An Auditor's Perspective

Northern Rivers Contaminated Land & Waste Forum

Kylie Lloyd

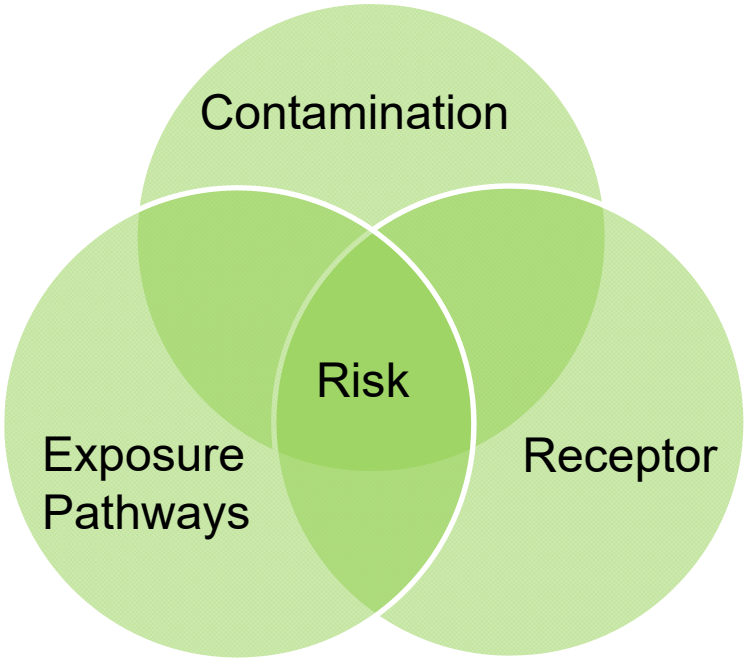
Talking points

- Setting the Scene
  - Framework for Assessing Contaminated Sites
  - Environmental Investigations are risk based
  - NEPM is risk based
  - Investigations are Iterative
  - Auditor's role
- Issues when work is not done correctly
  - Begin with the End in Mind – what are the DA conditions?
  - Guidelines
  - Conceptual Site Models
  - Residual Contamination and EMPs
  - Waste

Framework

- Legislation
  - EP&A Act 1979
  - State Environmental Planning Policy 55 (SEPP55)
  - CLM 1997
  - POEO 1997
- Guidelines
  - Section 105 of CLM Act lists
  - NEPM 2013

Environmental Investigations



Environmental investigations are designed to be carried out so that there is a 95 % probability of identifying significant contamination

In Fact – NEPM uses Risk Based Guidance

Table 1A(1) Health investigation levels for soil contaminants

Chemical	Health-based investigation levels (mg/kg)			
	Residential[1] A	Residential[1] B	Recreational[1] C	Commercial/ industrial[1] D
Metals and Inorganics				
Arsenic[2]	100	500	300	3 000
Beryllium	60	90	90	500
Boron	4500	40 000	20 000	300 000
Cadmium	20	150	90	900
Chromium (VI)	100	500	300	3600
Cobalt	100	600	300	4000

Table 1A(2) Interim soil vapour health investigation levels for volatile organic chlorinated compounds

Chemical	Interim soil vapour HIL (mg/m^3)			
	Residential[1] A	Residential[1] B	Recreational[1] C	Commercial / Industrial[1] D
TCE	0.02	0.02	0.4	0.08
1,1,1-TCA	60	60	1200	230
PCE	2	2	40	8
cis-1,2-dichloroethene	0.08	0.08	2	0.3
Vinyl chloride	0.03	0.03	0.5	0.1

Table 1A(3) Soil HSLs for vapour intrusion (mg/kg)

	HSL A & HSL B Low – high density residential				HSL C recreational / open space				HSL D Commercial / Industrial				
CHEMICAL	0 m to <1 m	1 m to <2 m	2 m to <4m	4 m+	0 m to <1 m	1 m to <2 m	2 m to <4 m	4 m+	0 m to <1 m	1 m to <2 m	2 m to <4 m	4 m+	Soil saturation concentration (Csat)
SAND													
Toluene	160	220	310	540	NL	NL	NL	NL	NL	NL	NL	NL	560
Ethylbenzene	55	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	64
Xylenes	40	60	95	170	NL	NL	NL	NL	230	NL	NL	NL	300
Naphthalene	3	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	9
Benzene	0.5	0.5	0.5	0.5	NL	NL	NL	NL	3	3	3	3	360
F1[9]	45	70	110	200	NL	NL	NL	NL	260	370	630	NL	950
F2[10]	110	240	440	NL	NL	NL	NL	NL	NL	NL	NL	NL	560

Table 1B(4) Generic added contaminant limits for lead in soils irrespective of their physicochemical properties

	Pb added contaminant limit (ACL, mg added contaminant/kg) for various land uses		
CHEMICAL	Areas of ecological significance	Urban residential and public open space[1]	Commercial and industrial
Lead	470	1100	1800

Table 7. Health screening levels for asbestos contamination in soil

Form of asbestos	Health Screening Level (w/w)			
	Residential A[1]	Residential B[2]	Recreational C[3]	Commercial/ Industrial D[4]
Bonded ACM	0.01%	0.04%	0.02%	0.05%
FA and AF[5] (friable asbestos)	0.001%			
All forms of asbestos	No visible asbestos for surface soil			

Investigation is an Iterative Process

- Stage 1 - Preliminary Site Investigation (PSIs)
  - Desktop Study
  - Initial conceptual site model (CSM)
- Stage 2 Detailed Site Investigation (DSI)
  - Sampling Analysis and Quality Plan (SAQP)
  - Data Quality Objectives (DQO) for data collection
- Human Health and Environmental Risk Assessment (HHERA) – if required
- Remedial Action Plans (RAP) – if required
- Site Validation and ongoing monitoring or management (EMP) – if required

Consultants and Auditors

- Auditors
  - Accredited and administered by NSW EPA
  - Aim is to protect human health and the environment through review process
- Consultants
  - Select with care
  - Contaminated land consultant **certification schemes** developed to ensure those consultants have the necessary competencies to carry out the work
  - 1 July 2017 - EPA will require all reports submitted to the EPA to comply with the requirements of the *Contaminated Land Management Act 1997* (CLM Act) and to be prepared, or reviewed and approved, by a certified SCPA, CEnvP CL specialist or CPSS CSAM practitioner.
  - Many Councils also require certified consultants for report submissions

Auditor's Role

NSW DEC (2006) Site Auditor's Guidelines - describe the site assessment and audit process as:

- ***Consultant*** *is commissioned to* ***assess*** *contamination*. The contaminated site consultant designs and undertakes the site assessment and, where required, all remediation and validation activities to achieve the objectives specified by the owner or developer; and
- ***Site auditor reviews*** *the* ***consultant's work***. The site owner or developer commissions the site auditor to review the consultant's work. The auditor prepares a site audit report and a site audit statement at the conclusion of the review, which are given to the owner or developer.

Therefore, the contaminated land consultant and other relevant parties should be satisfied that the work to be conducted conforms to all appropriate regulations, standards and guidelines and is suitable based on the site history and the proposed land use.

TRUST ME **Vs** **SHOW ME**

Interim Advice Vs Site Audit Statement

- Audit Interim Advice
  - Can only be considered interim and does not constitute a Site Audit Report or Statement
  - Must be consistent with Guidelines and policies
  - Not pre-empt conclusion drawn at the end of the site audit process
  - Clarify that a Site Audit Statement will be issued at the end of the audit process
- Site Audit Statement
  - Statutory or Non-Statutory
  - Site Audit Statement cannot be prepared without a Site Audit Report being prepared first
  - Statutory SAS must be provided to Council (even if Certifier used) and NSW EPA

Begin with the end in Mind

- Development Consent Conditions
  - Confirm reporting requirements and when required (IA, SAS or SAR) prior to CC or OC.
  - DA conditions can be ambiguous (what liaison/agreement with Council is needed).
  - Auditor appointment at the end of a project can be troublesome.
- If you need an Auditor – why?
  - Who or what is at risk?
  - Change of use – is it more sensitive, does it cover the entire site?
  - Change of zoning – what is permissible in the new zoning (exempt and complying development)?
  - Compliance with legislation – are there additional stakeholders or reporting required?
  - Results of regular inspections – during construction and post construction.

Consent Conditions – when are Audits required

(54) SITE AUDIT STATEMENT

Prior to the ~~***execution of works associated with the built form of the development (excluding building work directly related to remediation)***~~ ***issue of any Occupation Certificate,*** a Site Audit Statement prepared by a NSW EPA Accredited Site Auditor is to be submitted to City of Sydney Health and Building Unit certifying that the **site is suitable** for the intended use. Conditions on the Site Audit Statement shall form part of the consent.

Note: Where the Site Audit Statement is subject to conditions that require ongoing review by the Auditor or Council these should be discussed with Council before the Site Audit Statement is issued.

1. The submitted Detailed Environmental Site Assessment (DESA) identifies soil contamination and concludes a **Remediation Action Plan (RAP)** is required. A RAP there must be submitted. It is to be prepared by a suitably qualified and competent environmental consultant in accordance with the NSW Government Office of Environment and Heritage, Guidelines for Consultants Reporting on Contaminated Sites and Planning NSW Guidelines, Managing Land Contamination Planning Guidelines" and Councils Development Control Plan "Contaminated Land".

   This RAP must be reviewed by a NSW EPA Accredited Site Auditor and include a Section B Site Audit Statement or letter of interim advice issued by the Auditor certifying that the RAP is practical and the site will be suitable after remediation for the proposed use before any consent is granted.

(A) PART A - DEFERRED COMMENCEMENT CONDITIONS

(1) SECTION B SITE AUDIT STATEMENT

A section B Site Audit statement must be obtained from a NSW EPA Accredited Site Auditor and forwarded to the City's Area Planning Manager certifying that the Remediation Action Plan is practical and the site will be suitable after being remediated in accordance with the requirements of the submitted Remediation Action Plan.

(57) SITE AUDIT STATEMENT

Prior to the execution of works associated with the built form of the development (excluding building work directly related to remediation) a Site Audit Statement (SAS) is to be obtained from a NSW EPA Accredited Site Auditor is to be submitted to the Area Planning Manager. The SAS must confirm that the site has been remediated in accordance with the approved Remediation Action Plan and clearly state that site is suitable for the proposed use. Conditions on the Site Audit Statement shall form part of the consent.

(a) Where the SAS is subject to conditions that require ongoing review by the Auditor or Council these should be reviewed and approved by Council before the SAS is issued. In circumstances where the SAS conditions (if applicable) are not consistent with the consent, a S96 application pursuant to the *Environmental Planning & Assessment Act 1979* shall be submitted to ensure that they form part of the consent conditions.

(b) An Occupation Certificate must not be issued by the PCA unless a Site Audit Statement has been submitted to the City in accordance with this condition.

The Basics – What is missed in PSI

- Preliminary Site Investigation (PSI)
  - Wrong Site identification – address, legal identifier, site area etc
  - Poor description of past or current activities.
  - No Site visit (rely on google)
  - No Conceptual Site Model
  - Incomplete desktop data (e.g. Council information, incomplete/unclear aerial photograph, absence of WorkCover Dangerous Good search)

Example of Historical Aerial Photographs

Example of a Site visit

Pouring something into sewer with gloves…

Suspected Asbestos after a residential site had been remediated

Neatly stored drums (not bunded) but also note airport

The Basics – What is missed in DSI

- Detailed Site Investigation (DSI)
  - No Sampling Analysis or Quality Plan (SAQP) or Data Quality Objectives (DQO)
  - No Conceptual Site Model to guide lateral or vertical delineation of contamination
  - Borehole Logs poorly described and don't record odours, deleterious materials
  - Poorly installed monitoring wells (groundwater and soil vapour)
  - Samples not unique numbers
  - Results not tabulated or presented against relevant guidelines
  - Incorrect Asbestos sampling methodology
  - No Cross Sections
  - Inaccurate sample locations in figures – sample locations not measured against features

Example of Borehole logs and Site Plan

Figure 9. Example Borehole Log – W60 (sheet 1 of 2)

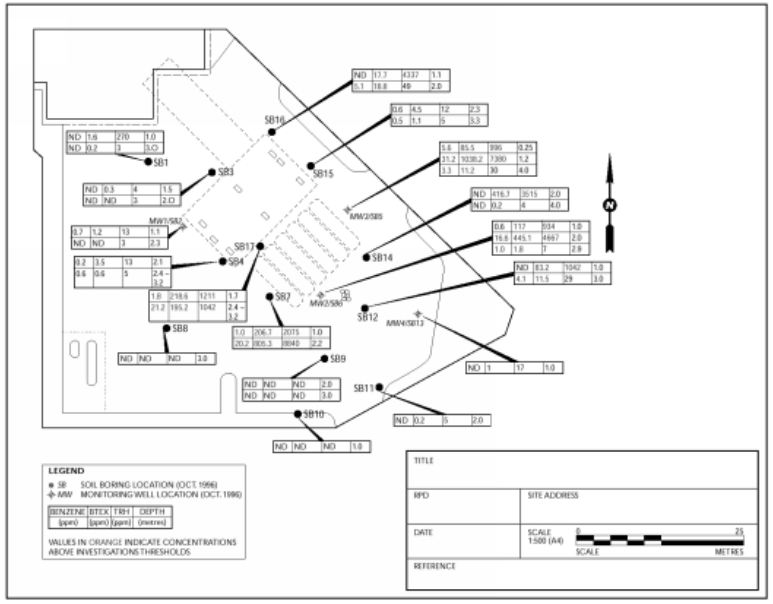
PROJECT:	BOREHOLE: W60	SHEET 1 of 2
Surface elevation: 3.509mAHD Well Head elevation: 3.444mAHD	Borehole location:	
Date: 19/11/98 Logged by: Checked by:	Drill type: Gemco 2100 Drilling method: 100mm Hollow flight auger	

SOIL DESCRIPTION	DEPTH (m)	GRAPHIC LOG CLASSIFICATION SYMBOL	WELL CONSTRUCTION	FIELD MONITORING	SAMPLE INTERVALS
FILL (SANDY CLAYEY GRAVEL): orange; moist; sand medium grained; gravel fine to medium grained; - becoming brown, some wire; coarse gravel	0	FILL		Concrete grout	
SANDY CLAY: brown with trace grey; moisture content< plastic limit; medium plasticity; firm; sand fine to medium grained; some pockets of black organic matter; trace gravel; trace membane; no odour - very moist; soft	1.0	CL			
SILT: grey/black; moisture content<plastic limit; low to medium plasticity; soft to firm		OH			
SANDY SILTY CLAY: grey with trace orange mottling; moisture content<plastic limit; medium plasticity; soft; sand fine to medium grained; trace angular coarse gravel (blue metal?) in surface; fine shell fragments/quartz sand; occasional very sandy moist bands	2.0	CL		Bentonite granules	
- becoming CLAYEY SAND: grey with orange mottling; moist to wet; sand medium grained; trace fine shell fragments	2.90	SC		2mm Clean Graded Quartz sand Water level at 3.0m (3/2/99)	
- trace subrounded fine to medium quartz gravel; increasing shell fragments	3.0				
	4.0			Class 18 50mm UPVC screen 0.4mm slotted	

WELL CONSTRUCTION LOG

REVISION 0

Figure 3. Example Results – v – Site Features



Example of Result Table

Table 11. Example tabulation of analytical results against geological profiles *to illustrate* correlation between contamination and particular fill types

Bore/ test pit	Depth (m)	Description	Sample depth (m)	Analysis results in mg/kg																	Sample date	Date to lab	Analysis date (organic)	Analysis Date (inorganic)
				C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	B	T	E	X	Total PAH	As	Cd	Cr	Cu	Pb	Zn	Ni	Hg				
TP1/1	0.0-0.1	Silty sand, brown, damp, loose, fine sand	0.0-0.2	1500	2240	1200	<100	<1	<1	<1	<1	<5	66	<1	8	312	209	310	97	<0.05	27/05/97	28/05/97	28/05/97	29/05/97
/2	0.1-3.55	Gravelly silt sand, dark grey red, loose, fine to coarse sand, ASH FILL	0.3-0.5	1000	1900	1100	<100	<1	<1	<1	<1	11	45	4	8	269	307	274	85	<0.05	27/05/97	28/05/97	28/05/97	29/05/97
/3		bricks and steel throughout	0.85-1.05	700	59	900	<100	<1	<1	<1	<1	8	32	5	5	211	253	213	69	<0.05	16/09/97	17/09/97	18/09/97	18/09/97
/4	3.55-3.75	Clay, olive grey, moist, soft, plastic	3.55-3.75	50	<20	200	<100	<1	<1	<1	<1	<5	1	<1	1	82	21	20	62	<0.05	16/09/97	17/09/97	18/09/97	18/09/97
TP2/1	0.0-0.3	Sandy silt, brown, dry, loose, soft, non-plastic	0.0-0.2	60	130	1200	1500	9	5	8	11	30	22	<1	64	100	541	450	27	0.05	27/05/97	28/05/97	28/05/97	28/05/97
/2	0.3-0.5	Silty sand, black, dry, loose, fine to coarse sand, ASH FILL	0.3-0.5	<20	110	700	<100	3	2	<1	5	22	34	3	4	184	400	533	22	<0.05	27/05/97	28/05/97	28/05/97	28/05/97
/3	0.5-1.0	Clay, brown, dry, hard, plastic	0.5-1.0	<20	<20	<50	<100	<1	<1	<1	2	7	<1	<1	<5	52	30	142	23	<0.05	27/05/97	28/05/97	28/05/97	28/05/97
TP3/1	0.0-0.3	Gravelly silty sand, black, loose, damp, fine to coarse sand, ASH FILL	0.0-0.3	<20	<20	<50	<100	<1	<1	<1	<1	9	17	6	1	115	218	264	23	<0.05	27/05/97	28/05/97	28/05/97	29/05/97
/2			0.3-0.5	<20	<20	<50	<100	<1	<1	<1	<1	<5	12	2	15	88	123	425	23	<0.05	27/05/97	28/05/97	28/05/97	29/05/97
/3	0.3-1.0	Silty clay, brown, damp, soft, non-plastic clay and silt	0.5-1.0	<20	<20	<50	<100	<1	<1	<1	<1	<5	1	<1	16	35	25	166	19	<0.05	16/09/97	17/09/97	19/09/97	18/09/97
TP4/1	0.0-0.5	Silty sand, brown, dry, loose, fine sand	0.0-0.2	1200	224	1200	1000	27	15	17	25	<5	15	2	12	45	900	540	15	<0.05	16/09/97	17/09/97	19/09/97	22/09/97
/2	0.5-2.2	Gravelly silty sand, grey, dry, loose, fine to coarse sand, ASH FILL	0.2-0.5	600	220	1300	900	19	9	12	19	13	23	<1	75	209	1000	560	13	<0.05	16/09/97	17/09/97	19/09/97	22/09/97

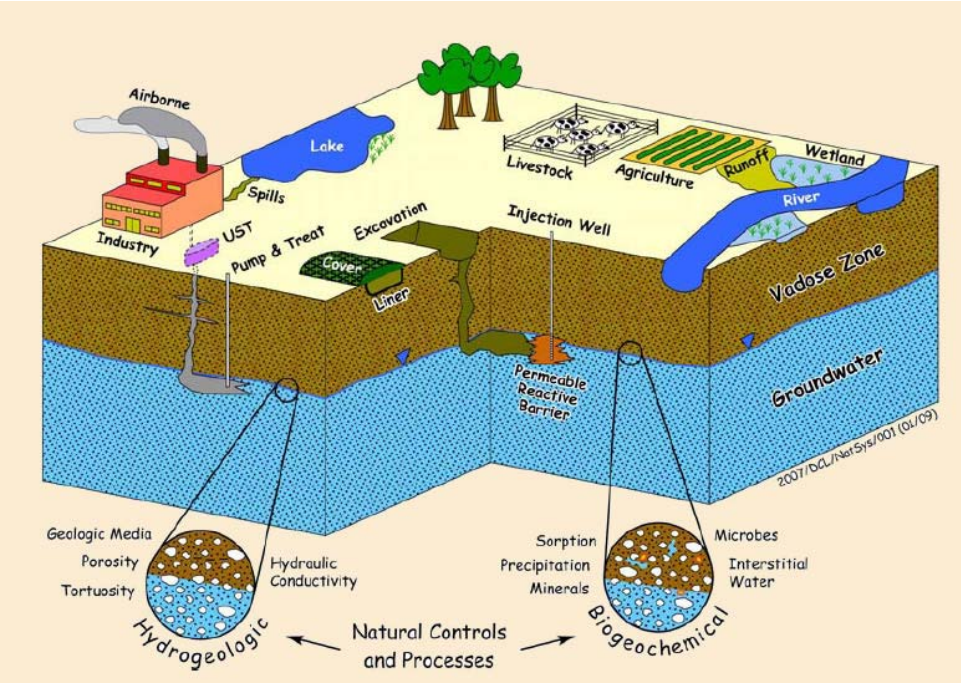
ZOIC

Conceptual Site Model

NEPM defines CSM as

.. “a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors.”

- Known and potential sources of contamination
- Primary and secondary sources
- Pipe leak, pour, spill etc
- Potentially affected media
- Human and ecological receptors
- Potential and complete exposure pathways



Residual Contamination & EMPs

- Residual contamination needs to be identified and managed – usually by EMP.
- EMPs often not clearly identify what is being managed and how.
- Council often confuses construction EMP with long term EMP.
- If an EMP is in place:
  - Can only be Section A Site Audit if management is not ‘active’
  - EMP can reasonably be made to be legally enforceable.
  - Residual Contamination has appropriate notification.
  - No off-site migration or if off-site migration no unacceptable risk to human health or the environment.
  - If contamination is migrating off-site there is a Duty to Report

Vapour Intrusion

- CSM not considered – probe depth depends on source and migration of vapours
- Shallow screen depth – atmospheric influence
- Groundwater penetration
- Both current impact and future exposure not considered (lift shafts & basement levels)
- Poor well location, design and construction
- Background conditions not considered
- Quality Control or Quality Assurance not considered
- No equipment calibration (flow rates inappropriate, leaky trains)
- No field notes

Human Health and Ecological Risk Assessment

- Assessment not conducted by experienced person.
- Assessment not conducted as per NEPM (2013).
- Equations are not provided.
- Calculations cannot be checked – not enough detail/assumptions are provided.
- Exposure scenarios are not as per CSM.
- Exposure assumptions are not as per NEPM (2013).
- Outdated toxicological data.

Waste

- Draft Auditor Guidelines require:
  - Confirm the waste has been appropriately characterised
  - Confirm the quantity of waste leaving the site (view disposal dockets)
  - Confirm that the location of transported waste is a lawful facility
  - Confirm that the location of transported waste can receive classified waste from site
  - Confirm exemption policies
  - Report to EPA ‘immediately’
- So Beware:
  - Inappropriate waste classification e.g. Classification as ‘CT1’ or VENM (with inclusions)
  - No tabulation of volumes leaving site or volumes don’t match site excavations and dockets
  - No receiving locations nominated or licenses provided or available information
  - Hazardous waste treatment & disposal not documented and not approved by EPA

Thank you