DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

REPT.BK.NO. 86/43
CREOSOTE INVESTIGATION
Woods & Forests Department -
Mt. Gambier

GEOLOGICAL SURVEY

by

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and

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GROUNDWATER & ENGINEERING

JULY, 1986

DME.132/75

CONTENTS

PLAN

Mount Gambier Sawmill - Site Layout

INTRODUCTION

An investigation was commenced in July, 1985 to delineate the sub-surface extent of groundwater contamination resulting from the spillage of approximately 6 300 litres of creosote at the Woods and Forests Department State Mill at Mount Gambier in March, 1983. Part of the investigation also included an appraisal of likely groundwater pollution in the vicinity of the C.C.A. and creosote timber preservation plants.

Initially a field survey was undertaken to locate existing water supply and drainage wells within and adjacent to the mill complex to carry out a detailed groundwater sampling programme (the locations of the wells are shown on the appended locality plan).

As a large number of the drainage wells were either blocked or partially backfilled with debris, it was necessary to clean out and deepen seven wells to obtain a representative network of sampling wells. With the approval of the Woods and Forests Department, one existing deep well was progressively backfilled, cemented and the casing slotted to obtain water quality data at various depths within the aquifer. One new well was also drilled in close proximity to this deep well to obtain water quality at the top of the unconfined aquifer.

A sampling programme was undertaken in late 1985/early 1986 using the Department of Mines and Energy's submersible pumping unit.

The results of the investigations carried out to date and recommendations for further work are presented below.

RESULTS

1. DRILLING RESULTS

A total of seven wells were cleaned out and deepened to obtain an adequate aquifer interval in each well for sampling purposes.

During the clean outs, the following observations were made (refer to locality plan for location of wells):

Well 7022-1545: 18 pine logs were removed from this well.

Well 7022-1547: The samples taken from this ex-septic tank drainage well were black and had a putrid odour. During the cleaning out of this well, a light grade oil was also present in the bailed samples.

Well 7022-1555: This drainage well near the C.C.A. treatment plant showed signs of C.C.A. contamination with occasional green stained limestone fragments.

Well 7022-1548: This drainage well, which is located near the creosote treatment plant, had obvious evidence of creosote contamination and also evidence of suspected C.C.A. contamination (pale green drilling samples).

Well 7022-1549: The black silt that was removed from this ex-septic tank drainage well had a very putrid odour.

Well 7022-4000: Pine bark was evident in the samples from this well and the water samples had a distinct organic odour.

Well 7022-5849: Although no work was undertaken on this well, it is believed that the well is still being used for the drainage of septic tank effluent.

GROUNDWATER QUALITY RESULTS

A total of 17 wells were sampled in and adjacent to the State Mill complex. Of these wells, the deep well which was progressively backfilled and cemented, was sampled at three intervals and the adjacent new well was sampled to provide water quality data at the top of the unconfined aquifer.

All wells were sampled after one hour of pumping, and wells adjacent to the timber preservation plants were also sampled at the commencement of pumping.

Groundwater samples were analysed for a range of parameters, including nutrients, predominant cations and anions, copper, chromium, inorganic arsenic, phenols, total organic carbon, dissolved organic carbon, and various constituents of creosote. In the discussion of the results, only analyses of samples taken after one hour of pumping have been used as these are considered to be representative of the unconfined aquifer.

Groundwater contamination was detected at a number of sites within the State Mill complex, and these are discussed individually below:

1. Analyses of samples from wells (7022-1555 and 7022-1547) adjacent to the C.C.A. treatment plant indicated contamination of the unconfined aquifer, with the highest concentrations of copper, chromium and arsenic being 0.57, 1.00 and 1.09 mg/L respectively. Some arsenic contamination was also detected in wells about 125 metres from the C.C.A. treatment plant and located on a likely northwest/southeast trending joint line. The occurrence of arsenic in these wells and not chromium and copper is to be expected because of the higher degree of chemical precipitation which will occur with both copper and chromium in the alkaline aquifer matrix.

   One of the wells (7022-1547) near the C.C.A. treatment plant and previously used as a septic tank drainage well had high concentrations of TKN and total phosphorus. These results indicate that contamination from septic tank effluent is still present within the unconfined quifer.

2. The sampling undertaken at various depths in the deep well (7022-1545) and the adjacent shallow well (7022-5968) indicated that some minor contamination from copper and chromium was evident at a depth of about 30 metres within the unconfined aquifer.

3. The drainage well (7022-1548) adjacent to the creosote treatment plant was heavily contaminated with an estimated total creosote concentration of 64 mg/L. An employee stated that the direct discharge of creosote to a drainage well was a common practice in the 1960's. Minor copper, chromium and arsenic contamination was also detected in the drainage well and this is probably due to past C.C.A. treatment at this site prior to the establishment of the new C.C.A. treatment plant.

This well also showed high concentrations of TKN and total phosphorus, indicating groundwater contamination from septic tank effluent.

4. A well (7022-1544) close to the power station also showed a high concentration of both copper and chromium. A preliminary investigation of the area showed that ash from the power station is stockpiled for short periods nearby and it is known that waste C.C.A. treated timber has in the past been burnt in the power station. This practice has now ceased. It is therefore likely that the copper and chromium contamination could have resulted from the past storage of ash with high copper and chromium concentrations.

5. Some phenolic contamination of the aquifer was found in the southwest corner of the State Mill complex in the vicinity of a debarking machine. Pine bark is known to contain phenolic compounds and it is considered that stormwater runoff from this area is the likely source of this contamination.

6. An apparently anomalous result was obtained for a drainage well (7022-1997) which indicated a high concentration of both copper and chromium, but the total dissolved salts showed that the sample was mostly stormwater. Further sampling of other nearby wells failed to confirm any other copper or chromium contamination. It seemed unlikely that stormwater draining to this well would pick up any significant amounts of copper or chromium.

7. Contamination from the discharge of septic tank effluent was also evident in drainage well 7022-1549, which had elevated concentrations of TKN and total phosphorus of 25 mg/L and 3.7 mg/L respectively.

CONCLUSIONS

The investigations undertaken to date have shown that the unconfined aquifer beneath various parts of the State Mill complex is contaminated. This pollution has mainly resulted from the discharge of contaminated stormwater or septic tank effluent into the unconfined aquifer via various drainage wells. In some cases, particularly near the creosote treatment plant, the contamination has resulted from the past direct discharge of creosote into a drainage well.

The two main areas of concern are the present C.C.A. and creosote treatment plants where elevated concentrations of copper, chromium, arsenic and creosote have been detected.

It is considered that the investigations undertaken have not located the groundwater pollution plume resulting from the spillage of creosote in March, 1983. This is likely due to the spacing of the wells used in the sampling programme and the expected presence of solution features within the unconfined aquifer.

RECOMMENDATIONS

It is recommended that:

1. Further investigations be undertaken to locate the groundwater pollution plume resulting from the 1983 creosote spillage. This would include the drilling of one or two investigation wells in areas to the northwest or southeast of the cave which is presently used for the disposal of stormwater from the Mill Complex.

2. The C.C.A. and creosote treatment plants be upgraded in line with the guidelines recently issued by the Standards Association of Australia for the timber preservation industry (AS 2843.1 and AS 2843.2).

3. The Woods and Forests Department undertake remedial measures to remove contaminated groundwater in the areas around both the C.C.A. and creosote treatment plants. This would involve pumping considerable volumes of groundwater from either existing or new wells. This water could probably be discharged directly or after some initial pre-treatment to the sewer.

   Pumping should initially be undertaken from wells 7022-1547 and 7022-1555 at the C.C.A, plant and well 7022-1548 at the creosote plant. At a later stage, wells 7022-1549 and 7022-1984 should also be pumped.

4. Due to other commitments by both the Department of Mines and the Engineering and Water Supply Department, it is recommended that the Woods and Forests Department engage a groundwater consultant to undertake recommendations 1 and 3 above.

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A Emmett
per FS

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1530

WEIGH BRIDGE

REGIONAL OFFICE

TOURIST OFFICE

RECREATION AREA

1997

CuNiCr amenolaus

POST DEBARKER

ELECTRICITY TRUST

EMPLOYEES CAR PARK

CAVE

POST DRYING AREA

1543

POWER STATION

OFFICE

WELDERS SHOP

CARD SHOP

GARAGE

CAVE

TRUSS PLANT

1544

CuNiCr (ash)

5849

1553

OFFICE

MEDICAL CENTRE

TOILET

MACHINE SHOP

TRAVERSER TRACK No 1

TRAVERSER TRACK No 2

5968

1545

CuNiCr

ACID NEUTRALISATION PIT

REGIONAL STORE

DESTACKING

STORAGE OVER

CCA plant

1549

TKNP

SALTS TREATMENT PLANT

ELEC SHOP

UNIT STORAGE

STORES COMPOUND

KILNS

PLANING MILL 'A'

1555

TKNP

1547

CuCrAs contam

FUEL STORAGE AREA

SAW SHOP

23-24

CUTTER TOILET

No 1 GREEN CHAIN

PLANING MILL 'B'

1984

POLE SHAVER

LOG YARD

OLD GREENMILL

5400

4000

NEW GREENMILL

DEBARKER

No 2 GREEN CHAIN

MAINTENANCE SHOP

CANTEEN

1548

Creosote contam - mon

CCA contam

2 phenolics

SORTED STACKED

CREOSOTE TREATMENT PLANT

TKNP

1539

1533

1537

CAR PARK

900

TIMBER ENGINEERING FACTORY

1988

KOPPERS PTY LTD AUSTRALIA
VACSOL TREATMENT PLANT

WOODS AND FORESTS DEPARTMENT

MOUNT GAMBIER SAWMILL

SITE LAYOUT

Scale 1:2,500

1545 WELL LOCATED DURING FIELD SURVEY

(TO OBTAIN UNIT NO. PREFIX WITH 7022)

D 6703

Drawn by PVanHeerden July 1982