DAILY SITE DIARY

Week No:	Date:	Project Name:	Project No:
Security (night activity & condition of site fencing):			
Weather:			
Name of Visitors to Site:		Reason for visit:	
Activity Report:			
Hours Lost this day:	Reason for Delay:		

Environmental Monitoring in place (tick if applicable)	Dust:	Noise:	Odour:	Vibration:	Asbestos:	Mud on Road: Yes / No

Complaints / Non-conformances:

Labour on Site	
Job Title	**Total**
Site Manager	
Site Supervisors	
Engineer	
Site Operatives	
Labourers	

Inspection & Tests:

Plant in Use	Total

Name:		Other Trades on Site	Total
Signed:			
Distribution: Project Lead / Main File			

ENVIRONMENTAL INSPECTION FORM

Project Name:		Project No.		Date:	
Site Manager:				Time:	
Inspector:		Position:			
Description of Current Activities:					

CHECKS & REMARKS

1	2	3	
X			OK
	X		NOT OK
		X	N/A

RELATED DOCUMENTS

- Environmental Permit **AND** Environmental Permit Deployment Form
- Remedial Method Statement
- Environmental Monitoring Records
- Duty of Care Records
- Environmental Incident Reports
- Complaints Records

#	Management			
A1				Supervisor understanding
A2				Environmental Permit **and** EP DF available on site
A3				DF valid (within expiry)
A4				WAMITAB Manager attendance
#	**Site ID & Security**			
B1				Identification Notice Board
B2				Fence specifications to standard
B3				Lock on gate
#	**Site Infrastructure**			
C1				Site layout consistent with site plan
C2				Permitted activities same as in DF
C3				Drainage plan consistent with DF
C4				Geo-textile lining
C5				Bunds
C6				Sumps
C7				High/Low level switches
#	**Leaks & Spillage Prevention**			
D1				Plant/Vehicle inspections (H&S form HS.056)
D2				Skip/drum leak inspections (H&S form HS.061)
D3				Skip/drum labelling
D4				Form ENV-013 Emergency Spill Drill completed
D5				Incident Reports (H&S form HS.019)
#	**Material Control & Records**			
E1				ID labels for stockpiles etc
E2				Quarantine area
#	**Off-Site Nuisance**			
F1				Noise/dust/odour leaving site
F2				Control of mud and debris on roads
F3				Litter/ scavengers/ pests
#	**Pollution Control**			
G1				Dust control (water bowsers, spray bars etc)
G2				VOC control (covers, GAC, odour suppression) etc)
#	**Environmental Management**			
H1				Environmental Aspects Register available, correct & complete (Form IMS.005)
H2				Remedial Method Statement Present- current, sign off
H3				Personnel Confirmation of Instruction –M/S Sign off
H4				Other documents specified in the Permit / Deployed Permit being maintained / adhered to

#	Point Source Emissions			
I1				Are records available/up to date
I2				Air emission (VOC etc.)
I3				Groundwater
I4				Surface water
I5				Soil Gas
I6				Have trigger levels been exceeded.
I7				What actions were taken?
I8				Compliance evaluation undertaken?
#	**Fugitive Emissions**			
J1				Dust/ fibres/ particulates
J2				VOCs/Odours
J3				Noise
#	**Records/Reporting**			
K1				Site Diary/records up to date (Form CON-003)
K2				All records secure
K3				Monitoring Summary submitted EA (monthly)
K4				Materials accepted/removed submitted EA (quarterly)
#	**Abstraction Licence**			
L1				Availability
L2				Monitoring
L3				Compliance
#	**Discharge Consent**			
M1				Availability
M2				Monitoring
M3				Compliance
#	**Duty of Care**			
N1				Consignment Notes
N2				Transfer Notes
N3				Materials Management Plan
N4				SWMP/MMP up-to date/Completed
#	**Display Board**			
O1				Policies available and current revision?

ENVIRONMENTAL INSPECTION FORM

Priority	Response	Definition			
A	Immediate	An issue requiring immediate attention to eliminate high risk of accident or incident. Breach of environmental legislation			
B	Within 3 Days	Action required to minimise environmental risks. No breach of environmental legislation			
C	Within 1 week	Improvement action required to meet best practice and continually improve standards			
Item Ref No.	Comments / Findings	Action to be taken and future recommendations	Priority	Action by Whom	Action Date

Inspection Action Complete – Sign off		
Site Manager Signature: Print: Signature:	Project Lead: Print: Signature:	Visiting Manager Inspector: Print: Signature:

Site:		Contract Ref:		Organisation:	
Date:		Site Manager:		Assessor name:	
Daily activity:					

		ODOUR									DUST		NOISE	HOUSEKEEPING			
Location	Time	Detectability	Intensity	Quality	Hedonic tone	Odour frequency	Location sensivity	Odour source	PID reading	Odour Control Inspection	Visual	PM10	Average	Litter	Pests	COMPLAINTS	ACTIONS REQUIRED
	Start	(Y/N)	(0 to 6)	(Description)	(-4 to + 4)	(1-5)	(H/M/L)	(1 to 5)	(ppm)	On/Off	Y/N	(ug/m3)	(dBa)	(Y/N)	(Y/N)		(Description)

Meteorological and environmental conditions

Wind speed	Wind Direction	Temp	Weather description	Cloud cover	Ground conditions	Barometric Pressure
(mph)	(e.g. N, SW)	(^{0}C)	(e.g. rain, sun, wet, dry)	(0 to 8)	(e.g. wet, dry)	mbar

General Notes

Assessors Signature..

ENV-003 MATERIALS MANAGEMENT SOIL WATER AUDIT - Issue 1
Discharge Water

Project Ref:		Project Name:			Client:		Project Engineer:	
Origin	Storage Location	Treatment Activity	Visual Classification	Volume(m3)	No. Samples Tested	Test Report No.	Result PASS/FAIL	Discharge/Disposal

NOISE MONITORING

Contract Title: ..... Contract Number: .....

Date: ..... Weather: .....

Ref	Max	LPeak	LEQ	L10	L90	Location

Influences / Comments

Sketch

Taken by:	**Instrument:** CEL

Note: All measurements in dBA

ODOUR ASSESSMENT FORM

Contract Title: ..... Contract Number: ..... MPL.Number: EAWML

Date: ..... Site Manager: ..... Type of Treatment: .....

Taken By: ..... Start Time: ..... Finish Time: .....

Complaint Received	YES/NO	Date	
Location of Complaint Area		Grid Reference (where not a property)	

Weather		Wind (strength and direction)	
Temperature (deg. C)		Bar Pressure (mbar) (rising/falling)	
% Cloud Cover		General Air Stability	
General Air Quality		Ground Condition	

Plan attached showing location and extent of odour Yes/No

Additional Comments

Action Required

Reported to on site:

Signature:

ODOUR ASSESSMENT FORM

Location	Odour Intensity	Odour Extent	Location Sensitivity	Odour Description	External Sources Of Odour	Waste Sources of Odour

GROUND WATER PRODUCT MONITORING DATA

Project Ref:	Project Name:	Engineer Name:

Date	Time	Location	Depth to Product (mBGL)	Depth to GW (mBGL)	Depth to Base of Well (mBGL)	Thickness of product (m)	Type of Product	Colour	Viscosity (High - Honey - 10) (Low - Water - 1)	Monitored with:	PID (ppm)	Assessor	Comments

PID Reading

Date	16/10/2014	22/10/2014	23/10/2014
SVE Well ID	**PID (ppm)**		
SVE UNIT	**ON**	**OFF***	**OFF***
1	0.0	2.0	2.8
2	0.9	1.2	6.0
3	0.3	122.4	2.6
4	163.8	0.5	40.7
5	137.9	808.9	721.7
6	0.4	5.6	8.9
7	0.0	6.4	1.8
8	0.0	2.6	0.4
9	0.2	1.0	0.1
10	0.8	4.9	34.9
11	0.0	12.8	64.7
12	0.0	2.1	2.6
13	0.0	0.0	1.6
14	0.0	0.3	4.0
15	0.4	2.9	2.4
16	0.0	0.7	0.8
17	0.0	1.1	0.8
18	0.1	0.4	0.7
19	0.3	1.1	1.9
20	0.0	1.3	1.3
21	0.0	7.8	7.0

Date	21/01/2015		22/01/2015	
SVE Well ID	PID (ppm)		PID (ppm)	
SVE Unit	**Peak reading (ppm)**	**Settled reading (ppm)**	**Peak reading (ppm)**	**Settled reading (ppm)**
1	0.9	0.1	0.9	0.2
2	1	0	0.2	0
3	2.7	0.2	1.5	0.2
4	1.7	0.2	0.7	0.2
5	45.5	6.5	125.4	10
6	1.4	0.3	6	2
7	0.9	0.2	3.1	1
8	0.4	0	2	0.1
9	4.8	2	32.9	21
10	6.2	0.5	8.5	0.5
11	0.1	0	7.3	1.5
12	1.3	0.1	1.3	0.1
13	0	0	0	0
14	0.1	0	1.5	0.2
15	1	0.1	1	0
16	0.6	0.2	0.9	0
17	0.2	0	0.6	0.1
18	0.4	0	0.6	0
19	1.1	0.1	4.5	0.7
20	0.3	0	1.3	0
21	0.4	0	2.6	0

* OFF meaning the unit was switched off for more than 12 hours

SOP 002 - STANDARD OPERATING PROCEDURES
WATER QUALITY MONITORING KIT

PURPOSE / BACKGROUND

This standard operating procedure (SOP) covers monitoring of groundwater quality parameters using a Hanna Dissolved Oxygen , pH/ORP/Conductivity/TDS Meters.

These pieces of equipment enables in-field real time analysis of groundwater for a range of parameters including temperature, electrical conductivity, dissolved oxygen, pH and oxidation-reduction potential (commonly abbreviated to Eh or ORP). These parameters are displayed on the screens in several different units.

Analysis is undertaken by either submerging the probes below groundwater in the monitoring well, or more commonly by submerging the probe below purged water contained in a bucket or a apparatus called a flow-through cell. Flow through cells reduce introduction of oxygen into the water and ensure readings are taken from freshly purged groundwater whilst ensuring the continuous flow of water past the sensors.

Recorded parameters may be used to indicate whether biochemical processes are likely to be occurring in the groundwater by determining whether the water is aerobic (generally considered to be >0.5mg/l dissolved oxygen) or anaerobic (<0.5mg/l DO) and whether conditions are reducing or oxidising (low or high ORP). The spatial variation of these parameters along with the variation in temperature and pH can be used to map organic (e.g. TPH and solvent) contaminant plumes in aquifers if biodegradation processes are occurring. Electrical conductivity may be used to determine whether purged water from different monitoring wells is being abstracted from the same aquifer unit and salinity can be used to map freshwater / saline water interfaces and characteristics.

GENERAL INSTRUCTIONS

1. This SOP provides sequential instructions which should be undertaken in the correct order.
2. The method of purging (i.e. down hole, in bucket at surface, using flow-through cell, using submersible pump or Waterra tubing etc) and any visual and olfactory evidence (e.g. methanogenic odour, free product) should be noted.
3. Monitoring undertaken by placing the probe directly down the well is considered less favourable to purging the groundwater to the surface due to the potential for cross contamination (use of decontamination detergents on sensors are likely to lead to erroneous readings) and the likelihood of exposing the probe above groundwater level when water is purged from the well.

TOOLS, MATERIALS AND EQUIPMENT

- Groundwater purging equipment (e.g. submersible or peristaltic pump and tubing, battery).
- Bucket or flow-through cell.
- Water monitoring kit
- PPE appropriate for groundwater monitoring - disposable gloves, safety boots, high visibility jacket and overalls as a minimum.
- Data record sheet and/or pre-set datalogger.

LIMITATIONS OF METHOD	
1.	The units require regular calibration. Dissolved oxygen must be calibrated by the operator in the field on a daily basis and this process can be affected by changes in temperature and pressure.
2.	The sensors on the probes can be affected by a build up of sediment, algae or free product (LNAPL) which can lead to inaccurate readings. The membrane on the DO meter may be damaged easily.
3.	Readings may be affected by the introduction of oxygen into the water and associated changes in chemistry at the surface when the water is exposed to the atmosphere.
4.	Readings should be recorded when water is flowing past the sensors which is not always possible if the well is purged dry due to the rate of purging relative to the rate of recharge in the monitoring well.

PREPARATION	
1.	The equipment should be checked prior to each visit to site to ensure that it is in a good state of repair, fully operational and that calibration certificates will be valid at the time of monitoring. Sensors on the probes should be clean.
2.	The dissolved oxygen meter membrane should be changed if the unit has not been used for approximately one month by unscrewing the plastic dissolved oxygen (DO) cap, gently sanding the silver electrode until shiny with 'wet and dry' paper and rinsing the electrode with KCl electrolyte solution. A new plastic membrane cap is then filled up to the screw thread with electrolyte solution and the cap is placed back over the silver electrode and screwed finger tight.
3.	DO must be calibrated in the field daily as per the manufactures instruction. This is generally by placing a few millimetres of water into the plastic calibration cup, removing the metal probe sensor guard and placing the probe over the calibration cup loosely or with one screw thread engaged and left for at least 20 minutes with the unit turned on. Water in the calibration cup must not be covering any of the probe sensors. The probe should ideally be calibrated at a similar temperature to the groundwater (i.e. in a cool place if possible). The main display screen is should display the DO% which should not be fluctuating significantly (up to say 0.2% is usual) when the probe and calibration cup are gently agitated (ensuring humid air inside the container is not allowed to escape and fresh less humid air is not accidentally allowed to enter). Follow the manufacturer's unit operational system to 'Calibrate' the DO reading changes to 99.9%. If this value fluctuates significantly whilst the probe remains in the calibration cup and is gently agitated then the procedure should be repeated. . Several attempts at calibration may be required before readings do not fluctuate significantly. Once the unit is calibrated, screw the metal probe sensor guard onto the probe head.
4.	Calibration of the pH meter should be undertaken weekly if the kit is used regularly during the week or upon each use if the kit is used infrequently. Follow manufactures instruction calibration can be a 1 or 2 point calibration. .
5.	Calibration of the conductivity meter should be undertaken weekly if the kit is used regularly during the week or upon each use if the kit is used infrequently. Follow manufactures instruction and use calibration solution reflective of the conductivity anticipated on the water to be tested to give the highest accuracy for the site conditions e.g. Saline or brackish water use a high concentration calibration solution.
6.	If sensors are left open to the atmosphere for long periods of time then they can dry and become damaged. The probe head should therefore be submerged in water if it is not going to be used for several hours or the calibration cup should be screwed onto the probe with a damp piece of tissue in the bottom.

PROCEDURE

1. Ideally the probes will be used with a flow through cell and low flow pump for more information see *SOP007*.
2. Assuming water is being purged into a bucket, place the probe into the bucket and start purging the water. Purging should ideally be done using a high flow pump (e.g. submersible or peristaltic pump) and the outflow tubing should be placed in the base of the bucket below water level (to avoid introduction of oxygen into the water) and so that it is flowing through the sensor guard past the sensors. The sensors on the probe must remain below the water level. Allow the water to flow out of the bucket into another receptacle if necessary to ensure readings are taken from water which is representative of that within the aquifer.
3. Observe the change in readings on the display and when they settle out, either record the values using the instrument datalogger (this can be set to record readings at regular intervals if desired) or manually. It typically takes around five minutes for values to settle out although the ORP and DO are typically less stable and will continue to fluctuate to some extent. Readings should ideally be recorded when water is flowing past the probe and air bubbles should not be flowing in to the purged water (e.g. due to a hole in the pipe). If the well is purged dry then the probe should be agitated gently or slowly stirred in the purged water, ensuring the sensors remain below the water level and avoiding introduction of air bubbles into the water. This is because the DO sensor utilises oxygen so will reduce the concentration of DO in the water immediately surrounding the sensor. It should be noted on the record sheet if values were recorded using standing water as results are likely to be less accurate.
4. When monitoring is completed, unscrew any probe guards and clean the glass bulbs on the pH / ORP sensors using a damp tissue or cloth to remove any sediment. The temperature, salinity and electrical conductivity sensor should be cleaned. Contact with the DO sensor is likely to lead to damage of the plastic membrane and should therefore be avoided. The DO membrane should be replaced if it appears damaged or soiled.
5. Place a damp piece of tissue or cloth into the probe caps/covers to prevent the sensors from drying out.

RECORDS AND DOCUMENTATION

1. Monitoring results to be recorded on standardised form (or field notebook). If a data logger is used then readings should also be recorded manually.
2. Date and time of attendance on site.
3. Method of purging (e.g. bucket and submersible pump) should be recorded.
4. Any visual and olfactory evidence should be noted along with any additional information such as whether the well was purged dry and whether readings had to be recorded when water was not flowing past the sensors (in standing water).

SOP 003 - STANDARD OPERATING PROCEDURE PHOTO-IONISATION DETECTOR (PID) (SOIL AND GROUNDWATER SCREENING)

PURPOSE / BACKGROUND

This standard operating procedure (SOP) covers monitoring of agitated head space for volatile organic compounds (VOCs) using a PID. *However*, General Instructions, Tools and Equipment, Limitations of Method and Preparation contain general important information for the proper care and maintenance of a PID.

This field procedure allows for soil and groundwater samples to be screened by means of agitated headspace analysis and ambient air, for VOCs, including aromatic compounds, amines, alkanes (>C4), alkenes, heterocyclics and certain chlorinated solvents, but does not indicate a specific compound. The values obtained by the instrument in parts per million per (ppm) provide a reasonable indication of the hydrocarbon vapours that may be present in soil pore spaces and in water.

For the purpose of field screening of soil samples a 10.6v lamp is recommended. An optional 11.7v lamp should be used if ionised chlorinated solvents are also suspected to be present – however it should be noted that all VertaseFLI PIDs are fitted with the 10.6v lamp as standard. A list of compounds included within the suite for which the 10.6v lamp has been designed to measure is attached.

In the event that a specific compound is known to be present exclusively in the soil sample, then the PID reading needs to multiplied by a conversion factor to give a more accurate reading. Details of conversion factors for various compounds are contained in the attached document.

Positive readings can be used as field evidence that VOCs are present within the soil fabric and can be used as confirmation that soil samples are being submitted for an appropriate analytical suite.

A reading of equal to or greater than 100ppm is usually considered to be significant. In the absence of any known sources of solvents on a site, a reading of 10ppm may be considered to be of equal significance with respect to field evidence of contamination.

A reading of >1ppm in ambient air is considered to be the Human Health limit based on the eight hour exposure limit for Benzene. If readings are >1ppm operatives in effected area should be instructed to wear a half mask with carbon filter or other filter depending on known contaminants on site.

GENERAL INSTRUCTIONS

1. This SOP provides sequential instructions which should be undertaken in the correct order.
2. If the sequence of instructions can not be completed as described, the Vertase FLI Project Lead should be informed so that amendments can be made or steps can be clarified.
3. This SOP should be read in conjunction with any other SOP's that are applicable to the works being undertaken.

TOOLS, MATERIALS AND EQUIPMENT

- MiniRae3000 PID.
- 100ppm Isobutylene calibration gas.
- Gas Regulator.
- Carbon filter.
- Moisture / Dust Filters.
- Tubing.
- Sealable clear plastic bags or sample jar and cling film.
- Appropriate labelling materials.
- Agitating instrument (agitation of bagged sample can be achieved by hand).

PPE – Standard PPE as a minimum: disposable gloves; safety boots; high vis jacket; and hardhat. Additional PPE as per site rules.

LIMITATIONS OF METHOD

1. PID units are very susceptible to moisture and heat, which may cause failure of the unit. When using in a saturated vapour stream (monitoring air stream from a force ventilation / extraction system for e.g.) it is important to change the filter as soon as it shows condensation build up.
2. Avoid using a PID in adverse weather conditions (moderate to heavy rain or fog) if possible.
3. Exposure to dust and moisture can cause the PID to report false readings. If this occurs the PID will require cleaning internally which requires great care (refer to instruction manual).
4. The filter inherently causes a delayed response in recording VOCs, so it may be difficult to respond to sudden changes in real time.
5. Exhaust fumes generated from motor vehicles and plant will result in elevated readings being recorded.
6. If the PID is exposed to extreme levels of VOCs (greater than circa 500ppm) then this may ‘poison’ / damage the PID cause the PID to ‘wander’ resulting in false readings.
7. Excessive or prolonged exposure to VOCs can ‘poison’ / damage the PID. This may be evidenced if the PID is recording elevated readings in clean air (away from VOC sources or through the carbon filter).

PREPARATION

1. Access to site should be agreed in advance with relevant people (site owners, client etc).
2. Site engineers should have received site specific H&S induction by Site Managers.
3. Permits to Work should be obtained in advance, where required (to be advised by Site Manager).
4. Site induction to be received by all site engineers, where applicable (to be advised by Project Lead)
5. The aforementioned equipment needs to be booked out by the equipment supervisor and on completion of the monitoring booked back in. Any faults should be reported promptly to the equipment supervisor.
6. The equipment supervisor is responsible for the aforementioned equipment which should be checked prior to each site visit to ensure that it is in a good state of repair, fully operational (i.e. fully charged) and that calibration certificates, where appropriate, will be valid at the time of monitoring.
7. If the site engineer suspects that the unit is faulty then carry out a 'bump' test using the 100ppm Isobutylene calibration gas. Readings +/- 3ppm of 100ppm are considered an acceptable tolerance.
8. The PID requires calibration (refer to user manual for instructions) on the commencement of a new project and then once a week thereafter – unless 'bump' tests show that the PID readings have exceeded the 3ppm tolerance limit against the 100ppm Isobutylene gas, or the engineer suspects readings have 'wandered' – in which case they should carry out a 'bump' test to confirm. A record should be kept of the results of each calibration and each bump test.
9. As excessive exposure to VOCs can 'poison' / damage the PID, calibration should only be carried out when necessary.
10. The PID should be calibrated to both the 100ppm Isobutylene Calibration gas – and to clean air, ideally by using the carbon filter. If there is no carbon filter available in the PID case, then the equipment manager should be informed and a replacement ordered. If no carbon filter is available to carry out the clean air calibration, then carry out the clean air calibration away from any potential sources of VOCs including roads.

PROCEDURE FOR AGITATED HEADSPACE TEST

1. During soil sampling for chemical and geotechnical laboratory scheduling, a small quantity of soil should be retained at regular intervals throughout the ground profile, changes in lithology or where visual or olfactory evidence of contamination has been observed.
2. The sample should be placed into a plastic bag or a glass/plastic cup/tub, sealed and appropriately identified with sample location and sample reference / depth.
3. Within 5 minutes of sampling each soil sample should be subject to agitated volatile headspace analysis.
4. Manually agitate the soil before inserting the PID probe into the chosen soil receptacle – be very careful to not push the end of the probe into the soil as this will block the inlet and cause the PID to malfunction. When using a plastic/glass container a bulk bag can be stretched over the opening to create a temporary seal and the PID probe pushed through the bag to obtain a reading.
5. The same method can be used to screen groundwater during sampling. The use of a plastic or glass container is preferable to a bag.
6. Record the maximum PID reading and note the time period that elevated readings are maintained. Wait for the readings to stabilise (usually lower than the maximum as VOCs are trapped in soil and suddenly liberated when agitated – resulting in a higher reading). When the PID readings have stabilised record the stabilised reading in your note book. A stabilised reading is usually of greater importance if you may only report one reading – otherwise report both.

RECORDS AND DOCUMENTATION

1. Monitoring results to be recorded in field note book or on standardised form.
2. Date and time of attendance of site.
3. Any H&S related incidents (slips, trips, falls etc).
4. Permits to Work and site inductions, where applicable.
5. Any relevant TBRAs and/or RAMS.
6. All operatives associated with the work are to be given a tool box talk to describe the content of this SOP and related documentation and sign a register to acknowledge that they have received such instruction and understand the method and health and safety issues related to the task.

SOP 005 - STANDARD OPERATING PROCEDURE GROUNDWATER SAMPLING

PURPOSE

This standard operating procedure (SOP) covers the standard procedure for sampling groundwater monitoring wells.

This can include the use of depth samplers (bailers), submersible pumps, and peristaltic (surface) pumps, for simple and short-term sampling.

It does not include specialist sampling methods for complex groundwater contamination scenarios (e.g. free product sampling, dissolved gas sampling, long term monitoring, natural attenuation studies and remediation validation). Specialist advice should be sought in such circumstances.

GENERAL INSTRUCTIONS

1. This SOP provides sequential instructions which should be undertaken in the correct order.
2. If the sequence of instructions can not be completed as described, the Vertase FLI Project Lead should be informed so that amendments can be made or steps can be clarified.

TOOLS, MATERIALS AND EQUIPMENT

- Borehole Location Plan
- Tools for opening installation covers (Bring a wide variety)
- Dipmeter or interface probe where appropriate
- Water sampling devices:
  - Bailers – (clean bailers and bailer cable (dedicated for each well)
  - Battery to power pump
  - Peristaltic pump (dedicated silicone & plastic tubing in correct diameter)
  - Submersible pump – (Whale Pump or Bladder Pump)
- Multi-parameter probes and flow-thru cells if required
- Gas analyser if required
- Notebook to record dip, parameters and observations
- Appropriate water sample containers
- Stickers to label containers without lab labels
- Fine marker pen to label samples.
- Cool boxes (with ice packs)
- Bubble wrap and parcel tape
- Chain of custody forms
- Paper to label coolbox
- PPE - disposable gloves, safety boots, safety glasses & high vis jacket as a minimum

PREPARATION

1. Access to site should be agreed in advance with relevant people (site owners, client etc).
2. Site Engineers should have received site specific H&S induction by Site Managers.
3. Permits to Work should be obtained in advance, where required (to be advised by Site Manager).
4. Ground water conditions should be assessed prior to attending site to determine the type of pump required / length of tubing. It is advisable to look at borehole logs to determine expected depth to groundwater, geology, slotted pipe placement and depth to base.
5. The aforementioned equipment should be checked prior to each visit to site to ensure that it is in a good state of repair and fully operational. Any faults should be reported promptly to the equipment supervisor.

PROCEDURE

1. Do a last minute risk assessment/TBRA that it is safe to work prior to each borehole location. Use cones to mark your working area if required. Place all equipment in a tidy manner to avoid trips.
2. If specific gas monitoring readings are required these are to be obtained before removing the bung for groundwater sampling. Close the gas valve after taking a reading.
3. Where there is cause for concern over volatile organic compounds (VOCs) an initial organic vapour reading can be taken using a Photo Ionisation Detector (PID) prior to removal of the gas valve;
4. Prior to groundwater sampling, preferably following completion of the well installation, each groundwater monitoring installation should be cleaned and developed to settle packing materials, and to allow free flow of liquids to and through the well screen, in addition to removing any fluids which may have been introduced into the borehole during drilling. This can be achieved by removing 3 well volumes of water. This may also be required prior to routine sampling, particularly if there is a long interval between installation and sampling.
5. If specific gas monitoring readings are required these are to be obtained before removing the bung. Close the valve in the bung after the reading has been taken.
6. Where there is cause for concern over volatile organic compounds (VOCs) an initial organic vapour reading can be taken via the gas valve using a Photo Ionisation Detector (PID) prior to removal of the bung.
7. Prior to purging water from the well, the depth to the surface of the groundwater / free product should be measured using a dip meter / interface probe. Measure depth to base. State if the measurement is from ground level, top of riser (north edge) or top of casing. Best practice to record all three.
8. Where the presence of free product is suspected an oil / water interface probe should be used to determine its thickness as detailed in the appropriate method statement. Where encountered obtain a sample of free product using a bailer lowered gently into the water column.
9. Calculate the volume of water in the well using the formula:

   π x (borehole radius)^2 x groundwater thickness = $\pi r^2 h$
10. Once the volume of the water standing in the borehole has been calculated the well may be purged. This entails removing a minimum of three water well volumes using pumps or bailers as appropriate. Best practice is to use a low flow pump and monitor in-situ parameters. Sample when parameters stabilise. Minimum of one purged well volume.
11. The amount of water to be purged is ultimately dependent upon the well yield. If it is not possible to continuously pump, or the well is bailed dry, then the well will be allowed to recover for approximately 1 hour, and a sample recovered using a bailer.
12. Purged volumes should be measured by placing the discharged groundwater into a container. (It is recommended that this water is retained until a water sample from the purged well has been recovered - an unpurged sample is better than no sample).
13. Purged groundwater should be disposed of in a manner agreed with the landowner and appropriate for any known / suspected contamination. A water container will be needed to collect purged water within buildings. Direct discharge of purge water onto outdoors ground surface may be permissible dependent on chemistry of groundwater and soil.

RECORDS AND DOCUMENTATION

1. Date and time of attendance of site.
2. All monitoring data should be clearly recorded, together with the date and reference to the project number in a field notebook. Comments on any odour, sheens, colours, silt content etc should also be recorded.
3. During purging, a record of the field parameters should also be kept.
4. All samples should be clearly and unambiguously labelled with job number, sample location, client, date etc.
5. Chain of custody (COC) forms must be completed for all samples. Each suite of analysis should be entered onto the COC form.
6. If sending a consignment of more than one box, each box must have it's own COC form
7. Any H&S related incidents (slips, trips, falls etc).
8. Permits to Work and site inductions, where applicable.
9. All operatives associated with the work are to be given a tool box talk to describe the content of this SOP and related documentation and sign a register to acknowledge that they have received such instruction and understand the method and health and safety issues related to the task.

SOP 006 - STANDARD OPERATING PROCEDURE
GROUNDWATER LEVEL MONITORING

PURPOSE

This standard operating procedure (SOP) covers water level monitoring using an electrical contact dip meter.

It is used to determine groundwater levels in boreholes within monitoring installations.

GENERAL INSTRUCTIONS

1. This SOP provides sequential instructions which should be undertaken in the correct order.
2. If the sequence of instructions can not be completed as described, the Vertase FLI Project Lead should be informed so that amendments can be made or steps can be clarified.
3. This SOP should be read in conjunction with any other SOP's that are applicable to the works being undertaken.

TOOLS, MATERIALS AND EQUIPMENT

- Borehole Location Plan.
- Tools for opening installation covers.
- Electrical contact dip meter / interface probe

- PPE - disposable gloves, safety boots and overalls as a minimum.

LIMITATIONS OF METHOD

Although most new dip meters will contain a metal cord throughout their length to prevent stretching, it should be noted that many older dip meters will not. Careless use and storage of a dip meter can lead to stretching of the measuring tape and result in inaccurate measurements. It is always best to use the same dip meter for each monitoring visit to a particular site to ensure that all measurements for that site are relative and consistent. It is difficult to calibrate the tape on a dip meter as any stretching could have occurred at any point on the tape. As a rough guide a metal rule could be used to calibrate short lengths along the tape, but if stretching is suspected then the dip meter should be replaced.

Always ensure the tape starts at zero as tapes could have been 'repaired' resulting in a shortened tape.

PREPARATION

1. Access to site should be agreed in advance with relevant people (site owners, client etc).
2. Site Engineers should have received site specific H&S induction by Site Managers.
3. Permits to Work should be obtained in advance, where required (to be advised by Site Manager).
4. Ground water conditions should be assessed prior to attending site to determine the type of pump required / length of tubing. It is advisable to look at borehole logs to determine expected depth to groundwater, geology, slotted pipe placement and depth to base.
5. The aforementioned equipment should be checked prior to each visit to site to ensure that it is in a good state of repair and fully operational. Any faults should be reported promptly to the equipment supervisor.
6. The equipment supervisor is responsible for the aforementioned equipment which should be checked prior to each site visit to ensure that it is in a good state of repair, fully operational (i.e. fully charged) and that calibration certificates, where appropriate, will be valid at the time of monitoring.

PROCEDURE

1. Gain access to the borehole and identify the datum. The datum is the point from which water levels are measured from, it could be ground level, the top of the borehole liner, the top of borehole headworks or something else. If you don't know where the datum is, measure the differences between all possible datums to allow the correct dip to be calculated once back in the office.
2. Lower the probe until it reaches the water surface, which is indicated as a continuous alarm sound and/or a light signal. Move the probe slightly up and down until it is located exactly in the air/water interface, the depth to the interface is then read from the tape at the datum and recorded in a notebook.
3. Dip the base of the monitoring point. Lower the dipper to the base (tape goes slack), slowly raise the dipper. The dipper is measuring the depth to base at the instant the tape loses its slackness upon removal.
4. Check the measurements against previous monitoring (if any) and repeat the measurement in case of major differences.
5. When retrieving the probe, check for any indication of contamination such as smearing of the probe or odours.

RECORDS AND DOCUMENTATION

1. Monitoring results to be recorded in field note book or on standardised form.
2. Date and time of attendance of site.
3. Any H&S related incidents (slips, trips, falls etc).
4. Permits to Work and site inductions, where applicable.
5. All operatives associated with the work are to be given a tool box talk to describe the content of this SOP and related documentation, and sign a register to acknowledge that they have received such instruction and understand the method and health and safety issues related to the task.

SOP 007 - STANDARD OPERATING PROCEDURES
LOW FLOW SAMPLING

PURPOSE

This standard operating procedure (SOP) covers the standard procedure for low flow sampling in groundwater monitoring wells.

The purpose of this method statement is to define the standard operating procedures for taking groundwater samples from a monitoring wells utilising the low flow sampling method.

The low flow sampling method limits drawdown around the monitoring well consequently creating minimal hydraulic stress and giving a more representative sample of ground water conditions.

This SOP details 2 different methods for Low Flow Sampling of Groundwater: Chemical Parameter Stabilisation using probes and; Purging 3 times the well volume. Both are valid approved methods and both have strengths limitations.

GENERAL INSTRUCTIONS

1. This SOP provides sequential instructions which should be undertaken in the correct order.
2. If the sequence of instructions can not be completed as described, the Vertase FLI Project Lead should be informed so that amendments can be made or steps can be clarified.
3. This SOP should be read in conjunction with *SOP002 Water Quality Monitoring* as it details the instructions and limitations of equipment used herein.

TOOLS, MATERIALS AND EQUIPMENT

- Borehole Location Plan.
- Tools for opening installation covers.
- Dip-meter or interface probe.
- Peristaltic pump and operator's manual (fully charged battery pack).
- Tubing – appropriate to the suspected or known contaminants of concern (enough for each monitoring well).
- Flexible tubing for Peristaltic pump housing.
- Flow-through cell and in-line groundwater monitoring probes.
- Approximately 25 litre water barrel.
- Winchester bottles, VOCs vials and sample labels.
- Low flow sampling record and pen.
- Cool boxes (with ice packs) for storage of volatile organic samples.
- Chain of custody forms.
- PPE - disposable gloves, safety boots, high vis jacket and overalls as a minimum

PREPARATION

1. Access to site should be agreed in advance with relevant people (site owners, client etc).
2. Site engineers should have received site specific H&S induction by Site Manager/Project Lead.
3. Permits to Work should be obtained in advance, where required (to be advised by Site Manager/Project Lead).
4. Site induction to be received by all site engineers, where applicable (to be advised by Project Lead).
5. Task based Risk Assessment and Method Statement (TBRA) specific to the site and the chemicals of concern.
6. Ground conditions associated with each response zone should be assessed prior to attending site to determine the potential well yield (i.e. rate of water entry into the well).
7. The aforementioned equipment needs to be booked out by the equipment supervisor and on completion of the monitoring booked back in. Any faults should be reported promptly to the equipment supervisor.
8. The equipment supervisor is responsible for the aforementioned equipment which should be checked prior to each site visit to ensure that it is in a good state of repair, fully operational (i.e. fully charged) and that calibration certificates, where appropriate, will be valid at the time of monitoring.

PROBE CALIBRATION AND CARE

Dissolved Oxygen Probe (DO)

1. Never touch the probe membrane as this will cause errors in measurements.
2. Must be calibrated in air before every use.
3. When putting the probe away, Always put a few drops of distilled water or clean tap water in then end of the cap as the probe membrane must be stored damp.
4. When you have finished clean the probes with distilled water or tap water.
5. Never over tighten the probe cap on the probe, you will break the probe if you do, the cap needs to be moderately tight to keep the probe damp.
6. For the DO probe to work there must be electrolyte solution in the probe if there is none the probe will not work. If the electrolyte solution needs refilling see equipment supervisor.

pH and Conductivity Probe

The pH probe is at the bottom of the probe the conductivity section of the probe is halfway up the probe they must be submerged in the sample to get a reading.

1. Never touch the probe membrane as this will cause errors in measurements.
2. When putting the probe away, Always put a few drops of pH 4 solution in then end of the cap as the probe membrane must be stored damp in conditions. There should be some pH 4 solution in the probe box.
3. When you have finished clean the probes with distilled water or tap water.
4. Never over tighten the probe cap on the probe, you will break the probe if you do, the cap needs to be moderately tight to keep the probe damp.

Redox Probe

1) Never touch the probe membrane as this will cause errors in measurements.
2) When putting the probe away, Always put a few drops of TAP WATER in then end of the cap or KCl solution as the probe membrane must be stored damp in conditions.

PROBE CALIBRATION AND CARE

3) When you have finished clean the probes with distilled water or tap water.

4) Never use two probes in the same sample at the same time.

5) Never over tighten the probe cap on the probe, you will break the probe if you do, the cap needs to be moderately tight to keep the probe damp.

Always read the manufactures instructions on storage of the probes incorrect storage causes the probes to stop working properly, this generally means new probes need to be bought as probes generally cannot be fixed/repaired, probes generally cost upwards of a £100 each to replace.

PROCEDURE (CHEMICAL PARAMETER STABILIZATION)

1. Remove the borehole cover and gain access to the well.
2. Measure the depth to groundwater using a water level dip meter, record depth. Lower the dip meter to the bottom and calculate water profile thickness, record.
3. Set up peristaltic pump in accordance with operators manual. Position tubing down borehole in middle of screened area (if known – middle of profile if screen not known) and sampling end in to low flow cell. From the low flow cell the tubing should expel water into the water barrel.
4. Ensure that groundwater quality probes are fully submerged in flow-through cell. Refer to SOP sheet 14 (Redox monitoring) for full instructions.
5. Flow rate when purging and sampling of the borehole should not exceed 0.5 litres per minute as aggressive pumping can cause dissolved phase Volatile Organic Compounds to volatilise out of the water into air – leading to lower / false results being reported by the laboratory.
6. Recording of pH, dissolved oxygen, temperature, conductivity and dissolved salts (NaCl) should be undertaken at 5 minute intervals.
7. When sampling parameters remain stable over 3 consecutive recording events (15 minutes) record as final results and sample water into Winchester bottle and VOC vial.
8. Label the bottle with the job title, job number, sample reference. record labelling system on record sheet.
9. Dispose of tubing accordingly and use new tubing for every well.
10. Water passing through the monitoring point (in the water barrel(s)) should be suitably disposed of depending on factors such as contamination and site specific conditions.

PROCEDURE (PURGE 3 TIMES THE WELL VOLUME)

1. Remove the borehole cover and gain access to the well.
2. Measure the depth to groundwater using a water level dip meter, record depth. Lower the dip meter to the bottom and calculate water profile thickness, record. Measure internal diameter of BH casing and use profile thickness and BH diameter to calculate one well volume – include BH pack in this calculation if known.
3. Set up peristaltic pump in accordance with operators manual. Position tubing down borehole in middle of screened area (if known – middle of profile if screen not known) and sampling end in to a water barrel.
4. Put end of pump into 1 litre Winchester water bottle – switch on the pump and time how long it takes to fill the 1 litre Winchester bottle. From this you can determine the flow rate of the pump – note flow rate may very between each borehole depending on borehole depth and settings on the peristaltic pump.
5. With flow rate (litres/min) and calculated well volume (litres) you can calculate the length of time the pump needs to run for to purge 3 well volumes. Turn on the pump and purge the well for the calculated length of time.
6. Flow rate when purging and sampling of the borehole should not exceed 0.5 litres per minute as aggressive pumping can cause dissolved phase Volatile Organic Compounds to volatilise out of the water into air – leading to lower / false results being reported by the laboratory.
7. After the allotted time for purging 3 well volumes has expired – sample water into Winchester bottles and VOC vial.
8. Label the bottle with the job title, job number, sample reference. record labelling system on record sheet.
9. Dispose of tubing accordingly and use new tubing for every well.
10. Water passing through the monitoring point should be suitably disposed of depending on factors such as contamination and site specific conditions.

RECORDS AND DOCUMENTATION

1. Date and time of attendance of site.
2. All monitoring data should be clearly recorded, together with the date and reference to the project number in a field notebook. Comments on any odour, sheens, colours etc should also be recorded.
3. All samples should be clearly labelled with job number, sample location, client, date etc.
4. Chain of custody (COC) forms must be completed for all samples. Each suite of samples should be entered onto the COC form.
5. If sending a consignment of more than one box, each box must have it's own COC form
6. Any H&S related incidents (slips, trips, falls etc).
7. Permits to Work and site inductions, where applicable.
8. Signed Task Based Risk Assessment and Method Statement.
9. All operatives associated with the work are to be given a tool box talk to describe the content of this SOP and related documentation and sign a register to acknowledge that they have received such instruction and understand the method and health and safety issues related to the task.

SOP 010 - STANDARD OPERATING PROCEDURE
SURFACE WATER MONITORING

PURPOSE

This standard operating procedure (SOP) covers the sampling of surface water.

GENERAL INSTRUCTIONS

1. This SOP provides sequential instructions, which should be undertaken in the correct order.
2. If the sequence of instructions can't be completed as described, the Vertase FLI Project Lead should be informed so that amendments can be made or steps can be clarified.
3. This SOP should be read in conjunction with any other SOP's that are applicable to the works being undertaken.

TOOLS, MATERIALS AND EQUIPMENT

- Location plan showing surface water locations.
- Dip meter if water levels are required.
- Bailers and string / telescopic sampling pole with stainless steel bucket.
- 0.45 micron filters and syringes if filtering is required on site.
- Sampling bottles appropriate for sampling. Contact the laboratory to find out which containers and how many are required for the analysis to be performed. Certain analytes may require preservatives or fixatives if low detection limits are required, such as sulphide, cyanide and ammonia. Advice should be sought from the laboratory prior to visiting the site if unsure.
- Cool box with bubble wrap and frozen ice packs.
- Field meters: pH, conductivity, redox, TDS and dissolved oxygen. To be calibrated as detailed in the equipment manual before use.
- Notebook to record field parameters and any other observations.
- PPE - disposable gloves, safety boots, safety glasses and high vis jacket as a minimum. Lifejackets as appropriate.
- Best practice to not work alone due to risk of falling in water. If you must work alone a life jacket must be worn.

PREPARATION

1. Access to site should be agreed in advance with relevant persons (site owners, client etc).
2. The sample collection should be arranged with the laboratory as soon as possible.
3. Site engineers should have received site-specific H&S induction by the Site Manager.
4. Permits to Work should be obtained in advance, where required.
5. The aforementioned equipment needs to be booked out by the equipment supervisor and on completion of the monitoring booked back in. Any faults should be reported promptly to the equipment supervisor.
6. All equipment should be checked before leaving for site and field meters should be calibrated before sampling.
7. Standard water monitoring forms should be printed out.

LIMITATIONS OF METHOD / OTHER CONSIDERATIONS

Field Meters

Field meters are highly accurate sensitive pieces of equipment. As such the user should ensure that they are familiar with the manuals provided by the manufacturer and undertake a calibration check at the beginning and end of each monitoring visit.

HEALTH AND SAFETY CONSIDERATIONS

- Before undertaking the work a full risk assessment/TBRA should be carried out to include: condition and stability of the sampling point; the depth and flow of the water; presence of dangerous sediment or trip hazards; requirement for safety equipment, eg: life jackets and throwing lines.
- Appropriate PPE must be worn at all times to include gloves, safety boots, safety glasses and hi vis jacket.
- A life jacket must be worn if the health and safety risk assessment identifies the necessity.
- If a site operative identifies an unforeseen hazard that prevents the sampling being undertaken, the project lead should be contacted immediately.

PROCEDURE

1. Label the sample containers before taking the samples using permanent ink.
2. Gain access to the sampling location and check that it is safe to proceed. If possible choose location where there is no risk of falling into the water, such as a bridge with a barrier. If such a location does not exist and the water is of significant depth (>0.5m, especially on a fast flowing river) then a lifejacket must be worn.
3. If safe to do so, sample containers should be filled from the surface water directly to avoid cross contamination and limit aeration of the sample. Hold the mouth of the container under water to avoid collection of debris floating on the surface.
4. If sampling directly from the surface water (eg: river / lake) is not possible, use the telescopic sampling pole or bailer to obtain a water sample.
5. Sample containers should be filled slowly to avoid aeration, and leaving no air bubbles in vials.
6. Field tests should be undertaken using the field monitoring equipment in accordance with the manufacturer's instruction manuals. The equipment sensors/probes should be cleaned with de-ionised water between each monitoring location.
7. Sample containers are to be placed in cool boxes and securely packaged with bubble wrap. Ice packs are to be placed in the cool boxes such that samples are kept below 4^{o}C. Chain of Custody forms must be sent with samples to the laboratory.

RECORDS AND DOCUMENTATION

The following should be recorded in a field notebook or preferably on a standardised form:

1. Project number, date and time of sampling, ground conditions, and weather conditions.
2. Dipmeter measurements: depth to water, depth to base.
3. Field meter results – Conductivity, TDS, redox, pH, ORP etc.
4. Observations – sample colour, silt content, sheen, odour etc.
5. Any H&S related incidents (slips, trips, falls etc).
6. Permits to Work and site inductions, where applicable.
7. All operatives associated with the work are to be given a tool box talk to describe the content of this SOP and sign a register to acknowledge that they have read and understood a TBRA for the health and safety issues related to the work.

<u>Chain of Custody</u>

1. A chain of custody should be completed and sent with the samples detailing all sample numbers and which sample bottles have been taken. State which suite of analysis is required for each sample.
2. The site engineer should ensure that they are aware of how to fill in all forms and the chain of custody before going on site.

SOP 020 - STANDARD OPERATING PROCEDURES FOR ODOUR MONITORING USING OLFACTORY METHODS

PURPOSE

This standard operating procedure (SOP) covers the standard procedure for odour monitoring using olfactory methods.

Odour is monitored for both environmental monitoring purposes and health and safety.

GENERAL INSTRUCTIONS

1. This SOP provides sequential instructions which should be undertaken in the correct order.
2. If the sequence of instructions can not be completed as described, the Vertase FLI Project Lead should be informed so that amendments can be made or steps can be clarified.
3. This SOP should be read in conjunction with any other SOP's that are applicable to the works being undertaken.

TOOLS, MATERIALS AND EQUIPMENT

- Access to weather monitoring programme data.
- Site drawing of monitoring locations marked.
- *VFLI ENV.006-Odour Assessment Form* – Issue 1.
- Clipboard.
- Pencil.

ODOUR DESCRIPTION – INTENSITY CATEGORIES

1. An appropriate number of monitoring positions are required this number depends on the size of the site and the sensitivity of the receptors.
2. To ensure monitoring locations stay constant a marker should be placed where possible to indicate the exact monitoring location.
3. Consider all information required to complete the odour assessment form and complete the appropriate sections before entering the field.

ONSITE RECORDED DATA – ATMOSPHERIC STABILITY CATEGORIES

Category	Stability	Dispersion	Occurrence (% time in the year)	Wind Speed (km/hr)	Time of Day	Sunshine or cloud cover
A	Very unstable	Very good	<1	<5	Day time only	Strong sunshine. Most common in the summer.
B	Unstable	Good	5 – 10	7 to 18	Day time only	Slight to moderate sunshine

C	Slightly unstable	Moderate	20	>7	Mainly day time	Moderate sunshine
D	Neutral	Moderate	45 - 60	7 to 29	Day or Night	Sight sunshine or overcast
E	Stable	Poor	5 – 10	7 to 18	Night time only	Clear or overcast
F	Very Stable	Very Poor	10	<11	Night time only	Clear or overcast

ODOUR DESCRIPTION – INTENSITY CATEGORIES	
1	No detectable odour
2	Faint odour (barely detectable, need to stand still and inhale while facing into the wind)
3	Moderate odour (odour easily detectable while walking and breathing normally, possibly offensive)
4	Strong odour (bearable, but offensive odour)
5	Very strong odour (unbearable)

ODOUR DESCRIPTION – EXTENT CATEGORIES	
1	Local and non-persistent (only detectable during brief periods when wind drops or blows)
2	Non-persistent as above, but detected away from the site boundary
3	Persistent, but fairly localised
4	Persistent and pervasive up to 50m from the site boundary
5	Persistent and widespread (odour detected >50m from site boundary)

ODOUR DESCRIPTION – SENSITIVITY CATEGORIES	
1	Remote (no housing, commercial/industrial premises or public area within 500m)
2	Low sensitivity (no housing etc within 100m of location)
3	Moderate sensitivity (housing etc within 100m of location)
4	High sensitivity (housing etc within area affected by odour)
5	Extra sensitive (complaints arising from residents within area affected by odour)

PROCEDURE

1.Prior to completing the odour assessment the initial fields must be completed:

- Date
- Name and initials of engineer undertaking assessment
- Start time

2.On site recorded data

- Weather conditions
- General air quality
- Ground condition
- % cloud cover
- General air stability

3. Weather station data

- Temperature
- Wind strength and direction
- Barometric pressure

4.Odour classification by human perception using the following classifications:

- Odour intensity
- Odour extent
- Location sensitivity

5.Once the assessment is complete the following fields must be completed

- Finish time

RECORDS AND DOCUMENTATION

1. Once the assessment is completed the engineer should print and sign *ENV-006 Odour Assessment Form* to indicate that the assessment has been undertaken and the information is complete.

SOP021 - NOISE MONITORING

PURPOSE

This standard operating procedure (SOP) covers the standard procedure for noise monitoring. Noise is monitored for both environmental monitoring purposes and health and safety.

GENERAL INSTRUCTIONS

This SOP provides sequential instructions which should be undertaken in the correct order.

If the sequence of instructions cannot be completed as described, the Vertase FLI Project Lead should be informed so that amendments can be made or steps can be clarified.

This SOP should be read in conjunction with any other SOP's that are applicable to the works being undertaken.

TOOLS, MATERIALS AND EQUIPMENT

- Noise monitor and required peripherals
- Notebook
- Plan of site
- PPE – as a minimum hard hat, safety boots and hi vis jacket

PREPARATION

1. Access to site should be agreed in advance with relevant people (site owners, clients etc).
2. Site engineers should have received site specific H&S induction by Project Lead.
3. Permits to work should be obtained in advance, where required (to be advised by Site Manager/Project Lead)
4. The aforementioned equipment needs to be booked out by the equipment supervisor and on completion of the monitoring booked back in. Any faults should be reported promptly to the equipment supervisor.
5. The equipment supervisor is responsible for the aforementioned equipment which should be checked prior to each site visit to ensure that it is in a good state of repair, fully operational (i.e. fully charged) and that calibration certificates, where appropriate, will be valid at the time of monitoring.
6. If the site engineer suspects that the unit is faulty, advice should be sought from the equipment supervisor.

PROCEDURE

1. Background readings will be required out of operating hours.
2. The user manual for equipment used should be read in conjunction with this SOP to provide more detailed explanation of specific operating procedures.
3. The sound monitor may require calibration prior to daily monitoring (refer to user manual for instructions)
4. Ensure if the equipment is not fully waterproof it doesn't get exposed to excessive quantities of water, as this will affect the quality of results and the performance of the equipment.
5. Turn instrument on, ensuring all necessary peripherals are attached and working correctly.
6. Walk around the site and along the site boundary, monitoring and recording the sound in decibels at regular intervals. Monitoring locations should be targeted to ensure all possible sources of noise are included, especially those in sensitive areas of the site such as close to the site boundary.
7. If noise exceeds 85 dBA, appropriate ear protection is required for site workers. If noise exceeds 85dBA at the site boundary, remedial actions will be required including the installation of silencers on machines, the creation of a noise bund or activity ceased if no other possible action is appropriate.

RECORDS AND DOCUMENTATION

1. Monitoring results to be recorded in field notebook or on standardised form *ENV-005 Noise Monitoring Form*.
2. Date and time of attendance of site should be recorded as well as activities being undertaken at the time. Monitoring should be recorded at different times of the day to allow for variation.
3. Any H&S related incidents (slips, trips and falls etc).
4. Permits to work and site inductions, where applicable.
5. All operatives associated with the work are to be given a tool box talk to describe the content of this SOP and related documentation and sign a register to acknowledge that they have received such instruction and understand the method and health and safety issues related to the task.

Date	Time	Blower Running Hours	Wells Open				PID (ppm)			Temperature °C		Vacuum bar	Gas Analyser (%)				Air Flow		Air Volume m³/h		Comments
			Line 1	Line 2	Line 3	Line 4	Intake	Exhaust	General Air	General Air	Exhaust		CH_4	O_2	CO_2	LEL	Exhaust	Dilution	Dilution	Wells	
08/10/2014			3, 6, 7, 13, 17	1, 2, 4, 8, 9, 18	5, 10, 14, 15, 19	11, 12, 16, 20, 21	19.0	0.3			50.2	0.2					30	70			
08/10/2014	1800		3, 6, 7, 13, 17	1, 2, 4, 8, 9, 18	5, 10, 14, 15, 19	11, 12, 16, 20, 21	8.4	0.3			50.2	0.2					30	70			
09/10/2014	1000		3, 6, 7, 13, 17	1, 2, 4, 8, 9, 18	5, 10, 14, 15, 19	11, 12, 16, 20, 21	5.4	0.5			52.8	0.2					30	70			
09/10/2014	1200		3, 6, 7, 13, 17	1, 2, 4, 8, 9, 18	5, 10, 14, 15, 19	11, 12, 16, 20, 21	5.9	0.4			53.4	0.2					30	70			
09/10/2014	1500				5, 10, 14, 15, 19	11, 12, 16, 20, 21	6.8	0.6			63.5	0.25					30	70			
09/10/2014	1750				5, 10, 14, 15, 19	11, 12, 16, 20, 21	4.8	0.6			65.0	0.25					30	70			
11/10/2014	1300		3, 6, 7, 13, 17	1, 2, 4, 8, 9, 18	5, 10, 14, 15, 19	11, 12, 16, 20, 21	4.9	0.3			53.4	0.2					30	70			
13/10/2014	1747	38802	3, 6, 7, 13, 17	1, 2, 4, 8, 9, 18	5, 10, 14, 15, 19	11, 12, 16, 20, 21	4.9	0.5	0.8		44.9	0.2	0.0	20.2	0.0	-	30	70			**Blower Tripped System Shut Down**
14/10/2014	1000	38817	3, 6, 7, 13, 17	1, 2, 4, 8, 9, 18	5, 10, 14, 15, 19	11, 12, 16, 20, 21	4.5	0.3	0.6		49.1	0.2	0.0	20.1	0.0	-	30	70			
14/10/2014	1337	38819	3, 6, 7, 13, 17	1, 2, 4, 8, 9, 18	5, 10, 14, 15, 19	11, 12, 16, 20, 21	1.1	0.3	1.0		54.3	0.18	0.0	20.4	0.0	-	30	70			
14/10/2014	1750	38824	3, 6, 7, 13, 17	1, 2, 4, 8, 9, 18	5, 10, 14, 15, 19	11, 12, 16, 20, 21	1.2	0.3	2.2		50.5	0.18	0.0	20.7	0.0	-	30	70			
15/10/2014	1720	38847	3, 6, 7, 13, 17	1, 2, 4, 8, 9, 18	5, 10, 14, 15, 19	11, 12, 16, 20, 21	0.1	0.2	0.0		52.6	0.15	0.0	20.3	0.0	-	30	70			
17/10/2014	0934	38880	3, 6, 7, 13, 17	1, 2, 4, 8, 9, 18	5, 10, 14, 15, 19	11, 12, 16, 20, 21	1.4	0.0	0.0		55.2	0.22	0.0	20.0	0.0	-	30	70			
22/10/2014	1425	39002	3, 6, 7, 13, 17	1, 2, 4, 8, 9, 18	5, 10, 14, 15, 19	11, 12, 16, 20, 21	0.9	0.2	0.5		57.8	0.19	0.0	20.1	0.0	-			400	565	
23/10/2014	1130	39002	3, 7	4, 8,	5, 10, 15	11, 12	9.2	0.2	0.4		60.0	0.25	-	-	-	-	25.0	52.0			
23/10/2014	1442	39005	3, 7	4, 8,	5, 10, 15	11, 12	6.7	0.0	0.0		64.2	0.25	-	-	-	-	21.7	70.8			
23/10/2014	1500	39005	3, 7	4, 8,	5, 10, 15	11, 12	7.0	0.0	0.0		64.7	0.25	-	-	-	-	30.4	75.9			
27/10/2014	1300	39101	3, 7	4, 8,	5, 10, 15	11, 12	2.0	0.0	0.0		54.9	0.2	-	-	-	-	37.0	76.3			
27/10/2014	1700	39104	3, 7	4, 8,	5, 10, 15	11, 12	1.8	0.0	0.0		53.8	0.2	-	-	-	-	36.9	75.2			
28/10/2014	1300	39125	3, 7	1, 2, 4, 8, 9, 18	5, 10, 15, 19	11, 12, 16	1.9	0.0	0.0		51.0	0.2	-	-	-	-	37.4	75.5			
29/10/2014	1000	39145	3, 7	1, 2, 4, 8, 9	5, 10, 15	11, 12	0.8	0.1	0.9		51.7	0.2	-	-	-	-	21.5	75.7			
29/10/2014	1200	39148	3, 7	1, 2, 4, 8, 9	5, 10, 15	11, 12	1.9	0.1	0.3		54.1	0.25	-	-	-	-	21.4	75.5			
30/10/2014	1637	39175	3, 7	1, 2, 4, 8, 9	5, 10, 15	11, 12	1.0	0.0	0.2		65.4	0.23	-	-	-	-	31.0	73.6			
31/10/2014	0825	39191	3, 7	1, 2, 4, 8, 9	5, 10, 15	11, 12	1.6	1.1	0.5		58.9	0.24	-	-	-	-	27.3	72.1			
31/10/2014	1447	39198	3, 7	1, 2, 4, 8, 9	5, 10, 15	11, 12	1.6	1.0	0.3		57.5	0.18	-	-	-	-	-	-			
04/11/2014	1000	39256	3, 7	1, 2, 4, 8, 9	5, 10, 15	11, 12	1.9	0.2	0.2		57.3	0.25	-	-	-	-	19.4	49.0			
05/11/2014	0948	39278	3, 7	4, 8, 9	5, 10, 15	11, 12, 16	2.1	0.4	0.3		59.4	0.25	-	-	-	-	20.3	53.0			
06/11/2014	1239	39301	3, 7	4, 8, 9	5, 10, 15	11, 12, 16	1.8	0.9	0.3		60.3	0.25	-	-	-	-	18.2	46.0			
11/11/2014	1428	39423		4, 8, 9	5, 10, 15	11, 12, 16	1.1	0.6	0.2	18.7	58.9	0.275	-	-	-	-	18.7	28.7	51.4		
12/11/2014	1009	39443		4, 8, 9	5, 10, 15	11, 12, 16	0.4	0.7	0.1	19.1	57.5	0.275	-	-	-	-	19.1	25	43.8		
12/11/2014	1132	39444		4, 8, 9	5, 10, 15	11, 12, 16	0.3	0.3	0.2	19.2	59.4	0.27	-	-	-	-	19.2	25.8	35		Drained lines of water, shut off line 1 at manifold
18/11/2014	1537	39592		4, 8, 9, 18	5, 10, 14, 15, 19	11, 12, 16	0.4	0.4	0.3	23.4	57.2	0.2	-	-	-	-	23.4	45.9	49.3		Temp 64 when JMG arrived, wells opened to bring below 60 for POC's arrival
19/11/2014	0815	39608		4, 8, 9	5, 10, 14	11, 12, 16	0.8	0.7	0.6	18.8	56.3	0.29	-	-	-	-	18.8	24.7	49.5		Temp 52 some valves shut to bring up temp
19/11/2014	1108	39611		4, 8, 9	5, 10, 14	11, 12, 16	0.6	0.4	0.2	20.6	59.1	0.22	-	-	-	-	20.6	31.4	57.8		14 opened to reduce temp blow 60
21/11/2014	1449	39663		4, 8, 9	5, 10, 14	11, 12, 16	0.5	0.3	0.1	20.6	58	0.28	-	-	-	-	20.6	32.3	56.8		14 half opened
24/11/2014	1521	39735		4, 8, 9	5, 10, 14	11, 12, 16	0.2	0.0	0.1	18.4	53.5	0.245	-	-	-	-	18.4	21.5	65.2		
27/11/2014	1052	39736		4, 8, 9	5, 10	11, 12	3.2	1.8	0.5	18.8	60.5	0.31	-	-	-	-	18.8	19.2	54.5		SVE shut down from 24-27/11/2014
27/11/2014	1635	39742		4, 8, 9	5, 10, 14	11, 12	0.8	1.5	0.2	19.0	56.3	0.245	-	-	-	-	19	27.5	42.5		
28/11/2014	0930	39759		4, 8, 9	5, 10, 14	12	0.5	1.2	0.1	19.5	55.6	0.245	-	-	-	-	19.5	24.8	46		
28/11/2014	1340	39763		4, 8	5, 10, 14	12	0.6	1.3	0.1	21.0	55.8	0.245	-	-	-	-	21	48.2	56.5		
03/12/2014	1010	39879		4, 8, 9	5, 10, 14	11, 12, 21	0.9	1.2	0.0	18.4	54.3	0.2	-	-	-	-	18.4	29.1	49.8		
09/12/2014	1100	40024		4, 8, 9	5, 10, 14	11, 12, 21	1.0	0.8	0.2	16.8	54.2	0.275	-	-	-	-	16.8	46	48.5		
10/12/2014	0910	40046		4, 8, 9	5, 10, 14	11, 12, 21	0.4	0.8	0.2	18.5	54.6	0.25	-	-	-	-	18.5	45	40		
10/12/2014	1326	40050		4, 8, 9	5, 10, 14	11, 12, 21	0.6	0.8	0.4	19.6	54.3	0.25	-	-	-	-	19.6	47	43		
17/12/2014	1113	40198		4, 8, 9	5, 10, 14	11, 12, 21	1.0	1.0	0.2	20.3	60.9	0.25	-	-	-	-	20.3	47	38.7		
18/12/2014	0912	40220		4, 8, 9	5, 10, 14	11, 12, 21	0.7	0.9	0.1	19.1	57.8	0.25	-	-	-	-	19.1	47.6	41.7		
07/01/2015	0833	40220			5	11	4.8	0.1	0.0	11.3	40.5	0.25	-	-	-	-	23				System start up 2x dilution
07/01/2015	1054	40222			5	11	3.4	0.4	0.0	16.3	54.8	0.21	-	-	-	-	32.9				
15/01/2015	1052	40299			5	11	0.2	0.7	0.0	17.1	54.8	0.25	-	-	-	-	39	33			
15/01/2015	1625	40304			5	11	0.5	0.8	0.2	18.8	54.8	0.25	-	-	-	-	38.3	36			
16/01/2015	0939	40322			5	11	0.2	0.6	0.2	16.7	46.8	0.25	-	-	-	-	42.7	35.8			SVE shut down temporarily to monitor wells
16/01/2015	1445	40322			5	11	0.2	0.5	0.1	15.8	53.7	0.25	-	-	-	-	41.1				SVE switched on at 1430
21/01/2015	1037	40438			5	11	0.2	0.6	0.1	15.9	53.7	0.25	-	-	-	-	41.4				SVE shut down at 1045
22/01/2015	1630	40438		9	5						46.4	0.25	-	-	-	-					SVE switched on at 1600
27/01/2015	0903	40528			5		0.9	0.5	0.4	12.7	46.8	0.26	-	-	-	-	27	68			SVE switched on at 0900