

Paper 16: OIL SPILL MONITORING: AN INTRODUCTION

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Introduction

Monitoring is considered by most Australian scientific agencies involved with spill response to be an important component of the **response** process. As noted elsewhere in these proceedings, monitoring may provide a range of information of relevance to both the type of response undertaken, and to the overall design of future response **systems**. Monitoring is less **frequently** used as a tool for ongoing data **collection** and damage assessment in Australia, although these activities are common in other countries.

The historical reluctance of Australian response agencies to implement comprehensive monitoring systems in overall response design **relates** to a range of factors including:

- * the limited incidence of major spills where monitoring may have been employed to obtain data necessary for purposes such as damages recovery, impact research or assessment of ecosystem recovery;
- * the apparent lack of provision for recovery of costs of monitoring under National plan arrangements (this problem is also related to difficulties in determining and apportioning costs between the agencies responsible for monitoring and other involved agencies, including the polluter);
- * the lack of agreed monitoring protocols;
- * the difficulties involved in mounting an adequate monitoring response in the context of other response priorities and in situations where resources and expertise are often required for more urgent purposes (e.g. containment, clean-up or recovery of oil); and
- * the lack of adequate "baseline information" against which the effects of spill impacts can be compared has tended to reinforce after the event monitoring as a the pre-eminent approach - this approach tends to lack adequate rigour and is further undermined by the factors listed above.

Despite, these limitations, there is **general agreement** amongst Australian response agencies that monitoring is an important part of the role of **scientific** input to spill response. Because of the widely varying requirements of Australian **response agencies** and uncertainties about the legitimacy of various

aspects of monitoring under National Plan arrangements, this paper will not seek to prescribe a monitoring system for adoption by **SSCs**. Rather, the paper will attempt to provide an overview of some common elements of monitoring programs which may be developed on a State by State basis. Particular attention is paid to the objectives of monitoring and factors to be considered in the design of monitoring activities.

Monitoring Purposes

The reasons for monitoring are as variable as the nature of the spilt threat. Considerable discussion has occurred amongst international scientific and managerial agencies about the justification and efficacy of monitoring and a wide range of views exist about the level and type of monitoring response which could or should be undertaken in relation to any **incident**. As Lewis (1979) notes....

What justification is there now, after a decade of experience, for biologists and chemical oceanographers to jump to action stations and abandon other and perhaps long-running work and to converge from many different directions, just to record the consequences of yet another spill ? The adrenalin may flow, it may seem very heroic - 'our scientists are keeping careful watch on the damage' - but does it, can it serve any other purpose other than to excite further the frequently hysterical reporting that such tragedies call forth ? If we can at most only slightly mitigate the effects of a spill, can we turn the event to any scientific advantage ?

While those views may seem at odds with the **potential** benefits of monitoring argued by researchers such as Segar and Stamman (1986a), they reflect the dilemma which monitoring commonly poses to the SSC and response organisation **generally** - what difference does it make ? That dilemma is not capable of resolution until the relationship **between** monitoring and other aspects of the response system are clearly understood.

Kinsey and Ottosen (1987) suggest that **the** role of monitoring can be defined in two principal ways. ~~Firstly, monitoring can be seen as having a regulatory role to detect the harmful impacts from specific activities.~~ Secondly, monitoring can provide data which *can be useful in advancing the understanding of an ecosystem, and its dynamics, and as such represents contemporary baseline information to detecting and understanding the effects of a pollutant being monitored* . Both of these roles relate to **understanding** the environmental costs and consequences of spills - an approach which to date has not been a significant **element** of the **advice** given by Australian **SSCs**, but one which is considered to be important in:

- a. establishing the nature and **overall level** of **damage/impact** associated with a spill; and
- b. establishing the efficacy of scientific advice and **overall** response (e.g. did action **x,y,z** make a difference in minimising **the** impact of a spill ?).

Both of the roles of monitoring discussed by Kinsey and Ottesen (1987) are analogous to one of the two principal roles for marine environmental monitoring identified by a U.S. Interagency marine pollution committee (Segar and Stamman (1986b) **to obtain time series data for detecting significant changes**. A second role identified by that Committee, expands upon the views of Kinsey and Ottesen (1987). It seeks to . . . **provide timely warning and other advice to management so appropriate actions may be taken**. While in most cases this role relates to detection of ongoing impact (e.g. discharge from industry), in the case of oil spills it could be seen as the "real time" monitoring component of spill response (e.g. trajectory modelling and prediction of risk, concurrent assessment of the efficacy of clean-up measures, chemical analysis of the condition of oil in water, etc.). This role is perhaps the most common form of monitoring input to spill response at present, although the extent of SSC control over these activities is variable (most are routine operational actions).

To distil these roles for further evaluation by participants, it can be seen that monitoring has a range of purposes in spill response, the **three** principal ones **being**:

- a. to provide feedback and information during an incident on the efficacy of operational actions and the need for further action;
- b. to provide input to evaluation of an incident. This can include both evaluation of the efficacy of the response and assessment of the immediate environmental and socio-economic impacts of a spill; and
- c. to advance understanding of the longer **term** impacts of a spill to facilitate both future response planning and improve **knowledge** of the behaviour of the system(s) under threat from future incidents.

Monitoring Approaches

Possibly, the most important **step** in the design of a monitoring program is to have a clear understanding of the **objectives** of the program. In many **cases** the lack of clear understanding of the objectives of monitoring has **resulted** in mis-application of resources, a lack of adequate coordination of monitoring activities, inconclusive results, **inappropriate investigation** techniques and excessive cost. The net result of these being that monitoring may not **fulfil** a justifiable role within the overall response system.

In setting objectives for a monitoring program. **the** SSC will **need** to determine why the data are needed (the purpose(s) of monitoring) and how monitoring activities **relate** to the overall response system. Objective setting is primarily a **managerial** responsibility as it involves policy judgements relating to the nature of the concern(s) and **effect(s)**. Input by the SSC is, however, essential **in** making judgements, particularly in reconciling what is desirable and what is achievable. Such input should also

make explicit the differences between necessary monitoring activities and necessary research activities. While it is sometimes difficult to separate between these activities, such distinction is critical to the acceptability of any data collection under **the** National Plan.

Once objectives are derived for each monitoring activity and the relationship to the rest of the response system is clarified, detailed design of each activity can commence. This step is potentially controversial as there are wide ranging views amongst **researchers** about the most appropriate techniques for data collection and analysis, particularly where specific impacts are to be interpreted in the context of the functioning of ecosystems. **Nevertheless**, as Kinsey and Ottesen (1987) suggest, there are a range of existing techniques available for adoption by monitoring agencies. In assessing the utility of existing techniques or in developing new techniques, **Segar** and **Stamman** (1986b) suggest that their design must take into **account**:

- * sources and magnitude of variance;
- * optimum sampling strategies to achieve the **necessary** levels of statistical resolution (which will vary depending on the purpose of the activity); and
- * the nature of the potential change/impact to be monitored, having regard to ambient environmental conditions.

Each of these factors has an important **bearing** on the validity of results and the extent to which monitoring objectives can be met. For example, if it is not possible to sustain sampling over a sufficiently long period to address questions about the nature of an impact, then that effort may not meet the defined objective and thus may **represent** a waste of effort/resources.

To avoid such undesirable outcomes, it is recommended that **SSCs** develop a **standardised** set of agreed techniques as part of the SSC operations plan.

Relationship to National Plan Activities

While monitoring for purposes other **than** those related to “real-time” data collection/feedback are somewhat of a “**grey area**” under **the** present interpretation of National Plan provisions, there are strong arguments for an expanded view of the use of monitoring by **SSCs**. As noted in the discussion of monitoring purposes, the net benefit of **the three types** of monitoring is to improve the efficiency of all aspects of future response.

Consideration of monitoring **requirements** is **best undertaken** in the design of the SSC operations outlined elsewhere in **these proceedings**. For **illustrative purposes**, the following activities related to monitoring design and **implementation** in the main **phases** of response **organisation** are recommended:

Pre-danning

Monitoring and related activities in this phase include:

- * definition of purposes in specific context of **State/regional** plan,
- * establishment of monitoring objectives (**with** other **agencies** involved in response),
- * approval of monitoring activities and basis for funding,
- * compilation of "baseline" data for comparative purposes,
- * development of agreed protocols/techniques, and
- * identification of corollary research needs.

Incident

Monitoring activities in this phase include:

- * selection of monitoring activities to be undertaken in relation to incident (based on operations plan guidelines),
- * collection and provision of operational data (e.g. environmental conditions, updated predictions on threats, etc.),
- * implementation of recording **systems** for later evaluation activities (e.g. quantity of dispersant used, where and under what conditions, etc.),
- * formulation of hypotheses/questions for later evaluation in ongoing monitoring,
- * initiation of data collection programs for next phase (e.g. damage assessment), and
- * briefing and supervision of scientific workers who are not specifically involved in immediate response to avoid conflict **with** operations activities.

Post-Incident

Monitoring and related activities in this phase include:

- * **measurement** of impacts and **estimation** of damages for litigation purposes,
- * compilation of costs records for cost **recovery**,
- * assessment of recovery patterns and **processes** (may **be** linked with research projects, or could relate to assessment of efficacy of a particular **response** action),
- * development of **database** on spill impacts, **response techniques**, etc.,
- * reporting of information **derived** from **incident** and **dissemination** to other **SSCs**, and
- * revision of objectives, protocols, **operations procedures** for monitoring, etc.

These activities are indicative only and **require further** evaluation in the context of available resources and operational priorities. Their scope also suggests that the question of funding support for monitoring activities under the National Plan be clarified as a matter of urgency.

Conclusion

Monitoring is an important part of oil spill response. Responsibility for the design and implementation of monitoring activities **rests** largely with the SSC, by virtue of the expertise and resources available to the SSC.

For the SSC to effectively utilise monitoring as a tool for improving the adequacy and efficiency of spill response, a clear understanding of monitoring purposes and a formal commitment of support to meet those purposes is required. Contrary to the views of Lewis (1979), monitoring can make a difference in terms of both the level of impact and the costs which may result from future spills.

References

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