

### **Auditing For The Australian Capital Territory**

The Auditor-General is head of the Auditor-General's Office. He and his Office act independently of the Government. The Office assists the Auditor-General to carry out his duties, which are set out in the Audit Act 1989, by undertaking audits of management performance and the financial statements of public sector bodies. The aim is to improve public sector management and accountability by firstly, ensuring the Legislative Assembly and the electorate are provided with accurate and useful information about the management of public sector resources and secondly, by providing independent advice and recommendations for improving the management of public resources.

PA95/11

23 May 1996

The Speaker  
Australian Capital Territory  
Legislative Assembly  
South Building  
CANBERRA ACT 2601

Dear Mr Speaker

In accordance with the authority contained in the Audit Act 1989, I transmit to the Legislative Assembly a Report entitled "Management of Former Sheep Dip Sites".

This audit was conducted by Greg Martin and managed by Peter Hade of my Office.

Yours sincerely

John A. Parkinson

## TABLE OF CONTENTS

1.	REPORT SUMMARY	1
2.	RISKS TO HUMAN HEALTH POSED BY EXPOSURE TO ARSENIC FROM FORMER SHEEP DIP SITES	11
3.	COMPENSATION FOR RESIDENTS, INCLUDING BUY-OUTS	22
4.	LOCATION OF FORMER SHEEP DIP SITES	36
5.	ASSESSMENT OF FORMER SHEEP DIP SITES FOR ARSENIC CONTAMINATION	43
6.	CONVEYING INFORMATION TO THE COMMUNITY	57

*Appendix A - Significant Events*  
*Appendix B - Costs To The Territory*

# **1. REPORT SUMMARY**

## **1.1 INTRODUCTION**

This report presents the results of a performance audit of the management of matters arising from the detection of arsenic in the soil at former sheep dips in the Australian Capital Territory. The audit commenced in August 1995 and was substantially completed by November 1995. Some aspects of the audit were revisited between January and April 1996 following the identification of a site in the suburb of Watson.

To April 1996, a total of \$2.6m had been expended or committed in relation to former sheep dip sites. This included \$1.9m paid in buy-out and compensation to residents. Details of significant events in the management of the issues and the costs to the Territory are set out in *Appendices A* and *B* respectively.

## **1.2 AUDIT PURPOSE**

Performance audits are carried out by the Auditor General's Office in order to provide the Legislative Assembly with independent opinions on the effectiveness and efficiency of the management of public sector activities and resources.

The purpose of this audit was to review the effectiveness and efficiency of activities associated with the detection and management of former sheep dip sites which potentially contain the contaminant, arsenic, in the soil.

## **1.3 AUDIT SCOPE AND APPROACH**

The audit included reviewing the content of Departmental files for information related to the risks

to health from arsenic in the soil. Discussions were held in this regard with officers from the Department of Health and Community Care (*see Chapter 2*).

The audit examined particular activities carried out initially by the (then) Department of Environment, Land and Planning and, following a transfer of responsibilities, by the Department of Urban Services.

The audit reviewed the following main activities relating to sheep dip sites:

- identification of former sheep dip sites (*see Chapter 3*);
- assessment of former sheep dip sites for arsenic contamination (*see Chapter 4*);
- liaison with the community (*see Chapter 5*); and
- payment for buy-outs and compensation to residents (*see Chapter 6*).

This audit did not seek to come to any view about the potential legal liability of the ACT or the Commonwealth Government to the residents.

## **1.4 WHAT DID THE AUDIT CONCLUDE?**

The audit conclusion was that activities in relation to former sheep dip sites are generally being managed effectively. There are, however, aspects where effectiveness could have been significantly improved, particularly in the area of providing relevant and accurate information to residents and the public in a clear and positive manner.

The conclusion drawn in regards to efficiency and economy is that the most efficient and economic means of achieving objectives have not always been used and to date unnecessary expenditure of around

\$400,000 has been incurred or committed. Unless current practices are changed, further unnecessary costs will be generated.

If the NSW formula for buy-outs had been adopted, a further \$400,000 less expenditure would have been incurred or committed.

\* \* \* \* \*

## OVERVIEW OF FINDINGS - HEALTH RISK

### *On The Basis Of Current Scientific Knowledge, The Risk To Health From Arsenic In The Soil At Former Sheep Dip Sites in the ACT Is Very Slight*

The audit reviewed information contained within Government files and held discussions with Department of Health and Community Care officials on the risk to public health from arsenic which may be present in soil at former sheep dip sites. Conclusions drawn from this information are:

- on the basis of current scientific knowledge, the health risk to residents from arsenic present in the soil at former sheep dip sites is considered by toxicologists and public health experts to be very slight. Even in rare instances where arsenic readings taken are relatively high, a full health assessment is still required to understand whether a health risk is actually present (*Chapter 2*);
- no urine tests conducted on persons residing on or near former sheep dip sites have found arsenic above normal background levels. Medical opinions are that residents have not suffered ill effects from arsenic (*Chapter 2*);
- although arsenic is poisonous and carcinogenic if ingested in large amounts, low concentrations of arsenic in soil create little or no risk as soil

particles would not be eaten by people in anything like the amounts needed to adversely affect health (*Chapter 2*); and

- because of some possibility that large amounts of soil could be eaten by small children, there may be some increased level of health risk for young children (*Chapter 2*).

\* \* \* \* \*

## OVERVIEW OF FINDINGS - EFFECTIVENESS

Findings which support the audit conclusion that the management of the sites has generally been effective, with significant exceptions, include:

### ***There Is A High Level Of Assurance That Most Former Sheep Dip Sites In The Canberra City Region Have Been Located***

The Department has carried out extensive examination using old maps, aerial photographs and oral sources to determine the location of former sheep dip sites, particularly in the Canberra City region. Review of the Department's activities and documentation revealed that:

- 142 former sheep dip sites have been located in the ACT (*Chapter 4*);
- procedures within the Office of the Environment and the Land Information Office have been sufficient to identify all significant former sheep dip sites which can be located on the maps and records held by the ACT, however it is possible that other unrecorded sites could yet be found (*Chapter 3*); and
- the geographic locations of located former sheep dip sites have been recorded satisfactorily (*Chapter 3*).

***Assessments Performed At Former Sheep Dip Sites For The Presence Of Arsenic Have Been Mostly Effective<sup>1</sup>***

Site assessments have been or are in the process of being carried out on some located former sheep dip sites to determine the likely extent and magnitude of the presence of arsenic in the soil.

The purpose of assessments includes determining the likely levels of arsenic and other sheep dip chemicals present and to make recommendations on managing any health and environmental risks identified. Review of the assessment processes disclosed that:

- site assessments are being performed by consultants with appropriate qualifications and their results are being subjected to quality control processes. On this basis, the audit has concluded that the assessments are being carried out effectively in that the work being performed is sufficient to provide reliable information about the level of arsenic in the soil. At one site, however, the tests did not distinguish between arsenic occurring in the ground naturally and arsenic deposited in the soil as a result of dipping operations. This resulted in buy-out offers being made which subsequently were withdrawn (*Chapter 5*); and
- awarding of contracts to consultants for site assessments at Theodore and Lyneham provided value for money as sound competitive tendering procedures have been followed (*Chapter 5*).

***The Department Has Not Been Fully Effective In Providing Information To Residents***

It can be easily understood that very strong concerns would be created in residents when they learned that

---

<sup>1</sup> This study dealt with the assessment process for contamination by arsenic but the process for the assessment of other chemicals appeared equally effective.

arsenic could be present in the ground at or near their homes. The possibility of health damage occurring to themselves and family members and, perhaps, being forced to abandon their homes would obviously severely affect emotions, while the potential for economic loss through reduced market values of residences would also create great worry. In a situation such as this, ensuring that residents were promptly provided with accurate, relative and authoritative information was obviously a high priority for effectively managing the issues arising from the existence of the former sheep dip sites. Not only did this need to be a priority issue, it also needed to be approached as a difficult and complex task.

The audit opinion drawn is that overall, the Department has not been fully effective in providing all the necessary information to residents living near or on former sheep dip sites. This finding is based on the following:

- at the time that arsenic was first found in the soil at Theodore and communication with the public on the subject therefore became necessary, the Department lacked a strategy for managing its contact with the local community (*Chapter 6*);
- although the Department is now providing information on compensation arrangements and services provided to residents, adequate information on health risks, timetables, remediation processes and other matters is apparently not being provided and this is preventing residents from making fully informed decisions about accepting buy-out offers or choosing less costly remediation options (*Chapter 6*); and
- since Theodore, the Department has developed and implemented a strategy for providing community information and as a result at the Lyneham site

there was less overt public concern about the issue than occurred at Theodore, however strong public concern is again evident at Watson (*Chapter 6*).

The scientific complexity of the subject and its sensitive nature have clearly made decision-making difficult. The difficulties have been reflected in the length of time taken to make decisions on such issues as the types of remediation (if any) to be undertaken and when the remediations will occur. The delay in making decisions has contributed to residents' perceptions that they are not being provided with timely and adequate information. It should be noted, however, that decisions to make buy-out offers have, in the opinion of the audit, been made too quickly.

\* \* \* \* \*

## **OVERVIEW OF FINDINGS - EFFICIENCY AND ECONOMY**

Findings which support the audit conclusion that the most efficient and economic means of achieving objectives have not always been used include:

### ***Compensation Payments to Residents, Including Buy-Outs, Were Made Without Determining Legal Liabilities And Without Complete Assessments Of Health And Environmental Risks***

To date, offers of buy-outs (including compensation) have been made for 21 properties, however five of these have been withdrawn leaving 16 offers effective (*Chapter 3*). Nine of the buy-out offers have been accepted with expenditure aggregating to almost \$1.9m (*Chapter 3*). The remaining seven outstanding offers involve approximately \$1.6m.

Examination of buy-out and compensation issues raised concerns that unnecessary payments have been made. Review of the arrangements revealed that:

- the offers to provide compensation (including buy-outs) were made without obtaining legal advice on a case by case basis on legal liability (*Chapter 3*);
- the offers of buy-outs and compensation were made without assessments of health and environmental risks being completed. The offers did not take into account the very low risk to health from arsenic in soil and the varying levels which exist in different blocks. Consequently, until recently, less costly options have not been considered including remediation only, or reducing compensation payments where very low health or environmental risk exists (*Chapter 3*);
- on the basis of available evidence, the decision to offer the option of buy-outs to Theodore residents was not necessary to protect the physical health of the residents concerned. Departmental records indicate that the decision was taken to protect their psychological health and to limit the effects that stress may have caused (*Chapter 2*); and
- in relation to the houses which have been bought out at Theodore, the final consultants' advice was that the houses do not need to be demolished. An acceptable level of safety can be achieved by removing the affected soil and replacing it with clean soil. Soil beneath houses need not be removed unless the houses are demolished for other reasons (*Chapter 4*).

***Some Site Assessment Costs Were Incurred Unnecessarily***

The following site assessment costs are considered to have been incurred unnecessarily:

- a detailed site assessment at Tuggeranong Homestead which cost \$24,100 (*Chapter 4*); and

- \$30,000 for extra sampling boreholes requested by residents at Theodore (*Chapter 4*).

***Summary of Unnecessary Costs***

In addition to the unnecessary site assessment costs referred to above, expenditure of \$192,000 (*Chapter 3*) has occurred on the unnecessary purchase of a residence at Theodore. The premature offer of buy-out of a property at Watson may generate some \$160,000 (*Chapter 3*) further unnecessary expenditure.

\* \* \* \* \*

**1.5 FURTHER ACTIONS**

It is suggested that to improve management of the sites:

- site assessment reports which provide health and environmental risk assessments information on the extent of contamination, the costs of remediation and options to manage contamination and the extent of legal liability should be promptly obtained and considered prior to each decision being made whether to offer buy-out, remediation and/or compensation;
- the Department should accelerate its decision-making processes so that it can provide timely and authoritative information on health risks, timetables, remediation processes and other relevant matters to residents living on or near former sheep dip sites so that the residents can be fully informed why buy-out and compensation offers are or are not being made, and also on any remediation processes which may be considered necessary; and

## MANAGEMENT OF FORMER SHEEP DIP SITES

- in cases where low arsenic readings have been taken from residential blocks at a level which indicates that no actual risk to human health exists, owners need promptly to be assured that the market value of their homes will not be effected through disclosure to potential buyers of the existence of the low level readings.

## **2. RISKS TO HUMAN HEALTH POSED BY EXPOSURE TO ARSENIC FROM FORMER SHEEP DIP SITES**

### **2.1 INTRODUCTION**

The aim of this Chapter is to provide information on the risk to health associated with the presence of arsenic in the soil at former sheep dip sites. The Chapter summarises information about arsenic contained in the Department of Urban Services' files and the files of the Public and Environmental Health Service which is part of the Department of Health and Community Care.

The Chapter also reviews the results of health tests for arsenic conducted on people who lived on or adjacent to former sheep dip sites. The results of tests on plants grown at the sites and tests of dust samples taken at the sites are also outlined.

### **2.2 SIGNIFICANT FINDINGS FROM THIS CHAPTER**

- *On the basis of current scientific knowledge, the health risk to residents from arsenic in the soil at former sheep dip sites in the ACT is considered by toxicologists and public health experts to be very slight. In isolated instances where relatively high readings for arsenic in the soil are made at a site, a full health assessment is still required to evaluate whether a health risk is actually present;*
- *No urine tests conducted on residents residing on or near former sheep dip sites have found arsenic above normal background levels. Medical opinions are that residents have not suffered ill effects from arsenic in the ground;*

- *Although arsenic is poisonous and carcinogenic if ingested in large amounts, low concentrations of arsenic in soil create little or no risk as soil particles would not be eaten by people in anything like the amounts needed to adversely affect health; and*
- *Because of some possibility that large amounts of soil could be eaten by small children, there may be some increased level of health risk for young children.*

## 2.3 GENERAL INFORMATION

### **Arsenic In The Wool Industry**

Wool production has been an important export income earner for Australia for many years. The Southern Tablelands region of NSW has been a major producer of wool since European settlement of the region.

Among the parasites affecting sheep are lice, ked and itchmites. These parasites attack the skin of sheep, destroying wool quality and lowering yields. In the latter part of last century the technique of saturating sheep in an arsenic solution to kill lice, ked and itchmite was common practice. Initially, plunge dips were built to enable sheep to be completely submerged in arsenic solution. In later years, shower and spray dipping facilities were introduced.

Arsenic solutions which were marketed from 1843 to 1986 have a long shelf life. Sheep dipping using arsenic solutions spanned from the mid-1800s to relatively recent times. For these reasons, the potential for land to contain some arsenic continues to exist.

As a result of rain, or for cleaning purposes, dips were often flushed or pumped out, spreading remnants of

the arsenic solution a limited distance away from the dip sites. As well, soil containing arsenic from around dips may have been moved during land development.

### Normal Human Exposure To Arsenic

Arsenic is very widely distributed in the environment. All humans are exposed to low levels of arsenic through air, water and food. Typical background exposure levels range from 20 to 70 ug per day<sup>2</sup>, mostly from food.

The types and forms of arsenic consumed vary in form and toxicity. Some examples of typical human consumption levels are presented in the following table as total consumption expressed in ug per day.

#### *Typical Human Consumption Of Arsenic<sup>3</sup>*

Source of Arsenic	Consumption in Micrograms
Ground Water	20 ug/day
Food	21 ug/day
Wine	2.8 ug/day
Fish ( <i>See Following.</i> )	1,000 ug/day
50 Cigarettes Per Day	90 ug/day

Some edible fish and shellfish contain elevated levels of arsenic but this is predominantly in an organic form which has low toxicity.

### Effect Of Arsenic Consumption On Humans

Inorganic arsenic has been recognised as a human poison since ancient times. Large doses can produce death. When taken by mouth, a common effect is irritation of the digestive tract, leading to pain,

<sup>2</sup> A microgram (ug) is a millionth of a gram.

<sup>3</sup> South Australian Health Commission "Response Levels Of Arsenic" The Health Risk Assessment And Management Of Contaminated Sites, 1991, p125.

nausea, vomiting, and diarrhoea<sup>4</sup>. Ingested arsenic in sufficient amounts can cause skin cancer, and inhaled arsenic, lung cancer.

Unlike some other elements, arsenic does not accumulate in the body (except at extremely high levels of exposure). Arsenic absorbed into the body is detoxified by the liver and rapidly excreted in urine. Because of this, the recognised risk to health from arsenic comes from the consumption of a large amount of arsenic at a particular time (because it cannot be broken down and excreted quickly) rather than from exposure over a long period. There is no evidence that there are long term effects from exposure to low levels of arsenic such as those existing in soil in the ACT.

High levels of arsenic exposure generally occur where people:

- live in or around areas where copper and other metals are smelted;
- live in or around areas where there are large quantities of arsenic mineral deposits affecting drinking water; or
- handle arsenic in their work such as pesticide manufacturing or wood treatment.

In contrast to the adverse health effects associated with high levels of arsenic exposure, there is also some evidence that low levels of arsenic may be beneficial to good health. The estimated daily dose of arsenic which may be beneficial is quite small (about the same as normally supplied in the diet). No cases of arsenic deficiency in humans have been found<sup>5</sup>.

---

<sup>4</sup> Public And Environmental Health Service, ACT Department of Health, 1994, p2.

<sup>5</sup> South Australian Health Commission, Op Cit, p130.

The effect of arsenic on people varies with body weight and individual susceptibility, as well as the level of exposure. The more a person weighs, the less a given amount of arsenic will affect the person. Consequently, small children will be more affected by a particular amount of arsenic than adults. Also, people vary quite widely in their reaction to arsenic. For any given body weight, the impact of a particular level of arsenic will be different reflecting these individual tolerances.

The following table provides an indication of the impact on health of the consumption of increasing levels of arsenic.

*Exposure Levels And Reactions To Arsenic From Ingestion*

Level of Consumption <sup>6</sup>	Possible Reaction
1-10 ug/kg/day	Beneficial to Health
20 ug/kg/day	Some People Affected
150 ug/kg/day	Most People Affected
600 ug/kg/day	Can Cause Death

The World Health Organisation (WHO) has set a Provisional Tolerable Weekly Intake (PTWI) level of 2.14 ug/kg/day, i.e. 15 ug/kg/week<sup>7</sup>. The standard is set over a week to make allowance for individual variations in consumption and excretion.

**Risks From Arsenic In The Soil**

As arsenic in the soil is bound quite strongly to soil particles, it presents a lesser risk to health in this form than arsenic exposures through inhalation from the atmosphere, ingestion through food or drink or absorption through the skin. Arsenic in soil is of little risk if contact is made with skin<sup>8</sup>. It has been

---

<sup>6</sup> South Australian Health Commission, Op Cit, p126.

<sup>7</sup> Public And Environmental Health Service, Op Cit, p4.

<sup>8</sup> South Australian Health Commission, Op Cit, p123.

estimated that only about one-thousandth of the arsenic in soil can potentially be absorbed through the skin<sup>9</sup>.

The only practical health damaging potential exposure pathway for arsenic from soil to humans is through ingestion, i.e. by eating or consuming soil. In reality, there is very little risk that soil would be consumed by people in anything like the amounts which could affect a person's health.

Young children, particularly those playing in the open, however, might eat large amounts of soil at times. The table below compares the levels of arsenic typically ingested by young children through food and potentially from contaminated soil.

*Ingestion Of Arsenic Through Contaminated Soil*<sup>10</sup>

<b>WHO Standard</b>	<b>Intake From Soil</b>	<b>Intake From Food</b>
<i>PTWI For A 13 kg Child</i>	<i>Ingestion Of 100 mg Of Soil Per Day Which Contains 100 to 120 ppm Of Arsenic</i>	<i>Normal Intake From Food</i>
28 ug per day	12 ug per day	9 ug per day

Research has found that young children can typically swallow up to about 100 mg of soil (about a fortieth of a teaspoon) per day<sup>11</sup>. If the soil swallowed contained 100 to 120 ppm of arsenic, the amount of arsenic ingested (12 ug) would only be slightly greater than the amount ingested in food. Even when combined with the amount available in food it would still be well below the PTWI of 28 ug/day.

As mentioned above, doses of 600 to 700 ug/kg/day may be fatal. That is the equivalent of feeding

<sup>9</sup> South Australian Health Commission, Op Cit, Appendix 2.

<sup>10</sup> South Australian Health Commission, Op Cit, pp130-133; Public And Environmental Health Service, Op Cit, p4.

<sup>11</sup> Public And Environmental Health Service, Op Cit, p3.

approximately five tablespoonfuls of soil with a concentration of 100 to 120 parts per million to a two-year old child weighing about 13 kg<sup>12</sup>. Obviously, substantially higher concentrations of arsenic in the soil will create higher risks to small children who might swallow soil.

### **Advice From Health Experts On The Risk Of Arsenic From Former Sheep Dips**

Advice on the question of health issues relating to two blocks of land in the residential suburb of Theodore was provided by the Department of Health and Community Care as follows:

*“It is necessary to understand the possible routes of entry of arsenic into the human body and in this situation it is only possible by ingestion of contaminated soil. Therefore it can be safely assumed that only small children likely to ingest soil whilst at play may be at risk.”*<sup>13</sup>

Dr P. Stewart, the Head of the Clinical Biochemistry Department at Royal Prince Alfred Hospital in Sydney (together with Professor M. Moore from the National Research Centre for Environmental Toxicology at the University of Queensland) provided evidence to the inquiry by the Assembly Standing Committee On Planning And Environment On Contaminated Sites. In his evidence, Dr Stewart stated that:

*“There is no convincing evidence yet of any detrimental health effects in the residents who reside at or near the dip sites. In conclusion, we have seen no evidence that really supports exposure above*

---

<sup>12</sup> Public And Environmental Health Service, Op Cit, p3.

<sup>13</sup> Minute from Director, Public and Environmental Health Service, to Acting Manager, Office of the Environment (27 September 1994).

*levels that occur in any environment and are compatible with normal health.*"<sup>14</sup>

As part of a quality control process, when reviewing the final consultant's report on the Theodore Site Assessment, the Victorian Environment Protection Authority provided the following comments:

*"The main potential threat posed by the elevated arsenic at Theodore is increased incidence of skin cancer. The question of whether to take any clean-up action, and if so to what level, is really a question of what level of risk is acceptable. Based on very conservative assumptions, the level of incremental risk of getting skin cancer on the worst site is 1 in 10,000 compared to the background (or existing) risk of 2 in 3."*<sup>15</sup> (Chapter 5.)

## 2.4 HEALTH TESTING OF RESIDENTS LIVING ON FORMER SHEEP DIP SITES

Indications of arsenic exposure can be measured confidently by laboratory analysis of urine samples for arsenic metabolites. Measuring the levels of arsenic in urine is considered by public health experts to be the best way of determining recent exposures.

The Department of Health and Community Care carried out tests of the level of arsenic in urine samples from residents of houses where the level of arsenic found in soil testing was above the level of concern. (See Chapter 5 for discussion on the Health Investigation Level.)

Produce from these properties was also tested. Test results for five households involved are presented following.

---

<sup>14</sup> Transcript of proceedings, "Inquiry Into The Adequacy Of Processes Relating To Identifying And Managing Contaminated Sites In The ACT", Tuesday, 13 June 1995.

<sup>15</sup> Arsenic Contamination Of Residential Land At Theodore, ACT - Review Of CMPS&F's August 1995 Report.



*Health Testing Results Of Residents Living On Former Sheep Dip Sites*

	<b>Residence 1</b>	<b>Residence 2</b>	<b>Residence 3</b>	<b>Residence 4</b>	<b>Residence 5</b>
Urine Test Result	< 1 ug	< 1 ug	< 1 ug	< 1 ug	< 1 ug
Produce Test Result	< 0.05 ppm <sup>16</sup>	< 0.05 ppm <sup>17</sup>	n.a.	n.a.	< 0.05 ppm

A urine test result of 5 ug is considered normal. All residents recorded results of less than 1 ug.

The Department of Urban Services commented to the Audit Office that:

*“The test results only show that there was no recent exposure to arsenic. This is not a good indicator for determining whether in the long term there has been exposure to elevated levels of arsenic. The test results do not allow the conclusion to be drawn given that present exposure could be less than when landscaping and development took place.”*

The Audit Office accepts that urine tests can only assess recent exposure to arsenic. The test results nevertheless show that the residents are not presently exposed to any more than normal levels of arsenic.

While there is some possibility that there may have been higher levels of exposure for some people at times in the past, the nature of the exposure in the ACT is such that it is highly unlikely that there would have been any ill effects.

**ARSENIC TAKE-UP IN PLANTS<sup>18</sup>**

The quantity of soluble or potentially soluble arsenic in soil varies widely with pH, and the presence of other soil components such as iron, aluminium, clay

---

<sup>16</sup> One non-representative sample contained 0.17 ppm.

<sup>17</sup> Three samples in the range of 0.06 - 0.08 ppm were obtained.

<sup>18</sup> Assessment Of Contamination Associated With A Former Sheep Dip At Theodore, 1995, p27.

material and organic matter<sup>19</sup>. Unless the arsenic is in a soluble or potentially soluble form, it cannot be taken up by plants. Because arsenic is bound to soil particles and is therefore generally in an insoluble form, the levels of arsenic in edible plants will be low, even when crops are grown on contaminated soil.

In the ACT, extensive testing of home vegetables grown on former sheep dip sites found only one sample with a measurable concentration of arsenic. This concentration, however, was six times below the acceptable level described in the appropriate Australian Standard for food consumption. All other samples showed either nil or negligible arsenic. The Australian Food Standards Code contains a Maximum Permitted Concentration for Arsenic in fruit and vegetables of 1 ppm. The majority of vegetable samples from the gardens of residents registered less than 0.05 ppm. There was one sample with a reading of 0.17 ppm.

## **2.5 DUST SAMPLING**

Dust samples were taken from residences at two of the sites in September 1995. The samples were analysed by the National Research Centre for Environmental Toxicology in Queensland.

In commenting on the results, the ACT Government Analytical Laboratory concluded that the types of levels which may be experienced in a dusty house contaminated with the levels of arsenic found were approximately 20,000 times less than Worksafe Guidelines for exposure to arsenic. Although these guidelines are not fully applicable to domestic exposure, the results indicate that no risk to health from arsenic in dust in houses at the former dip sites can be considered to exist.

---

<sup>19</sup> O'Neill, P., Arsenic And Heavy Metals In Soils (Edited By B.J. Allowey).

### **3. COMPENSATION FOR RESIDENTS, INCLUDING BUY-OUTS**

#### **3.1 INTRODUCTION**

This Chapter reviews the action taken to provide compensation and buy-outs to residents whose homes are located on or near former sheep dip sites.

#### **3.2 SIGNIFICANT FINDINGS**

- *To date, offers of buy-out (including compensation) have been made in 21 cases (five of these were subsequently withdrawn at Watson);*
- *In nine cases, the offers of buy-out have been completed involving aggregate expenditure of almost \$1.9m. The seven outstanding offers involve potential aggregate expenditure of \$1.6m;*
- *Offers to provide compensation (including buy-outs) have been made without obtaining legal advice on a case by case basis on legal liability;*
- *The offers of buy-outs and compensation were made without assessments of health and environmental risks. The offers did not take into account the very low risk to health from arsenic in soil and varying levels in the soil at different locations. Consequently, less costly options have not been considered including remediation only, or not making or reducing compensation payments where little environmental or health risk exists; and*
- *The decision to offer the option of buy-outs to Theodore residents was unnecessary to protect the physical health of the residents concerned. The buy-outs apparently were undertaken to protect*

*the psychological health of residents arising from the possible effects of stress.*

### **3.3 THEODORE DIP SITE**

#### **Theodore Residences Test Sampling**

Initial testing around the former sheep dip site located in the suburb of Theodore found concentrations of arsenic above the ANZECC Health Investigation Level (HIL) (see Chapter 5 for explanation of HIL) at three residences (see following table).

#### *Theodore - Sample Testing*

<b>Soil Depth</b>	<b>Residence 1</b>	<b>Residence 2</b>	<b>Residence 3</b>
0 - 0.25 m	59 ppm	295 ppm	
0.5 - 0.7 m			320 ppm

ppm - parts per million

At Theodore, the decisions to buy out the three properties were taken before site assessments were carried out. In the first two cases, recommendations for the buy-out option were made on the evidence of three samples in total, of which only one was significantly greater than HIL. The other case (Residence 1 in the preceding table) was offered buy-out only because it was built on a dip site. No sample taken from this property at this time was above the HIL.

In Residence 1, the concentration found in an initial sample was 59 ppm<sup>20</sup>. This property was located over the site of the former sheep dip. At Residence 2, there was a single sample with a concentration of arsenic of 295 ppm at a depth from 0 to 0.25m. A single 320 ppm reading between 0.5 and 0.7 metres below the surface was found later at the third residence.

---

<sup>20</sup>

Testing after the buy-out offer had been made revealed levels of arsenic greater than 100 ppm.

### **Relocation of Occupants**

Initially, arrangements were made by the Department to relocate the residents of the first two houses where arsenic had been found to temporary accommodation. This was because of concerns of both households about the detection of arsenic in the soil and the site assessments which were to be carried out.

The Government based its decision on World Health Organisation guidelines which consider the mental and social aspects of health as well as the physical. It considered that this action would relieve the concerns of the occupants. The residents were relocated on 19 October and 8 November 1994.

The residents of the third house were relocated in April 1995.

### **Buy-Out Of The Theodore Properties**

Buy-out of the initial two Theodore properties was agreed to by the Government on 7 November 1994. Buy-out was agreed for the third property in February 1995.

The Government decided in October 1994 that the option of a buy-out for residents living on land with arsenic in the soil would be subject to a case by case assessment and with the advice of the Attorney-General and agreement with the Treasurer.

### **Compensation**

Compensation includes payments for factors such as loss of family home, disruption and relocation, loss of business and stamp duty.

The initial offers of buy-out which were made on 17 November 1994 did not include compensation. These initial offers had not been accepted by early

February 1995. Following strong representations to the Government, renewed offers were made to the residents on 17 February. These offers contained amounts of compensation up to \$40,000 per residence. Compensation has been included in all offers since that time.

By the time the revised offers were made, the Department had contacted the New South Wales Department of Agriculture which advised that the NSW Government had refused to pay compensation costs associated with buy-out in similar situations. *(See later details of the situation in NSW.)*

**Costs Of Compensation Packages Including Buy-Outs**

The costs of the three Theodore buy-outs and related compensation are presented in the following table.

*Costs Of Buy-Outs And Compensation - Theodore*

<b>Buy-Outs Of Leases</b>		\$465,000
<b>Compensation</b>	<b>Loss Of Family Home</b>	\$45,000
	<b>Disruption and Dislocation</b>	\$70,000
	<b>Demonstrated Economic Loss</b>	\$3,750
	<b>Relocation, Accommodation Costs, Etc.</b>	\$46,404
	<b>Legal and Stamp Duty</b>	\$34,835
<b>Total Pay-Out</b>		\$664,989

In total, the amount paid for buy-outs and other compensation for the three properties was \$664,989, an average of approximately \$220,000 per house.

**The NSW Experience**

The NSW Department of Agriculture has offered buy-out to residents living on former cattle tick dip sites in northern NSW. However, the terms are not as generous as in the ACT.

In all, as at January 1996, 28 residential blocks are involved. Fifteen residents have accepted buy-out

offers, five are undecided and eight residents have preferred remediation only.

The offer of buy-out in NSW consists of:

- legal fees and costs associated with the purchase of a new property;
- removal costs to \$750; and
- buy-out of property at unaffected market value.

Residents do not receive temporary accommodation and associated costs or compensation.

If the same terms of buy-out had been applied in the ACT as in NSW, a saving of about \$162,000 would have been made at Theodore. Based on costs incurred at Theodore, a further saving of \$240,000 would be involved for the six completed buy-outs which have occurred in other Canberra suburbs. The differences would amount to a saving of about \$0.8m on the estimated \$3.5m of total expenditure for 16 residences.

### **Reasons Put Forward For Buy-Outs Of Initial Two Theodore Residences**

Buy-out of the initial two Theodore properties was recommended to the Government by the Department on 4 November 1994 on the basis that:

- on the assessment of the Department and the Department of Health, whatever the results of the more detailed investigation and sampling regime, the existing contamination was sufficient to warrant agreeing to buy-out because the results already indicated contamination beyond the health level of concern;
- buy-out was inevitable;

- buy-out would reduce the level of immediate emotional and psychological pressure on the families concerned;
- buy-out would confirm the Government's commitment to act quickly to safeguard the physical and psychological health and well-being of people affected by contaminated land;
- the costs associated with ongoing temporary relocation would be reduced; and
- the Government would be seen to be responding promptly to the concerns of people who discover that they are living on contaminated land and, as a consequence, are unable to sell their house or undertake significant landscaping, extensions or the installation of a pool.

***Audit Comments***

There are several comments which can be made on the reasons put forward for the Theodore buy-outs as follows:

- the Government apparently acted with the intention of protecting the physical and mental well-being of the affected residents, however negligible risk to physical health existed and there had been no professional assessments made of the mental well-being of the residents concerned;
- contrary to the Government's earlier decision, there was no case-by-case assessment; and
- for the third residential block at Theodore, all but one of several samples taken were below the HIL. The one sample above the health level of concern was taken from the front yard of the premises (where any exposure to young children was highly

unlikely). Nevertheless, buy-out which incurred a total cost of \$260,000 (including property purchase and compensation) was paid based on this one sample. The buy-out seems unnecessary because remediation of the front yard, a much less costly option, would have quite adequately eliminated any health risk.

It would appear that the decisions to offer the buy-outs to the Theodore residents were not necessary to protect the physical health of the residents concerned. These decisions have now, however, become a precedent for offering buy-outs where arsenic is detected beyond the HIL including cases where only limited remediation is required.

**3.4 LATER DEVELOPMENTS IN BUY-OUTS AND COMPENSATION**

Since the Theodore cases, a further 18 buy-out offers and 14 remediation only offers have been made:

	<b>Total Offers</b>	<b>Buy-Out And/Or Remediation</b>	<b>Remediation Only</b>
Other Sites	3	1	2
Lyneham	5	2	3
Watson	24	15*	9

\* There were originally 15 offers but five have been suspended.

Six offers of buy-out were made at Watson in an area where confusion later arose over whether the existence of arsenic occurred naturally or from past sheep dipping activities (*Chapter 5*). One of these offers could not be withdrawn because it had been accepted prior to the decision to withdraw the offers being made. Based on costs incurred at Theodore, this premature buy-out offer may generate a total cost of \$220,000 (including property purchase and compensation).

Taking the acceptance of buy-outs in Lyneham and Watson into account, the costs associated with buy-

out are now approximately \$1.9m. If all offers of compensation and buy-outs are accepted, the Government will incur expenditure of approximately \$3.5m for 16 residences.

### **Compensation For Residents Who Suffer Economic Loss**

The Government has also agreed to provide compensation to any residents who suffer demonstrated economic loss on the sale of their residences because of the existence of arsenic in the area. This type of compensation has been paid in one case at Theodore and one case at Lyneham, with a total cost of \$22,750.

### **Remediation As An Option**

From April 1995, offers of buy-out have included the option of remediation without buy-out. This is to assist residents who prefer to retain their homes. In Watson there have been nine offers of remediation only (i.e. no buy-out) for properties with levels of arsenic not significantly higher than the HIL or where arsenic has been found away from the residence.

Remediation involves the removal of soil containing arsenic and replacement with clean soil. Where sites will have to be remediated, the remediation only option is less expensive as it does not require the purchase of properties. Under the remediation option, the Government remediates the properties, providing alternative accommodation during the remediation.

There is a perception, however, on the part of some residents that the Department is discouraging the remediation only option. This issue is discussed in *Chapter 6*.

## **Barriers to Exposure<sup>21</sup>**

It is possible to construct effective barriers against exposure to soil based arsenic. Well maintained grass will cause at least an 80% reduction in exposure to arsenic contamination in surface soil. In most situations, a half-metre of clean soil will give a high level of protection provided safeguards are established to deal with situations in which the soil barrier may be breached. While these forms of treatment rate marginally below the removal of soil to landfill in the preferred list of options contained in the ANZECC Guidelines<sup>22</sup> for remediation, they can be an effective alternative and are far less costly.

Where affected land has an existing cover of well maintained grass, the level of exposure has been minimised by this barrier and this may reduce the need for further remedial action.

### **3.5 AUDIT OFFICE CONCERNS WITH COMPENSATION PACKAGE**

#### **Specific Concerns**

The Audit Office has the following concerns with the compensation arrangements:

- offers of compensation including buy-outs are being made without obtaining legal advice on a case by case basis that the ACT has any liability; and
- offers of buy-out are being made without an assessment of the existing health and environmental risks being completed. The making

---

<sup>21</sup> Australian And New Zealand Guidelines For The Assessment And Management Of Contaminated Sites, January 1992, p42.

<sup>22</sup> Australian And New Zealand Guidelines For The Assessment And Management Of Contaminated Sites, January 1992, p5.

of the offers does not take into account the very low risk to health from arsenic in the soil and the varying levels of arsenic across properties.

## **Lack Of Legal Advice As To Liability**

### ***Background***

The Department sought advice from the Government Solicitor in September 1994 as to the liability of the Government arising from the former sheep dip sites. The Solicitor provided general advice only, drawing attention to broad principles of law, such as liability in negligence, and assuming only the most basic facts. The advice commented that:

*“In determining liability in particular cases specific information would need to be provided in relation to matters such as the knowledge of the Commonwealth or the Territory at the relevant time, the nature and degree of involvement of the Commonwealth or the Territory (e.g. sale/lease of land, health inspection), the state of scientific knowledge at that time and the nature and the degree of risk posed by the contamination.”*

A review of relevant Departmental files indicates that there was a strong commitment by the Government to provide compensation to residents. There also seemed to be an acceptance that the Government would be liable in negligence for physical and economic loss to residents caused by the presence of arsenic in the soil.

The Government did not seek legal advice specifically in relation to the Theodore buy-outs. Nor has advice been sought on a case by case basis in relation to later compensation offers.

Under current practices, a recommendation for buy-out is prepared by the Office of the Environment

(OOE) for consideration by the Office of Financial Management and the Attorney-General's Department. Correspondence dealing with buy-outs is cleared by the Government Solicitor's Office.

### *Audit Comments*

File examination indicates that the issue of liability is not considered on an individual case by case basis.

This audit has not sought to come to any view about the potential liability of the ACT or the Commonwealth Governments to the residents. In view, however, of the amounts of money involved, it is considered that specific legal advice should have been sought by the Department on a case by case basis. Advice as to legal liability in specific cases (particularly after the health risk had been assessed) would have provided information which would assist in determining the appropriate level of compensation.

### **Offers Of Buy-Out Are Being Made Without Assessments Of The Health And Environmental Risk**

#### *High Cost Of Buy-Outs*

As mentioned previously, it is estimated by the Audit Office that, on the basis of the Theodore buy-outs, expenditure of approximately \$220,000 per residential property is involved. In addition, the Government faces the cost of remediation of the 16 properties where buy-outs have been offered and 16 other properties where remediation only has been offered. On the basis of current practices, this is estimated to be approximately \$1.4m for the properties found so far. The following are estimates of the total costs likely to be involved.

**MANAGEMENT OF FORMER SHEEP DIP SITES**

*Estimated Costs*

No. Of Offers	Buy-Out	Compensation	Remediation	Total
16	2,640,000	880,000	1,200,000	4,720,000
16			255,000*	255,000
				<b>4,975,000</b>

Conservative estimate based on two Theodore properties - average cost of \$16,000.

It is arguable that the main costs of buy-out - that is, the actual property costs - can be recovered. Once remediation has been completed (and assuming that houses are not demolished), properties can be re-sold and much of the buy-out cost recovered. However, this view is hypothetical as to what future actions will be. There is no certainty that the properties concerned will be re-sold. Whatever happens in the future, buy-out requires that expenditure be made now.

On present estimates, buy-outs could involve future expenditure of up to \$1.6m.

*Criteria For Offering Buy-Outs*

The main criterion for offering relocation and buy-out, or relocation during remediation, was that there was at least one sample result from a property which was significantly in excess of 100 ppm. This criterion uses the Health Investigation Level (HIL) from the ANZECC Guidelines for the Management of Contaminated Sites (*see Chapter 6.3*). These guidelines state that further investigation in the form of a site assessment is required when initial test results are greater than the HIL (100 ppm for arsenic). The guidelines do not specifically require that action such as relocation occurs. According to the guidelines, the actual action to be taken in any particular situation depends on a range of factors including:

- the present and future use to be made of the site;

- the level and location of contaminants present;
- the risk to people from the presence of the contaminant; and
- alternatives for reducing the level of risk.

The guidelines envisage that these factors will be studied in a “site assessment” which includes an analysis of the extent of actual contamination and the health risks. Assessments usually involve detailed sampling as the level of health risk at a site depends on the level of contaminant that is found to be present across the site and the possible ways that humans may be exposed to the contaminant.

The extent of contamination and options for the management of the contamination including costs are provided in the site assessment reports.

Details of site assessments carried out at Theodore are included in *Chapter 5* of this Report.

### ***Audit Comments***

The “Health Investigation Level” (HIL) is simply that. It is the level which should “trigger” the initiation of an assessment to determine whether or not there is a real risk to health. It is not in itself an indicator of an unacceptable risk.

For this reason, it is inappropriate that buy-out offers are generated directly by the detection of a sample result in excess of the HIL. The sample reading should generate a site assessment, not a buy-out offer. Offers have been (and are being) made without an assessment of the health and environmental risk. They do not take into account the very low risk to health from arsenic in soil and differing levels of contamination.

## MANAGEMENT OF FORMER SHEEP DIP SITES

As a result, less costly options such as remediation only, or reduced compensation where there is little health or environmental risk, are not being considered.

This Report has already commented on the slight risk to health from small concentrations of arsenic in soil. None of the residents who live or have lived on the sites were found to have arsenic in urine testing.

## **4. LOCATION OF FORMER SHEEP DIP SITES**

### **4.1 INTRODUCTION**

This Chapter reviews the activities carried out to find the locations of former sheep dip sites in the ACT and to determine and record their geographic co-ordinates for future reference.

By October 1995, 120 sites had been identified through discussions and initial searches of maps and other records. Two further sites at Downer and Watson were identified in November 1995, and following additional searches, another 20 sites have been located.

Of the total 142 sites, over 90% are outside residential areas, mainly in rural locations and nature parks.

### **4.2 SIGNIFICANT FINDINGS FROM THIS CHAPTER**

- *142 former sheep dip sites have been located in the ACT;*
- *The initial approach failed to locate some sites. However, subsequent procedures have been sufficient to locate all significant former sheep dip sites which are identified in maps and other records held by the ACT. It remains possible, however, that there are other sites not shown in existing maps or records which could yet be found; and*
- *The geographic locations of all located former sheep dip sites have been recorded satisfactorily.*

#### **4.3 BACKGROUND**

Residential development commenced in Canberra around the present Kingston and Narrabundah suburbs in about 1913.

Prior to the creation of the Territory and commencement of residential development, most land was used for sheep grazing, with many properties having facilities for sheep dipping. Grazing continued over most lands in the ACT until development commenced. As a result, sheep dip sites are present in various areas of current residential development which because of topography were previously suitable for grazing. Under somewhat similar circumstances, residential development has occurred on former cattle tick dip sites in NSW.

#### **4.4 REASON FOR LOCATING FORMER SHEEP DIP SITES**

The objective of the identification activities was to determine the exact location of all former sheep dip sites in the Territory which could potentially present a health or environmental risk. Identification was required in order that health and environmental risk assessments could be undertaken for those sites located in residential areas (*Chapter 5*). The locations of sites are to be recorded in a permanent record which can be searched before future developments or redevelopments take place.

#### **4.5 METHODS USED TO ESTABLISH THE APPROXIMATE LOCATION OF SHEEP DIP SITES**

##### **Oral Information From A Parks And Conservation Ranger**

In May 1994, a long serving Parks and Conservation Ranger provided oral information to Departmental officials about the location of many old sheep dips. This ranger and a Departmental officer then conducted field visits to confirm the existence of the

former dips and mark their approximate locations on maps. About 85 former sites were located in this way.

### **Use Of Maps For Locating Former Dip Sites**

Because of the nature of sheep dips and the extensive land development which has taken place in the ACT, finding the locations of other former dipping sites relied on the examination of various maps and other records, some dating back to the last century. Whether or not all former sheep dip sites have been found depends on the accuracy of those maps and records.

In mid-1994, the Land Information Office (LIO) within the then Department of Environment, Land and Planning examined maps and other sources to find the locations of sheep dips in residential areas. The other sources included topographical maps, aerial photographs, old National Capital Development Commission (NCDC) plans and historical records and photographs.

The initial map research conducted by the LIO in 1994 was based on a series of maps prepared in the 1920s. This series was chosen by the LIO because it was historically the first series of detailed maps available for the purpose. The focus of that search was centred on homesteads and sheep grazing related structures. Parts of Canberra where some development had commenced prior to 1920 were not covered by this series. Approximately 300 maps were examined and further sheep dip sites were found. These were additional to those detected with the aid of the Parks and Conservation Ranger. Some of these dip sites were in residential areas.

Overall, 120 sites were identified from the ranger's involvement and the initial map searches.

### **More Map Searches Performed**

Approximately 6,000 other maps and plans were not included in the initial map search. It was considered at the time that a high level of resources would have been involved in examining these sources and that most, if not all, of the sites would be revealed by searching the 1920s series.

In November 1995, a sheep dip was found on former CSIRO land in Downer following a property search associated with the purchase of a home. Finding the Downer site led to the discovery of another site in residential Watson. The CSIRO's properties had not been included in earlier searches as these had been concentrated on rural leases.

These events prompted a renewed map search at the LIO. This task was undertaken in November and December of 1995. The renewed research, which was undertaken by a team of 12 officers, involved the examination of aerial photographs, 6,000 detailed maps and 300 parish and portion plans previously excluded from the search.

A further 22 sites were identified in the new search. Up to April 1996, a total of 142 former sheep dip sites have been located.

### ***Audit Comments***

It is considered that the original decision of the LIO not to search the 6,000 detailed plans was reasonably based in an effort to select the most efficient method to locate old sheep dip sites. In retrospect, it is apparent that all areas of Canberra and other sources of sheep dips should have been included in the original search. Parish and portion plans which cover these localities should have been considered at that time.

It is considered that procedures within the Office of the Environment and within the Land Information Office have been sufficient to locate the significant former sheep dip sites, however, as it has only been possible to carry out detailed searches of records such as maps and aerial photographs, it remains possible that some unrecorded sites could yet be found.

#### **4.6 DETERMINING THE GEOGRAPHIC CO-ORDINATES OF FORMER SHEEP DIPPING SITES**

##### **Recording The Location Of Potentially Contaminated Sites**

Geographic co-ordinates have been used to pinpoint the location of former sheep dip sites and these are eventually to be recorded in a permanent reference of potentially contaminated sites (including non-arsenic sites). This recording of the information should prevent inappropriate land use in future, however, details of the reference facility have yet to be decided by the Government.

##### **Map Searches**

More detailed maps and aerial photographs were examined by the LIO from July 1994 to determine if co-ordinates for locations on the sites listing could be determined. The co-ordinates of any locations which could not be determined accurately from maps and photographs were determined by land survey in the field. These locations, which were approximately 70% of the sites, were predominantly rural.

##### **Global Positioning System (GPS) Surveys**

Surveys can be conducted using traditional methods which rely on the existence of reference points or through the use of GPS which relies on satellite communication. The GPS method produces survey co-ordinates with an accuracy of one metre or better.

## MANAGEMENT OF FORMER SHEEP DIP SITES

As well, the GPS method is quick - several locations can be determined in a day.

The survey work to determine co-ordinates was near completion in November 1995. Overall, work to determine accurate co-ordinates for former sheep dip sites has been effective.

### Efficiency Of The Geographic Co-Ordinate Work

The table below shows the costs of the determining the survey co-ordinates by map research and by survey.

#### *Cost Of Determining The Geographic Co-Ordinates Of Listed Locations In The Initial Search*

Sub- Activity	Number Researched On Listing	Balance Requiring Survey	Estimated Salary Costs Of Activity	Salary Cost Per Search
Verification Of Co-Ordinates By Map Research	97	68	\$34,200	\$352
Determining Co-Ordinates By Survey		68	\$13,500	\$198

Map research techniques turned out to be insufficient for about 70% of the sites.

Because of the automation and computerisation of GPS techniques, the use of surveys for determining coordinates was considerably less costly (in staff costs) than using map research.

Had management been aware of the differences in staff costs for the two approaches, it could have split the listing into urban and rural and then chosen the most efficient method for finding the coordinates for each category.

Choice of the more efficient survey methods to determine coordinates for rural sites at an earlier stage

would have resulted in the same outcome for less costs.

*Audit Comments*

In retrospect, it could be concluded that the work to determine the co-ordinates of sites could have been organised more efficiently. It is recognised, however, that the procedures adopted were quite reasonable considering the knowledge available at the time the work commenced.

The geographic locations of all former sheep dip sites are being recorded satisfactorily.

## **5. ASSESSMENT OF FORMER SHEEP DIP SITES FOR ARSENIC CONTAMINATION**

### **5.1 INTRODUCTION**

This Chapter commences by outlining generally accepted guidelines for the assessment and management of contaminated sites and then reviews the activities of the Department of Urban Services in carrying out site assessments.

### **5.2 SIGNIFICANT FINDINGS FROM THIS CHAPTER**

- *Site assessments are being carried out effectively. The work being performed is sufficient to provide reliable information about the level of arsenic in the soil, however at one former sheep dip site (Watson), the early tests did not distinguish between naturally occurring arsenic and arsenic deposited in the soil as a result of dipping operations;*
- *Awarding of contracts to consultants for site assessments at Theodore and Lyneham has provided value for money as sound competitive tendering procedures have been followed;*
- *A detailed site assessment at Tuggeranong Homestead which cost \$24,100 is considered by the Audit Office to have been unnecessary;*
- *Extra sampling boreholes requested by residents at Theodore involved costs of up to \$50,000. More than \$30,000 of these costs of resident requested boreholes are considered by the Audit Office to have been unnecessary;*
- *Consultants' advice at Theodore is that houses need not be demolished. An acceptable level of*

*safety could be achieved by removing contaminated soil (except the soil below existing houses) and replacing it with clean soil; and*

- *On present numbers of properties likely to be remediated, remediation is estimated to cost the Government about \$1.4m.*

### **5.3 ANZECC GUIDELINES - HEALTH INVESTIGATION LEVEL (HIL)**

The Australian and New Zealand Environmental Conservation Council has produced Guidelines for the assessment and management of contaminated sites. Under these guidelines, which have been adopted by all States and Territories, the risk to health and the environment of a potentially contaminated site is to be investigated once sample testing finds levels of a contaminant in excess of the investigation level. In practice, sites which are visited infrequently, or are not near waterways, are not assessed to avoid unnecessary costs.

An investigation level or threshold is a term used to define the concentration of a contaminant above which further investigation and evaluation may be required to establish whether the site represents a potential health risk or not. The specific health risk which a site poses is dependent on the level of the contaminant present and the possible ways in which people can be exposed. The investigation level for each contaminant is specified in the ANZECC Guidelines.

The Health Investigation Level (or HIL) for arsenic is 100 parts per million. This investigation level is based on the safety margin for a two-year old child, using the Provisional Tolerable Weekly Intake (PTWI) set by the World Health Organisation (*see Chapter 2*).

## 5.4 SITE ASSESSMENTS OF FORMER SHEEP DIP SITES

### Introduction

Site assessments carried out on former sheep dip sites have been performed to determine the likely extent and magnitude of soil contamination. These assessments include determining the likely levels of arsenic present and the associated health and environmental risks. The assessments when completed also provide recommendations for managing any health and environmental risks identified.

### Preliminary Site Assessments

When potentially contaminated sites were identified in the residential suburbs of Theodore, Isabella Plains, Holder and Chapman, Departmental staff carried out preliminary sampling to determine the order of more detailed assessment. Where samples taken in the preliminary sampling contained more than 100 ppm arsenic, a more detailed site assessment was performed. This practice was in accordance with the ANZECC Guidelines referred to earlier. However, in some residential areas, intensive sampling was undertaken without there being any results greater than 100 ppm in preliminary sampling.

For sites at locations other than those referred to in the previous paragraph, it was decided that delays between initial testing by Departmental staff and detailed testing by a consultant created unnecessary concern in the community. Where a site is considered to potentially present a health threat, the current practice is for detailed sampling and assessment to be performed as soon as practical after the sites are identified. Where a site does not potentially present an immediate and obvious health and environmental risk because, for example, it is not located near a residential area, the practice is to not assess the site.

**Detailed Site Assessments**

Specialised contamination consultants are usually engaged to perform detailed site assessments. Consultants are required to provide a report which includes the results of their detailed sampling, an assessment of the level and extent of contamination, a health risk assessment and, if necessary, remediation options.

At the time of completing this report, detailed assessments on nine sites had been prepared to varying degrees of completion. Details are set out in the following table.

**Detailed Site Assessments - April 1996**

Site	Report Status	Total Cost of Consultancy \$
<b>Tuggeranong Homestead</b>	Preliminary Report	24,100
<b>Ngunnawal</b>	Preliminary Report	16,455
<b>Theodore</b>	Final Draft Report	100,636
<b>Lyneham</b>	Preliminary Report	42,433
<b>Holder, Chapman, Isabella Plains</b>	Preliminary Report	97,500
<b>Watson</b>	Not Completed	176,389
<b>Downer</b>	Not Completed	36,740

**5.5            AUDIT REVIEW OF SITE ASSESSMENT ACTIVITIES**

Three sites were chosen for review in the audit to cover a range of site conditions. The sites were:

- Tuggeranong Homestead;
- Theodore; and
- Lyneham.

## 5.6 TUGGERANONG HOMESTEAD SITE

### Background

Tuggeranong Homestead is a site without adjacent residential development. The Department conducted preliminary sampling of the former sheep dip at Tuggeranong Homestead in March 1994. Arsenic levels greater than the HIL were found, with one extreme observation of 5,000 ppm. A fence was constructed around the dip site in September 1994.

A contract for a detailed site assessment was let in October 1994. Competitive tender processes were followed. The successful consultant was chosen from six proposals. Work on the site assessment was carried out from November 1994 and a preliminary report was provided to the Department in March 1995. The assessment cost was \$24,100.

Management showed due regard for economy by selecting the best quality proposal for the lowest cost based on available information.

### **Necessity For A Detailed Site Assessment At Tuggeranong Homestead**

The former sheep dip at the Tuggeranong Homestead is approximately 190 metres from the nearest residence, 120 metres from the nearest gully and 290 metres from the nearest causeway.

In view of the comparative remoteness of the Homestead from residential areas and watercourses, it is not clear why a detailed assessment by a consultant was considered by the Department to be necessary. It is considered by the Audit Office that the Department had the skills to carry out the limited assessment required by the local environment and to develop an appropriate remediation option.

The Department advised that under a Draft Variation of the Territory Plan in February 1994, residential development was to be located much closer to the Tuggeranong Homestead. As well, a commitment had been made by Government that the assessment would be performed.

### ***Audit Comments***

The decision that residential development around the Homestead would not proceed was made in November 1994. This decision was influenced by the possible presence of arsenic at the Homestead. However, by that time the consultancy for site assessment had been let.

The Audit Office considers that the Department would have been aware in advance of the likelihood of the decision to not proceed with the residential development. In the circumstances, it should not have proceeded with the consultancy.

A detailed site assessment at Tuggeranong Homestead appears to have been unnecessary. The assessment which has been completed identified that a low cost remediation alternative is available<sup>23</sup> and should be considered. The Department has advised the remediation options for Tuggeranong Homestead will be considered as part of the process of determining future uses of the site. Any consideration will have due regard to the assessment undertaken.

## **5.7 THEODORE SITE**

### **Preliminary Site Assessment**

Preliminary sampling conducted by Departmental officers detected samples of 125 to 295 ppm on one residential block. This significantly exceeded the HIL

---

<sup>23</sup> ANZECC Guidelines suggest that a half-metre of clean soil can provide a successful barrier to arsenic exposure.

(see Section 5.3 of this Chapter). As well, a study of maps of Theodore indicated that there were two houses built over the former sheep dip with a possibility therefore that there may have been high levels of contamination adjacent to or under these houses. Detailed site assessments were therefore considered necessary for each of the three residential blocks.

### **Detailed Site Assessment - Contract Selection**

Competitive tender procedures were followed.

### **Contract Management**

The initial tender brief prepared by the Department specified that the work was to only cover testing for contamination on one block. A consultant was selected for the lowest tender price. Before the contract was signed, an estimate of the cost of drilling extra holes was requested. Shortly after signing, negotiations were carried out to double the number of boreholes requested and to renegotiate the price of these extra holes.

Sample boreholes were drilled in November and December 1994. Following requests by residents for extra holes to be dug (*see later*), a contractor was engaged to take approximately 30 samples. This contract, which was not a competitive tender was for approximately \$6,000.

Additional boreholes were dug in March and April 1995 by the principal contractor under a further variation to the contract. The need to dig these additional holes was not recognised at the time of the original contract.

### **Contract Difficulties**

File evidence indicates that management have had to exert considerable effort to ensure that the consultant's report provided the required information.

The initial sampling plan did not adequately take into account the potential for soil movement across the site. Officers of the Department had to become closely involved to ensure that aerial photographs, cut and cross section drawings and building plans were considered in subsequent sampling.

### **Draft Site Assessment Report**

A draft site assessment report based on the November and December testing was produced in February 1995. The Department engaged the services of Dr J. Bazelmans, Deputy Director of the Victorian EPA, to review the report.

Following Dr Bazelmans' review, another 125 boreholes were drilled in March and April 1995. About 32% of these holes were at the request of Dr Bazelmans or the consultant. Resident requests accounted for 68% of the holes dug.

### **Final Site Assessment Report**

The final consultant's report on the site assessment was provided in August 1995. The Victorian Environment Protection Authority (EPA), which was engaged to review the final consultant's report, confirmed the findings.

### **Summary Of Test Holes**

Overall, 289 test boreholes were dug. The table summarises the 14 boreholes which proved to have

**MANAGEMENT OF FORMER SHEEP DIP SITES**

arsenic levels greater than the Health Investigation Level (100 ppm).

***Number Of Boreholes Registering Arsenic Greater Than The Health Investigation Level At Theodore***

	<b>Preliminary</b>	<b>Nov., Dec. 1994</b>	<b>Mar., Apr. 1995</b>	<b>Total</b>
Resident Requested	-	2	0	2
Consultant Specified	-	9	2	11
CSU Specified	1	0	0	1
<b>Totals</b>	<b>1</b>	<b>11</b>	<b>2</b>	<b>14</b>

Arsenic levels found in the 14 contaminated boreholes ranged from 100 ppm to 380 ppm.

**Consultant’s Recommended Remediation**

The consultant’s final site assessment report recommended that the appropriate treatment was full remediation except for the soil below existing houses. According to the consultants, this option provided, in a cost effective manner, an appropriate mechanism to minimise and manage exposure to contaminants.

Dr Bazelmans recommended that houses on blocks affected by contamination need not be demolished. He advised that an acceptable level of environmental and human health safety could be achieved by removing contaminated soil and replacing it with clean soil.

**Costs Of Remediation**

On the basis of figures provided in the consultant’s report, The following table sets out the estimated remediation costs for the three affected Theodore residences.

**MANAGEMENT OF FORMER SHEEP DIP SITES**

	<b>Residence 1</b>	<b>Residence 2</b>	<b>Residence 3</b>
Remediation Cost	\$107,000	\$70,000	\$50,000

The average of the estimated costs is around \$75,000 per residence. Assuming that other remediations will also average about \$75,000, the overall cost of remediations facing the Government is, on present known numbers of properties affected by arsenic in the soil, about \$1.4m. This includes \$0.25m for minor remediations.

It should be noted that although the buy-outs at Theodore were completed in early 1995, at the time of completing this Report (April 1996), no remediation work had commenced.

**Resident Requested Test Holes**

Although a comprehensive sampling plan had been developed by the consultant, a large number of extra test boreholes were drilled at the requests of residents to relieve their anxiety about the possible location of arsenic. These holes were dug on the blocks where arsenic in the soil had been detected as well as around the local neighbourhood. The following table compares the number of planned samples with the number of resident requested test holes.

*Test Holes At Theodore*

<b>Time Of Testing</b>	<b>Requested By Consultant And CSU</b>	<b>Requested By Residents</b>
Nov., Dec. 1994	57 (35%)	107 (65%)
Mar., Apr. 1995	40 (32%)	85 (68%)

Residents requested about two-thirds of the test holes in both stages of the contract. The resident requested holes in 1994 were dug mainly by CSU. Those in 1995 were dug by the contractor.

*Audit Comments*

The additional cost of the resident requested holes has been estimated by the Audit Office to be approximately \$50,000. This considerably increased the site assessment costs at Theodore.

**Unnecessary Samples Taken**

There was a considerable level of repetition in the extra holes dug in March and April 1995.

Forty of the extra holes were drilled on the advice of Dr Bazelmans, or the contractors, to more fully understand the extent of the contamination. This extra testing is considered to be reasonable.

However, of the 85 holes requested by residents, 52 (61%) were in areas which had already been sampled in November and December 1994. These blocks had been found to be free of arsenic. The other resident requested holes were in areas where neither the consultants nor the Department considered tests to be required.

None of the additional resident requested sample holes detected contamination.

*Audit Comments*

The extra drilling and sampling to meet resident requests involved extra expenditure of at least \$30,000. It is considered that this expenditure was unnecessary.

**5.8 LYNEHAM SITE**

**Background**

In January 1995, the Department identified a former sheep dip site located in residential housing in Lyneham. Because of the location of the dip, a decision was made to carry out a fully detailed assessment of the site without a preliminary assessment.

### **Contract Selection And Management**

There was a competitive tender process to select a consultant. The consultant's brief for Lyneham included the following improvements over that used for Theodore:

- the extent of contamination was to be defined with a high level of confidence;
- there was a requirement of a time scaled work program;
- the cost of drilling additional holes was included as a contract clause; and
- the possible effects of widespread contamination identified through examination of aerial photographs and plans were emphasised.

A consultant with a sampling plan based on a grid pattern was chosen. This plan contained composite test holes which required less sample testing but still provided information on the perimeter of contamination over a wide area.

### **Resident Requested Test Samples**

There were only 5 resident requested test holes at Lyneham and these were drilled for a nominal fee.

### ***Audit Comments***

It would appear that the initial phases of the contract at Lyneham have run smoothly.

The improved consultancy results of Lyneham appear partly attributable to a refined community consultation process (*see Chapter 5*) and selection of a consultant with an improved sampling plan.

However, continuing variations to the contract have delayed the timely production of the consultant's report on the site assessment. The Audit Office was advised in January 1996 that the consultant's final report was close to completion.

## 5.9 WATSON SITE

The audit did not review in detail the arrangements for the assessments of the Watson site.

Testing at Watson found difficulties in determining the boundaries of arsenic deposited from the former sheep dip site. Early samples taken produced results which were reasonably consistent with the existence of an old sheep dip using arsenic solutions. There were inconsistencies noted, nevertheless, in the amounts of contaminant found, the depth at which it was found, and its spread. Following further analysis of samples taken in March 1996, it was concluded by the Department that some of the arsenic found in the area could have arisen from naturally occurring geological factors, rather than from the former sheep dip.

Following the conclusion that some of the arsenic could be naturally occurring, the Government withdrew some of the offers made to residents on the blocks affected (*Chapter 3*).

### *Audit Comments*

## MANAGEMENT OF FORMER SHEEP DIP SITES

The testing at Watson initially failed to distinguish the existence of naturally occurring arsenic from arsenic remaining in the soil from sheep dipping. Later tests have apparently detected this difference and, as a result, buy-out offers have been withdrawn.

It would seem that the early tests at Watson were effective in establishing levels of arsenic present but did not establish whether the arsenic was there as a result of sheep dipping operations.

## **6. CONVEYING INFORMATION TO THE COMMUNITY**

### **6.1 INTRODUCTION**

This Chapter reviews the action taken to provide information to residents living near or on former sheep dip sites. In particular, the audit assessed whether residents had been provided with:

- adequate information on the health risks from arsenic;
- adequate information on the soil sampling procedures which were to be carried out; and
- adequate information on the compensation arrangements and the services which would be provided by the Government if further action needed to be taken.

### **6.2 SIGNIFICANT FINDINGS FROM THIS CHAPTER**

- *At the time that arsenic was first found in the soil at Theodore, the Department lacked a strategy for managing its contact with the local community;*
- *Although the Department is now providing information on compensation arrangements and services provided to residents, adequate information on health risks, timetables, remediation processes and other matters is apparently not being provided and this is preventing residents from making fully informed decisions about accepting buy-out offers or choosing less costly remediation options; and*
- *Since Theodore, the Department has developed and implemented a strategy for providing*

*community information and as a result at the Lyneham site there was less overt public concern about the issue than occurred at Theodore, however strong public concern is again evident at Watson.*

### 6.3 BACKGROUND

The audit reviewed action taken in relation to the residences at the former sheep dip sites at Theodore and Lyneham and used the findings from those reviews to draw conclusions about the effectiveness of the operations as a whole.

In making assessments of this nature, there are difficulties in determining just what constitutes an “adequate” level of information. This was particularly the case in this audit where the perceptions and circumstances of individual residents varied widely. It is to be expected, for example, that people living on a former dip site and who have young children may expect, and are entitled to, more information, consultation and support than those who live in the local area but not on the actual site.

Some people may be satisfied with the provision of scientific or technical information, however others may need to be led through the information. As well, there is no easily obtainable measure of the adequacy of information without, for example, carrying out a survey of each individual’s satisfaction.

For these reasons, the audit assessment was based on a judgement by the Audit Office of what seemed reasonable or appropriate in the circumstances. In order to make these judgements, the audit reviewed files relating to the community information activities and discussed issues with Departmental officers. Matters raised by residents and the actions taken by the Department were noted. The audit reviewed the transcript of the Assembly Standing Committee on

Planning and Environment Inquiry into Contaminated Site Management's hearings held prior to February 1996.

As well, Audit Office staff held discussions with some Watson residents who had received buy-out offers and some Theodore residents.

## **6.4 THEODORE SITE**

### **Introduction**

Following detection of a former sheep dip site in the suburb of Theodore in July 1994, Department of Urban Services' officers and officers from the Department of Health and Community Care contacted the residents who lived in two houses which were adjacent to the site. Samples of soil were taken from the blocks and were analysed in August and September 1994.

The residents were advised about the location of the former site and provided with information on some health aspects of arsenic exposure. They were also advised about the processes of assessment and remediation and were offered the choice of being moved to alternative accommodation while sample testing was taking place. The residents chose to move away in October and November 1994.

In late October and early November, other residents in the vicinity of the former sheep dip site were contacted by Departmental officers. (This contact had been delayed at the request of the families which had moved out.)

### **Information Provided To Residents On Health Risks**

Officers met with local residents, as well as with representatives of the local community, to discuss issues relating to the health risks from arsenic and the

**MANAGEMENT OF FORMER SHEEP DIP SITES**

Government's response. Experts in public health and toxicology addressed the residents.

The main events are summarised as follows.

28/10/94 - 3/11/94	A Departmental community liaison officer visited residents in the vicinity of the sheep dip at Theodore and advised that further sampling was to take place and discussed the issues involved with the discovery of the dip.
16/11/94	The first group meeting was held with residents in the vicinity of the dip. Residents were addressed by Doctor Cathy Mead, Chief Health Officer, ACT Health, on the health risks posed by exposure to arsenic. Residents' requests for further sampling were agreed to.
14/12/94	Professor Ben Selinger of the Department of Chemistry at the Australian National University addressed a public meeting of residents and answered queries about exposure to arsenic. Results of sampling up to this date were provided to the residents. Further residents' requests for sampling were agreed to.
13/2/95	Dr Jeff Bazelmans, Deputy Director of the Victorian Environment Protection Authority, addressed residents of Theodore on assessment and remediation and the results received from sampling to date. Dr Bazelmans discussed health issues associated with site remediation.
10/3/95	Professor M. Moore, National Centre for Environmental Toxicology, University of Queensland, and Doctor P. Stewart, Department of Clinical Biochemistry, Royal Prince Alfred Hospital, Sydney, visited residents individually to assure them about the risks posed to human health from soil contaminated by arsenic.

### **Other Departmental Contacts**

In addition to these meetings, there were frequent contacts between officers of the Urban Services and Health Departments and residents. A Liaison Officer had been appointed to work full time on the matter. As well, residents were able to phone the Department for information.

### **Sampling Procedures**

The Audit Office's examination of files indicates that information was provided to residents on site assessment processes. Residents were also consulted on sampling point locations. These efforts were initially targeted at the immediately affected residents but were subsequently expanded to include all neighbouring residents.

Where residents had concerns about the level of sample testing, arrangements were made to increase the sampling and to cover specific areas requested by residents.

### **Discussion With Theodore Residents**

During the conduct of the audit, Audit Office staff met with some Theodore residents who lived near the former sheep dip site but had not received buy-out offers as no sample readings on their properties exceeded the Health Investigation Level (HIL). In the discussion, the following was raised by the residents:

- they believed that they will be obliged to declare the presence of arsenic on their blocks if and when they sell their homes and that declaring the arsenic readings will significantly reduce the market value of their properties;

- no agreement has been reached with the Department on the remediation of blocks at Theodore even though arsenic was first detected in 1994. It was believed that remediation to depths of three metres may not necessarily be enough and that remediation of blocks with readings well below the HIL needs to be considered by the authorities;
- the handling of the sheep dip site problem at Theodore could have been handled in a better way by:
  - using a more open approach to providing information to residents, for example - avoiding the secrecy behind the departure of the residents who received buy-outs;
  - less politicalisation of the issues;
  - the development of a comprehensive site assessment plan at the beginning of testing;
  - providing the site assessment report on a timely basis; and
  - developing a site remediation plan more quickly.

Based on the currently available information on health risk exposure from arsenic in the soil, there is a very low risk (*Chapter 2*) posed by readings that are well below 100 ppm such as those observed in Theodore. Nevertheless, residents fear that disclosing these readings will drive down the price which potential purchasers would be willing to pay for their residences.

Because of this, residents feel a necessity to pursue deeper and more extensive remediation to gain a clean

bill of health on their properties and if they cannot achieve this through negotiations they consider that litigation may be their only remaining option. These actions will cause themselves inconvenience and cost, the Government greater expense and the staff of the Department difficulties in negotiating a site management plan on a timely basis.

The Department has advised the Audit Office that residents with arsenic readings of 100 ppm or greater are informed that if they intend to sell their blocks, they must declare the readings to potential purchasers. Residents with less than 100 ppm arsenic in their soil are not required to do this but this does not seem to have been effectively communicated to at least some of the affected residents.

### *Audit Comments*

It is clear that high community concern existed about the location of old sheep dip sites, the possibility of contamination and the fears of resultant injury to health. These concerns appeared to be exacerbated by delays by the Department of Urban Services in contacting some residents and in providing information.

It appears that, in the early stages at least, the Department lacked a strategy for managing its dealings with the community affected. As a result, it was forced to adopt a somewhat reactive or defensive approach, in part to protect property values in the area.

It seems also that affected residents who were not offered buy-outs continue to have unnecessary concerns which should by now have been alleviated if communication had been effective.

## 6.5 LYNEHAM AND WATSON SITES

### Introduction

In January 1995, the Department of Urban Services became aware that there was a former sheep dip site located in the suburb of Lyneham. The Watson site was discovered in November 1995.

### Information Provided To Residents On Health Risks And Sampling Procedures

Using the experience gained at Theodore, a pro-active approach was used at Lyneham and Watson. All nearby residents were informed of the existence of the dip site prior to the commencement of sampling. Departmental staff followed a set of protocols for consulting with residents and site assessment procedures. These protocols included explanation of the sampling plan on an individual basis prior to any testing and incorporation of resident requested test holes. Residents were visited individually with results of testing and the results were clearly displayed on plans. Residents were also provided with information about the health services which were available.

### *Audit Comments*

In comparison to Theodore, the approach followed at Lyneham and Watson appears to have been effective in reducing the overall level of community concern.

## 6.6 CONSULTATION WITH RESIDENTS IN DIRECT CONTACT WITH FORMER SHEEP DIP SITES

Where the results of testing have indicated arsenic in the soil on a residential block, the Government has provided:

- consultations with a toxicologist (Professor Michael Moore) and consultant biochemist and clinical physician (Dr Peter Stewart);
- urine testing;
- analysis of garden produce; and
- analysis and speciation of house dust and high surface readings to attempt to determine the level of bio-availability of the contaminant.

Comments on each of these follow.

*Consultation With Toxicologists*

At Theodore, advice was provided initially by Department of Health and Community Care officers within two days of confirmed sampling results, however some delay was experienced in engaging toxicological advice. The delay is not considered unreasonable given the availability of such specialists. Lyneham and Watson residents have been able to meet with the specialists.

*Urine Tests*

Urine tests were offered to all residents. Test results have taken about a fortnight to be returned.

*Analysis Of Garden Produce*

Analysis of garden produce at Theodore experienced considerable delays. The ACT Government Analytical Laboratory could not conduct tests because of delays in the arrival of equipment. These delays have been overcome for Lyneham and Watson.

*Speciation Of House Dust And Of Soil Close To The Surface With High Arsenic Levels*

Speciation involves testing for arsenic in forms with different levels of bio-availability. Where high overall levels of arsenic are detected, speciation identifies the levels of toxic and non-toxic forms of arsenic.

In early cases, the importance of speciation testing was not fully understood. Speciation samples were collected from Lyneham residents in August 1995 and results received in September 1995.

### **Discussion With Watson Residents**

At the invitation of the residents, Audit Office staff met with some Watson residents to discuss aspects of their contact with the Department. In the discussion, the residents mentioned the following areas where they considered that less than adequate information or advice had been provided to them:

- there was a perception that the option of remediation only was discouraged by the Government and that the advice being provided to residents was “biased” toward acceptance of offers of buy-out. It was understood by the residents that the remediation process would devastate their properties. Sites would be cleared of all vegetation (and possibly buildings) and the soil would be replaced to a depth of three metres. Residents were not advised about likely remediation timetables and there was a perception that the assessment and remediation processes would take more than a year to complete;
- there was uncertainty about the Government’s plans for the neighbourhood and the public identification of affected blocks. Residents mentioned fears of future medium or high level development on the remediated sites, possible bars on selling affected properties and of the labelling of properties as “toxic sites”;

- although specialist medical advice was that the level of risk was low, residents were concerned that this advice appeared to be inconsistent with the Government's approach of encouraging residents to move out. One resident asked, "*if there is no health risk, why are they hysterical?*"; and
- the Department had built up good relationships with the residents. However, the uncertainties and the long time-frames were causing dissatisfaction with the Government.

The residents reported that because of the many uncertainties, their general perception was that it would be less trouble to cut their losses by accepting a buy-out offer and moving out, rather than stay in the area, however much they liked it.

The residents also commented on the buy-out and compensation offers along the following lines:

- there was no flexibility in the offer of buy-out. Where residents had over-capitalised their homes, or had made substantial improvements in their gardens, the valuation did not properly reflect this. Residents commented that the amount provided for the buy-out would be insufficient to enable them to live in another area of comparable amenity.

### *Audit Comments*

The approaches taken at Theodore, and at Lyneham and Watson were substantially different.

When arsenic was found at Theodore, the Department lacked a strategy for managing contacts with the local community. As it was working on this issue for the first time, it had to develop community information approaches "on the run" (as well as manage other aspects of the issue). A heightened and possibly

unnecessary level of community concern was expressed. This concern was met with a substantial effort on the parts of the Departments of Urban Services and Health and others to provide useful information to the community, however this has not been completely successful.

Since that time, the Department has developed and implemented a strategy for community information and consultation. As a result, there is now less overt public concern about the issue. This is, of course, not to say that the individual residents affected do not feel strong concern.

It is considered that the Department is now effective in providing adequate information on soil sampling procedures to residents. The Department, however, does not appear to be providing complete information on health risks, timetables, remediation processes and other matters. This has limited residents' abilities to make fully informed decisions about buy-out and remediation offers. As a result, the residents may be suffering unnecessary concern and also may make decisions which are not in their best interests while the Government may be involved in unnecessary expenditure.

**Appendix A****Significant Events**

<b>DATE</b>	<b>KEY EVENT</b>
<b>March 1994</b>	The possibility of contamination emanating from a disused sheep dip at Tuggeranong Homestead was brought to the attention of the Office of the Environment.
<b>May 1994</b>	A further site became apparent at Ngunnawal.
<b>May to July 1994</b>	The potential for sheep dips being built in residential areas was considered and a search was instigated to identify all sheep dips in the ACT. The Land Information Office undertook map searches. Officers from the OOE undertook field searches and investigated anecdotal evidence.
<b>August 1994</b>	In August 1994, a Task Force was commissioned to develop appropriate policies to address contaminated sites issues.
<b>September 1994</b>	Results of soil sampling in residential areas indicated arsenic contamination at Theodore.
<b>November 1994</b>	The Government adopted the option of offering buy-out to residents. Assessment of contamination commenced at Theodore.
<b>December 1994</b>	The Contaminated Sites Unit was formed.
<b>January 1995</b>	The sheep dip at Lyneham is reconsidered and discovered to be amongst residential housing.
<b>February 1995</b>	Compensation is included with buy-out offers.
<b>March 1995</b>	Sampling conducted at Lyneham.
<b>April 1995</b>	Offers of buy-out now include the option of remediation and retaining the family home.
<b>May to June 1995</b>	Sampling conducted at Isabella Plains, Chapman and Holder.
<b>June 1995</b>	Further hearings for the Inquiry Into the Adequacy of Processes Relating to Identifying and Managing Contaminated Sites in the ACT were held.
<b>November 1995 to January 1996</b>	More sites are found in urban and residential areas.

## Appendix B

### **Costs To The Territory**

The Contaminated Sites Unit (CSU) was established in the Environment and Culture Division of the Department of Environment, Land and Planning in December 1994. Prior to that date officers from the OOE addressed sheep dip issues as they arose.

The contaminated sites unit manages site assessment through consultants. It conducts community consultation with residents and negotiation with directly affected residents for operational issues, relocation, buy-out and compensation. Officers are also involved in the identification of sites.

Contaminated sites issues involve a number of aspects including health, legal and technical.

Land Division, the ACT Planning Authority, ACT Health, Treasury, the Chief Minister's Department, the Department of Urban Services and Public Administration and the Attorney General's Department were involved in policy development through a Task Force. Since the units formation several of these departments have assisted the unit by providing services associated with management of sites.

The considerable activity both across Departments and within the Contaminated Sites Unit since the discovery of the first sheep dips in the ACT has resulted in the following expenditure, most of which is related to sheep dips.

<b>Expenditure And Notional Cost Commitments For The Period March 1994 To April 1996</b>				
<b>Department</b>	<b>Activity</b>	<b>Type Of Cost</b>	<b>Breakdown</b>	<b>Total Cost</b>
OOE		Salaries	483,590	
	Operating		112,035	
				595,625
	Site Assessments	Consultancies	502,033	
	Specialist Advice	Other Consultancies	10,700	512,733
Treasury	Resident Compensation	Buy-Outs	1,452,500	
	Resident Compensation	Additional Claims	441,600	1,894,100
ACT Analytical Laboratories	Laboratory Services			7,116
Land Information	Verification	Salaries	90,070	
	Site Clearances	Salaries	5,500	95,570
Land Supply		Salaries		8,700
DPA		Salaries		369
Treasury		Salaries		5,479
P&EHS		Salaries		73,000
Parks & Con.		Salaries		1,700
Attorney-General	Settlements	Salaries	25,080	
	Advice	Salaries	18,700	43,780
<b>Total Expenditure</b>				<b>2,642,547</b>

Expenditures for Departments other than the Office of the Environment and Land Information are based on officers' estimates of time and salary costs.

The Contaminated Sites Unit (CSU) has an expected estimated expenditure of \$1m per annum for three years commencing September 1995.

## **Annexure**

### ***Reports Published in 1992***

- 1 Information Technology Management Policies in the ACT Government Service
- 2 Financial Audits with Years Ending to 30 June 1991
- 3 GAO Annual Management Report for Year Ended 30 June 1992
- 4 ACT Board of Health - Management of Information Technology
- 5 Budget Outcome Presentation and the Aggregate Financial Statement for the Year Ended 30 June 1992
- 6 Financial Audits with Years Ending to 30 June 1992

### ***Reports Published in 1993***

- 1 Management of Capital Works Projects
- 2 Asbestos Removal Program
- 3 Various Performance Audits Conducted to 30 June 1993
  - Debt Recovery Operations by the ACT Revenue Office
  - Publicity Unaccountable Government Activities
  - Motor Vehicle Driver Testing Procedures
- 4 Various Performance Audits
  - Government Home Loans Program
  - Capital Equipment Purchases
  - Human Resources Management System (HRMS)
  - Selection of the ACT Government Banker
- 5 Visiting Medical Officers
- 6 Government Schooling Program
- 7 Annual Management Report for the Year Ended 30 June 1993
- 8 Redundancies
- 9 Overtime and Allowances
- 10 Family Services Sub-Program
- 11 Financial Audits with Years Endings to 30 June 1993

### ***Reports Published in 1994***

- 1 Overtime and Allowances - Part 2
- 2 Department of Health
  - Health Grants
  - Management of Information Technology

---

12 Reports were issued prior to 1992. Details can be obtained from the Government Audit Office.

## Annexure (Continued)

### *Reports Published in 1994 (Continued)*

- 3 Public Housing Maintenance
- 4 ACT Treasury - Gaming Machine Administration  
- Banking Arrangements
- 5 Annual Management Report for Year Ended 30 June 1994
- 6 Various Agencies - Inter-Agency Charging  
- Management of Private Trust Monies
- 7 Various Agencies - Overseas Travel - Executives and Others  
- Implementation of Major IT Projects
- 8 Financial Audits with Years Ending to 30 June 1994
- 9 Performance Indicators Reporting

### *Reports Published in 1995*

- 1 Government Passenger Cars
- 2 Whistleblower Investigations Completed to 30 June 1995
- 3 Canberra Institute of Technology - Comparative Teaching Costs and Effectiveness
- 4 Government Secondary Colleges
- 5 Annual Management Report for Year Ended 30 June 1995
- 6 Contract for Collection of Domestic Garbage / Non-Salary Entitlements for Senior Government Officers
- 7 ACTEW Benchmarked
- 8 Financial Audits With Years Ending to 30 June 1995

### *Reports Published in 1996*

- 1 Legislative Assembly Members - Superannuation Payments / Members' Staff - Allowances and Severance Payments
- 2 1995 Taxi Plates Auction
- 3 VMO Contracts
- 4 Land Joint Ventures
- 5 Management of Former Sheep Dip Sites
- 6 Collection of Court Fines

### **Availability of Reports**

Copies of Reports issued by the ACT Auditor-General's Office are available from:

ACT Government Audit Office  
Scala House  
11 Torrens Street  
BRADDON ACT 2601

or

PO Box 275  
CIVIC SQUARE ACT 2608

Phone (06)2070833 / Fax (06)2070826