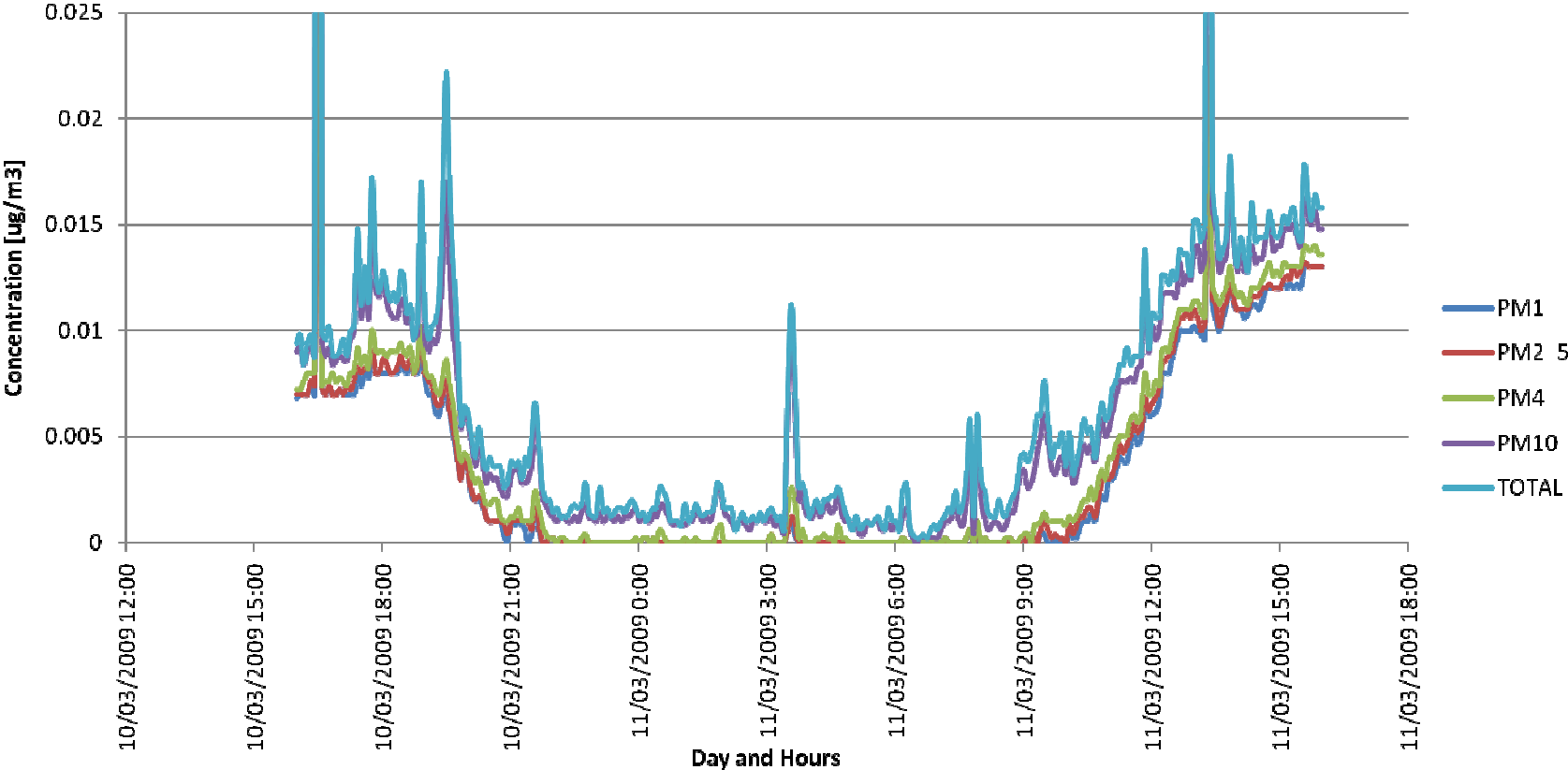
Sample of DRX Logging Dust

Dust Monitoring at Mine - Logger 1

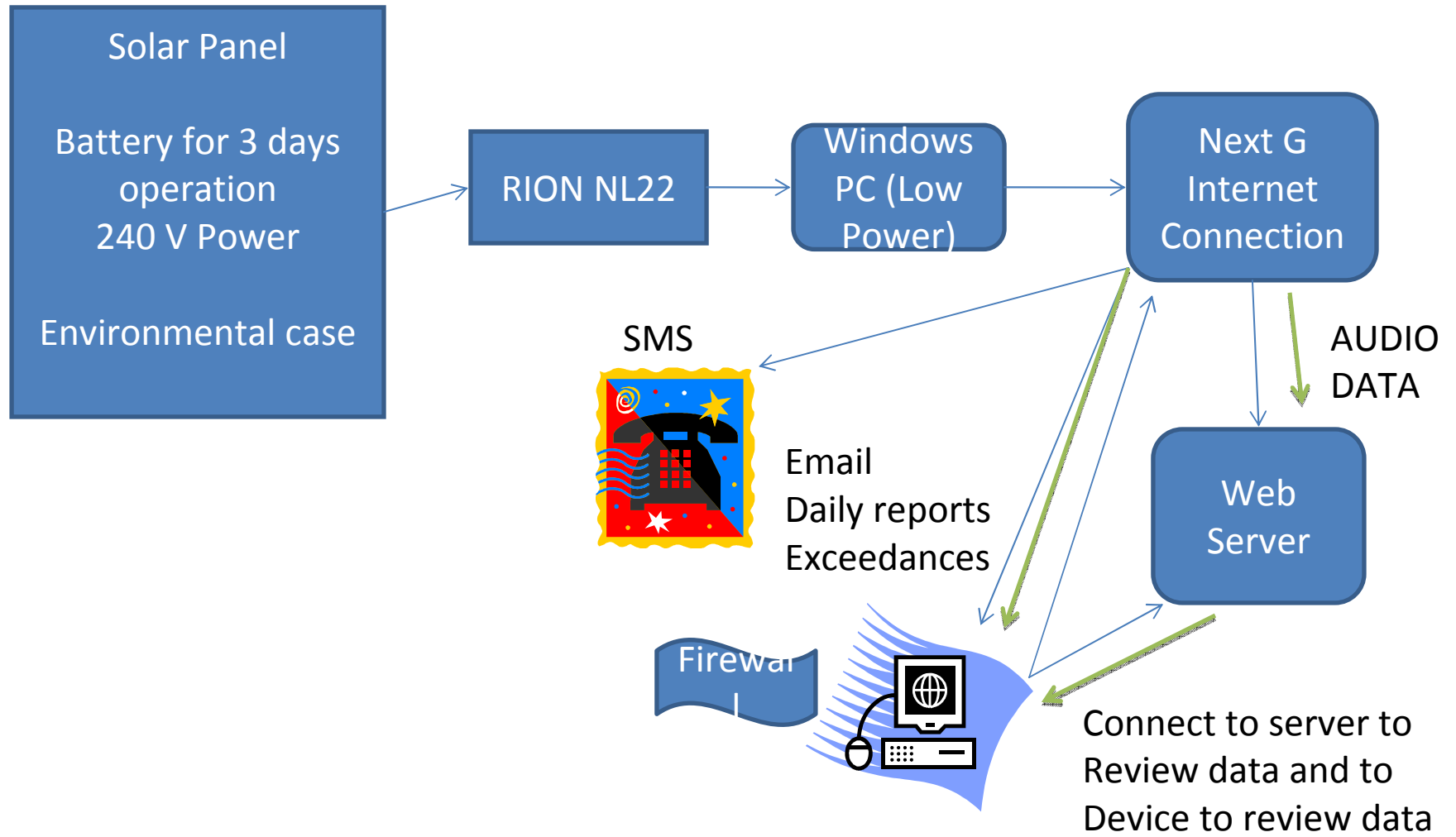


Sample of Online DRX Dust

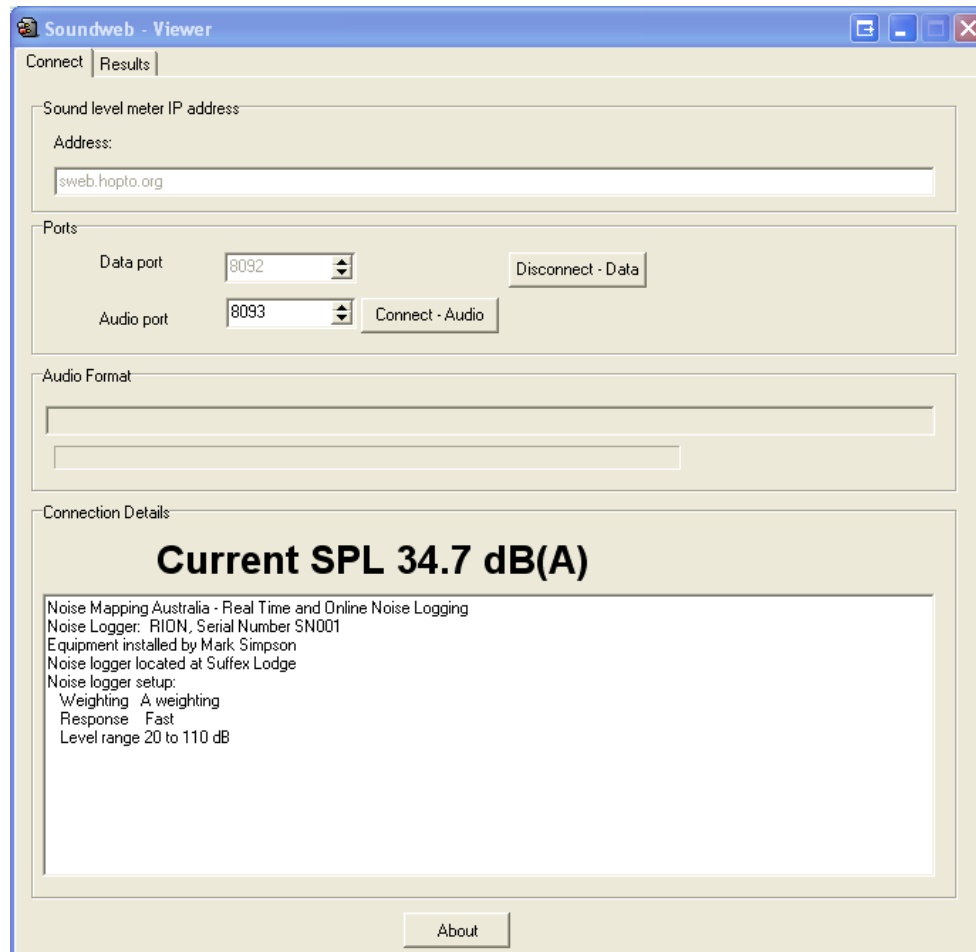
Dust Monitoring at Mine - Logger 1



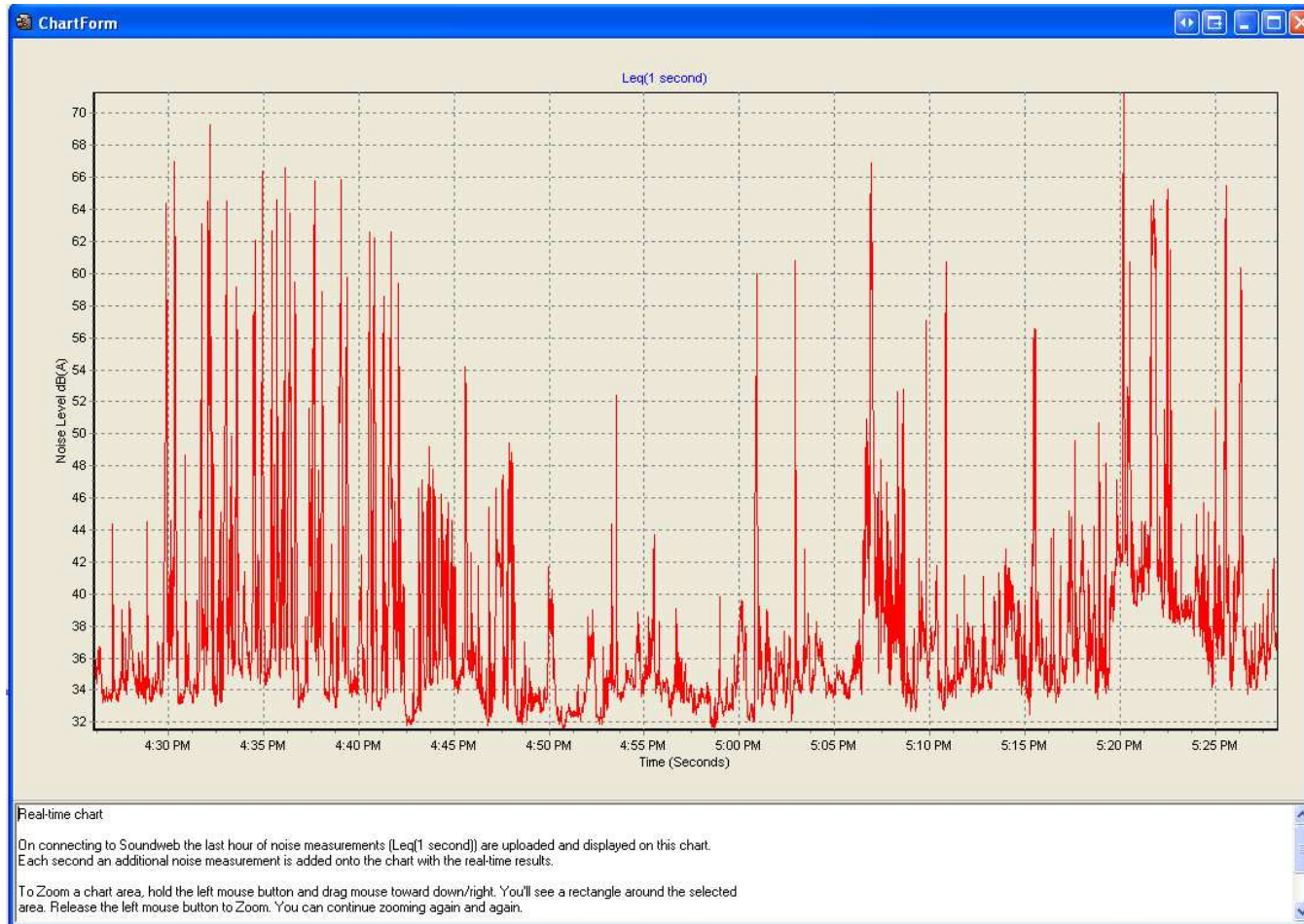
Soundweb Diagrammatically



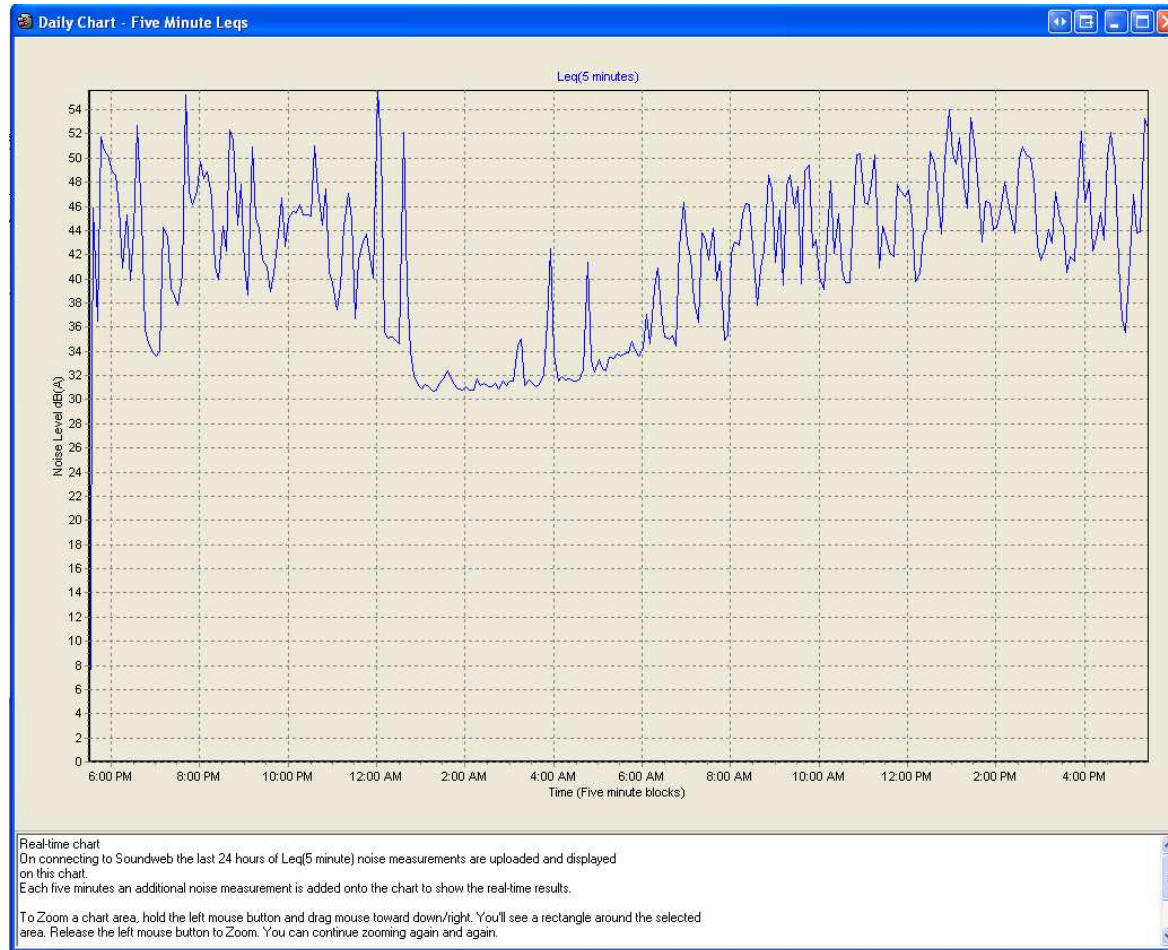
Sample of Real-time noise



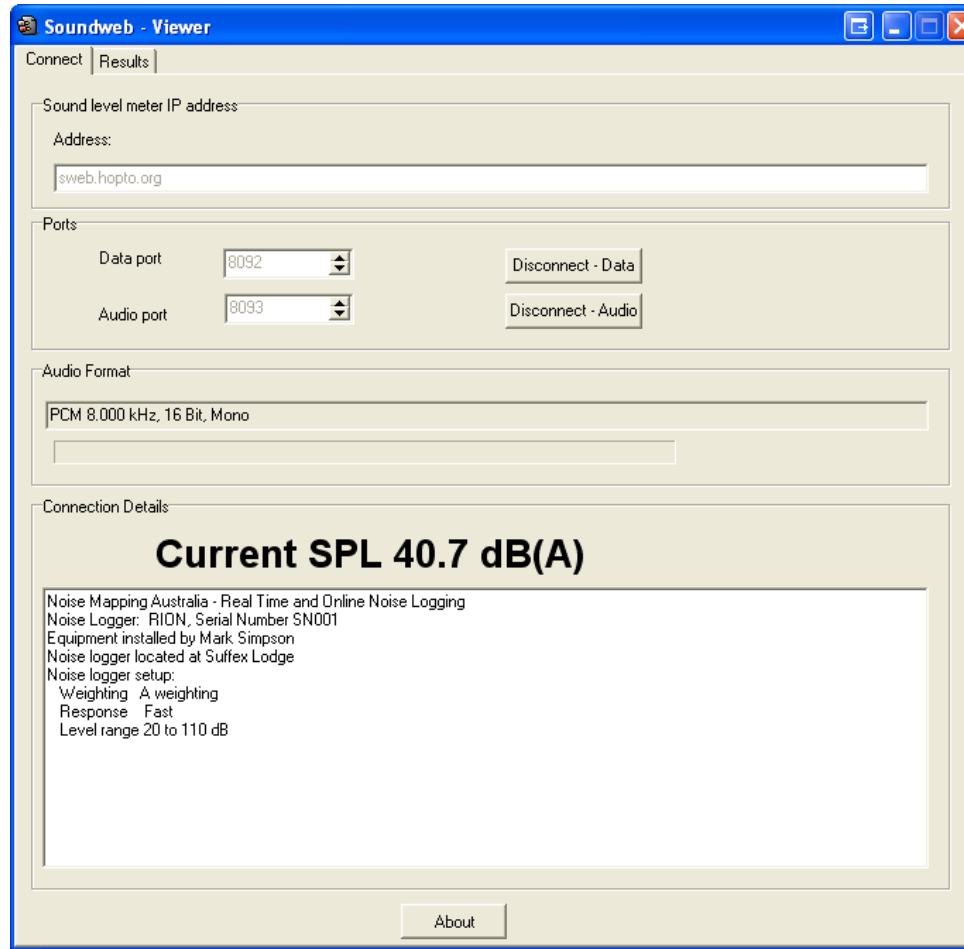
Auto-updating with 1 second data



Last 24 hours



Audio also available



Public Issues

 **thedaily**
com.au
Sunshine Coast Daily Online

News Sport Entertainment Lifestyle Money Blogs Photos Weather Search

sunshine coast noosa coolumb national world

Concrete plant dust concerns

10:00a.m. 9th March 2009 | By Alan Lander

Residents of a retirement village at Kawana Island claim they are being poisoned by a concrete batching plant 200 metres away.

Don Champion, of Living Choice Retirement Village at the south end of the island, said his wife had twice been admitted to hospital with double pneumonia with symptoms arising from dust inhalation.

The village manager, Russ Dunstan, is supporting Mr Champion's complaints and said some other residents believe they have been affected by dust from the plant, which is located in a Kawana industrial estate.

"We are on the northern side of the lake; it's on the south side," Mr Champion said.

"For three years we have wondered why there was black dust on our balcony furniture every other day.

"We contacted the council, who organised tests and took samples, but the results were inconclusive because the dust is worse during southerly winds and the sample time had predominantly northerlies."

Mr Champion said he and Mr Dunstan were organising an independent test.

He said the plant had been directed to undertake dust-limiting steps which he said had initially been adhered to but was no longer sure it was still so.



Don and Maurine Champion say they are being poisoned by dust. Photo: Jason Dougherty/181306

Limits - Goals

- Dust
 - PM2.5 $25\mu\text{g}/\text{m}^3$ 24 hours and $8\mu\text{g}/\text{m}^3$ 1 year
 - PM10 $50\mu\text{g}/\text{m}^3$ 24 hours 5 days per year
 - TSP $90\mu\text{g}/\text{m}^3$ 1 year
 - Project specific
- Noise
 - $L_{\text{Aeq, adj, 1hr}}$, $L_{\text{A10, adj, 1hr}}$, $L_{\text{A1, adj, 1 hr}}$
 - Indoors limits or outdoors, sometimes related to background $L_{\text{A90, 1hr}}$
 - Project Specific, i.e. Status quo

Acceptable Equipment

- Dust
 - High volume sampler is standard method. Cannot be automated, requires laboratory
 - TEOM is highly regarded and seen as equivalent to standard method. Can be automated, very high cost
 - Dusttrak DRX, Osirus etc real-time and can be automated. Can also measure multiple PM fractions simultaneously. Studies show good correspondence with TEOM and accuracy can be further improved by calibrating with high volume samplers. Without calibration I term these screening assessments

Acceptable Equipment

- Noise
 - Type 1 or Type 2 sound level meter
 - Statistics and L_{Aeq}
 - Robust microphone
 - Regular calibration. I have found that even after 12 months installation calibration has not changed. However, auto calibration microphones available
 - Recording audio (digital sample rates limits frequency content). Calibrate to obtain transfer function
 - Some meters also have 1/1 or 1/3 real-time band filters. Much more expensive. Multi-microphone arrays for directionality

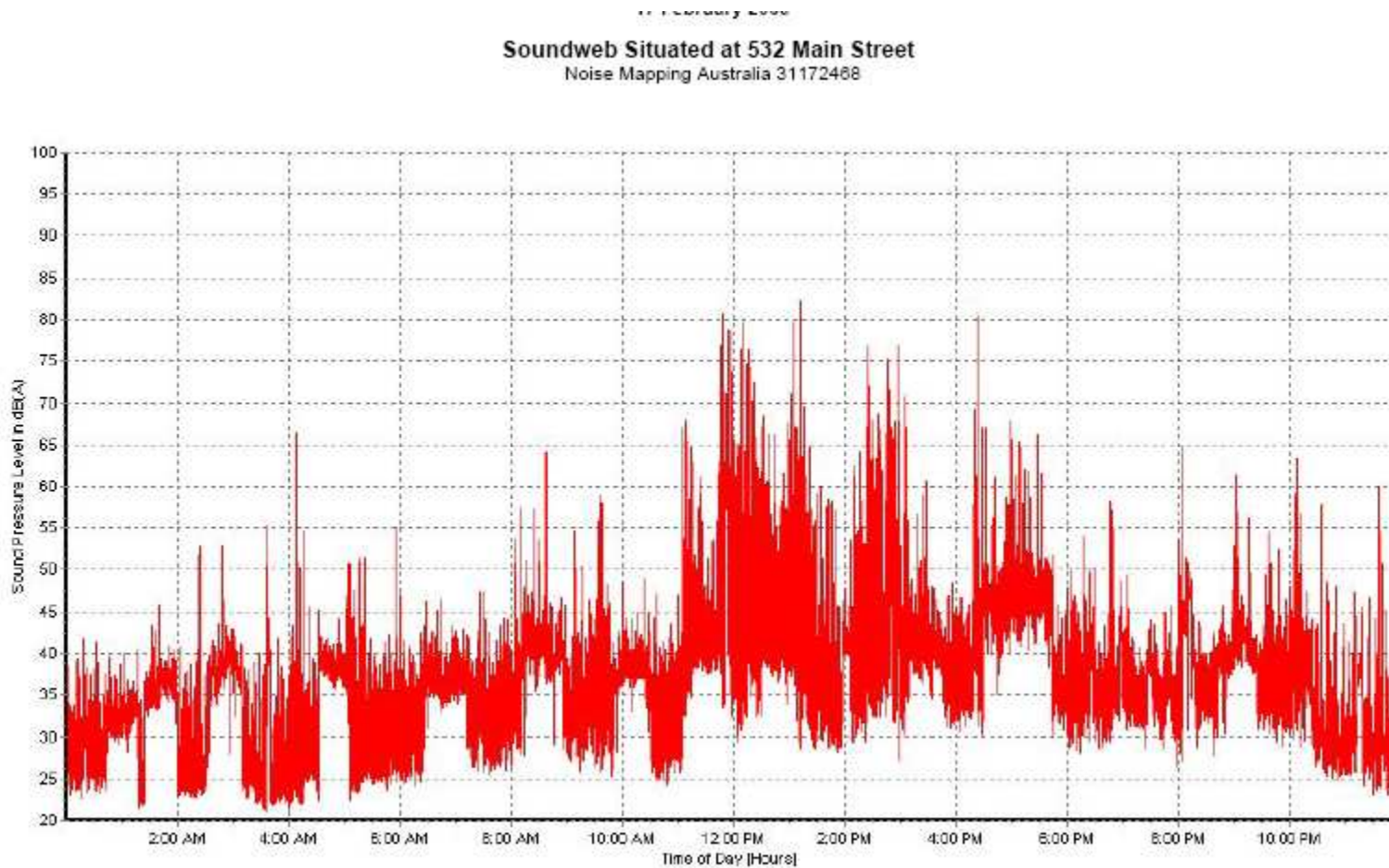
System Enhancements

- Weather station
 - Wind speed, wind direction, temperature
 - Temperature at second height
- Activity log
 - Keep track of potential noise and dust sources both onsite and offsite
 - Include vehicle GPS tracking on major items of plant and engine load logs with time stamps
- Ensure good spatial coverage (both sides of source)

Review of Data

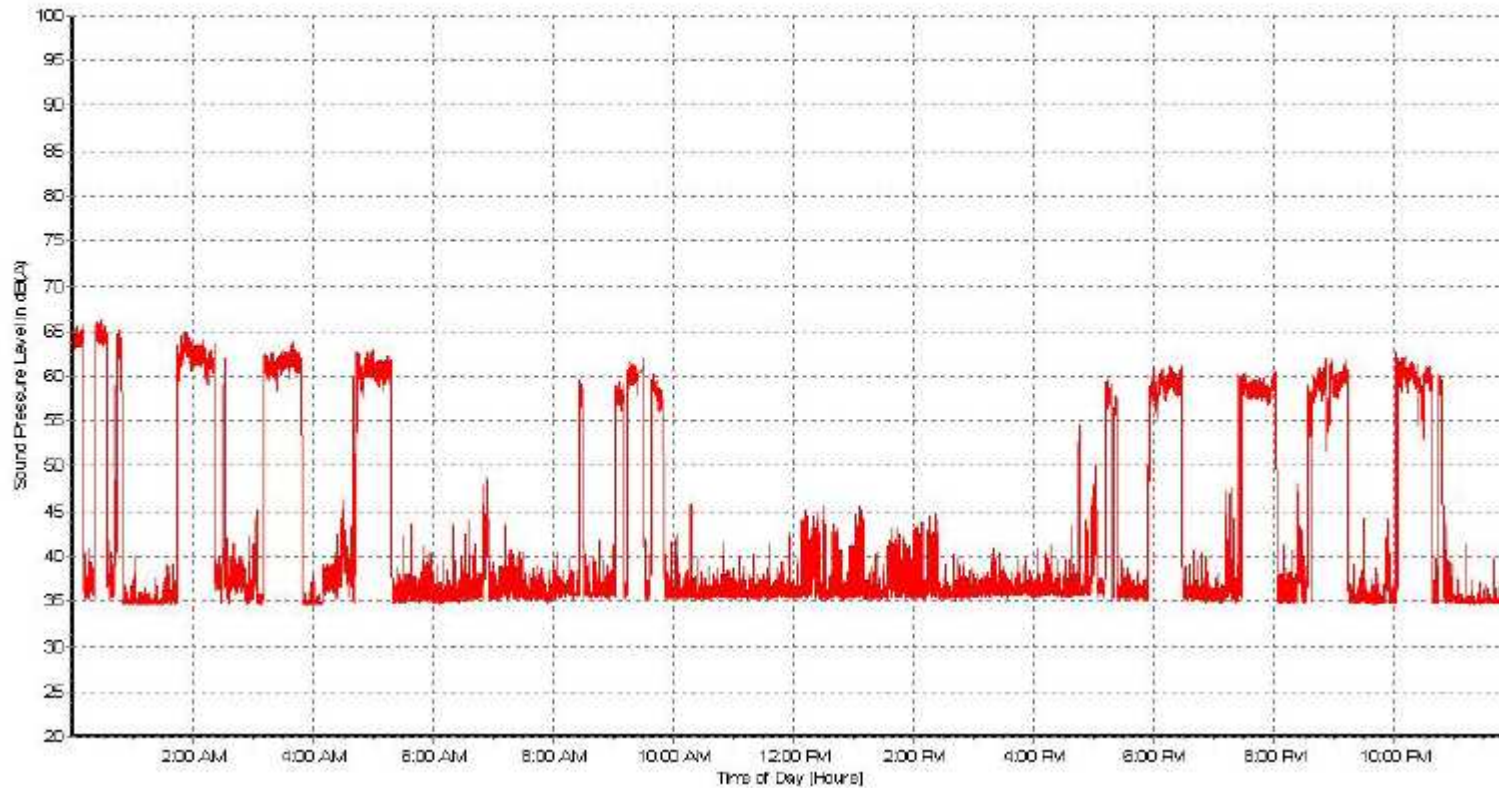
- Peak events usually due to local activity (birds, wind, car passing)
- Shift in baselines can be significant at other times
shift in the maximum levels can be significant
- Back calculate to determine source emissions
- For known source emissions calculation of dilution/attenuation
- Compliance checks (sometimes)
- Relationships/ratio between different dust fractions helps sets distances to sources

Shift in Baseline



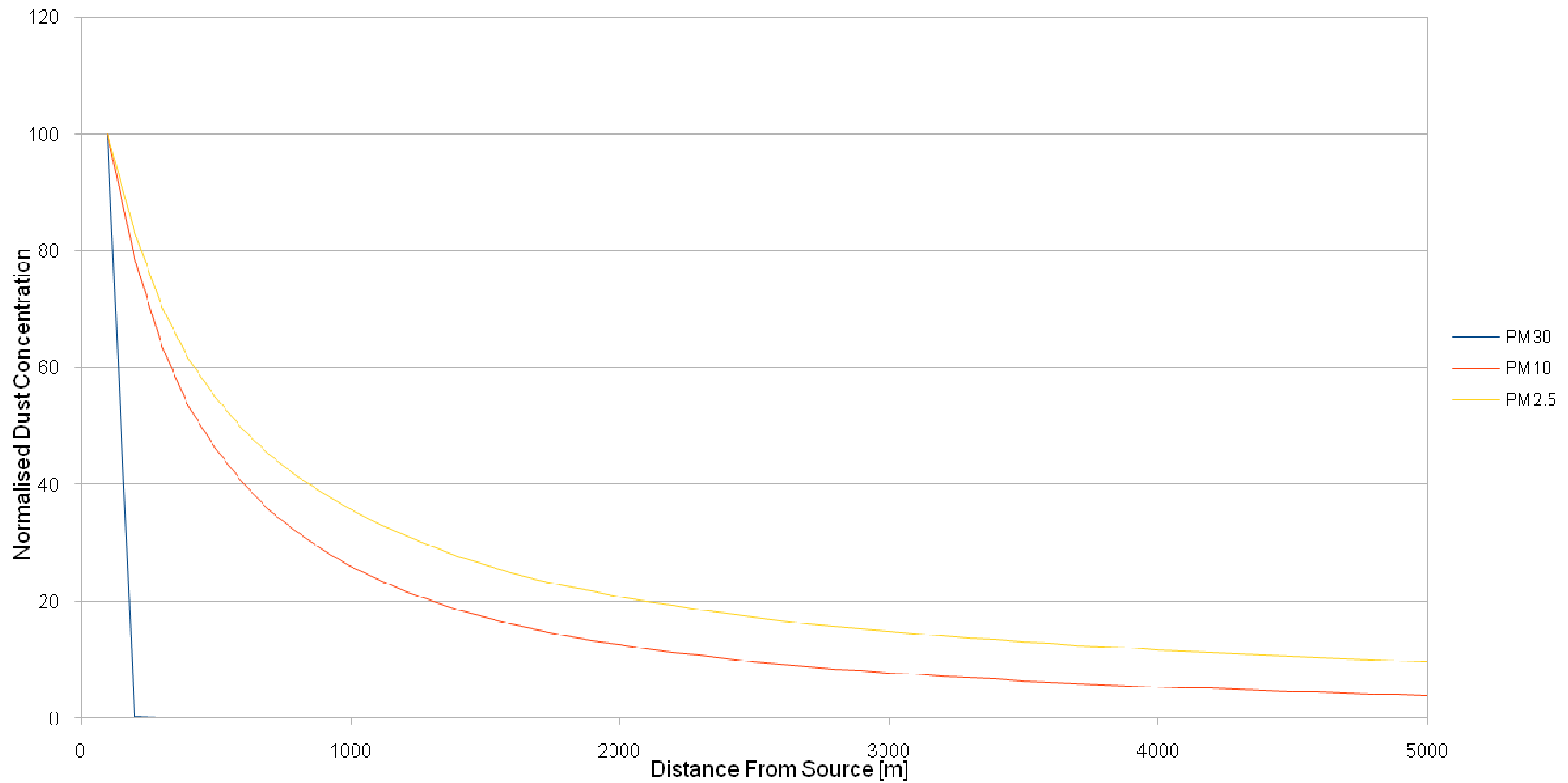
Shift in Maximums

Soundweb Situated at Bodies at Eze
Noise Mapping Australia 31172468



Back Calculate Dust

Dust Concentration with Increasing Distance From Sources



Ultimate real-time system

- The ultimate real-time system would comprise two parts a monitoring component and a physical model of the operations to provide spatial coverage, contours. These would be made available in real-time and most likely made available on the internet. (Similar to the Tropical Cyclone tracking maps).

Real-time system - Noise

- Develop noise profile for each item of plant for all load conditions
- From load and GPS position data put noise sources at appropriate locations in a noise model
- From weather station data enter appropriate weather conditions
- Include the latest terrain data in model
- Check the noise level at the receptors and refine noise model to match measurements. Some attended site verification work would be needed along with a noise measurement location close to operations
- After conducting statistical analyses the noise model is verified.
- Finally, the calibrated model is used to make assumptions regarding contouring based on the real-time collected data.

Real time system - Dust

- Dust emissions, unlike noise are not just related to load. Need to also consider dust control.
- Exposed areas, stockpiles are also sources of dust and only released if the surface is disturbed and wind speed sufficiently high. These areas need to be mapped from time to time
- Conduct a series of tests downwind of plant, equipment and exposed areas to establish baseline emission data. To ensure the number of variables are kept to a minimum, it is preferable to consider an ensemble of sources rather than each item of plant individually. It may be appropriate to consider the pit as a single source, the CHPP as another and the roads as another.
- Based on wind speed, direction, etc back calculate to possible dust emission sources. From GPS logs determine if any ensemble sources are a) likely to be source of dust and B) how many (ensemble) sources are involved.
- Calculate downwind dust concentrations with a model to verify at monitoring location and verify accuracy statistically.
- Finally, the calibrated model is used to make assumptions regarding contouring based on the real-time collected data.