EVALUATION OF HISTORIC SPILL SITES FOR LONG-TERM RECOVERY STUDIES

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Reports on over 300 oil spill incidents were reviewed for the potential value of conducting followup surveys to obtain new or additional information related to the long-term effects of the spill or cleanup operation. A three-stage screening process enabled focusing on marine spills where impacts to the coastal zone were well documented, where spill size was over 1,200 barrels (50,200 gallons), and had occurred prior to 1987. A total of 36 candidate sites were put on the shortlist, of which 25 were rated as low priority, 9 as moderate priority, and 2 (Amoco Cadiz and Metula) as high priority for future study. This study hopes to elicit feedback concerning additional sites that have been overlooked or have additional merits for followup investigation.

Historically thousands of documented oil spills have occurred in the marine environment. Under the appropriate circumstances, many of these spills provide the opportunity to advance our scientific knowledge of long-term effects of oil as well as cleanup operations. This project, sponsored by the Marine Spill Response Corporation (MSRC), evaluated more than 300 incidents for the validity of scientifically resurveying historic oil spill sites to assist MSRC in their task of oil spill control and cleanup in the marine environment. Toward this end, special attention was given to sites where cleanup operations were utilized and may have affected, positively or negatively, the habitat(s) in which they were used. This project goes beyond other studies by specifically evaluating historic sites for future

study based on a series of criteria relating the site to feasibility of study and overall scientific value.

Methodology

Three stages of evaluation were used to select the most appropriate sites. The first collected background information on aquatic spills larger than 50,200 gallons (1,200 barrels) and which occurred prior to 1987. A total of 310 sites were found using written reports and available government and private databases.

The second stage involved application of criteria to separate probable candidate sites from those areas which, because of oil type, insufficient data, or spill location, would not be viable for further study. The criteria used to review each spill included oil type (unknown oil types were eliminated), impact location (inland and freshwater spills were eliminated), and available data (spills having limited or no information available were eliminated). A total of 36 spills remained after this stage.

The third stage involved a review of the material available for each spill and the application of additional evaluation criteria which included oiling information, cleanup information, habitats affected, previous scientific studies, other pollution sources, physical factors, site location and accessibility, information likely to be gained, and expected study costs. Each of the nine criteria was scored using a semiquantitative scale into five levels of appropriateness, having values of 1 to 5. The higher the value, the more appropriate for future study. The most appropriate spill site, therefore, had a value closest to 45.

After ranking of each spill, a description of each of the 36 sites and related scores using the evaluation criteria were circulated for comment to an international advisory panel composed of Jenifer Baker, Ed Gilfillan, Ed Owens, and David Page. The advisory panel used the ranking as a guideline, but not as a reason for rejecting any candidate site. This stage produced a list of final candidate sites and a summary of potential field surveys that would be of particular value. After selection of the site and appropriate studies, a detailed project study plan was prepared which included the following major topics: experimental design and planning, field procedures, laboratory procedures, and estimated costs. Coordination with other researchers and international liaison activities were included in the study plan.

Study results

The information derived from this process indicated that it was no longer appropriate to study any site in entirety because each site was commonly composed of many affected habitats, each of which reacted differently to spilled oil. Differences in oil impacts, cleanup methods and effects, and natural cleansing rates, all introduce high variability and reduce the potential for clearly defined results. Further study and the development of particular study plans were, therefore, focused on the analysis of individual habitats or specific parts of a habitat where background information is well known. Additionally, it was noted that certain spill sites require additional first-hand information before committing to a specific field program.

Based on numerical ratings and review by the advisory panel and MSRC, the 36 candidate sites were subdivided into three categories (Table 1): low priority candidate sites, none of which could be recommended for additional study for a variety of reasons; moderate priority candidate sites, which lacked recent information from which to determine whether or not to proceed with additional study; and high priority candidate sites having specific sites or habitats worthy of additional study. In Table 1, note that several of the moderate priority sites were found to need additional information (a reconnaissance survey and/or a literature review) prior to determining if additional study remains valid. The *Tanio* was considered a special case since the site can be evaluated as part of the high priority survey of the *Amoco Cadiz* site. The *Metula* was also considered of particular importance. Although no cleanup operations were performed, it was considered of high value due to the long-term persistence of oil.

Additionally note in Table 1, several highly ranked sites did not receive a "high" priority. The *Florida* site has already had several detailed and long-term investigations. The Bahia las Minas and the *Arrow* sites have also received extensive and recent evaluations. The *Arco Anchorage* has had previous reports indicating recovery and is seriously complicated by additional pollution sources.

For the two high priority sites, study plans were developed to provide data on questions related to oil cleanup techniques. Study topics related to the *Amoco Cadiz/Tanio* site include: impact of beach trenches on long-term oil persistence, impact of cleanup on coastal erosion, impact of cleanup on dunes and amenity areas, and impact of cleanup and restoration on marshes. Study topics meriting research at the *Metula* site include recovery of marsh vegetation as a function of oil thickness, factors influencing the natural removal of asphalt pavement, and long-term impact of asphalt pavement on ecology and geomorphology.

Author

Erich Gundlach has studied oil spills for over 18 years, and participated in the scientific evaluation of many of the largest spills to date. He has also developed many spill-related review studies, contingency plans, and environmental impact analyses, both in the United States and internationally.

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Table 1. Principal candidate sites, evaluation scores, and priority level for undertaking additional study

Spill Name and Date	Avg. Score	Priority Level
Amoco Cadiz 1978	35.8	High
Florida 1969	35.7	Moderate (RS)
Bahia Las Minas 1986	35.5	Low (NR)
Arco Anchorage 1985	34	Moderate (AI)
Arrow 1970	33.8	Moderate (AI)
Metula 1974	33.5	High
Zoe Colocotroni 1973	33.5	Moderate (RS)
Peck Slip 1978	30.7	Moderate (RS)

Amazon Venture 1986	30.5	Low (NR)
Tanio 1980	29.3	Moderate (with Amoco Cadiz)
Sivand 1983	29.2	Moderate (LR + RS)
Alvenus M/V 1984	28.2	Moderate (RS)
Esso Bernicia 1978	28	Moderate (LR)
Urquiola 1976	27.5	Low (NR)
Tsesis 1977	27.2	Low (NR)
Torrey Canyon 1967	27.2	Low (NR)
Ixtoc I Platform 1979	26	Low (NR)
Christos Bitas 1978	25.2	Low (NR)
Esso Bayway 1979	25	Low (NR)
Burmah Agate 1979	25	Low (NR)
Tamano 1972	24.7	Low (NR)
Barge *Bouchard 65* 1977	24.5	Low (NR)
Funiwa No. 5 Well 1980	24.2	Low (NR)
Dona Marika 1973	24	Low (NR)
Santa Barbara Platform A 1969	22.5	Low (NR)
Pericles 1983	22.5	Low (NR)
Mobiloil US-31,760 1984	22.5	Low (NR)
Lee Wang Zin 1979	22.5	Low (NR)
Hasbah 6 1980	22.3	Low (NR)
Eleni V 1978	20.3	Low (NR)
Argo Merchant 1976	21.3	Low (NR)
Jakob Maersk 1975	21	Low (NR)
Betelgeuse 1979	20	Low (NR)
Sansinena 1976	19.7	Low (NR)
Mizushima Refinery 1974	17.5	Low (NR)
Ekofisk Bravo 14 Platform 1977	14.5	Low (NR)

AI = Additional information required
LR = Literature review required
NR = Not recommended for further study
RS = Reconnaissance survey required