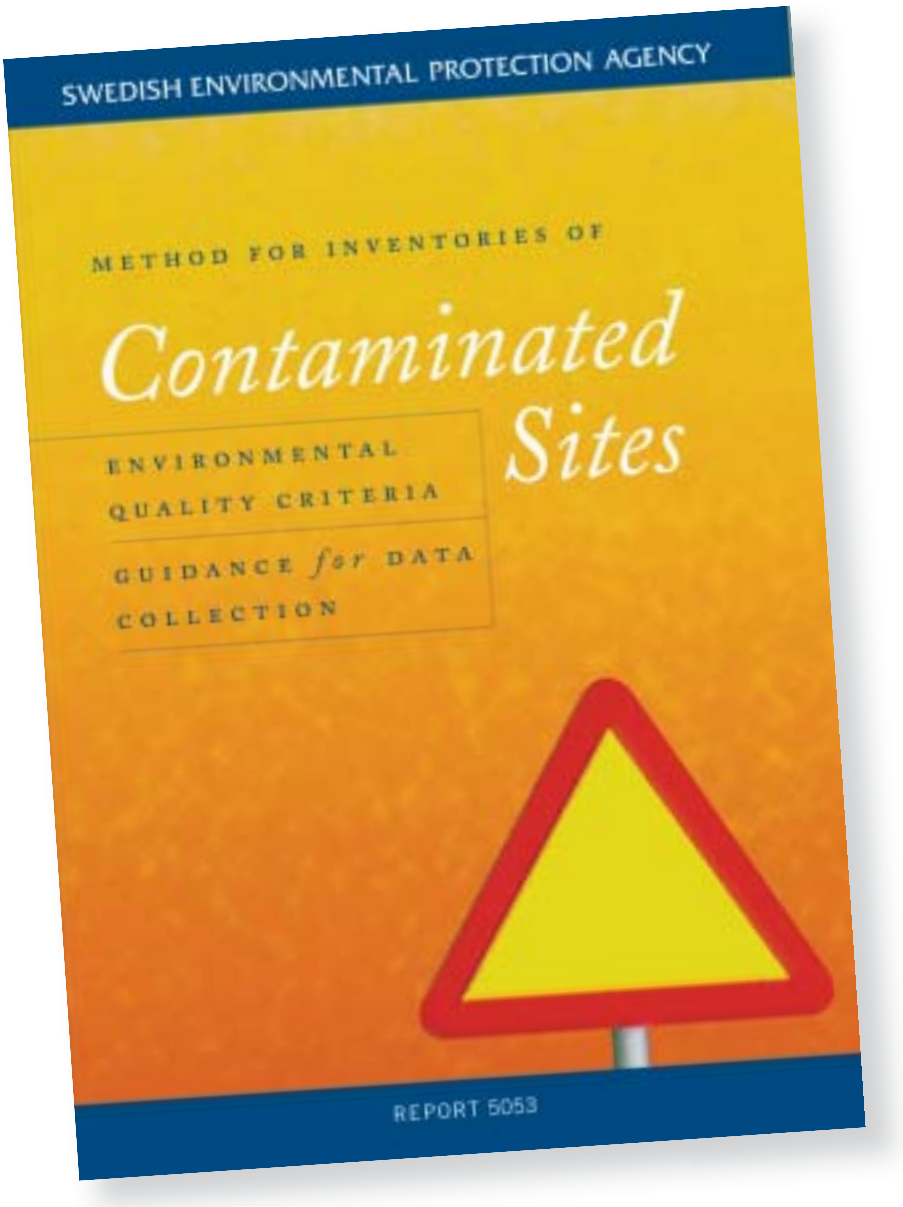
NATUR VÅRDS VERKET

Introduction to a method

FOR INVENTORIES AND RISK CLASSIFICATION OF CONTAMINATED SITES



SWEDISH ENVIRONMENTAL PROTECTION AGENCY

Risk classification

Risk classification is a procedure used in the assessment of contaminated sites.

The purpose is to permit a comprehensive assessment of the risks associated with specific contaminated sites, even in cases for which available data are limited. The results are intended to provide a basis for the setting of priorities and for decisions concerning additional investigations or remediation. The site is assigned to one of four risk classes.

Class 1: Very high risk
Class 2: High risk
Class 3: Moderate risk
Class 4: Low risk.

It should be possible to assess all types of contaminant that may be present at any given site.

Many different aspects of the contaminated site are considered within the context of four issues related to the overall risk:

- Hazard assessment
- Contamination level
- Potential for migration
- Sensitivity/protection value

The risks associated with each of these aspects are assigned one to four levels. The boundaries between the levels are set so that conditions at all contaminated sites in Sweden – from those which present only a slight risk, to the most severely contaminated – are taken into account.

Finally the four aspects are weighed together in a comprehensive assessment, on the basis of which the site is assigned to one of the four risk classes.

Both current and anticipated risks are evaluated – i.e. those associated with areas that are already contaminated, and with adjacent areas which may be affected in the future due to the spread of contaminants.

The risk assessments include contaminated buildings and other constructions, soil, groundwater, surface water and sediments. Landfills and filled-in areas are regarded as soil.

In order to make the assessments of the various aspects readily comprehensible, five forms are completed for each site – two for underlying assessments, one for the comprehensive risk evaluation and two for administrative data. As much information as possible is compiled.

Hazard Assessment

The first of the four aspects is hazard assessment, which deals with the risks that are associated with the hazardous properties of the contaminants present at the site. It is necessary to know in advance which contaminants are present.

In the absence of analytical results from field studies, the hazard assessment must be based on information about activities previously conducted at the site, including any industrial processes and chemicals that may have been involved.

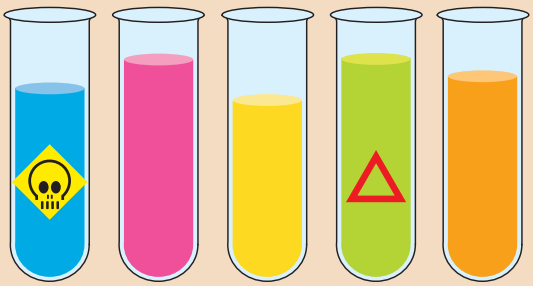
The contaminants at the site being assessed are noted on form E in the appropriate category under "Hazard assessment".

Hazard assessment of contaminants at polluted sites

Slightly hazardous	Moderately hazardous	Very hazardous	Extremely hazardous
"moderately harmful to health" (V)	"harmful to health" (Xn), "irritating" (Xi) "harmful to the environment without symbol" (-)	"toxic" (T), "corrosive" (C) "harmful to the environment" (N)	"very toxic" (T+), substances that are not allowed to be handled commercially or are being phased out

Hazard assessment of certain chemical substances, products and mixtures

Slightly hazardous	Moderately hazardous	Very hazardous	Extremely hazardous
Calcium, Iron, Magnesium, Manganese, Paper, Wood	Acetone, Aliphatic hydrocarbons, Aluminium, Scrap metal, Tree bark, Wood fibre, Zinc*	Ammonia, Aromatic hydrocarbons*, Aviation fuel, Chromium* (if Cr VI is not present), Cobalt*, Concentrated acid, Concentrated bases, Copper*, Cutting oil, Diesel oil, Formaldehyde, Glycol, Heating oil, Hydrogen peroxide, Lubrication oil, Nickel*, Paints and dyes, Petrol, Petroleum ash, Petroleum products, Phenol*, Solvents, Styrene, Vanadium*, Waste oil, Wood tar	Arsenic*, Benzene*, Cadmium*, Chlorinated solvents, Chlorobenzenes*, Chlorophenols*, Coal tar, Creosote*,**, Chromium (VI)*, Cyanide*, Dioxins*, Lead*, Mercury*, Organochlorine compounds, PAH*, PCB*, Pesticides, Sodium (metal), Tetrachloroethylene*, Trichloroethane*, Trichloroethylene*



* Swedish EPA generic guideline levels available
**aged creosote with high content of polycyclic aromatic hydrocarbons

Contamination Level

The second aspect, contamination level, is concerned with the assessment of the severity of the effects that can be caused by the contaminant concentrations; the amounts of the contaminants and the volume of contaminated material. It is necessary, in rough terms, to determine the level of every contaminant in each of the media where it is present, as well as the amount of every contaminant and the volume of contaminated material. The assessments concerning contamination level should be entered in form C.

Current conditions

The current environmental status is related to the severity of the effects that may be caused by the concentrations of the contaminants at the site. These concentrations are compared with effect-related guideline values, which are used to make an effect-related assessment.

Criteria for the classification of current conditions

Moderate	Slightly serious	Moderately serious	Serious	Very serious
Soil, sediment and groundwater, if guideline values are available	<guideline values	1–3 x guideline values	3–10 x guideline values	>10 x guideline values
Groundwater, if guideline values are not available	<drinking water quality standard*	1–3 x drinking water quality standard*	3–10 x drinking water quality standard*	>10 x drinking water quality standard*
Surface water	water quality criteria	1–3 x water quality criteria	3–10 x water quality criteria	>10 x water quality criteria
Tox data	$<LC_{50}/100$	$LC_{50}/1000$–$LC_{50}/300$	$LC_{50}/300$–$LC_{50}/100$	$>LC_{50}/100$

* = threshold of risk to human health

Example of classification of current conditions for contaminated soil in terms of mg/kg dw based on guideline values for contaminated soil. The guideline value for sensitive land use (KM) is used as the boundary between "Slightly serious" and "Moderately serious".

Substance	Slightly serious	Moderately serious	Very serious	Extremely serious
Metals				
Arsenic	< 15	15–45	45–150	>150
Lead	<80	80–240	240–800	>800
Cadmium	<0.4	0.4–1.2	1.2–4	>4
Cobalt	<30	30–90	90–300	>300
Copper	<100	100–300	300–1000	>1000
Chromium (applies only if	<120	120–360	360–1200	>1200

Deviation from reference value

Reference values represent the concentrations of substances which would be found at a site if it were not contaminated by point sources. They can be used to determine the extent of contamination from such sources. Reference values can often be measured in the immediate vicinity of a given site.

Criteria for classifying the deviation from reference values

Effect of point sources

Little or none	Moderate	Large	Very large
< Reference value	1–5 x Ref. value	5–25 x Ref. value	> 25 x Ref. value

Classification of deviation from reference value for contaminated land. The reference value used is the 90th percentile of samples taken in urban areas by the Swedish EPA, for metals in deep moraines analysed with ICP (mg/kg dw).

Effects from point source Substance	Little or none	Moderate	Large	Very large
Arsenic	<10	10–50	50–250	>250
Cadmium	<0.3	0.3–1.6	1.6–8	>8
Chromium	<30	30–150	150–800	>800
Cobalt	<10	10–45	45–230	>230
Copper	<25	25–120	120–600	>600
Nickel	<25	25–130	130–650	>650
Lead	<25	20–120	120–600	>600
Zinc	<70	70–350	350–1800	>1800
Mercury	<0.1	0.1–0.5	0.5–2.5	>2.5
Vanadium	<40	40–200	200–1000	>1000

Amount & volume

The risk to health and the environment is also related to the amounts of the contaminants at the site and the volume of contaminated material. The assessment of the amount of a contaminant is dependent upon its toxicity.

The volume of contaminated material (soil or sediment) is assessed without regard to type and concentration of the contaminant. In general, the greater the volume of contaminated material, the greater the risk.

Criteria for classification of the amount of contaminants and the volume of contaminated material (in kilograms)

Amount/volume:	Slight	Moderate	Large	Very large
Amount of extremely hazardous contaminant	—	—	Few kg	Tens of kg
Amount of very hazardous contaminant	—	Few kg	Tens of kg	100s of kg
Amount of moderately hazardous contaminant	Few kg	Tens of kg	100s of kg	Tons
Volume of contaminated material	<1000 m^3	1000–10 000	10 000–100 000	>100 000 m^3

Comprehensive assessment of the contamination level

The contamination level is assessed for each contaminant separately, in each of the media where it is present, by weighing together all four major factors:

- current environmental status
- deviation from the reference value
- amount of pollutant
- volume of contaminated material.

Large amounts of contaminants occurring in high concentrations and in a large volume of material imply a high general degree of contamination. A site with a few "hot spots", but with small total amounts of contaminants, has a lower general degree of contamination than a site with the larger amounts of the same contaminants.

Conclusions from the assessment of the degree of contamination are entered on the form for comprehensive risk assessment. (Form E).

Form C. CONTAMINATION LEVEL

Example of completed form C

Object:	Recorded by (name, date):
Valdemarsvik (formerly Lundberg's Leather)	Fredrika Norman, 1998-07-10
ID no.: BKL 123	Revised by (name, date):

Indicate uncertain items with question mark ("?")

Soil

Note substances, with reference numbers in parentheses

No. samples	7

Comparisons made with (tick): ❑ ...percentile, ❑ next-highest value, ❑ highest value, ❑ sensory impression

Environmental status	Slightly serious	Moderately serious	Serious	Very serious
	As, Co, Pb, V	Cu, Ni, Cr	Cd, Zn	Hg
Substances for which assessment of status is not possible due to lack of comparative data		Mn, Mo, Ti		
Deviation from reference value	Little or no effect from point source	Moderate effect from point source	Large effect from point source	Very large effect from point source
		As, Cd, Co, Pb, V, Ni, SPOT	Cu, Ni, Cr	Zn, Ha, EGOM, EOX
Substances for which assessment of deviation is not possible due to lack of comparative data		Mn, Mo, Ti		
	Slight	Moderate	Large	Very large
Amount of pollutant				
Volume of contaminated material				
References used	Appendix 4, Table 1: General guideline values for contaminated soil Appendix 5, Tables 1-3: Background levels in soil			

Groundwater

Note substances, with reference numbers in parentheses

No. samples	2

Surface water

Note substances, with reference numbers in parentheses

No. samples	5

Sediments

Note substances, with reference numbers in parentheses

No. samples	4

Buildings and other constructions

Note substances, with reference numbers in parentheses

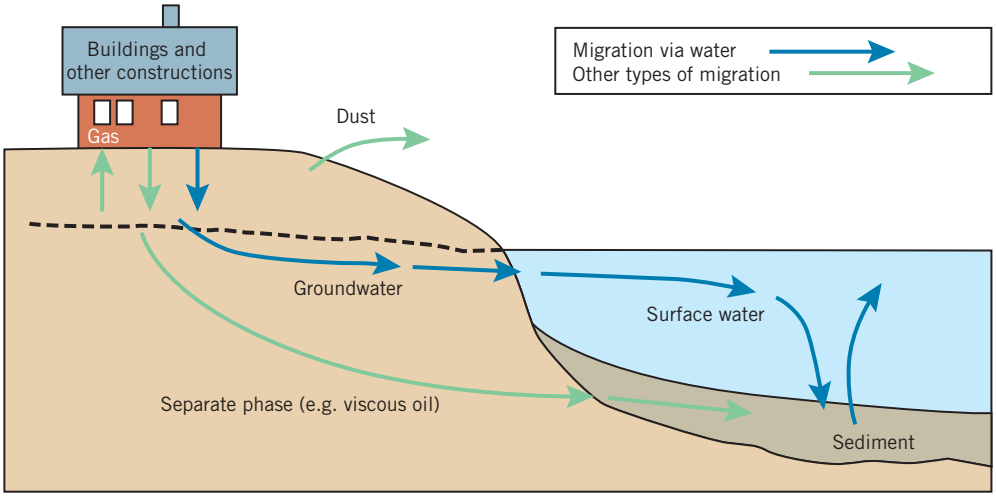
No. samples	0			
	Slight	Moderate	Large	Very large
Amount of pollutant				
Volume of contaminated material				
References used				

Potential for migration

The third aspect of the risk assessment is the potential for contaminant migration, which is a question of how rapidly contaminants may be dispersed within and between various media, in concentrations and amounts that imply a risk for harmful effects. The magnitude of the risk is related to the size of the calculated or estimated migration rate.

It is not necessary to determine the exact rate of migration, since that would require substantial resources. It is sufficient to carefully determine whether or not the spread of contaminants is currently in progress or likely to occur in the future and, in either case, to estimate the order of magnitude of the migration rate. The assessment is based on information about the geology and hydrology of the site and the chemical attributes of the environmental media.

Contaminant transport pathways are shown in the picture. In addition to the flow rate of the transporting medium, the contaminant migration rate is also influenced by such factors as degradation processes, dilution and sorption. The assessments of potential for migration should be entered in form D.



Migration pathways of contaminants in the environment. Each arrow indicates a pathway considered in risk classification.

Principles for the classification of potential for migration

Path/medium	Slight	Moderate	Large	Very large
From buildings, constructions	None	<5 %/yr	5-50 %/yr	>50 %/yr
In soil & groundwater	None	<0.1 m/yr	0.1–10 m/yr	>10 m/yr
From soil & groundwater to surface water	>1000 yrs	1000–100 yrs	100–10 yrs	<10 yrs
In surface water	None	<0.1 km/yr	0.1–10 km/yr	>10 km/yr
In sediments	None	<0.1 m/yr	0.1–10 m/yr	>10 m/yr

Example of completed form D

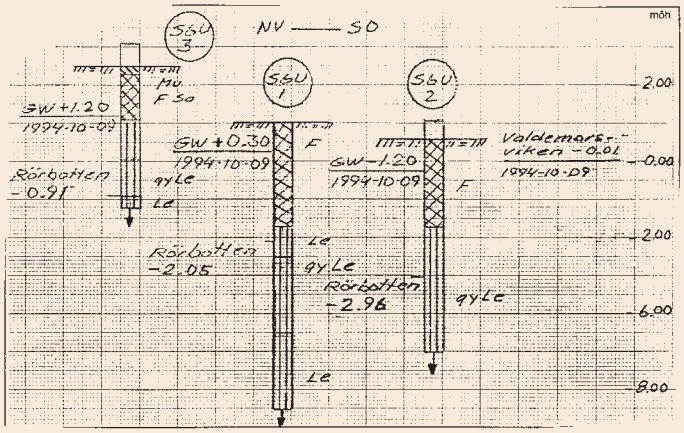
Form D: Potential for Migration

Object	Recorded by (name, date):
Valdemarsvik (formerly Lundberg's Leather)	Fredrika Norman, 1998-07-10
ID no:	Revised by (name, date):

Potential for migration are assessed for pollutants that are present in concentrations or amounts which pose a risk of negative effects. Indicate uncertain items with question mark ("?").

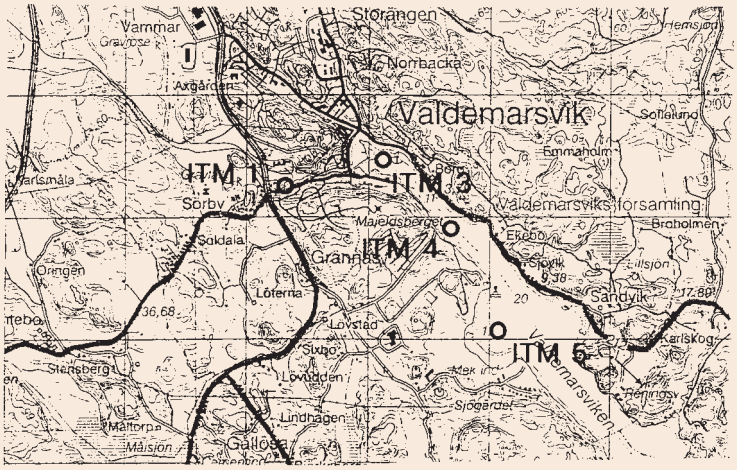
Borehole diagram and map of affected area

Borehole diagram



Map of affected area

The only groundwater flow is in a southeasterly direction to the bay.



From buildings and other constructions

From ground to buildings

Volatile pollutants in ground	–

Ground and groundwater

Current location of pollutants in ground,	In aquifer located in backfill above predominant clay/

Rate of migration for substances transported via water through ground

Pollutants transported by water	Hg, Zn, Cd, Cu, Ni, Cr
Ground's porosity in most porous stratum (m/s)	Hydraulic conductivity in backfill estimated to be >10^{-6} m/s within factory area
Slope of groundwater surface (%):	Northwest-southeast direction is 0.5%
Groundwater flow (approx. m/yr)	0.5 m/yr
Biodegradable pollutants	–

Example of completed form D

Rate of decay (half-life)	–
Pollutants retained in soil	–
Organic carbon content in soil (%)	–
Other favourable conditions for retention in soil, e.g. clay content (describe)	–
Natural transport channels, e.g. drying-cracks in clay (describe)	–
Man-made transport channels, e.g. buried utility lines (describe)	Old pipes that function as drainage channels from factory to river
Known previous migration (m/yr)	To Fifallaå River, ca. 100 m
Other	
Estimated migration rate in ground and groundwater (m/yr)	0.5 m/yr

Migration rate for substances transported from ground via dust

Pollutants dispersed via dust	–

Rate of migration for substances that move independently through the ground

Pollutants migrating in a separate phase	–

Ground/groundwater to surface water

Surface water already contaminated by known previous migration (name)	Fifallaå River and Valdemarsvik
Endangered surface water (name)	Valdemarsvik's currently unpolluted wataer
Pollutants' migration rate in ground/groundwater (m/yr)	–
Distance from pollution to endangered surface water (m)	100 m
Surface run-off via ground, ditches, sewage pipes (yes/no)	Old pipes are drainage channels from factory to river
Water table variations, flooding, high water (yes/no)	Yes, risk of flooding.
Other	
Estimated years for migration to surface water	Surface water is already polluted

Surface water

Sediments

Contaminated sediments, known previous migration, (describe and indicate on map)	–
Pollutants transported via water to sediments	Cr, Cu, Hg (?)
Sedimentary conditions in various sections of water system (describe)	–
Boat traffic that stirs up sediments (yes/no)	Yes, shipping
Dredging (yes/no)	–
Powerful waves (yes/no)	–
Gas-formation (yes/no)	–
Pollutants in separate phase in sediments (describe)	–
Other	Distribution affected by wind and saltwater stratification
Even distribution (m/yr)	–
Uneven distribution, note also on map (describe)	–

Sensitivity and protection value

The last of the four aspects of the risk assessment is sensitivity and protection value. This issue deals with the severity of the consequences of contamination with respect to exposure of man and the environment. In order to do this, it is necessary to determine and describe the degree of exposure to which humans and the environment are currently subjected and likely to be subjected in the future. The level of risk is related to the sensitivity of exposed humans, and to the degree of protection required for the exposed environment.

The human health risk is evaluated at the individual level, which means that the risk is the same whether one or several persons are exposed. Risk to the environment is evaluated in terms of the effects on species and ecosystems.

Criteria for classifying levels of human sensitivity to contaminants (S)

Slight	Moderate	High	Very high
- No human exposure, e.g. small enclosed unused area	– Slight occupational exposure – Groundwater not used for drinking, e.g. enclosed industrial area	– Significant occupational exposure during work hours – Slight exposure of children – Ground- and/or surface water used for drinking – Land used for crops or animal husbandry – Outdoor recreation area	– Permanent residential area – Extensive exposure of children – Ground- and/or surface water used for drinking, e.g. house lot, day-care centre

Criteria for classifying the required degree of protection

Slight	Moderate	High	Very high
– Heavily contaminated site – Ecosystem heavily damaged by various uses and activities, e.g. landfills, spoil heap or asphalted area	– Somewhat disturbed ecosystem – Common ecosystem within region, e.g. typical forest or farmland	– Relatively unusual ecosystem within region – Exposure of individual species or ecosystems identified in local or regional conservation plans as of great value, e.g. shorelines, sensitive watercourses, recreation areas and urban parks	– Site with individual species or ecosystems identified in local, regional or national conservation plans as being of especially great value, e.g. national parks, marine sanctuaries, and other areas in which the protection of endangered species and their habitats is considered to be of national interest

Comprehensive assessment and risk classification

The comprehensive assessment and risk classification are performed by weighing together the four assessment aspects, resulting in the site being assigned to one of the following risk-classes:

Class 1— Very high
Class 2— High
Class 3— Moderate
Class 4— Low

Form E, Comprehensive Risk Assessment, is intended to assist in the evaluation process. Among the items of information to be noted are conclusions from the separate forms for potential for migration (form C) and for contamination level (form D). Assessments of hazard and of sensitivity protection value are entered directly. The following information should also to be included: administrative details that may help in setting priorities; previous risk classifications; impressions from the on-site inspection.

Comprehensive risk assessments are made on the basis of a "reasonably conservative" scenario.

Included with Form E is a diagram that provides an overview of the four assessment aspects; it is intended to be of use in weighing together all the information.

Form E COMPREHENSIVE RISK ASSESSMENT

Example of completed form E

Object: Valdemarsvik (formerly Lundberg's Leather)	Recorded by (name, date): Fredrika Norman, 1998-07-10
ID no: BKL 123	Revised by (name, date):
Industrial branch: Tannery	

Indicate uncertain items with question mark ("?")

Hazard assessment (H)

Note substances in appropriate squares

Slightly hazardous	Moderately hazardous	Very hazardous	Extremely hazardous
	Zn, bark extract, colour dyes, preserving salts	Cu, Ni, chromium salts, phenol	Cd, Cr, Hg, Pb, DDT

Contamination level (C)

Shows current polluted media. Data from Form C, Degree of contamination. Note substances in appropriate squares

Media	Slight	Moderate	High	Very high
Buildings/construction				
Soil		As, Pb, V, SPOT	Cu, Cd, Ni, Cr	Hg, Zn, EGOM, EOX
Groundwater		Ni, As, EOX	Cu, Zn, Zd, SPOT algae test	Cr, Pb, HEGOM, microtox (Hg not measured)
Surface water			Co	(Hg not measured)
Sediment		Cu, Hg, SPOT, EOX		Cr

Migration potential

Data from Form D, Migration potential. Put cross (x) or note substances in appropriate squares

Direction	Small	Moderate	Large	Very large
From buildings/ constructions		X (?)		
To buildings	X (?)			
In soil and groundwater				X (?)
To surface water				Already polluted
In surface water	X (?)			
In sediments			X (?)	

Sensitivy (S) Protection value (P)

Write S for sensitivity and V protection value

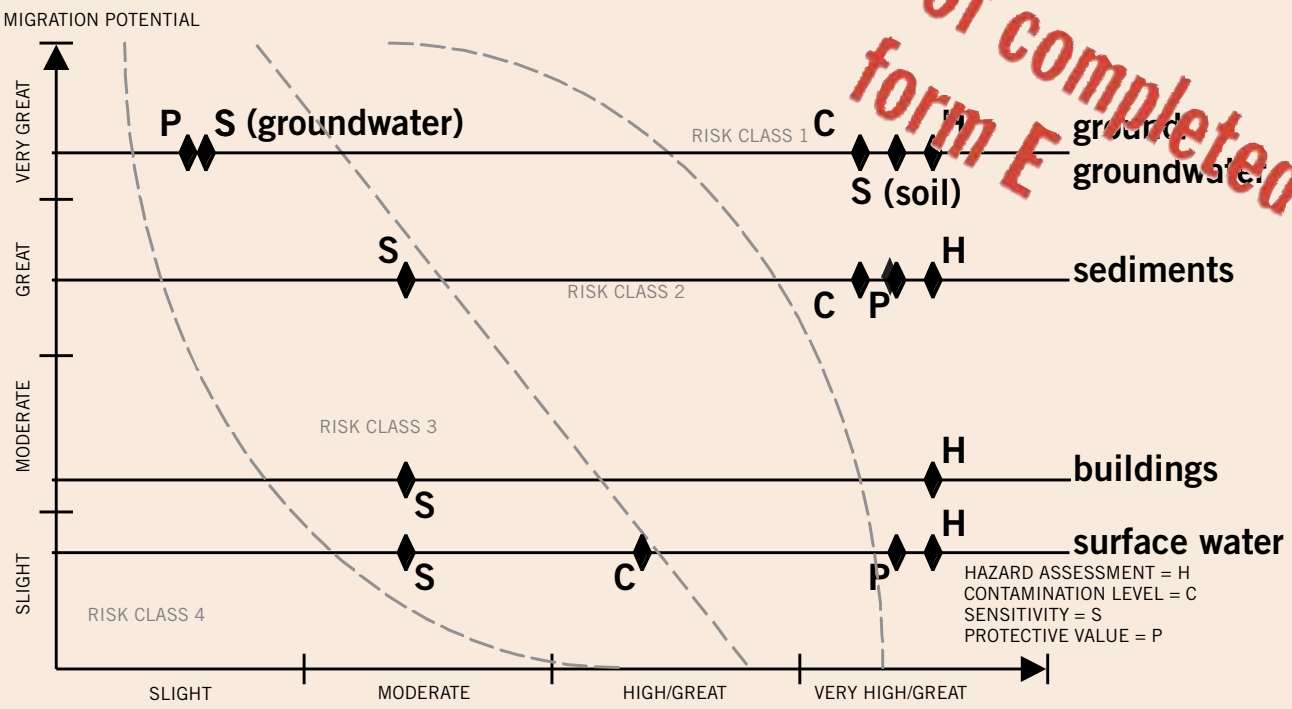
	Slight	Moderate	Great	Very great
From buildings/ constructions		S		
Soil & groundwater	S, P (groundwater)			S (soil)
Surface water & sediments		S		P

Evaluation of S and P based on land use. Industrial land, urban area, built up area ..... which is (check) ☒ current land use, ❑ future land use as per detailed plan, ❑ future land use as per general guidelines.

Brief description of exposure conditions: The ground area and water are heavily used for active forms of outdoor recreation, and is located near permanent buildings. The site is centrally located in an urban area, near a housing area. There is currently no natural flora or fauna within the site. No extraction of groundwater, now or in the future.

Example of completed form E

COMBINED ASSESSMENT & RISK CLASSIFICATION



Investigator's general impressions: .....

.....

.....

.....

.....

Site assigned to risk class (check)

- ☒ 1 "Very high risk"
- ❑ 2 "High risk"
- ❑ 3 "Moderate risk"
- ❑ 4 "Low risk"

Explanation: Great potential for dispersion in soil, sediments and surface water. For soil, sensitivity is judged to be great; for other media, slight or moderate. The degree of environmental protection required is greatest for surface water and sediments, slight for soil and groundwater. Pollutants are mercury, cadmium, chromium and lead, which are very hazardous. Degree of contamination is high or very high.

Other grounds for setting priorities

❑ exposure to pollutants occurs at present in following ways.....

.....

Links

❑ there are other contaminated sites which endanger the same body of water, namely: the local community, other buildings and industries, household dumps and an older copper works north of Lövstad that pollutes Valdemarsvik. Pollution in groundwater comes primarily from the leather works.

❑ there are other contaminated sites associated with the same activity, namely: a waste dump that was located outside the industrial area, beneath the present-day ICA supermarket. Outside the site are at least two dumps that are treated as separate objects.

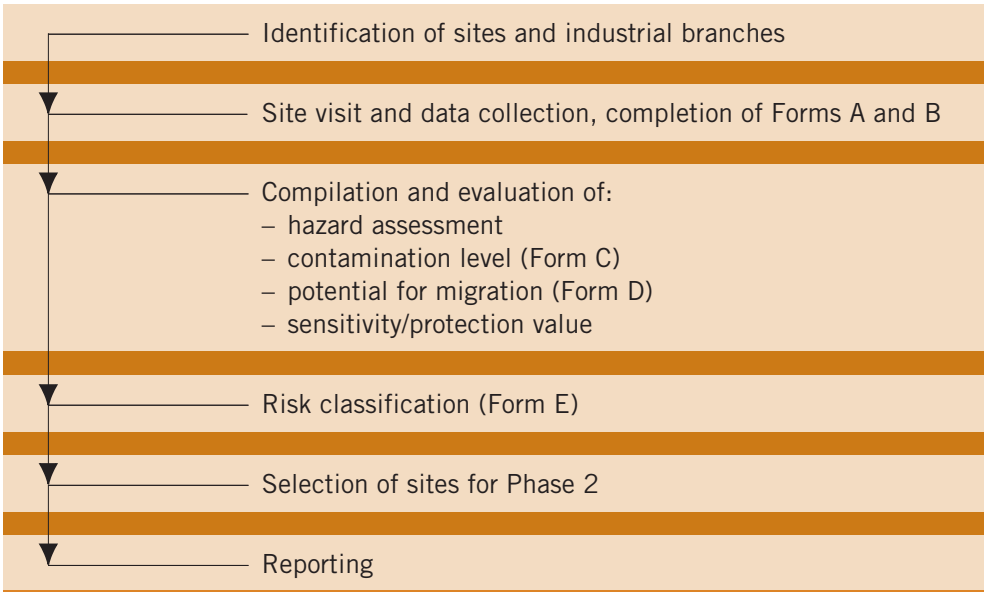
Data Collection

Data collection is based on thorough studies of maps and archive materials, and on preliminary site investigations, which include the analysis of samples from various media at strategically selected locations.

Data collection and risk classification can be divided into two phases, the first, *preliminary survey* and the second *preliminary site sinvestigation.*

Foto: Dag Fredriksson

Phase 1: preliminary survey



Site visits and data-collection

Available data about the site is gathered by performing a site inspection, studying maps and archival materials, and conducting interviews. Information of an administrative nature is entered on Form A page 19, while descriptions of the site, the activities conducted there, and the surrounding area are entered on Form B page 20.

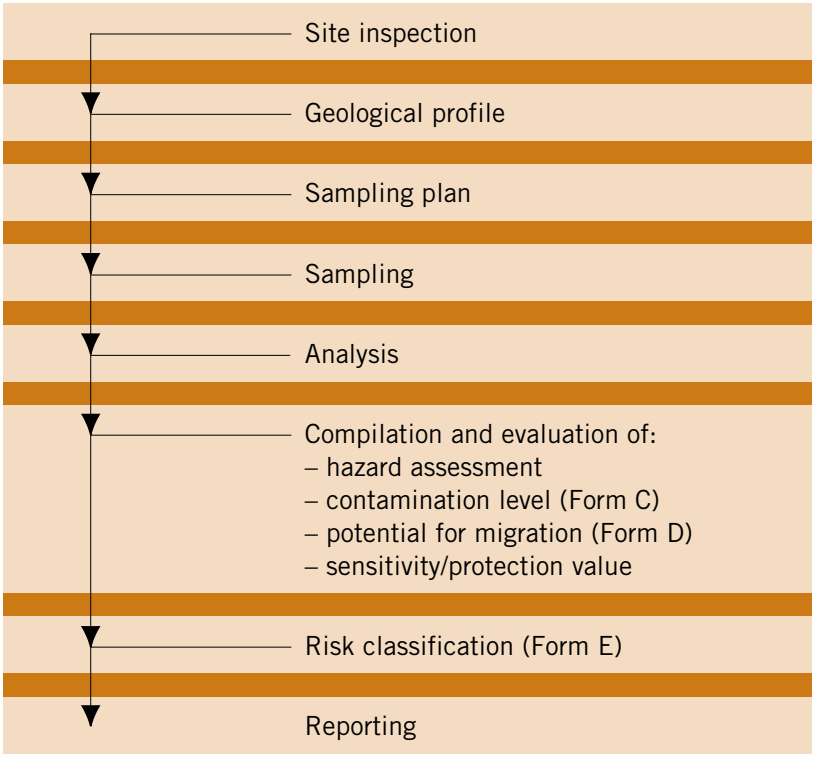
Selection

After the risk classification has been carried out, the sites to be included in Phase 2 are selected.

Reporting

The results are reported and then stored in digital format.

Phase 2: preliminary site investigation



On-site inspection and geological profile

A preliminary site investigation begins with an on-site inspection in order to get a general impression of the migration potential, with the help of available maps.

Sampling plan

A sampling plan is designed on the basis of the on-site inspection and available information concerning the site's geology and history of contamination. Included in the plan are details about the media to be sampled, the sampling locations, and the types of analysis to be carried out.

Bore-holes and sampling stations are selected with the object of:

- verifying the presence of contaminants
- verifying the potential for migration

Analytical procedures should be selected with the objective of a general picture of contamination of the site.

Sampling

The number of samples can vary, but it is always better to take too many rather than too few.

The collection, sealing and storage of samples must be done in such a way that the sample properties remain unchanged until analysis is complete.

Analysis

The risk assessment method includes a number of selected chemical analyses and toxicological tests for screening purposes. Specific analyses should be carried out if it is known that specific substances have been handled or released at the site. The method also includes tests relating to acute toxicity, genotoxicity and reproductive effects.

Risk classifications

The risk classification of Phase 2 is usually much more reliable than that of Phase 1.

Quality Control

Quality control is a collective term for all activities associated with the systematic planning which is necessary to ensure that a product or service fulfils stated quality requirements. High standards must be maintained at every stage of risk assessment and classification in order to achieve comparable results of sufficient quality.

Safety Issues

When conducting site ivestigations, it is essential to take precautions against the special risks associated with contaminated soil, gas, water and waste material. Drilling personnel must be informed of the risks that their work may entail, and a clear chain of responsibility must be established before any work is begun. An emergency plan should also be in place in case of accident.

Reporting

The basis of the final report is the information included on the completed forms, maps, analysis results and other data. Most of the information is kept in folders and databases, with the ultimate aim of storing it all in an integrated national data base.

Form A. ADMINISTRATIVE INFORMATION

Indicate uncertain items with question mark ("?")

Example of completed form A

Name of survey: Sw. Env. Protection Agency Preliminary survey, 1994-95	Phase (1 or 2, per MIFO): 2
Object: Valdemarsvik (formerly Lundberg's Leather)	First recorded by (name, date) : Ulf Qvarfort, 1996-05-25
Id no: BKL 123	Revised by (name, date): Dag Fredriksen, 1996-10-22
Preliminary risk-classification, per BKL 2	Revised by (name, date):

Industrial branch	Tannery		
SNI branch code Automatically filled in when data recorded			
County (name, code)	Östergötland		
Municipality (name, code)	Valdemarsvik (0563)		
Topographic map Automatically filled in when data recorded	8G Norrköping SO		
Economic-Yellow map Automatically filled in when data recorded	Oj Valdemarsvik		
Geographical co-ordinates. Object's, property's or main building's centre point National grid, six figure grid reference	X= North	Y= East	Z= Elevation
Type of property, per CFD			
Buildings and other constructions present and previous (outline)	Tanning vats,storage facilities, preparation area, central heating unit, oil cistern, machine shop, carpenter shop		
Object address			
Facility's owner or equivalent, including address	Municipality of Valdemarsvik, 615 80 Valdemarsvik		
Current property owner, if other than facility owner, incl. address			
Contact person at monitoring agency or the like, incl. address	Karin Karlsson, Maintenance Dept.; Knut Knutsson, Property Management		
Property size (m^2)	10,000		
Previous studies and surveys	Eva Siljeholm, 1992: Metals in Valdemarsvik's bottom sediments; Valdemarsvik Maintenance Dept. ELK Co., 1995: Analysis of metals from Valdemarsvik, J&W. SGU survey related to clean-up of Lundberg's Leather.		
Other sources (maps, aerial photos, etc.), and their present locations	SGU, Aa 158, Ae 167 plus reports and notice no. 48, Area map; Valdemarsvik Maintenance Dept. Old photos in city archive and museum		
Bench mark locations			
Wells/boreholes within industrial or affected area: location, condition and type (groundwater tubes of metal and plastic, dug and drilled wells, none)	(None)		

Example of completed form B

Form B. DESCRIPTION OF ACTIVITY, SITE AND SURROUNDINGS

Indicate uncertain items with question mark ("?")

Object: Valdemarsvik (formerly Lundberg's Leather)	Recorded by (name, date): Dag Fredriksson, 1996-08-30
Id No: BKL 123	Field inspection (name, date): Dag Fredriksson, 1996-08-30
	Field inspection (name, date):

Description of activity

Facility status (in operation, discontinued before 1969, discontinued after 1969, no known previous activity)	Shut down before 1969
Accessibility (fenced, open)	Open
Industrial activity, approximate number of years	100
Start and stop of operations (year)	1860-1960/70
Environmental disturbance from operation, approximate number of years	100
Production (product & quantity including, if possible, years for various products)	Unknown
Process description, current (outline)	None
Process description, previous (outline)	Tannery, and carpentry shop
Process waste water, current disposal (connected to own or municipal treatment facility, untreated to named body of water)	–
Process waste water, previous disposal (same alternatives as foregoing)	To nearby body of water
Chemicals used in industrial processes	Chromium, phenols, DDT, colour dyes, salts, mercury
Process waste products, temporary storage (amount and type)	None
Remediation carried out (type of measure, e.g. covering, enclosing)	Clean-up near oil cistern, emptying of tanning vats under central building, asphalting of ground surface for road and parking area
Planned remediation (same alternatives as foregoing)	None
Conflicting uses (water supply, local residents, farming, forestry, water use, recreation, imminent change of ownership, other— specify). Note all known conflicts.	Water use, change of ownership

Site and surroundings

Land use at site (industrial, agricultural, dense settlement, forestry, park, other)	Industrial land, urban area, buildings
Land use within affected area (same alternatives as foregoing)	Urban area, buildings, park
Distance from object to *nearest* housing area 0-50 m, 50-200 m, 200-500 m, 500-1000 m, >1000 m)	0-50 m
Visible damage to vegetation within site (yes, no)	
Visible damage to vegetation within affected area (yes, no)	None
Predominant soil conditions within site (impermeable, semi-permeable or porous, backfill material, rock, other)	Impermeable soil strata, backfill
Topography, slope (%)	0.5%
Type of nearby recipient (groundwater, ditch, brook, river, lake, sea)	Groundwater, sea
Name of nearby recipient and distance from pollution (per topographic, economic map)	Valdemarsvik, Baltic Sea
Principal drainage basin, per SMHI	68/69

Example of completed form B

Buildings and other constructions

Buildings, including demolished (age and condition)	Old industrial buildings and an oil cistern.

Contaminated ground

Location	Under central building and central heating unit		
Volume of contaminated material (m3)			
Surface area (m2)			
Geographical co-ordinates, national grid, six figure reference	X= North 645370	Y= East 154690	Z= Elevation
Contaminants	Oil, Cr, Hg		

Contaminated groundwater

Location	

Contaminated sediments

Location	See separate site, "Valdemarsviken"

Drainage water and dumps

Type of water drainage system (closed, open, unknown). Destination (groundwater, ditch, brook, river, lake, sea, peat bog, other)	Unknown		
Dump (within object, outside object, none, other)	Outside the object are two dumps that are treated as separate objects		
Type of dump (in use, open, under construction, discontinued, used as backfill)	Used as backfill		
Contents			
Leaching from dump (to surface water, groundwater, none)	To surface water; to groundwater		
Geographical co-ordinates national grid, six figure reference	X= North 645370	Y= East 154690	Z= Elevation

Other (e.g. settling, contents of filled areas, covered piles of earth, loading areas, tanks, burned areas, filled-in water accumulations):

Publications: Environmental Quality Criteria

The Swedish Environmental Protection Agency's Criteria for Environmental Quality Assessments constitute a system of classification which facilitates the interpretation of environmental data. The system can be used to determine whether measured values are low or high in relation to either a national average or baseline readings.

Environmental Quality Criteria have been developed for:

Title	Order no	Price/availability
Groundwater	5051-6	SEK 216
Lakes and Watercourses	5050-8	SEK 182
Coasts and Seas	5052-4	SEK 180
Forest Landscapes	www.naturvardsverket.se > legislation, guidelines	
Agricultural Landscapes	www.naturvardsverket.se > legislation, guidelines	
Contaminated Sites	5053-2	SEK 192

Information does not acquire meaning until it can be compared with something else. It is only then that it becomes possible to determine whether the measured values represent good or bad news.

The assessment criteria are intended to facilitate that kind of comparison and interpretation. Comparisons are based primarily on chemical indicators of pollution, but also on several measures of biological diversity and how agriculture, forestry and similar activities affect it.

Assessment criteria are based on a system that is applied uniformly in every relevant situation. In most cases, their first application is to provide a basis for the assessment of current environmental conditions. If possible, they are also used to determine whether or not those conditions may have negative consequences for the ecosystem or human health.

Contaminated Sites

Title	Order no	Price/availability
Requirements for site remediation Guidelines for practical achievement of acceptable residaual concentrations and quantities – methods and quality aspects. (1998)	4808-2	SEK 75
Development of generic guideline values Model and data used for generic guideline values. (1997)		www.naturvardsverket.se > miljobokhandeln
Proposed guideline values for contaminated petrol stations Handbook. (1998)	9894-2	free

Further information: www.naturvardsverket.se

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Introduction to a method

FOR INVENTORIES AND RISK CLASSIFICATION OF CONTAMINATED SITES

The Swedish Environmental Protection Agency has developed a method for conducting inventories and evaluating the risks of contaminated sites. It is outlined in this leaflet and described more thoroughly in "Method for Inventories of Contaminated Sites" (Report No. 5053).

The method provides guidelines for uniform data collection and risk classification which yield an acceptable level of reliability, making it possible to compare sites and set priorities for additional investigations or remediation. The guidelines have been in use by Swedish county administrative boards for the past several years.

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NATUR VÅRDS VERKET

Swedish Environmental Protection Agency
SE-106 48 Stockholm
Tel +46 8 698 10 00
www.naturvardsverket.se