The National Centre for Environmental Data and Surveillance

Development of water quality monitoring instrumentation

ENVIRONMENT AGENCY

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EA-NCEDS Box 5

INTRODUCTION

The Wessex Region of the National Rivers Authority (NRA) decided at its inception not to invest any further resources into its fixed site water quality monitors. It decided that better use could be made of its capital and resources by investing in mobile water quality monitoring equipment which could be deployed where a known problem had been identified, the problem could be monitored and resolved and the equipment moved to the next site for investigation. Commercial systems to meet the NRA's specification were not available therefore the required instruments were developed in-house, and later commercially produced under licence. This policy of innovative development has continued when the market place cannot meet the requirements of the NRA/Environment Agency.

INTELLECTUAL PROPERTY RIGHTS

Sherlock was the first system to be developed at Wessex Regions Twerton Office, prior to the formation of the NRA. As a consequence of this several separate organisations were involved with the commercialisation of the Sherlock system and is difficult to determine who owns what Intellectual Property Rights (IPR). Fortunately as the range of instruments has developed the ability of the Centre to carry out the work in house has increased, therefore there are no similar issues about the ownership.

SHERLOCK AND MERLIN

A prototype water quality monitoring system was developed at the Twerton Office, Bath in 1987, it was designed to monitor and log water quality parameters and transmit them back to a remote personal computer using a cellular telephone. Sherlock is a river bank-side automatic monitor and sampler. Merlin is the same system that floats mid stream of a river or for use in estuaries. The initial prototype was developed by the Wessex Water Authority Catchment Control Function prior to the formation of the NRA.

A water quality sampling system was developed by Roman Environmental Instruments (REI) in 1989 to further enhance the Sherlock system. REI were paid £1000 for the IPR of the sampling system and the embedded software to run it and this now remains the property of the NRA/EA. The NRA/EA own and possess the circuit diagrams, flow diagrams and programs for the sampler hardware and software

A claim for a patent application (8914125.3) for the Sherlock system was made on 31/5/90 by the NRA, the named inventors being DJ Palmer and PN Williams. A selection of documents relating to the commercialisation of Sherlock has been collated in Appendix A.

A series of meetings were held with Wessex Water Services Ltd (WWS) to commercialise the Sherlock system. 3I Research marketing consultants were employed to give advice on the commercialisation of Sherlock. On 30/11/90 a marketing agreement was signed between WWS and the NRA to agree to split equally any profits made from the commercialisation of Sherlock. On 3/12/90 a confidentiality agreement was signed between WWS and the NRA, and the sole

right to commercially exploit Sherlock was given to WWS.

On 6/11/90 a Technical Assistance and Licence Agreement was signed with Siemens Plessey, this outlined their rights to improve and modify the system. On 16/1/91 a specification for Merlin and Sherlock was drawn up by Paul Williams. This specification allowed Siemens Plessey to commercially produce Merlins and Sherlocks.

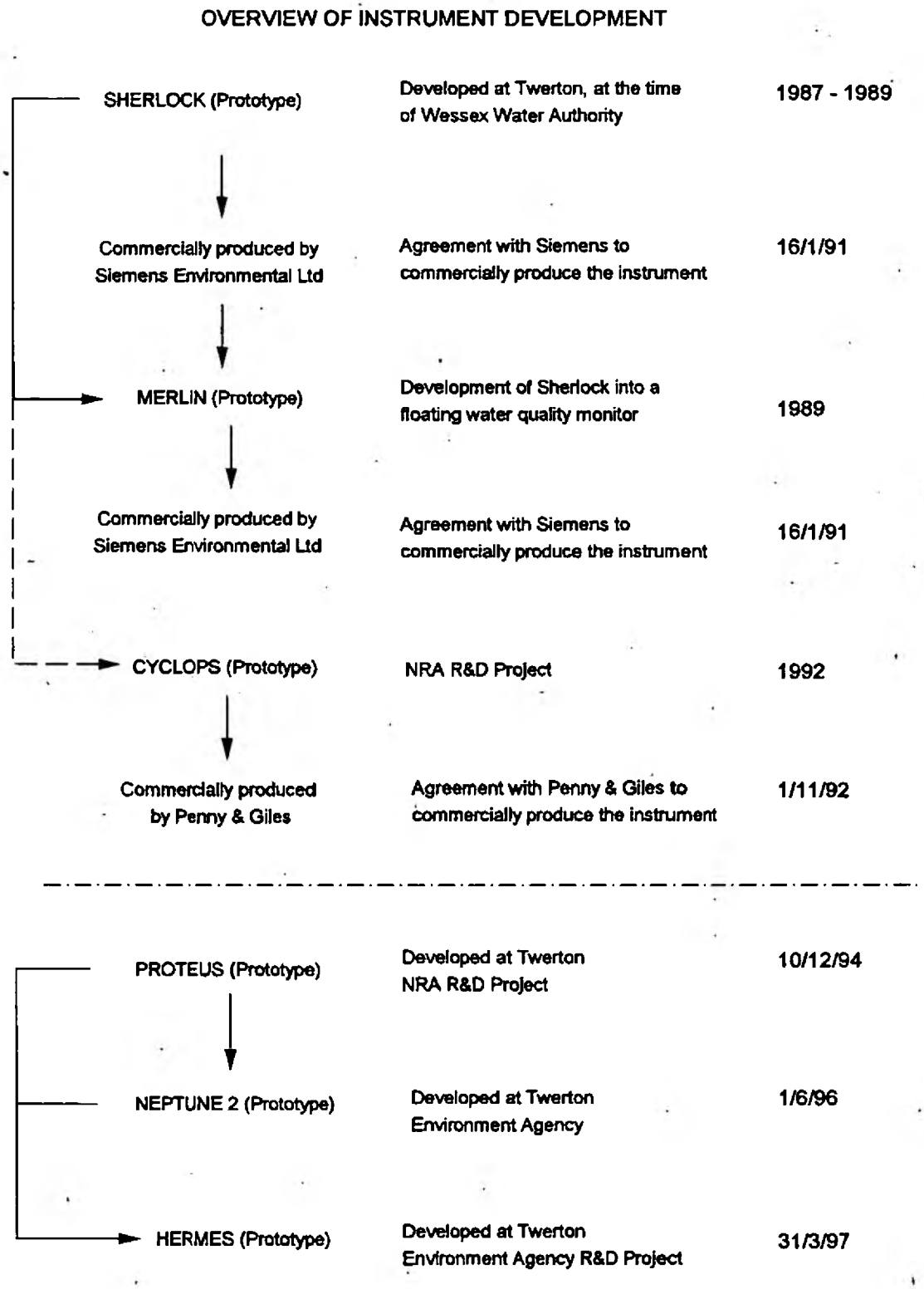

Figure 1 History of the instruments developed at the Twerton Office

CYCLOPS

Cyclops was built as a natural development of the Sherlock monitoring system. The philosophy had been proven with Sherlock that a water sample could be taken remotely or on alarm for later analysis and Cyclops extended that principle to include all the procedures necessary for compliance with formal sampling requirements.

An original schematic diagram of the Cyclops system was developed at the Twerton Office. The Cyclops prototype was developed as a product of an R&D project A10(91)02 undertaken by Paul Williams at the Twerton Office. The Cyclops system was developed utilising hardware and communications software developed by Penny & Giles (P&G). An agreement was made with REI for £500 whereby they signed over all property rights for the high/low electronics card which formed an integral part of the Cyclops system. The NRA now owns the intellectual property rights of the high low card. P&G did not incorporate the high/low card into the commercial Cyclops, but rather emulated the card in their software.

A Cyclops specification was written in November 1992 which formed the basis of a tender document to produce two commercial prototypes. This tender was won by Penny & Giles.

With the successful detection and prosecution of an illegal discharge by Rhone Poulenc a decision was made by Kevin Bond (NRA Director of Operations) to purchase a commercially produced Cyclops unit for each area office of the NRA.

A patent application for Cyclops was entered by Helen Stephenson (NRA South Western Legal Department), however this collapsed on 6/1/94, as it was not pursued by the NRA. An agreement was signed with P&G on 18/10/94 to supply 30 Cyclops units to the NRA.

Cyclops was registered as a trademark on 30/1/95 on the authorisation of Kevin Bond, Carol Williams was paid £50 for her creation of the Cyclops logo. Negotiations were undertaken by Bridget Marshall (NRA Head Office Legal Department) and Mark Liddiard (secondment to Kevin Bond) to negotiate a price with P&G to allow them to purchase the Cyclops logo and name. At this moment it is unclear who owns exactly what IPR on the Cyclops system. However it is assumed that P&G own the IPR to their own hard and software within the Cyclops system, though this claim forms a contentious point, as it was the NRA who had the original idea for a high/low feature and developed this in the prototype in electronic hardware, P&G emulated the card during the commercialisation process in software and claimed the idea as theirs. The NRA own the logo and name, and the IPR of the high/low card and the Cyclops concept as an automatic formal sampling machine.

The NRA and P&G held many discussions regarding the IPR of the system, each claiming they had contributed the major part of the work. This dialogue has remained unresolved and there has been poor take up of Cyclops within or outside the Agency. As there is no longer a legal requirement for formal sampling (because of the Environment Act 1995), further Cyclops sales seem unlikely. A selection of documents relating to the commercialisation of Cyclops has been collated in Appendix B.

PROTEUS

The Proteus prototype was developed as a product of an R&D project E1523 undertaken by Paul Williams at the Twerton Office. The budget for the project was £146k.

Proteus is a self contained marine monitoring buoy capable of measuring a wide range of water and meteorological parameters. The buoy can also take samples on alarm or remote command for subsequent laboratory analysis.

The project to develop the Proteus system consisted of 5 major components. A specification was written by Paul Williams on 10/12/94. Whilst a number of contractors were brought in to work on the development of Proteus the NRA/EA set out and has managed to retain the IPR on all 5 components. REI commissioned the sampler for the NRA.

Component	Developer	IPR Rights
The buoy and monitoring equipment	NRA	NRA/EA
Communications controller	NRA/EA	NRA/EA
Communications controller software	Shades	NRA/EA
Sampler and software	REI	NRA/EA
PC based software	NRA/EA	NRA/EA

To date there has been no assessment of the internal or external market for subsequent Proteus units.

NEPTUNE

Neptune was borne out of an ad-hoc idea at the Twerton Office to meet the requirements of users of water quality instrumentation within the Agency. Neptune is not the product of an R&D project but rather an initiative carried out by the Centre. Estimates for the cost of developing Neptune are detailed below. Neptune 2 is a multi-channel, remote access data logger. It is designed to record data from multiple sources, and, when requested, send these data over a radio link to a PC. Neptune was developed entirely in-house and as such there is no dispute over IPR. Neptune was developed from the work carried out on the Proteus communications controller, it utilises similar hardware and some components of the Proteus software.

Neptune has attracted considerable interest from commercial instrument suppliers and has particular potential for external sales. A comprehensive list of the potential companies whom might be interested in purchasing Neptune are shown in Appendix C.

Development Costs of Neptune

ITEM	Time/Cost	Cost to Agency
Time for design and development of the hardware	4 months	£ 9,211 *
Time for design and development of the software	4 month	£ 9,211 *
Time for management	2 week	£ 1,776 *
List and approximate cost of development tools for the hardware. Prototype components Custom label Radio Pads and 1 months rental		£ 3,500 £ 3,500 £ 1,200 £ 1,000
List and approximate cost of specialist development tools for the software; eg PC Printer EPROM blower Software		 £ 2000 £ 1000 £ 600 £ 500
Total		£33,500

*These carry Agency 100% on-costs

HERMES

Hermes is an R&D project, P2B(96)14, with a budget of £30k and is a low cost, low maintenance automatic effluent monitoring system. The Hermes system will demonstrate self monitoring techniques to dischargers to encourage them obtain commercial systems.

Hermes has been developed entirely in-house and as with Neptune builds to some degree on the work carried out to develop Proteus. The Agency holds all the IPR on this system.

Hermes was developed to meet a gap in the commercial monitoring instrument capabilities, and therefore has potential for commercial exploitation.

CONCLUSION

The National Centre at Twerton has successfully developed a number of environmental monitoring systems which have been produced commercially under license. The financial returns for this work are not qualified but are assumed to be have been limited. The small returns experienced so far on these systems has partly been due to the complicated license agreements necessary to satisfy all the claimants of intellectual property rights, and the specific nature (and therefore limited market) of the instruments produced.

The Centre with later projects, ie Proteus onwards, has clearly kept control of the IPR of all development work carried out by contractors, and is in a much stronger position to capitalise on the commercialisation of its recent environmental instrumentation.

APPENDIX A - Sherlock Documents

FOR DOCUMENTS SEE PAUL WILLIAMS MASTER COPY

APPENDIX B - Cyclops Documents

FOR DOCUMENTS SEE PAUL WILLIAMS MASTER COPY

APPENDIX C - Companies within the environmental instrumentation industry

FOR DOCUMENTS SEE PAUL WILLIAMS MASTER COPY