Institute of Hydrology

[redacted]

Natural Environment Research Council

TERRESTRIAL AND FRESHWATER SCIENCES DIRECTORATE
Natural Environment Research Council
Polaris House
North Star Avenue
Swindon SN2 1EU
Tel: 0793 411500 Fax: 411502
Telex: 444293 ENVRE G

INSTITUTE OF FRESHWATER ECOLOGY

Windermere Laboratory
Far Sawrey, Ambleside
Cumbria LA22 0LP
Tel: 09662 2468 Fax: 6914
Telex: 94070416 WIND G

River Laboratory
East Stoke, Wareham
Dorset BH20 6BB
Tel: 0929 462314 Fax: 462180
Telex: 94070672 WARE G

Edinburgh Laboratory
Bush Estate, Penicuik
Midlothian, EH26 0QB
Tel: 031 445 4343 Fax: 3943
Telex: 72579 BUSITE G

Eastern Rivers Laboratory
Monks Wood Experimental Station
Abbots Ripton, Huntingdon
Cambs PE17 2LS
Tel: 04873 381 Fax: 467
Telex: 32416 MONITE G

Teesdale Laboratory
c/o Northumbrian Water
Lartington Treatment Works
Lartington, Barnard Castle
Co Durham DL12 9DW
Tel: 0833 50600 Fax: 50827

INSTITUTE OF HYDROLOGY

Maclean Building
Crowmarsh Gifford
Wallingford
Oxon OX10 8BB
Tel: 0491 38800 Fax: 32256
Telex: 849365 HYDROL G

Plynlimon Office
Staylittle, Llanbrynmair
Powys SY19 7DB
Tel: 05516 652 Fax: 441

Balquhidder Office
Tulloch Lodge
Balquhidder, Lochearnhead
Perthshire FK19 8PQ
Tel: 08774 257

INSTITUTE OF TERRESTRIAL ECOLOGY (NORTH)

Edinburgh Research Station
Bush Estate, Penicuik
Midlothian EH26 0QB
Tel: 031 445 4343 Fax: 3943
Telex: 72579 BUSITE G

Banchory Research Station
Hill of Brathens, Glassel
Banchory, Kincardineshire, AB31 4BY
Tel: 03302 3434 Fax: 3303

Merlewood Research Station
Grange-over-Sands, Cumbria LA11 6JU
Tel: 05395 32264 Fax: 34705
Telex: 65102 MERITE G

INSTITUTE OF TERRESTRIAL ECOLOGY (SOUTH)

Monks Wood Experimental Station
Abbots Ripton, Huntingdon
Cambs PE17 2LS
Tel: 04873 381 Fax: 467
Telex: 32416 MONITE G

Bangor Research Unit
University College of North Wales
Deinol Road, Bangor LL57 2UW
Tel: 0248 370045 Fax: 355365
Telex: 61224 BANITE G

Furzebrook Research Station
Wareham, Dorset BH20 5AS
Tel: 0929 551518/9 Fax: 551087

INSTITUTE OF VIROLOGY AND ENVIRONMENTAL MICROBIOLOGY

Marsfield Road, Oxford OX1 3SR
Tel: 0865 512361 Fax: 59962

UNIT OF COMPARATIVE PLANT ECOLOGY
Department of Animal and Plant Sciences
University of Sheffield, Sheffield S10 2TN
Tel: 0742 768555 Fax: 760159
Telex: 547216 UGSHEF G

CENTRE FOR POPULATION BIOLOGY
Imperial College, Silwood Park
Ascot, Berks SL5 7PY
Tel: 0344 23911 Fax: 294339

WATER RESOURCE SYSTEMS RESEARCH UNIT
Department of Civil Engineering, Newcastle University
Newcastle-upon-Tyne NE1 7RU
Tel: 091 232 8511 Fax: 091 261 1182
Telex: 53654 UNINEW G

UNIT OF BEHAVIOURAL ECOLOGY
Department of Zoology, University of Oxford
South Parks Road, Oxford OX1 3PS
Tel: 0865 271165 Fax: 310447

Natural Environment Research Council

Terrestrial and Freshwater Sciences

COED TALON (CLWYD)

HYDROLOGICAL MONITORING - 1994

Report to Countryside Council for Wales

CCW Contract Report No. 45

K Gilman MA MIWEM
Institute of Hydrology
Staylittle
Llanbrynmair
Powys
SY19 7DB

Tel: 01686-430652
Fax: 01686-430441

December 1994

Background

Coed Talon Marsh SSSI (SJ 270581) is located on the floor of a narrow valley cut through the Coal Measures about 9 km north-west of Wrexham. The eastern boundary of the SSSI is a stream (designated the Coed Talon stream) which flows southwards towards its confluence with the River Cegidog. Opencast coal extraction is proposed on land on the western slope of the valley.

In advance of any works, hydrological and water quality monitoring was undertaken by the developer according to recommendations agreed between Aspinwall & Co. and the Institute of Hydrology (Gilman 1994, Aspinwall & Co. 1994). This report interprets the results obtained up to the end of November 1994.

Climate

1994 was a drier-than-average summer.

Potential soil moisture deficit (PSMD) was calculated from the MORECS estimates of rainfall for 40-km squares 104 and 113, and the number of months with month-end PSMD greater than 25mm, 50mm, 75mm, 100mm and 125mm was tabulated for the years 1961 to 1993. The number of months with a PSMD>100mm is quite a good indicator of the seriousness of drought years for wetland sites, for instance three years in the record, 1975, 1984 and 1990 had five, four and six months respectively with PSMD>100mm. Twenty wetter years had PSMD always less than 100mm. By comparison 1994's PSMD reached 121mm at the end of July, and 126mm at the end of August. Rather higher than average September and October rainfall then reduced the PSMD and started to raise groundwater levels. Two months with PSMD>100mm places 1994 at about the 75 percentile (of dryness).

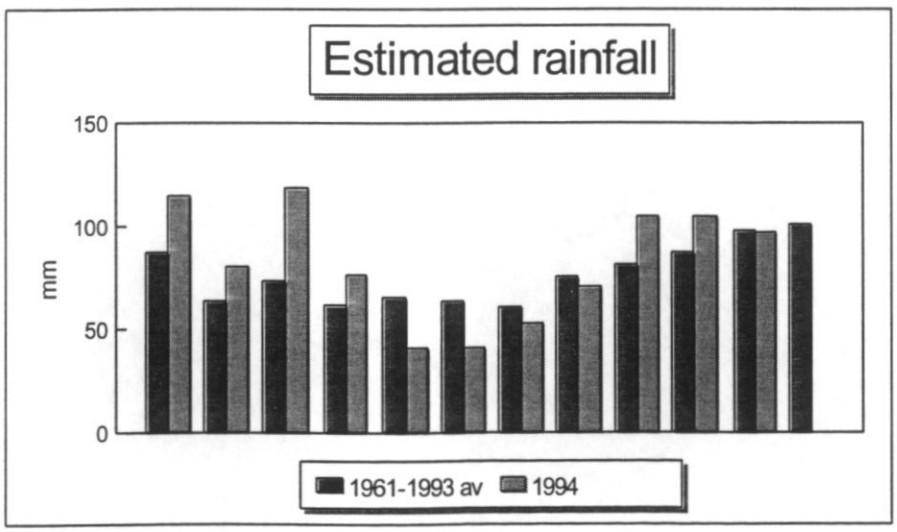


Figure 1 *Comparison between 1994 monthly rainfall estimated from the Met. Office's MORECS data and the long-term average of MORECS rainfall from 1961 to 1993.*

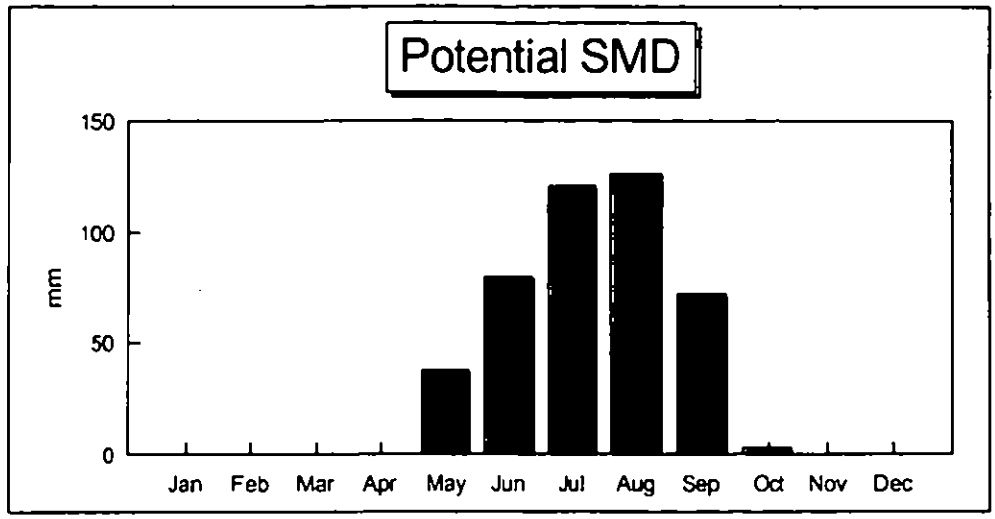


Figure 2 The development of the potential SMD over the summer of 1994.

Groundwater levels

The water levels recorded in the Coed Talon piezometer network show relatively constant levels through July, August and September, then a steep rise, especially at piezometers A1, B1, D1 & E1, presumably coinciding with rainfall, between 22 September and 6 October. The low levels recorded on 8 June (e.g. at B2 & D3) probably result from a delayed stabilisation after drilling and should be disregarded (see Figures 3 to 7).

The largest change in water level between June-September and October-December occurred near the foot of the slope at E1: this indicates that the slope here is a source of surface and near-surface runoff rather than groundwater seepage, which would be expected to have less seasonal variation. This is also borne out by the rather low levels observed in piezometers D1 and E1 during the summer period, which suggests that there is no west-east flow at these points, and that the source of water for the bog upstream of the access road is further north than the proposed opencast site.

The most constant behaviour is shown by piezometers C1, C2 and C3 and some of the piezometers nearest to the stream (e.g. D3 and E3). A water level of 137.9 mOD in the stream was recorded at the time of the levelling survey (undated but supplied to P Day in October) at the site access. This is almost the same as the water levels in piezometers C1, C2 and C3 and intermediate between A3 and D3. It must be concluded that the stream exercises a regulating influence on groundwater levels, but it may still be the case that the spring marked on the map immediately downstream of the site access is active, and maintaining a seasonally constant flow.

The PSMD is a good indicator of the year-to-year variation in the minimum water table level reached at a wetland site. The PSMD reached in 1994 was 126mm, which is about half the

maximum PSMD reached in 1976. A similar PSMD obtained in 1990. It is difficult to pick out "index" piezometers that would typify the behaviour of the water table at Coed Talon, but it might be appropriate to take piezometers A2, B2 and D2 to represent those stations within the expanse of the fen that show some seasonal variation. The annual range in these three piezometers appears to be between 0.4m and 0.5m. In a drought year, the PSMD model suggests that there would be about double this variation, i.e. levels would fall to 137.3m, 137.2m and 137.3m in piezometers A2, B2 and D2 respectively.

It is recommended that 137.2m be adopted as the level to which the marsh water level should be allowed to drop before compensation water is supplied.

Water quality

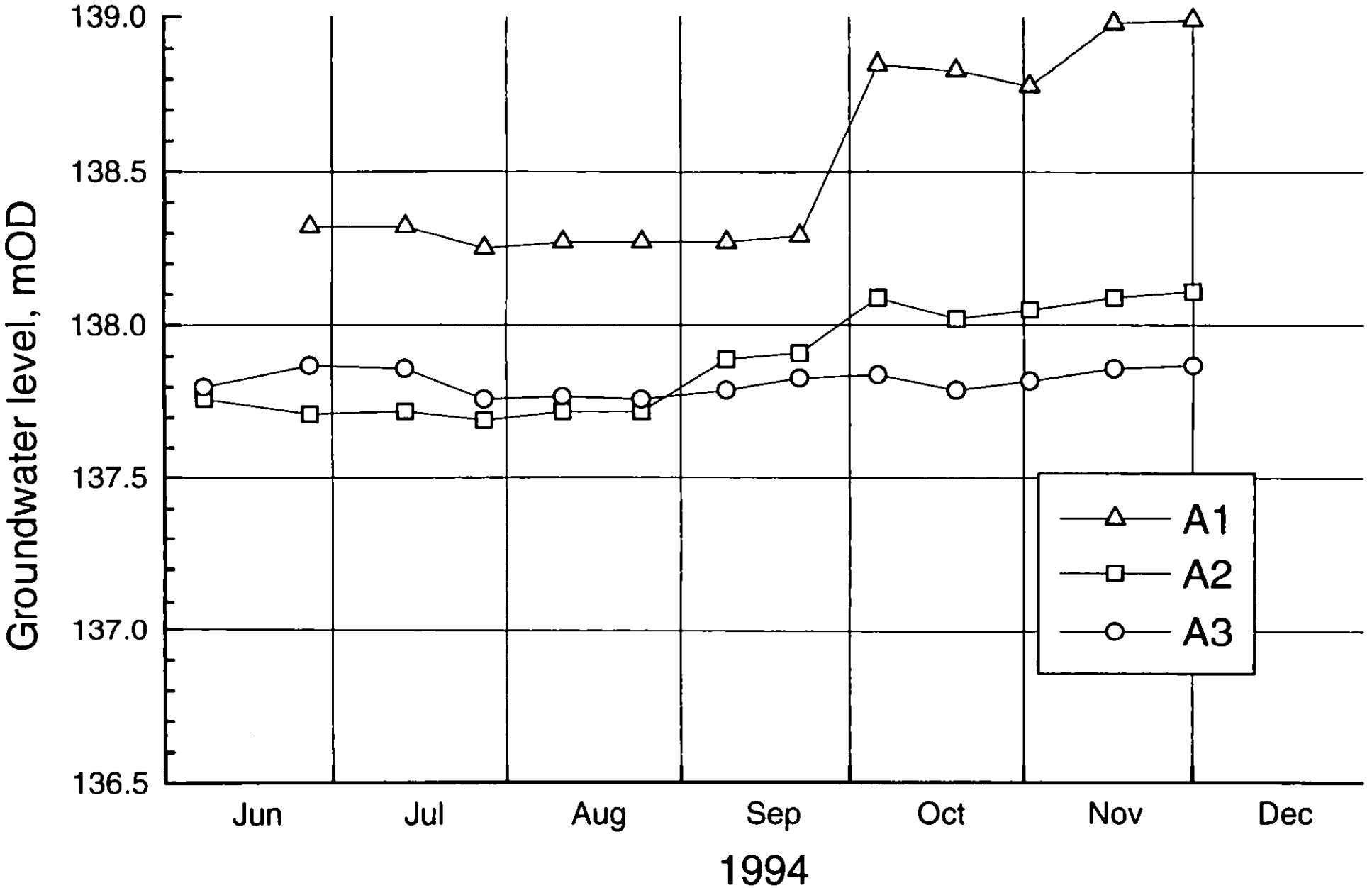
The eight water quality samples demonstrate that the waters on site are of the calcium bicarbonate type, with very high concentrations of iron at downstream stations in the fen. This iron, which may enter the fen from the Coal Measures, is probably oxidised and precipitated before it enters the stream. Concentrations of calcium and magnesium indicate a groundwater source, but there is no downstream increment in calcium that would demonstrate that there was a large input of very high calcium water (similar to sample E194677) from the area of the proposed mine.

There is no significant spatial variation in major ion chemistry that would prevent stream water being allowed to disperse over the fen, though it would be essential to control the suspended sediment concentrations of any water supplied. It is not possible to say at this stage whether treated surface runoff and mine waters would be acceptable as compensation water, but the signs are hopeful.

References

Aspinwall & Co. (1994) Monitoring of groundwater at Coed Talon Marsh, Report to Ward Bros Mining Ltd.

Gilman K (1994) Hydrological aspects of proposed opencast mining at Coed Talon site, Clwyd, Report to Countryside Council for Wales.


139.0
138.5
138.0
137.5
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136.5
Groundwater level, mOD
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Jul
Aug
Sep
Oct
Nov
Dec
1994
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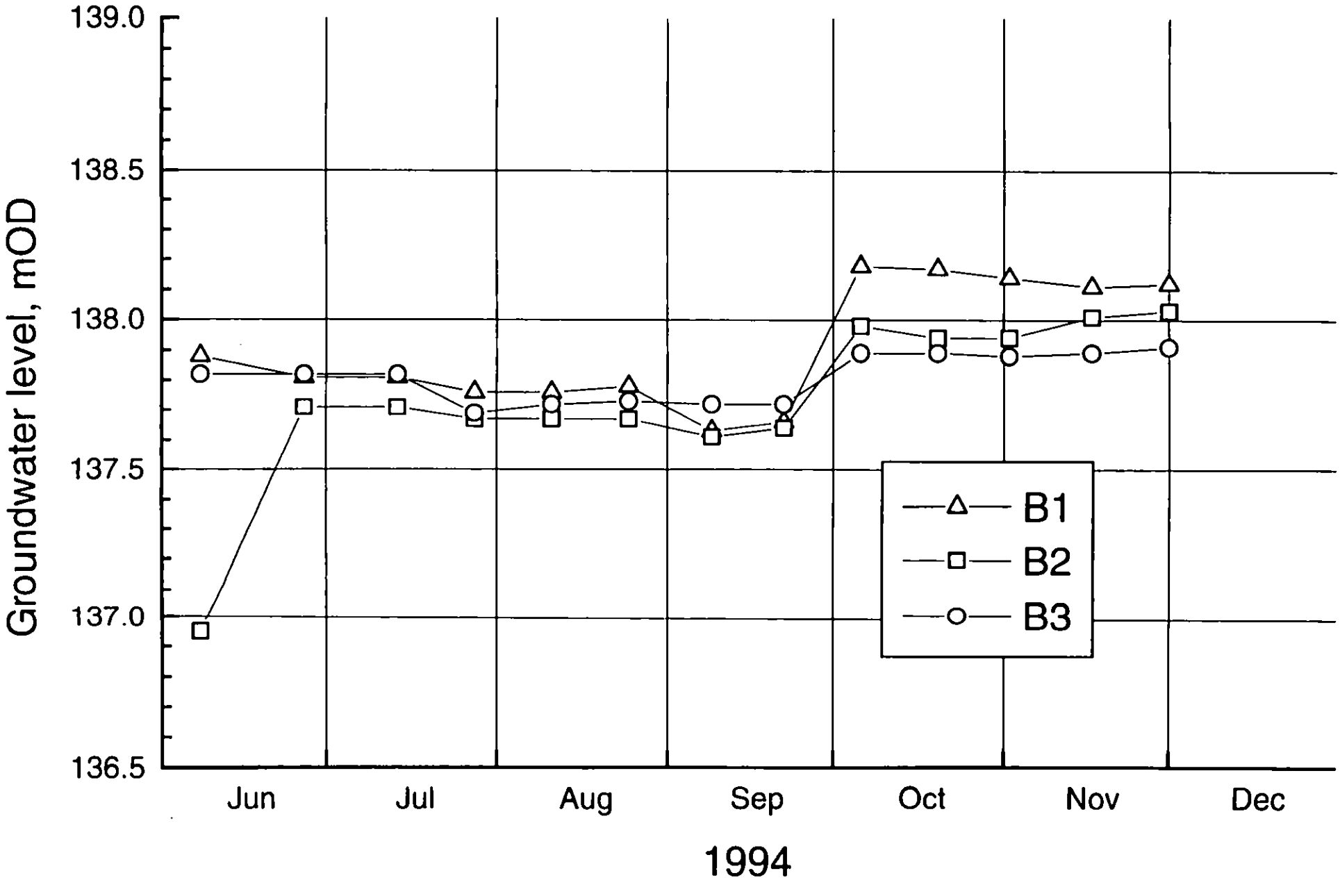
A2
A3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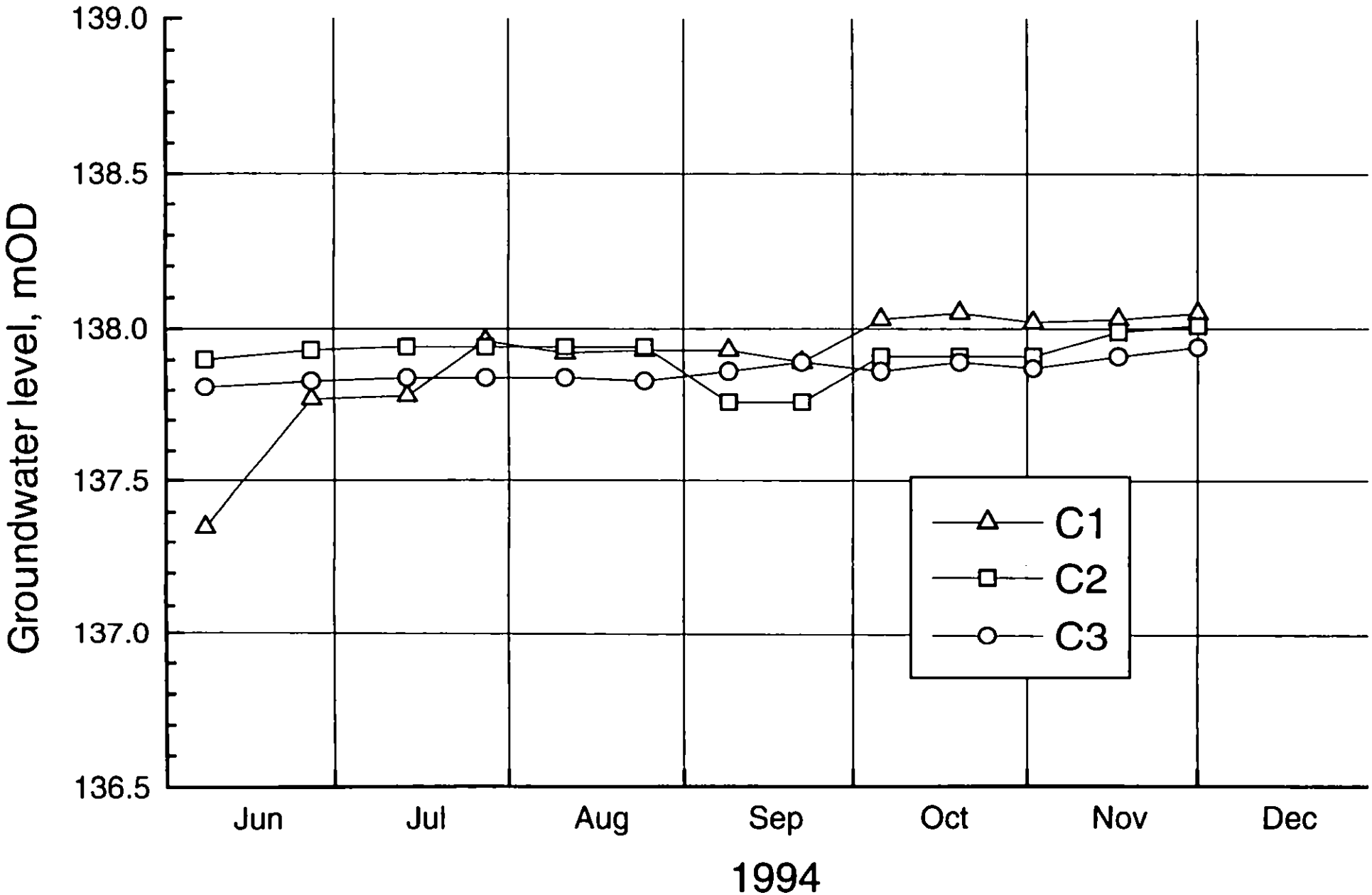
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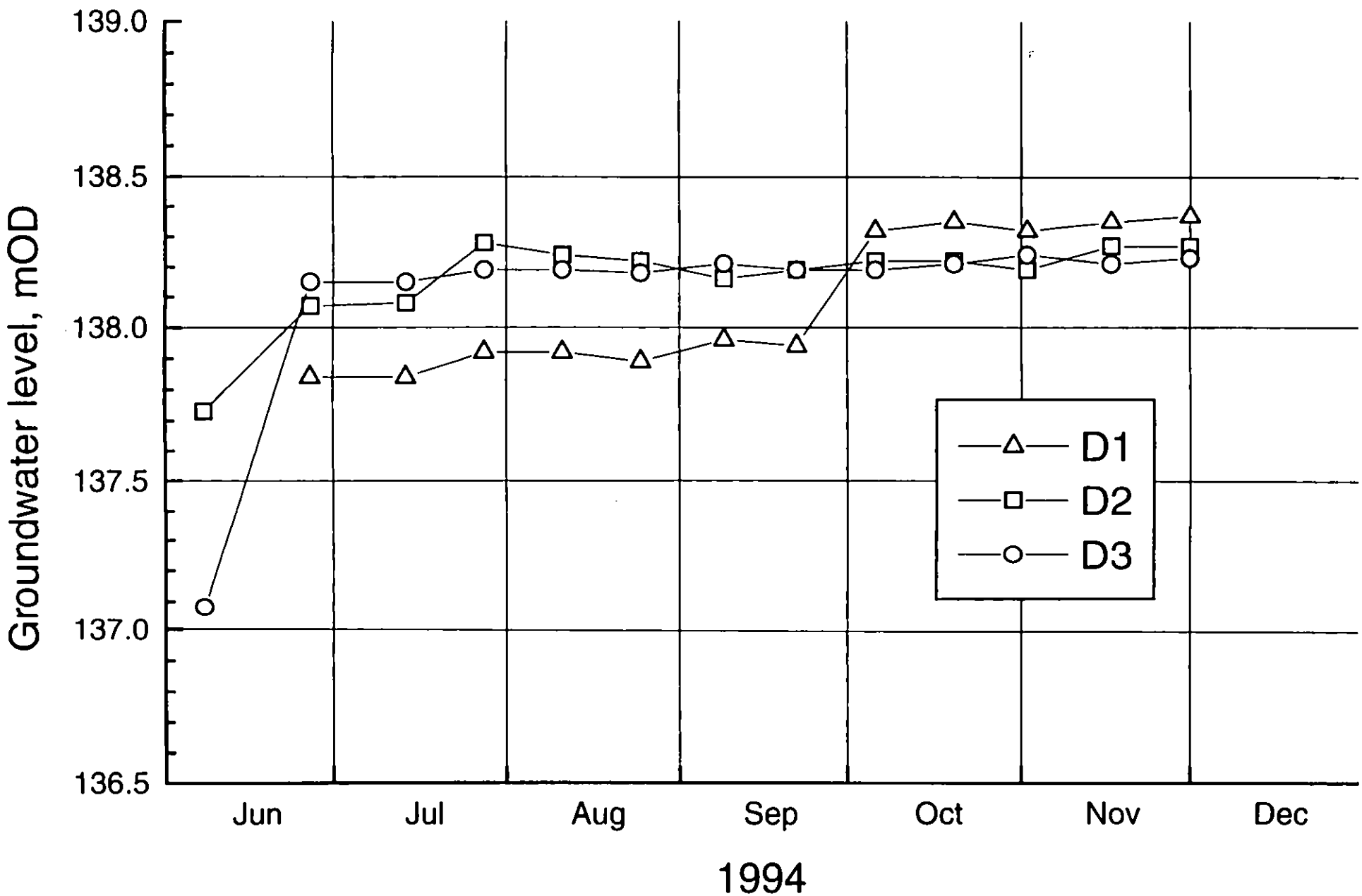
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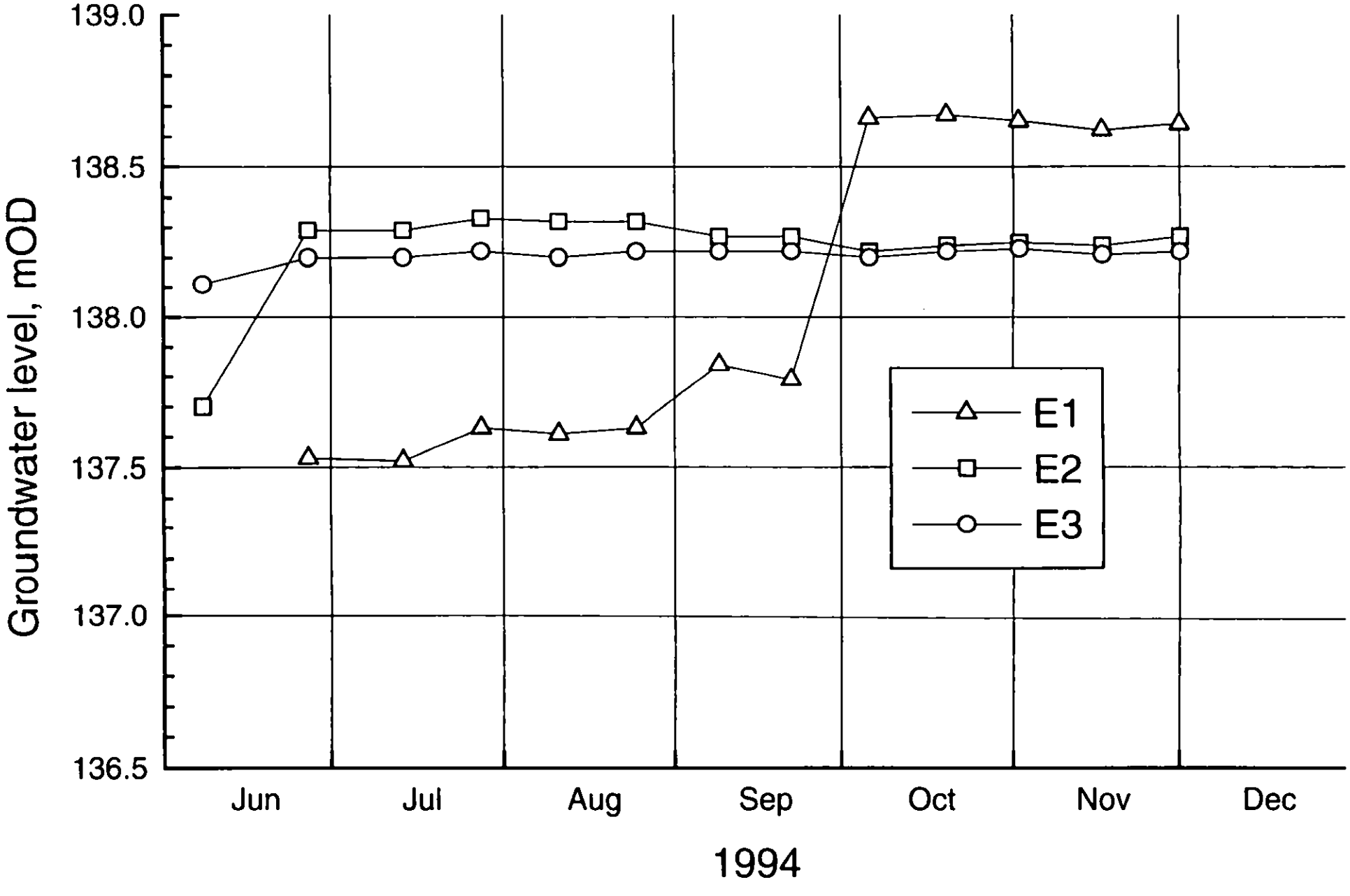
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Groundwater level, mOD
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1994
E1
E2
E3